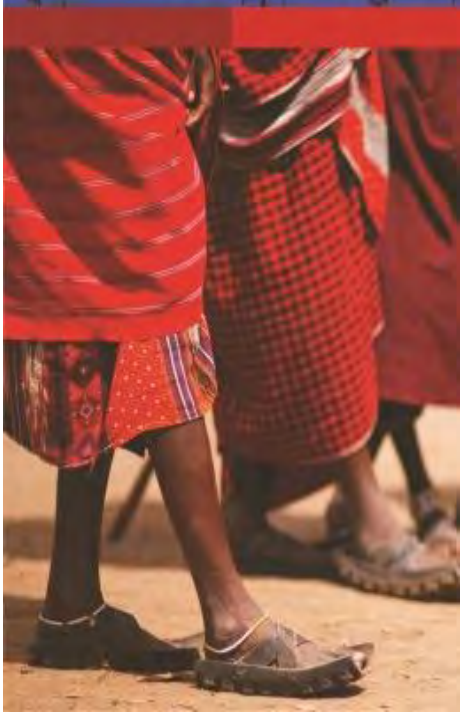

DIGBY WELLS
ENVIRONMENTAL

SAHIRS Case ID: 10852

Environmental Authorisation Process for the Establishment of Five Borrow Pits near Lephalale, Limpopo Province

Heritage Basic Assessment Report

Project Number:

LED4349

Prepared for:

Ledjadja Coal (Pty) Ltd

March 2017

Digby Wells and Associates (South Africa) (Pty) Ltd
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This document has been prepared by Digby Wells Environmental.

Report Type:	**Heritage Basic Assessment Report**
Project Name:	**Environmental Authorisation Process for the Establishment of Five Borrow Pits near Lephalale, Limpopo Province**
Project Code:	**LED4349**

Name	Responsibility	Signature	Date
Justin du Piesanie HRM Manager ASAPA Member 270	Report compilation		March 2017
Mel Pillay	ExCo Review		March 2017

DECLARATION OF INDEPENDENCE

Digby Wells and Associates (South Africa) (Pty) Ltd

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I, Justin du Piesanie as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Ledjadja Coal (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Heritage Resources Management (HRM) Process for the Environmental Authorisation Process in support of the Ledjadja Coal Borrow Pits Mining Permit Applications, located near Steenbokpan, Limpopo Province.

_____

Full Name:	Justin du Piesanie
Title/ Position:	Manager: HRM
Qualification(s):	MSc
Experience (Years):	11 years
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EXECUTIVE SUMMARY

Ledjadja Coal (Pty) Ltd (hereinafter Ledjadja Coal) intend to establish five borrow pits in support of construction of the approved railway line and road diversion associated with the Boikarabelo Coal Mine. The proposed locations of the various borrow pits occur outside of the approved Mining Right Area on properties owned by Resgen South Africa (Pty) Ltd and lawfully occupied by Ledjadja Coal.

To comply with the requirements of the National Environmental Management Act, 1998 (Act no. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations (2014), Environmental Authorisation (EA) is required prior to the implementation of construction activities associated with the borrow pits. As such, Ledjadja Coal has employed the services of Digby Wells Environmental (hereinafter Digby Wells) to complete the necessary Basic Assessment (BA) process and Environmental Management Plan (EMP) in support of EA application for the five borrow pits in accordance with the regulatory requirements. Commensurately the Project must demonstrate compliance to the provisions of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) in terms of Section 38(8).

The Scope of Work for this Heritage Basic Assessment Report (HBAR) was to comply with the requirements of Section 38(3) of the NHRA. A total of four (4) newly identified heritage resources, and two (2) previously identified heritage resources were located within the proposed development footprints and 100 m buffer of the borrow pits.

The table below summarises the identified heritage resources considered in this report, the designated Cultural Significance (CS), and minimum recommended mitigation measures.

Site Name	Designation	Recommended Field Rating	Field Rating Description	Recommended Mitigation
FC001	Negligible	General Protection IV C	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance	Sufficiently recorded, no mitigation required
SA001				
SA002				
SA003				
2327CA53				

Site Name	Designation	Recommended Field Rating	Field Rating Description	Recommended Mitigation
RES901/009	Medium	General Protection IV A	Resources under general protection in terms of NHRA sections 34 to 37 with Medium significance	Mitigation of resource to include detailed recording and mapping, and limited sampling, e.g. STPs.

The identified heritage resources with negligible cultural significance (CS), in accordance with the SAHRA minimum standards are considered to be sufficiently recorded, and no further mitigation measures are required. The identified heritage resource 2327/RES901/009 however, was recoded as a Middle Stone Age (MSA) site with a medium CS designation. The site was described as a high density MSA site associated with a natural seep where lithics were eroding from an “ouklip” layer. The fabric of the site was considered as intact with high information potential.

A summary of the assessment of the potential impacts to this resource is presented in the following table:

Code	Impact	Pre-mitigation:						Post-mitigation:					
		Duration	Extent	Intensity	Conse-quence	Probability	Signifi-cance	Duration	Extent	Intensity	Conse-quence	Probability	Signifi-cance
RES901/009	Direct impact, i.e. damage	Permanent	Province/ Region	Moderately high - negative	Highly detrimental	Highly probable	Moderate - negative	Permanent	Limited	Moderate - positive	Moderately beneficial	Unlikely	Minor - positive

Considering the results if this report, the following recommendations have been made:

- No further mitigation of sites FC001, SA001, SA002, SA003, and 2327CA53 is required;
- The site RES901/009 occurs within a 100 m buffer from the development footprint of BP 5 on Bitterfontein 272 LQ. To mitigate against any potential negative impacts to this site, the following specific recommendations are made:
  - A qualified and registered archaeologist must undertake surface sampling of the site with the necessary permits required in terms of Section 35 of the NHRA and Chapter III of GNR 548 prior to any earth moving activities associated with BP 5; and

- A Watching Brief by qualified archaeologist must be undertaken during the establishment of BP 5 to record and collect any exposed lithic material to preserve the site through record;

- A review of the geological context demonstrated that the site-specific study area of Loopleegte 302 LQ is underlain by lithostrigraphy that has a high palaeontological sensitivity rating. These sensitivities notwithstanding, and considering the nature of the Project, potential palaeontological impacts are considered to be low risk that can be managed through implementation of the approved Boikarabelo Coal Mine Chance Find Protocols (CFPs).

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1 Introduction

1.1 Project background

Ledjadja Coal (Pty) Ltd (hereinafter Ledjadja Coal), submitted a Mining Right Application (MRA) for the Boikarabelo Coal Mine to the Department of Mineral Resources (DMR) in 2010 for adjudication. Subsequent to the DMR submission in terms of Section 22 of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), Ledjadja Coal received approval of their application, and were issued with a Mining Right (LP30/5/1/2/2/169MR) for various farms within the Waterberg District, north of Steenbokpan in the Limpopo Province.

In accordance with the requirements of the MPRDA, Ledjadja Coal contracted the services of Digby Wells Environmental (hereinafter Digby Wells) to undertake the necessary Environmental Authorisations (EAs) for *inter alia*:

- The Boikarabelo Coal Mine;
- The Boikarabelo Power Station;
- Diversion of the district road D2286; and
- The Boikarabelo Railway.

In 2013 EA for the Boikarabelo Coal Mine and associated infrastructure was issued by the Limpopo Department of Economic Development, Environment and Tourism (LEDET) (Reference No. 12/1/9/2-W08) in respect of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and listed activities encapsulated in the NEMA Environmental Impact Assessment (EIA) Regulations (2010) (GN R 543).

The necessary authorisations are in place to construct the railway line and undertake the diversion of the district road D2286. To construct these infrastructures however, Ledjadja Coal will be required to establish five borrow pits on properties outside the approved Mining Right Area. This will require additional EAs as part of the greater Boikarabelo Coal Mine development.

1.2 Project description

Ledjadja Coal intend to establish five borrow pits in support of construction of the aforementioned approved railway line and road diversion. The proposed locations of the various borrow pits occur outside of the approved Mining Right Area on properties owned by Resgen South Africa (Pty) Ltd (hereinafter Resgen) and lawfully occupied by Ledjadja Coal. Both Ledjadja Coal and Resgen form part of the group of companies under Resource Generation Limited. Location details of the proposed borrow pits is presented in Table 1-1:

Table 1-1: Proposed borrow pit locations

Name	Total Footprint Size	Location
Rail borrow pit		
BP 3	5 ha	Loopleegte 302 LQ
BP 5	1.5 ha	Bitterfontein 272 LQ
Road borrow pits		
BRD 1	3.5 ha	Bitterfontein 272 LQ
BRD 3	5 ha	Vlughtkraal 273 LQ, Ptn1
BRD 5	5 ha	Kamiesbult 291 LQ, Ptn RE

Ledjadja Coal will establish the proposed borrow pits for the sole purpose of providing infill material for the rail and road diversion. Proposed specified activities include the following:

Table 1-2: Proposed specified activities

Phase	Description
Establishment	Site clearance and vegetation removal
	Establishment of access roads/tracks
	Topsoil stockpiling
Operational	Mining of the infill material
Decommissioning	The area will be reinstated by blending the borrow area with the surrounding area.
	Excess gravel material originating from operations will be spread within the borrow area prior to the placing of topsoil and grassing operations.
	Borrow areas will be shaped to drain to designated points.

The specified activities exceed thresholds published under GN R 983. To comply with the requirements of the NEMA EIA Regulations (2014), EA is required prior to the implementation of construction activities associated with the borrow pits.

1.3 Project location

The Project is located within the Waterberg Coalfield, some 72 km north-west of Lephalale in the Limpopo Province. The Boikarabelo Coal Mine and associated infrastructures fall within the Lephalale Local Municipality within the Waterberg District.

Table 1-3 presents a summary of the Project location details:

Table 1-3: Project location summary

Province	Limpopo
District Municipality	Waterberg District Municipality (WDM)
Local Municipality	Lephalale Local Municipality (LLM)
Nearest town	Steenbokpan / Lephalale
Name of property/ies	Bitterfontein 272 LQ; Kamiesbult 291 LQ, Ptn RE Loopleegte 302 LQ Vlughtkraal 273 LQ, Ptn1
Maximum extent of proposed development	BP 3 = 5 ha BP 5 = 1.5 ha BRD 1 = 3.5 ha BRD 3 = 5 ha BRD 5 = 5 ha
Current use	Agriculture / game farming
Predominant land use/s of surrounding properties	Agriculture / game farming / mining

1.4 Terms of reference

The Terms of Reference (ToR) are to complete the necessary Basic Assessment (BA) process and Environmental Management Plan (EMP) in support of EA application for the five borrow pits in accordance with the requirements of the NEMA and NEMA EIA Regulations (2014).

Commensurate to the national legislative framework, the Project must demonstrate compliance to the provisions of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) in terms of Section 38(8).

1.5 Scope of work

The Scope of Work (SoW) completed to comply with Section 38(3) of the NHRA included:

- (a): Identification and mapping of heritage resources in the affected area;
- (b): Determine the Cultural Significance (CS) of identified heritage resources and the greater cultural landscape;

- (c): Assess the identified potential impacts to heritage resources by project related activities;
- (d): Assess the identified potential impacts in relation to the socio-economic benefits that will be derived from the Project;
- (e): Present the result of consultation undertaken as part of the EA process;
- (f): Demonstrate the consideration of alternatives; and
- (g): Provide suitable management and/or mitigation measures or conditions of authorisations considering the determined CS and general protections in terms of the NHRA (Chapter II).

1.6 Expertise of the specialist

The expertise of the Heritage Resources Management (HRM) specialist is presented in Table 1-4:

Table 1-4: Expertise of the specialist

Team Member	Bio Sketch
Justin du Piesanie ASAPA Member 270 AMAFA Registered ICOMOS Member 14274 Years' Experience: 11	Justin is the HRM Manager at Digby Wells. Justin joined the company in August 2011 as an archaeologist and was subsequently made the HRM manager in the Social and Heritage Services Department. He obtained his Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. Justin also attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. Justin is a professional member of the Association of Southern African Professional Archaeologists (ASAPA), and accredited by the association's Cultural Resources Management (CRM) section. He is also a member of the International Council on Monuments and Sites (ICOMOS), an advisory body to the UNESCO World Heritage Convention. He has over 10 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, and NHRA Section 34 application processes. Justin has gained further generalist experience since his appointment at Digby Wells in Botswana, Burkina Faso, Cameroon, the Democratic Republic of Congo, Liberia, Mali and Senegal on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. Justin's current focus at Digby Wells is to develop the HRM process as an integrated discipline following international HRM principles and standards. This approach aims to provide clients with comprehensive, project-specific solutions that promote ethical heritage management and assist in achieving strategic objectives.

1.7 Structure of the report

The remainder of the report is structured as follows:

Table 1-5: Structure of the report

Chapter	Description
2	Outlines the relevant legal framework considered in the compilation of this assessment.
3	Identifies the specific constraints and limitations experienced in the compilation of this HIA
4	Describes the methodology employed in the data collection and impact assessment.
5	Provides a cultural heritage baseline for the defined study areas to provide the reader with contextual information.
6	Outlines identified impacts and assesses the intensity of predicted heritage impacts
7	Categorises cumulative impacts on the cultural landscape that may manifest due to various existing and proposed developments in the local study area.
8	Highlights potential unplanned events and low risks that may manifest as potential future impacts.
9	Examines identified heritage impacts against the sustainable socio-economic benefits of the Project.
10	Describes the current status of the consultation process for this Project.
11	Collates the most salient points of the heritage assessment and concludes with the specific outcomes and recommendations of the study.
12	Lists the source material used in the development of the report.

2 Legislative and policy framework

The HRM process is governed by the national legislative framework. This section provides a brief summary of the relevant legislation pertaining to the conservation and responsible management of heritage resources.

Table 2-1: Applicable legislation considered in the HRM process

Applicable legislation used to compile the report	Reference where applied
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – i. Prevent pollution and ecological degradation; ii. Promote conservation; and iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.	The HRM process is being undertaken to identify heritage resources and determine heritage impacts associated with the project. As part of the HRM process, mitigation measures and monitoring plans will be recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
National Environmental Management Act, 1998 (Act No. 107 of 1998) The NEMA, as amended, was set in place in accordance with Section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making on issues affecting the environment. Section 24 (1)(a), (b) and (c) of NEMA state that: *The potential impact on the environment, socio-economic conditions and cultural heritage of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended.	The BA process is being undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA Regulations, 2014, promulgated in terms of NEMA.

Applicable legislation used to compile the report	Reference where applied
GN R. 982: Environmental Impact Assessment Regulations, 2014 These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes: ▪ Regulation GN R. 983 - Listing Notice 1: This listing notice provides a list of various activities that require environmental authorisation and that must follow a basic assessment process. ▪ Regulation GN R. 984 – Listing Notice 2: This listing notice provides a list of various activities that require environmental authorisation and that must follow an environmental impact assessment process. ▪ Regulation GN R. 985 – Listing Notice 3: This notice provides a list of various environmental activities that have been identified by provincial governmental bodies that if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	Proposed specified activities exceed thresholds contained within GN R 983 – Listing Notice 1. The HBAR specifically, was compiled to comply with the requirements of Appendix 1: Basic Assessment Process Section 2(d) and 3(1)(h)(iv) and (vii) of GN R. 983.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa, with specific reference to the following Sections: ▪ 5. General principles for HRM; ▪ 6. Principles for management of heritage resources; ▪ 7. Heritage assessment criteria and grading; and ▪ 38. Heritage resources management. The Act requires that Heritage Resources Authorities (HRAs), in this case the South African Heritage Resources Agency (SAHRA) and the Limpopo Provincial Heritage Resources Authority (LIRHA), be notified as early as possible of any developments that may exceed certain minimum thresholds in terms of Section 38(1), or when assessments of impacts on heritage resources are required by other legislation in terms of Section 38(8) of the Act.	A Notice of Intent to Develop (NID) will be submitted, as part of this HBAR to the SAHRA and LIHRA. The HBAR was compiled to comply with subsection 3(3)(a) and (b) of the NHRA.

Table 2-2: Applicable policies considered in the HRM process

Applicable policies used to compile the report	Reference where applied
South African Heritage Resources Agency (SAHRA) Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports (2007) The Minimum Standards provide the minimum standards that must be adhered to for the compilation of a HIA Report. Chapter II Section 7 outlines the minimum requirements for inclusion in the heritage assessment as follows: ▪ Background information on the Project; ▪ Background information on the cultural baseline; ▪ Description of the properties or affected environs; ▪ Description of identified sites or resources; ▪ Recommended field rating of the identified sites to comply with Section 38 of the NHRA; ▪ A statement of Cultural Significance in terms of Section 3(3) of the NHRA; and ▪ Recommendations for mitigation or management of identified heritage resources.	The HBAR was compiled to adhere to the minimum standards as defined by Chapter II of the SAHRA APM Guidelines (2007)

3 Constraints and limitations

The following constraints and limitations were considered in the compilation of this report:

- The local study area is generally covered by windblown sand affiliated with Regic sands of the Namib form. This extensive coverage of sand imposed a visual limitation with regards to the extent material culture could be identified during the pre-disturbance survey; and
- Archaeological sites commonly occur at sub-surface levels with no or limited trace evidence on the surface. To investigate the potential of subsurface occurrences, a permit regulated under Section 35 of the NHRA is required. No Section 35 permits to investigate possible sub-surface were held by the specialists, as this normally forms part of a Phase 2 investigation. As such, it is possible that archaeological sites may be identified during the construction and operational phase of the Project.

4 Methodology

The HBAR provides a brief Project background and cultural heritage baseline to contextualise the defined CS, assigned Field Ratings, and potential heritage risk and impacts identified. This information further enables the relevant heritage authorities to

specify any restrictions or additional requirements for inclusion in the EMP. This section describes the activities used to develop the cultural heritage baseline profile, CS, Field Ratings and impact assessment.

4.1 Defining the study area

Heritage resources do not exist in isolation to the greater natural and social (including socio-cultural, -economic and -political) environments. In addition, the NHRA requires the grading of heritage resources in terms of national, provincial and local concern based on their importance and consequent official (i.e. State) management effort required. The type and level of baseline information required to adequately predict heritage impacts varies between these categories. Four 'concentric' study areas were defined for the purposes of this study. The four defined study areas included the following:

- The *development footprint* area – the immediate boundaries of the proposed borrow pits, i.e. BP3, BP5, BRD1, BRD 3 and BRD 5;
- The *site-specific* study area – the extent of the farm portions associated with the proposed project including a 500 m buffer area. These include Bitterfontein 272 LQ, Kamiesbult 291 LQ, Loopleegte 302 LQ and Vlughtkraal 273 LQ. The site-specific study area may extend linearly. In such instances, the defined site-specific study area includes the linear development, e.g. a road, and a 200 m buffer either side of the development footprint;
- The *local* study area – the area most likely to be influenced by any changes to heritage resources in the project area, or where project development could cause heritage impacts. Defined as the immediate surrounding properties / farms, as well as the affected local municipality. The local study area was specifically examined to offer a backdrop to the socio-economic conditions within which the proposed development will occur. The local study area furthermore provided the local development and planning context that may contribute to cumulative impacts; and
- The *regional* study area – defined as the area bounded by the district municipal demarcation. Where necessary, the regional study area was extended outside the boundaries of the district municipality to include much wider regional expressions of specific types of heritage resources and historical events. The regional study area also provided the regional development and planning context that may contribute to cumulative impacts.

4.2 Data collection

4.2.1 Primary data collection

Primary data was collected by Justin du Piesanie through a pre-disturbance survey of the various development footprint areas and site-specific study area from 6 – 7 February 2017. A second pre-disturbance survey was undertaken on 3 March of the development footprint of BRD 1. The survey objectives were to:

- Visually record the current state of the cultural landscape; and
- Ground truth certain heritage resources and sites known to occur within the site-specific study area; and
- Record tangible heritage resources situated within the boundaries of the various development footprint areas.

Identified heritage resources were recorded as waypoints using handheld GPS and documented through written and photographic records. The actual survey was recorded as track logs.

The heritage pre-disturbance survey was conducted as an unstructured, non-intrusive (*i.e. no sampling*) pedestrian survey. The heritage specialist however, was accompanied by a pedological specialist who completed several Auger Test Pits (ATPs) within the development footprint areas for soil sample collection. The ATPs collected soils samples to a maximum depth of ~1.2 m. Soils samples were inspected by the heritage specialist to assess the potential presence of archaeological deposit or material culture.

Figure 4-1: Examples of ATP within the development footprints

4.2.2 Secondary data collection

Data collection assists in the development of a cultural heritage baseline profile of the study area under consideration. Qualitative data was collected to inform the HBAR and primarily obtained through secondary information sources, i.e. desktop literature review and historical layering.

Secondary data collection, in this instance, primarily utilised information collected by Digby Wells from various studies completed for the Boikarabelo Coal Mine[1] and relevant applications on surrounding properties. The cultural heritage baseline profile presented

[1] Refer to SAHRIS Case IDs: 177, 601, 1074, 2123, 6249 and File Reference 9/2/253/0003 available at http://www.sahra.org.za/sahris/sahris

herein collates information from a diverse range of repositories. The objectives of the literature review were to:

- Present an abbreviated description of the cultural landscape within which the Project is located; and
- Identify any potential fatal flaws, sensitive areas, current social complexities / issues and known or possible tangible heritage.

Repositories that were surveyed included the SAHRIS, online / electronic journals and platforms, and certain internet sources. This HBAR only includes a summary and discussion of the most relevant findings. Relevant sources were cited and included in the literature review's reference list.

Additionally, historical layering was completed for the project area and aimed to identify historical heritage resources within the project area. Historical layering is a process whereby diverse cartographic sources from various time periods are layered chronologically using Geographic Information System (GIS). The rationale behind historical layering is as follows:

- Provides relative dates based on the presence/absence of visible features; and
- Identifies potential locations where heritage resources may exist within an area.

Cartographic sources referred to in this report are listed in Table 4-1 below.

Table 4-1: Relevant reviewed cartographic sources

Historical Maps						
Map Series		**Name/Number**			**Date**	
Fairview Drawings		Palala-Mouth Transvaal Degree Sheets			1902 - 1909	
Aerial Photographs						
Job No.	**Flight Plan**	**Photo no.**	**Map ref.**	**Area**	**Date**	**Reference**
216	14	00947 - 00948	2327	Krokodilrivier/Mokolo (Mogol)	1949	1949/216
	15	1023, 01031, 01033, 01034 and 01035				

4.3 Site naming convention

Heritage resources identified by Digby Wells during the field survey were prefixed by the SAHRIS case identification generated for this Project. Information on the relevant period / feature code and site number followed (e.g. 10852/BGG-001). This number may be shortened on plans or figures to the period / feature code and site number (e.g. BGG-001).

Heritage resources identified through secondary data collection were prefixed by the relevant SAHRIS case or map identification (*where applicable*), and the original site name used by the author (e.g. 138/Site1).

4.4 Developing Cultural Significance and Field Ratings

4.4.1 Cultural Significance

CS was determined based on identified resources' importance or contribution to four broad value categories: aesthetic, historical, scientific and social values. These categories summarised the CS and other values described in Section 3(3) of the NHRA. The resources' importance or contributions to these values were considered in terms of associative (qualitative) and / or rarity (quantitative) attributes, based on collected secondary data.

The integrity or condition of resources further influenced the CS. Integrity is largely determined based on resources' current, observed state of conservation, as well as notable changes made to it over the years.

4.4.2 Field Ratings

Field ratings assist the responsible heritage resources authority to grade heritage resources into national (Grade I), provincial (Grade II) or local (Grade III) categories, and are required under Chapter II Section 7(J) of the SAHRA Minimum Standards.

Field ratings considered the assigned CS and the level of official management required or the local competency of heritage authorities[2].

4.5 Defining heritage impacts

Project activities can impact on heritage resources in a number of ways. For instance, although identified heritage resources may not be physically (i.e. directly) affected by project activities, the same activities could impact on the intangible nature of heritage resources.

An example that best illustrates the complexity of heritage impacts is where burial grounds occur within the site-specific project area, but will not be physically affected by any project activities. Access to such sites by descendants of the deceased or other parties may be restricted or lost; the intangible heritage associated with graves as places of memory, ritual, identity, etc., can therefore be impacted without actual, physical impact on the sites. Such impacts may manifest in social repercussions.

Heritage impacts are further compounded when the intensity of predicted impacts and the assigned CS of heritage resources differ significantly. Again, burial grounds are the best

[2] Currently LIHRA is only competent to manage and issue permits on NHRA Section 34 heritage resources, and no local (i.e. local government) competency exists within the province. All decisions relating to archaeology, palaeontology and burial grounds and graves therefore fall under the ambit of SAHRA.

example. These resources are generally considered to be of very high CS; even low ranked impacts may therefore be detrimental to their tangible and intangible conservation.

Predicted heritage impacts were therefore placed into the following three broad categories (adapted from Winter & Bauman 2005: 36):

- **Direct or primary heritage impacts** that could change the fabric or physical integrity of heritage resources: for example, destruction of an archaeological site or historical building. Direct or primary impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense, but can often be erroneously assessed as high-ranking if the CS of sites are not considered;
- **Indirect, induced or secondary heritage impacts** that can change the fabric or intangible quality of heritage resources later in time or at a different place from the causal activity (e.g. descendants of deceased), or as a result of a complex pathway. For example, restricted access to a heritage resource resulting in the gradual erosion of its cultural significance that may be dependent on ritual patterns of access. Although the physical fabric of the resource is not affected through any primary impact, its significance is affected that can ultimately result in the loss of the resource itself.
- **Cumulative heritage impacts** that change the CS and integrity of heritage resources due to in-combination effects on heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be:
  - **Additive**: the simple sum of all the effects, e.g. the total number of development activities that will occur within the study area.
  - **Synergistic**: effects interact to produce a total effect greater than the sum of the individual effects, e.g. the effect of each different activity on the archaeological landscape in the study area.
  - **Time crowding**: frequent, repetitive impacts on a particular resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building.
  - **Neutralizing**: where the effects may counteract each other to reduce the overall effect, e.g. the effect of changes in land use could reduce the overall impact on sites within the archaeological landscape of the study area.
  - **Space crowding**: high spatial density of impacts on a heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

5 Cultural heritage baseline

This section provides an abbreviate description of the cultural landscape commensurate to the known heritage resources within the local study area. The local study area comprises the following heritage resource types:

Table 5-1: Number of previously identified heritage resources within the local study area

Heritage Resource Type	Number identified
Archaeological – Middle Stone Age (MSA)	103
Archaeological – Late Stone Age (LSA)	3
Archaeological – Early Farming Community (EFC)	2
Archaeological – Late Farming Community (LFC)	97
Burial Grounds & Graves	27
Historical Built Environment	38
Grand Total	**270**

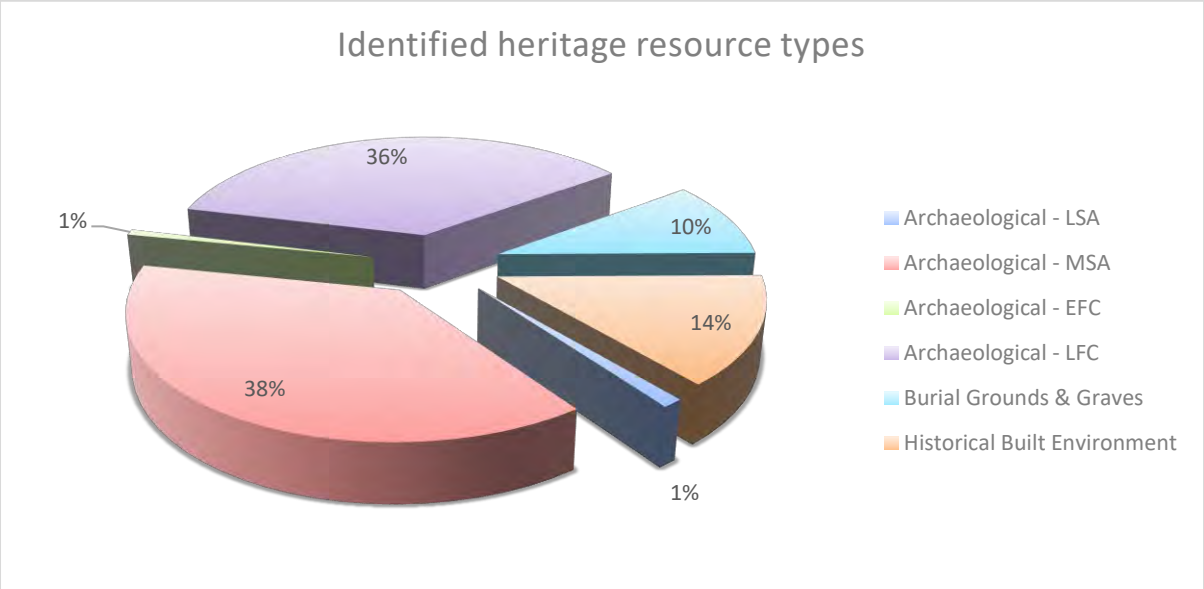

Figure 5-1: Dominant heritage resource types within the local study area

As demonstrated, the cultural landscape is predominantly associated with an archaeological (*comprising 76% of identified heritage resources*) and historical farming landscape (*comprising 24% of identified heritage resources*). Accordingly, the following baseline description focusses on the archaeological context of the Project to inform the development of CS and guide the recommendations presented in Section 11 below

5.1 Current natural environment

The local study area has a topography of gentle rolling plains that dip toward the Limpopo River valley to the west and north. Several water courses and pans are associated with the Limpopo River floodplain. The vegetation comprises tall open to low woodlands of the Western Sandy Bushveld. Characteristic flora includes *Acacia erubescens* on flat areas, *Combretum apiculatum* on shallow soils and *Terminalia sericea* on deep soils (du Piesanie & Nel, 2017).

Figure 5-2: Example of the current state of the natural environment

5.2 Geology and palaeontological sensitivities

To comply with the requirements of SAHRA[3], this section considers the specific geology and palaeontological sensitivities of the site-specific study areas.

Regionally, the geology is characterised by lithostrigraphic units of the Karoo Supergroup ranging in age from Late Carboniferous (~ 320 Million year ago [Ma]) to Middle Jurassic (~ 170 Ma). Locally, the study area is dominated by the *Wellington and Swartrant Formation* of the Dwyka and Ecca Groups respectively.

The *Wellington Formation* is the dominant lithology on the farms Vlugtkraal, Kamiesbult and Bitterfontein. It is characterised by dark-grey, horizontally laminated mudstone and siltstone. Based on the nature of the Project, and the designated low palaeontological sensitivity, this formation is not considered further in this assessment.

[3] The requirements are available at http://www.sahra.org.za/sahris/map/palaeo

The *Swartrant Formation*, comprises a lower, middle and upper zone, stretching from the north of the immediate study area in a south-easterly fashion, and is extensively present on the farm Loopleegte.Stratigraphically, it is theorised that the *Swartrant Formation* is closely interlinked with the *Goedgedacht Formation,* a recognised paleontologically sensitive lithostrigraphic unit characterised by coal seams (Johnson, et al., 2006). These strata are expected to include abundant Glossopterid coal flora associated with thick coal seams.

Stratigraphy & Age				Sensitivity	Fossil types	Rock types
KAROO SUPERGROUP	Jurassic	Stormberg Group	Clarens Formation	High	Silicified wood; plant remains; freshwater crustaceans; primitive bony fish; invertebrate trace fossils; rare dinosaurs *e.g.* Massospondylus; crocodylomorphs; advanced cynodonts including early mammals, *e.g. Erythrotherium;* dinosaurs and mammal track ways; coprolites; eggshell fragments.	Aeolian desert sandstone ("Cave Sandstone") Aeolian (wind-blown) sand, minor playa lake, ephemeral stream deposits, basaltic lava flows.
	Triassic	Beaufort Group	Lisbon Formation	Low	No coals (probably Beaufort Group. or Elliot / Molteno equivalents)	Dominantly massive mudstone and siltstone
			Greenwich Formation	Low	No coals (probably Beaufort Group. or Elliot / Molteno equivalents)	Medium- to coarse-grained sandstone & granulestone
			Eendragtpan Formation	Low	No coals (probably Beaufort Group. or Molteno equivalents)	Variegated mudrock of arid floodplains
	Permian	Ecca Group	Grootegeluk Formation	Very High	Glossopterid coal flora abundant; associated with thick coal seams.	Numerous thick coal seams, carbonaceous shale and mudstone
			Goedgedacht Formation	Very High	Glossopterid coal flora abundant; associated with thick coal seams.	Mudstone, sandstone, coal within proglacial alluvial fans, braided streams.
			Swartrant Formation	High	Glossopterid coal flora abundant; associated with thick coal seams	Alternating sandstone, siltstone, mudstone with interspersed coal seams
			Wellington Formation	Low	No information available on SAHRIS	Dark-grey mudstone & siltstone becoming lighter-coloured upwards
	Carboniferous	Dwyka Group	Waterkloof Formation	Low	Trace; organic-walled micro; rare marine invertebrates (*e.g.* molluscs), fish, vascular plants; inter- and post-glacial trace fossil assemblages.	Glacial, inter- and post-glacial siliciclastic sediments (*e.g.* tillite).

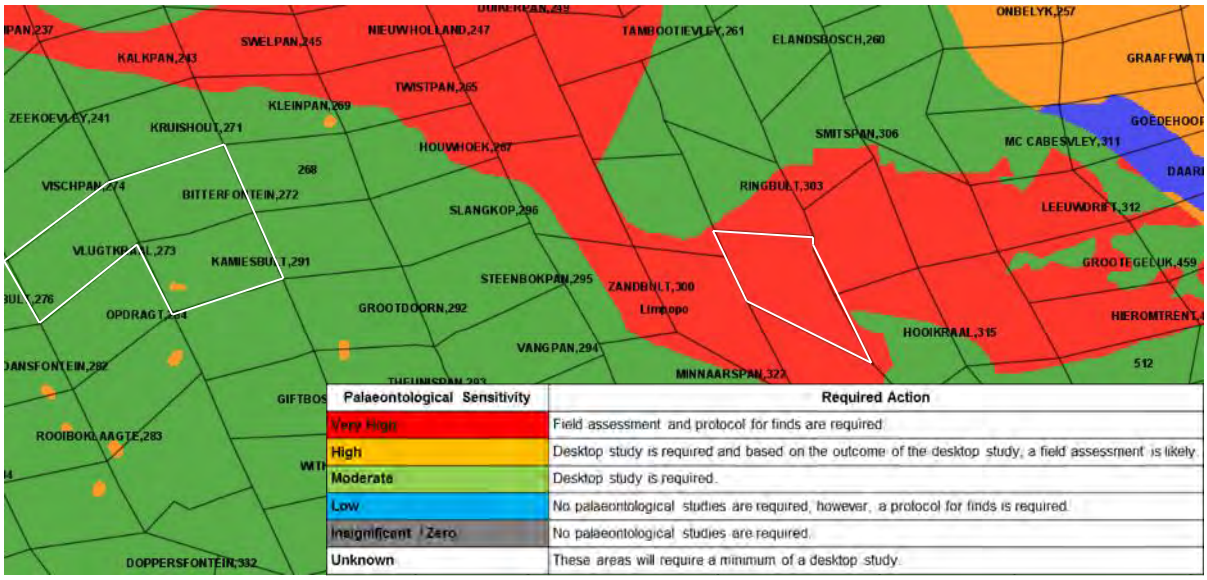

Figure 5-3: Palaeontological sensitivity of site-specific study area of various borrow pit locations (site-specific study areas in white)

5.3 Archaeological context

Extensive heritage surveys[4] and archaeological assessments within the local study area have been undertaken by Digby Wells. The results of these studies demonstrate that the local study area is associated with an archaeological context ranging from the MSA through to the LFC period.

The MSA dates from ~300 000 years ago (kya) to 20 kya. It is marked by a significant trend in the manufacture of the tools to smaller dimensions and increasing variety when compared to the Early Stone Age. In Southern Africa the earliest MSA industries are characterised by high proportions of minimally modified blades, represented by the Levallois technique. Regional traditions become more varied with a greater degree of local differentiation, making the Southern African MSA difficult to interpret (Clark, 1982). Modern humans – *Homo sapiens sapiens* – appear during the MSA as well as the origins of culture and language. The exponential increase in human cognitive abilities (*abstract thinking*) is evident in the increased complexity of the stone tools created and the development of symbolic actions such as personal adornment, art and mortuary practice (Henshilwood, d"Errico, Marean, Milo, & Yates, 2001; Mitchell, 2002).

Within the local study area, the MSA is represented by isolated surface find spots (*32 recorded, 2 of which are embedded in rock matrix*), low density surface scatters (*66 recorded*), medium density surface scatters (*3 recorded*) and a single site with multiple components.

[4] Refer to SAHRIS Case IDs 177, 601, 1074, 2123, 6249, 8728, 10767 and File Reference 9/2/253/0003 (Available at http://www.sahra.org.za/sahris/sahris)

The MSA is followed by the LSA period dating to ~20 kya to 1840. In comparison to the MSA industries, LSA tool technology comprises specific tool created for specific purposes. Associated sites commonly contain diagnostic artefact such as microlithic scrapers and segments. In a southern African context, the LSA is closely associated with hunter-gatherer groups, such as the San. Due to the nomadic nature of LSA people, open sites are difficult to identify and usually poorly preserved (Mitchell, 2002).

Within the local study area, three LSA heritage resources have been recorded. These consisted of one isolated find spot and two low density surface scatters.

It is also within the LSA period that the San hunter-gatherers came into contact with groups migrating (*Bantu-speakers*) into southern Africa. Archaeologically, the Bantu-speaking groups are affiliated with farming community period settlements, broadly divided into the EFC and LFC periods. Within the local study area, these migrations are specifically associated with the movements and settlement during the LFC period, dating from approximately the 14th century through to the colonial period. These migrations were necessitated by the need for natural resources, gradually resulting in the encroachment and colonisation of traditional hunter-gatherer territories, ultimately resulting in the subjugation of hunter-gatherer groups, or forcing them into more marginal areas (du Piesanie & Nel, Phase 2 Archaeological Impact Assessment Mitigation for the Boikarabelo Coal Mine (SAHRA PERMIT NO 80/11/07/015/51), 2012).

Common tangible identifiers for LFC sites are ceramics and evidence of domesticated animals, specifically cattle through dung or faunal remain deposits. Through a method of ceramic seriation[5], and supported by the results of Phase 2 archaeological assessments completed by Digby Wells (du Piesanie & Nel, Phase 2 Archaeological Impact Assessment Mitigation for the Boikarabelo Coal Mine (SAHRA PERMIT NO 80/11/07/015/51), 2012), possible ceramic facies related to the Moloko branch. Of the LFC sites where ceramic facies have been documented, seven (87%) have been attributed to the *Letsibogo facies*, and one (13%) to the *Madikwe facies* of the Moloko branch. These two facies appear in the archaeological record from approximately 1500 common era (CE). Both are intermediate between the *Icon* parent facies and historical types such as *Buispoort* that is later associated with western Sotho-Tswana identity (Huffman T. N., 2007). These facies differ stylistically based on decoration technique: *Letsibogo* emphasises punctates as opposed to stabs and fingernail impressions in *Madikwe* (Huffman T. N., 2007; Beimond, 2012).

Analysis of excavated material from the Boikarabelo Phase 2 archaeological mitigations however, was inconclusive in the verification of the ceramic affinities. Key features that were identified include rim notching and the presence of short neck jars and constricted vessels

[5] Further readings include Huffman (1980) and Phillipson (1977)

(Beimond, 2012). These features, though not exclusive, suggest that the ceramics can be associated with Kwena[6] ceramics from the 18th and 19th century.

5.4 Historical period

The historical period is commonly associated with contact between Europeans with LFCs, and consequent *written* records. The closest large town is Lephalale which was established in 1960. It was originally called Ellisras after the two original farm owners Patric Ellis and Piet Erasmus who settled in the area in the 1930's (Lephalale Municipality, 2013).

In an excerpt from the Transvaal Fairdrawings Map (1902-1909) (Figure 5-4), occupation of the general area is evidenced by several routings through the various farms considered in this assessment. With the exception of a store indicated on the banks of the Limpopo River to the northwest of the site specific study area, no significant towns, settlements or infrastructures are indicated. This assessment is supported by historical imagery dated to 1949, where no historical structures that may be protected in terms of Section 34 of the NHRA existed (Refer to Figure 5-5 through Figure 5-8).

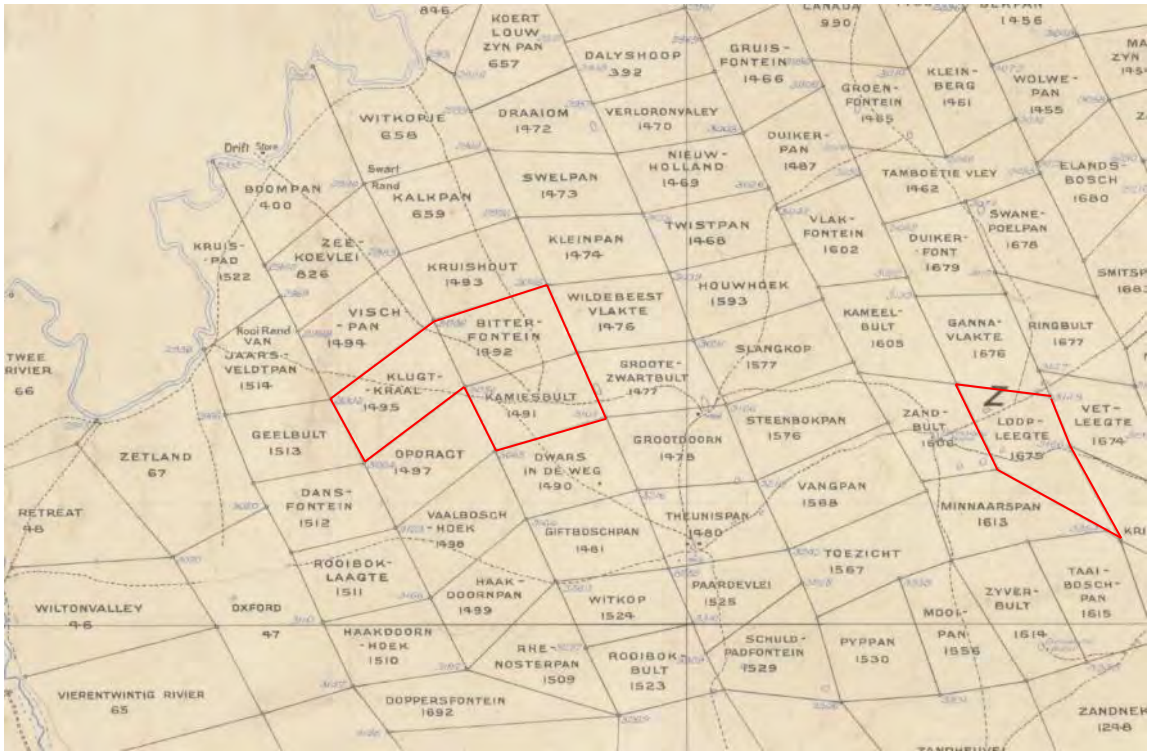

Figure 5-4: 1902 – 1909 map. Site-specific study areas indicated in red.

[6] For detailed discussion of the ethno-archaeological context, please refer to Section 9.1.2 of the Phase 2 Archaeological Impact Assessment (du Piesanie & Nel, 2012) available at http://www.sahra.org.za/sahris/cases/boikarabelo (Case ID 177)

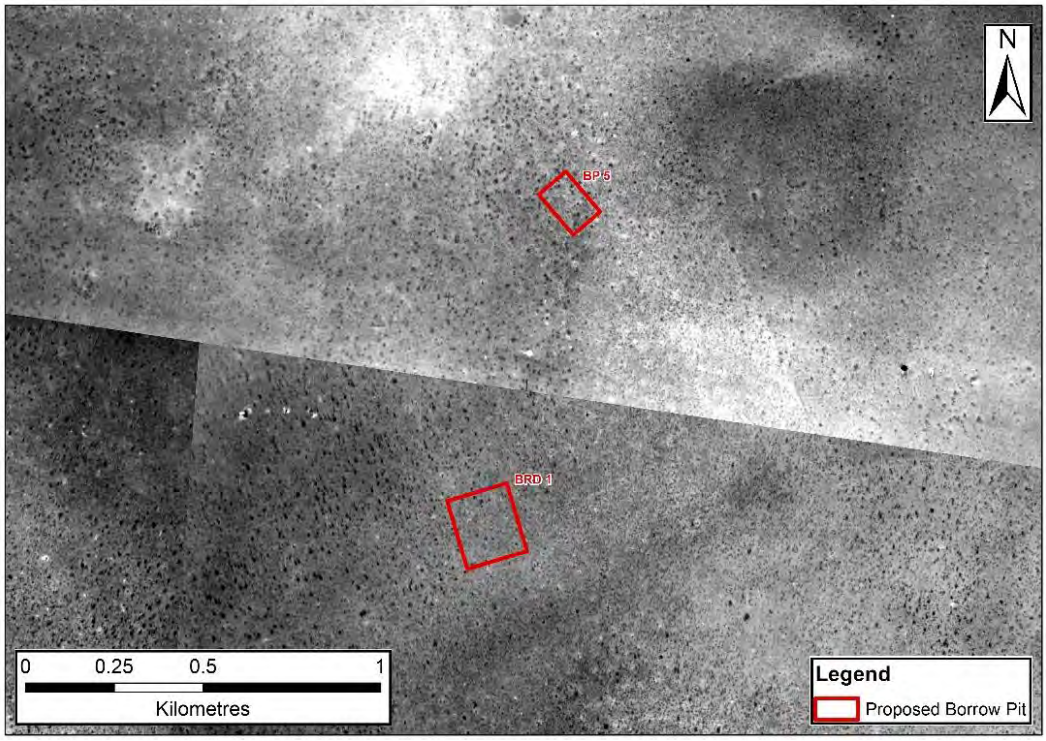

Figure 5-5: Aerial imagery for BRD 1 and BP 5 on Bitterfontein dated 1949

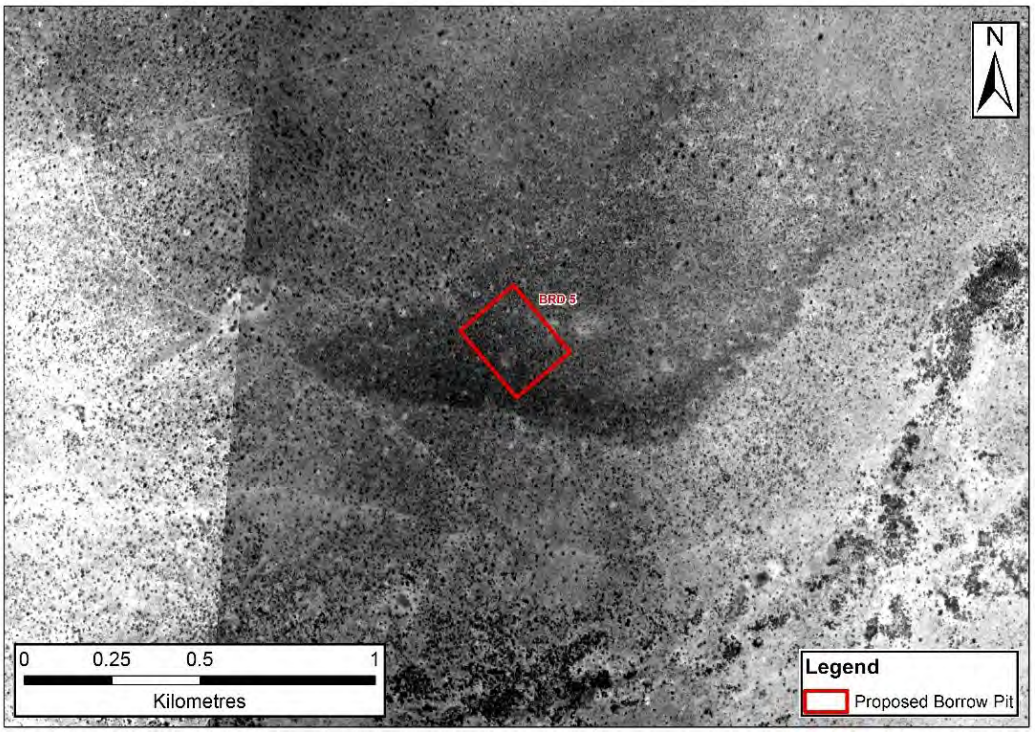

Figure 5-6: Aerial imagery for BRD 5 on Kamiesbult dated 1949

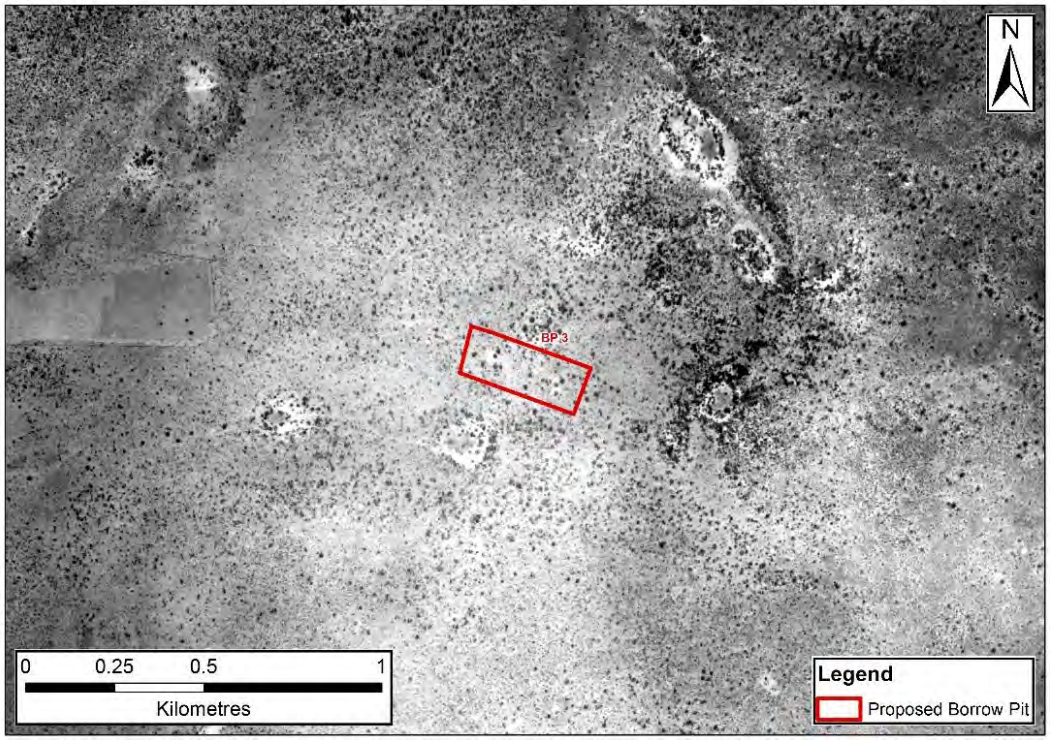

Figure 5-7: Aerial imagery for BP 3 on Loopleegte dated 1949

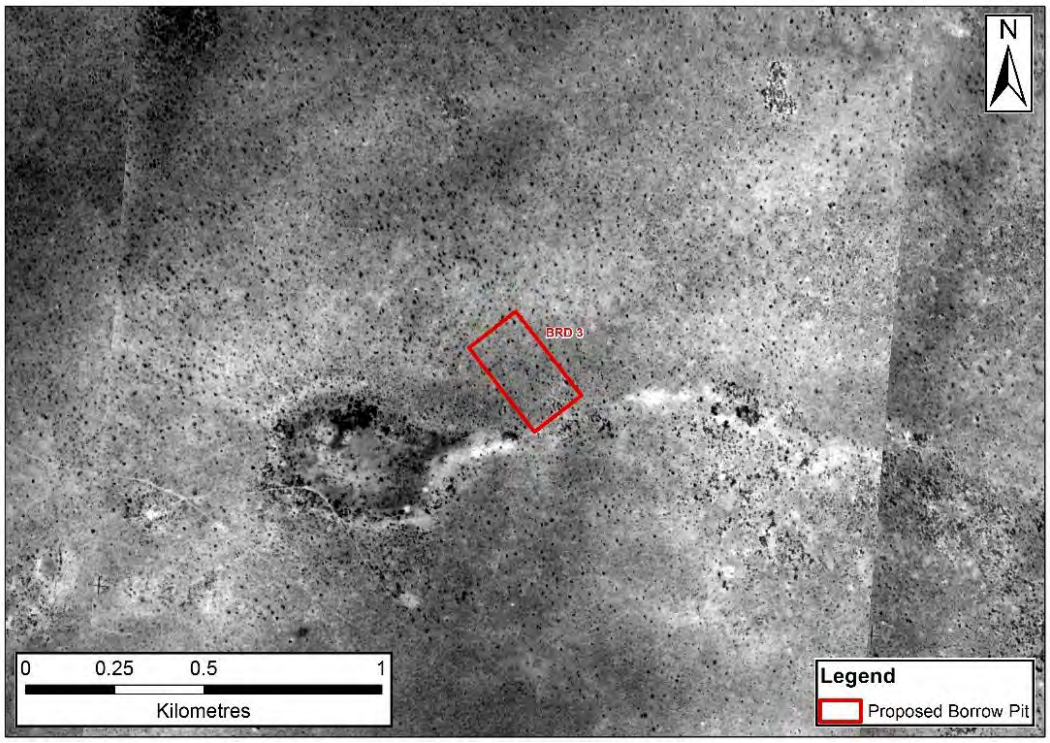

Figure 5-8: Aerial imagery for BRD 3 on Vlughtkraal dated 1949

Considering the previously recorded heritage resources within the local study area, 65 historical period resources have been recorded. These comprise of 27 burial grounds and graves and 38 historical built environment resources. No historical resources however, were recorded within or immediately surrounding the development footprint areas.

5.5 Results of the pre-disturbance survey

The results of the pre-disturbance survey are presented in Table 5-2:

Table 5-2: Results of the pre-disturbance survey

Site Name	Latitude	Longitude	Description	Photographs
10852/FC001	-23.673360	27.201121	An isolated find spot. Single, undiagnostic potsherd. No other visible surface features identified within proximity.	
10852/SA001	-23.674211	27.199872	Low density surface scatter. Undiagnostic flakes, and one possible core. Temporally associated with the MSA.	
10852/SA002	-23.672753	27.199860	Low density surface scatter. Undiagnostic flakes. Temporally associated with the MSA.	
10852/SA003	-23.666393	27.145874	An isolated find spot. Single, undiagnostic flake. Temporally associated with the MSA.	

Table 5-3: CS designation[7] of identified heritage resources and recommended mitigation measures in accordance with the SAHRA minimum standards (SAHRA, 2007)

Site Name	Aesthetic	Historic	Scientific	Social	INTEGRITY	VALUE	Designation	Recommended Field Rating	Field Rating Description	Recommended Mitigation
FC001	1	0	1	0	0	0	Negligible	General Protection IV C	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance	Sufficiently recorded, no mitigation required
SA001	1	0	1	-	0	0				
SA002	1	0	1	-	0	0				
SA003	1	0	1	-	0	0				

[7] The report also considered previously identified heritage resources within a 100 m buffer of the borrow pit development footprints. These consisted of 2327/RES901/009 with a medium CS rating (Nel, 2011) and 2327CA53 with a negligible CS (WITS, 2010).

6 Impact assessment

6.1 Cultural Significance

The assigning of CS to the identified heritage resources considered the methodology presented in Section 4.4. The assigned designations guide the impact assessment and recommendations for the appropriate mitigation and / or management measures to adhere to the published SAHRA minimum standards (SAHRA, 2007).

The identified heritage resources were assessed on aesthetic, historic and scientific criteria. These resources were deemed to exhibit attributes that could be considered in particular dimension, but are also common and well represented throughout various landscapes. The integrity of these resources however, are considered to be broken, where the original setting is completely lost and information potential does not exist.

The assessment of the CS as presented in Table 5-3: CS designation of identified heritage resources and recommended mitigation measures in accordance with the SAHRA minimum standards Table 5-3 indicates the identified heritage resources have a CS designation of negligible.

6.2 Heritage Impact Assessment

6.2.1 Bitterfontein 272 LQ

Two borrow pits will be established on the farm Bitterfontein 272 LQ. These comprise of BP 5 and BRD 1. No heritage resources were identified within the development footprint and 100 m buffer of BRD 1. This borrow pit is not considered further in this assessment.

One previously identified heritage resources occurs within the 100 m buffer of BP 5, ~20 m to the west of the development footprint boundary. The identified heritage resource, 2327/ RES901/009 was recoded as a MSA site with a medium CS designation. The site was described as a high density MSA site associated with a natural seep where lithics were eroding from an “ouklip” layer. The fabric of the site was considered as intact with high information potential (Nel, 2011).

Based on the location of the identified resource, it may be directly impacted upon by the specified activities presented in Table 1-2. An assessment of the possible direct impact to 2327/RES901/009 is presented in Table 6-1.

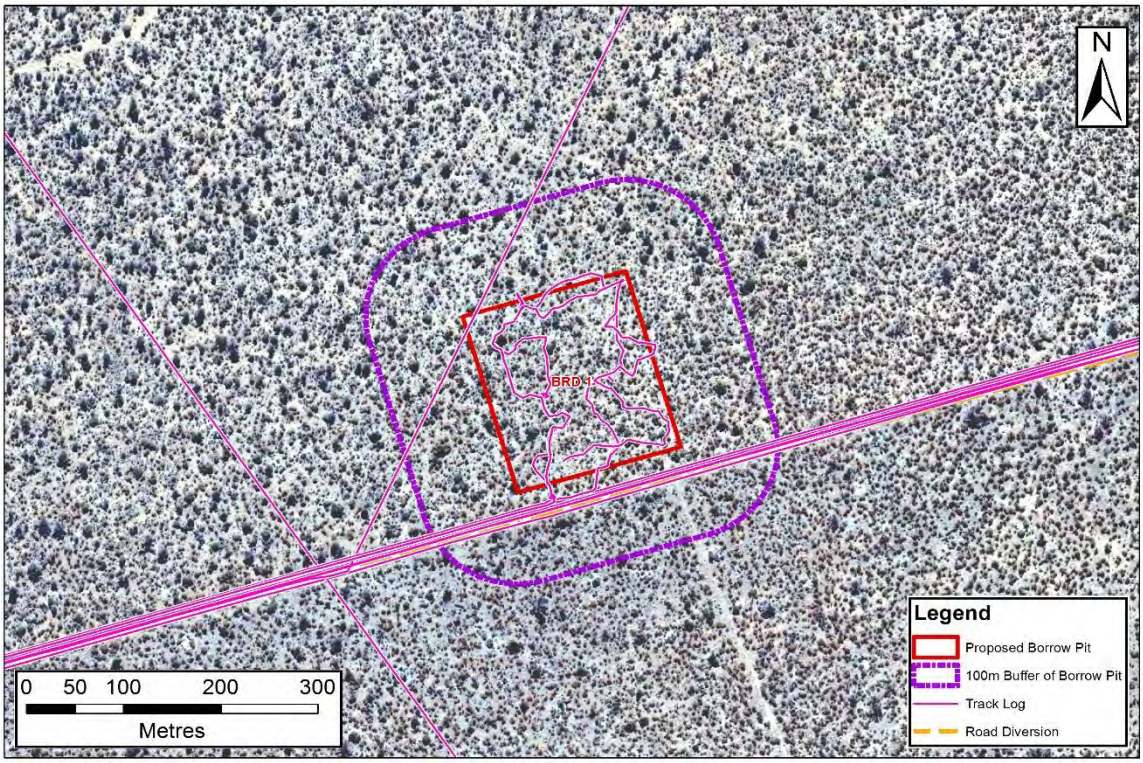

Figure 6-1: BRD 1 and 100 m buffer

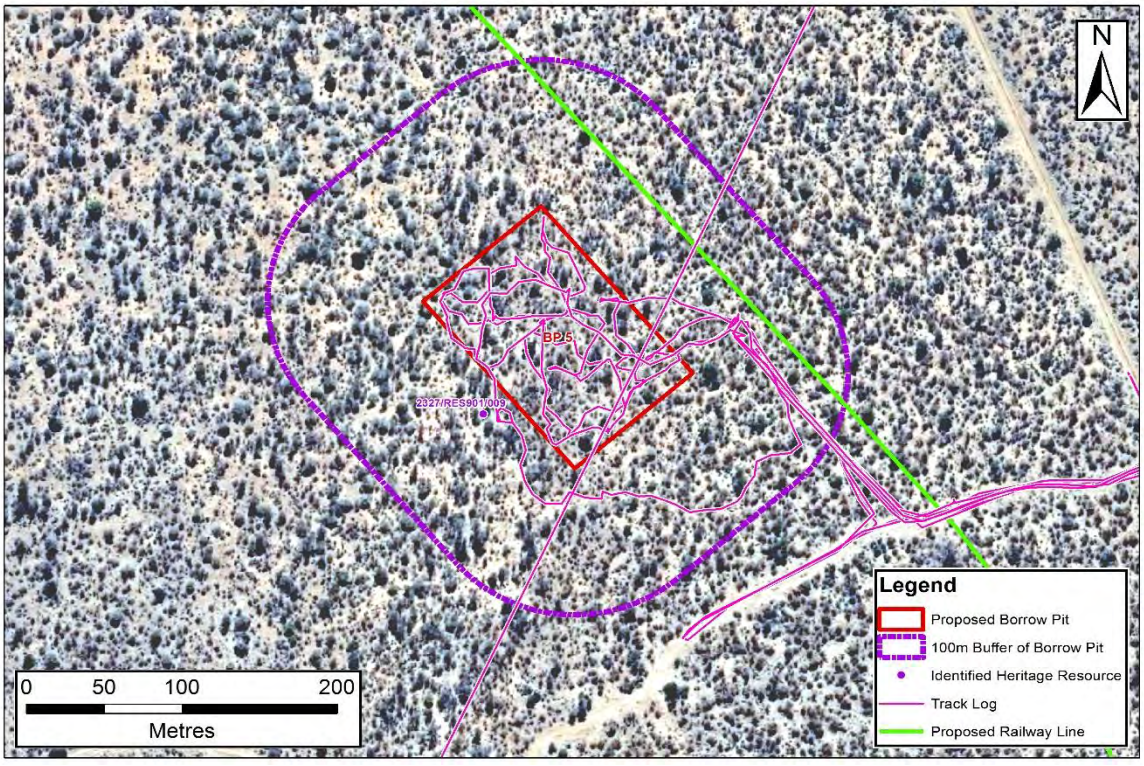

Figure 6-2: BP 5, 100 m buffer and identified heritage resources

Table 6-1: Summary of the potential direct impact to 2327/RES901/009

IMPACT DESCRIPTION: Direct impact, i.e. damage				
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Unmitigated change will result in permanent loss of the heritage resource	Consequence: Highly detrimental (-16)	Significance: Moderate - negative (-96)
Extent	Province / Region (5)	Damage to the site will affect the understanding of the MSA within the local study area		
Intensity x type of impact	Moderately high - negative (-4)	The damage to the site is classified as a major change to a resource with medium significance		
Probability	Highly probable (6)	Without the implementation of mitigation or management measures, it is highly probable that the envisaged impact will manifest		
MITIGATION: A qualified archaeologist must undertake surface sampling of the site with the necessary permits required in terms of Section 35 of the NHRA and Chapter III of GNR 548 prior to any earth moving activities associated with BP 5; A Watching Brief by qualified archaeologist must be undertaken during the establishment of BP 5 to record and collect any exposed lithic material to preserve the site through record.				
POST-MITIGATION				
Duration	Permanent (7)	Heritage resources are finite, and damage to the site will remain permanent	Consequence: Moderately beneficial (12)	Significance: Minor - positive (36)
Extent	Limited (2)	Through implementation of the mitigation measures, potential impacts will be limited to components of the site		
Intensity x type of impact	Moderate - positive (3)	The mitigation measures will reduce the intensity of the identified impact, and the preservation through record is considered a moderate positive change as it can contribute to the scientific understanding of the MSA in the local study area		
Probability	Unlikely (3)	Where mitigation measures are implemented, the severity of the pre-mitigation ratings is unlikely to manifest.		

6.2.2 Kamiesbult 291 LQ

One borrow pit, BRD 5, is situated within the Kamiesbult 291 LQ site-specific study area. Three heritage resources were recorded within the development footprint and 100 m buffer. These comprised, FC001, SA001, and SA002 respectively. As demonstrated in Section 6.1 and Table 5-3, these resources have a designated negligible CS.

In accordance with the SAHRA minimum standards, these resources have been sufficiently recorded and require no further mitigation.

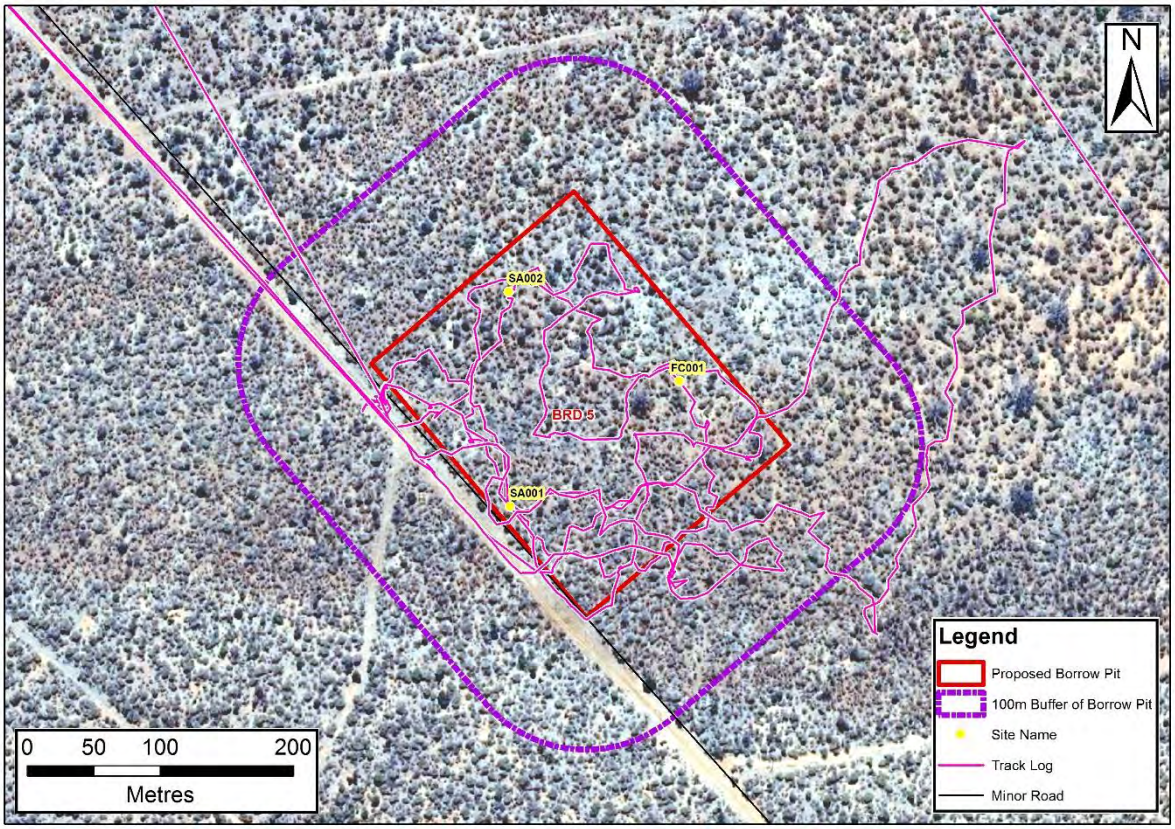

Figure 6-3: BRD 5, 100 m buffer and identified heritage resources

6.2.3 Loopleegte 302 LQ

One borrow pit, BP 3, is situated within the Loopleegte 302 LQ site-specific study area. No heritage resources were identified within the development footprint and 100 m buffer.

No heritage impacts have been considered for BP 3, and no further mitigation measures are required.

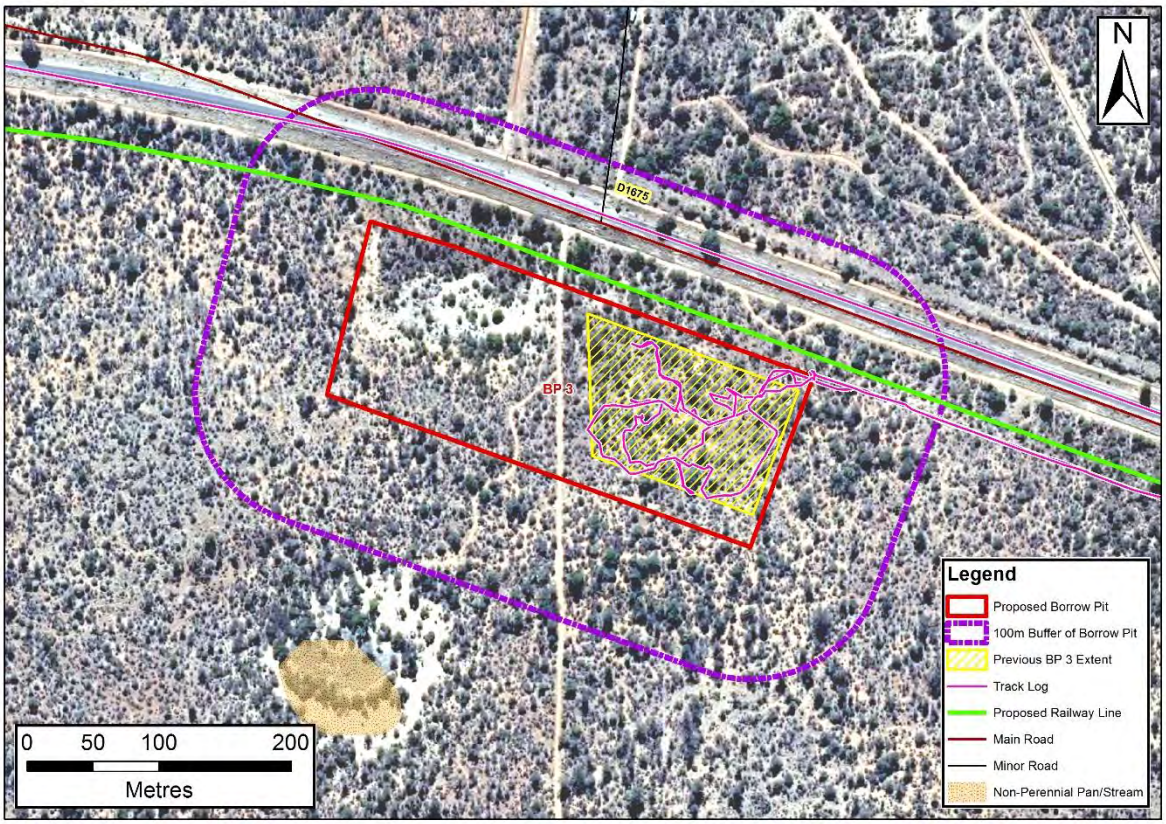

Figure 6-4: BP 3 and 100 m buffer

6.2.4 Vlughtkraal 273 LQ

One borrow pit, BRD 3, is situated within the Vlughtkraal 273 LQ site-specific study area. Two heritage resources were recorded within the development footprint and 100 m buffer. These comprised SA003, and 2327CA53 from the University of the Witwatersrand (Wits) Archaeological Site Database (WITS, 2010).

Site 2327CA53 is described as a low density MSA surface scatter associated with a pan. The site is situated ~76 m southwest of the development footprint boundary. Commensurate to similar examples in the study area, these types of sites are designated with a negligible CS as they are common throughout diverse landscapes and have limited information potential.

Considering the location of 2327CA53, as well as the designated negligible CS of both identified sites and the SAHRA minimum standards, they have been sufficiently recorded and no further mitigation measures are required.

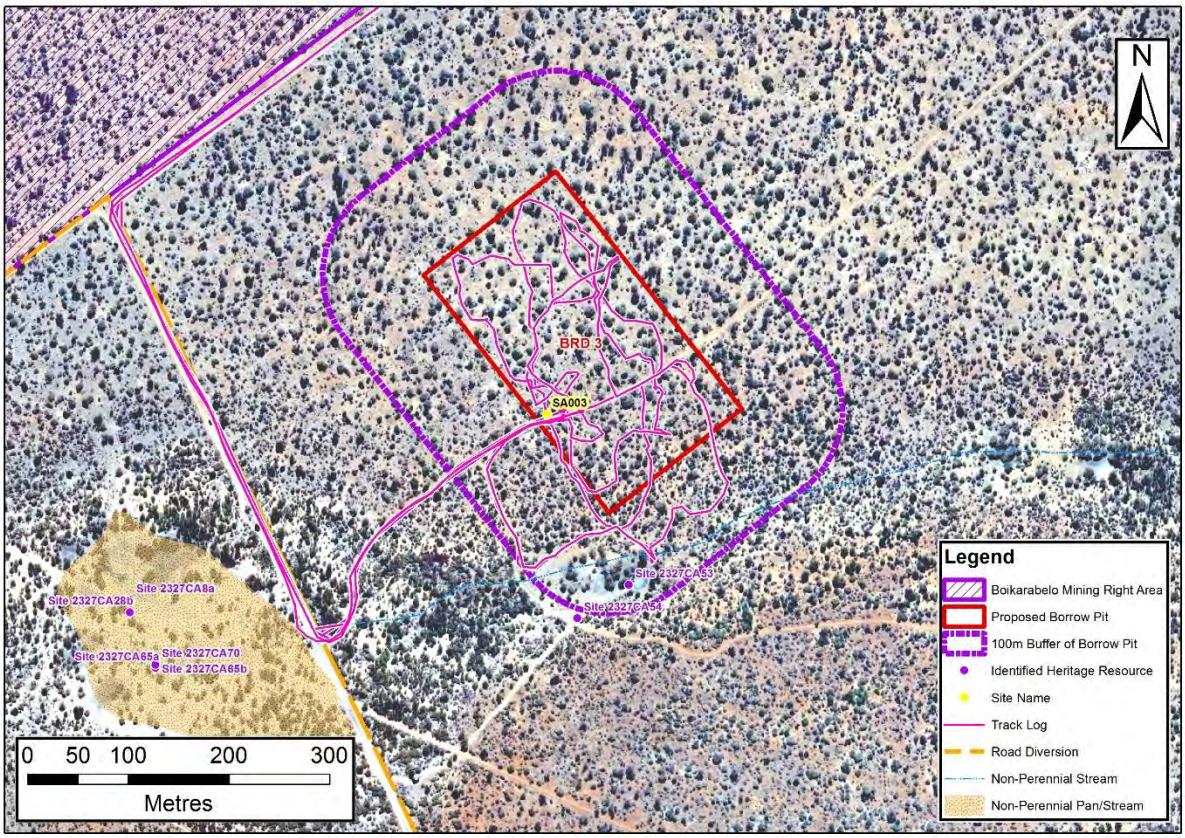

Figure 6-5: BRD 3, 100 m buffer and identified heritage resources

7 Cumulative impacts on the cultural landscape

Cumulative impacts occur from in-combination effects of various impacts on heritage resources acting within a host of processes that result in an incremental effect. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts. This implies that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation.

Considering the nature of this Project in relation to the other proposed and approved developments in the local study area, envisaged potential cumulative impacts will be additive and synergistic in nature. Briefly, this entails the interaction of individual effects and consequent sum of all the effects of the proposed and approved future developments on heritage resources that result in negative cumulative impacts greater than the intensity of individual impacts. This may include the following:

- Contribution to the change of “sense-of-place” from an archaeological to industrial landscape; and
- Sterilisation of tangible heritage resources and consequently the possible effect on the integrity of the local intangible heritage, i.e. early history of the Bantu groups, specifically the Sotho-Tswana.

8 Low risk and unplanned events

The project activities as presented in Table 1-2 present low risks to heritage resources or alternatively may result in unplanned events manifesting. Low risks, where identified, can be monitored to gauge if the baseline changes and mitigation is required. Unplanned events are events that cannot be monitored but can however, be planned for to reduce the severity of any potential impacts that may manifest.

Information in terms of the identified potential low risks and unplanned events are summarised in Table 8-1:

Table 8-1: Summary of potential unplanned events, potential impacts, and proposed mitigation and management

Unplanned event	Potential impact	Mitigation / Management / Monitoring
Accidental exposure of fossil bearing material implementation of the Project	Damage or destruction of heritage resources generally protected under Section 35 of the NHRA	The established and approved Boikarabelo Project specific Chance Find Protocols (CFPs) must be adhered to. The CFPs, that form part of the Boikarabelo Environmental Management Programme (EMPr) is available on SAHRIS under Case ID 177 and appended to this report.
Accidental exposure of *in situ* MSA and LSA accumulations during implementation of the Project		
Accidental exposure of *in situ* LFC settlement sites during the implementation of the Project		
Accidental exposure of human remains during the construction phase of the Project	Damage or destruction of heritage resources generally protected under Section 36 of the NHRA	

9 Heritage impacts versus socio-economic benefits

Demographically, the LLM has a total population of 115 767 in 2015, which accounts for 17% of the District's population and 17% of its household. Its population density is 6 persons per km^2. This low density is consistent with the rural nature of most of LLM with the majority of the population being concentrated in towns. The level of education in LLM can be described as low, as only 19% of the population aged 20 and older has a matric qualification and 6% has higher education. The largest proportion of this population (35%) has some secondary education. A steady increase in educational levels has been noted, which is

consistent with increasing industrialisation within the local study area. This low level of education is mirrored in the employment statistics. Almost two thirds of the working age population in the LLM were not economically active in 2010. Of the available labour force, 23% were unemployed, as against 20.4% in the WDM (Statistics SA, 2017).

According to the Lephalale Spatial Development Plan (SDP), the Waterberg Coalfields are earmarked as a future growth point (Lephalale Municipality, 2012). The exploitation of these coalfields, through the establishment of developments such as the Boikarabelo Coal Mine, will in part address economic challenges of the local population. This Project in turn, is necessary for the development of the Boikarabelo Coal Mine and will indirectly contribute to the predicted benefits to the local communities.

Considering the results of this assessment as presented in Sections 6, 7 and 8 respectively, the potential socio-economic benefits outweigh potential heritage impacts. This assumption is based on the following reasoning:

- Identified heritage resources that may be directly impacted upon by the various borrow pits are not unique and have an assigned negligible CS; and
- Other identified heritage resources within the local study area occur outside of a 100 m buffer of the borrow pit development footprint and are unlikely to be impacted upon.

10 Consultation

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EA process. The objectives of the Stakeholder Engagement Process (SEP) include the following:

- To ensure that I&APs are informed about the project;
- To provide I&APs with an opportunity to engage and provide comment on the project;
- To draw on local knowledge by identifying environmental and social concerns associated with the project;
- To involve I&APs in identifying methods in which concerns can be addressed;
- To verify that stakeholder comments have been accurately recorded; and
- To comply with the legal requirements.

No heritage-specific consultation was undertaken for this assessment, and at the time of compiling this report the required SEP had not commenced.

All comments received through the public review of this report and the draft BA Report (BAR) will be collated into a Comments and Response Report (CRR) to respond to and address any comments raised.

The final BAR, CRR and HBAR will be submitted to SAHRA and LIHRA for adjudication as required in terms of Section 38(8) of the NHRA.

11 Recommendations and conclusion

This HBAR was compiled to promote compliance with the requirement of Section 38(8) of the NHRA. It considered the baseline cultural environment at a local and site-specific study area level to identify and classify tangible heritage resources that may be impacted upon by the proposed establishment of five borrow pits.

The findings of this assessment demonstrate that the greater study area is predominantly associated with an archaeological and historical landscape. A total of seven heritage resources were identified in the development footprints and considered in this assessment, all related to the archaeological context of the local study area.

With the exception of one site RES901/009, all identified heritage resource have a negligible CS and have been sufficiently recorded. In accordance with the SAHRA minimum standards, no further mitigation of these sites is required.

The site RES901/009 occurs within a 100 m buffer from the development footprint of BP 5 on Bitterfontein 272 LQ. To mitigate against any potential negative impacts to this site, the following specific recommendations are made:

- A qualified and registered archaeologist must undertake surface sampling of the site with the necessary permits required in terms of Section 35 of the NHRA and Chapter III of GNR 548 prior to any earth moving activities associated with BP 5; and
- A Watching Brief by qualified archaeologist must be undertaken during the establishment of BP 5 to record and collect any exposed lithic material to preserve the site through record.

Furthermore, a review of the geological context demonstrated that the site-specific study area of Loopleegte 302 LQ is underlain by lithostrigraphy that has a high palaeontological sensitivity rating. These sensitivities notwithstanding, and considering the nature of the Project, potential palaeontological impacts are considered to be low risk that can be managed through implementation of the approved Boikarabelo Coal Mine CFPs.

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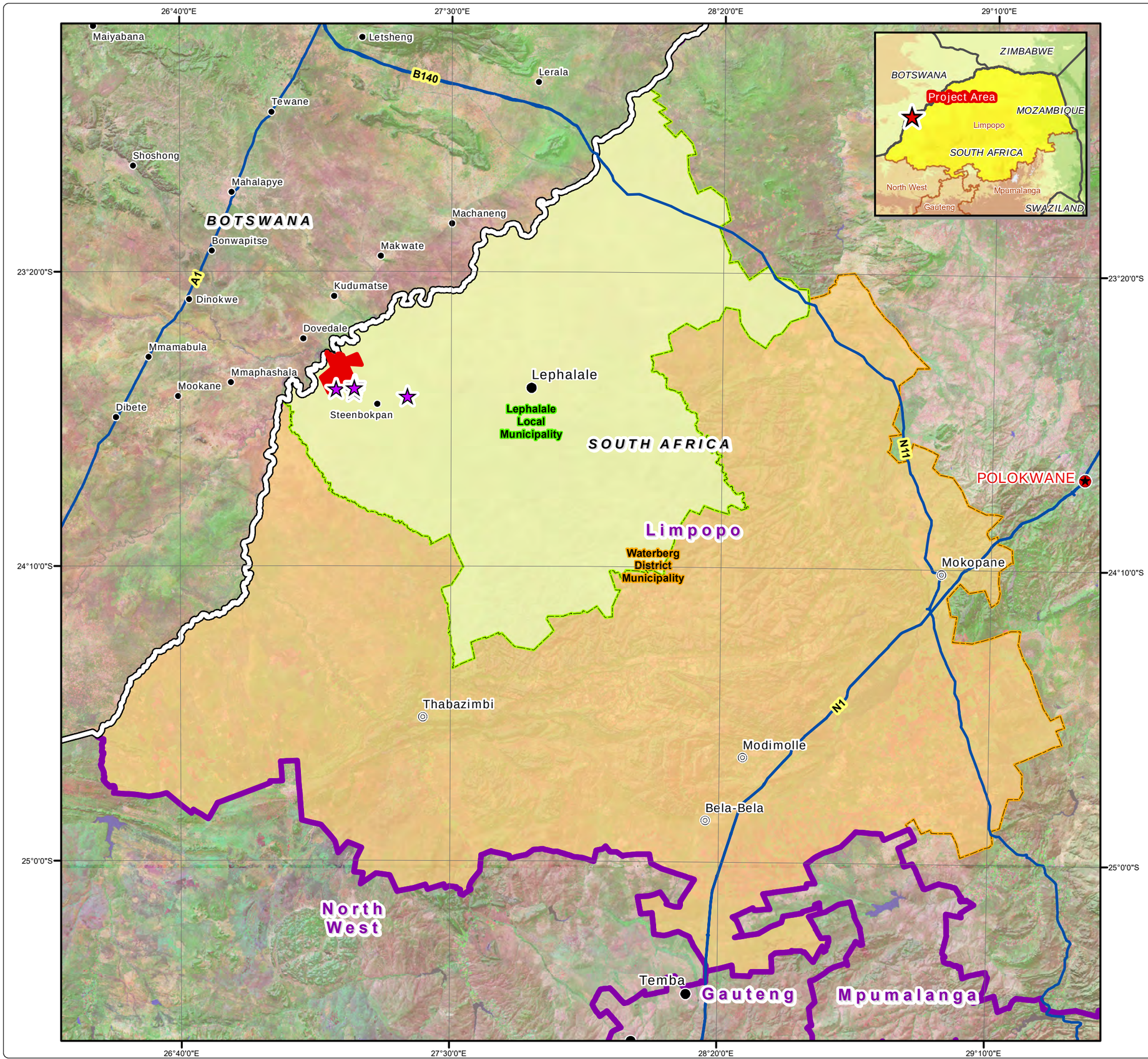
Appendix A: Plans

Ledjadja Coal Borrow Pits BAR

Study Areas



Legend

- Boikarabelo Mining Right Area
- Proposed Borrow Pits
- City
- Major Town
- Secondary Town
- Settlement
- National Road
- Local Study Area
- Regional Study Area
- Provincial Boundary
- International Boundary

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Projection: Transverse Mercator	Ref #: kam.LED4349.201703.088
Datum: WGS 1984	Revision Number: 1
Central Meridian: 27°E	Date: 15/03/2017

N

0 10 20 40 60

Kilometres

1:1 200 000

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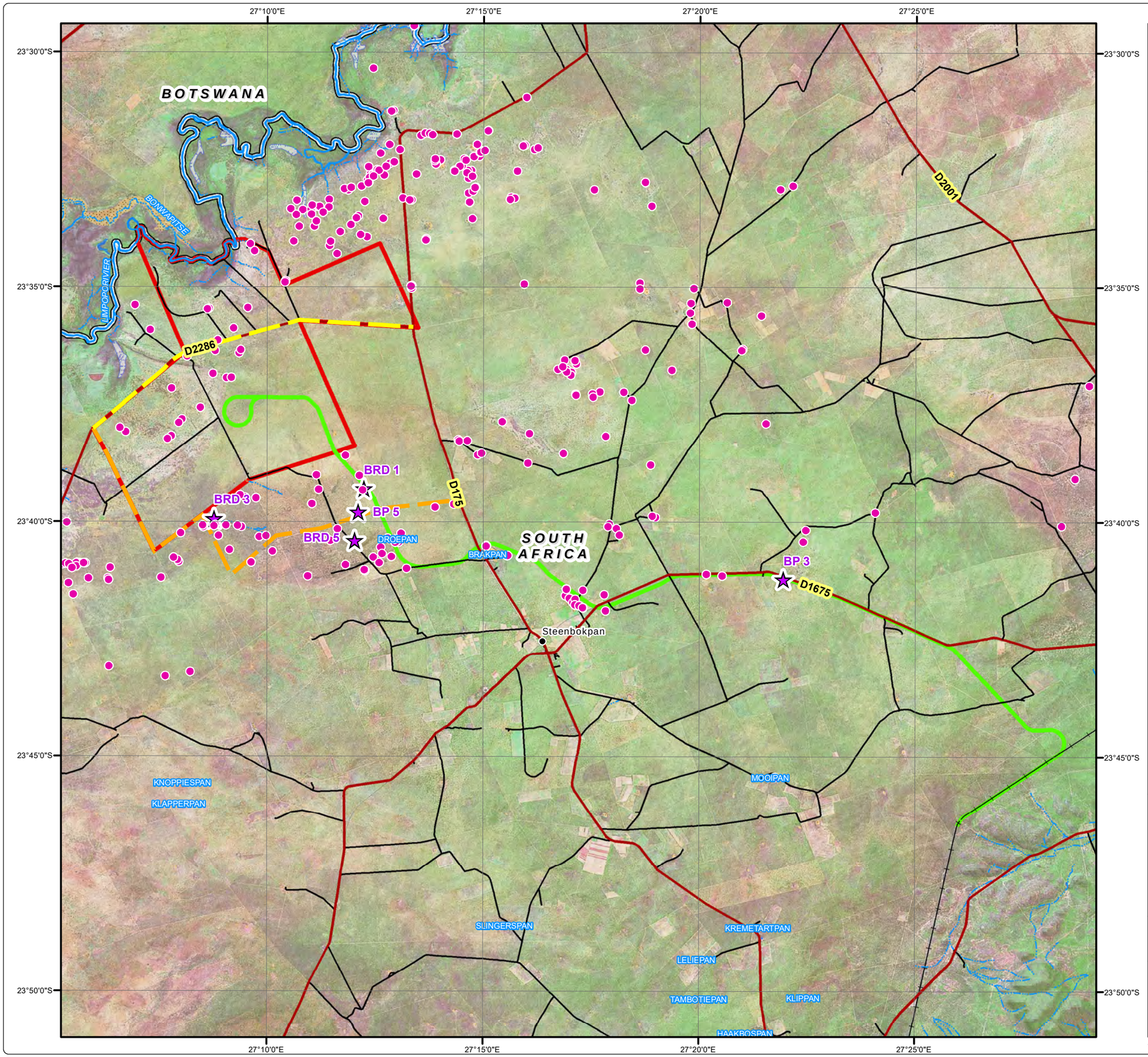
Ledjadja Coal Borrow Pits BAR

Identified Heritage Resources



Legend

- Boikarabelo Mining Right Area
- Proposed Borrow Pits
- Identified Heritage Resources
- Settlement
- Proposed Railway Line
- Road Diversion
- Road to be Diverted
- Main Road
- Minor Road
- Railway Line
- Perennial Stream
- Non-Perennial Stream
- Dam
- Non-Perennial Pan/Stream
- Wetland
- International Boundary

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Datum: WGS 1984	Revision Number: 1
Central Meridian: 27°E	Date: 15/03/2017

N

0 2 4 8

Kilometres

1:150 000

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Ledjadja Coal Borrow Pits BAR

Identified Heritage Resources - BRD 3

27°8'32"E
27°8'40"E
27°8'48"E
27°8'56"E
23°39'44"S
23°39'52"S
23°40'0"S
23°40'8"S

BRD 3
SA003
Site 2327CA53
Site 2327CA54

Legend

- Boikarabelo Mining Right Area
- Proposed Borrow Pit
- 100m Buffer of Borrow Pit
- Site Name
- Identified Heritage Resource
- Track Log
- Road Diversion
- Non-Perennial Stream
- Non-Perennial Pan/Stream

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Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 29°E

Ref #: kam.LED4349.201703.136
Revision Number: 1
Date: 27/03/2017

N

0 25 50 100 150
Metres
1:3,000

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Ledjadja Coal Borrow Pits BAR

Identified Heritage Resources - BRD 5

27°11'52"E
27°12'0"E
27°12'8"E
23°40'16"S
23°40'24"S
23°40'32"S

SA002
FC001
BRD 5
SA001

Legend

- Proposed Borrow Pit
- 100m Buffer of Borrow Pit
- Site Name
- Track Log
- Minor Road

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Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 29°E

Ref #: kam.LED4349.201703.137
Revision Number: 1
Date: 27/03/2017

N

0 25 50 100 150
Metres
1:3,000

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Ledjadja Coal Borrow Pits BAR

Identified Heritage Resources - BP 5

Legend

- Proposed Borrow Pit
- 100m Buffer of Borrow Pit
- Identified Heritage Resource
- Track Log
- Proposed Railway Line

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Projection: Transverse Mercator	Ref #: kam.LED4349.201703.137
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Metres

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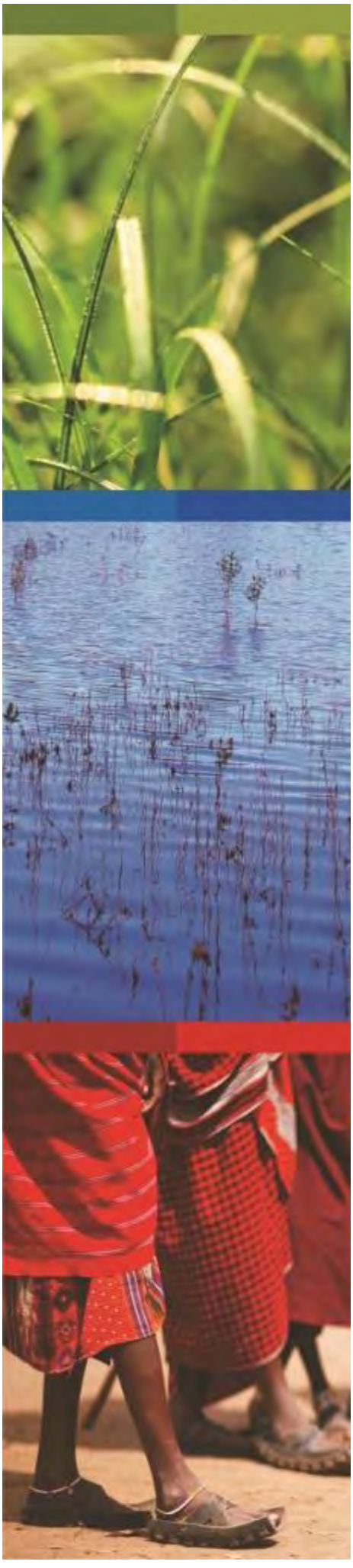
Appendix B: Boikarabelo CFPs



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Boikarabelo Coal Mine

Archaeological and Palaeontological Chance Find Protocols

Project Number:

LED 2867

Prepared for:

Ledjadja Coal (Pty) Ltd

January 2015

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This document has been prepared by Digby Wells Environmental.

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Project Code:	**LED 2867**

Report Revision History		
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Vers. 2	Louise van den Berg-Nicolai (Boikarabelo Coal Mine)	6 December 2014
Vers. 3	Johan Nel (Digby Wells)	8 December 2014
Vers. 4	Johan Nel (Digby Wells)	23 January 2015

DECLARATION OF INDEPENDENCE

This Chance Find Protocol (CFP) has been compiled by Johan Nel. A technical review was completed by Justin du Piesanie. Both author and reviewer are professional, qualified archaeologist and members of the Association of Southern African Professional Archaeologists (ASAPA). The author holds Field Director: Iron Age accreditation in ASAPA's Cultural Resources Management (CRM) section (Member No. 095). The reviewer holds Field Supervisor: Iron Age accreditation in the CRM section (Member No. 270).

The relationship of Digby Wells and its employees with Boikarabelo Coal Mine, Ledjadja Coal (Pty) Ltd and Resgen South Africa (Pty) Ltd (Resgen) is solely one of professional association between client and independent consultant. All work undertaken was done in return for professional fees based upon agreed commercial rates paid to Digby Wells that were never in any manner contingent on the results of this report. As such, Digby Wells has no material interest in the Boikarabelo Coal Mine, Ledjadja Coal (Pty) Ltd or Resgen South Africa (Pty) Ltd.

As salaried employees of Digby Wells, neither the author nor the reviewer receive any financial or other benefit from Boikarabelo Coal Mine, Ledjadja Coal (Pty) Ltd or Resgen South Africa (Pty) Ltd.

The CFP was developed in association with the Boikarabelo Coal Mine who will ultimately implement it. The CFP was thus reviewed by Louise van den Berg-Nicolai to ensure technical details related to the Boikarabelo Coal Mine were correct.

I, Johan Nel, therefore declare that all work and results presented in this report are wholly independent and free from any undue influence from Boikarabelo Coal Mine, Ledjadja Coal (Pty) Ltd or Resgen South Africa (Pty) Ltd, or any of their employees.

Signed in _____on the _____day of _____ 2015.

_____ _____

Johan Nel As Witness

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1 Introduction

Chance Find Protocols (CFP) aim to minimise damage and destruction to any heritage resource that might be accidentally exposed during the course of development activities. The CFP outlined here are based on the legal requirements and procedures contained in the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA). A proactive Archaeological Monitoring Procedure (AMP) and Palaeontological Monitoring Procedure (PMP) compliment the procedures.

The aim of this document is to enable the on-site Environmental Manager (EM) at Boikarabelo Coal Mine to proactively identify and manage heritage with specific focus on archaeological and palaeontological resources. In addition, the procedures contained herein will aim to reduce operational downtime as far as possible if the accidental discovery of significant heritage occurs. The document is structured as follows.

First, relevant definitions are described. Then, the proactive AMP is presented, including examples of typical archaeological resources known to occur in the Boikarabelo Coal Mine properties. This is followed by the PMP, including a summary of potential palaeontology associated with the various rocks known to be present in the area. Finally, the presented CFP includes a generic reporting schedule based on the NHRA.

2 Definitions

The following definitions are summarised from Section 2 and Section 38(1) of the NHRA.

Alter	Any action affecting the structure, appearance or physical properties of a *place* whether by way of structural or other works, or any other means. Cross reference "d*evelopment*" below.
Archaeological	Any material remains that were produced or created by humans or that resulted from any human activity that are unused and older than 100 years. This includes artefacts, human and hominid remains and artificial features and structures (see "s*tructures*" below). Archaeology also refers to rock art that is defined as any form of painting, engraving or other graphic representation on fixed rock surfaces or loose rocks or stones that was made by humans and that are older than 100 years, including a 10 m area surrounding such site. Archaeology also includes: ■ Any wrecks or parts thereof that was wrecked in South Africa more than 60 years ago, including any cargo, debris or artefacts found or associated with it; and

	■ Any features, structures and artefacts older than 75 years that are associated with military history, including the sites on which they are found.
Conservation	The protection, maintenance, preservation and sustainable use of "*places"* to safeguard their "*cultural significance".*
Cultural significance	The possible aesthetic, historical, social, or spiritual value or significance attached to the "*site"* by people.
Development	Any physical intervention, excavation, or action that could cause changes to the nature, appearance, fabric of a place. In addition, development might also influence the stability or future well-being of a place. Development could include: ■ construction, alteration, demolition, removal or change of use of a place or a structure at a *place*; ■ carrying out any works on or over or under a *place*; ■ any change to the natural or existing condition or topography of land; and ■ any removal or destruction of trees, or removal of vegetation or topsoil. Cross reference "*Categories of Development*" below.
Grave	The place of interment (burial ground) and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such *place*.
Heritage resource	Any place of cultural significance.
Improvement	Includes the repair, restoration and rehabilitation of a place protected in terms of the NHRA.
Management	Includes the *conservation*, presentation and *improvement* of a *place* protected in terms of the NHRA.
Object	Any movable property of cultural significance that are protected in terms of the NHRA, including:

	■ All archaeological artefacts; ■ All palaeontological and rare geological specimens; ■ All meteorites; and ■ Any other object referred to in section 3 of the Act.
Owner	Includes the owner's (Boikarabelo Coal Mine) authorised agent and any person with a real interest in the property.
Palaeontological	Any fossil remains or traces of animals or plants that were alive in the geological past, and any site that contains such fossils. Fossil fuels such as coal, and fossiliferous rock intended for industrial use are, however, excluded.
Place	A place may include: ■ (a) the site; ■ (b) a structure such as a grainbin; ■ (c) a group of structures such as a group of grainbins; and ■ (e) in relation to the management of a place, includes the immediate surroundings of a place.
Site	Any area of land, including land covered by water, and including any *structures* thereon.
Structure	Any works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.

Categories of development that are typically expected to be undertaken by the Boikarabelo Coal Mine are listed and described in TABLE below.

Linear development	Linear developments refer to the construction of roads, power lines, pipelines, canals or similar infrastructure longer than 300 m. In addition, bridges and similar infrastructure longer than 50 m can also be consider linear developments.
Development of areas	This refers to any development that will change the character of a site. This means *any* change to a site, for example using an open piece of veldt as a laydown yard. The threshold for this category is 5 000 m^2 or 0.5 ha.

	In addition, this development category also refers to any changes to three or more *existing* erven or subdivisions thereof or such erven that were consolidated within the past five years, irrespective of the size of such erven. This might not be relevant to the Boikarabelo Coal Mine.
Rezoning	Any site or piece of land larger than 10 000 m^2 or one hectare that will be rezoned.

3 Proactive Archaeological Monitoring Procedure

All archaeological artefacts, features, objects and sites are generally protected in terms of Section 35 of the NHRA. It is therefore an offence to alter, damage, destroy or otherwise change archaeological resources without permits issued by the South African Heritage Resources Agency (SAHRA). *Archaeological* resources are defined as (NHRA Section 2):

- The material remains of past human activity that are no longer used and that are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.
- Rock art – any form of painting, engraving or other graphic representation created by humans on a fixed rock surface such as cave wall, or loose rock or stone that is older than 100 years, including a surrounding 10 meter area.
- Any wrecks that may include any vessel or aircraft and any part thereof that was wrecked in South Africa more than 60 years ago or which SAHRA considers to be worthy of conservation, including any cargo, debris or artefacts found or associated with it.
- Any features, structures and artefacts older than 75 years that are associated with military history, including the sites on which they are found.

The following outlines a proactive archaeological monitoring procedure (AMP) to reduce or limit impacts on unidentified archaeological resources in mine development footprint areas. The purpose of this procedure is to record the* status quo *of a development site to identify any possible archaeological remains that may be exposed and / or accidently destroyed by intrusive activities.

The AMP comprises four primary steps that must be implemented prior to any large-scale development taking place. This section is structured as follows:

- Step 1 – delineate development footprint area
- Step 2 – complete a site walk down
- Step 3 – excavate and monitor test trench
- Step 4 – compile AMP report

3.1 Step 1 - delineate development footprint area

The first step required under the AMP is to delineate the impact footprint area. This will require close cooperation and communication between the EM and the persons responsible for carrying out work. The maximum known extent of the development must be communicated to the EM well in advance of any physical work taking place.

If possible, the development footprint should be demarcated using GIS and a survey grid established. This will enable the site walk down to follow a structured survey approach and accurate plotting of identified artefacts and features.

The EM must ensure that the responsible contractor or department demarcate the footprint area and implement a site walk down of the area.

Determining and delineating the development footprint area can be done according to the categories of development described under Definitions above.

3.2 Step 2 – site walk down

The purpose of a site walk down is to identify and record any possible archaeological and other heritage resources in the development footprint. A qualified archaeologist must ideally supervise the walk down. However, if an archaeologist cannot be present, the EM must assume the responsibility provided that the person has received basic training in archaeological techniques. Skills that will be required and that can be transferred through external training include amongst others:

- Identifying archaeological artefacts;
- Archaeological survey techniques;
- Recording and documenting archaeological material and sites; and
- Determining context of finds.

The archaeologist and / or EM must ensure that the following objectives are met during the walk down.

3.2.1 Photographic documentation

The development footprint must be photographically documented to provide a record of the pre-development landscape. Photographic documentation must include:

- Photo records of the general landscape of the development footprint taken from different angles;
- Photo records of any identified artefacts and deposit. The photographs must include an appropriate photographic scale;
- Photo records of any intrusions into the soil, e.g. animal burrows, road cuttings, old excavations, etc.;

- Photo records of any material distinct from and / or specific to the natural landscape, e.g. rubble or rocky outcrops; and
- Photo records of distinctly atypical vegetation, e.g. a group of aloes in an area where aloes are uncommon, bare soil in otherwise well-vegetated area or denser vegetation in otherwise under-vegetated area.

3.2.2 Determining context

The purpose of the site walk down is to identify any material culture visible on the surface, such as pottery fragments, as well as any changes in the natural soil that may indicate archaeological deposit. Identified artefacts, features and deposits should be flagged and recorded using a hand-held GPS.

An archaeologist should ideally determine context. However, the following may be noted to assist the EM in identifying artefacts and sites and determining context and consequent significance of material found in a development footprint.

3.2.2.1 Stone Age

Stone artefacts (see Figure 4 to Figure 16) that may include formal lithics generally represent Stone Age sites, ranging from 2.5 million years ago to at least 1000 CE in the region. A rough rule of thumb is that earlier tools are larger and associated with the Early Stone Age (ESA), approximately 1.8 million to 280 000 years ago. Tool size decreases during in the Middle Stone Age (MSA), approximately 280 000 to 25 000 years ago, to a microlithic technology associated with the Later Stone Age (LSA), from around 25 000 to nearly 1000 years ago.

Where such finds are found imbedded in rock such as calcrete or ferricrete, the significance of the site increases. This is due to the finds probably being part of an *in situ* deposit. *In situ* Stone Age deposits are rare, especially 'open air sites', and significantly contributes to research. In addition, calcrete can be dated through radiometric dating techniques, and finds embedded in calcrete can therefore provide an absolute date of deposit.

If there is evidence that the flakes are of the same or similar raw material found in the general vicinity, the site may represent a manufacturing site with high potential of *in situ* deposit.

In general, a density ratio of >10:1 (10 lithics per square meter) may be considered high, and the site should be assessed by a qualified archaeologist. Figure 3 below is an example of how Stone Age material may be plotted to enable spatial analysis and artefact density to be determined. A more simplified manner to achieve this is to determine the number of tools in randomly placed square meter grids. High concentrations, i.e. >10:1, should be investigated by a qualified archaeologist.

The key indicators for Stone Age sites are the presence of stone tools (also called *lithics*) on the surface. Examples of Stone Age tools are depicted in Figure 4 to Figure 16. Although

stone tools are not easy to identify by non-specialists, the list below provides some identifying characteristics.

Flakes are probably the most common type of stone tool found. They are characterised by relative sharp edges and percussion bulbs. Stone tools are usually produced using fine-grained material such as quarts, banded iron stone, silicate, chert and feldspar.

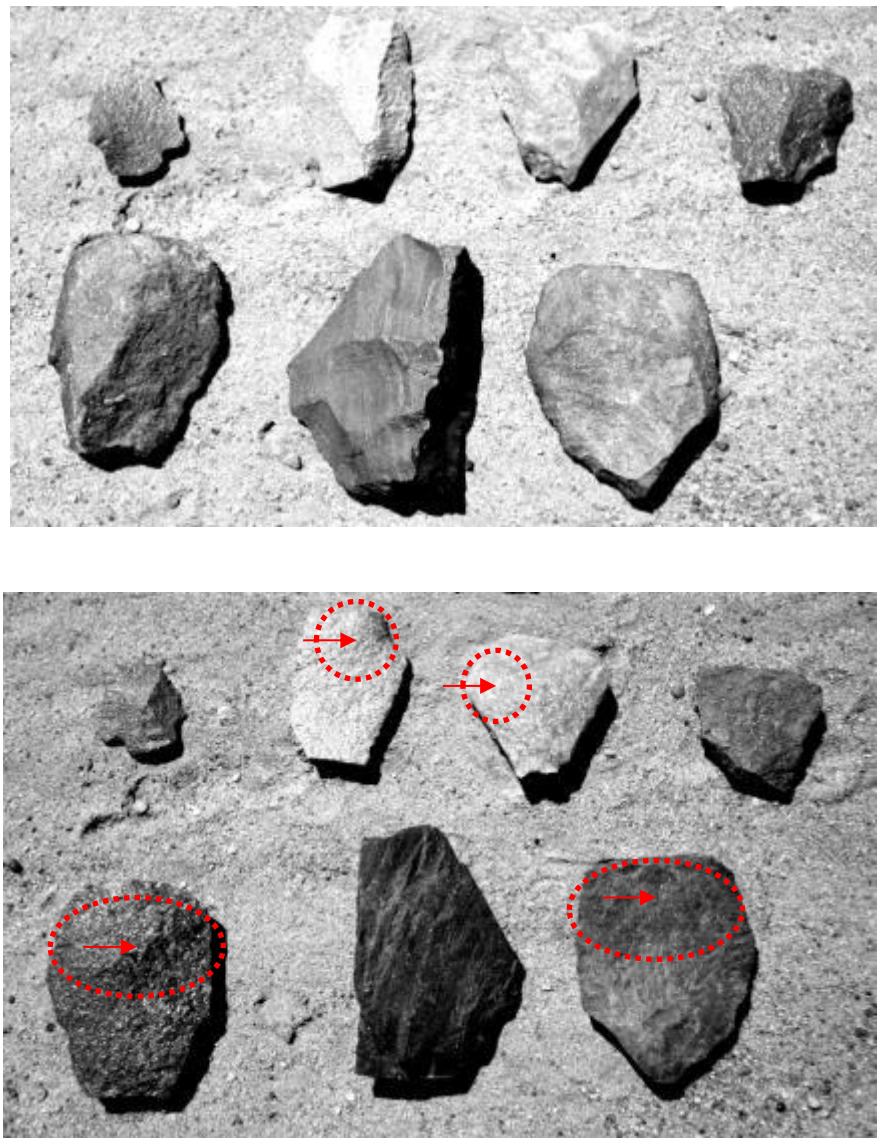


Figure 1: Examples of Stone Age tools found at Boikarabelo Coal Mine.

The images to the left depict typical stone flakes found at Boikarabelo. The top image shows the dorsal surfaces, i.e. the 'top', and the bottom image the ventral surfaces, i.e. 'bottom' aspects. Note the sharp edges clearly visible on all flakes.

The red circles in the bottom image show the area where percussion bulbs are clearly visible. The arrows indicate the approximate centres of the bulbs. The image below indicates some identifying characteristics in schematic form.

Most simple stone tools and nearly all flakes have a striking platform on the proximal end. This is typically a small surface area from where the flake is struck off the core or parent material. Immediately below the striking platform is the percussion bulb. This feature is the result of the striking force that flakes the tool from the core. The percussion bulb is always positive – that means it creates little raised parts on the flake. If the core has not been reduced more, as indicated in Figure 2 below, then a negative percussion bowl and flake area can be seen.

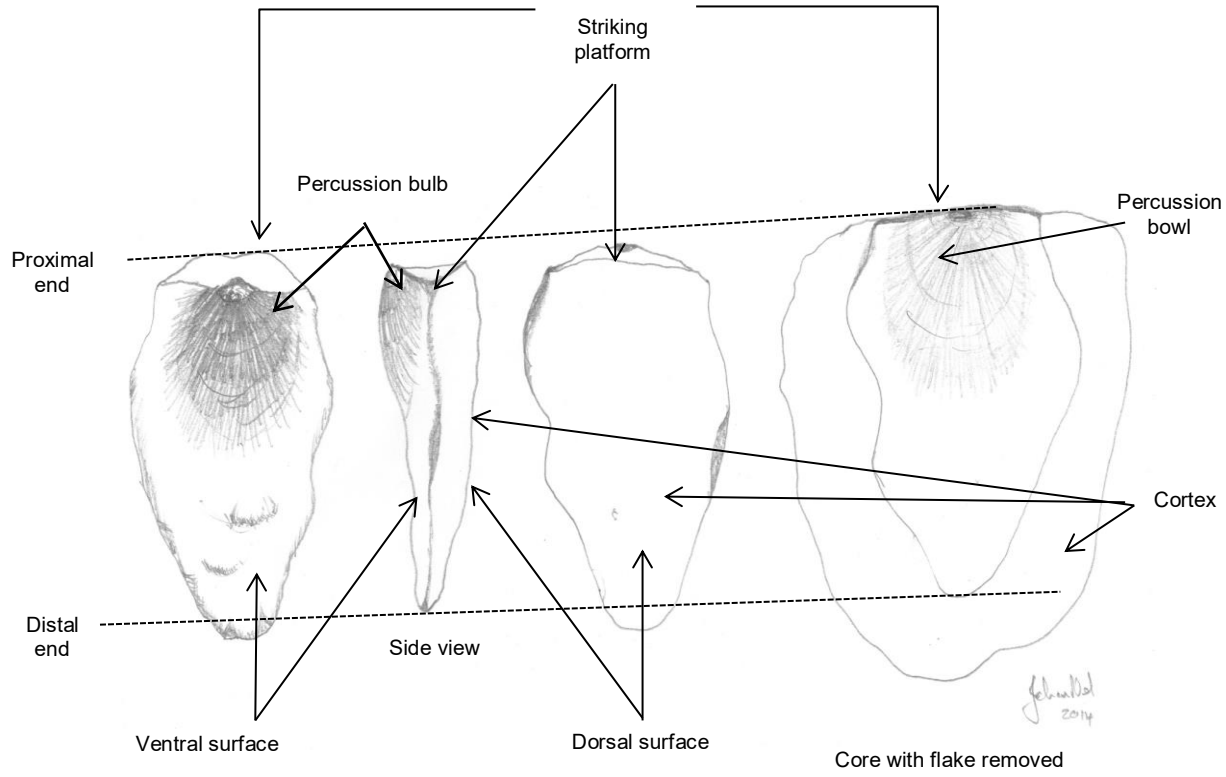


Figure 2: Schematic drawing indicting identifying feature on a stone flake or tool (drawing © Johan Nel 20140

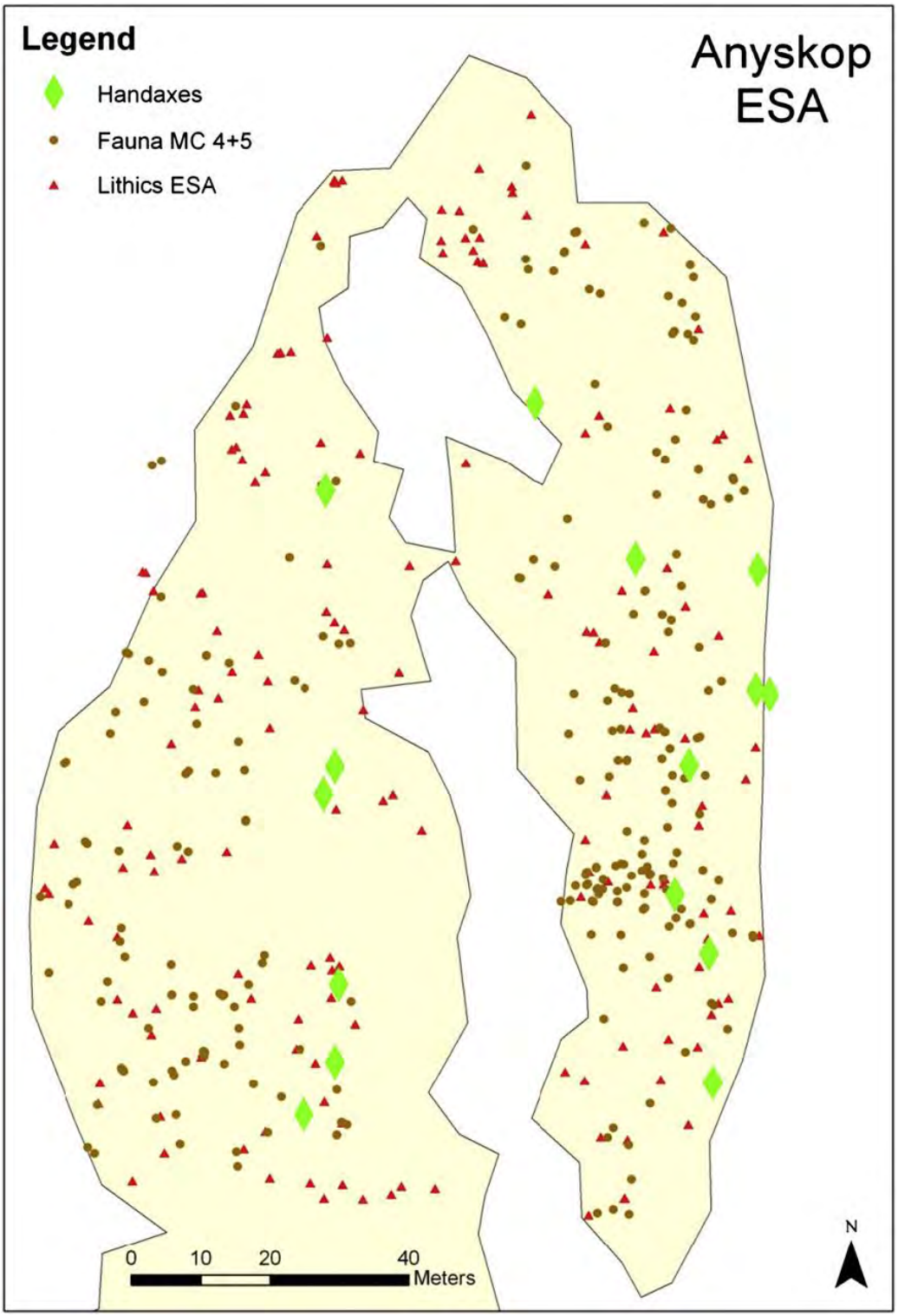


Figure 3: Example of an Early Stone Age spatial map showing artefact distribution and densities (© Kandel & Conard 2012).

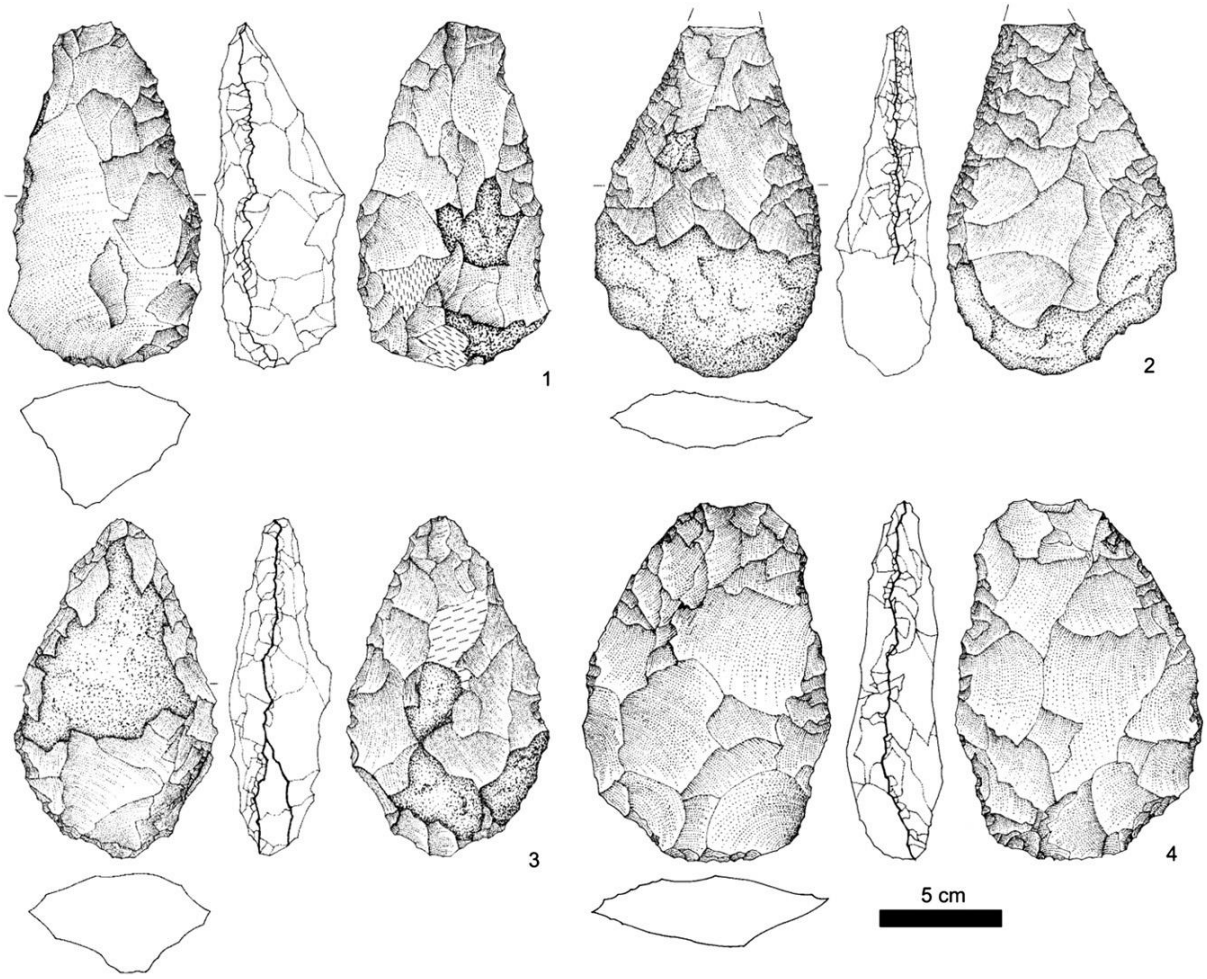


Figure 4: Examples of ESA Late Acheulean handaxes from Anyskop Blowout (© Kandel & Conard 2012)

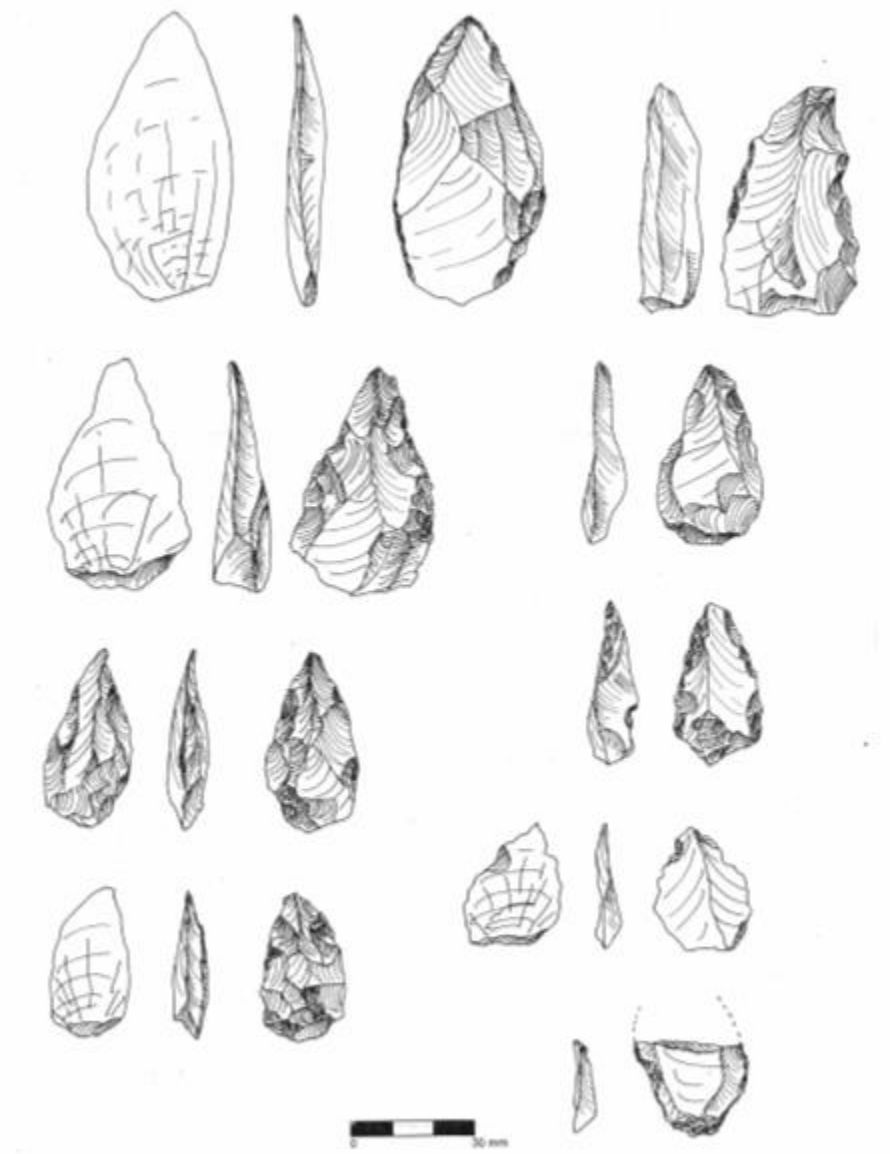


Figure 5: Examples of MSA tools from Olieboompoort (© van der Ryst 2007)

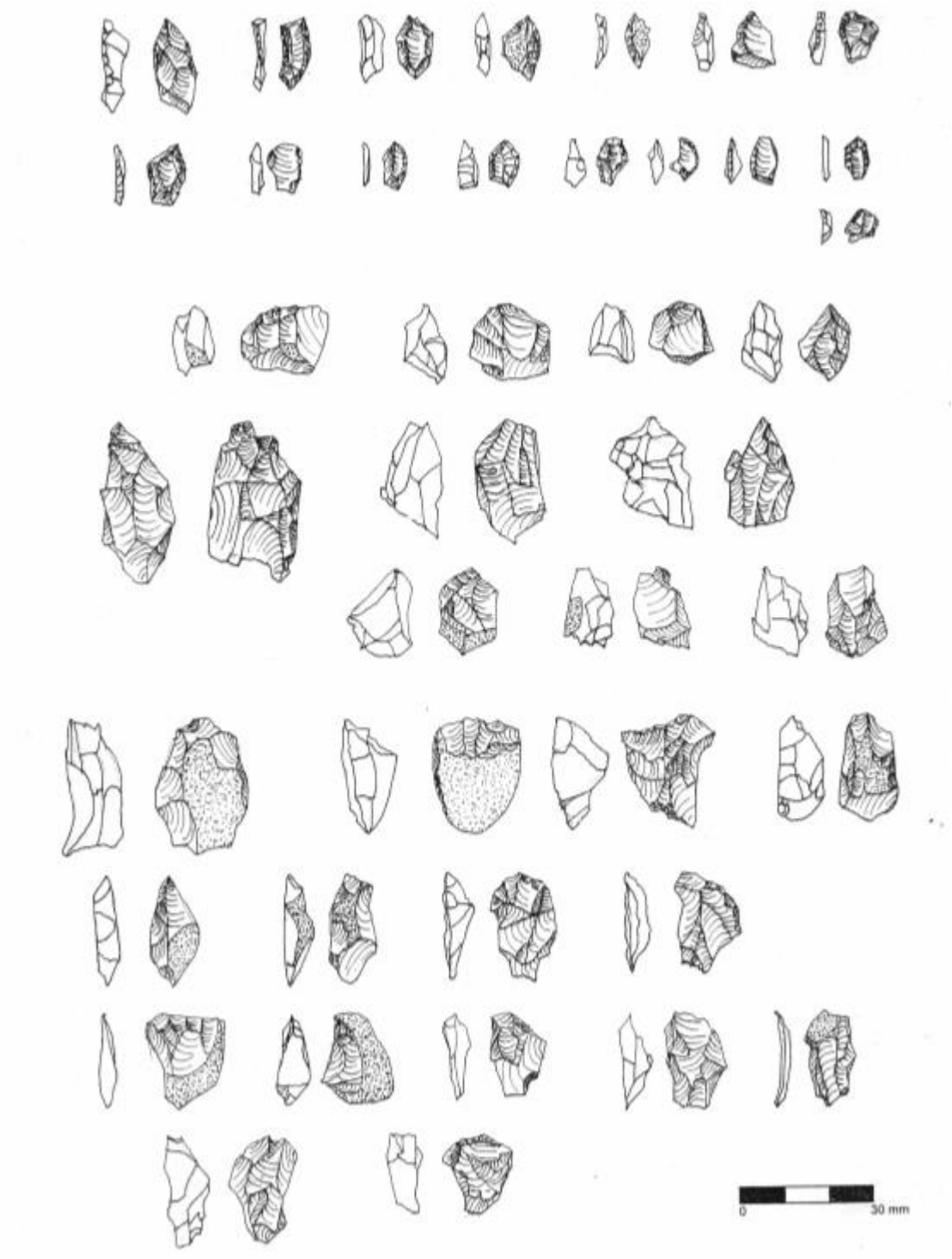


Figure 6: Examples of stone tools from Olieboompoort[1] (© van der Ryst 2007)

[1] Rows 1-2: backed scrapers; Rows 3-9: cores

Figure 7: Examples of microliths from Olieboompoort[2] (© van der Ryst 2007)

[2] Row 1: segments; Row 2 & 9: side scrapers; Row 3: circular scraper; Row 4: end scrapers; Rows 5-6 & 10: backed scrapers; Row 7: cortical end scrapers; Row 8: side-and-end scrapers.

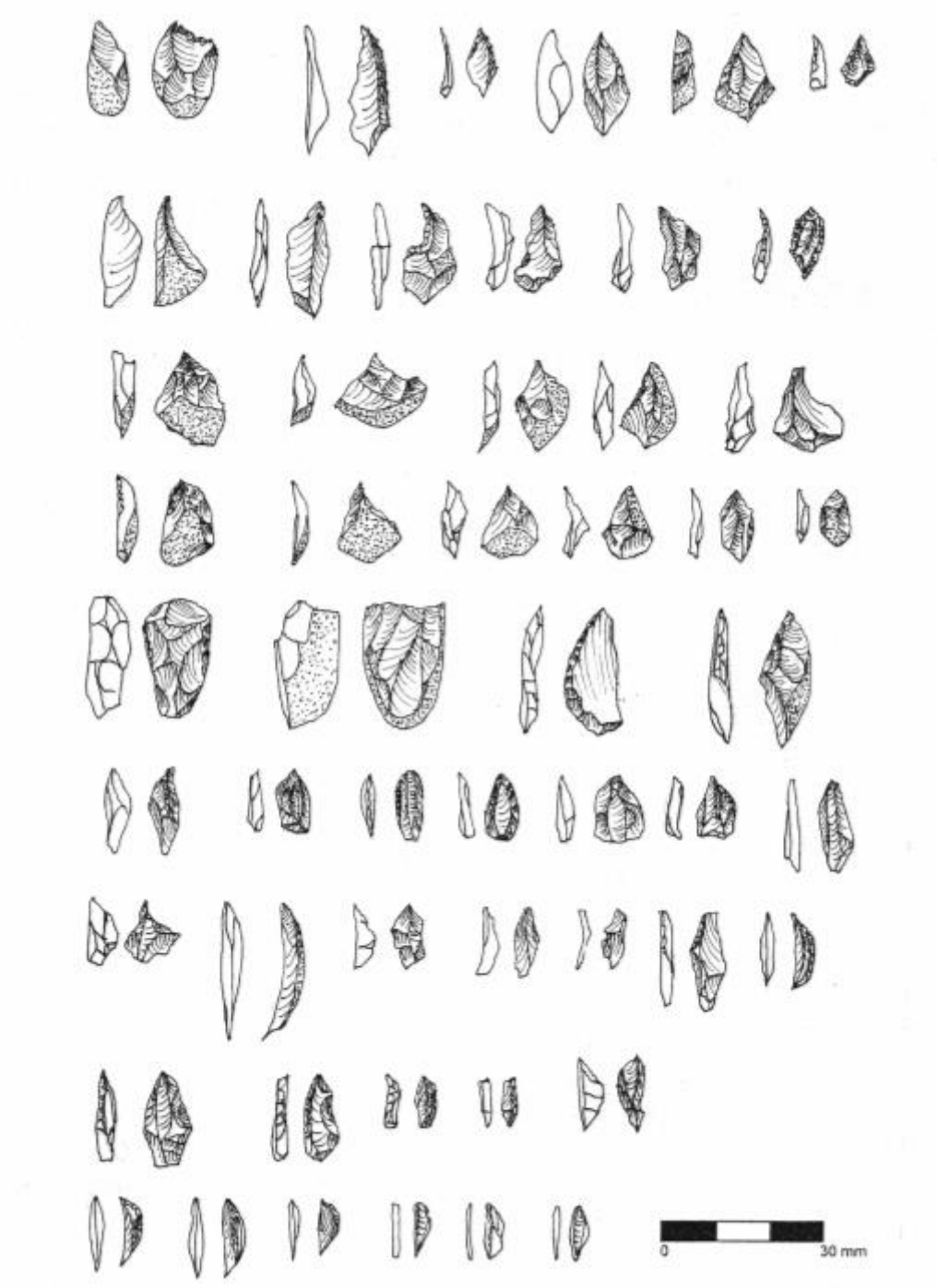


Figure 8: Examples of LSA microliths from Olieboompoort[3] (© van der Ryst 2007)

[3] Rows numbered top to bottom. Rows 1-4: borers; Row 5: medium side scraper, cortical medium end scraper, backed scraper; Row 6: bladelet core; Row 7: borer; Row 8: backed scraper; Row 9: segments

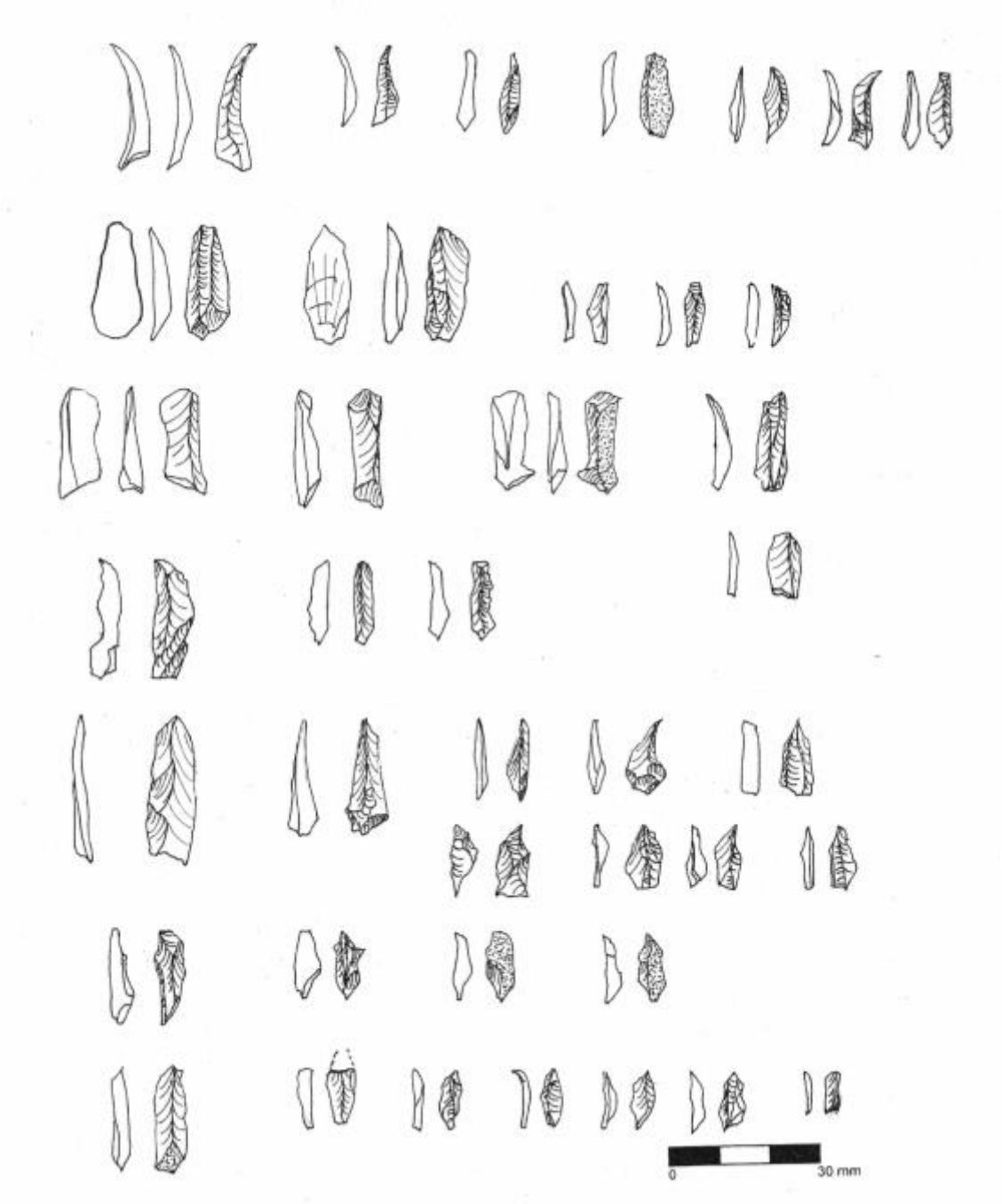


Figure 9: Examples of LSA bladelets from Olieboompoort[4] (© van der Ryst 2007)

[4] Rows 1-2 & 5-6: pointed bladelets; Row 3: parallel-sided bladelets; Row 4: thick triangular bladelets; Rows 7-8: backed bladelet.

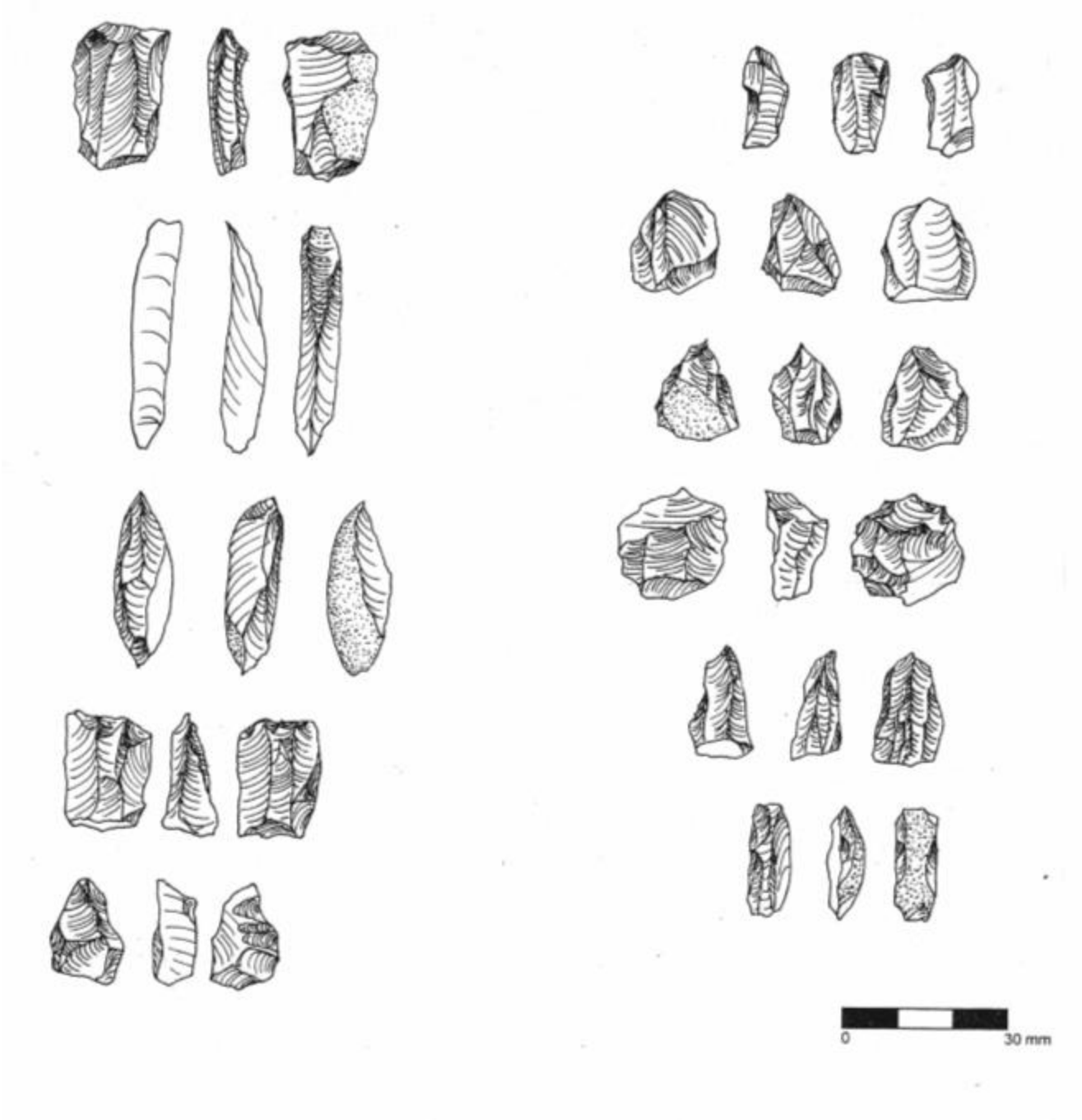


Figure 10: Examples of LSA bladelet cores from Olieboompoort (© van der Ryst 2007)

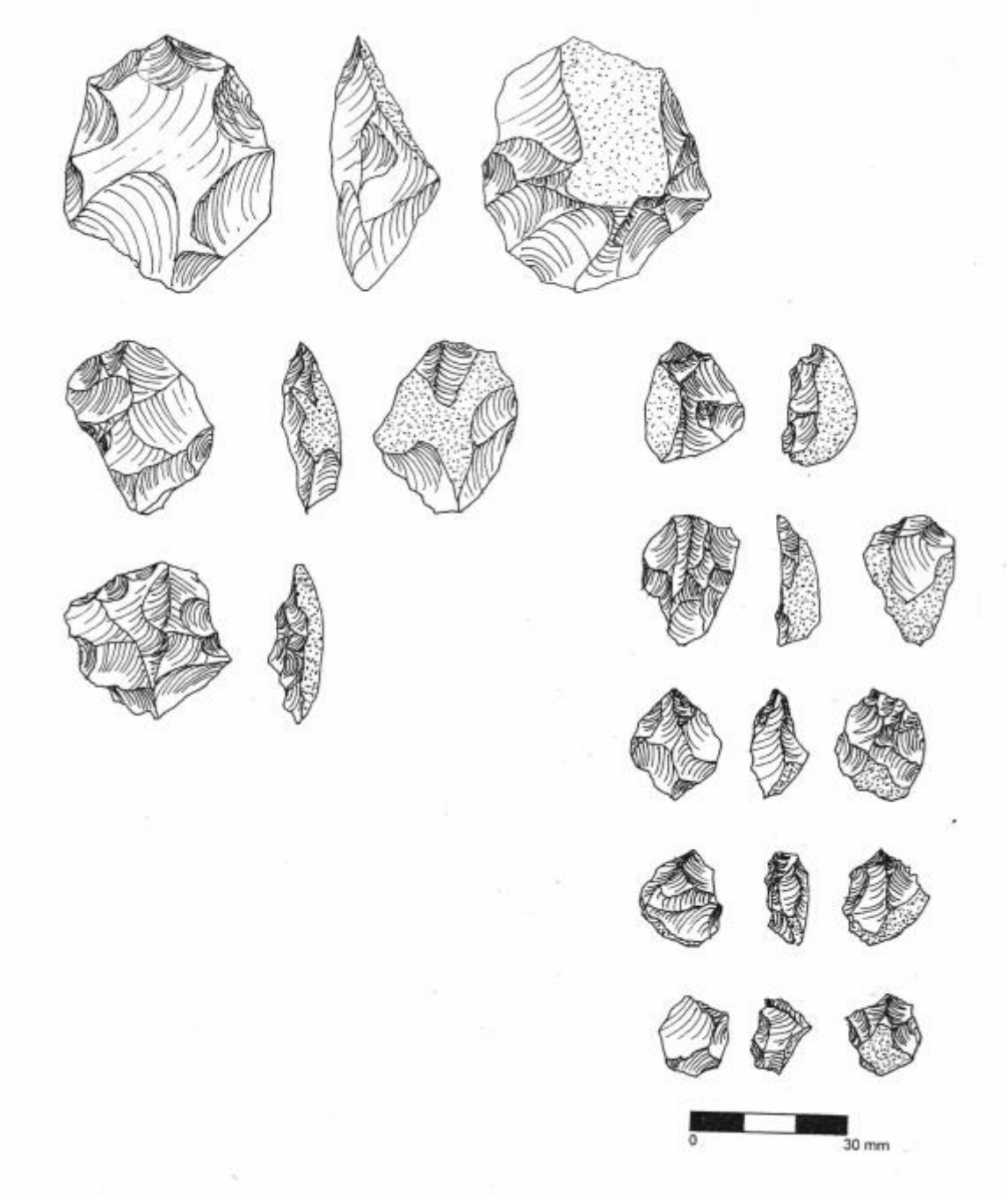


Figure 11: Examples of LSA cores with cortex from Olieboompoort (© van der Ryst 2007)

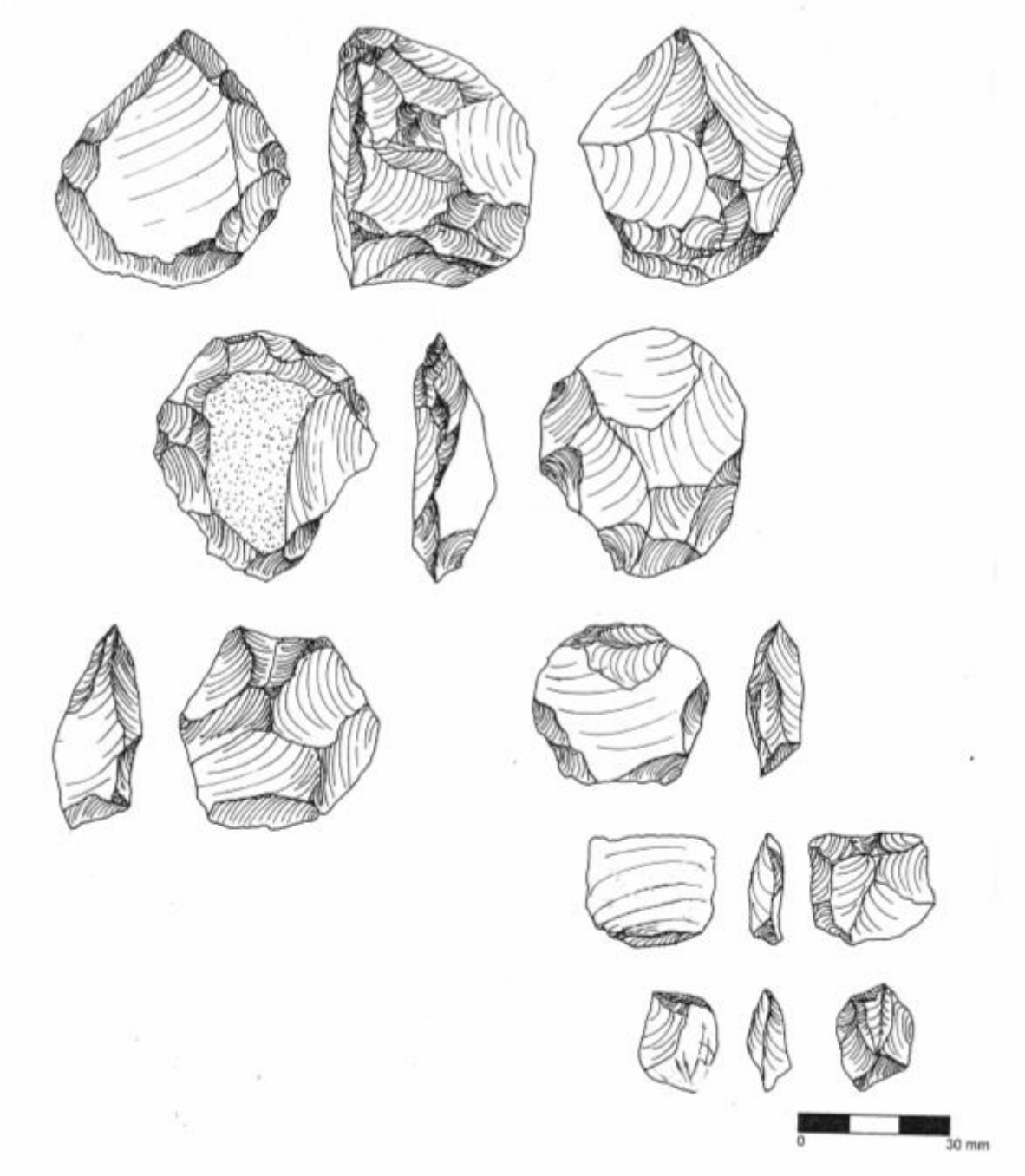


Figure 12: Examples of LSA cores[5] from Olieboompoort (© van der Ryst 2007)

[5] Rows 1-2: irregular cores; Row 3: pebble cores; Rows 4-5: core-reduced

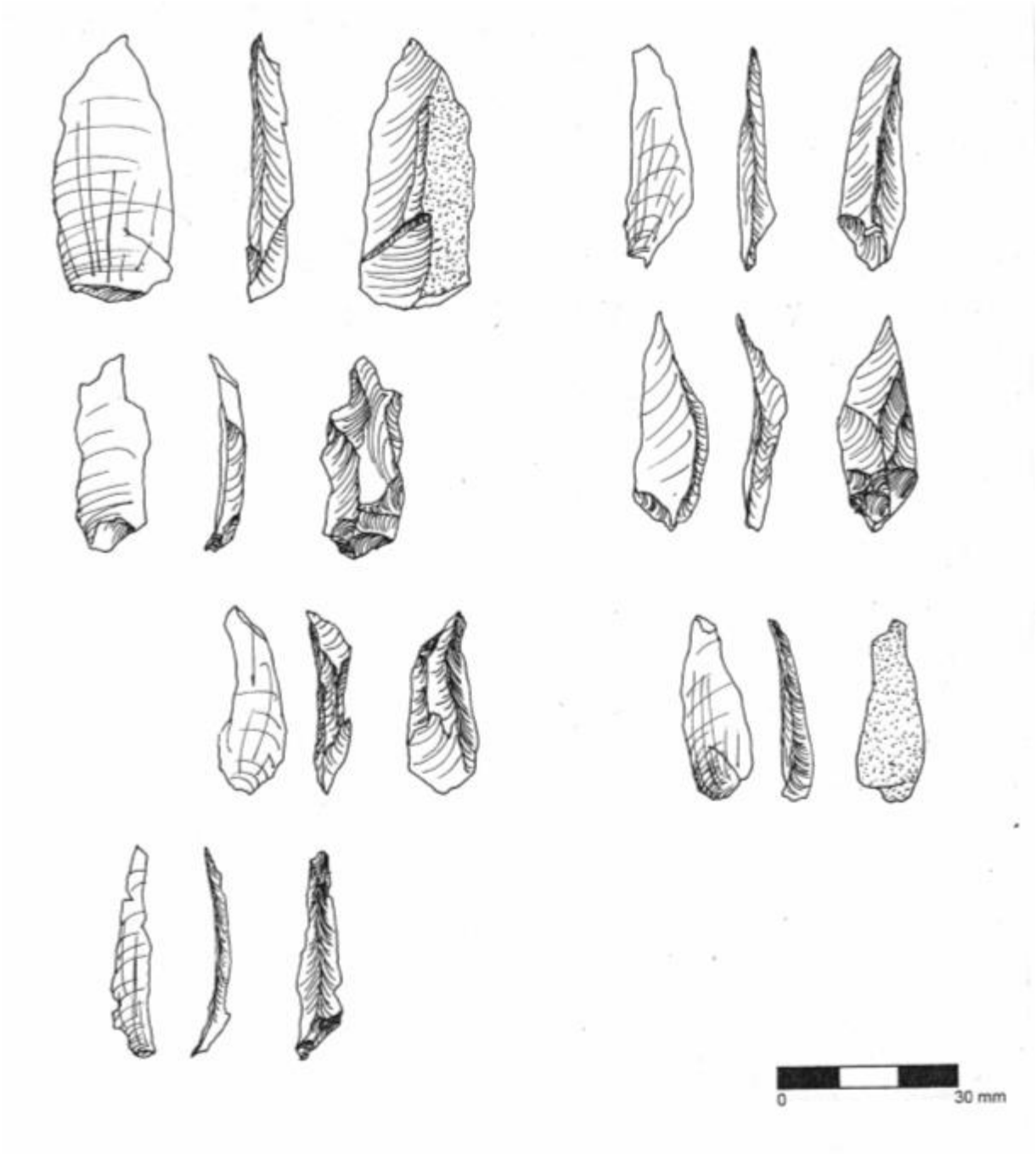


Figure 13: Examples of LSA blades from Olieboompoort (© van der Ryst 2007)

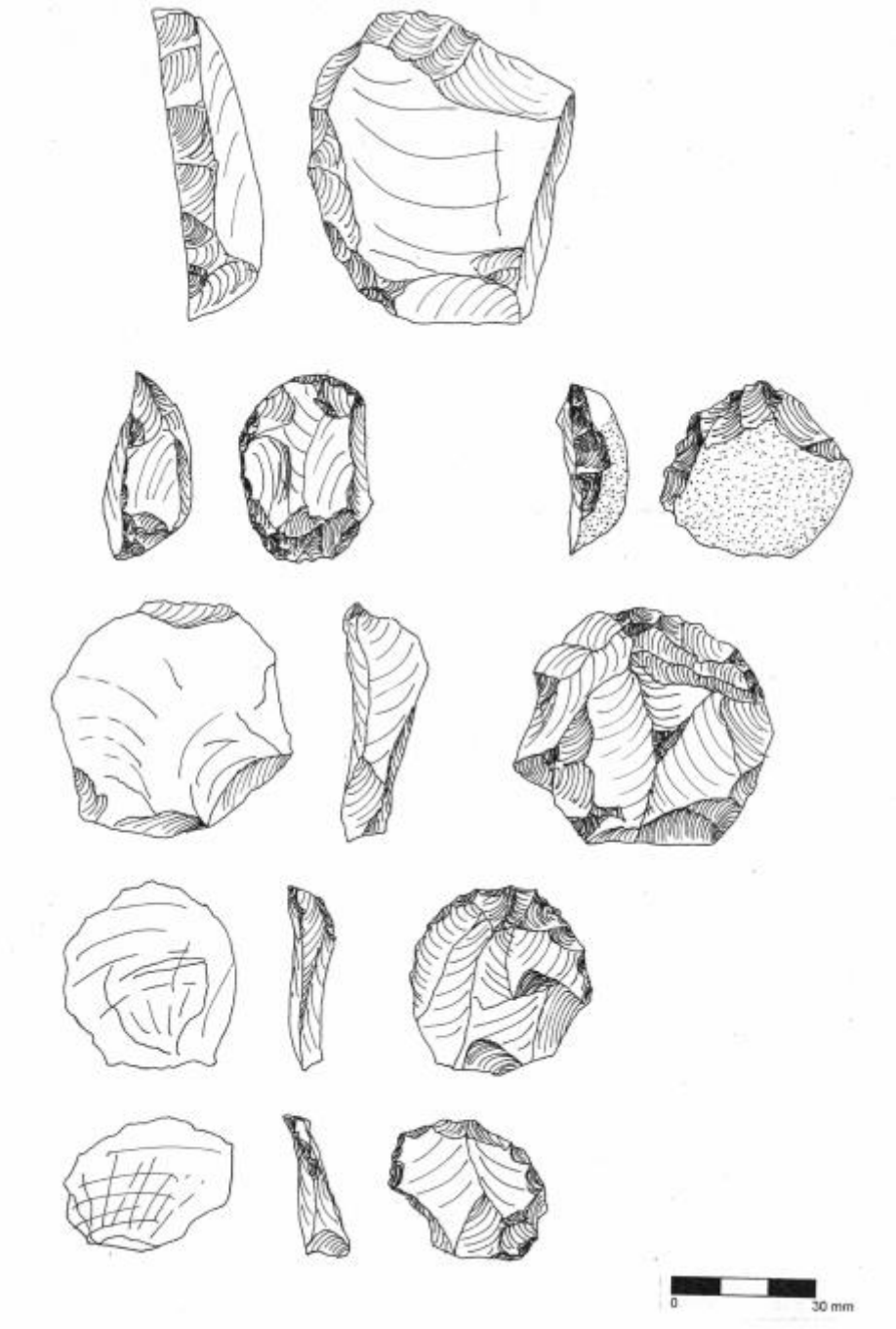


Figure 14: Examples of large LSA scrapers from Olieboompoort[6] (© van der Ryst 2007)

[6] Rows 1-2: large end-and-side scrapers; Row 3: core scraper: Row 4: circular and large end-and-side scraper.

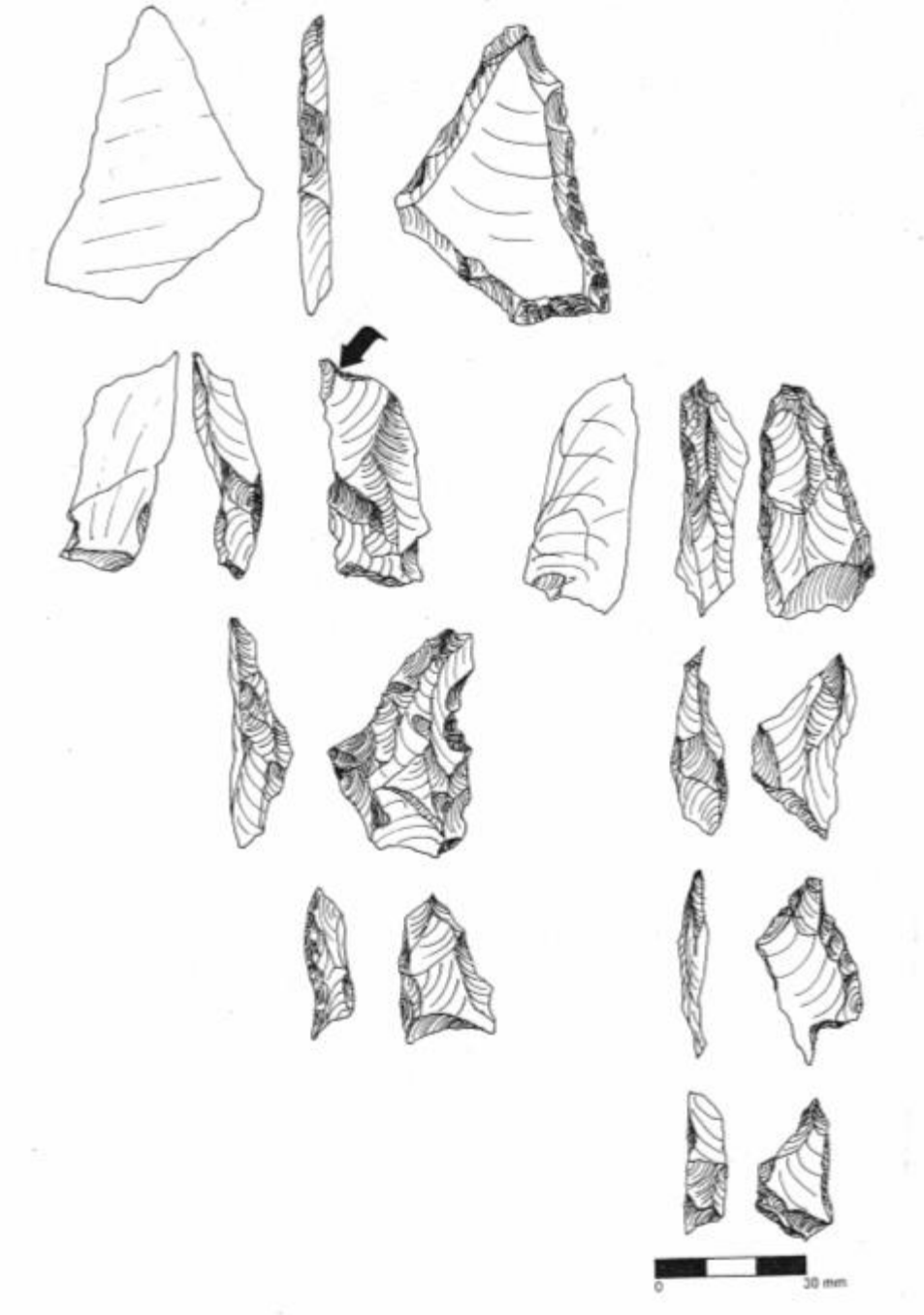


Figure 15: Examples of spokeshaves, adzes and burins from Olieboompoort[7] (© van der Ryst 2007)

[7] Rows 1, 3 & 5: spokeshaves; Row 2: burin; Row 4: adze.

Figure 16: Examples of stone tools collected at Boikarabelo Coal Mine (© Nel 2013)
Iron Age

3.2.2.2 Iron Age

The southern African Iron Age is generally associated with the appearance of metalworking and farming. The Iron Age archaeological record in the region begins around 300 CE and continuous to the mid-19th century. Although the Iron Age refers to metalworking and farming practices, pottery represents the predominant material culture most often noted.

Key indicators for Iron Age sites include pottery. In addition, certain other indicators may be noted to place a site within an Iron Age context. The archaeological surveys and excavations undertaken at Boikarabelo have identified grain bin foundations, grindstones, metal slag, as well as midden and kraal deposits (see Figure 19 to Figure 21 for examples). Another indicator of Iron Age occupation is the presence of burnt hut clay and floors (daga): this may be less easy to identify than other indicators.

Pottery is probably the easiest artefacts to identify in the project area, both as surface finds and exposed in excavations (resulting from animal and human activities). Pottery is most often found as fragments of fired clay pots. Figure 17 below shows a number of pottery fragments found at Boikarabelo.

Grainbin foundations are typically identified as a concentration of stones arranged in a roughly circular manner. Well-preserved grainbin foundations at Boikarabelo have been noted to be approximately one meter in diameter and often have lower grindstones associated, for example the one depicted in Figure 18.

Changes in soil colour and texture often indicate some form of past land use. Sometimes such changes are very obvious and noticeable on aerial imagery such as Google Earth (see Figure 23). On the ground, midden deposit may be identified as whitish to greyish finely textured ashy soil, sometimes with charcoal inclusions. Possible kraal deposit may be identified as whitish to pale greenish fairly rough textured soil. Should any such deposit be noted there is a high probability of also finding animal (and human) bones, pottery and other material culture intermixed with the deposit as indicated in Figure 22.

Although pottery is most frequently found as isolated surface scatters, there is a high probability that one or a combination of the other indicators is present as well. The more indicators present on a site, the higher the significance should be considered. Surface finds should therefore be mapped and plotted to create a site plan as depicted in Figure 24. Where sites include a lot of pottery, features and deposit, an archaeologist must called upon to assess the site before any further development takes place.

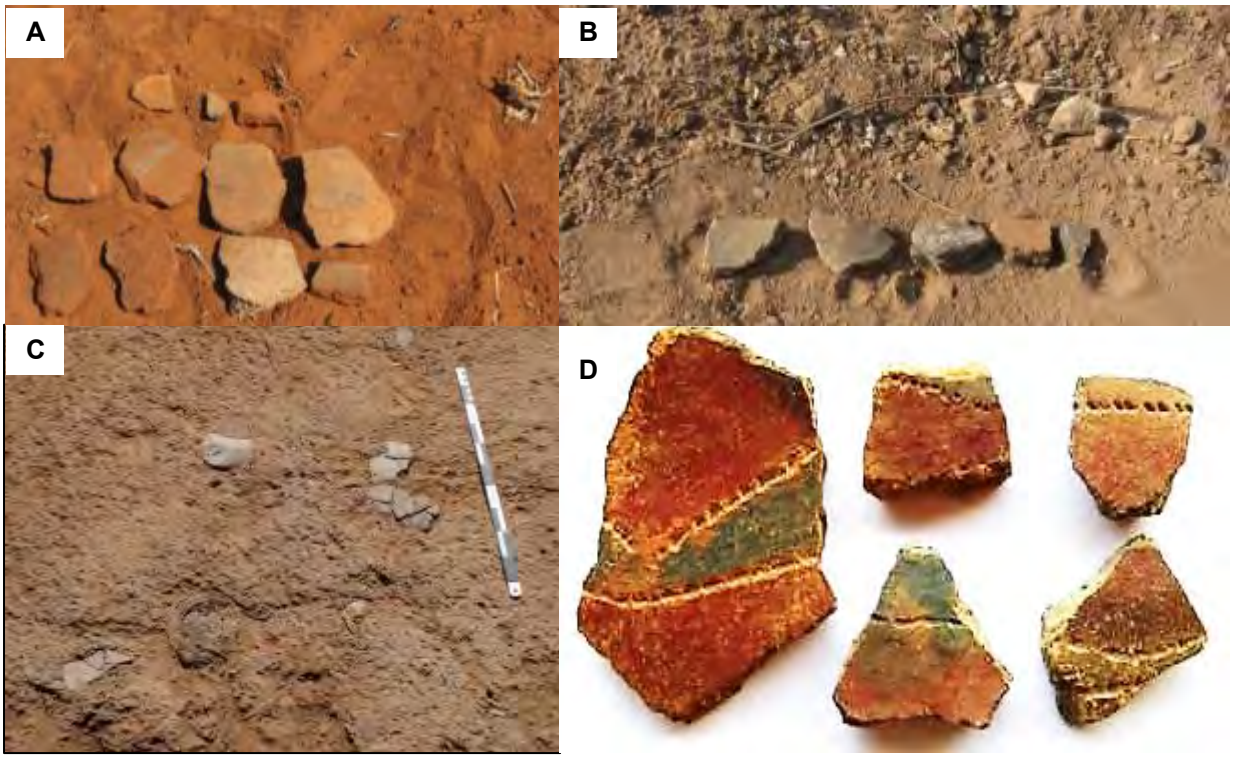


Figure 17: Typical examples of pottery found at Boikarabelo. A-B – surface finds; C – *in situ* pottery found in excavation; D – pottery analysed in laboratory

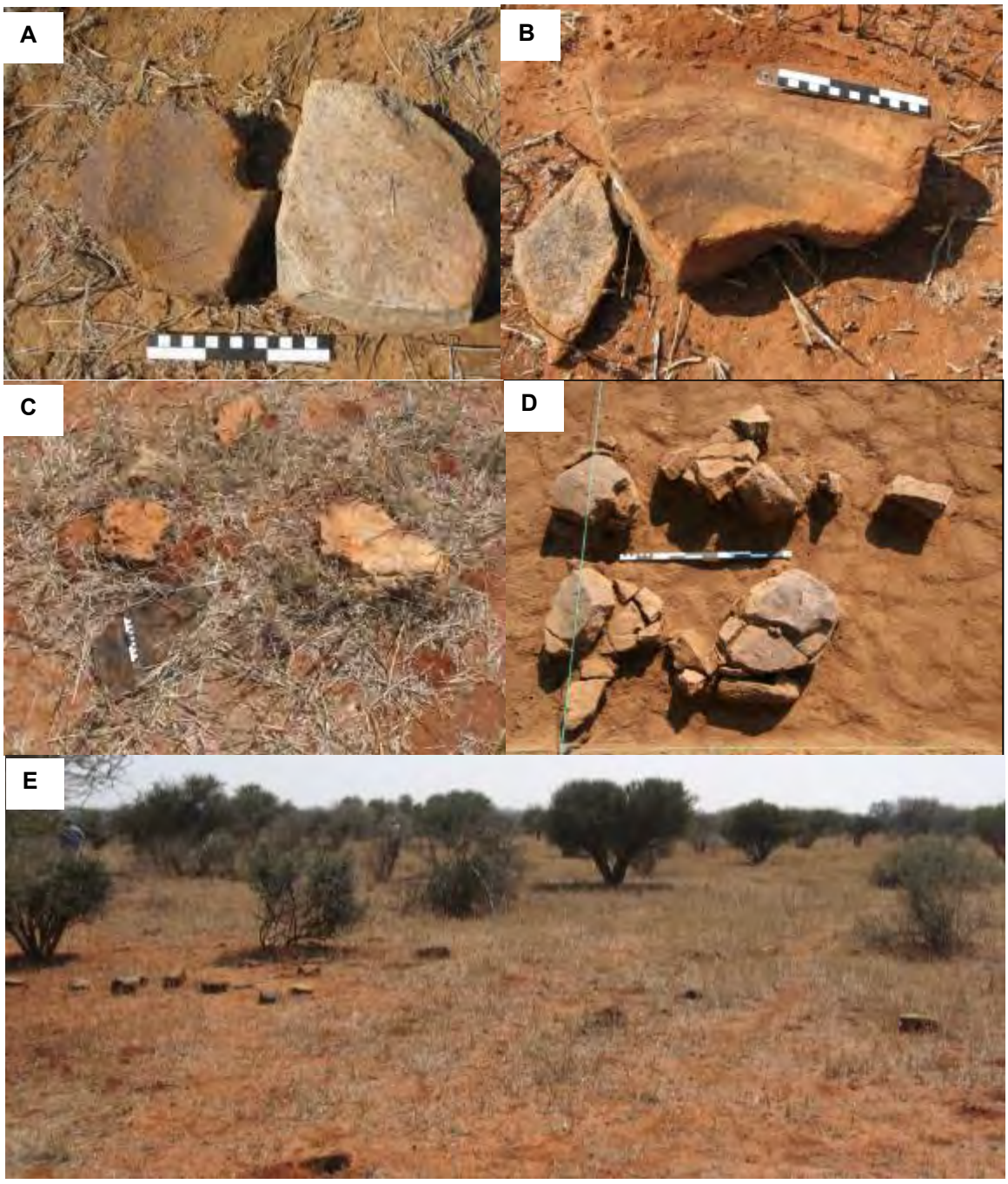


Figure 18: Lower grindstones and grainbin foundations found at Boikarabelo. A-B – lower grindstones; C – grainbin foundation; D – grainbin foundation exposed in excavation; E – typical grainbin site, note the stones indicting grainbin foundations and lower grindstones.

Figure 19: Example of an Iron Age lower grindstone, typically found at Boikarabelo.

Figure 20: Example of an Iron Age grainbin foundation, typically found at Boikarabelo.

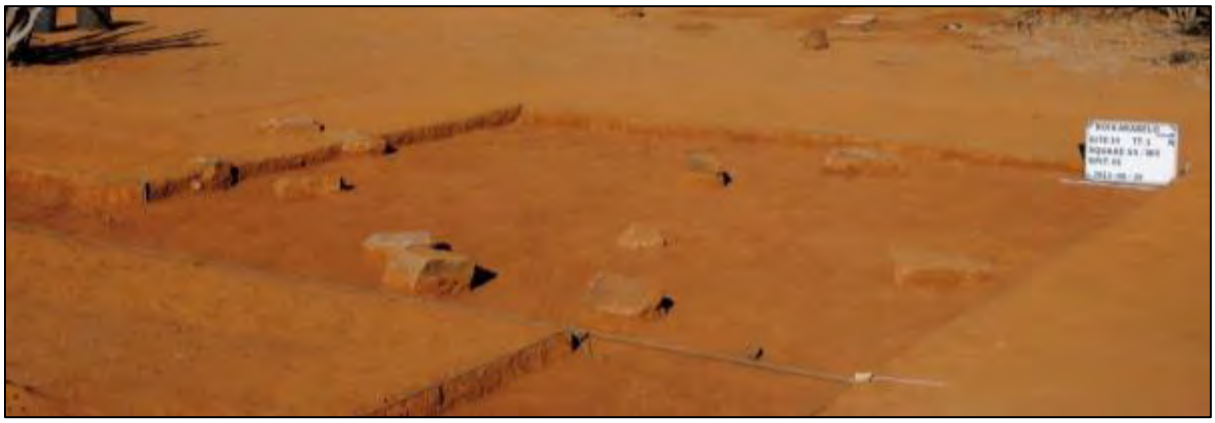


Figure 21: Example of an exposed Iron Age grainbin foundation, excavated at Boikarabelo in 2012

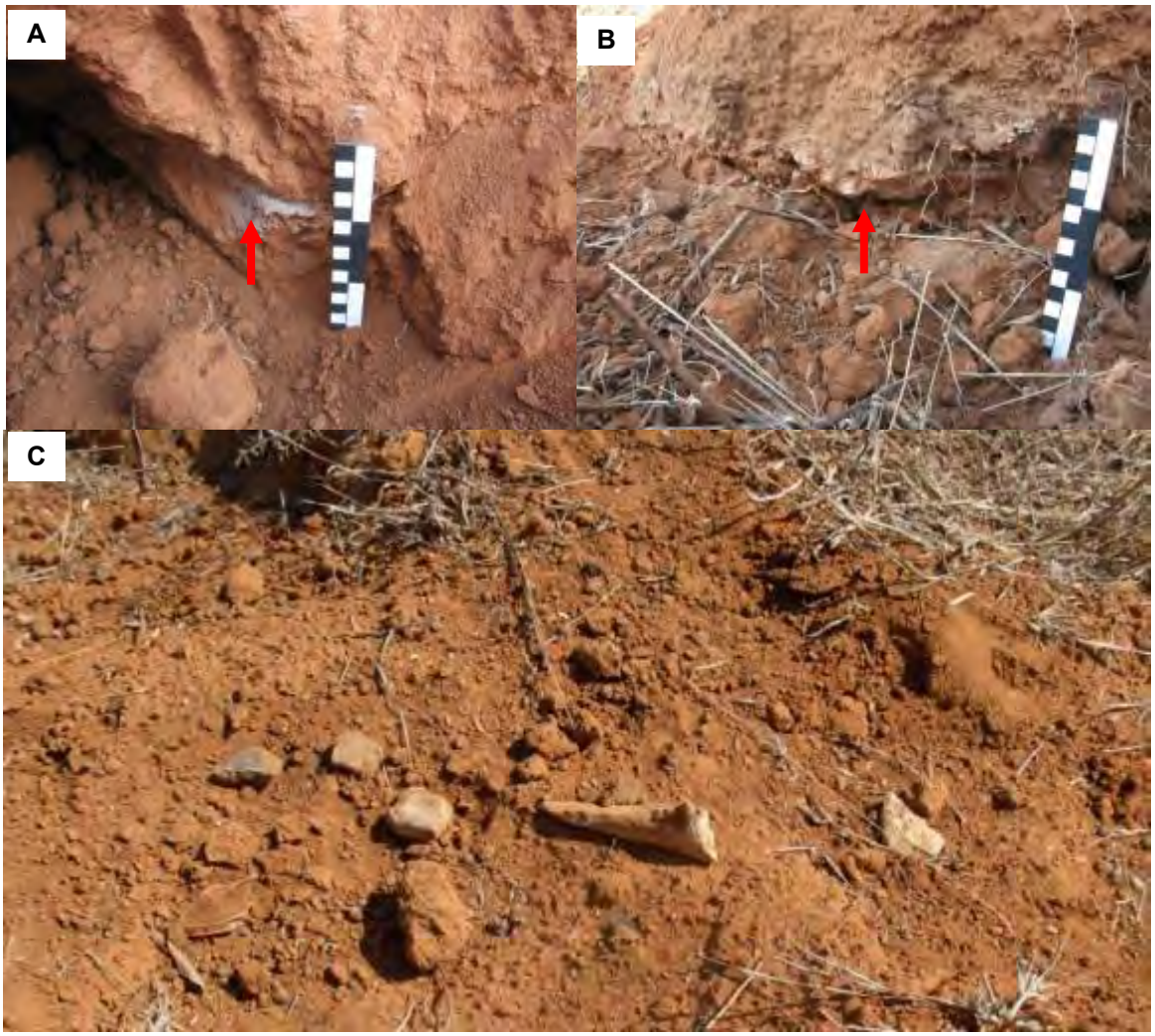


Figure 22: Examples of deposit found at Boikarabelo: A – ashy deposit in animal burrow; B – possible cattle dung or ash deposit in animal burrow; C – midden deposit with exposed animal bones and pottery.

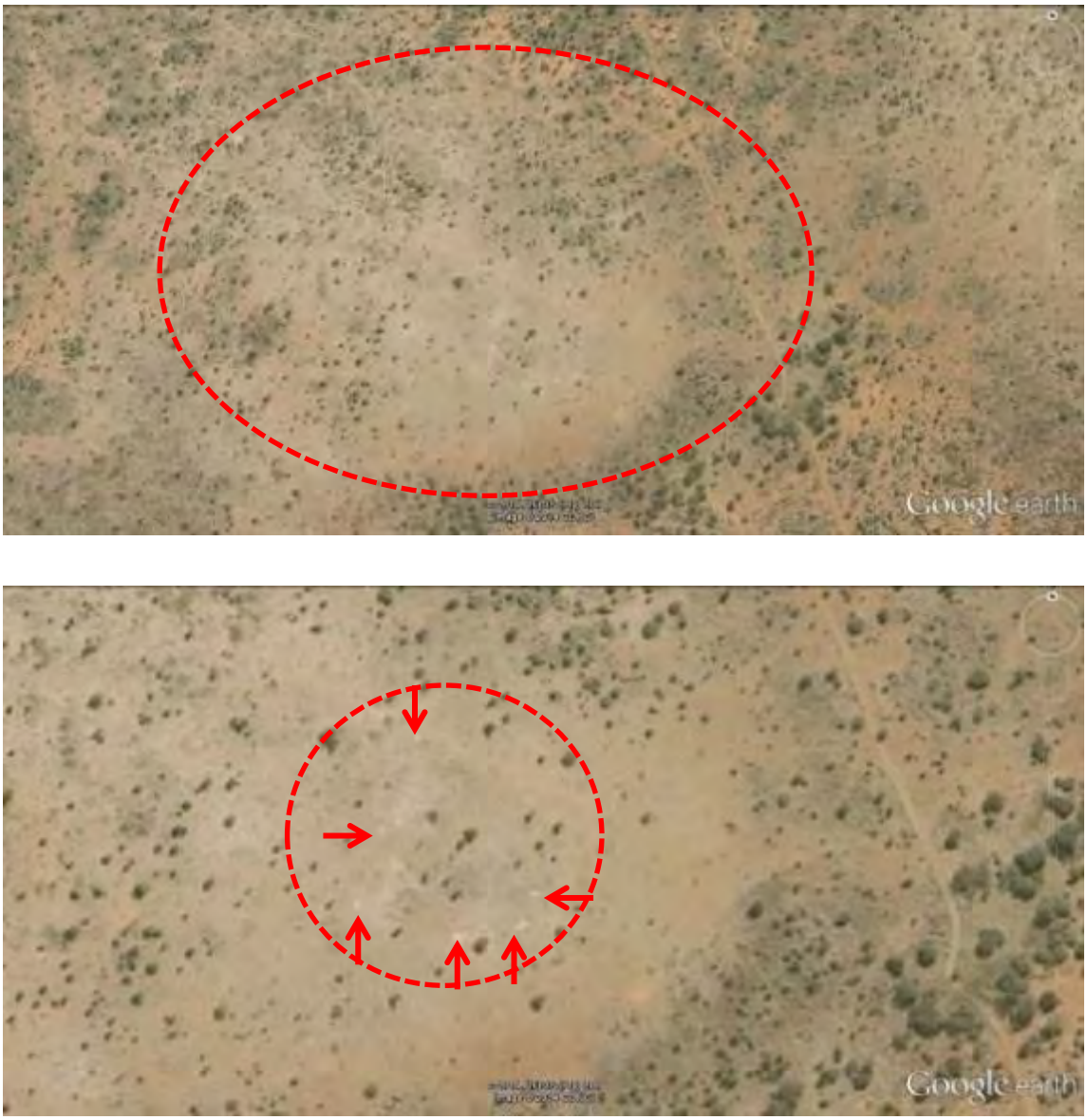


Figure 23: Example of an Iron Age site visible on Google Earth[8].

[8] The top image shows the general landscape, with the site in the bottom centre of the image – whitish ground surface. The bottom image shows the site zoomed in – the white patches are ashy deposits surrounding a central cattle kraal.

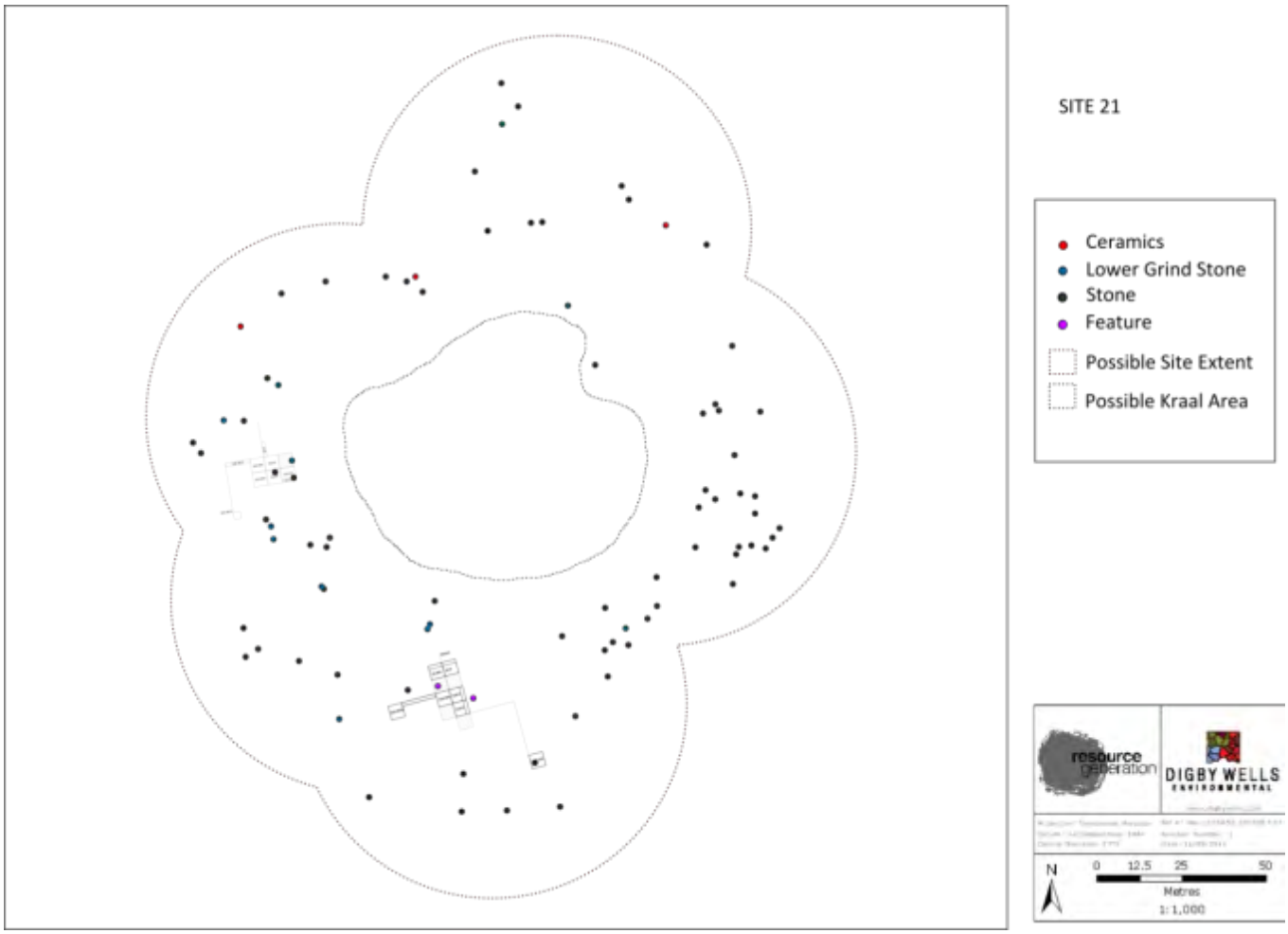


Figure 24: Example of mapped and plotted surface features to create a site plan of an Iron Age site at Boikarabelo

3.3 Site Recording

Everything that was identified in the development footprint during the site walk down must be recorded. If possible, the EM must plot the finds using GIS to develop a site map that will help to determine the significance of the site (see Figure 24). If the site is found to be very complex, the EM must appoint and archaeologist to assess the site and possibly undertake a watching brief during construction. In addition, such sites must be recorded on the South African Heritage Resources Information System (SAHRIS) Site Recording template. The site recording form or report must include all the observations made during the site walk down, including photographs.

The site recording forms are important in case very significant chance finds (e.g. human remains or rich deposits) are made during construction. The site reports will provide evidence that sites were screened before construction and that necessary mitigation measures were put into place. A site recording form template is provided at the end of the CFP document.

4 Proactive Palaeontological Monitoring Procedure

All fossils are generally protected in terms of Section 35 of the NHRA. It is therefore an offence to alter, damage, destroy or otherwise change palaeontological resources without permits issued by SAHRA. *Palaeontological* resources are defined as (NHRA Section 2):

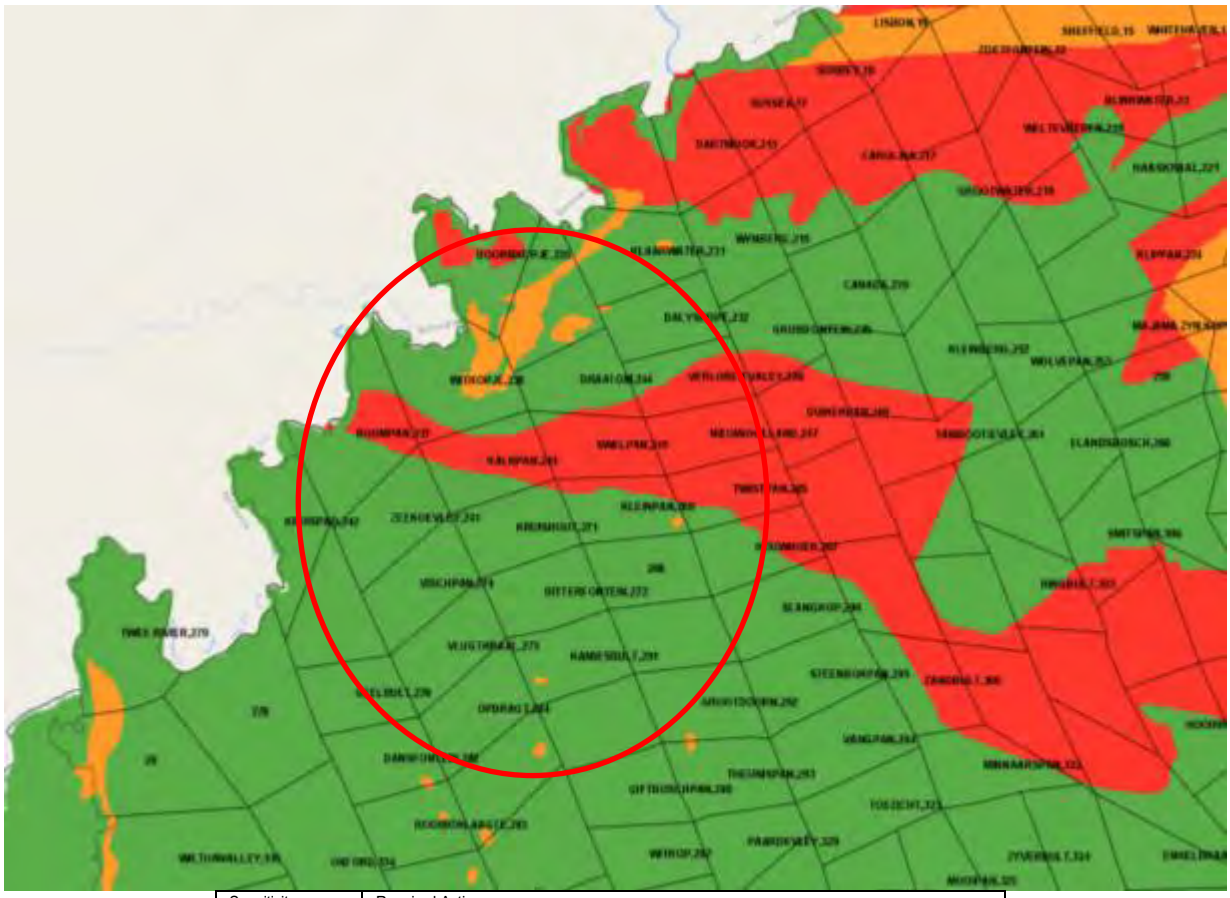
- Any fossilised remains or traces of animals or plants that lived in the geological past and any site that contains such remains or traces.
- However, fossil fuels or any fossiliferous rock intended for industrial use are excluded.

The following outlines a palaeontological monitoring procedure (PMP) to reduce or limit impacts on unidentified palaeontological resources in development footprint areas. The creation of the SAHRIS Fossil Sensitivity Map (Palaeo Map) has enabled the proactive management of palaeontological heritage resources (http://www.sahra.org.za/map/palaeo). The map serves as a guide with which to screen areas for palaeontological sensitivity.

The geology within which coal typically occurs is inherently plant fossil rich, but fossils in the coal itself are modified beyond recognition. Associated shale and mudstone allow for better preservation of fossil plants.

Figure 25 below is an excerpt from the Palaeo Map indicating the approximate area of the Boikarabelo Coal Mine and the expected palaeontological potential. The Mining Right Area is situated in an area ranging from moderate to very high fossil sensitivity. The minimum actions required by SAHRA therefore include desktop studies and a protocol to monitor any chance finds.

The most common of these are *Glossopteris* plants. Typical fossils will include leaves, flowers and fruits, ferns, sphenophytes and lycopods. In addition to Glossopterid fossils, the SAHRIS Fossil Heritage Layer Browser indicates other possible fossil types that may be expected in the various rocks, listed in Table 1 (http://www.sahra.org.za/fossil-heritage-layer-browser).



Sensitivity	Required Action
Very high	A physical field survey and assessment is required and a finds protocol must be implemented.
High	A palaeontological desktop study is required to determine if a field assessment is needed.
Moderate	A desktop study is required.
Low	No palaeontological studies are required, but a finds protocol must be implemented.
Insignificant / zero	No palaeontological studies are required.
Unknown	At least a desktop study is required to determine the sensitivity.

Figure 25: SAHRIS Palaeo Map indicating approximate location of Boikarabelo Coal Mine and fossil sensitivity

Table 1: Possible fossiliferous rocks occurring in the Boikarabelo Coal Mine properties

Stratigraphy & Age				Sensitivity	Fossil types	Rock types
KAROO SUPERGROUP	Jurassic	Stormberg Group	Clarens Formation	High	Silicified wood; plant remains; freshwater crustaceans; primitive bony fish; invertebrate trace fossils; rare dinosaurs *e.g.* Massospondylus; crocodylomorphs; advanced cynodonts including early mammals, *e.g. Erythrotherium;* dinosaurs and mammal track ways; coprolites; eggshell fragments.	Aeolian desert sandstone ("Cave Sandstone") Aeolian (wind-blown) sand, minor playa lake, ephemeral stream deposits, basaltic lava flows.
	Triassic	Beaufort Group	Eendragtpan Formation	Low	No coals (probably Beaufort Group. or Molteno equivalents)	Variegated mudrock of arid floodplains
	Permian	Ecca Group	Upper Ecca			
			Volksrust Formation	High	Trace; rare temnospondyl amphibian remains; invertebrates (bivalves, insects); minor coals with plant remains; petrified wood; organic microfossils (acritarchs); low-diversity marine to non-marine trace fossil assemblages.	Dark Grey Shale. Basinal dark mudrock with phosphatic / carbonate / sideritic concretions, minor coal offshore shelf, but possibly also nearshore / lacustrine / lagoonal deposits
			Middle Ecca			
			Goedgedacht Formation	Very high	Glossopterid coal flora abundant; associated with thick coal seams.	Mudstone, sandstone, coal within proglacial alluvial fans, braided streams.
				Moderate	Non-marine trace; vascular plants, including petrified wood; palynomorphs of *Glossopteris* flora; mesosaurid reptiles; fish including microvertebrate remains, coprolites; crustaceans; sparse marine shelly invertebrates (molluscs, brachiopods); microfossils (radiolarians *etc.*); insects.	Offshore basin plain (predominantly non-marine) to coastal deltaic sediments, minor volcanic ash (tuff).
	Carboniferous	Dwyka Group		Low	Trace; organic-walled micro; rare marine invertebrates (*e.g.* molluscs), fish, vascular plants; inter- and post-glacial trace fossil assemblages.	Glacial, inter- and post-glacial siliciclastic sediments (*e.g.* tillite).

The PMP comprises three primary steps that must be implemented prior to any large-scale development taking place. This section is structured as follows:

- Step 1 – determine geological context
- Step 2 – appoint qualified palaeontologist
- Step 3 – collect fossils.

4.1 Step 1 – determine geological context

The EM in association with the resident geologist must determine the geological context of areas where development will expose bedrock. The SAHRIS Fossil Heritage Layer must be consulted to determine whether the geology is considered sensitive.

If the geology is found to be insignificant, the following steps are not required. However, should the geology be considered low significance or higher, the following steps need to be implemented.

The SAHRIS Fossil Heritage Layer information can be used to ensure that a palaeontologist with the require expertise is identified, for example:

- Paleaobotanist if the rocks have potential to produce predominantly trace and plant fossils;
- An invertebrate palaeontologist if the rocks have potential to produce predominantly marine invertebrates or insects; and
- A vertebrate palaeontologist if the rocks have potential to produce predominantly vertebrate fossils such as fish or dinosaurs.

4.2 Step 2 – palaeontological field assessment

The EM must ensure that the services of a qualified palaeontologist are procured. The palaeontologist must undertake a field assessment to identify and assess any possible fossils that may occur in the rocks.

The palaeontologist will be responsible to collect any rare or unique fossils under a permit issued by SAHRA for suitable storage and curation. The palaeontologist may advise on common fossils that can be sacrificed if they are of minimal or no scientific importance but a representative collection could be made if deemed necessary.

4.3 Step 3 – ongoing fossil collection

The EM must ensure that the resident mine geologist regularly inspect the potential fossil bearing rock such as shale and mudstone of no economic value before being discarded. The EM must collect any identified fossiliferous material.

The relevant qualified palaeontologist must undertake inspections on a regular basis agreed with Boikarabelo Coal Mine to inspect the selected material and briefly survey the discard dumps, where feasible.

Inspections should ideally be monthly. However, if the EM and resident geologist are diligent and extract fossil material, inspections can be less frequent. If the palaeontologist considers fossil material to be poor, site inspections may be reduced to longer intervals.

The palaeontologist will remove fossils from the mine that considered to of good quality or scientific interest for cataloguing and long-term curation.

Fossils can only be removed if a SAHRA permit has been issued. The EM must also ensure that annual reports are submitted to SAHRA.

5 Chance Find Protocol

As indicated in the Introduction above, the purpose of CFPs is to reduce damage and destruction to any heritage resource that might be accidentally exposed during the course of development activities association. The CFP outlined here are based on the legal requirements and procedures contained in the NHRA. The AMP and PMP procedures discussed above under sections 3 and 4 above. The structure of this section is as follows:

- How to spot a chance find
- CFP procedure; and
- Legal processes.

5.1 How to spot a chance find

The guidelines presented in the AMP and PMP sections above should enable the EM and other persons to spot some chance finds during development. However, many chance finds will not be noted during large-scale earth moving. The EM should therefore ensure that contractors undergo induction training to identify any chance finds that may be exposed. The following list typical chance finds that may be exposed during development:

- Human remains, possibly with associated material culture such as pottery;
- Animal bones, possible indication of a midden;
- Pieces of brick-like burnt or baked clay, indicating possible hut remains; and
- Distinct, localized changes in soil colour and texture.

5.2 Chance Find Protocol Procedure

In the event that any heritage resources are accidently exposed during project activities, the H-E-R-I-T-A-G-E procedure must be implemented.

HALT ALL WORK	The moment a chance find is made, the person responsible must immediately stop all work near the find.
EXAMINE CHANCE FIND	The person who made the chance find must examine the find and secure the site to protect it from any further damage.
REPORT CHANCE FIND	The person who made the chance find must immediately report the chance find to her / his direct supervisor, according to reporting protocols instituted by the Mine. The supervisor must report the find to her / his manager and the EM. The EM must report the find to the relevant Authorities and an archaeologist or palaeontologist, as the case may be.
INVESTIGATE CHANCE FIND	The EM must ensure that a qualified specialist is engaged to investigate the chance find and site and assess its context, age and possibility of the find representing a more extensive site.
TAKE RECORD	The EM and specialist must ensure that proper records and documentation are kept. Documentation must start with the initial find report, and include records of all actions taken, persons involved and contacted, comments received and findings. Records and documentation will be necessary to request approvals and permits from the relevant Authorities to continue work on site.
APPROVALS AND PERMITS	The archaeologist or palaeontologist will submit a report, including all records kept by the EM to SAHRA. The report will include recommendations for any additional specialist work that may be necessary, or request approval to continue with the development.
GO AHEAD WITH PLANNED WORK	As soon as the necessary approvals have been issued, the Mine may continue with the development.
END CHANCE FIND PROCEDURE	The EM will be responsible to close off the chance find procedure. This may require implementing or integrating any requirements issued by any Authority into operational management plans.

5.3 Legal Processes

In addition to the CFP procedure outlined above, there are legal processes that must be followed when a chance find is made.

5.3.1 Archaeological and Palaeontological Chance Finds

All archaeological and palaeontological sites and materials are protected in terms of Section 35 of the NHRA. It is therefore important that any chance find be immediately reported to SAHRA. No person or entity is allowed to destroy, damage, alter, excavate or remove from its original site any archaeological or palaeontological material without a permit issued by SAHRA.

SAHRA will only issue permits to professionally trained archaeologists or palaeontologists. These professionals must keep proper records of any excavations or collecting programmes that may be required by SAHRA on reporting a chance find. Any finds considered to be significant must be placed in a public institution where it is available to anyone for study. Finds may not be kept by any Mine employees, contractors or local residents.

It is therefore important that Boikarabelo Coal Mine makes sufficient financial provision to ensure that archaeological and palaeontological sites are rescued. This should include contingencies to appoint a professional archaeologist or palaeontologist approved by SAHRA.

SAHRA also requires that permits are obtained for the destruction of sites: Permit applications have prescribed fees per site that must be paid before permits will be issued.

If these requirements are not met, SAHRA may serve on the owner or developer an order to cease work and may require an archaeological investigation and mitigation.

5.3.2 Burial Grounds and Graves

The NHRA protects certain types of graves in terms of Section 36 of the Act. Within context of the Boikarabelo Coal Mine, the main types include graves older than 60 years, and archaeological burials. Chapter XII of the NHRA: Regulations provide the legal framework that must be complied with in the event than graves or human remains chance finds are made. This process is summarized below.

The moment a grave or human remains are found, the site must be secured to ensure that no further damage or disturbance occurs. The H-E-R-I-T-A-G-E process outlined must be implemented as soon as possible after the find is made. Authorities who must be specifically notified are the SAHRA Burial Grounds and Graves (BGG) unit and the local South African Police Service (SAPS). These Authorities must inspect the grave to determine if the grave older than 60 years or otherwise protected in terms of the NRHA, and if any further graves exist in the vicinity.

Note that in practice, SAHRA generally delegates their responsibility to an archaeologist to inspect the grave site and provide a report on her / his findings to the SAHRA BGG for consideration.

In the event that the grave is found to be older than 60 years, the Mine must ensure that a proper investigation is undertaken by an archaeologist to establish the context of the grave/s. The NHRA and NHRA: Regulations require that test excavations and documentary research be undertaken if required. The outcome of this investigation may require on the following three processes to be implemented.

- If the archaeologist determines that the grave is protected in terms of Section 36 of the NHRA, then the processes outlined in Chapters XI and IX of the NHRA: Regulations must be implemented.
- If the archaeologist determines that the grave is archaeological, a permit application in terms of Section 35 of the Act and Chapters II and IV of the NHRA: Regulations must be made. In general, a grave is considered to be archaeological if it is older than 100 years and obviously associated with archaeological material.
- If the remains are younger than 60 years, an application to exhume and rebury the remains must be made to the provincial Department of Health and local municipality. However, it is advisable that the same consultation process is followed as it applies to graves older than 60 years.

6 Bibliography and Further Reading

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SITE RECORDING FORM

DATE: YYYY-MM-DD	**SITE NO.:**
RECORDER:	
SECTION 1: DEVELOPMENT DETAILS	
DEVELOPMENT CATEGORY	IMPLEMENTED BY
SECTION 2: GEOGRAPHIC DETAILS	
LIMPOPO PROVINCE	**ELLISRAS MAGISTERIAL DISTRICT**
LEPHALALE LOCAL MUNICIPALITY	**STEENBOKPAN**
FARM NAME & NO. / ERF NO. / STREET ADDRESS	
GPS MODEL NAME/ NUMBER	
ACCURACY	
EAST COORDINATES	SOUTH COORDINATES
SECTION 4: SURVEY INFORMATION	
WEATHER CONDITIONS	
ENVIRONMENTAL CONDITIONS	
SURVEY METHOD, E.G. PEDESTRIAN, TRANSECT, RANDOM, VEHICULAR, TOPOGRAPHICAL	
SECTION 5: SITE INFORMATION CATALOGUE	
VEGETATION TYPE, E.G. GRASSLAND, BUSHVELD, INVASIVE, SICKLEBUSH, ETC.	
SITE LOCATION E.G. VALLEY, SLOPE, MOUNTAIN, PLAIN, SHELTER	
SITE PERIOD, E.G. STONE AGE, IRON AGE, HISTORICAL	
SITE TYPE, E.G. FIND SPOT, OPEN SCATTER, MIDDEN, STONE WALL, INDUSTRIAL, GRAVE OR BURIAL GROUND, BUILT ENVIRONMENT	
ARTEFACTS PRESENT, E.G. LITHICS, POTTERY, PORCELAIN, SLAG	
SITE EXTENT, E.G. APPROXIMATE DIAMETER, LENGTH & BREADTH, DEPTH, ETC.	

SECTION 6: IDENTIFIED SURFACE INDICATORS

Fossil		Stone tools		Stone tool source material		Stone tools in calcrete		Rock painting		Rock engraving											
Pottery		Ash		Cattle dung		Lower grindstone		Upper grindstone		Grainbin foundation											
Metal slag		Daga		Animal bones		Human bones		Burnt clay		Charcoal											
Glass beads		Worked stone		Metal		Glass		Hut floor		Other											

SECTION 7: ARTEFACT DENSITY

Stone tool density calculated as number of tools per square meter	1:1		≤5:1		≤10:		≤15:1		≤20:1		>20:1										
Pottery density calculated as number of fragments per square meter	1:1		≤5:1		≤10:1		≤15:1		≤20:1		>20:1										
Animal bones density calculated as number of bones per square meter	1:1		≤5:1		≤10:1		≤15:1		≤20:1		>20:1										
Grainbin foundations density calculated as number of features per 10 square meters	1:10		2:10		≤5:10		≤10:10		≤15:10		>15:10										
Density of combined surface indicators per 10 square meters	1:10		≤5:10		≤10:10		≤15:10		>15:10		>15:10										

SECTION 5: PHOTOGRAPHIC RECORDS
CAMERA MAKE & MODEL AND IMAGE NUMBER/S
FILE LOCATION ON SERVER
SECTION 8: DETAILED SITE DESCRIPTION AND SKETCHES (OVERLEAF)

Appendix C: Specialist CV

Mr. Justin du Piesanie

Unit Manager: Heritage Resources Management

Social and Heritage Services Department

Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2015	Continued Professional Development, Intermediate Project Management Course	PM.Ideas: A division of the Mindset Group
2013	Continued Professional Development Programme, Architectural and Urban Conservation: Researching and Assessing Local Environments	University of Cape Town
2008	MSc	University of the Witwatersrand
2005	BA (Honours) (Archaeology)	University of the Witwatersrand
2004	BA	University of the Witwatersrand
2001	Matric	Norkem Park High School

2 Language Skills

Language	Written	Spoken
English	Excellent	Excellent
Afrikaans	Proficient	Good

3 Employment

Period	Company	Title/position
2016 to present	Digby Wells Environmental	Unit Manager: Heritage Resources Management
2011-2016	Digby Wells Environmental	Heritage Management Consultant: Archaeologist
2009-2011	University of the Witwatersrand	Archaeology Collections Manager
2009-2011	Independent	Archaeologist
2006-2007	Maropeng & Sterkfontein Caves UNESCO World Heritage Site	Tour guide

4 Experience

I joined the company in August 2011 as an archaeologist and was subsequently made unit manager in the Social and Heritage Services Department in 2016. I obtained my Master of Science (MSc) degree in Archaeology from the University of the Witwatersrand in 2008, specialising in the Southern African Iron Age. I further attended courses in architectural and urban conservation through the University of Cape Town's Faculty of Engineering and the Built Environment Continuing Professional Development Programme in 2013. I am a professional member of the Association of Southern African Professional Archaeologists (ASAPA), and accredited by the association's Cultural Resources Management (CRM) section. I am also a member of the International Council on Monuments and Sites (ICOMOS), an advisory body to the UNESCO World Heritage Convention. I have over 10 years combined experience in HRM in South Africa, including heritage assessments, archaeological mitigation, grave relocation, and NHRA Section 34 application processes. I gained further generalist experience since my appointment at Digby Wells in Botswana, Burkina Faso, the Democratic Republic of Congo, Liberia and Mali on projects that have required compliance with IFC requirements such as Performance Standard 8: Cultural Heritage. Furthermore, I have acted as a technical expert reviewer of HRM projects undertaken in Cameroon and Senegal. My current focus at Digby Wells is to develop the HRM process as an integrated discipline following international HRM principles and standards. This approach aims to provide clients with comprehensive, project-specific solutions that promote ethical heritage management and assist in achieving strategic objectives.

5 Project Experience

Please see the following table for relevant project experience:

Project Title	Project Location	Date:		Description of the Project	Name of Client
Klipriviersberg Archaeological Survey	Meyersdal, Gauteng, South Africa	2005	2006	Archaeological surveys	ARM
Sun City Archaeological Site Mapping	Sun City, Pilanesberg, North West Province, South Africa	2006	2006	Phase 2 Mapping	Sun International
Witbank Dam Archaeological Impact Assessment	Witbank, Mpumalanga, South Africa	2007	2007	Archaeological survey	ARM
Archaeological Assessment of Modderfontein AH Holdings	Johannesburg, Gauteng, South Africa	2008	2008	Heritage Basic Assessment	ARM
Heritage Assessment of Rhino Mines	Thabazimbi, Limpopo Province, South Africa	2008	2008	Heritage Impact Assessment	Rhino Mines
Cronimet Project	Thabazimbi, Limpopo Province, South Africa	2008	2008	Archaeological surveys	Cronimet
Eskom Thohoyandou SEA Project	Limpopo Province, South Africa	2008	2008	Heritage Statement	Eskom
Wenzelrust Excavations	Shoshanguve, Gauteng, South Africa	2009	2009	Phase 2 Excavations	Heritage Contracts Unit
University of the Witwatersrand Parys LIA Shelter Project	Parys, Free State, South Africa	2009	2009	Phase 2 Mapping	University of the Witwatersrand
Transnet NMPP Line	Kwa-Zulu Natal, South Africa	2010	2010	Heritage survey	Umlando Consultants
Archaeological Impact Assessment – Witpoortjie Project	Johannesburg, Gauteng, South Africa	2010	2010	Archaeological Impact Assessment	ARM
Der Brochen Archaeological Excavations	Steelpoort, Mpumalanga, South Africa	2010	2010	Phase 2 Excavations	Heritage Contracts Unit
De Brochen and Booysendal Archaeology Project	Steelpoort, Mpumalanga, South Africa	2010	2010	Phase 2 Mapping	Heritage Contracts Unit
Eskom Thohoyandou Electricity Master Network	Limpopo Province, South Africa	2010	2010	Heritage Statement	Strategic Environmental Focus
Batlhako Mine Expansion	North-West Province, South Africa	2010	2010	Phase 2 Mapping	Heritage Contracts Unit
Kibali Gold Project Grave Relocation Plan	Orientale Province, Democratic Republic of Congo	2011	2013	Grave Relocation	Randgold Resources
Kibali Gold Hydro-Power Project	Orientale Province, Democratic Republic of Congo	2012	2014	Heritage Impact Assessment	Randgold Resources
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2012	Heritage Impact Assessment	Aquarius Resources
Environmental Authorisation for the Gold One Geluksdal TSF and Pipeline	Gauteng, South Africa	2012	2012	Heritage Impact Assessment	Gold One International
Platreef Burial Grounds and Graves Survey	Mokopane, Limpopo Province, South Africa	2012	2012	Burial Grounds and Graves Survey	Platreef Resources
Resgen Boikarabelo Coal Mine	Limpopo Province, South Africa	2012	2012	Phase 2 Excavations	Resources Generation
Bokoni Platinum Road Watching Brief	Burgersfort, Limpopo Province, South Africa	2012	2012	Watching Brief	Bokoni Platinum Mine

Project Title	Project Location	Date:		Description of the Project	Name of Client
SEGA Gold Mining Project	Burkina Faso	2012	2013	Socio Economic and Asset Survey	Cluff Gold PLC
SEGA Gold Mining Project	Burkina Faso	2013	2013	Technical Reviewer	Cluff Gold PLC
Consbrey and Harwar Collieries Project	Breyton, Mpumalanga, South Africa	2013	2013	Heritage Impact Assessment	Msobo
New Liberty Gold Project	Liberia	2013	2014	Grave Relocation	Aureus Mining
Falea Uranium Mine Environmental Assessment	Falea, Mali	2013	2013	Heritage Scoping	Rockgate Capital
Putu Iron Ore Mine Project	Petroken, Liberia	2013	2014	Heritage Impact Assessment	Atkins Limited
Sasol Twistdraai Project	Secunda, Mpumalanga, South Africa	2013	2014	Notification of Intent to Develop	ERM Southern Africa
Daleside Acetylene Gas Production Facility	Gauteng, South Africa	2013	2013	Heritage Impact Assessment	ERM Southern Africa
Nzoro 2 Hydro Power Project	Orientale Province, Democratic Republic of Congo	2014	2014	Social consultation	Randgold Resources
Eastern Basin AMD Project	Springs, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	AECOM
Soweto Cluster Reclamation Project	Soweto, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	Ergo (Pty) Ltd
Klipspruit South Project	Ogies, Mpumalanga, South Africa	2014	2014	Heritage Impact Assessment	BHP Billiton
Klipspruit Extension: Weltevreden Project	Ogies, Mpumalanga, South Africa	2014	2014	Heritage Impact Assessment	BHP Billiton
Ergo Rondebult Pipeline Basic Assessment	Johannesburg, South Africa	2014	2014	Heritage Basic Assessment	Ergo (Pty) Ltd
Kibali ESIA Update Project	Orientale Province, Democratic Republic of Congo	2014	2014	Heritage Impact Assessment	Randgold Resources
GoldOne EMP Consolidation	Westonaria, Gauteng, South Africa	2014	2014	Gap analysis	Gold One International
Yzermite PIA	Wakkerstroom, Mpumalanga, South Africa	2014	2014	Palaeontological Assessment	EcoPartners
Sasol Mooikraal Basic Assessment	Sasolburg, Free State, South Africa	2014	2014	Heritage Basic Assessment	Sasol Mining
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012	2015	Heritage Impact Assessment	Aquarius Resources
Oakleaf ESIA Project	Bronkhorstspruit, Gauteng, South Africa	2014	2015	Heritage Impact Assessment	Oakleaf Investment Holdings
Rea Vaya Phase II C Project	Johannesburg, Gauteng, South Africa	2014	2014	Heritage Impact Assessment	ILISO Consulting
Imvula Project	Kriel, Mpumalanga, South Africa	2014	2015	Heritage Impact Assessment	Ixia Coal
Sibanye WRTRP	Gauteng, South Africa	2014	2016	Heritage Impact Assessment	Sibanye
VMIC Vanadium EIA Project	Mokopane, Limpopo, South Africa	2014	2015	Heritage Impact Assessment	VM Investment Company

Project Title	Project Location	Date:		Description of the Project	Name of Client
NLGM Constructed Wetlands Project	Liberia	2015	2015	Heritage Impact Assessment	Aureus Mining
ERPM Section 34 Destruction Permits Applications	Johannesburg, Gauteng, South Africa	2015	2015	Section 34 Destruction Permit Applications	Ergo (Pty) Ltd
JMEP II EIA	Botswana	2015	2015	Heritage Impact Assessment	Jindal
Gino's Building Section 34 Destruction Permit Application	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Impact Assessment and Section 34 Destruction Permit Application	Bigen Africa Services (Pty) Ltd
EDC Block Refurbishment Project	Johannesburg, Gauteng, South Africa	2015	2016	Heritage Impact Assessment and Section 34 Permit Application	Bigen Africa Services (Pty) Ltd
Namane IPP and Transmission Line EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Impact Assessment	Namane Resources (Pty) Ltd
Temo Coal Road Diversion and Rail Loop EIA	Steenbokpan, Limpopo Province, South Africa	2015	2016	Heritage Impact Assessment	Namane Resources (Pty) Ltd
Groningen and Inhambane PRA	Limpopo Province, South Africa	2016	2016	Heritage Basic Assessment	Rustenburg Platinum Mines Limited
NTEM Iron Ore Mine and Pipeline Project	Cameroon	2014	2016	Technical Review	IMIC plc
Palmietkuilen MRA	Springs, Gauteng, South Africa	2016	2016	Heritage Impact Assessment	Canyon Resources (Pty) Ltd
Copper Sunset Sand Mining S.102	Free State, South Africa	2016	2016	Heritage Basic Assessment	Copper Sunset Sand (Pty) Ltd
Exxaro Belfast GRP	Belfast, Mpumalanga, South Africa	2013	2017	Grave Relocation	Exxaro
Grootvlei MRA	Springs, Gauteng, South Africa	2016	2016	Notification of Intent to Develop	Ergo (Pty) Ltd
Lambda EMP	Mpumalanga, South Africa	2016	2016	Palaeontological Impact Assessment	Eskom Holdings SOC Limited
Kilbarchan Basic Assessment and EMP	Newcastle, KwaZulu-Natal, South Africa	2016	2016	Heritage Basic Assessment	Eskom Holdings SOC Limited
Grootegeluk Amendment	Lephalale, Limpopo Province, South Africa	2016	2016	Notification of Intent to Develop	Exxaro
Eskom Northern KZN Strengthening	KwaZulu-Natal, South Africa	2016	2017	Heritage Impact Assessment	ILISO Consulting
Garsfontein Township Development	Pretoria, Gauteng, South Africa	2016	2016	Notification of Intent to Develop	Leungo Construction Enterprises

Project Title	Project Location	Date:	Description of the Project	Name of Client
Massawa EIA	Senegal	2016 2017	Technical Reviewer Heritage Impact Assessment	Randgold Resources
Louis Botha Phase 2	Johannesburg, Gauteng, South Africa	2016 2016	Phase 2 Excavations	Royal Haskoning DHV
Beatrix EIA and EMP	Welkom, Free State, South Africa	2016 2017	Heritage Impact Assessment	Sibanye Gold Ltd
Sun City Heritage Mapping	Pilanesberg, North-West Province, South Africa	2016 2016	Phase 2 Mapping	Sun International
Sun City Chair Lift	Pilanesberg, North-West Province, South Africa	2016 2017	Notification of Intent to Develop	Sun International
Hendrina Underground Coal Mine EIA	Hendrina, Mpumalanga, South Africa	2016 2016	Heritage Impact Assessment	Umcebo Mining (Pty) Ltd
Elandsfontein EMP Update	Clewer, Mpumalanga, South Africa	2016 2017	Heritage Impact Assessment	Anker Coal

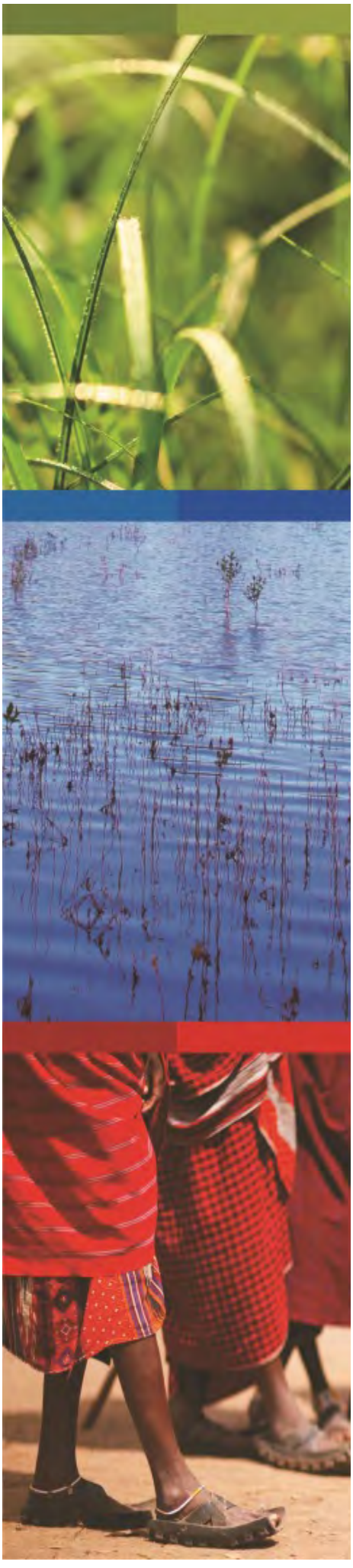
6 Professional Registrations

Position	Professional Body	Registration Number
Member	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	270
Member	International Council on Monuments and Sites (ICOMOS)	14274
Member	Society for Africanist Archaeologists (SAfA)	N/A

7 Publications

Huffman, T.N. & du Piesanie, J.J. 2011. Khami and the Venda in the Mapungubwe Landscape. Journal of African Archaeology 9(2): 189-206

Appendix D: HRM Impact Assessment Methodology



DIGBY WELLS
ENVIRONMENTAL

Heritage Cultural Significance, Field Rating and Impact Assessment Methodology

Assessment Methodology Statement

Project Number:

ZZZ9999

Prepared for:

Internal Document

June 2016

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Document:	**Assessment Methodology Statement**
Description:	**Heritage Cultural Significance, Field Rating and Impact Assessment Methodology**
Project Code:	**ZZZ9999**

Revision History

Name	Responsibility	Version	Date
Johan Nel ASAPA Member 095	HRM Unit Manager	Ver 1	May 2014
		Ver 2	October 2014
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Justin du Piesanie ASAPA Member 270	HRM Manager	Ver 4	January 2016
		Ver 5	June 2016

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1 Introduction

Assessment of impacts include several steps aimed to evaluate the way in which environmental aspects will / may interact with the cultural landscape (*the environment*) resulting in environmental impacts to heritage resources. Environmental aspects and impacts are defined as:

- Environmental aspects: an element of an organisation's activities or products or services that can interact with the environment' (ISO 14001: 2004 - 3.6); and
- Environmental impacts: any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects (ISO 14001: 2004 - 3.7).

However, in terms of cultural heritage resources, environmental impacts should be assessed relative to the heritage value or cultural significance of a resource. The methodology employed in the various stages of the impact assessment process is described in more detail below.

2 Evaluation of Cultural Significance

The significance rating process is designed to provide a numerical rating of the cultural significance[1] of identified heritage resources. The evaluation was done as objectively as possible through a matrix developed by Digby Wells for this purpose. In addition, the methodology aims to allow ratings to be reproduced independently should it be required, provided that the same information sources are used.

Dimension		Attributes considered	NHRA Ref.
Aesthetic & technical	1	Importance in aesthetic characteristics	S.3(3)(e)
	2	Degree of technical / creative skill at a particular period	S.3(3)(f)
Historical importance & associations	3	Importance to community or pattern in country's history	S.3(3)(a)
	4	Site of significance relating to history of slavery	S.3(3)(i)
	5	Association with life or work of a person, group or organisation of importance in the history of the country	S.3(3)(h)
Information potential	6	Possession of uncommon, rare or endangered natural or cultural heritage aspects	S.3(3)(b)
	7	Information potential	S.3(3)(c)
	8	Importance in demonstrating principle characteristics	S.3(3)(d)
Social	9	Association to community or cultural group for social, cultural or spiritual reasons	S.3(3)(g)

Box 1: NHRA section 3 criteria

This matrix takes into account heritage resources assessment criteria set out in subsection 3(3) of the NHRA (see Box 1), which determines the intrinsic, comparative and contextual significance of identified heritage resources. A resource's importance rating is based on information obtained through review

[1] Cultural significance is defined in the NHRA as the intrinsic "aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance" of a heritage resource. These attributes are combined and reduced to four themes used in the Digby Wells significance matrix: aesthetic, historical, scientific and social.

of available credible sources and representivity or uniqueness (i.e. known examples of similar resources to exist). The final significance attributed to a resource furthermore takes into account the physical integrity of the fabric of the resource. The formula used to determine significance can is summarised in Box 2.

Value = Importance x Integrity

where

Importance = average sum

of

Aesthetic + Historic + Scientific + Social

Box 2: CS formula

The rationale behind the heritage value matrix takes into account the fact that a heritage resource's value is a direct indication of its sensitivity to change (impacts). Value therefore needs to be determined prior to the completion of any assessment of impacts.

This matrix rates the potential, or importance, of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social.

The significance of a resource is directly related to the impact on it that could result from project-related activities, as it provides minimum accepted levels of change to the resource. SAHRA has published minimum standards that include minimum required mitigation of heritage resources. These minimum requirements are integrated into the matrix to guide both assessments of impacts and recommendations for mitigation and management of resources.

The weight assigned to the various parameters for significance in the formula, significance ratings and recommended mitigation are presented in Table 3-1.

3 Field Rating

Although grading of heritage resources remains the responsibility of heritage resources authorities, SAHRA requires in terms of its Minimum Standards that heritage reports include Field Ratings for identified resources to comply with section 38 of the NHRA. The NHRA in terms of section 7 provides for a system of grading of heritage resources that form part of the national estate, distinguishing between three categories.

The field rating process is designed to provide a numerical rating of the recommended grading of identified heritage resources. The evaluation was done as objectively as possible by integrating the field rating into the significance matrix. Field ratings guide decision-making in terms of appropriate minimum required mitigation measures and consequent management responsibilities in accordance with section 8 of the NHRA. The formula used to determine field ratings is summarised in Box 3. The weight assigned to the various field rating parameters in the formula and the sum of the average ratings are is presented in Table 3-1.

Field Rating = average sum

of

Aesthetic + Historic + Scientific + Social

Box 3: Field rating formula

Table 3-1: Ratings and descriptions used in determining CS and field ratings

Rating	IMPORTANCE *A heritage resource's contribution to aesthetic, historic, scientific and social value.*	INTEGRITY *The undivided or unbroken state, material wholeness, completeness or entirety of a resource or site*	FIELD RATING *Recommended grading of identified heritage resources in terms of NHRA Section 7*
-	Not assessed - dimension and/or attribute not considered in determining value.		Not assessed - dimension and/or attribute not considered in field rating.
0	The resource exhibits attributes that may be considered in a particular dimension, but it is so poorly represented that it cannot or does not contribute to the resource's overall value.	No information potential, complete loss of meaning, Fabric completely degraded, original setting lost	
1	Common, well represented throughout diverse cultural landscapes	Fabric poorly preserved, limited information, little meaning ascribed, extensive encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with Negligible significance Grade IV C
2	Generally well represented but exhibits superior qualities in comparison to other similar examples	Fabric is preserved, some information potential (quality questionable) and meaning evident, some encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with Low significance Grade IV B
3	The resource exhibits attributes that are rare and uncommon within a region. It is important to specific communities.	Fabric well preserved, good quality information and meaning evident, limited encroachment	Resources under general protection in terms of NHRA sections 34 to 37 with Medium to Medium-High significance Grade IV A
4	Rare and uncommon, value of national importance	Excellent preservation of fabric, high information potential of high quality, meaning is well established, no encroachment on setting	Resources under general protection in terms of NHRA sections 34 to 37 with High significance Grade III B
5	The resource exhibits attributes that are considered singular, unique and/or irreplaceable to the degree that its significance can be universally accepted.		Resources under general protection in terms of NHRA sections 34 to 37 with Very High significance Grade III A
6			Heritage resources under formal protection that can be considered to have special qualities which make them significant within the context of a province or a region Grade II
7			Heritage resources under formal protection that can be considered to have special qualities which make them significant within a national and / or international context. Grade I

4 Impact Assessment

The following are terms and definitions applicable to the EIA concept (ISO 14001):

- **Project Activity:** Activities associated with the project that result in an environmental interaction during the different phases (construction, operation and decommissioning), e.g., new processing plant, new stockpiles, development of open pit, dewatering, water treatment plant;
- **Interaction:** An "environmental interaction" is an element or characteristic of an activity, product, or service that interacts or can interact with the environment. Environmental interactions can cause environmental impacts (but may not necessarily do so). They can have either beneficial impacts or adverse impacts and can have a direct and decisive impact on the environment or contribute only partially or indirectly to a larger environmental change.
- **Environmental Aspect:** The term "environmental aspect" refers to the various natural and human environments that an activity may interact with. These environments extend from within the activity itself to the global system, and include air, water, land, flora, fauna (including people) and natural resources of all kinds.
- **Environmental Impact:** An "environmental impact" is a change to the environment that is caused either partly or entirely by one or more environmental interactions. An environmental interaction can have either a direct and decisive impact on the environment or contribute only partially or indirectly to a larger environmental change. In addition, it can have either a beneficial environmental impact or an adverse environmental impact.

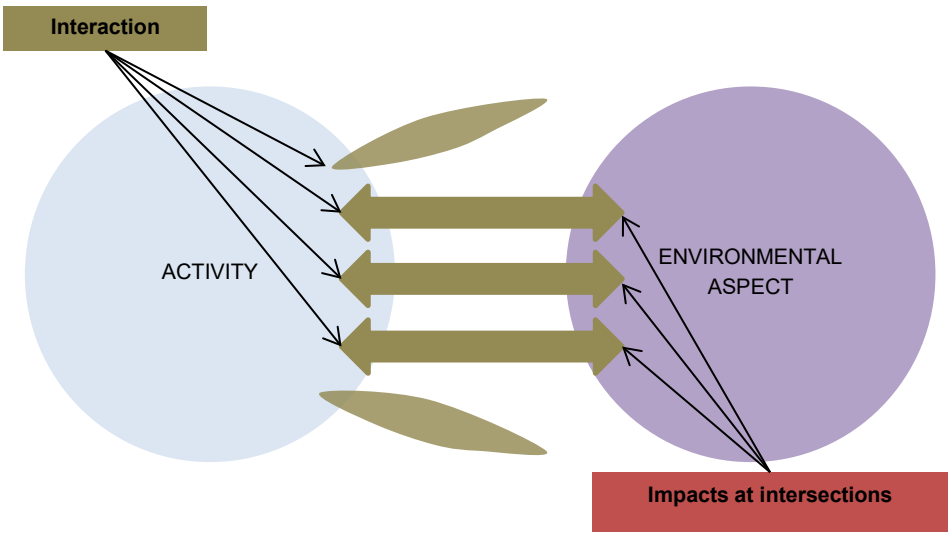

Figure 4-1: Graphical representation of impact assessment concept

The potential impacts were considered through an examination of the project phase and activity, the environmental aspect, the interdependencies between aspects, an assessment and classification of categories, and consideration of the potential impact on heritage resources. An example of this process is presented in Figure 4-2.

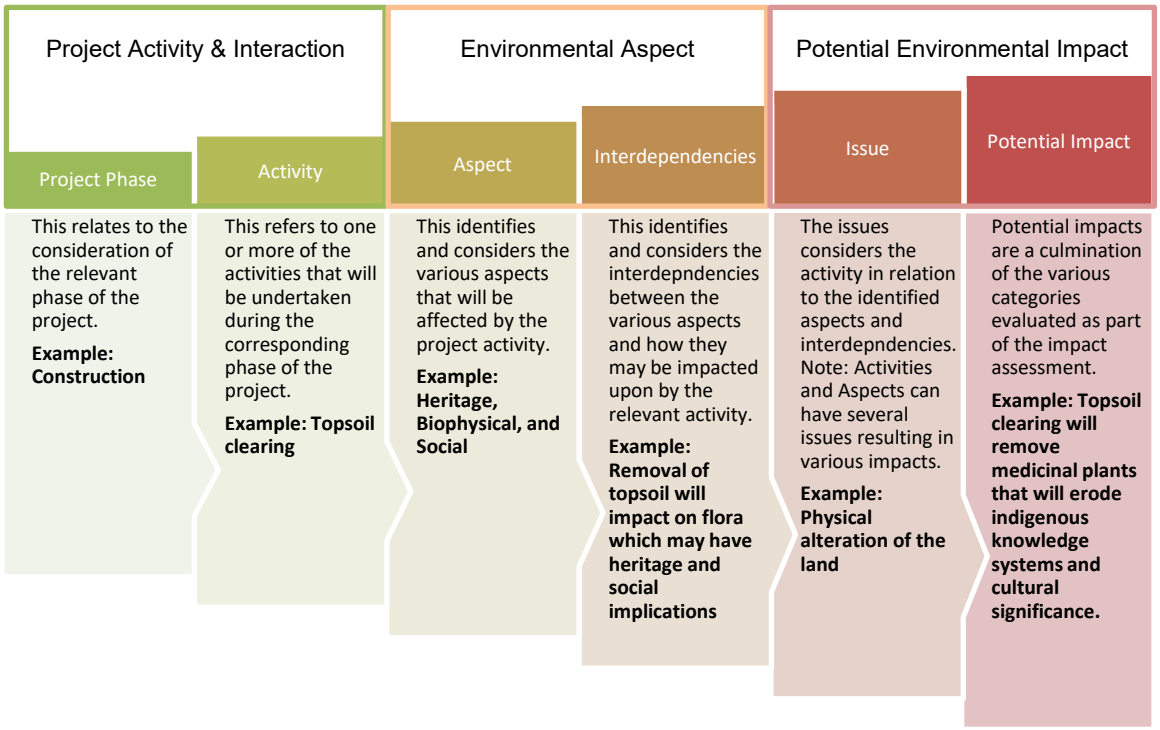

Figure 4-2: Example of how potential impacts were considered.

4.1 Defining Heritage Impacts

Different heritage impacts may manifest in different geographical areas and diverse communities. For instance, heritage impacts can simultaneously affect the physical resource and have social repercussions: this is compounded when the intensity of physical impacts and social repercussions differ significantly. In addition, heritage impacts can influence the cultural significance of heritage resources without any actual physical impact on the resources taking place. Heritage impacts can therefore generally be placed into three broad categories (adapted from Winter & Bauman 2005: 36):

- **Direct or primary heritage impacts** affect the fabric or physical integrity of the heritage resource, for example destruction of an archaeological site or historical building. Direct or primary impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense, but can often be erroneously assessed as high-ranking.

- **Indirect, induced or secondary heritage impacts** can occur later in time or at a different place from the causal activity, or as a result of a complex pathway. For example, restricted access to a heritage resource resulting in the gradual erosion of its cultural significance that may be dependent on ritual patterns of access. Although the physical fabric of the resource is not affected through any primary impact, its significance is affected that can ultimately result in the loss of the resource itself.
- **Cumulative heritage impacts** result from in-combination effects on heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be:
  - **Additive**: the simple sum of all the effects, e.g. the total number of development activities that will occur within the study area.
  - **Synergistic**: effects interact to produce a total effect greater than the sum of the individual effects, e.g. the effect of each different activity on the archaeological landscape in the study area.
  - **Time crowding**: frequent, repetitive impacts on a particular resource at the same time, e.g. the effect of regular blasting activities on a nearby rock art site or protected historical building high.
  - **Neutralizing**: where the effects may counteract each other to reduce the overall effect, e.g. the effect of changes in land use could reduce the overall impact on sites within the archaeological landscape of the study area.
  - **Space crowding**: high spatial density of impacts on a heritage resource, e.g. density of new buildings resulting in suburbanisation of a historical rural landscape.

The relevance of the above distinction to defining the study areas in the HSR arises from the fact that heritage resources do not exist in isolation to the wider natural, social, cultural and heritage landscape: cultural significance is therefore also linked to rarity / uniqueness, physical integrity and importance to diverse communities.

In addition, the NHRA requires that heritage resources are graded in terms of national, provincial and local concern based on their importance and consequent official (i.e. State) management effort required. The type and level of baseline information required to adequately predict heritage impacts varies between these categories. Three ‘concentric’ study areas were defined for the purposes of this study and are discussed in detail in the HSR.

4.2 Impact Assessment

The impact rating process is designed to provide a numerical rating of the identified heritage impacts. The significance rating follows an established impact/risk assessment formula is shown in Box 4.

The weight assigned to the various parameters for positive and negative impacts in the formula is presented in Table 4-2 below.

Project-related impacts on heritage resources have taken into account the inherent value of heritage resources, described above, and only applied to resources with values above negligible. As a result, the impact assessment did not consider individual resources, but was applied to diverse resources grouped in terms of similar values.

The magnitude will then be applied to pre- and post-mitigation scenarios with the intention of removing all impacts on heritage resources. Where project related mitigation does not avoid or sufficiently reduce negative changes/impacts on heritage resources with high values, mitigation of these resources may be required. This may include alteration, restoration or demolition of structures under a permit issued by the HRAs.

Significance = consequence of an event x probability of the event occurring

where:

Consequence = type of impact x (Intensity + Spatial Scale + Duration)

and

Probability = Likelihood of an impact occurring

In the formula for calculating consequence:

Type of impact = +1 (positive) or -1 (negative)

Box 4: Impact assessment formula

Impacts were rated prior to mitigation and again after consideration of the proposed mitigation measures. Impacts were then categories into one of eight categories listed in Table 4-2. The relationship between the consequence, probability and significance ratings is also graphically depicted in Table 4-2.

Table 4-1: Description of duration, extent, intensity and probability ratings used in impact assessment

Value	DURATION RATING - A measure of the lifespan of the impact		EXTENT RATING A measure of how wide the impact would occur		INTENSITY RATING- A measure of the degree of harm, injury or loss.		PROBABILITY RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	Probability	**Description**	**Exposure**	**Description**	**Intensity**	**Description**	**Probability**	**Description**
7	**Permanent**	Impact will permanently alter or change the heritage resource and/or value (Complete loss of information)	**International**	Impacts on heritage resources will have international repercussions, issues or effects, i.e. in context of international cultural significance, legislation, associations, etc.	**Extremely high**	Major change to Heritage Resource with High-Very High Value	**Certain/Definite**	Happens frequently. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	**Beyond Project Life**	Impact will reduce over time after project life (Mainly renewable resources and indirect impacts)	**National**	Impacts on heritage resources will have national repercussions, issues or effects, i.e. in context of national cultural significance, legislation, associations, etc.	**Very high**	Moderate change to Heritage Resource with High-Very High Value	**High probability**	Happens often. It is most likely that the impact will occur.
5	**Project Life**	The impact will cease after project life.	**Region**	Impacts on heritage resources will have provincial repercussions, issues or effects, i.e. in context of provincial cultural significance, legislation, associations, etc.	**High**	Minor change to Heritage Resource with High-Very High Value	**Likely**	Could easily happen. The impact may occur.
4	**Long Term**	Impact will remain for >50% - Project Life	**Municipal area**	Impacts on heritage resources will have regional repercussions, issues or effects, i.e. in context of the regional study area.	**Moderately high**	Major change to Heritage Resource with Medium-Medium High Value	**Probable**	Could happen. Has occurred here or elsewhere
3	**Medium Term**	Impact will remain for >10% - 50% of Project Life	**Local**	Impacts on heritage resources will have local repercussions, issues or effects, i.e. in context of the local study area.	**Moderate**	Moderate change to Heritage Resource with Medium - Medium High Value	**Unlikely / Low probability**	Has not happened yet, but could happen once in a lifetime of the project. There is a possibility that the impact will occur.

Value	DURATION RATING - A measure of the lifespan of the impact		EXTENT RATING A measure of how wide the impact would occur		INTENSITY RATING- A measure of the degree of harm, injury or loss.		PROBABILITY RATING - A measure of the chance that consequences of that selected level of severity could occur during the exposure window.	
	Probability	**Description**	**Exposure**	**Description**	**Intensity**	**Description**	**Probability**	**Description**
2	**Short Term**	Impact will remain for <10% of Project Life	**Limited**	Impacts on heritage resources will have site specific repercussions, issues or effects, i.e. in context of the site specific study area.	**Low**	Minor change to Heritage Resource with Medium - Medium High Value	**Rare / Improbable**	Conceivable, but only in extreme circumstances. Have not happened during the lifetime of the project, but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures
1	**Transient**	Impact may be sporadic/limited duration and can occur at any time. E.g. Only during specific times of operation, and not affecting heritage value.	**Very Limited**	Impacts on heritage resources will be limited to the identified resource and its immediate surroundings, i.e. in context of the specific heritage site.	**Very low**	No change to Heritage Resource with values medium or higher, or Any change to Heritage Resource with Low Value	**Highly Unlikely /None**	Expected never to happen. Impact will not occur.

Table 4-2: Impact significance ratings, categories and relationship between consequence, probability and significance

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change.	Major (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the heritage resources.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the project. These impacts will usually result in positive medium to long-term effect on the heritage resources.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the heritage resources.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the heritage resources.	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the heritage resources.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term change to the heritage resources and result in severe effects.	Moderate (negative)
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects.	Major (negative)

Relationship between consequence, probability and significance ratings

Probability \ Significance	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Consequence

5 Mitigation Measures and Recommendations

The desired outcome of an impact assessment is the removal of negative impacts on heritage resources through the implementation of feasible mitigation measures. The mitigation and management measures recommended in this section comply with the General Principles set out under section 5 of the NHRA. The recommendations further considered the cultural significance of heritage resources and were guided by the minimum mitigation contained in the SAHRA Minimum Standards (See Box 5).

Designation	Recommended mitigation
Negligible	Sufficiently recorded, no mitigation required
Low	Resource must be recorded before destruction, including detailed site mapping, surface sampling may be required
Medium	Mitigation of resource to include detailed recording and mapping, and limited sampling, e.g. STPs.
Medium High	Project design should aim to reduce or remove changes; Mitigation of resource to include extensive sampling and recording, e.g. test excavation, analyses, etc.
High	Project design must aim to avoid change to resource; Partly conserved, Conservation Management Plan (CMP)
Very High	Project design must change to avoid all change to resource; Conserved in entirety, CMP

Box 5: Recommended minimum level of required mitigation

Recommended mitigation is therefore divided into two categories: *project-related* and *mitigation of heritage resources* defined below.

- Project-related mitigation requires changes or amendments to project design, planning and siting of infrastructure to avoid or reduce physical impacts on heritage resources. Project-related mitigation measures are always the preferred option, especially where heritage resources with higher cultural significance will be impacted on. Project-related mitigation may include:
  - *In situ* preservation (i.e. no-development) of heritage resources for which Conservation Management Plans (CMPs) are required; and
  - Conservation of heritage resources through, for example, incorporating the resources into project design and planning, for which CMPs are also required.
- Mitigation of heritage resources may be necessary where project-related mitigation will not sufficiently reduce or remove impacts, thus resulting in partial or complete changes (including destruction) to a resource. Such resources need to be mitigated to ensure that they are fully recorded, documented and researched before any negative change occurs. This may require actions such as:
  - Intensive detailed recording of sites through various non-intrusive techniques to create a documentary record of the site – “preservation by record”;
  - Intrusive recording and sampling such as shovel test pits (STPs) and excavations, relocation (usually burial grounds and graves, but certain types of sites may be relocated), restoration and alteration. Any form of intrusive mitigation is a regulated permitted activity for which permits need to be issued by

the relevant heritage authorities. Such mitigation may result in a reassessment of the value of a resource that could require conservation measures to be implemented. Alternatively, an application for a destruction permit may be made if the resource has been sufficiently sampled; and

- Where resources have negligible significance the specialist may recommend that no further mitigation is required and the site may be destroyed, for which a destruction permit must be applied for.

Appropriate mitigation measures were identified for each impact, and the procedure discussed above was to assess the possible consequence, probability and significance of each impact post-mitigation.

The post-mitigation rating provided an indication of the significance of residual impacts, while the difference between an impact's pre- and post-mitigation ratings represents the degree to which the recommended mitigation measures are expected to be effective in reducing or ameliorating that impact.