THE PROPOSED DEVELOPMENT OF A TYRE MANAGEMENT FACILITY IN KATHU, NORTHERN CAPE PROVINCE

Heritage Impact Assessment

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Declaration of Independence

I, Nikki Mann, declare that –

- General declaration:
- I act as the independent heritage practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting heritage impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

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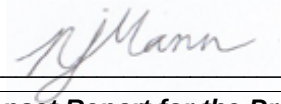
SIGNATURE: 

Report Title	*Heritage Impact Report for the Proposed Development of a Tyre Management Facility in Kathu, Northern Cape Province*

Control	Name	Signature	Designation
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CLIENT: EXM Environmental Advisory (Pty) Ltd

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The table below sets out the relevant sections as listed in Appendix 6 of the EIA Regulations (2017), which describes the requirements for specialist reports. For ease of reference, the table provides cross-references to the report sections where these requirements have been addressed. It is important to note that where something is not applicable to this HIA, this has been indicated in the table below.

Table 1: Reporting requirements as per NEMA Appendix 6 for specialist reports

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**	**Comment where not applicable**
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii of Report – Contact details and company	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to **Appendix A**	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 3	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6 and 7	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3	-
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3	-
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Sections 5 and 6	-
(g) An identification of any areas to be avoided, including buffers	NA	-
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	NA	-
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3	-
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Executive Summary, Sections 6, 7, 8 and 9	-
(k) Any mitigation measures for inclusion in the EMPr	Executive Summary, Sections 8 and 9	-
(l) Any conditions for inclusion in the environmental authorisation	Executive Summary, Sections 8 and 9	-
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Executive Summary, Sections 8 and 9	-

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Executive Summary and Section 9	-
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and		-
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Executive summary, Sections 8 and 9	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study		Not applicable. A public consultation process was handled as part of the environmental process.
(p) A summary and copies if any comments that were received during any consultation process		Not applicable. To date no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.		Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	NEMA Appendix 6 and GN648 SAHRA guidelines on HIAs, PIAs and AIAs	

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by EXM Environmental Advisory (Pty) Ltd (EXM) to undertake a Heritage Impact Assessment (HIA), which forms part of the environmental process for the proposed Tyre Management Facility near Sishen mine, 1.7km south-west of the centre of Kathu, Northern Cape Province.

Heritage resources are unique and non-renewable and as such, any impact on such resources must be seen as significant.

General Desktop Study

An archival and historical desktop study was undertaken to provide a historic framework for the project area and surrounding landscape. This was augmented by a study of available historical and archival maps and an assessment of previous archaeological and heritage studies completed for the area. The desktop study revealed that the surroundings of the study area are characterised by a long and significant history, whereas previous archaeological and heritage studies from this area have revealed several archaeological and heritage sites from the surroundings. The Kathu Archaeological Complex demonstrates the importance of the archaeological heritage of the region (Walker et al, 2013).

Palaeontological Desktop Study

The tyre management facility plant is underlain by surface limestone. These sediments are in turn underlain by the Griqualand West rocks of the Transvaal Supergroup. According to the PalaeoMap of the South African Heritage Resources Information System the Palaeontological Sensitivity of the Tertiary surface limestone is High. However, in the Sishen area the Late Caenozoic superficial sediments overlying the Transvaal Supergroup are rarely fossiliferous (Butler, 2021).

The general low palaeontological sensitivity of the bedrocks and superficial sediments in the proposed development footprint indicates that the proposed development will have an overall LOW impact significance in terms of palaeontological heritage post-mitigation. It is therefore considered that the development will not lead to detrimental impacts on the palaeontological resources of the area.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that correct mitigation can be carry out by a palaeontologist.

It is consequently recommended that no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

Fieldwork

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was undertaken by way of intensive walkthroughs of the proposed tyre management footprint area.

The fieldwork was executed by two archaeologists from PGS (Nikki Mann and Wynand van Zyl) and was conducted on 10 November 2021. Throughout the fieldwork, hand-held GPS devices were used to record tracklogs showing the routes followed by the fieldwork team. One findspot (**FS-01**) was identified immediately adjacent to a track. There were no identified scatters of artefacts dense enough to be classified as archaeological sites.

It is important to note that although as intensive a fieldwork coverage as possible was undertaken, sections of the study area were severely disturbed by dumped rubble and other materials, which limited visibility in those areas of the study area.

Heritage Impacts

This HIA has shown that the proposed Tyre Management Facility will have a minimal impact on heritage resources within the project area due to the extensive disturbance of the footprint.

General Recommendations

A Chance Find Procedure (refer **Section 8**) must be implemented and adhered to.

Conclusions

It is the considered opinion of the authors of this report that the overall post-mitigation impact of the proposed Tyre Management Facility on heritage resources will be Low. Provided that the general recommendations and mitigation measures outlined in this report are implemented, the impact would be acceptably Low or could be totally mitigated to the degree that the project could be approved from a heritage perspective.

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TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency, and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; and
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- 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.

Early Stone Age

The archaeology of the Stone Age between 700 000 and 3 300 000 years ago.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance and can include (but is not limited to) the following list as outlined under Section 3 of the National Heritage Resources Act (NHRA):

- places, buildings, structures, and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

Holocene

The most recent geological time which commenced 10 000 years ago.

Late Stone Age

The archaeology of the last 30 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Iron Age

The archaeology of the period between 900-1300AD, associated with the development of the Zimbabwe culture, defined by class distinction and sacred leadership.

Middle Stone Age

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Site

Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

Table 2: List of abbreviations used in this report

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Earlier Stone Age
EXM	EXM Environmental Advisory (Pty) Ltd
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LCTs	Large Cutting Tools
LSA	Late Stone Age
LIA	Late Iron Age
LOM	Life of Mine
MSA	Middle Stone Age
MIA	Middle Iron Age
NC HRA	Northern Cape Heritage Resources Authority
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No 25 of 1999)
PGS	PGS Heritage (Pty) Ltd
PHRA	Provincial Heritage Resources Authority
PIA	Palaeontological Impact Assessment
PSSA	Palaeontological Society of South Africa
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SIOC	Sishen Iron Ore Company (Pty) Ltd

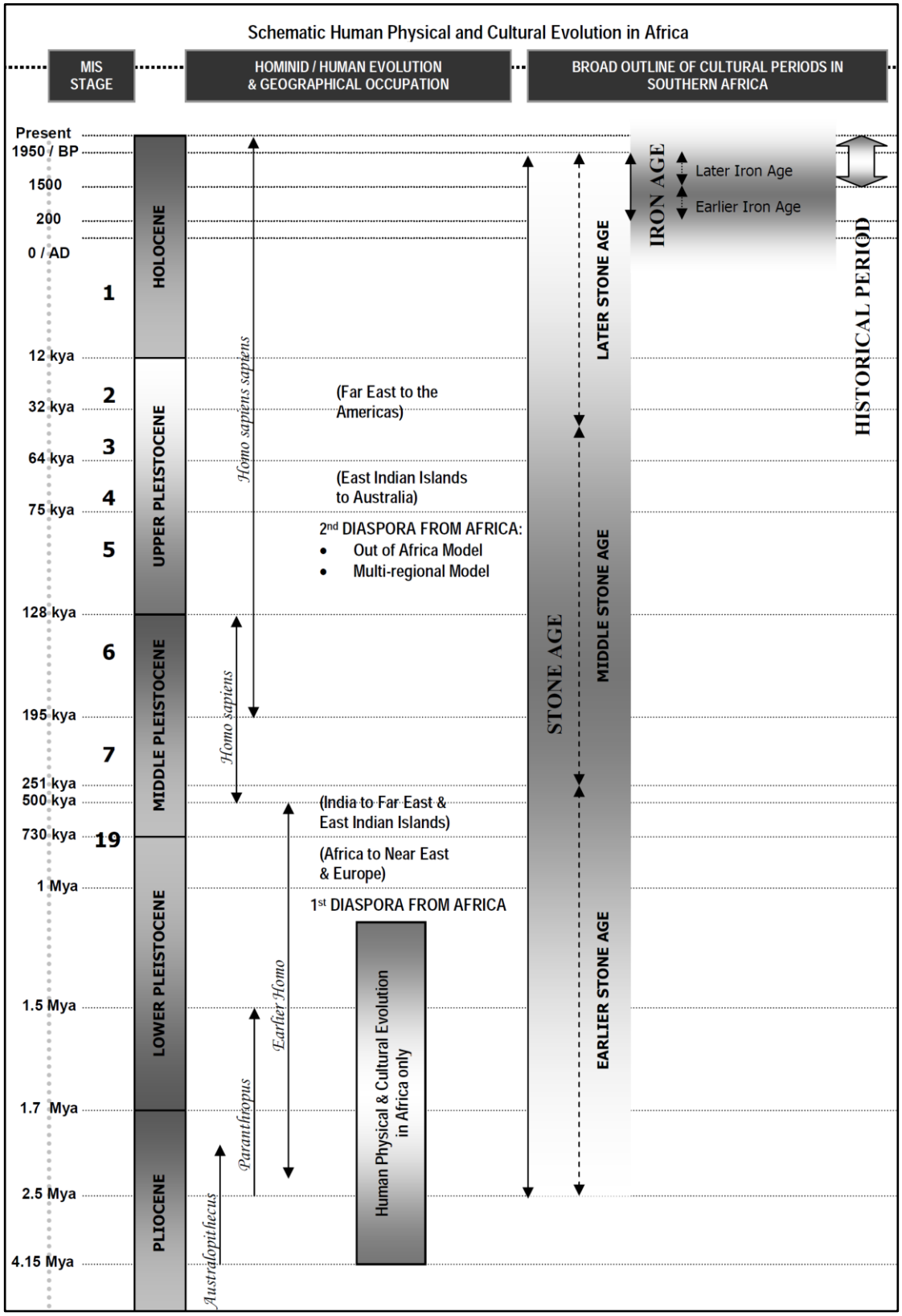

Figure 1: Human and Cultural Timeline in Africa (Morris, 2008).

1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by EXM Environmental Advisory (Pty) Ltd (EXM) to undertake a Heritage Impact Assessment (HIA), which forms part of the environmental process for the proposed Tyre Management Facility 1.7km south-west of the centre of Kathu, Northern Cape Province.

1.1 Scope of the Study

The aim of the study is to identify possible heritage resources and finds that may occur in the proposed development area. The HIA will inform the Environmental Impact Assessment (EIA) to assist the developer in managing the discovered heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This HIA was compiled by PGS. The staff at PGS has a combined experience of nearly 90 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. And will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

The following individuals were involved with this study:

- Wouter Fourie, the Project Coordinator, is registered with the ASAPA as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (APHP).

- Nikki Mann, the author of this report, is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA). She has 4 years of experience in the heritage assessment field and holds a Master's degree (MSc) in Archaeology from the University of Cape Town.

- Wynand van Zyl, field archaeologist who assisted with the fieldwork, holds a BA (Hons) in Archaeology.

1.3 Assumptions and Limitations

The following assumptions and limitations regarding this study and report exist:

- Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is important to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites, as well as the dumping of materials across the study area. Areas also not assessed during the fieldwork comprise severely disturbed areas and the south-western section of the study area which is at present occupied by informal recyclers. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.
- The study area boundaries and development footprints depicted in this report were provided by the client. As a result, these were the areas assessed during the fieldwork. Should any additional development footprints located outside of these study area boundaries be required, such additional areas will have to be assessed in the field by an experienced archaeologist/heritage specialist long before construction starts.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

1.4.1 Statutory Framework: The National Heritage Resources (Act 25 of 1999)

The National Heritage Resources Act (NHRA) has applicability as the HIA is done in terms of the provisions of Section 34, 35, 36 and 38 of the NHRA and identifies heritage resources, informants, and issues relating to the palaeontological, archaeological, built environment and cultural landscape.

The NHRA is utilised as the basis for the identification, evaluation and management of heritage resources, and in the case of Cultural Resource Management (CRM), those resources specifically impacted by the development as stipulated in Section 38 of NHRA.

The National Heritage Resources Act (Act No 25 of 1999, s3) outlines the following types and ranges of heritage resources that qualify as part of the National Estate, namely:

a) places, buildings structures and equipment of cultural significance;
b) places to which oral traditions are attached or which are associated with living heritage;
c) historical settlements and townscapes;

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

The NHRA (Act No 25 of 1999) also distinguishes nine criteria for places and objects to qualify as 'part of the national estate if they have cultural significance or other special value'. These criteria are:

3) Without limiting the generality of subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—

a) its importance in the community, or pattern of South Africa's history;
b) its possession of uncommon, rare or endangered aspects of South Africa's
c) natural or cultural heritage;
d) its potential to yield information that will contribute to an understanding of
e) South Africa's natural or cultural heritage;
f) its importance in demonstrating the principal characteristics of a particular
g) class of South Africa's natural or cultural places or objects;
h) its importance in exhibiting particular aesthetic characteristics valued by a

i) community or cultural group;
j) its importance in demonstrating a high degree of creative or technical
k) achievement at a particular period;
l) its strong or special association with a particular community or cultural group
m) for social, cultural or spiritual reasons;
n) its strong or special association with the life or work of a person, group or
o) organisation of importance in the history of South Africa; and
p) sites of significance relating to the history of slavery in South Africa.

1.4.2 Section 34 – Structures

According to Section 34 of the NHRA, no person may alter, damage or destroy any structure that is older than 60 years, and which forms part of the built environment of the site, without the necessary permits from the relevant provincial heritage authority.

1.4.3 Section 35 – Archaeology, Palaeontology and Meteorites

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the NHRA, Palaeontological Impact Assessments (PIAs) and Archaeological Impact Assessments (AIAs) are required by law in the case of developments in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is known to have occurred during prehistory and the historic period.

1.4.4 Section 36 – Burial Grounds & Graves

A Section 36 permit application is made to the SAHRA or the competent provincial heritage authority which protects burial grounds and graves that are older than 60 years and must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit. SAHRA must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A permit is required under the following conditions:

Permit applications for burial grounds and graves older than 60 years should be submitted to the South African Heritage Resources Agency:

- destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of the conflict, or any burial ground or part thereof which contains such graves.
- destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

- bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.
- SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant.

1.4.5 Section 38 - HIA as a Specialist Study within the EIA in Terms of Section 38(8)

A NHRA Section 38 (Heritage Impact Assessments) application is required when the proposed development triggers one or more of the following activities:

a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
b) the construction of a bridge or similar structure exceeding 50 m in length;
c) any development or other activity which will change the character of a site,
    i. exceeding 5 000 m2 in extent; or
    ii. involving three or more existing erven or subdivisions thereof; or
    iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
d) the re-zoning of a site exceeding 10 000 m2 in extent; or
e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority

In this instance, the heritage assessment for the property is to be undertaken as a component of the EIA for the project. Provision is made for this in terms of Section 38(8) of the NHRA, which states that:

- An HIA report is required to identify, and assess archaeological resources as defined by the NHR Act, assess the impact of the proposal on the said archaeological resources, review alternatives and recommend mitigation (see methodology above).

Section 38 (3) Impact Assessments are required, in terms of the statutory framework, to conform to basic requirements as laid out in Section 38(3) of the NHRA. These are:

- The identification and mapping of heritage resources in the area affected;
- The assessment of the significance of such resources;
- The assessment of the impact of the development on the heritage resources;
- An evaluation of the impact on the heritage resources relative to sustainable socio/economic benefits;

- Consideration of alternatives if heritage resources are adversely impacted by the proposed development;
- Consideration of alternatives; and
- Plans for mitigation.

1.4.6 National Environmental Management Act, 1998 (Act No. 107 of 1998)

The cultural environment in South Africa is managed through Section 24 of the National Environmental Management Act (NEMA), No. 107 of 1998. The NEMA creates the legal framework by which cultural heritage can be managed.

Furthermore, under Section 2(4)(a) of the NEMA:

2 (4) (a) Sustainable development requires the consideration of all relevant factors including the following:

> (iii) the disturbance of landscapes and sites that constitute the nation's cultural heritage must be avoided, or where it cannot be altogether avoided, is minimised and remedied.

1.4.7 Notice 648 of the Government Gazette 45421

Although minimum standards for archaeological (2007) and palaeontological (2012) assessments were published by SAHRA (2016), Government Notice (GN) 648 of 2019 requires sensitivity verification for a site selected on the national web-based environmental screening tool for which no specific assessment protocol related to any theme has been identified. The requirements for this GN are listed in **Table 3** and the applicable section in this report noted.

Table 3: Reporting requirements for GN 648 of 2019

GN 648	Relevant section in report	Where not applicable
2.2 (a) a desktop analysis, using satellite imagery	Section 4 and 5	-
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web-based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	Section 4 and 5	-
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web-based environmental screening tool	Section 1 and 5	-
2.3(b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity	Section 4 provides a description of the current use and confirms the status in the screening report	-

An assessment of the Environmental Screening tool provides the following sensitivity rating for archaeological and heritage resources that fall within the proposed area as High (**Figure 2**), and palaeontological resources are also rated as High (**Figure 3**).

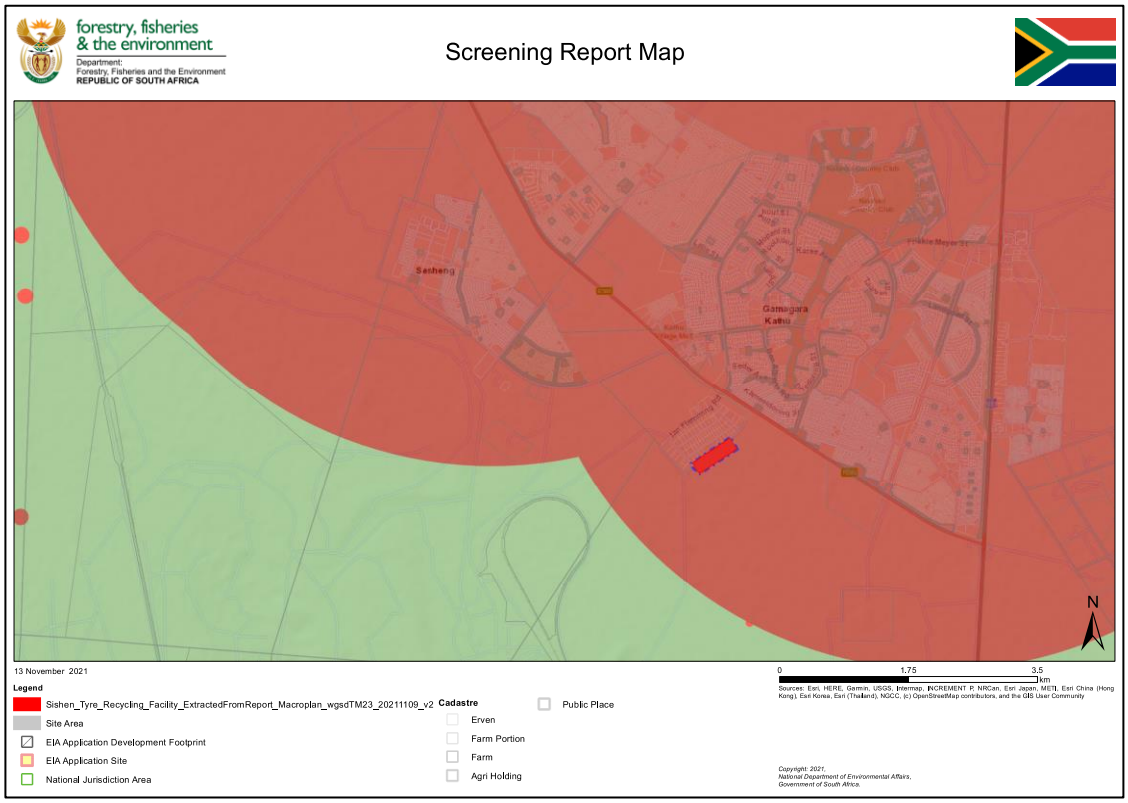

Figure 2: Environmental screening tool's depiction of the archaeological and heritage sensitivity of the study area and surroundings.

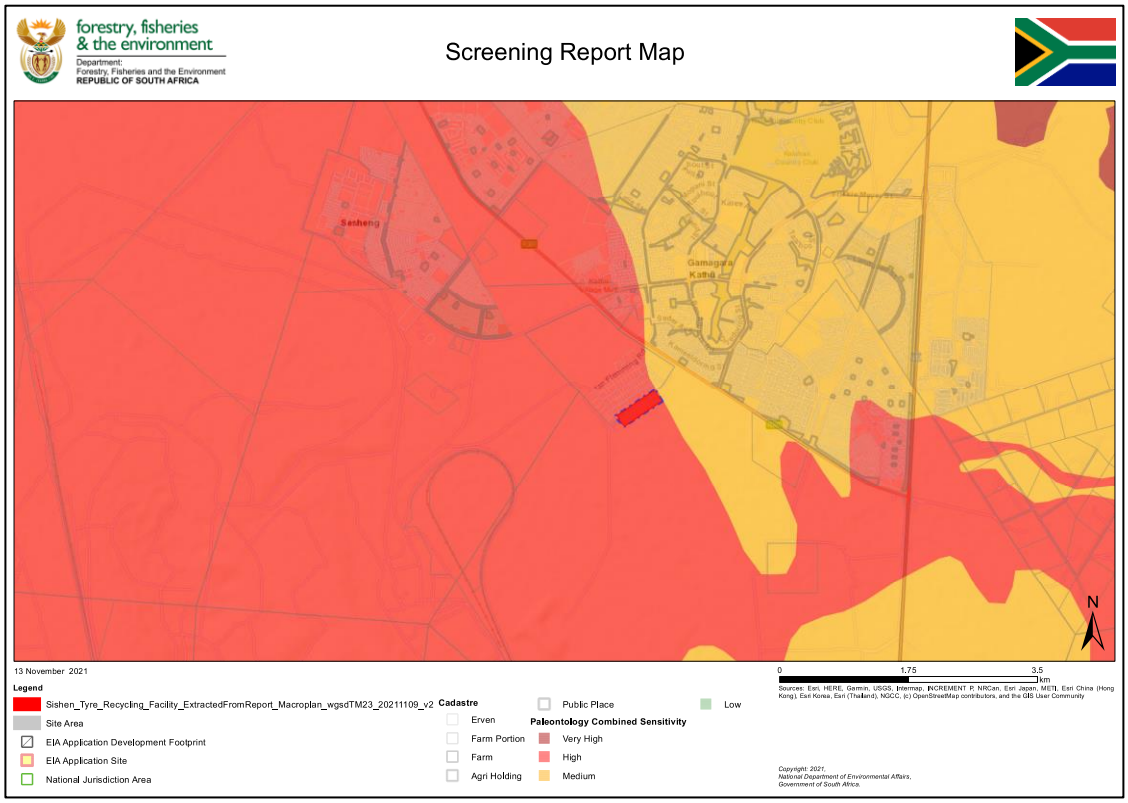

Figure 3: Environmental screening tool's depiction of the palaeontological sensitivity of the study area and surroundings.

1.4.8 NEMA – Appendix 6 requirements

The HIA report has been compiled considering the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (2014, and as amended in 2017) (**Table 1**).

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Locality

Coordinates for Study Area	Northernmost point: S -27.711946 E 23.040106	Easternmost point: S -27.713112 E 23.040939
	Southernmost point: S -27.715735 E 23.036406	Westernmost point: S -27.714631 E 23.035525
Location	The proposed facility is located 1.7km south-west of the centre of Kathu, Northern Cape Province.	
Property	Remaining Extent of the Farm Sekgame No. 461 within the Gamagara Local Municipality of the John Taolo Gaetsewe District, Northern Cape Province.	
Topographical Map	2723CA KATHU	
Extent	The proposed development footprint size is approximately 8.41hectares.	

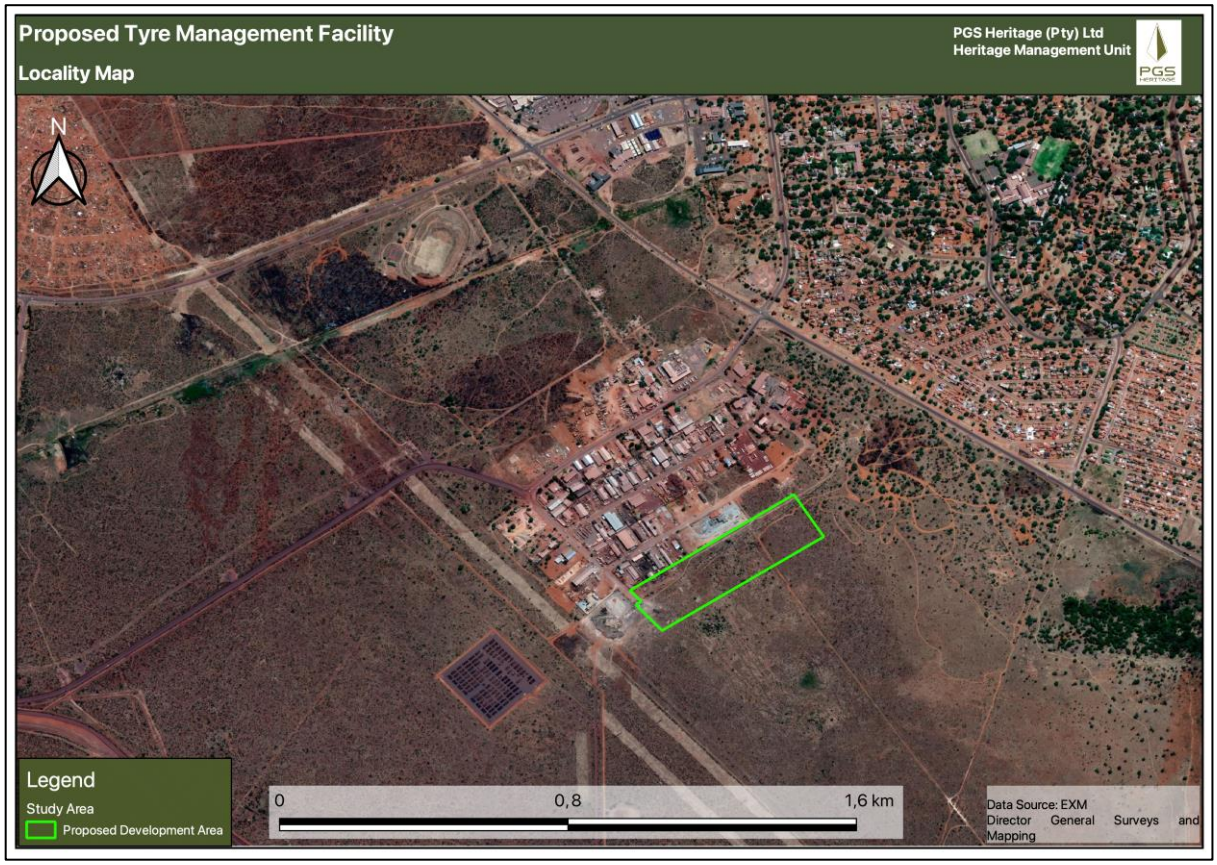

Figure 4: Location of the study area (proposed Tyre Management Facility: green polygon).

2.2 Technical Project Description (provided by EXM)

2.2.1 Background

The following brief project description for the project has been supplied by EXM.

Sishen Iron Ore Company (Pty) Ltd proposes to develop a facility for the storage and mechanical downsizing (cutting, shredding and granulation) of waste tyres on the Farm Sekgame 461 Kuruman RD, 1.7km south west of the centre of Kathu in the Gamagara Local Municipality. The site is located adjacent (south) to an existing industrial area and the closest residential area is located 460m north-east of the site ().

Waste tyres will be transported to the site and downsized to approximately 30-60mm, or even smaller. The product will be transported to offsite facilities for further processing. No further processing (management or recovery) of the material will be undertaken and therefore a Waste Management Licence (WML) will not be required for the proposed facility.

The proposed facility including the associated infrastructure will require the clearance of indigenous vegetation of approximately 8.4 hectares and will entail the development of the following structures/infrastructure.

- Building which contains equipment for shredding/cutting of waste tyres;
- Security office;
- Staff building with cafeteria;
- Admin and finance building;
- Diesel storage area (approximately 10m3);
- Waste tyre storage area;
- Workshop and parking areas; and
- Perimeter fence.

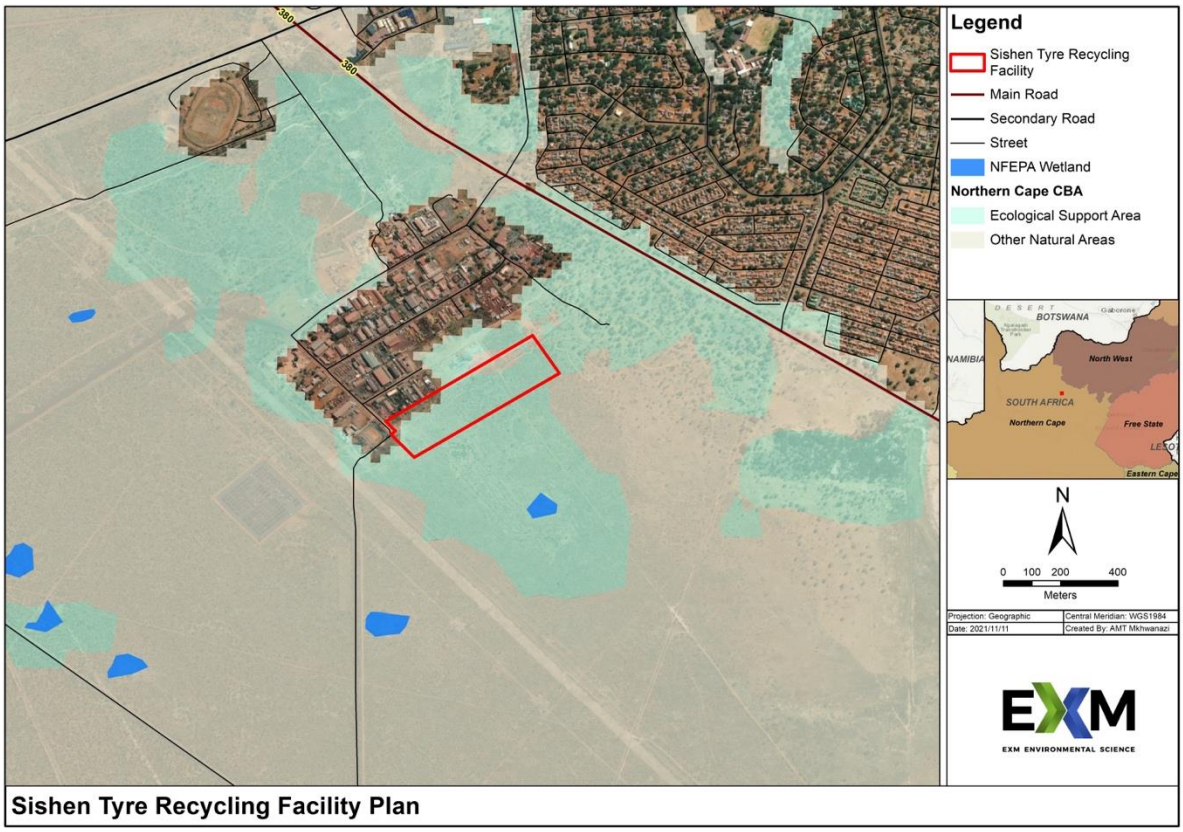

Figure 5: The proposed development layout (provided by client).

3 ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

3.1 Methodology for Assessing Heritage Site Significance

This report was compiled by PGS for the proposed Tyre Management Facility near Kathu. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999) and the NEMA (no 107 of 1998). The HIA process consisted of three steps:

Step I – Desktop Study: A detailed archaeological and historical overview of the study area and surroundings was undertaken. This work was augmented by an assessment of reports and data contained on the South African Heritage Resources Information System (SAHRIS). Additionally, an assessment was made of the available historic topographic maps. All these desktop study components were undertaken to support the fieldwork.

Step II – Field Survey: The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was undertaken by way of intensive walkthroughs of the proposed development footprint areas.

The fieldwork was undertaken by two archaeologists (Nikki Mann and Wynand van Zyl) on 10 November 2021. Throughout the fieldwork, hand-held GPS devices were used to record the track logs showing the routes followed by the fieldwork team.

Step III – Report: The final step involved the recording and documentation of relevant archaeological resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

The significance of heritage sites was based on five main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
    - Low - <10/50m2
    - Medium - 10-50/50m2
    - High - >50/50m2
- Uniqueness; and
- Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development activity position;

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site.

3.1.1 Site Significance

Site significance classification standards use is based on the heritage classification of s3 in the NHRA and developed for implementation keeping in mind the grading system approved by SAHRA for archaeological impact assessments. The update classification and rating system as developed by Heritage Western Cape (2016) is implemented in this report.

Site significance classification standards prescribed by the Heritage Western Cape Guideline (2016), were used for the purpose of this report (**Table 4** and **Table 5**).

Table 4: Rating system for archaeological resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Wonderwerk Cav), Cradle of Humankind	May be declared as a National Heritage Site managed by SAHRA. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Highest Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current examples: Blombos, Paternoster Midden.	May be declared as a Provincial Heritage Site managed by NC HRA.	Exceptionally High Significance
III	Heritage resources that contribute to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay	Resource must be retained. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree.	Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	Medium Significance
IIIC	Such a resource is of contributing significance.	Resource must be satisfactorily studied before impact. If the recording already done (such as in an HIA or permit application) is not sufficient, further recording or even mitigation may be required.	Low Significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant or the consultant and approved by the authority.	No research potential or other cultural significance

Table 5: Rating system for built environment resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status. Current examples: 8 Ventershoek Street,Colesberg	May be declared as a Provincial Heritage Site managed by NC HRA.	Exceptionally High Significance
II	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at local level.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement or community.	Like Grade IIIA buildings and sites, such buildings and sites may be representative, being excellent examples of their kind, or may be rare, but less so than Grade IIIA examples. They would receive less stringent protection than Grade IIIA buildings and sites at local level.	Medium Significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
IIIC	Such a resource is of contributing significance to the environs. These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.	This grading is applied to buildings and/or sites whose significance is contextual, i.e., in large part due to its contribution to the character or significance of the environs. These buildings and sites should, as a consequence, only be regulated if the significance of the environs is sufficient to warrant protective measures, regardless of whether the site falls within a Conservation or Heritage Area. Internal alterations should not necessarily be regulated.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant and approved by the authority. Section 34 can even be lifted by HWC for structures in this category if they are older than 60 years.	No research potential or other cultural significance

3.2 Methodology for Impact Assessment

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance.

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 6**.

Table 6: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	Proposed site	Incidental
2	LOW	Study area	Short-term
3	MODERATE	Local	Medium/High-term
4	HIGH	Regional / Provisional	Long-tern
5	VERY HIGH	Global / National	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

3.2.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1 000 km2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 7** below.

Table 7: Description of the significance rating scale

RATING		DESCRIPTION
5	Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	High	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	Moderate	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	Very low	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity are needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	No impact	There is no impact at all - not even a very low impact on a party or system.

3.2.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 8**.

Table 8: Description of the spatial rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of possible impacts and will be felt at a regional scale (District Municipality to Provincial Level).
3	Local	The impact will affect an area up to 10 km from the proposed site.
2	Study Site	The impact will affect an area not exceeding the boundary of the study area.
1	Proposed site	The impact will affect an area no bigger than the site.

3.2.3 Temporal/Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 9**.

Table 9: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium-term	The environmental impact identified will operate for the duration of life of the project.
4	Long-term	The environmental impact identified will operate beyond the life of the operation of the project.
5	Permanent	The environmental impact will be permanent.

3.2.4 Degree of Probability

Probability or likelihood of an impact occurring will be described as shown in **Table 10** below.

Table 10: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very likely
5	It's going to happen / has occurred

3.2.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in **Table 11**. The level of detail for specialist studies is

determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 11: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40% and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.
Don't know	The consultant cannot, or is unwilling, to make an assessment given available information.

3.2.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale, as described below:

$$\textbf{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \text{Spatial} + \text{Temporal})}{3} \text{ X } \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown in **Table 12**.

Table 12: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Local	Medium Term	Could Happen	Low
Impact on heritage structures	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, which is divided by 3 to give a criterion rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the **Table 13** below.

Table 13: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	**Very Low**
1.1 – 2.0	2	**Low**
2.1 – 3.0	3	**Moderate**
3.1 – 4.0	4	**High**
4.1 – 5.0	5	**Very High**

Therefore, with reference to the example used for heritage structures above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

4 CURRENT STATUS QUO

A site visit was conducted by two archaeologists from PGS on 10 November 2021.

The study area is situated in the southern portion of Kathu along a small dirt road. It comprises a relatively small area approximately 8.41 hectares in extent. The study area's northern boundary is adjacent to numerous business establishments. Informal recyclers are established in the south-western portion of the area. Access to the site was gained from a municipal road via a dirt road situated on the eastern boundary of the study area.

In terms of the climate, the region experiences summer and autumn rainfall with very dry winter periods. The topography of the study area comprises of a relatively level portion of land. No exposed pebble/gravel layers were visible. The area falls within a landscape that can be described as largely disturbed due to the area previously being used as a "dumping" site for mostly building rubble.

The study area is located within the Kathu Bushveld (Mucina and Rutherford, 2006). This type of vegetation is characterised by medium height thorn tree savanna and shrubs. The grass cover varies across the region due to fire damage.

In terms of geology and soils, the area is characterised by Campbell Group dolomite. The red Kalahari aeolian soils are often bioturbated and are predominantly sandy with small rock fragments. Locally, rock pavements are formed in places.

Overall, the accessibility of the project footprint area was fairly good. The archaeological visibility of the area was limited due to large areas of the region being covered in dumped waste materials and/or being burnt.

The photographs below provide general views and landscape features of the proposed development area.

Figure 6: View towards the neighbouring businesses with evidence of fire and dumping.

Figure 7: View of the boundary feature created by dumped rocks in the northern part of study area.

Figure 8: General view of sparse vegetation with the occasional low-growing tree.

Figure 9: View of cleared section within study area.

Figure 10: Mounds of dumped sand and calcrete boulders.

Figure 11: Calcrete outcrop exposed in the road.

Figure 12: Example of plastic, glass, metal and rubble scattered across the study area.

Figure 13: Burnt area within the study area.

5 DESKTOP STUDY FINDINGS

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources. Furthermore, it determines the historical and cultural context of the study area. Relevant archaeological and historical texts, topographic maps and satellite imagery were studied and consulted.

5.1 Archaeological and Historical Overview of the Study Area and Surrounding Landscape

DATE	DESCRIPTION
3.2 million to 250 000 years ago	The Earlier Stone Age (ESA) is the first and oldest phase identified in South Africa's archaeological history and here it comprises two technological phases. The earliest of these, known only from sites outside of southern Africa, is the Lomekwian industry (3.2 Myr) and is associated with percussive tools and large flakes. Occurring in South Africa is the Oldowan industry (2.6 – 1.5 Myr), characterised by expedient, yet organised flaking systems with primarily core- and flake-based assemblages. Finally, the Acheulian industry (1.7 Myr – 250 kyr) is the last ESA industry to develop, comprised by Large Cutting Tools (i.e. handaxes and cleavers) and organised core reduction (i.e. Levallois). Several important ESA sites are known from the general vicinity, including the very significant ESA Kathu Pan and Kathu Townlands localities and the Bestwood sites (Chazan et al, 2012). These sites are approximately 6.3km north-west, 3.5km north-east and 6.3km north-east of the study area, respectively. Research at Kathu Townlands was first undertaken by P.B. Beaumont (1990, 2004). The locality has a remarkable high lithic density containing millions of ESA artefacts (Mitchell, 2002; Walker et al, 2013 Walker et al. 2014). Moreover, the interface between the ESA and MSA is also represented at Kathu Pan by the transitional lithic industry of the Fauresmith (Porat et al 2010).
>250 000 to 40 000 years ago	The MSA is associated with flakes, points and blades manufactured by means of the prepared core technique. This phase is furthermore associated with modern humans and complex cognition (Wadley 2013). MSA sites and occurrences have been identified in the Kathu area, including the very significant Kathu Pan localities (Wilkins & Chazan, 2012). See also, for example, Beaumont (2008a, b) and Kruger (2014).

DATE	DESCRIPTION
40 000 years ago to the historic past	The Later Stone Age (LSA) is the third archaeological phase identified and is associated with an abundance of very small stone tools known as microliths. A number of LSA sites are known from the direct vicinity of the existing Kathu area. According to Beaumont (2000) pecked engravings, originally from the farms Sishen 543 and Bruce 544, were donated to the McGregor Museum with some engravings located on the grounds of the Sishen Iron Ore Mine as well. These farms are located 4.3km south-west and 7.8km south of the present study area. More engraving sites are known from further afield, including one on the farm Palingpan. This farm is situated roughly 48km south of the present study area.
800 AD – 820 AD	The archaeological excavations undertaken by Beaumont and Boshier (1974) and Thackeray et al (1983) have revealed that the mining of specularite at Doornfontein and Tsantsabane/Blinkklipkop commenced during this time. Blinkklipkop for example is located 65km south of the study area. During this initial period the mining activities would have been undertaken by San hunter-gatherers and Kora pastoralists. Only after the seventeenth century were such mining activities likely also undertaken by the Iron Age Tswana groups.
Early 1600s	The Tswana groups known as the Thlaping and Thlaro moved southward into the area presently known as the Northern Cape. A century later they were settled in areas as far south as Majeng (Langeberg), Tsantsabane (Postmasburg) and Tlhaka le Tlou (Daniëlskuil) (Snyman, 1986). In terms of the Thlaro specifically, Breutz (1963) states that after they broke away from the Hurutshe during the period between 1580 and 1610, they travelled along the Molopo River and the Southern Kalahari before arriving at the confluence of the Kudumane, Mosaweng and Molopo. From here they established themselves at Tsowe (west of Morokweng), Gatlhose (immediately east of the study area), Majeng (Langberg), Khoiise (Khuis on the Molopo River) and Tlhaka-la-Tlou (present day Danielskuil situated roughly 72km south-east of the study area). It is evident that the study area and surrounding landscape would be central within the overall settlement area of the two Tswana groups at the time.
c. 1770	During this time, the Kora moved into the area. Due to their superior firearms, they applied increasing pressure on the Thlaping and Thlaro groups. In the end, the Thlaping moved into a north-eastern direction to settle in the general vicinity of Dithakong, north-east of present-day Kuruman. The Thlaro settled in areas to the west and north-west of the Thlaping (Snyman, 1986).
c. 1786 – c. 1795	A German deserter named Jan Bloem established himself at Tsantsabane (Blinkklip) (Legassick, 2010). This place is located 5km north-east of the present-day town of Postmasburg. The settlement of Jan Bloem at the specularite mine may have been a way in which to control the valuable site and any trading activities associated with it.
c. 1795	Legassick (2010) confirms the presence of the Thlaping, Thlaro and Kora in the general vicinity of the study area during this time. This said, the study area and surrounding landscape would have represented a western peripheral area of the overall landscape occupied by especially the Thlaping and Thlaro groups at the time. From a map depicted in Leggassick (2010:338), it is evident that at the time the Kora started moving in north-eastern direction from the areas along the central Orange River to the banks of the Harts River.
Early 1800s	After the threat of the Kora became less intensive, the Thlaping moved to the vicinity of present-day Kuruman. The Thlaro returned to the Langeberg, establishing them on a permanent basis there during the 1820s (Snyman, 1986). The settlement of the Thlaping in the vicinity of Kuruman occurred during the reign of Molehabangwe. This period in the history of the Thlaping was seen as a period of wealth and power, and at the time they even had control of the *sibello* quarry near Blinkklip (Legassick, 2010).

DATE	DESCRIPTION
1801	The first known visit to this area by European explorers (i.e. excluding European renegades and fugitives such as Jan Bloem) took place in 1801. The journey was undertaken by P.J. Truter and Dr W. Somerville. They crossed over the Orange River in the vicinity of Prieska, and passed Blinkklip on their way to present-day Kuruman (Bergh, 1999). Although their exact route is not known, it is possible that their journey from present-day Postmasburg to Kuruman would have passed some distance to the east of the proposed cemetery.
1802 - 1813	During this period William Anderson and Cornelius Kramer, both of the London Missionary Society, established a mission station at a place called Leeuwenkuil. The focus of their work was a group known as the Bastards (Erasmus, 2004). This group could be described as a cultural conglomeration descending not only from relationships between different cultures and races (i.e. European and Khoi), but also comprised remnants of Khoi and San groups as well as freed slaves. The particular group later became known as the Griqua. Due to the problems caused by the presence of lions at Leeuwenkuil, the mission station was moved in 1805 to Klaarwater. On 7 August 1813 the name of the settlement which had sprung up here was renamed Griquatown. This came about as a result of a number of proposals made by Reverend John Campbell, the Director of the London Missionary Society who was visiting the mission stations from this area at the time. He suggested that "...*the Bastards change their name to 'Griqua' and that Klaarwater became Griquatown. This was because 'on consulting among themselves they found a majority were descended from a person of the name Griqua'*..." (Legassick, 2010). Griquatown is located 127km south of the present study area.
1805	During this year German explorer Martin Hinrich Carl Lichtenstein travelled through the general vicinity of the study area. After crossing the Orange River in the vicinity of present-day Prieska, Lichtenstein's party visited present-day Daniëlskuil, and by June 1805 they were at Blinkklip (Postmasburg), a well-known source for obtaining specular haematite. Archaeological investigations at Blinkklipkop (also known as Nauga) established a date of AD 800 for the utilisation of this particular rich source (Thackeray, et al 1983). From here they travelled further north and reached the Kuruman River where they met Tswana-speaking people. They followed the river downstream for three days, after which they followed a tributary to reach Lattakoe. From here they turned south and reached the Orange River on 11 July 1805. While on his way to the Kuruman River (and to the south thereof), Lichtenstein visited a small settlement consisting of "*…about thirty flat spherical huts.*" Although the people staying here were herdsmen who looked after the cattle of richer people living on the Kuruman River, they indicated that San (Bushmen) were also present in the area (Lichtenstein, 1930). Although Lichtenstein was certainly not the first European explorer to travel through this area (the Truter & Somerville expedition had for example passed through this area in 1801), or for that matter the last (Burchell travelled through the area in 1811 followed by John Campbell in 1813) (Bergh, 1999), Lichtenstein did leave behind a written record of this journey providing a valuable glimpse into the early history of the general surroundings of the study area. What is also significant about Lichtenstein's visit is that his journey took him from present-day Postmasburg to a place known as Tsenin which is located north-west of Kuruman. As a result, he would have passed near the present study area.

DATE	DESCRIPTION
	 *Figure 14: Reverend John Campbell (Campbell, 1815). He passed through the general vicinity of the study area during his travels from Klaarwater to Kuruman.*
1813	During 1813 John Campbell of the London Missionary Society also visited the general vicinity of the study area. He arrived at Klaarwater on 9 June 1813, where he rested for a few days before continuing in a northern direction toward present-day Kuruman, passing through Blinkklip on the way (Bergh, 1999).
20 December 1820	On this day Andries Waterboer was elected as leader of Griquatown in the place of Berend Berends (Legassick, 2010). This period saw fission within the Griqua community, and it is not surprising that two long-term leaders moved away from Griquatown to establish autonomous settlements away from their former town. Berend Berends for example moved to Danielskuil, whereas Adam Kok II established himself in the vicinity of Campbell (Legassick, 2010).
1821 – August 1828	During this period a group of Griqua became dissatisfied with Waterboer and moved away from Griquatown to settle along the Modder River. They were known as the Bergenaars and were supported by Kora and San elements (Cope, 1977). A section of the Bergenaars known as the Klein Bergenaars (Little Bergenaars), settled along the Langberg. The Bergenaars constantly attacked the Thlaro, Thlaphing as well as the Griqua. On three separate occasions (Late 1824, July 1827 and December 1827) they attacked Griquatown and also attacked the London Missionary Society station at Kuruman on several occasions with the last attack taking place in August 1828 (Cope, 1977).
1824	Robert Moffat of the London Missionary Society established the mission station at Kuruman (Erasmus, 2004).
Early 1830s	During this time Andries Waterboer stationed a number of Griqua families at a fountain north of Tsantsabane (Blinkklip) as well as at Danielskuil (Legassick, 2010).
22 April 1842	On this day a treaty was signed between Griqua leader Andries Waterboer and Thlaping leader Mahura at Mahura's settlement near Taungs. The

DATE	DESCRIPTION
	agreement included a definition of the boundary between the two groups. The section of the agreed upon boundary closest to the study area ran from "...*the northerly point of the Langeberg and extending a little south of Nokaneng, and further half-way between Maremane and Klipfontein*..." (Legassick, 2010:291). While the exact location of Nokaneng is not currently known, the farms Klipfontein 437 and Maremane 678 are situated 51km to the south south-east and 33km to the south by south-east of the study area respectively. This suggests that the present study area was located north of the boundary line between the Griqua and the Thlaping as defined in the treaty. As such, the study area was defined within this treaty as forming part of the land of the Thlaping. However, it must be noted that this boundary line was not cast in stone. This boundary was very similar to an earlier one that was thought to have been agreed to during the 1820s as a boundary between the Griqua and the Thlaping (Legassick, 2010).
1850	During this time a Thlaro leader by the name of Molete and his baThlaro baga Keakopa moved away from the Korannaberg and established themselves at Gathlose, which is located immediately east of the study area. Breutz (1963) states that the land around Gathlose and Maremane used to belong to the Kora (Koranna) people and that they gave permission to Molete to settle here. After his death between 1885 and 1890, Molete was succeeded by Holele who ruled until his death during the Langberg Rebellion of 1897. Holele was succeeded by Kebiditswe John Holele who filled the post until 1912 when he was succeeded by his younger brother Kgosieng. Kgosieng ruled until he was pensioned on 28 February 1937, and was succeeded by Kebiditswe's son, Kgosietsiele Smous. Kgosietsiele died on 30 June 1956 and was succeeded by his son Frank Motsewakgosi Holele (Breutz, 1963). Likely between 1850 and 1860 the area known as Maremane (located directly south of Gathlose) was an outpost grazing area of the BaThlaro chief Makgolokwe and his son Toto. The first designated leader of this area was Isaak Thupane, followed by Toto's son Robanyane who fled to present-day Namibia after the Langberg Rebellion of 1897. He was succeeded by his father's brother Jan Molebane Toto. However, the government only recognised him as chief in 1912 up to which point John Holele of the Gathlose Reserve was appointed by the government to act for the Maremane area as well. Molebane was dismissed in 1925 and was succeeded in 1926 by his brother David Makgolokwe. David Makgolokwe remained at his post until his death in 1942 when he was succeeded by Puso Togelo who remained as leader until his death in 1954. He in turn was succeeded by Felix Kgosithebe Toto (Breutz, 1963).
1850 – 1855	During this period Isaak Thupane established himself at Logageng (Gatkoppies) near Postmasburg. He subsequently moved with his followers to Groenwater 453. During the time that Thupane was living at Logageng, Kgangeng discovered the fountain at Metsematale. Subsequently, the land was ceded by Waterboer to the Thlaro and Kgangeng and his followers settled at Groenwater as well. The farm Groenwater 453 is located 63km south by south-east of the study area.

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	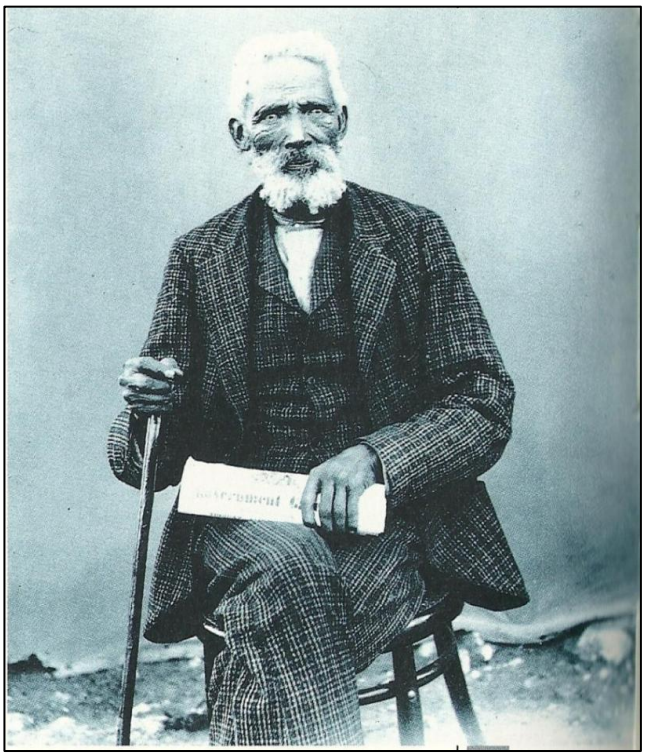 *Figure 15: Nicolaas Waterboer, who succeeded as leader of Griquatown in 1852 after the death of his father Andries Waterboer (Reader's Digest, 1994:168).*
13 December 1852	After the death of Andries Waterboer, his son Nicolaas Waterboer became the leader of Griquatown. He ruled Griquatown until the annexation of the area by the British in 1871 (see below) (Legassick, 2010). It was during the rule of Nicolaas Waterboer that diamonds were discovered in the area which led to a period of claims and counter-claims between the Griqua, the Orange Free State as well as the Zuid-Afrikaansche Republiek and which eventually led to the annexation of the area.
Before 1856	During the period before 1856 the Thlaro leader Masibi occupied the area known as Skeyfontein, which is located approximately 86km south of the study area.
1867	Diamonds were discovered for the first time in South Africa near Hopetown. Alluvial diamonds were also discovered along both banks of the Orange River (Van Staden, 1983).
27 October 1871	The area located in general terms between the Orange and Vaal Rivers and south of Kuruman was proclaimed as British Territory and named Griqualand West (www.wikipedia.org). The study area fell outside and to the north of this territory at the time.
1878	A rebellion broke out amongst some of the Tswana communities living in Griqualand West. This rebellion, which was a response to British expansion and colonialism, spread to the Langberg. A British force left Griqualand West in October 1878 and defeated the "rebels" at the Langberg (Snyman, 1986).

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	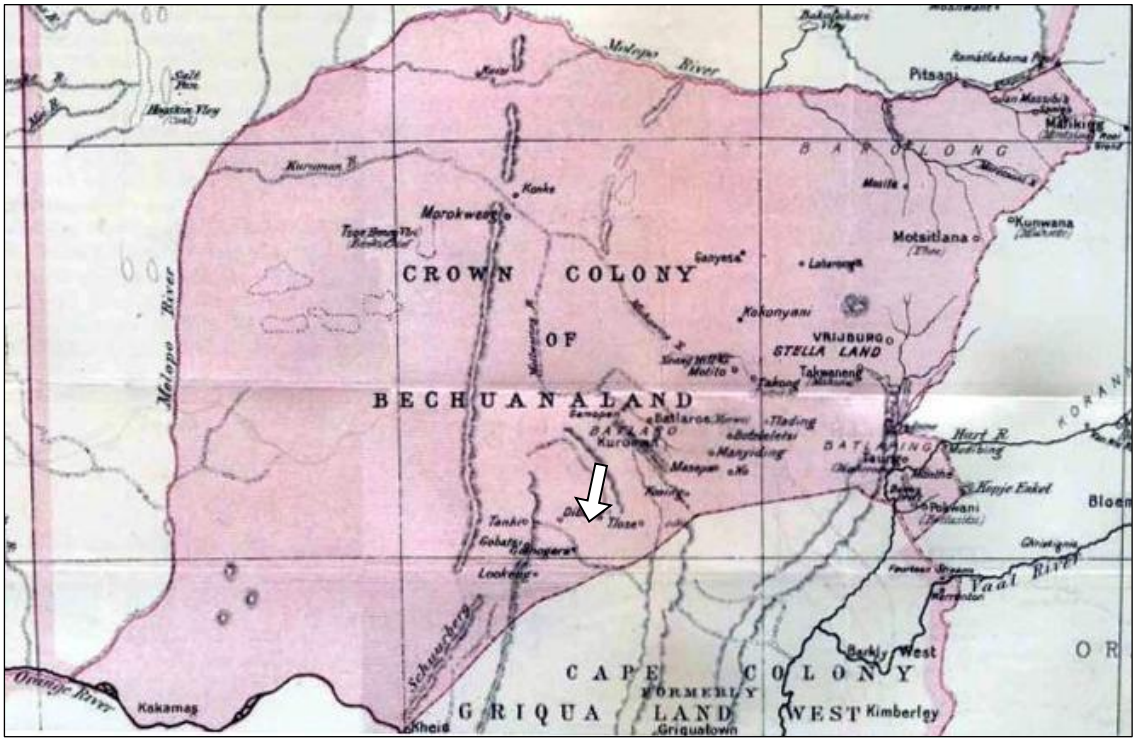 *Figure 16: Section of a map titled "Sketch Map of British Bechuanaland" which is dated to May 1887 (www.wikipedia.com) (www.kaiserscross.com). The approximate position of the study area is shown.*
30 September 1885	Sir Charles Warren proclaims the area between the Molopo River and the northern boundary of Griqualand West as the Crown Colony of British Bechuanaland. Its western boundary was defined by the Molopo River and its eastern extremity reached as far as Mafeking. The proclamation followed on a military operation under Warren's command to occupy the Boer Republics of Stellaland and Goosen. As a result, the Crown Colony of British Bechuanaland included the lands of the two republics as well as the land of various Tswana groups. (www.wikipedia.org). At the time the study area was located near the southern boundary of this newly proclaimed territory.
1886	As a result of the work of a commission appointed by the British rulers of the Crown Colony of British Bechuanaland, a number of so-called "native reserves" were established in this area. These included Deben (approximately 20km north-west of the study area), Ga-Tlhose (approximately 25km south-east of the study area), Maremane (33km to the south by south-east of the study area), Langberg (approximately 160km south-east of the study area) as well as Kathu (Snyman, 1986). The establishment of so many "native reserves" in close proximity to the study area clearly support the suggestion made earlier that the study area was centrally located in the historic and prehistoric territories of Tswana groups such as the Thlaro and Thlaping. In the same year a trader by the name of John Ryan established a shop on the farm Bishop's Wood. This farm is located approximately 14km west of the study area.
16 November 1895	The Crown Colony of British Bechuanaland was annexed by the Cape Colony (www.wikipedia.org).
September 1896	During this time a viral disease affecting cattle (and some other species of even-toed ungulates) known as Rinderpest swept through Southern Africa (www.wikipedia.org). Although attempts were made to halt the spread of the

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	disease from the north by erecting a fence between the boundaries of Griqualand West and Bechuanaland, this proved unsuccessful. Incidentally, only three gates were placed in the above-mentioned fence, namely at Gatlhose, Nelsonsfontein and Blikfontein (Snyman, 1988). Of these three places, Gatlhose is the closest and is situated approximately 25km south-east of the study area.
 *Figure 17: An everyday scene during the Rinderpest Epidemic (Snyman, 1983:20).*	
1897	The Rinderpest epidemic did not only have a massive socio-economic impact on the landscape, it also resulted in the Langberg Rebellion of 1897. During this time conflict broke out between the authorities and a Thlaping leader from Taung, namely Galeshiwe. The conflict arose after infected cattle belonging to him were destroyed by representatives of the government as a way of kerbing the spread of the disease. After killing an officer, Galishewe fled to the Thlaro leader Toto of the Langberg. Subsequently, a full-scale rebellion broke out (Breutz, 1963). The British authorities eventually mustered a military force which included sections of the Cape Mounted Rifles and Bechuanaland Field Force and which on 14 March 1897 stood at roughly 1,000 men. Opposing this formidable and well equipped force supported by artillery the Tswana rebels possessed an army of roughly 1,500 men who from the start of the rebellion already experienced serious shortages in the way of provisions and ammunitions (Snyman, 1986). Although most of the activities associated with the rebellion took place some distance to the west of the study area, the impact of the rebellion was felt throughout the surrounding landscape. Some noteworthy skirmishes took place on 9 May 1897 at Puduhush (approximately 35km south-west of the study area) and on 30 July 1897 at Gamaluse and Gamasep (37km west of the study area). Furthermore, the main British force under the overall command of Lieutenant-Colonel E.H. Dalgety used the farm Bishop's Wood as a base of operations (Snyman, 1986). The farm Bishop's Wood is located 14km west of the study area. The rebellion was suppressed and came to an end with the surrender of rebel leader Toto, his son Robanyane and their Thlaro followers on 2 August 1897 (Snyman, 1986).

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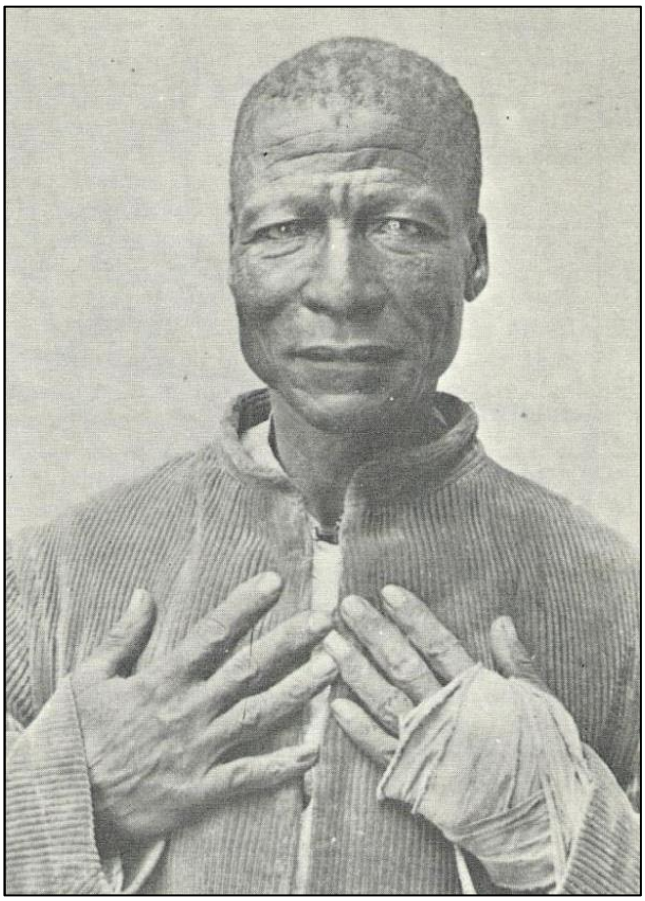
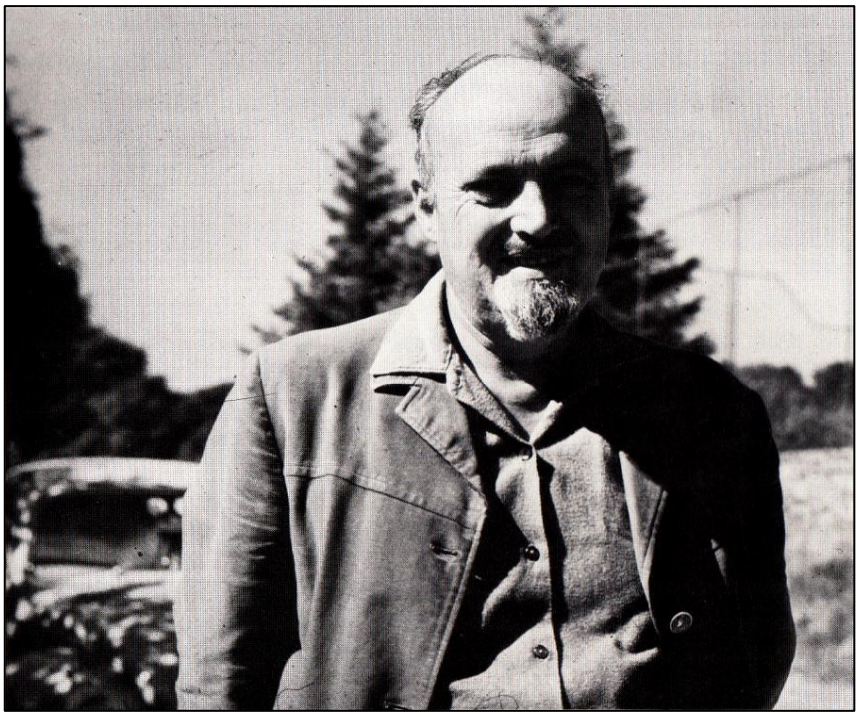
	 *Figure 18: Toto, leader of the Thlaro along the Langberg (Snyman, 1986:17).*
1899 - 1902	The South African War was fought between Great Britain and the Boer republics of the Zuid-Afrikaansche Republiek and Orange Free State. However, no skirmishes or battles from this war are known from the direct vicinity of the study area. The closest known battles and skirmishes to the present study area include Kareepan on 10 August 1901 and Doornfontein in February 1902 (Snyman, 1983). These farms are located some distance south and south-east of the study area.
1907	A number of trekboers from the southern Free State arrived in the general vicinity of the present study area (Erasmus, 2004).
1913	In this year the so-called "Native Locations" of Skeyfontein and Groenwater were established by Proclamation 131 of 1913 (Breutz, 1963).
1914	The town of Dibeng was laid out in 1914 on the banks of the Ga-Mogara river. This followed on the establishment of the Dibeng Dutch Reformed Church parish in 1909 (Erasmus, 2004).
1927	Gamagara Manganese Corporation Ltd and Central Manganese Ltd obtained options on farms in the vicinity of Lomoteng and Sishen (Snyman, 1988).
4 November 1930	On this day the extension of the railway line from Koopmansfontein to Postmasburg was officially opened by the Minister of Railways, C.W. Malan. This meant that Postmasburg was now one of the few towns in the Northern Cape which boasted a direct rail link. While the extension of the railway line to Beeshoek was built by the Manganese Corporation further extensions to Lohatla and Manganore (1936), Sishen (1953) and Hotazel (1961) were undertaken by the South African Railways (Snyman, 1983).
1930 - 1932	During 1930 an Englishman by the name of Pringle-Smith was appointed by S.A. Manganese to devise and execute a "...*thorough prospecting*

DATE	DESCRIPTION
	programme of S.A. Manganese's properties..." (S.A. Manganese, 1977:46). This meant that the prospecting work undertaken in 1927 and which had been halted due to the poor financial climate and the lack of a railway link could now be proceeded with. Within a relatively short spate of time Pringle-Smith started opening up the beds on the farms Kapstewel and Doornput. However, the company did not have the market, which for example the Manganese Corporation possessed at the time, and as a result the ore was stockpiled at these two farms. Pringle-Smith left the Postmasburg area in 1932 after the financial implications of the Great Depression worsened the situation for S.A. Manganese to such an extent that he was asked to agree to a much lower salary (S.A. Manganese, 1977).
Early 1930s	Due to the financial impacts of the Great Depression, a number of smaller manganese mining companies were closed down. A period of amalgamation followed which resulted in the South African Manganese Limited as well as the Associated Manganese Miners of South Africa Limited becoming the leaders in the manganese mining industry (Snyman, 1983).
c. 1932 - 1937	During this approximate period a geological assessment of the minerals and ore deposits of the Postmasburg District was undertaken by the South African Geological Survey. One member of the geological team was Dr Leslie Gray Boardman. His responsibility was to work on manganese and haematite deposits in the district. Apart from the manganese deposits near Postmasburg, Dr Boardman also identified large deposits of iron ore deposits on farms along the northern end of their area of study including Sishen, Bruce and King (S.A. Manganese, 1977). The farm King adjoins the farm Demaneng, with the farms Sishen and Bruce are located 4.3km south-west and 7.8km south of the present study area.
 *Figure 19: Dr Leslie Gray Boardman, the geologist who during the 1930s realized the immense potential of the Sishen area for iron ore mining (S.A. Manganese, 1977:65).*	
c. 1936	After the willingness of the South African Railways Administration to extend the railway line from Postmasburg to Kapstewel and Lohatla became known, the entire manganese industry north of Postmasburg changed for the better. An example of this was that S.A. Manganese stepped up operations on the farm Kapstewel. The work here was overseen by Captain

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	T.L.H. Shone (S.A. Manganese, 1977). The promise of railway extensions to this area also resulted in other mining activities such as the establishment of a mining company by the name of Gloucester Manganese. This company was established to mine the manganese deposits on the farm Gloucester. Shortly thereafter an amalgamation took place between Gloucester Manganese and the Manganese Corporation which resulted in the formation of the Associated Manganese Mines of South Africa Limited (Ammosal). Ammosal re-erected the old ore handling plant from Beeshoek on the farm Gloucester and the operations here represented a large portion of the total manganese production of 250,000 tons (S.A. Manganese, 1977). Gloucester is situated 40km to the south.
1937	The farm to the east of Gloucester, named Lohatla, was now being viewed more favourably by S.A. Manganese. During this year they reached an agreement with the owner, which eventually resulted in the acquisition of the farm. During the same year the company bought the freehold of the farm Klipfontein and also bought 600 morgen of the farm Kapstewel in order to build a staff village. This village was named Manganore (S.A. Manganese, 1977). The Lohatla mine village was also established (Snyman, 1983). Furthermore, the African Metals Corporation Limited (Amcor) was established "…*to manufacture semi-processed iron and steel products*…" and in 1937 obtained the farm Demaneng for this purpose. However, this venture was a failure (Snyman, 1988:84).
Late 1940s	During this time the decision was made by two of the bigger role players in the manganese mining industry around Postmasburg for the mining of haematite iron ore to commence in earnest. S.A. Manganese in conjunction with the African Metals Corporation (Amcor) established a new company known as Manganore Iron Mining Ltd. to work on the iron ore deposits owned by them. These deposits were *inter alia* located on the farms Klipfontein, Kapstewel and Doornput (S.A. Manganese, 1977).
c. 1950	At the time D. L.G. Boardman was assessing the ore reserves at Manganore and Lohathla as well as the farm Lylyveld for S.A. Manganese. He found that the latter farm contained large quantities of haematite iron ore and persuaded the directors of S.A. Manganese to acquire the farm (S.A. Manganese, 1977). The farm Lylyveld 545 adjoins a section of the western boundary of the farm Demaneng.
1953	Iscor commenced iron production at Sishen (Snyman, 1983). In the same year the railway line from Postmasburg to Sishen was extended to haul ore to Iscor's plants in Pretoria, Vanderbijlpark and Newcastle (Erasmus, 2004).
1958	At least by 1958, Manganore Iron Mining also owned mineral and surface rights on the farm Sekgame, located immediately north of the farm Demaneng.
1973	In this year a second mine was opened at Sishen to supply export iron ore to Saldanha Bay. During the same year the town of Kathu was established to accommodate employees for the new mine (Erasmus, 2004).
1976 - 1977	During this time the Gatlhose and Maremane Communities were removed from their land and taken to the Shipton Farms in the then homeland of Bophutatswana. After their removal, the South African Government decided to establish a Battle School here. As the Khosis Community was still staying on the land, they were moved to a section of the original land roughly 14 000 hectares in extent. The Lohatla Battle School was subsequently established (www.lrc.org.za/Docs/Judgments/khosis.doc).
1980	In 1980 the town of Kathu received municipal status (Erasmus, 2004).

5.2 Archaeological Sites from the Surroundings of the Study Area

Several archaeological surveys and research projects have been undertaken in the general surroundings of the study area. The reason for this focus in archaeological work in the surrounding area particularly, is most likely due to the large-scale manganese and iron ore mining activities taking place and the resulting requirement for archaeologists to assess the proposed mining areas as well as the well-known presence of pre-colonial mining, rock art and Stone Age sites from this general area.

5.2.1 Kathu Archaeological Complex

The Kathu Complex sites contain important ESA Acheulian and transitional ESA/MSA Fauresmith assemblages (Beaumont, 1990, 2004, 2013; Herries, 2011; Chazan et al, 2012; Wilkins & Chazan, 2012, Walker et al, 2014). The presently identified sites making up the Kathu Archaeological Complex include the Kathu Pan Sites, Kathu Cemetery, Bestwood and Kathu Townlands.

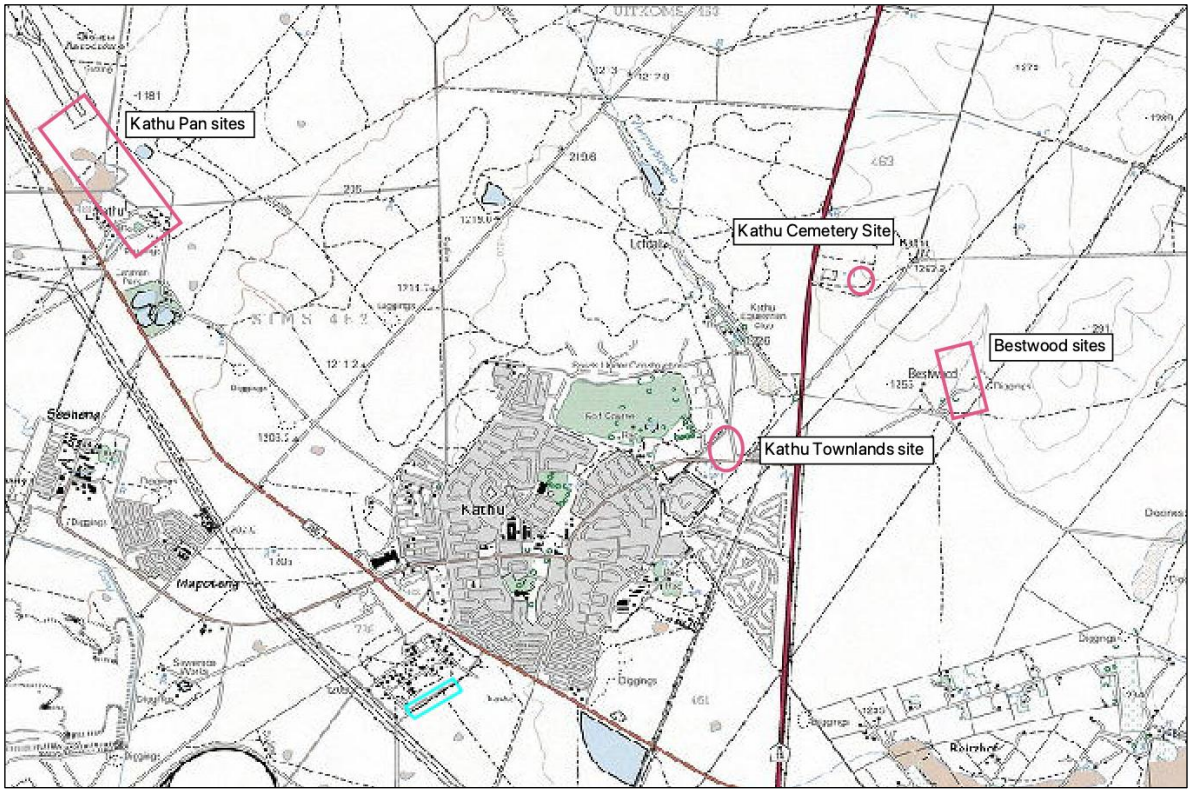

Figure 20: This map depicts the positions of the sites collectively known as the Kathu Archaeological Complex. The present study area is located relatively close to these sites (see blue polygon).

Walker et al (2014) suggest that the intensive occupation of the Kathu region can be linked to the availability of water resources. Current research projects are yielding important data on typologies, lithic technologies, technological innovations, complex spatial organization and also dates for the ESA Acheulian and for the MSA assemblages. Research at Kathu Pan 1 established a date of 500 000 years for a Fauresmith blade assemblage where blades were systematically removed from prepared cores

(Wilkens & Chazan, 2012). It is argued that some of these were used as speartips (Rots et al, 2014; Wilkins et al, 2015).

Archaeological and paleoenvironmental data from Kathu Pan and Kathu Townlands were used to reconstruct changes over time in the prehistoric environment (Beaumont 2004b). Associated faunal remains with some of the Acheulian include *Elephas recki*. These animals disappeared at sites in East Africa such as at Olorgesailie, Kenya, at around 600 000/800 000 years ago (Beaumont, 2004b; McNabb, 2004). Biostratigraphy or faunal correlation is often used to date the southern African sites and gives some indication of the approximate age of some of the associated assemblages. More recently a combination of OSL and ESR/U-series dating (Porat et al, 2010; Herries, 2011; Walker et al, 2014) were used to date the transition to MSA tool forms. At Kathu Pan the transitional Fauresmith has been dated to ca. 500 000 BP (Porat et al, 2010). Kathu Pan is formed by a shallow depression with an internal drainage and a high water table.

The large cutting tools (LCT's) from this area often contain very fine handaxes with some superb examples produced on banded ironstone. Lithics in some of the Acheulian deposits, but also in MSA levels, display a shiny silica skin. At Kathu Townlands an outcropping of banded ironstone that covers a large area of around 25 km contains enormous quantities of flaked items. This phenomenon is ascribed to the use of the high-grade bedrock ironstone as a source for raw materials and is supported by the high incidence of handaxe roughouts (Beaumont 2004b). The prepared core technique was used to produce the spectacular small handaxes, long blades, convergent flakes/points, scrapers found in Fauresmith collections.

North-east of Kathu several newly-found ESA sites with LCT's and an associated range of tools occur in sand quarries and on a hilltop at Uitkoms Farm and the Bestwood locality (Chazan et al, 2012). The residential and commercial developments at Bestwood and close to the Townlands demonstrate the importance of Phase 2 heritage studies in the Kathu region.

The concerns that Walker et al (2014:8) raise with regard to the impact of the exponential development should feature in any survey that is undertaken around Kathu. With reference to the general locality they urge that a "*broader landscape-based effort of subsurface testing including palaeo-landscape and paleo-environmental reconstruction is essential to our understanding of this extraordinary record. Sources of this information must be protected along with archaeological remains. Together with the other components of the Kathu Complex, this site represents a high density of hominin occupation that presents a challenge to reconstructions of hominin adaptations during the Early-Middle Pleistocene*".

Orton and Walker (2015:12) in remarking on the significance of Kathu again emphasize '*that the area is best regarded as an archaeological landscape rather than a collection of individual sites*'.

Kathu Pan

Klein (1984) describes the Kathu Pan as the best paleoenvironmental sequence from the Kalahari Basin area. It is a broad surface of organic marshland that is located in the centre of four farms, namely Marsh 467, Sacha 468, Kathu 465 and Sims 462.

In the past, the pan would have been maintained by artesian seepage rather than surface waters (Klein 1984). Due to this, Butzer (1984) maintains that from a sedimentological perspective the Kathu Pan is unique. He points out that the long term ground water trends provide a filtered climatic record that affords unique evidence for protracted climatic intervals during the Pleistocene. The particular environment provided a range of subsistence resources as pointed out by Van Zinderen Bakker (1995: 101).

'*Since ESA times the water table at the pan has mostly been so high that, under natural conditions, it rises in summer above the peaty surface. This environment provided an oasis for prehistoric people and animals'*

However, since the extraction of ground water pumped to supply Kathu with water, the surface of this water body has not risen above the ground surface (Klein, 1984, Walker et al, 2013). The pumping activities revealed a covered karst in the calcrete substrate of the Kathu Pan. Klein (1984) explains that although calcrete is commonly found 2-3m below the surface, an 8m drop of the watertable due to excessive ground water extraction has led to compaction of the numerous doline fills with collapse and partial exposure of the sedimentary sequence.

In 1974 handaxes and faunal remains were discovered in the walls of a newly formed doline near the farmstead of then farm manager Naas Viljoen. Viljoen called the McGregor Museum when his children discovered the artefacts whilst playing in the doline (Walker et al, 2013).

The first archaeologist to conduct work on the Kathu Pan sites was A.J B. Humphreys on 13 August 1975. Subsequently, P.B. Beaumont conducted extensive studies in the vicinity. Beaumont began his initial research in the area just after he was appointed to the McGregor Museum in 1978 (Walker et al, 2013). During this year several researchers visited the site. These included botanist Andy Gubb, pollen scientist Van Zinderen Bakker, Professor van der Merwe (University of Pretoria) as well as John Vogel (The Quaternary Dating Research Unit (QUADRU)).

In the article written by Walker et al (2013), the history of research on the pan is made clear. Walker et al (2013) describe the official excavations at the site referred to as KP1 in 1980 as this is where most research at the pan sites have been conducted. Excavations were then undertaken at KP1 – KP5 in 1982. In 1983 KP5, KP6 and KP7 were excavated. In 1984, surface collections were undertaken at KP11. In 1985 KP6 and KP8 were excavated and KP9 was excavated in 1990. Also in 1990, KP10 was mechanically dug, however no archaeological excavations were conducted. During 1990 to 2004 there

was a gap in the research conducted in the area. Thereafter, Dr Chazan and other members of the research team on the Kathu Pan conducted further excavations and research at the site. It was through this extended research and a re-examination of previous work that KP1 was declared as a Grade 1 site in 2013.

In 1990 P.B. Beaumont created a schematic map, which depicts the localities and details of 11 sites within the Kathu Pan. The current team researching the site used this map and geo-rectified it atop the CDSM 1:50 000 map 2723CA (1972) in order to gain approximate GPS coordinates for each of the localities previously mapped by Beaumont. The coordinates of the sites as determined by Walker et al 2013 can be viewed in Table 10 below. A twelfth site is included that has been discovered by Walker et al but has not yet been investigated.

Figure 21: Three handaxes recovered from the Kathu Pan sites (Walker et. al. 2013:15).

A buffer zone has not yet been established around the Kathu Pan sites. According to Walker et al (2013) a considerable amount of fieldwork still needs to be undertaken to clarify the extent of the deposit. They noted that while the sink holes have offered windows into the deposits around the pan, and some excavations around the 1980s have offered clues to the deposits outside the sink holes, the overall extent of what the Kathu Pan sites have to offer is unknown.

The Kathu Pan is an exceptionally significant landscape, one of the reasons being that the archaeological deposits contain both ESA artefacts and associated fauna in near primary context (Walker et al 2013). This is unusual as only seven southern African sites contain ESA artefacts and bones in primary context (Cave of Hearths, Wonderwerk, Pomongwe, and the open air sites of Elandsfontain, Mwanganda, Namib IV and Kathu Pan) (Volman, 1984). The second reason for the high significance of Kathu Pan is that it also includes stratified deposits from the MSA. Walker et al point out that most MSA sites are along the coast and in caves or shelters, whereas there are MSA deposits in an open-air setting in the interior at Kathu.

In conclusion, the Kathu Pan sites are of considerable significance due to the unique geology and formation of the dolines, which could be considered as windows into the past. Kathu Pan Site 1 contains a near perfect stratigraphy of the ESA, MSA and LSA that provides the best paleoenvironmental sequence from this area as well as a useful guide to archaeological events.

Kathu Pan is located 6.3km north-west of the study area, Kathu Townlands is located 3.5km north-east of the study area and the Bestwood sites 6.3 km north-east of the study area.

5.2.2 Blinkklipkop

Blinkklipkop is arguably the most significant archaeological and historical site in the vicinity of Postmasburg. It is located roughly 5km north-east of the town of Postmasburg, and is situated on the farm Postmasburg.

The site comprises a pre-colonial specularite mine located in a hill known as Blinkklipkop (or Gatkoppies). Specularite is a "...*crystalline form of hematite that is steel grey/iron-black in colour with a silvery sparkle*..." (Thackeray et.al., 1983:17) and which was much prised as a cosmetic by the different pre-colonial cultures of the area.

The presence of the site had been known since the early historical times, and European explorers and travellers such as the German explorer Martin Hinrich Carl Lichtenstein in 1805 and the well-known artist and traveller William Burchell in 1812.

At the time, the specularite mine was interpreted by these and other visitors as associated with Kora and Tswana groups. However, the archaeological research undertaken by A.I. Thackeray, J.F.

Thackeray and P.B. Beaumont between 8 and 25 April 1980 provided much older origins for the site (Thackeray et.al., 1983).

The archaeological excavations revealed a large number of lithics (stone artefacts) which included mining tools as well as scrapers; ostrich eggshell fragments and beads; pottery; glass beads as well as faunal remains (Thackeray et.al., 1983).

The archaeological research has revealed that mining activities at the site likely commenced before roughly 800 AD, and that before the 17th century these mining activities were undertaken by Khoi herders and possibly San hunter gathers with Late Iron Age Tswana pastoralists also in all likelihood involved thereafter (Thackeray et.al., 1983).

Blinkklipkop is located 64 km south of the present study area.

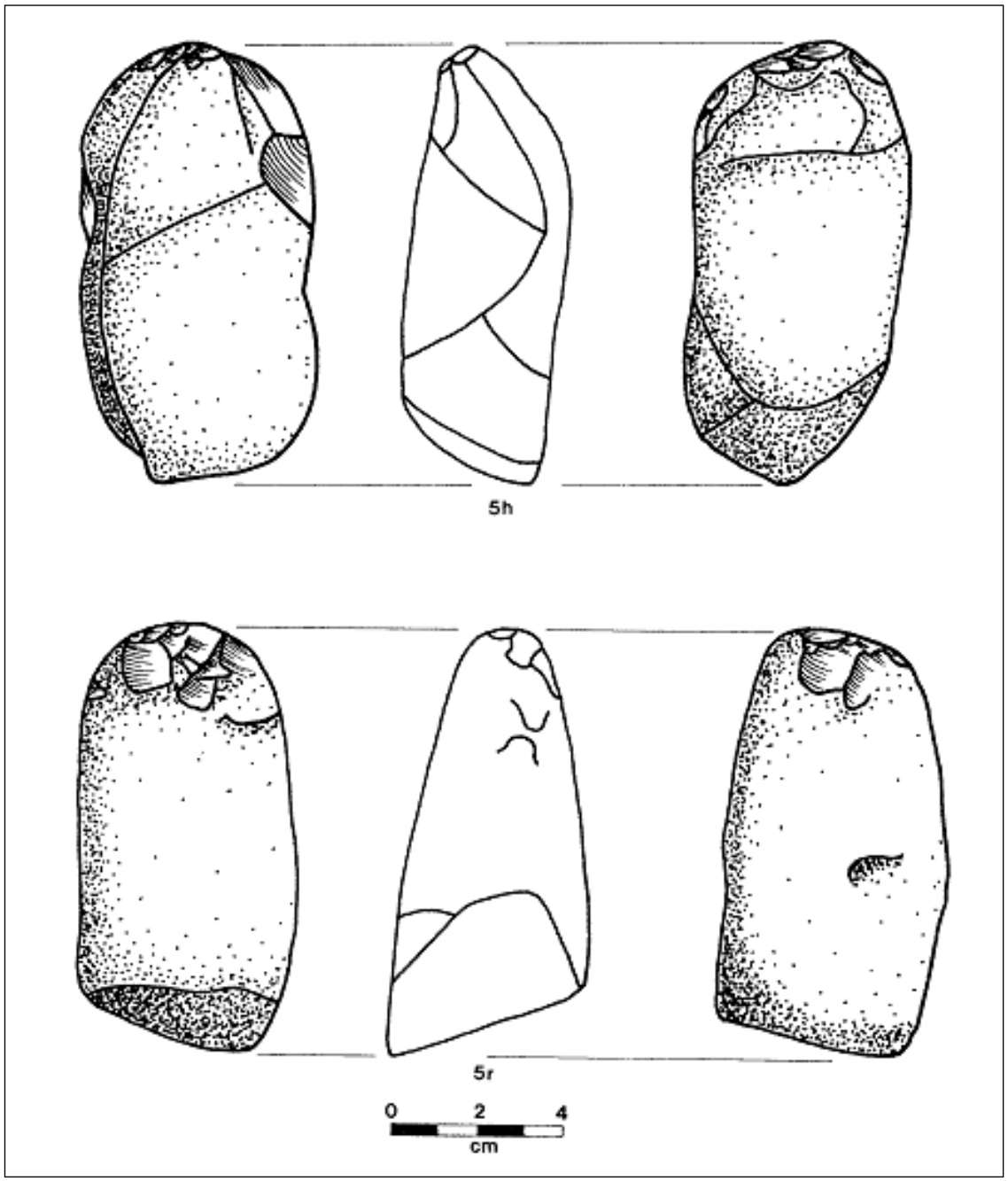

Figure 22: Examples of mining-related lithics from Blinkklipkop (Thackeray et.al., 1983:20).

5.2.3 Doornfontein

During 1973 archaeological research was undertaken by P.B. Beaumont and A.K. Boshier on a pre-colonial specularite mine located in a slight rise in an area known as Jonas Vlakte on the farm Doornfontein 446. The farm is located 6.8 km north-west of Postmasburg (Beaumont & Boshier, 1974). The archaeologists identified four chambers at the site, and excavated two trenches located within Chamber 3. The archaeological collection excavated from the site included a large number of lithics of which typical mining tools such as hammer stones were particularly evident; ostrich eggshell fragments and beads; decorated and undecorated pottery, metal artefacts which included an iron spear head and a copper strip bead; bone artefacts such as an arrow point and possible pendant as well faunal remains.

Interestingly, human remains were also excavated from the site (Beaumont & Boshier, 1974). Radiocarbon dates obtained from the excavations indicated that mining activities at this site commenced in approximately 830 AD (Beaumont & Boshier, 1974) which is roughly contemporary with the dates obtained from Blinkklipkop.

Doornfontein is located 56 km south of the present study area.

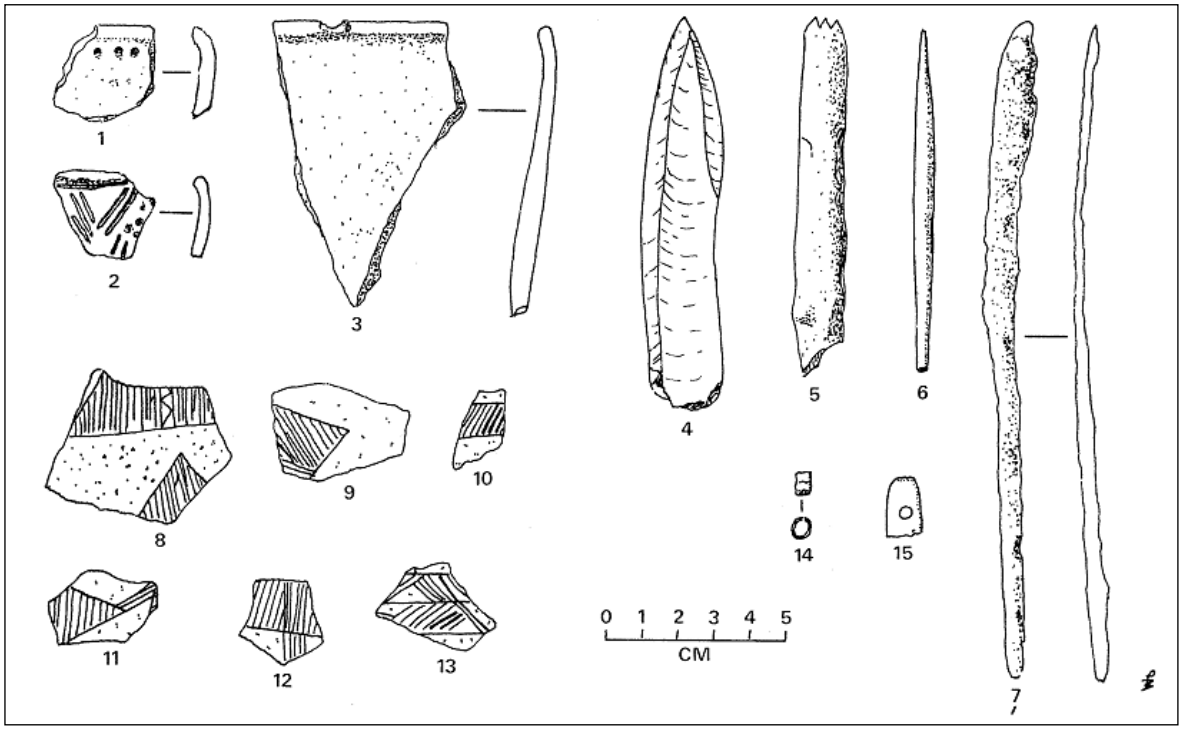

Figure 23: Non-lithic artefacts from the excavations at Doornfontein (Beaumont & Bashier., 1983:42). Caption numbers 1, 2 and 3 are potsherds; numbers 4, 5 and 6 are bone artefacts (including a bone arrow point); number 7 is a iron spear head; numbers 8, 9, 10, 11, 12, and 13 are decorated ostrich eggshell fragments with numbers 14 and 15 interpreted as a copper strip bead and possible broken bone pendant.

5.2.4 Beeshoek

The farm is located 5.4km north-west of Postmasburg. The rock art at Beeshoek had been known from some time (Wilman, 1933) (Fock, 1969) (Judner & Judner, 1969) and comprises petroglyphs of various animals such as giraffe, ostrich, elephant, kudu as well as some animal foot prints. A number of examples of geometric symbols are also found at the site (Judner & Judner, 1969).

While the exact position of the rock art site at Beeshoek is not presently known, the farm Beeshoek is located approximately 59 km south of the present study area.

Figure 24: Photograph depicting some of the rock engravings at Beeshoek (Cairncross et al., 1997:31).

5.2.5 *Paling*

The farm is located 12 km north-west of Postmasburg. Beaumont and Boshier (1974) refer to the presence of a rock art site as well as a pre-colonial specularite mining site on the farm Paling. Although no further information with regard to the mining site is provided, Beaumont and Boshier (1974) state that the rock art site comprises geometric and naturalistic depictions which includes a giraffe. Furthermore, graffiti from the 1920s were also observed here. While the exact position of the rock art site at Paling is not presently known, the farm is located 48 km south of the present study area.

5.2.6 *Gloucester*

The farm is located 22 km north of Postmasburg. Beaumont and Boshier (1974) refer to the presence of a pre-colonial specularite mine here. While the exact position of the pre-colonial mining site at Gloucester is not presently known, the farm is located 40 km south of the present study area.

5.2.7 *Mount Huxley*

The farm is located 24.6 km north-east of Postmasburg. Beaumont and Boshier (1974) refer to the presence of a pre-colonial specularite mine here.
While the exact position of the pre-colonial mining site at Mount Huxley is not presently known, the farm is located 44 km south-east of the study area.

5.2.8 Wonderwerk Cave

Wonderwerk Cave is located 44km south of Kuruman. Its palaeontological and archaeological significance was first realised by B.D. Malan, Basil Cooke and Laurie Wells more than 60 years ago. Karl Butzer carried out excavations at the site between 1974 and 1977, while Peter Beaumont, Anne Thackeray and Francis Thackeray conducted fieldwork during 1978 and 1979. Their work recovered Later Stone Age fauna, lithics and rock engravings. During 1980 Peter Beaumont continued his work at the cave, and his findings at the time included Early Stone Age deposits. More recently, work has been undertaken at the cave by Michael Chazan of the University of Toronto and Liora Kolska Horwitz of the Hebrew University (Bamford & Thackeray, 2009).

The Wonderwerk Cave is located 52 km south-east of the study area.

5.3 Previous Heritage Impact Assessment Reports from the Study Area and Surroundings

A search of the South African Heritage Resources Information System (SAHRIS) database revealed that a number of previous archaeological and heritage impact assessments had been undertaken within the surroundings of the study area, with various heritage and archaeological site types identified. All these previous studies located on the SAHRIS system will be briefly discussed in chronological order below. In each case, the results of each study are shown in bold.

- Beaumont, P.B. 2000. Archaeological Impact Assessment: Archaeological Scoping Survey for the purpose of an EMPR for the Sishen Iron Ore Mine. An unpublished report by the McGregor Museum on file at SAHRA as 2000-SAHRA-0023.

- Morris, D. 2001. Report on Assessment of Archaeological Resources in the vicinity of proposed mining at Morokwa. An unpublished report by the McGregor Museum on file at SAHRA as 2001-SAHRA-0078.

- Beaumont, P.B. 2004. Heritage EIA of two areas at Sishen Iron Ore Mine. An unpublished report by the McGregor Museum on file at SAHRA as 2004-SAHRA-0067.

- Morris, D. 2005. Report on a Phase 1 Archaeological Assessment of Proposed Mining Areas of the Farms Bruce, King, Mokaning and Parson, Between Postmasburg and Kathu, Northern Cape. An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0032.

- Beaumont, P.B. 2005a. Heritage Impact Assessment of an area of the Sishen Iron Ore Mine that may be covered by the Vliegveldt waste dump. An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0230.

- Beaumont, P.B. 2005b. Heritage Impact Assessment for EMPR Amendment for crusher at Sishen Iron Ore Mine. An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0259.

- Morris, D. 2005. Report on a Phase 1 Archaeological Assessment of proposed mining areas on the farms Bruce, King, Mokaning and Parson, between Postmasburg and Kathu, Northern Cape. **Four cemeteries and a very sparse scatter of Stone Age artefacts were found.**

- Beaumont, P.B. 2006a. Phase 1 Heritage Impact Assessment Report on Erf 1439, Remainder of Erf 2974, Remainder of Portion 1 of the Farm Uitkoms 463, and Farms Kathu 465 and Sims 462 at and near Kathu in the Northern Cape Province. An unpublished report by the McGregor Museum on file at SAHRA as 2006-SAHRA-0127.

- Beaumont, P.B. 2006b. Phase 1 Heritage Impact Assessment Report on Portions A and B of the Farm Sims 462, Kgalagadi District, Northern Cape Province. An unpublished report by the McGregor Museum on file at SAHRA as 2006-SAHRA-0165.

- Beaumont, P.B., 2006c. Phase 1 Heritage Impact Assessment Report on Portion 48 and the remaining Portion of Portion 4 of the Farm Bestwood 459, Kgalagadi District, Northern Cape Province. An Archaeological Impact Assessment report by the Archaeology Department, McGregor Museum, prepared for MEG Environmental Impact Studies.

- Dreyer, C. 2006. First Phase Archaeological and Cultural Heritage Assessment of the proposed residential developments at the farm Hartnolls 458, Kathu, Northern Cape. Accessed SAHRIS 14 August 2014.

- Beaumont, P.B. 2008a. Phase 1 Archaeological Impact Assessment Report on Portion 459/49 of the farm Bestwood 459 at Kathu, Kgalagadi District Municipality, Northern Cape Province. Accessed SAHRIS 14 August 2014.

- Beaumont, P.B. 2008b. Phase 1 Heritage Impact Assessment Report on a portion of the remainder of the farm Sekgame 461, Kathu, Gamagara Municipality, Northern Cape Province. Accessed SAHRIS 14 August 2014.

- Dreyer, C. 2007. First Phase Archaeological and Cultural Heritage Assessment of the Proposed Garona-Mercury Transmission Power Line, Northern Cape, North-West Province & Free State.

An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2007-SAHRA-0052.

- Dreyer, C. 2008a. First Phase Archaeological and Cultural Heritage Assessment of the proposed residential developments at a portion of the remainder of the farm Bestwood 459 Rd, Kathu, Northern Cape. An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2008-SAHRA-0433.

- Dreyer, C. 2008b. First Phase Archaeological and Cultural Heritage Assessment of the proposed Bourke project, ballast site and crushing plant at Bruce Mine, Dingleton, near Kathu, Northern Cape. An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2008-SAHRA-0666.

- Kaplan, J.M. 2008. Phase 1 Archaeological Impact Assessment: proposed housing development, Erf 5168, Kathu, Northern Cape Province. An unpublished report by the Agency for Cultural Resources Management on file at SAHRA as 2008-SAHRA-0487.

- Morris, D. 2008. Archaeological and Heritage Phase 1 Impact Assessment for proposed upgrading of Sishen Mine diesel depot storage capacity at Kathu, Northern Cape. An unpublished report by the McGregor Museum on file at SAHRA as 2008-SAHRA-0489.

- Morris, D. 2010. Solar energy facilities. Specialist input for the environmental impact assessment phase and environmental management plan for the proposed Kathu-Sishen solar energy facilities, Northern Cape. Accessed SAHRIS 13 August 2014.
- Van Schalkwyk, J. 2010. Archaeological impact survey report for the proposed development of a solar power plant on the farm Bestwood 459, Kathu Region, Northern Cape Province. Accessed SAHRIS 13 August 2014.

- Van der Ryst, MM & Küsel, SU. 2011. Specialist report on the Stone Age and other heritage resources at Kolomela, Postmasburg, Northern Cape. Commissioned by African Heritage Consultants.

- Gaigher, S. 2012. Proposed establishment of the San Solar Energy Facility, on a Portion of the Farm Wincanton 472, located 16km south of Kathu, Northern Cape Province. **Some railway related structures are located on the western fringe of the development, (outside of the study area) however, they will not be affected by the development.**

- Van der Ryst, MM and Küsel, SU. 2012. Phase 2 specialist study of affected Stone Age locality at site SA02, a demarcated surface area, on the farm Nooitgedacht 469 (Woon 469). Commissioned by Sishen Iron Ore Mine and AGES (Pty) Ltd.

- Beaumont, P.B. 2013. Phase 2 archaeological permit mitigation report on a ~0.7 ha portion of the farm Bestwood 549, situated on the eastern outskirts of Kathu, John Taolo Gaetsewe District Municipality, Northern Cape Province. Accessed SAHRIS 14 August 2014.

- Walker S.J.H., Chazan M., Lukich V. & Morris D. 2013. A second Phase 2 archaeological data recovery at the site of Kathu Townlands for Erf 5116: Kathu, Northern Cape Province. Accessed on SAHRIS 12 August 2014.

- Walker, S.J., Chazan, M & Morris, D. 2013a. Kathu Pan: location and significance. A report requested by SAHRA for the purpose of nomination. Accessed SAHRIS 12 August 2014.

- Walker, S.J. Chazan, M., Lukich V., & Morris, D. 2013b. A second Phase 2 archaeological data recovery at the site of Kathu Townlands for Erf 5116: Kathu, Northern Cape Province. Accessed SAHRIS 11 December 2014.

- Hutten, M. & Birkholtz, P. D. & Van der Ryst, M. 2014. Heritage Impact Assessment for the Proposed Kathu Supplier Park on parts of the Remainder and on Portion 9 of the Farm Sekgame 461 on the southern side of the town of Kathu in the Gamagara Local Municipality, Northern Cape. **Only one site of heritage significance was identified, namely, low-density scatters of stone tools that were identified within and around a dirt road that crosses the study area**.
- Kaplan, J. 2014. Heritage Impact Assessment proposed mixed use development in Kathu, Northern Cape Province. Remainder & Portion 1 of the Farm Sims 462, Kuruman RD. Prepared for: Enviroafrica. Accessed on SAHRIS 14 August 2014.

- Morris, D. 2014. Rectification and/or regularisation of activities relating to the Bestwood township development near Kathu, Northern Cape: Phase 1 Archaeological Impact Assessment. **Isolated occurrences of flakes are found within the project area.**

- Birkholtz, P. D. & Angel, J. & Van der Ryst, M. 2015. Heritage Impact Assessment for the proposed Grazing Project on a Portion of the Farm Marsh 467, Dingleton, Gamagara Local Municipality, Northern Cape Province. **Only one site of heritage significance was identified. A low density scatter of stone tools was recorded.**

- Birkholtz, P. D. 2016. Proposed mining activities on the Remainder and Portion 1 of the farm Jenkins 562, between Kathu and Olifantshoek, Northern Cape Province. **A total of seven heritage sites were identified including a surface scatter of MSA and LSA lithics, an Historic farmstead, a Rectangular stone structure, five crescent-shaped stone structures and a Rock shelter with Rock Art and low density surface scatter LSA lithics.**

- Birkholtz, P. D., Forssman, T., Lotter, M. and Caruana, M. 2017. Phase 1 Heritage Impact Assessment for the Proposed Development of a new Pollution Control Dam at Aldag, on the Remainder of the Farm Sishen 543, and the Expansion of a Currently Planned Pollution Control Dam on the Remainder of the Farm Lylyveld 545, Northern Cape. **No heritage sites were identified within the study area during the fieldwork.**

- Morris, D. & Henderson, A. 2018. Heritage Impact Assessment for the Proposed Transnet Sishen Railway Line Link, near Kathu, Gamagara Local Municipality, Northern Cape Province. **Six sites containing isolated surfaces scatters of flakes were found**.

- Pelser, A. 2018. Report On A Phase 1 Heritage assessment for the proposed township establishment on Portions 1 & 2 of the farm Kalahari Gholf & Jag Landgoed 775, Gamagara Local Municipality (Kathu), Northern Cape Province. **A number of known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. No sites are known on the specific land parcel.**

- Birkholtz, P. D. 2018. Proposed DMS Upgrade Project at the Sishen Mine, Sishen, Gamagara Local Municipality, Northern Cape Province. **No sites of any archaeological or heritage significance could be identified during the survey.**
- Birkholtz, P. D., Forssman, T., Lotter, M. and Caruana, M. 2018. Heritage Impact Assessment for the proposed Expansion of Mining Activities and the Widening of a Haul Road on the Farm Lylyveld 545, near Kathu, Northern Cape Province.**A scatter of stone tools was observed, and only one stone tool was found on a roadway just to the south of Lylyveld North.**

5.4 Archival and Historical Maps

The examination of historical data and cartographic resources represents a critical tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Relevant topographic maps and satellite imagery were studied to identify structures, possible burial grounds or archaeological sites present in the footprint area.

Historical topographic maps (1:50 000) for various years (1972, 2001, 2009) were available for utilisation in the background study. These maps were assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The study area was overlain on the map sheets to identify structures or graves situated within or immediately adjacent to the study area that could possibly be older than 60 years and thus protected under Section 34 and 36 of the NHRA.

5.4.1 First Edition of the 2723CA Kathu Topographical Map dated to 1972

This section deals with the First Edition of the 2723CA Topographical Sheet. The 2723CA sheet was based on aerial photography conducted in 1972, was surveyed in 1974 and printed in 1975 by the Director-General of Surveys. Overlays of the study area over this map sheet are provided in the image below. The following observations can be made from this overlay:

- No heritage sites or features are depicted within the study area.

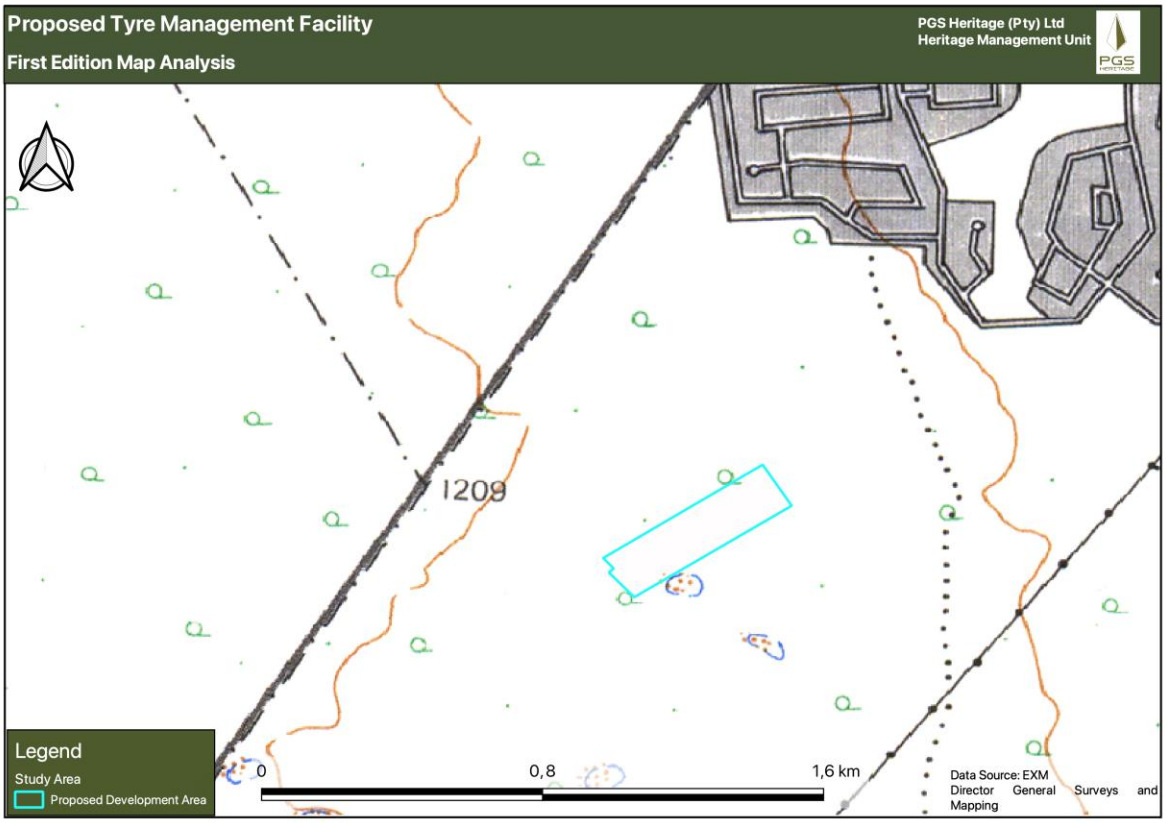

Figure 25: Section of First Edition of the 2723CA Topographical Map, illustrating that no heritage features are depicted within or adjacent to the study area (cyan polygon).

5.5 Findings of the historical desktop study

5.5.1 Palaeontological Heritage

The palaeontological desktop assessment completed by Butler (2021) indicates that the tyre management facility plant is underlain by surface limestone. These sediments are in turn underlain by the Griqualand West rocks of the Transvaal Supergroup. According to the PalaeoMap of the South African Heritage Resources Information System the Palaeontological Sensitivity of the Tertiary surface limestone is High. However, in the Sichen area the Late Caenozoic superficial sediments overlying the Transvaal Supergroup are rarely fossiliferous. (Almond and Pether 2008, SAHRIS website).

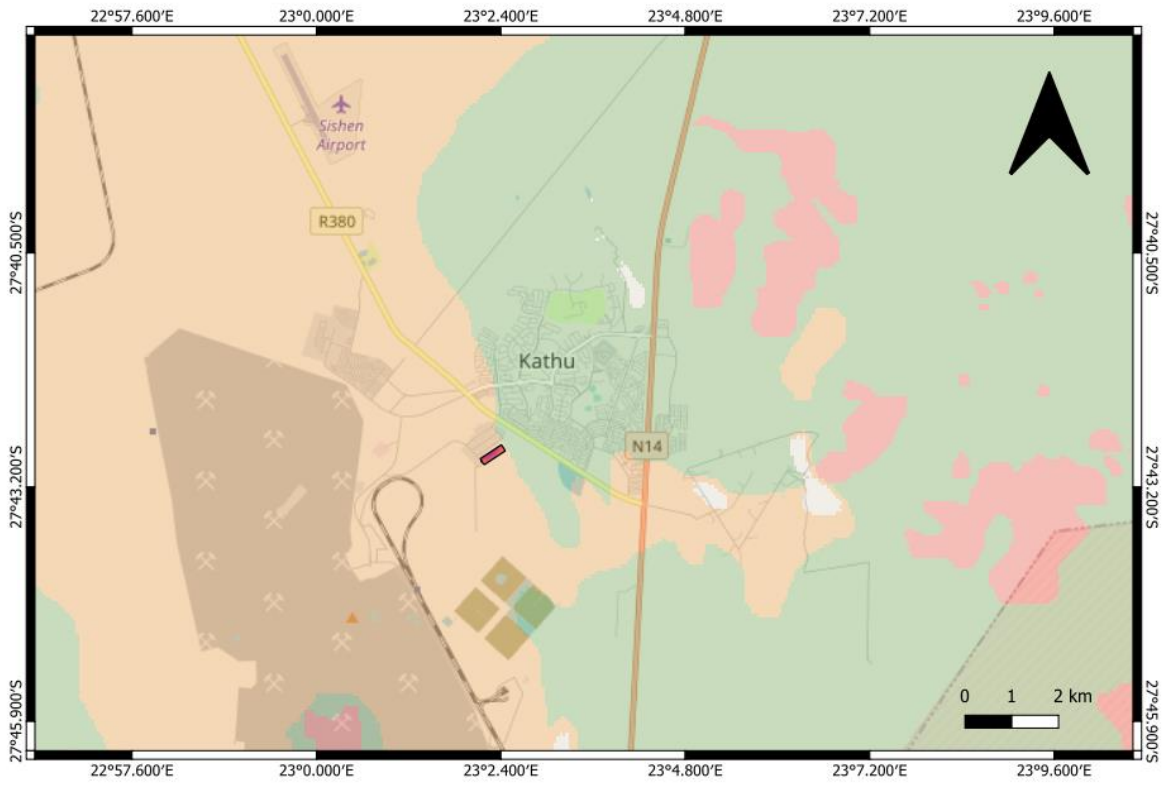

Figure 26: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed development in purple.

The general low palaeontological sensitivity of the bedrocks and superficial sediments in the proposed development footprint, indicates that the proposed development will have an overall LOW impact significance in terms of palaeontological heritage with the implementation of the chance finds protocol. It is therefore considered that the development will not lead to detrimental impacts on the palaeontological resources of the area.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that correct mitigation can be carry out by a palaeontologist.

It is consequently recommended that no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

5.5.2 Heritage Screening

A heritage screening report was compiled by the Department of Forestry, Fisheries and the Environment (DFFE) National Web-based Environmental Screening Tool as required by Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended. According to the heritage screening report, the project area has a High Heritage Sensitivity (**Figure 2**).

The high rating as provided by the Environmental Screening Tool reflects the high archaeological sensitivity of the well-known sites, such as the Kathu Archaeological Complex, in the region. The field work that was conducted in the study area demonstrates that there were no archaeological or historical sites of heritage significance that warrant conservation. This is most likely due to the level of disturbance in the study area. Therefore, in the case of this particular study area, the DFFE screening tool sensitivity map is not fully supported based on the findings of this fieldwork.

5.5.3 Heritage Sensitivity

Analysis of maps and satellite imagery enabled the identification of possible heritage sensitive areas. By superimposition and analysis, it was possible to rate these structures according to age and thus their level of protection under NHRA. **Table 14** lists the possible tangible heritage sites identified in the vicinity of the study area and the relevant legislative protection.

Table 14: Tangible heritage site in the study area.

Name	Description	Legislative protection
Archaeology	Older than 100 years	NHRA Sections 3 and 35
Structures	Possibly older than 60 years	NHRA Sections 3 and 34
Burial grounds	Graves	NHRA Sections 3 and 36 and MP Graves Act

Additionally, evaluation of satellite imagery has indicated the following areas that may be sensitive from a heritage perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix (**Table 15**).

Table 15: Landform type to heritage find matrix

LANDFORM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters, LIA settlements
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Water holes/pans/rivers	MSA and LSA sites, LIA settlements
Farmsteads	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements

6 FIELDWORK AND FINDINGS

6.1 Introduction

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was conducted by two archaeologists from PGS (Nikki Mann and Wynand van Zyl) on 10 November 2021. The fieldwork comprised a controlled exclusive survey of the proposed development footprint areas. The fieldwork team recorded track logs with their hand-held GPS devices. These track logs are depicted in yellow in **Figure 28** and show the areas assessed by the archaeologists during the fieldwork. For the most part, the archaeological visibility of the area was not ideal for surveying due to dumping of rubble and other waste material.

The fieldwork identified one findspot (**FS-01**; **Figure 27**) of Middle Stone Age (MSA) scatter. There were no identified scatters of artefacts dense enough to be classified as archaeological sites.

Table 16: Find spot information

Site Number	Lat	Lon	Description	Sensitivity	Heritage Rating
FS-01	-27.713400°	23.039210°	Low density MSA scatter	Low	NCW

Figure 27: Artefacts identified at FS-01.

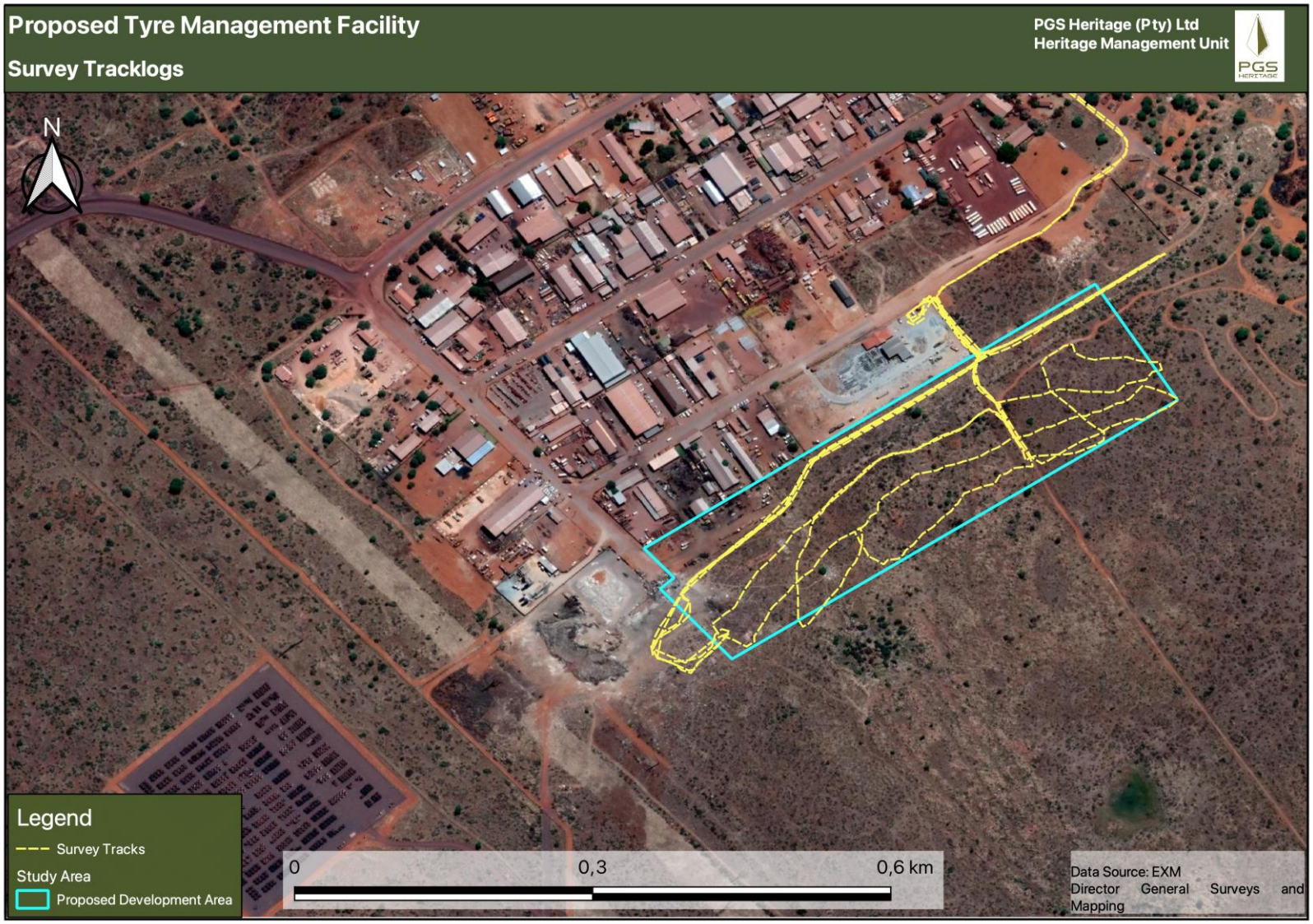

Figure 28: Map depicting the track logs (yellow lines) recorded during the fieldwork within the study area.

7 IMPACT ASSESSMENT

7.1 Heritage Impacts

The following section evaluates and rates the impact of the proposed borrow pit rehabilitation on the identified heritage resources and palaeontological heritage.

During the survey, only one findspot was identified. There were no identified scatters of artefacts dense enough to be classified as archaeological sites. The findspot has a **low heritage significance** and heritage rating of NCW.

According to the PalaeoMap of the South African Heritage Resources Information System the Palaeontological Sensitivity of the Tertiary surface limestone is High. However, in the Sishen area the Late Caenozoic superficial sediments overlying the Transvaal Supergroup are rarely fossiliferous. The proposed development will have a Moderate negative impact on Fossil Heritage pre-mitigation and a Low Impact post-mitigation. *Only the site will be affected by the proposed development.* The expected duration of the impact is assessed as potentially permanent to long term.

The general low palaeontological sensitivity of the bedrocks and superficial sediments in the proposed development footprint, indicates that the proposed development will have an overall LOW impact significance in terms of palaeontological heritage.

7.2 Impact Assessment Table

Table 17: Impact Assessment Table (pre-mitigation)

IMPACT	IMPACT DIRECTION	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on archaeological resources	Negative	LOW	Isolated sites/proposed site	Permanent	Unlikely	Low
		2	1	5	2	1,07
Impact on Paleontological Heritage Resources	Negative	HIGH	Study site	Permanent	Could happen	Moderate
		4	2	5	3	2,16

Table 18: Impact Assessment Table (post-mitigation)

IMPACT	IMPACT DIRECTION	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on archaeological resources	Negative	LOW	Isolated sites/proposed site	Permanent	Practically impossible	Very low
		2	1	5	1	0,53
Impact on Paleontological Heritage Resources	Neutral	HIGH	Study site	Permanent	Unlikely	Low
		4	2	5	2	1,44

8 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

8.1 Construction Phase

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camp areas and small-scale infrastructure development associated with the project.

It is possible that cultural material will be exposed during construction and may be recoverable. Development surrounding infrastructure and construction of facilities results in significant disturbance, however foundation holes do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure developments, such as construction camps and laydown areas, are often changed or added to the project as required. In general, these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction phase, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented.

8.2 Chance Find and Monitoring Procedure

The proposed development is planned within the archaeological significant Kathu landscape. The nature of the archaeological deposits is subsurface, and the following recommendations are based on experience on the discovery of significant subsurface archaeological deposits during other developments within the Kathu townlands area.

- A heritage practitioner / archaeologist should be appointed to develop a heritage induction program and conduct training for the ECO as well as team leaders in the identification of heritage resources and artefacts.
- An appropriately qualified heritage practitioner / archaeologist must be identified to be called upon if any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities halted.
- The qualified heritage practitioner / archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- The contractor therefore should have contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.
- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner / archaeologist.

8.2.1 Possible finds during Pre-Construction and Construction Phases

The study area occurs within a greater historical and archaeological context as identified during the desktop and fieldwork phase. Soil clearance may uncover the following:

- High density concentrations of stone artefacts
- Unmarked graves.

8.3 Timeframes

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead times must be worked into the construction time frames. The table below gives guidelines for lead times on permitting.

Table 19: Lead times for permitting and mobilisation

Action	Responsibility	Timeframe
Preparation for field monitoring and finalisation of contracts	The contractor and service provider	1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and SAHRA	3 months
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	3 months
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and SAHRA	2 weeks
Relocation of burial grounds or graves in the way of construction	Service provider – Archaeologist, SAHRA, local government and provincial government.	6 months

8.4 Heritage Management Plan for EMPr implementation

Table 20: Heritage Management Plan for EMPr implementation

Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for implementation	Monitoring Party (frequency)	Target	Performance indicators (monitoring tool)
General project area	• Implement a chance find and monitoring procedures during construction activities.	Construction	During construction	Applicant ECO Heritage Specialist	ECO (monthly / as or when required)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34-36 and 38 of NHRA	ECO Monthly Checklist/Report
Palaeontological finds	• However, if fossil remains are discovered during construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the ECO in charge of these developments.	Construction	During construction	Applicant ECO Palaeontologist	Monthly	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35 of NHRA	Final report to be used by the develop to apply for a destruction permit under s35 of the NHRA.

9 CONCLUSIONS

9.1 Introduction

PGS was appointed by EXM to undertake a HIA, which forms part of the environmental process for the proposed Tyre Management Facility for Sishen mine, 1.7km south-west of the centre of Kathu, Northern Cape Province.

Heritage resources are unique and non-renewable and as such, any impact on such resources must be seen as significant.

9.2 General Desktop Study

An archival and historical desktop study was undertaken to provide a historic framework for the project area and surrounding landscape. This was augmented by a study of available historical and archival maps and an assessment of previous archaeological and heritage studies completed for the area. The desktop study revealed that the surroundings of the study area are characterised by a long and significant history, whereas previous archaeological and heritage studies from this area have revealed several archaeological and heritage sites from the surroundings. The Kathu Archaeological Complex demonstrates the importance of the archaeological heritage of the region (Walker et al, 2013).

9.3 Palaeontological Desktop Study

The tyre Management facility plant is underlain by surface limestone. These sediments are in turn underlain by the Griqualand West rocks of the Transvaal Supergroup. According to the PalaeoMap of the South African Heritage Resources Information System the Palaeontological Sensitivity of the Tertiary surface limestone is High. However, in the Sichen area the Late Caenozoic superficial sediments overlying the Transvaal Supergroup are rarely fossiliferous (Butler, 2021).

The general low palaeontological sensitivity of the bedrocks and superficial sediments in the proposed development footprint indicates that the proposed development will have an overall LOW impact significance in terms of palaeontological heritage post-mitigation. It is therefore considered that the development will not lead to detrimental impacts on the palaeontological resources of the area.

If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the **Chance Find Protocol** must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that correct mitigation can be carry out by a palaeontologist.

It is consequently recommended that no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

9.4 Fieldwork

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was undertaken by way of intensive walkthroughs of the proposed tyre Management footprint area.

The fieldwork was undertaken by two archaeologists from PGS (Nikki Mann and Wynand van Zyl) and was conducted on 10 November 2021. Throughout the fieldwork, hand-held GPS devices were used to record tracklogs showing the routes followed by the fieldwork team. One findspot (**FS-01**) was identified immediately adjacent to a track. There were no identified scatters of artefacts dense enough to be classified as archaeological sites.

It is important to note that although as intensive a fieldwork coverage as possible was undertaken, sections of the study area were severely disturbed by dumped rubble and other materials, which limited visibility in those areas of the study area.

9.5 Heritage Impacts

This HIA has shown that the proposed Tyre Management Facility will have a minimal impact on heritage resources within the project area due to the extensive disturbance of the footprint.

9.6 General Recommendations

A Chance Find and monitoring Procedure (refer **Section 8**) must be implemented and adhered to.

9.7 Conclusions

It is the considered opinion of the authors of this report that the overall post-mitigation impact of the proposed Tyre Management Facility on heritage resources will be Low. Provided that the general recommendations and mitigation measures outlined in this report are implemented, the impact would be acceptably Low or could be totally mitigated to the degree that the project could be approved from a heritage perspective.

10 REFERENCES

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10.5 Historic Topographic Maps

All the historic topographic maps used in this report were obtained from the Directorate: National Geo-spatial Information of the Department of Rural Development and Land Reform in Cape Town.

10.6 Google Earth

All the aerial depictions and overlays used in this report are from Google Earth.

Appendix A

CURRICULUM VITAE

WOUTER FOURIE

Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

Summary of Experience

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave "rescue" excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
- Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
- Involvement with various Heritage Impact Assessments, outside South Africa, including -
- Archaeological Studies in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation project in DRC

Key Qualifications

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

Principal Investigator - Grave Relocations

Field Director – Iron Age

Field Supervisor – Colonial Period and Stone Age

Accredited with Amafa KZN

Key Work Experience

2003- current - Director – Professional Grave Solutions (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mozambique, Malawi, Mauritius and the Democratic Republic of the Congo

PROFESSIONAL CURRICULUM VITAE FOR NIKKI MANN

Professional Archaeologist for PGS Heritage

Name:	Nikki Mann
Profession:	Archaeologist
Date of birth:	1992-10-13
Parent Firm:	PGS Heritage (Pty) Ltd
Position at Firm:	Archaeologist
Years with firm:	2
Years of experience:	7
Nationality:	South African
HDI Status:	White

EDUCATION:

Name of University or Institution	**:**	University of Cape Town
Degree obtained	**:**	BSc
Major subjects	**:**	Archaeology, Environmental and Geographical Sciences
Year	**:**	2013

Name of University or Institution	**:**	University of Cape Town
Degree obtained	**:**	BSc [Hons]
Major subjects	**:**	Archaeology
Year	**:**	2014

Name of University or Institution	:	University of Cape Town
Certificate obtained	:	MSc – Archaeology (phytolith analysis)
Year	:	2017

Professional Qualifications:

Professional Archaeologist - Association of Southern African Professional Archaeologists - Professional Member – No 472

Languages:

English

French

KEY QUALIFICATIONS

- 3 years of work in the heritage consulting field;
- 7 years working experience in archaeological excavations;
- Proven experience in report writing and report deliverables;

HERITAGE IMPACT ASSESSMENTS

South African

10MW Chelsea Solar PV. Gqeberha, Eastern Cape. SLR. **Position:** Heritage Specialist.
Koup 1 and Koup 2 WEF. Beaufort West, Western Cape. SiVEST. **Position:** Heritage Specialist.
Victoria West Pipelines. Victoria West, Northern Cape. iXEng. – **Position:** Heritage Specialist.
East Orchards Poultry Farm Project. Delmas, Mpumalanga. EcoSphere. – **Position:** Heritage Specialist.
Gunstfontein WEF and OHL. Sutherland, Northern Cape. Savannah– **Position:** Heritage Specialist.
Overhead power line for Oya PV Facility. Sutherland, Northern Cape. SiVEST– **Position:** Heritage Specialist.
Infrastructure for Kudusberg WEF. Sutherland, Northern Cape. SiVEST– **Position:** Heritage Specialist.
Proposed SKA fibre optic cable, between Beufort West and Carnarvon, Northern and Western Cape. **Position:** Heritage Specialist.
Proposed SANSA Space Operations. Matjiesfontein, Western Cape. **Position:** Heritage Specialist
Pienaarspoort WEF 1 and 2. North-west of Matjiesfontein, Western Cape. Savannah- **Position:** Heritage Specialist.
Swellendam WEF. Swellendam, Western Cape. – **Position:** Heritage Specialist.
Matjiesfontein Road Extension Project. Matjiesfontein, Western Cape. **Position:** Heritage Specialist.

MITIGATION WORK

2020 – Coega Zone 10, Coega IDZ, Eastern Cape Province. Colonial Period Phase 2 Mitigation Archaeological Excavation. ***Archaeologist.***
2019 **–** 2020 **- Lesotho Highland Development Authority – Polihali Dam Project - Heritage Management Plan development and Implementation.** Mokhotlong, Kingdom of Lesotho. ***Archaeologist***.
2018- Proposed development of boreholes and associated pipelines for the Langebaan Aquifer within the Hopefield Private Nature Reserve, Hopefield, Western Cape. **Archaeologist.**

POSITIONS HELD

2021 – current: Archaeologist - PGS (Pty) Ltd
2019 – 2020: Archaeologist - PGS (Pty) Ltd Lesotho

2018 – 2020: Contract Archaeologist – CTS Heritage

REFERENCES

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