



PGS HERITAGE

**HERITAGE IMPACT REPORT, FOR INCLUSION IN THE
ENVIRONMENTAL ASSESSMENT REPORT FOR THE PROPOSED
KOOKFONTEIN PROSPECTING RIGHT APPLICATION, SEDIBENG
DISTRICT MUNICIPALTY, GAUTENG PROVINCE**

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Declaration of Independence

I, Jennifer Kitto, declare that –

General declaration:

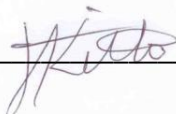
- I act as the independent heritage practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity 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

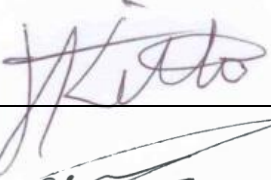

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

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ACKNOWLEDGEMENT OF RECEIPT

Report Title	<i>Heritage Impact Assessment Report for inclusion in the Environmental Assessment report for the Proposed Kookfontein Prospecting Right Application, Sedibeng District Municipality, Gauteng Province</i>		
Control	Name	Signature	Designation
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Executive Summary

PGS Heritage (Pty) Ltd was appointed by Environmental Impact Management Services (Pty) Ltd, to undertake a Heritage Impact Report (HIA) that forms part of the Environmental Impact Assessment for the proposed Kookfontein Prospecting Project, situated between Vereeniging and Meyerton within the Sedibeng District Municipality, Gauteng Province.

The HIA identified a total of thirteen heritage resource within the Kookfontein study area. The majority of these (six) were graves and burial grounds (KF001, KF002, KF005, KF006, KF007, KF010), with one historical farmstead (KF008), and five sites containing structures associated with the historical Springfield Colliery and Klip Power Station (KF009, KF011, KF012, KF013). The known archaeological rock engraving site of Redan (KF004) is also located within the study area. The remains of a modern dairy and piggery were also identified (KF003).

Burial Grounds and Graves

The possible impact would be damage to the six identified graves and burial grounds due to activities associated with the drill site establishment. Mitigation measures would include avoidance of these sites with a buffer of at least 50m.

The pre-mitigation Environmental Risk impact significance is rated as Medium negative, and with the implementation of the required mitigation measures, the post-mitigation ER impact would become Low negative. The overall Environmental significance will be Low to Medium negative.

Historical Structures

The HIA study identified five sites containing historical structures within the Kookfontein study area. Mitigation measures would include avoidance of these sites with a buffer of at least 50m. (especially site KF008).

The pre-mitigation Environmental Risk impact significance is rated as Medium negative, and with the implementation of the required mitigation measures the post-mitigation ER impact will be Low. The overall Environmental significance would be Medium negative.

Archaeological Site (Redan engraving site)

There is one known formally protected archaeological site (Redan rock engraving site) located within the study area and at least one previously archaeological find spot was identified in a previous study. This site should be demarcated as a “no go” area with a buffer zone of at least 200m.

The pre-mitigation Environmental Risk impact significance for the Provincial Heritage Site (Redan) is rated as High negative, and with the implementation of the required mitigation measures the post-mitigation ER impact will be Low negative. The overall Environmental significance would be Medium negative.

Palaeontology

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Desktop Assessment (PDA) of the Kookfontein prospecting right study area. This study found that the geology of the proposed Kookfontein study area is primarily underlain by the Vryheid Formation (Ecca Group, Undifferentiated Karoo), Precambrian dolomites and associated marine sedimentary rocks that are allocated to the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup), as well as Quaternary superficial deposits. According to the PalaeoMap on the SAHRIS database, the Palaeontological Sensitivity of the Vryheid Formation (Ecca Group, Undifferentiated Karoo) is Very High, while that of the Malmani Subgroup and Quaternary deposits are both High (Almond and Pether 2008, SAHRIS website). Groenewald and Groenewald (2014) allocated a High Sensitivity to

the Malmani Subgroup as they noted that, in addition to the stromatolites, potentially fossiliferous Late Cenozoic Cave breccias within the “Transvaal dolomite” outcrop area could be present. These breccias are not individually mapped on geological maps (Butler 2020).

It is thus recommended that an EIA level palaeontology report should be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment would be conducted with research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

General

The combined considered opinion of the heritage specialists is that the potential impacts on identified heritage resources could be mitigated sufficiently to allow the project to continue.

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A CVs of PGS Team

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;
- 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 2 500 000 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 not limited to) as stated under Section 3 of the 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 period which commenced 20 000 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 Stone Age

The archaeology of the Stone Age between 20 000-300 000 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.

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEFF	Department of Environment, Forestry and Fisheries
DHSWS	Department of Department of Human Settlements, Water and Sanitation
DMRE	Department of Mineral Resources and Energy
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
EIMS	Environmental Impact Management Services Pty Ltd
EMPr	Environmental Management Program
ESA	Early Stone Age
GIS	Geographic Information Systems
GN	Government Notice
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HSR	Heritage Scoping Report
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
MPRDA	Mineral and Petroleum Resources Development Act
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

1 Introduction

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS), to undertake a Heritage Impact Assessment report (HIA) that forms part of the Environmental Impact Assessment process for the proposed Kookfontein Prospecting Right application.

This report will inform the EIA and EMP to be completed in terms of the MPRDA and Section 24 of the National Environmental Management Act, 1999 (Act No. 107 of 1999) (NEMA).

The aim of the study is to identify potential heritage sites and finds that may occur in the proposed development area. The HIA aims 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 (Act 25 of 1999) (NHRA).

2 Document Structure

This report has been compiled in accordance with the EIA Regulations, 2014 (Government Notice (GN) R982). A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in Table 1 below.

Table 1: Report Structure

Environmental Regulation	Description	Section in Report
NEMA EIA Regulations 2014 (as amended)		
Appendix 6 (1)(a):	Details of – (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 3 Appendix A
Appendix 6 (1)(b):	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page ii
Appendix 6 (1)(c):	an indication of the scope of, and the purpose for which, the report was prepared;	Section 4
Appendix 6 (1)(cA):	an indication of the quality and age of base data used for the specialist report;	N/A
Appendix 6 (1)(cB):	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 10
Appendix 6 (1)(d):	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 8.3
Appendix 6 (1)(e):	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 7

Environmental Regulation	Description	Section in Report
Appendix 6(1)(f):	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 9
Appendix 6(1)(g):	an identification of any areas to be avoided, including buffers;	Section 9
Appendix 6(1)(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;	Section 9
Appendix 6(1)(i):	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 14
Appendix 6(1)(j):	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Sections 8.2, 8.3
Appendix 6(1)(k):	any mitigation measures for inclusion in the EMPr;	Section 10 and 11
Appendix 6(1)(l):	any conditions for inclusion in the environmental authorisation;	N/A, desktop scoping
Appendix 6(1)(m):	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A, desktop scoping
Appendix 6(1)(n):	a reasoned opinion- <ul style="list-style-type: none"> (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan; 	Section 11 and 12,
Appendix 6(1)(o):	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 8.3
Appendix 6(1)(p):	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A at this stage
Appendix 6(1)(q):	any other information requested by the competent authority.	Not applicable

3 Specialist Details

The staff at PGS has a combined experience of nearly 70 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Jennifer Kitto, author of this report and Heritage Specialist, has 22 years' experience in the heritage sector, a large part of which involved working for a government department responsible for administering the National Heritage Resources Act, No 25 of 1999. She is therefore well-versed in the legislative requirements of heritage management. She holds a BA in Archaeology and Social Anthropology and a BA (Hons) in Social Anthropology.

Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (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).

See Appendix A for the curricula vitae of the specialist team.

4 Terms of Reference

- i. Heritage and Palaeontology Scoping and EIA specialist reports.
The scope of work and report contents will be in line with the proposal submitted by PGS to EIMS on 28 February 2020 (Ref QU-14266).
- ii. The Sub-Contracted Services shall be rendered at the following Site(s): Kookfontein Prospecting Right Area (Gauteng)

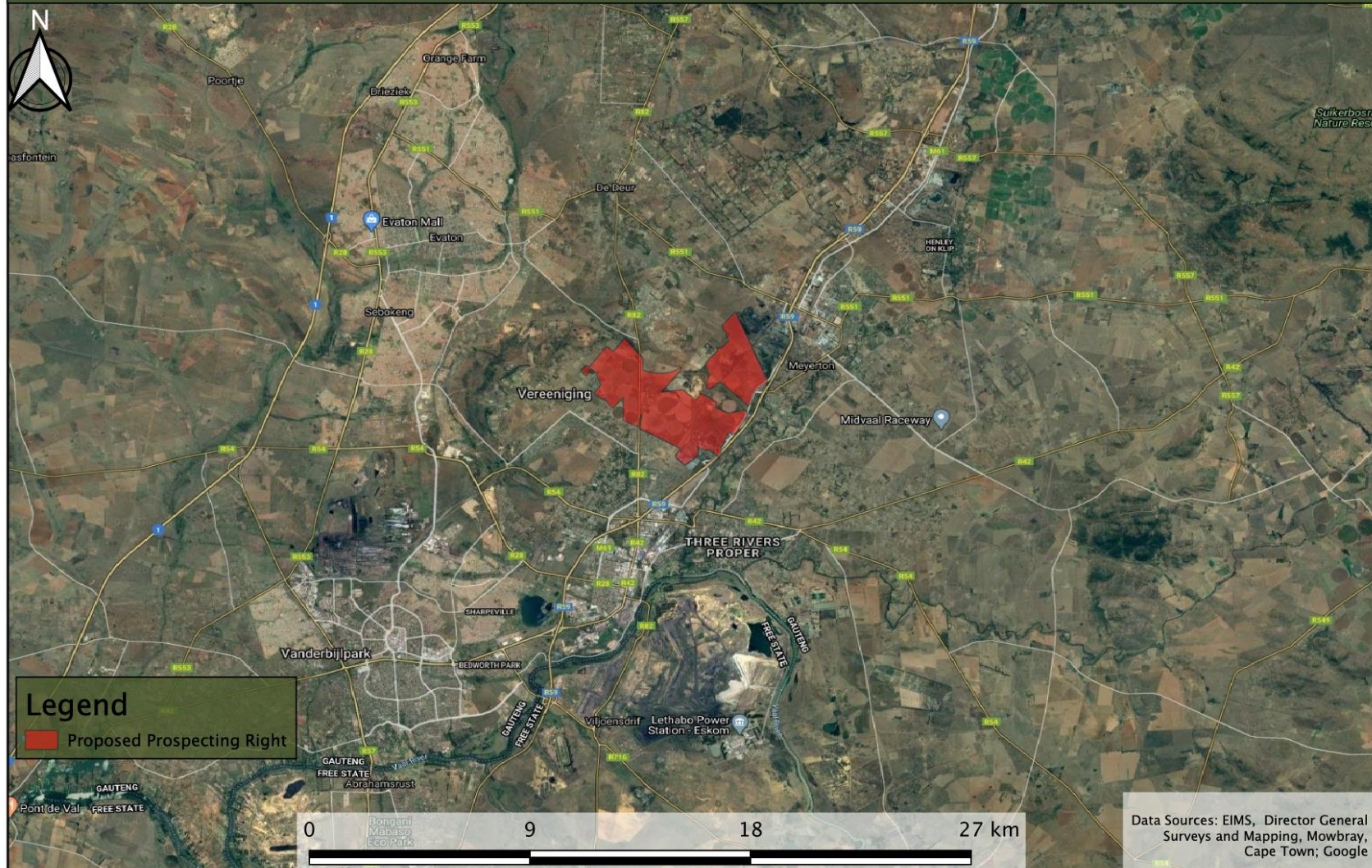
5 Project Description

5.1 Site Location and Description

The application area falls within the Emfuleni and Midvaal Local Municipalities of the Sedibeng District Municipality and is located 4km South of Meyerton and 7km North of Vereeniging. The project area includes various portions of the farms Kookfontein 545 IQ (portions 2, 16, 22, 27, 29, 30, 35, 55, 64, 65, 66, 83, 84, 85, & 95), Damfontein 541 IQ (portions 1, 2, 36 and 37), Smaldeel 542 IQ (Portion 4), Waldrift 599 IQ (Portions 16 & 89) and Vlakfontein 546 IQ (Portions 7, 111, 114, 115, 118, 119, 125, 144, 151, 152, 153, 154, 159, 167, 173, 175, 194, 195, 197 & 198) (**Figure 1** and **Figure 2**). The extent of the Application area is 3099.966 Ha.

Proposed Kookfontein Prospecting Rights Application Regional Locality Map

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Unit



5.2 Proposed Activities

The applicant is applying for a prospecting right in order to ascertain if economically viable mineral deposits exist within the application area for Sand (General), Clay (General) and Silica Sand (General & Silica). The application will follow a phased approach, and project is divided into several sequential phases. The different phases and timeframes of the prospecting envisaged are, by their nature, dependent on the results obtained during the preceding phases of prospecting. The project will include the use of Non-Invasive and Invasive prospecting techniques.

- Non-Invasive Prospecting Techniques: The project will include the following non-invasive activities:
 - Geophysical Survey,
 - Field surveys,
 - Literature Studies,
 - Obtaining historical borehole and trenching data and resource information
 - Analytical Desktop and Feasibility Studies
- Invasive Prospecting Techniques: Invasive techniques that will be utilized during prospecting include the following:
 - Infill Drilling and Lab Analysis of cores/samples.

5.2.1 Description of Planned Non-Invasive Activities

5.2.1.1 Desktop Studies

The desktop studies will involve accessing all available public information on the geology, mineral occurrence and topography of the prospecting right application area, and all information on past work carried out in the area from geophysics, geochemistry, image interpretation, drilling and mining. Any literature accessed will be reviewed, collated and archived for reference.

5.2.1.2 Spatial Database Compilation

Spatial information will be compiled into a GIS database for access, correlation and evaluation. The GIS system will be used and maintained for the period of the prospecting right exploration program and regularly updated as new information is generated by the exploration program.

5.2.1.3 Land Survey

All spatial information accessed and collected in the field will be standardized using the WGS84 datum.

5.2.1.4 Remote Sensing

As part of the initial review, public domain aerial photos will be acquired, and a detailed geological and structural interpretation will be done on these to aid in identifying target areas that are not readily evident on the ground and to provide an independent interpretation of the geology of the area.

Satellite imagery will also be acquired to provide a more regional viewpoint of the area of interest. As before a detailed geological and structural interpretation will be done on these images to provide a more regional viewpoint on the target areas. Satellite imagery is used to complement the aerial photos interpretations as the combination of multi-spectral bands can be used to highlight certain lithology's, vegetation types, soil types, alteration minerals, etc.

5.2.1.5 Geophysical Survey to be Undertaken

Both airborne and ground geophysical surveys may be undertaken for the prospecting right area. This is dependent on the results of the desktop study. These surveys will be used in conjunction with the data available to the public from the Council for Geoscience.

A small airborne magnetic/radiometric survey may be carried out over the prospect and surrounding areas to map the structural geology of the area.

Follow up ground geophysical surveys will be carried out on coincident targets from the compilation of geological and geophysical data. These surveys may include ground gravity, ground electromagnetics, IP and controlled source audio magnetotellurics (CSAMT).

5.2.2 Description of Planned Invasive Activities

5.2.2.1 Drilling

It is not possible at this stage to locate exactly where drilling will be carried out as this will be determined by the results of geophysical and geological work carried out in Phase 1 of the prospecting programme. In order to limit amendments of the PWP & EMP on the location of drill holes it will be assumed that a drill hole will be located in intervals of 500 meters (indicated resource as per SAMREC code) with no more than 2 holes being actively drilled at any given time. The initial holes will be drilled on the Prospecting area that forms part of this application. A map indicating the location of holes on a grid of 500m intervals is provided in **Figure 4**. A maximum amount of 71 holes will be drilled.

By the quarter of exploration, there will be clearly defined targets that will warrant testing by diamond, reverse circulation or percussions drilling. It is envisaged that a combination of HQ (63.5mm) and NQ (47.63mm) drilling will be used to drill targets. The borehole depths are expected to vary between 100m and 200m with an average of approximately 150m. The core will be logged, cut and sampled at a core yard to be located near the prospecting site. The samples will be crushed and milled and then analysed at an accredited laboratory for consistency.

Refer to **Figure 3** and **Figure 4** below for the proposed prospecting plan and drill site maps.

Proposed Kookfontein Prospecting Rights Application Property Plan

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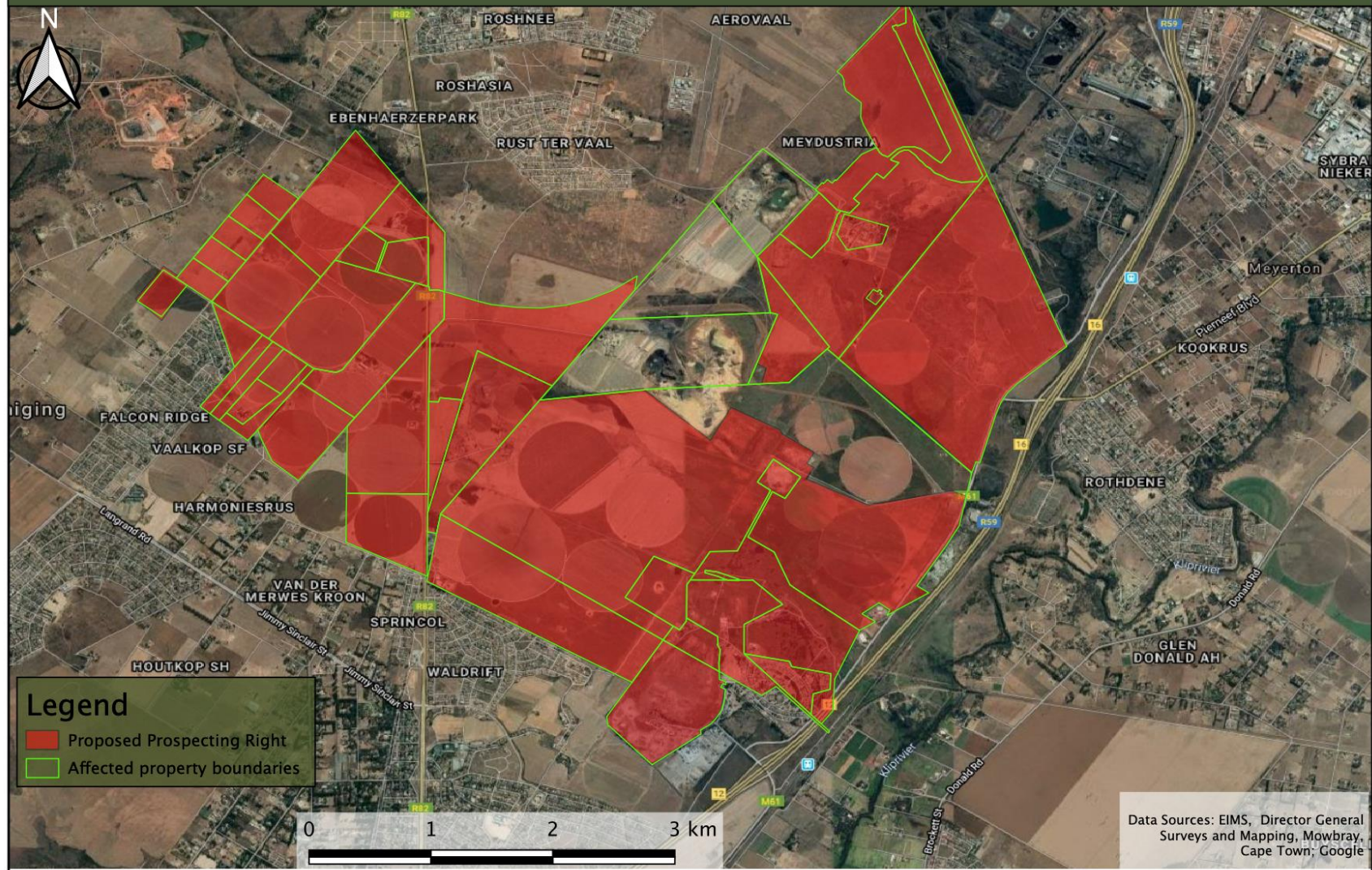


Figure 3 – Kookfontein Prospecting Application Property Plan (Nimbargo Resources)

Proposed Kookfontein Prospecting Rights Application Proposed drill grid

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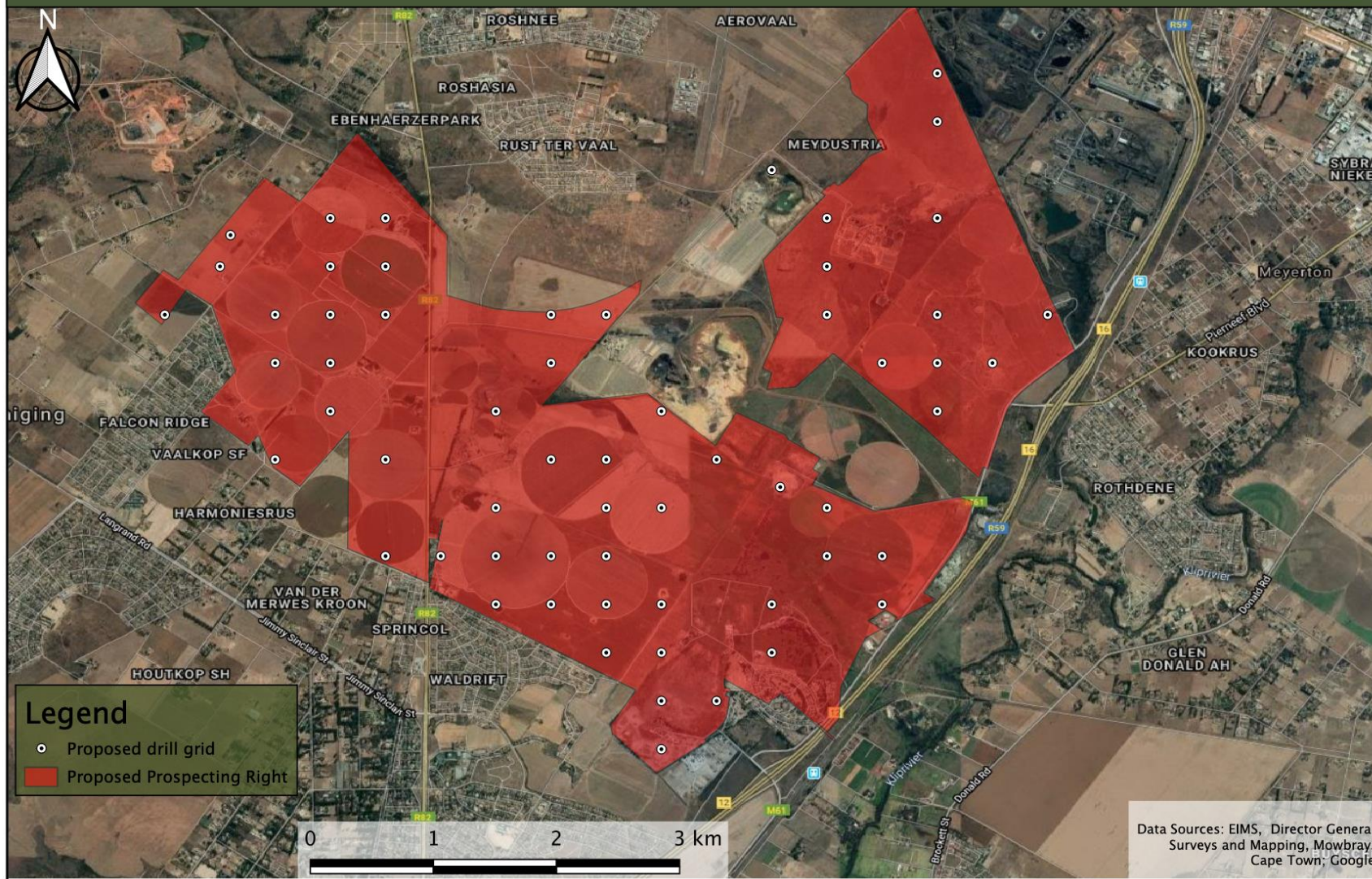


Figure 4 – Kookfontein Prospecting Application Preliminary Drill Site Map (Nimbargo Resources)

6 Legislative and Policy Framework

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:

- i. National Environmental Management Act (NEMA), Act 107 of 1998
- ii. National Heritage Resources Act (NHRA), Act 25 of 1999
- iii. Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

- i. GNR 982 of 2014, as amended 2017 (Government Gazette 38282) promulgated under the (NEMA):
 - a. Basic Assessment Report (BAR) – Regulations 19 and 23
 - b. Environmental Scoping Report (ESR) – Regulation 21
 - c. Environmental Impacts Report (EIR) – Regulation 23
 - d. Environmental Management Programme (EMPr) – Regulations 19 and 23
- ii. NHRA:
 - a. Protection of Heritage Resources – Sections 34 to 36; and
 - b. Heritage Resources Management – Section 38
- iii. MPRDA Regulations of 2014:
 - a. Environmental reports to be compiled for application of mining right – Regulation 48
 - b. Contents of scoping report – Regulation 49
 - c. Contents of environmental impact assessment report – Regulation 50
 - d. Environmental management programme – Regulations 51
 - e. Environmental management plan – Regulation 52
- iv. The Regulations relating to the Management of Human Remains (GNR 363 of 2013 in Government Gazette 36473) promulgated under the National Health Act (Act No. 61 of 2003)
 - a. Exhumation and Reburial of Human Remains - Regulations 26, 27 and 28

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority, and that an HIA will be required if a development triggers any of the development types listed in section 38 of the NHRA. Sections 34-36 further stipulate the protections afforded to structures older than 60 years, archaeological and palaeontological sites and material and meteorites, and graves and burial grounds, as well as the process to be followed if these resources need to be disturbed.

NEMA states that an integrated EMP should, (23 -2 (b)) "...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage". In addition, the NEMA (No 107 of 1998) and the GNR 982 (Government Gazette 38282, 14 December 2014) state that, "the objective of an environmental impact assessment process is to, ... identify the location of the development footprint within the preferred site ... focussing on the geographical, physical, biological, social, economic, cultural and heritage aspects of the environment" (GNR 982, Appendix 3(2)(c), emphasis added). In accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive legally compatible HIA report is compiled.

7 Methodology for Assessing Heritage Site Significance

This HIA Report was compiled by PGS for the proposed Kookfontein Prospecting Right application. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the NEMA (no 107 of 1998).

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 Heritage Impact Assessment process consisted of three steps:

Step I – Literature Review: a high-level desktop study was undertaken to identify potential heritage resources and areas of potential heritage sensitivity.

Step II - Physical Survey: A physical survey was conducted by vehicle through the proposed project area by a team consisting of a qualified archaeologist and a field assistant. The survey was conducted over three days (12-14 May 2020) and was aimed at locating and documenting sites falling within and adjacent to the proposed mining rights footprint. The positions of the heritage resources identified were recorded by Garmin GPS and recorded photographically. The season was autumn and the vegetation cover was generally dense over most of the area.

Step III – The final step involved the assessment of identified heritage 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 four 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.

Impacts on these sites by the development will be evaluated as follows:

7.1.1 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 2** and **Table 3**).

Table 2: 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: Langebaanweg (West Coast Fossil Park), 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 Provincial Heritage Resources authority. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	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
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 3: 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: St George's Cathedral, Community House	May be declared as a Provincial Heritage Site managed by Provincial Heritage Resources authority.	Exceptionally High Significance
III	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
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	Low Significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
		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.	
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

8 Receiving Environment

The application area falls within the Emfuleni and Midvaal Local Municipalities of the Sedibeng District Municipality and is located 4km South of Meyerton and 7km North of Vereeniging. The project area includes various portions of the farms Kookfontein 545 IQ (portions 2, 16, 22, 27, 29, 30, , 39, , 55, 64, 65, 66, 83, 84, 85, & 95), Damfontein 541 IQ (portions 1, 2, 36 and 37), Smaldeel 542 IQ (Portion 4), Waldrift 599 IQ (Portions 16 & 89) and Vlakfontein 546 IQ (Portions 7, 111, 114, 115, 118, 119, 125, 144, 151, 152, 153, 154, 159, 167, 173, 175, 194, 195, 197 & 198) (Figure 2 and Figure 3). The extent of the Application area is 3099.966 Ha.

The area is predominantly characterised by intensive agriculture and grazing, agricultural smallholdings and farmsteads, with some mining activities, residential urban development and industrial development.

The largest portion of the study area has been disturbed through agricultural activities in the recent past (ploughing and crop growing). A few brickworks and quarries occur in the north-west section of the study area as well as a waste-water treatment works. The disused Springfield Colliery and the historical village of Redan are both located in the south-east section.

8.1 Heritage Desktop Study

The high-level archival research focused on available information sources that were used to compile a general background history of the study area and surrounds. This included published literature sources, historical topographical maps, previous heritage studies and analysis of satellite imagery.

8.2 Site Description

The PR application is characterised by vast tracks of cultivated agricultural land under centre pivot irrigation made possible by the water aquifer created by the mining activities of the historic Springfield colliery.

The topography is flat with a gentle slope from the west toward the Klip river that runs north-south just outside the study area



Figure 5 – Open tracts of land



Figure 6 – Grass farming under irrigation



Figure 7 – Cultivated land and pastures



Figure 8 – View from the western boundary of the study area towards the east



Figure 9 – Ash dumps associated with the Springfield Colliery



Figure 10 – View of the Waldrift landfill site

8.2.1 Archaeological And Historical Background

Table 4: Summary of archival data found on the general area

DATE	DESCRIPTION
2.5 million to 250 000 years ago	<p>The Earlier Stone Age (ESA) is the first phase identified in South Africa’s archaeological history and comprises two technological phases. The earliest of these is known as Oldowan (2.6 – 1.5 Myr) and is characterised by expedient yet organised flaking systems, with primarily core- and flake-based assemblages. The second technological phase is the Acheulian industry (1.7 Myr – 250 kyr) which is comprised of Large Cutting Tools (i.e. handaxes and cleavers) and organised core reduction (i.e. Levallois).</p> <p>Several ESA sites are known from the confluence of the Klip, Suikerbosrand and Vaal Rivers in proximity to the town of Vereeniging. These sites include Klipplaatdrift, River View Estates and Three Rivers (Bergh 1999). Another Early Stone Age was identified by C Van Riet Lowe during the late 1940s near Henley-on-Klip (Van Riet Lowe & Van der Elst, 1949). The Henley-on-Klip site is approximately 8.90km north-east of the present study area.</p> <p>Several Acheulean-bearing sites are known from the Vereeniging area. According to Bergh (1999) these include Waldrif, Drie Riviere, Duncanville, Riverview Estates. Of these sites, Duncanville is the closest and is located approx. 2.35km south of the study area. The Duncanville Archaeological Reserve was proclaimed as a National Monument in 1944 (Oberholster, 1972). The site contains many Acheulian stone implements lying on the surface of the gravel beds deposited by the Vaal River several million years ago. A similar site is located at the Klip River Quarry (also now a Provincial Heritage Site). Both sites were discovered initially by T N Leslie, an engineer, and later investigated by Van Riet Lowe, who was instrumental in them being declared as National Monuments. These two sites were both excavated by Revil Mason between 1960/61 (Prins, 2005).</p>
250 000 to 40 000 years ago	<p>The Middle Stone Age (MSA) is associated with flakes, points and blades manufactured by means of the so-called ‘prepared core’ technique. This phase is furthermore associated with modern humans and complex cognition (Wadley 2013). Although not many MSA sites are known from this area, MSA stone tools were identified on a property in Meyerton in stratigraphic context for an HIA undertaken in 2017 (Fourie 2017). No archaeological work has been carried out in this area.</p>
40 000 years ago, to the historic past	<p>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.</p> <p>A Later Stone Age site is known from the farm Badfontein, roughly 17km south-east of the present study area (Bergh, 1999). An unidentified rock engraving site is known between the study area and Heidelberg (see Bergh, 1999).</p> <p>One identified LSA site has been found in the region of Meyerton (Huffman, 2008), although no archaeological work has been carried out in this area concerning this techno-complex.</p>
AD 1450 - 1650	<p>Evidence of the Late Iron Age (1500-1800 AD) is prevalent in the Suikerbosrand and Klipriviersberg area. Other Late Iron Age stone walled sites, dating from the 18th and 19th centuries, occur towards Alberton, along the rocky ridges of the eastern part of the Klipriviersberg (Huffman, 2007).</p> <p>This period is associated with a Late Iron group referred to as the Ntsuanatsatsi facies of the Urewe Tradition (Huffman, 2007). The Ntsuanatsatsi facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the earliest known Iron Age period within the region of the study area. The decoration on the ceramics from this facies is characterised by a broad band of stamping in the neck, stamped arcades on the shoulder and appliqué (Huffman, 2007).</p>
AD 1500 - AD 1700	<p>The Olifantspoort facies of the Moloko Branch of the Urewe Ceramic Tradition is the next Iron Age facies to be identified within the surroundings of the study area. The key features of the decoration used on the ceramics from this facies include multiple bands of fine stamping or narrow incision separated by colour (Huffman, 2007).</p>

DATE	DESCRIPTION
AD 1650 – AD 1850	The Uitkomst facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the third Iron Age period to be identified for the surroundings of the study area. The decoration on the ceramics associated with this facies is characterised by stamped arcades, appliqué of parallel incisions, stamping as well as cord impressions (Huffman, 2007). Based on the available archaeological and oral evidence from this period, the sixteenth and seventeenth centuries saw the movement of Sotho/Tswana communities from the lower lying Bushveld areas in the north (where they had been settled since AD 1500) toward the higher, predominantly grassland areas to the south. By AD 1650, these communities had successfully settled in these areas (Hall, 2007).
1700 - 1840	The Buispoort facies of the Moloko branch of the Urewe Ceramic Tradition is the next phase to be identified within the study area's surroundings. The key features on the decorated ceramics include rim notching, broadly incised chevrons and white bands, all with red ochre (Huffman, 2007).
c.1823s	By 1823 the Khudu were known to have resided in the general vicinity of the present study area, and especially near the confluence of the Suikerbosrant and Vaal Rivers (Bergh, 1999). This confluence is located roughly 5.70km south of the present study area.
1823 - 1827	During the so-called Difaqane, the Khumalo Ndebele (also known as the Matabele) of Mzilikazi established themselves along the banks of the Vaal River and pushed the Khudu further to the west (Bergh, 1999). In c. 1827 the Matabele moved further north and settled along the Magaliesberg Mountain and five years later in 1832 settled along the Marico River.
October 1834	A group of Griqua hunters under the leadership of Pieter David were hunting near the confluence of the Vaal and Wilge Rivers when they were attacked here by Mzilikazi's Khumalo Ndebele (Bergh, 1999).
February 1836	Voortrekker leader Louis Trichardt moved with his party to the confluence of the Wilge and Vaal Rivers and stayed on the western bank of the Wilge for a while before crossing over the Vaal (d'Assonville, 2002). They subsequently met up with Lang Hans van Rensburg at Elandspruit, near present-day Heidelberg (Bergh, 1999).
1839	These years saw the early establishment of farms by the Voortrekkers in the general vicinity of the study area. The district of Potchefstroom was also established in 1839 (Bergh, 1999), of which the study area formed part.
1876-1878	In December 1876 President Brand of the Republic of the Orange Free State acquired authority from his Volksraad to appoint Mr GW Stow to undertake prospecting surveys. In 1878 Stow conducted test shafts in the vicinity of the Taaiboschspruit and Vaal River confluence as well as on the farms Maccauvlei and Leeuwspuit. His investigations on both these latter farms indicated the presence of extensive coalfields (Leigh, 1968).
1880-	Subsequent to this discovery, Stow and Samuel Marks, the Kimberley diamond magnate, formed a company in 1880, to exploit the coal deposits and transport them to the Kimberley mines. The company was called " <i>De Zuid Afrikaansche en Oranje Vrijstaatsche Kolen en Mineralen Vereeniging</i> " and was later to become the nucleus of the <i>Vereeniging Estates Limited</i> . As a result, the farms Leeuwkuil, Klipplaatdrift, Maccauvlei and Rietfontein were acquired. The first mining activities were undertaken in the vicinity of the test shaft on Leeuwkuil, which later was to become Bedworth Colliery (Leigh 1968)
1882-1884	In 1882 the <i>Vereeniging Estates Limited</i> applied to the Zuid Afrikaansche Republiek to establish a village on the farms Leeuwkuil and Klipplaatdrift. On 4 July 1884 the Volksraad approved the application as well as the proposed name " <i>Vereeniging</i> ", which was derived from the company's name (Leigh, 1968).
1899 – 1902	During the Anglo Boer War (1899-1902) the town of Vereeniging had a significant role to play. This was largely due to its strategic value in that one of the main entry points from the Republic of the Orange Free State into the Zuid Afrikaansche Republiek was located in this area. The railway link between the two republics had also been established here (Leigh 1968).

DATE	DESCRIPTION
	<p>During the initial phase of the war, very few military activities took place in this area. However, after the defeat of the Boer forces in various places, and the British advance into the republics, the Vereeniging area became very significant. After the annexation of the Republic of the Orange Free State on 24 May 1900, Lord Roberts (the commander in chief of the British forces) was able to travel via railway line from Bloemfontein all the way to the Vaal River (Bergh, 1999). On 27 May 1900 the crossing of the main army over the Vaal River took place. Vereeniging was annexed on the same day.</p> <p>During the latter period of the war, the Boer forces divided themselves into smaller mobile units (commandos) and fought the British forces in a guerrilla war. In response to this tactic, the Boer farms of both republics were destroyed, while black and white men, women and children still residing on the farms were taken to various concentration camps. Such a camp was also established at Vereeniging. The camp was located on the farm Maccauwei and was divided into a camp for the Boers and another camp for black people. The Boer camp in turn was divided between the Boer concentration camp (for prisoners-of-war, women and children) and a camp which housed Boers who had surrendered and joined the British forces as part of a Burger Corps (Leigh, 1968).</p> <p>With time the Boer forces and their leaders started considering negotiating for peace. Sammy Marks offered the opposing sides a site for these negotiations at the Central Mine. Different tented camps were erected for the different participants, such as the Z.A.R leadership, Orange Free State republic leadership and the British leadership. The representatives for the Boer republics were President Steyn of the Orange Free State, as well as Generals Botha, Smuts, Hertzog, De La Rey and De Wet. The British were represented by Lords Milner and Kitchener. The negotiations undertaken here resulted in the eventual signing of the Peace Treaty of Vereeniging at Melrose House, Pretoria on Saturday, 31 May 1902 (Leigh, 1968).</p>
1904	On 17 August 1904 the Milner Government conferred municipal status on Vereeniging (Prins 2005).
1912	In 1912 the status of major municipality was conferred on Vereeniging and Leslie was elected mayor (Prins 2005).
1934 - 1938	The construction of the Vaal Dam was undertaken jointly by Rand Water and the Department of Irrigation. Construction commenced in 1934 and the aim of the dam was to address the rapidly increasing need for water of the population of the Witwatersrand. The dam wall was completed in 1938 with a wall height of 54.2 m above the lowest foundation and a full supply capacity of 994 million m ³ . In the early 1950s the wall was raised to 60.3m resulting in a capacity of 2 188 million m ³ . In 1985 the wall was raised to a height of 63.4m above the lowest foundation. This increased the capacity of the dam to 2 536 million m ³ (Birkholtz 2009).
21 March 1960	<p>Although a number of important political events took place in the general area, including the massacre at Boipatong on 17 June 1992, the most significant of these was probably the tragedy of Sharpeville, which took place on 21 March 1960. Sharpeville is a township situated near Vereeniging and is located to the west of the present study area. On 16 March 1960 the Police Commissioner was informed by the head of the Pan Africanist Congress, Robert Sobukwe, that a protest campaign against pass laws will be held on 21 March 1960. The aim of the campaign was for black people to leave their passes at home, and to report in their thousands at different police stations, thereby overcrowding the jails and forcing the government to make concessions.</p> <p>By 10 am on the morning of 21 March 1960 a group of between 3000 and 5000 gathered in the centre of Sharpeville. Similar events also took place in neighbouring areas such as Boipatong and Evaton. The group from Sharpeville marched to the Sharpeville police station, where a tense situation soon started developing. By one o'clock police reinforcements were called for and started arriving. The police force now consisted of 300 policemen who were supported by armoured vehicles.</p>

DATE	DESCRIPTION
	<p>At 13:15 a scuffle broke out after which the fence surrounding the police station was trampled and a police officer pushed over. Simultaneously the front ranks of the crowd pushed forward, which resulted in the police opening fire without any order to do so. The crowd panicked and fled. Sixty-seven protesters (including children) were killed, while 186 people were wounded.</p> <p>The news of the Sharpeville tragedy carried across the world's press, and focused international attention on the political situation and injustices taking place in South Africa (www.sahistory.co.za; Birkholtz 2009).</p> <p>The 21st of March is still annually commemorated in South Africa today as Human Rights Day.</p>

8.2.2 Archaeological Background

8.2.2.1 STONE AGE

Archaeological investigations in the Vereeniging-Meyerton area date to the late 1930's when C. van Riet Lowe investigated the occurrence of archaeological materials stratified within the Vaal River Gravel sequence. This led to the discovery of several sites near Vereeniging and Meyerton, which preserved Large Cutting tools (LCTs) from the Acheulean Industry (Fourie 2017). This established an ESA sequence that is collectively known as the 'Three Rivers Sites' or the 'Vereeniging Sites' which include Klip River Quarry, Henley-on-Klip, Badfontein and the Meyerton Townlands (Fourie 2017).

The 'type site' of the Vaal River Gravel sequence, for the Vereeniging sites mentioned above, is the Klip River Quarry, discovered by C. van Riet Lowe (1937). The gravel sequence of this area comprises rocks of shales and sandstones from the Karoo Supergroup with diabase intrusions (dolerites and andesites). The latter rock types are the major toolstone materials utilized in Acheulean assemblages. Characteristic Acheulean LCTs were discovered, including handaxes and cleavers, yet detailed descriptions of this assemblage have not been provided. The Klip River quarry site was proclaimed as a National Monument in (also a Provincial Heritage Site). This site is located approx. 3.25km south, of the Kookfontein study area.

Another site similar to the Klip River Quarry, is the Duncanville Archaeological Reserve which is located approx. 2.35km south-west of the Kookfontein study area. The Duncanville was proclaimed as a National Monument in 1944 (Oberholster, 1972). In terms of the NHRA the site is now protected as a Provincial Heritage Site. This site was proclaimed due to the large number of stone implements dating to the Acheulean period of the Early Stone Age which were discovered on the surface of the Vaal River gravel beds.

Both of the above proclaimed sites were initially discovered by T N Leslie, an engineer, and later investigated by Van Riet Lowe, who was instrumental in them being declared as National Monuments. These two sites were also excavated by Revil Mason between 1960/61 (Prins, 2005).

A further known site in the nearby area the Meyerton Townlands site, which was briefly reported by le Roux and le Roux in 1959 (Fourie 2017). Trenches excavated by the Rand Water Board exposed gravels associated with the Klip River from which over 100 artefacts made on quartzite were collected. LCTs were produced through bipolar and large-flaking techniques, similar to other assemblages from the Vereeniging Sites (Fourie 2017).

8.2.2.2 IRON AGE

Evidence of the Late Iron Age (1500-1800 AD) is prevalent in the Suikerboschrand and Klipriviersberg area. Stone kraals and remnants of stone dwellings of the Sotho -Tswana peoples have been found.

Other Late Iron Age stone walled sites, dating from the 18th and 19th centuries, occur towards Alberton, along the rocky ridges of the eastern part of the Klipriviersberg (Huffman, 2000).

Iron Age sites have been identified in an AIA produced by Huffman (2008) for the Mountain View development on Farm Nooitgedacht 176 IR, Gauteng, located approximately 18 km north of the proposed Kookfontein site. Stone walling and ceramic residues were identified at several localities near Perdeberg Hill, located on Farm Nooitgedacht. Some ceramics were associated with the "Uitkomst facies" (AD 1800) and of high significance (Fourie 2017).

8.2.2.3 REDAN ROCK ENGRAVING SITE (PROVINCIAL HERITAGE SITE)

The rock engraving site of Redan, which is located within the study area, approximately 700m west of the R59 road, is also believed to date to the Late Iron Age. In 1891 T.N. Leslie, an emigrant from England who was employed by Marks settled on the farm Leeuwkuil and opened the Wildebeest Quarry in the area close to the confluence of the Klip River and the Vaal River. While excavating for building stone, he discovered that the area was exceptionally rich in fossil plants, Early Stone Age tools and rock engraving sites. He discovered that rock engravings occurred on both the farms Klipplaatdrift and Leeuwkuil as well as on the farm Kookfontein. However, the inclusion of Klipplaatdrift and Leeuwkuil in the town of Vereeniging, subsequently destroyed those sites. The engravings on Kookfontein were saved only because the farm was excluded from the plans for the new town (Prins 2005).

The rock engravings at Kookfontein were temporarily in the news in 1936 when the Klip Power Station was erected by ESCOM on a portion of the farm Waldrift No. 599, very close to the rock engraving site on the adjoining farm Kookfontein (Prins 2005). These two farms, bought originally in 1888 by Donald McKay, were both coal-bearing, and coal mining was conducted at the Meyerton Colliery on Kookfontein. In order to supply sufficient fuel to the Klip Power Station McKay Estates entered into a contract with Amalgamated Collieries and Springfield Colliery was established at Kookfontein some distance away from the engraving site (Prins 2005: 49-50).

A small settlement and a post office were subsequently established on Waldrift. The closest railway station was Redan and the settlement adopted the name of Redan. The adjoining rock engraving site at Kookfontein also became known as the Redan rock engraving site (Prins 2005).

Prins (2005) notes that Van Riet Lowe published the first systematic index of rock art sites, *Prehistoric Art in South Africa* in 1941, which included the farm Kookfontein No. 187 among four sites in the Vereeniging area.

The engraving site of Redan was researched by A.R. Willcox and H.L. Pager in 1967. Willcox and Pager copied all the petroglyphs by drawing them to scale and recorded a total of 244 petroglyphs, the majority of which comprised geometrical designs. Besides the petroglyphs, Willcox and Pager also documented 21 flattened or smoothed surfaces produced by rubbing or grinding activities. Willcox and Pager considered that the weathering of the surfaces of the petroglyphs suggested an estimated age of between 500 and 100 years; they were therefore probably made by the San people (Kovacs 1998).

In terms of the NHRA this site is now a formally protected Provincial Heritage Site. It was previously declared as a National Monument in 1971 (Prins 2005; SAHRIS). However, subsequent to 1994, and the replacement of the Vereeniging Town Council with the Lekoa Vaal Metropolitan Council, the farm Kookfontein that had been owned and managed by the Town Council and on which Redan is situated, was sold to a private individual, K. Badenhorst. According to the most recent information, portion 29 of Kookfontein 545 IQ is now owned by a brickwork company, Ocon Brick Pty Ltd. The local community

is very aware of the site and it has been recently highlighted by the local press with regard to another proposed mining project (Vaal Weekblad, 27 February 2020).

8.2.2.4 FOSSILISED FOREST

Prins notes that in addition to the archaeological sites discovered by Leslie, he also discovered the remains of a fossilised forest on the exposed bed of the Vaal River, in 1906 when he built a weir to dam the river in order to stabilise the water supply to the coal mine and other industries. This fossilised forest was later completely submerged when the Vaal River Barrage was built in 1923 by the Rand Water Board (Prins 2005: 42-43).

8.2.3 Historical Background

8.2.3.1 COAL MINING

There is some disagreement in the literature as to whether coal was discovered in the Vereeniging-Sasolburg Coalfield in 1871 by Karl Gottlieb Mauch, or in 1878 by George William Stow. However, coal was being commercially exploited during the 1880s and 1890s and supplied to the diamond and gold mining industries in Kimberley and the Witwatersrand. In 1880 Stow met the diamond magnate Sammy Marks, who realised the importance of Stow's discovery and authorised him to purchase all the farms on which he considered coal to exist. Stow purchased the 5675 morgen (= 4860 ha) farm Leeuwkuil (meaning Lion's pit) which lay on the northern bank of the Vaal River. This was the first mine to produce in the coalfield and was also the only colliery to mine coal commercially on the north side of the Vaal River. It was later to become known as the Bedworth Colliery. The discovery of gold on the Witwatersrand in 1886 dramatically increased the demand for coal (Hancox and Götz, 2014).

8.2.3.2 SPRINGFIELD COLLIERY

Donald McKay, who had seen an outcropping of coal on the farms Kookfontein and Waldrift before Marks had registered his company, persuaded Cecil John Rhodes to purchase these farms (totalling 5600 morgen or around 4800 ha) and in 1881 they became equal partners in the mine which was later to be known as Springfield Colliery (Hancox and Götz 2014:60). In 1934, still in partnership with Victoria Falls Power company, Eskom built the 400MW Klip Power Station just north of Vereeniging to supply the Rand. It was constructed on the Klip River at the pithead of the Springfield Colliery, which was developed by the Vereeniging Estate specifically to supply the new plant (Groundwork 2006: 64). Springfield Colliery was started in 1948 to supply the requirements of Eskom's early Klip Power Station. In its later life it also supplied the Grootvlei Power Station. Underground sections at Springfield Colliery were eventually closed due to steep gradients and poor and unstable mining conditions caused by dolerite intrusions and faulting (Hancox and Götz 2014:69).

Mining activities ceased at Springfield Colliery in 1953, making Kookfontein available for agricultural purposes (Willemsse 1999; Prins 2005).

8.2.3.2.1 KLIP POWER STATION

Klip Power Station was built as a result of the rapid growth in the demand for electricity that followed the increase in the price of gold in 1933. Negotiations were started between ESCOM and the Victoria Falls and Transvaal Power Company (the VFP), with the object of producing power on the most economical basis in the interests of consumers as a whole. An agreement was entered into between the VFP and ESCOM by which a new station would be financed and owned by ESCOM but be constructed and operated by the VFP on behalf of ESCOM. It was decided in 1933 to build Klip Power Station adjacent to the Klip River at Redan, about 7km north-east of Vereeniging. Like Vereeniging Power Station, it would be a pithead station. It would be established adjacent to a new colliery shaft from which coal would be mechanically fed right into the bunkers (<http://www.eskom.co.za/sites/heritage/Pages/Klip.aspx>).

The first generator was started up in March 1936 and the last was taken into service in July 1940. With twelve 33 MW generators and four 7MW house sets, giving a total of 424MW of installed plant, Klip had the distinction of then being the largest steam power station in the Southern Hemisphere. As far as is known, it had the greatest output of any power station in the world at that time, and probably the lowest cost of production of any other similar station. The rate of construction and commissioning of plant constituted another world record. It was the first station in ESCOM to have cooling towers. (The name ESCOM was changed to Eskom in 1987) (<http://www.eskom.co.za/sites/heritage/Pages/Klip.aspx>)

Coal was initially supplied from the Springfield Colliery and was raised through two shafts, the East and the West. The East shaft was located immediately adjacent to the station and delivered the coal via a relatively short conveyor belt system. Coal supplied from the West shaft was delivered via a rail connection approximately 2.5km long in 40 ton hopper wagons drawn by steam locomotives and dumped into an open staithe. Both shafts had their own crushing and washing plants. When the station was planned, it was estimated that the mine could supply the station for 40 years. However, by 1948 it became apparent that the coal was becoming exhausted and coal would have to be brought from further afield. Plans were made for the construction of a 65km railway to transport coal to the power station. By 1953 the Springfield colliery was closed down and coal was railed in from Cornelia Colliery (<http://www.eskom.co.za/sites/heritage/Pages/Klip.aspx>).

The Klip Power station was in operation for almost exactly fifty years, being closed down in March 1986. During the 1980's Eskom had been commissioning its new giant six-pack power stations. But due to a decrease in the rate of growth in the demand for electricity in South Africa, Eskom began to experience a surplus of generation capacity. The older and less efficient stations were thus no longer required. Explosives demolished the cooling towers during 1987. These were the first cooling towers to be built at an ESCOM power station and the first to be demolished. The power station plant and equipment were disposed of as scrap, the buildings were totally demolished and the land rehabilitated. Only the workshops and township remained (<http://www.eskom.co.za/sites/heritage/Pages/Klip.aspx>).

When the staff housing became redundant after closure of the power station, rather than demolish the buildings, which were fundamentally still sound. The estate included 129 houses and single quarters for 73 employees, as well as other facilities. The township was transformed into a proper retirement village with facilities for local management, medical care, catering and recreation. Accommodation was to be administered jointly by the tenants and the Eskom Foundation, an organisation formed specifically to provide housing and related facilities for Eskom pensioners. The housing estate was handed over for development as a retirement village at a ceremony in June 1988. In later years the Eskom Foundation withdrew participation, and the staff of Lethabo Power Station managed the township (<http://www.eskom.co.za/sites/heritage/Pages/Klip.aspx>).



Figure 11 - Aerial view of Klip power station with the residential houses still under construction



Figure 12 - Aerial view of the retirement village (<http://www.eskom.co.za/sites/heritage/Pages/Klip.aspx>).

8.2.4 Archival/Historical Maps

Historical topographic maps from 1941 to 1979 were available for utilisation in the background study. 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. Many of the structures identified are farmsteads or homesteads, demarcated as “huts”. Clusters of residential structures were also identified. Several grave and cemetery sites were identified in the same location on all three editions of the map sheets utilised. The Springfield Colliery and the historical railway and road alignments are also depicted.

8.2.4.1 1:50 000 Topographical Map 2627DB Vereeniging Ed 1 1941

A portion of the First Edition of the 2627DB Vereeniging Topographical Sheet is depicted below (*Figure 13*). The map was compiled and drawn by the survey Depot (Tech) S.A.E.C. from various 1:25 000 sheets published in 1941 and revised in the field by 45 Survey Company in 1943. It was printed by the Government Printing Works of the Union Government in 1945.

Nineteen potential heritage features were identified. Two sites containing graves, various groups of residential structures and several groups of African homesteads (“huts”) are depicted in the vicinity of the study area. A colliery and a blockhouse (from the South African War) are also depicted. All these sites are likely to be at least 79 years old.

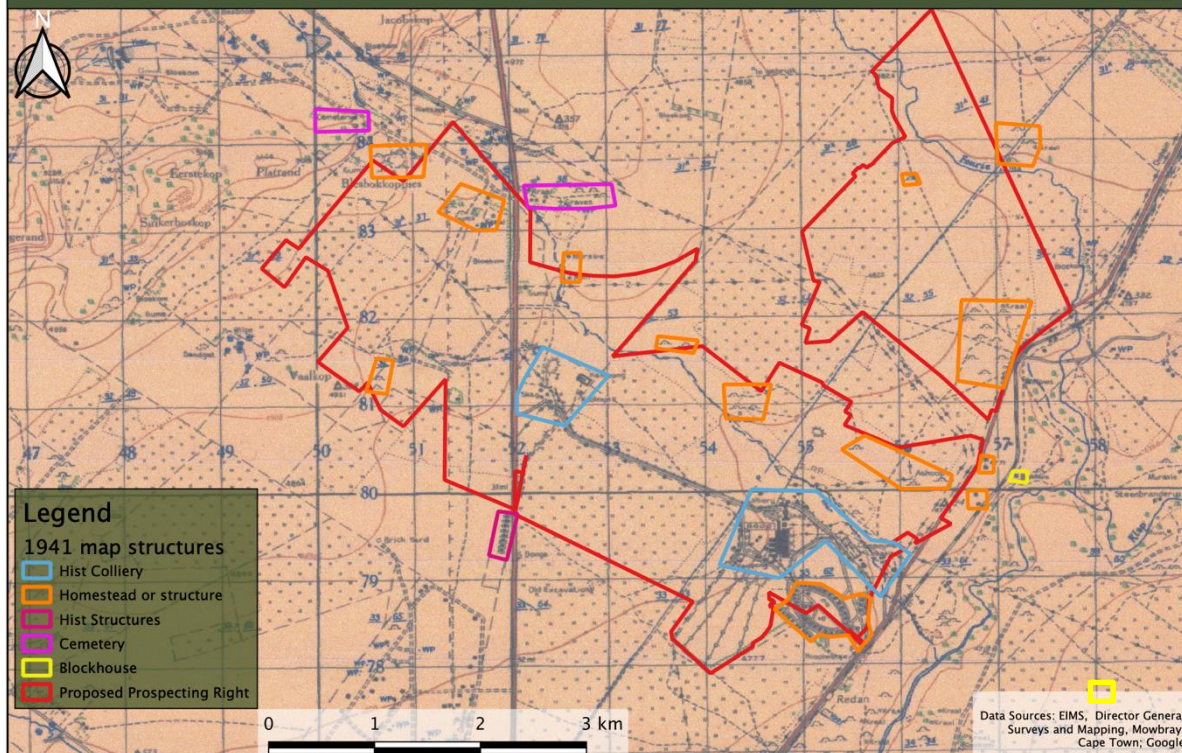


Figure 13 - Enlarged portion of the 1941 2627DB Map, showing structures and African homesteads (orange polygons) and grave site (purple polygons), and a blockhouse (yellow polygon)

8.2.4.2 1:50 000 Topographical Map 2627DB Vereeniging Ed 2 1954

A portion of the Second Edition of the 2627DB Topographical Sheet is depicted below (**Figure 14**). The map was based on air photography from 1952. It was surveyed in 1954 and drawn in 1957 by the Trigonometrical Survey Office. The map was printed in the Union of South Africa by the Government Printer in 1957.

Many of the same groups of structures and groups of African homesteads (“huts”) are depicted on this sheet. In total, 25 potential heritage features are depicted. The Springfield Colliery and the blockhouse are still depicted. Only one of the two grave sites from the previous sheet is depicted on this sheet. Some of these sites will be 66 years old or older.

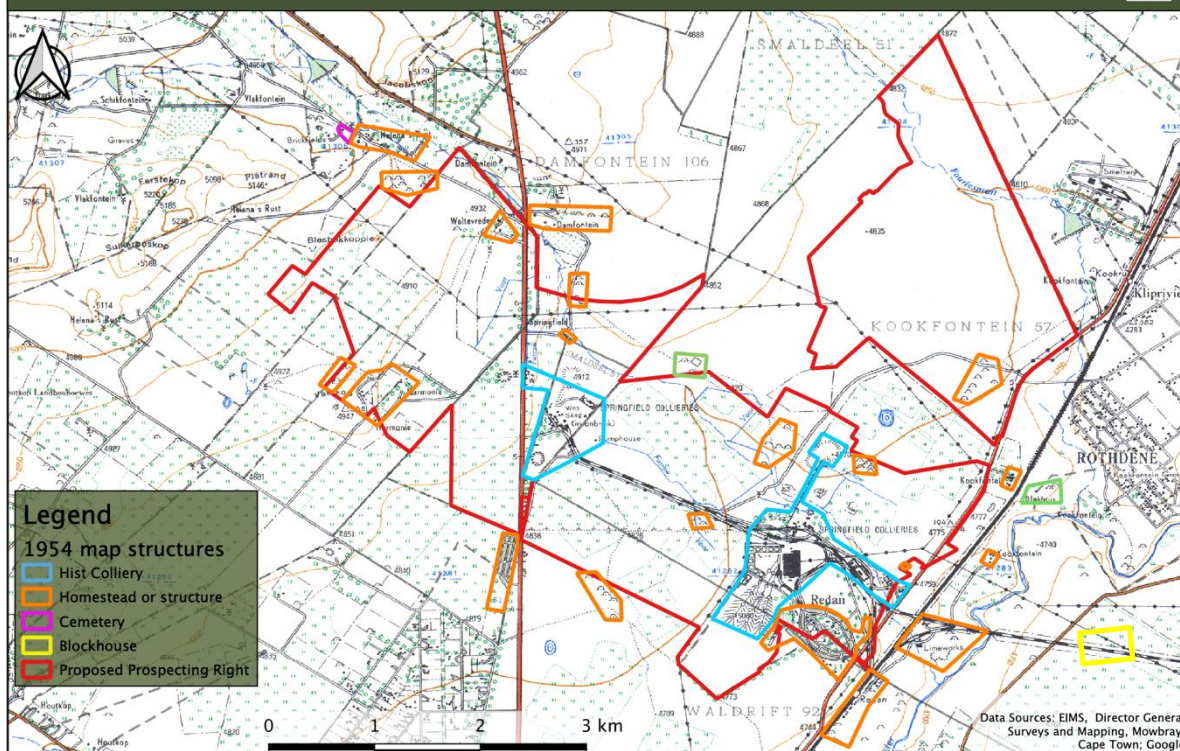


Figure 14 - Enlarged portion of the 2627DB Map 1954, showing the grave site (purple polygon), structure groups, homesteads groups, Springfield Colliery (blue polygons) and the blockhouse (yellow polygon)

8.2.5 Previous Heritage Studies

A search on the South African Heritage Resources Information System database (SAHRIS) has identified several Heritage Impact Assessments conducted in and around the study area. A number of these covered various portions of the farm Kookfontein 545 IQ, while one study (v Schalkwyk 2013), included portions of the current study area and identified a number of sites situated within the study area boundaries.

- *Pistorius, JJ. 2007. A Phase I Heritage Impact Assessment Study for Water and Sewage Pipeline Corridors near Vanderbijlpark in the Gauteng Province of South Africa.* This study identified the following types of heritage resources: two historical graveyards, a number of historical houses near Houtkop, historical stone structures, historical houses located in one of the suburban areas of Vanderbijlpark. The proposed route corridors are located roughly 6.50km south-west of the current project area.
- *Coetzee, FP. 2008. Cultural Heritage Survey of the Proposed Development of Portion 53 of the Farm Kookfontein 545-IQ, Rothdene, Midvaal Local Municipality. For Triviron EAP.* No archaeological or historical resources were recorded during the survey. The study area is located immediately adjacent to the north-east section of the current project area.
- *Pelser A.J. & van Vollenhoven A.C. 2009. A Report on a Heritage Impact Assessment Study for the Powerline from Glockner-Kookfontein Substations Vereeniging, Gauteng. For: Baagi Environmental Consultancy CC.* No objects, features or any sites of cultural (archaeological or historical) heritage significance were identified in the area of proposed development. This route corridor is located immediately within the north-east section of the current project area.
- *Pelser A.J. 2011. A Report on a Heritage Walkdown Study for the Proposed New 275kv Powerline between the Glockner-Kookfontein Substations Vereeniging, Gauteng. For: Baagi Environmental*

Consultancy CC. No cultural heritage (archaeological or historical) sites, features and objects of significance were identified during the Walk Down survey. The study area is the same as the report above.

- *Pelser A.J. 2013. Basic Assessment Report for a Waste Management License Application, DMS Powders, Meyerton Portions 4 & 63 of Kookfontein 545IQ, Gauteng. For: Shangoni Management Services (Pty) Ltd.* No sites, features or objects of any archaeological or historical (cultural heritage) significance were identified during the fieldwork. The site is located on Portions 4 & 63 of the farm Kookfontein 545IQ, situated in the industrial area located immediately north-east of the current project area.
- *Van Schalkwyk, J. 2013. Heritage Impact Assessment for the Proposed Construction of Eskom Five (5) 88kv Powerlines Connecting Kookfontein and Jaguar Substations, Midvaal and Emfuleni Municipalities, Gauteng Province.* Eight heritage resources were identified, of which six are situated within or close to the current project area. The six sites include: the rock engraving site of Redan (Provincial Heritage Site), a Stone Age findspot, three cemetery or informal grave sites and a stone railway culvert.
- *Fourie, W. 2017. Finding on Possible Exemption from a Heritage Impact Study: Mixed Use Development on Portion 81 of the Farm Rietfontein 364IQ, Meyerton, Gauteng Province.* Although large sections of the property were heavily degraded and had in the past been used for dumping and backfilling of quarries, there were two areas identified with high density scatters or remnants of Early (ESA) and Middle Stone Age (MSA) material. This study area is located approx. 3.43km north-east of the current project area.
- *Fourie, W. 2017. Archaeological Impact Assessment for Meyerton Mall and Residential Development on Portion 64 of Portion 81 of the Farm Rietfontein 364IQ, Meyerton, Gauteng, Province.* This report was a follow-up survey of the two areas identified in the previous study. Thirteen specific sites/findspots were identified containing mostly Middle Stone Age (MSA) stone tools, and a few Late Stone Age (LSA) stone tools. One of these sites was assessed to have medium significance.

8.2.6 Analysis of Satellite Imagery

After the analysis of the historical topocadastral maps was completed, an analysis of available satellite images was done. The aim was to identify man-made structures and grave/burial sites, as well as landforms that can indicate archaeological sites (**Figure 15**).

In total 50 potential heritage features were identified within and adjacent to the Kookfontein study area. These features include possible historical structures or farmsteads (green polygons) and grave sites (purple polygons), as well as sites that were identified in a previous heritage study (Van Schalkwyk 2013; red icons).

8.2.7 Findings Of The Heritage Desktop Study

The desktop study revealed that the surroundings of the study area are characterised by a long and significant history, while previous archaeological and heritage studies from this area have revealed a number of heritage sites that include informal graves or burial grounds, historical farmsteads and other structures or the remains of such structures and archaeological artefacts and sites.

Proposed Kookfontein Prospecting Rights Application
Possible heritage sensitive areas

PGS Heritage (Pty) Ltd
 Heritage Management
 Unit



Figure 15 -View of satellite imagery showing the potential heritage features within the Kookfontein study area

8.3 Fieldwork Findings

During the field work a total of thirteen heritage resource were identified. The majority of these (six) were graves and burial grounds (KF001, KF002, KF005, KF006, KF007, KF010), with one historical farmstead (KF008), and five sites containing structures associated with the historical Springfield Colliery and Klip Power Station (KF009, KF011, KF012, KF013) (**Figure 16**). The known archaeological rock engraving site of Redan (KF004) is also located within the study area. The remains of a modern dairy and piggery were also identified (KF003). See the **Table 5** below.

The PGS team met with three of the landowners, Mr Piet Hamman, Mr William de Jager and Mr Frik Wepener, who directed the PGS team to specific areas on their properties where heritage resources were located.

It should be noted that while most of the prospecting rights area was accessible, the PGS team was unable to access the Ocon Bricks property due to labour unrest.

Proposed Kookfontein Prospecting Rights Application

Heritage sites and tracklogs

PGS Heritage (Pty) Ltd
Heritage Management
Unit

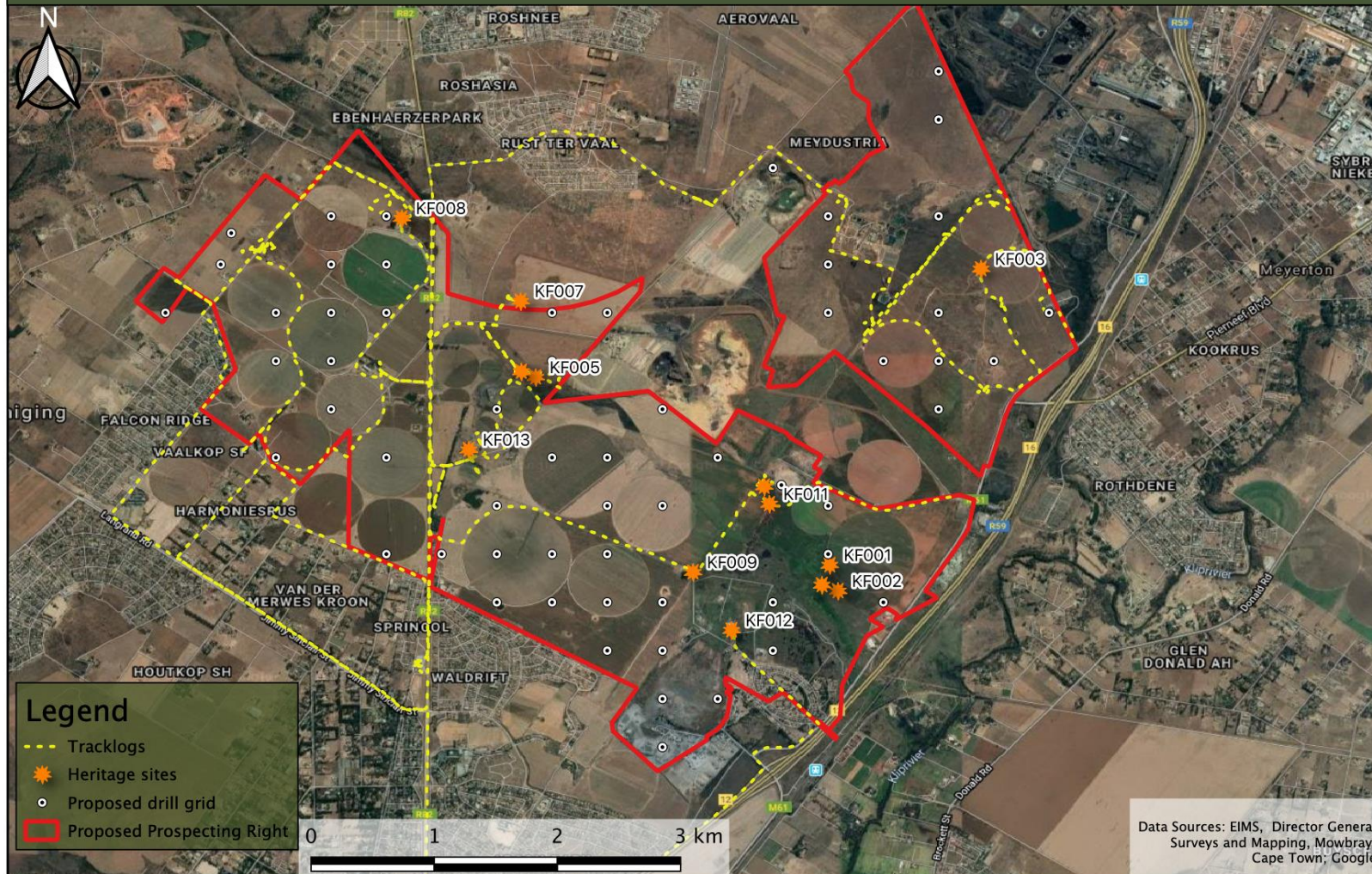


Figure 16 – Tracklog and identified heritage resources in relation to the proposed drill sites

Table 5: Heritage resources identified during the field work

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF001	26,60951°S	27,96893°E	<p>The site is an informal burial ground situated in between cultivated maize fields. The burial ground is overgrown and an exact count of the number of graves was not possible (Figure 17). A rough count indicated around 200 graves.</p> <p>Grave dressings varied between stone packed to formal headstones with inscriptions with dates ranging from 1918 to 1953 (Figure 18). The burial ground and its graves are protected under s36 of the NHRA.</p> <p>Site extent: Site is approximately 4000m² (60x70 meters); it is located close to a proposed drill site and should be demarcated and avoided.</p>	High	IIIA



Figure 17 – View of the burial ground showing one of the headstone in the foreground



Figure 18 – A grave dating to 1918

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF002	26,58536°S	27,96960°E	<p>This possible grave is heavily overgrown (Figure 19) and the only indication that it is possibly a grave is a precast cement slab with a wooden extension and a name painted on it. The name reads “Lentsa” (Figure 20).</p> <p>Site extent: approx. 5x5m.</p>	Moderate	IIIB



Figure 19 – View of heavily overgrown structure



Figure 20 – Inscription on the possible headstone

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF003	26,58536°S	27,98126°E	<p>The site consists of the ruins of a modern dairy and piggery. The dairy is fenced with a low precast wall, while its foundations were constructed with concrete and fired clay bricks (Figure 21). The piggery was constructed with precast slabs and pillars (Figure 22).</p> <p>Site extent: approx. 50x50m</p>	None	Not conservation worthy



Figure 21 – View of the low precast walling around the dairy



Figure 22 – Remains of the piggery

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF004	Coordinates withheld for safety considerations		<p>The site is that of the Redan archaeological site. As described in section 8 of this report, the site was declared a national monument in 1971 (Figure 23). Under the NHRA the site is now classified as a Provincial Heritage Site and protected under s27 and s35 of the NHRA.</p> <p>The site consists of 244 petroglyphs (Figure 24), ranging from geometric patterns (Figure 25) to depictions of animals (Figure 27) most related to the hunter gatherers and early herders. Some more recent engraved graffiti consists of dates and initials from the early part of the 20th century.</p> <p>The site is characterised by a rock outcrop on the northern edge of a tributary of the Klip river. The only remains of the original fence are the stubs of the corner posts.</p> <p>The area is scattered with broken glass and other household waste, while damage to some of the depictions is evident (Figure 29Error! Reference source not found.).</p> <p>Site extent: approx. 50x50m</p>	Very high	II



Figure 23 – View of the Redan rock art site towards the east



Figure 24 – The main central panel of the Redan site



Figure 25 – Geometric petroglyph



Figure 26 – Modern graffiti engravings dating to 1913



Figure 27 – Petroglyphs depiction of animal



Figure 28 – Engraved initials



Figure 29 – Damage to a section of one of the petroglyph panels

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF005	26,59420°S	27,94494°E	<p>This burial ground is situated to the north east of the old Springfield Colliery West shaft on the property owned by Mr William de Jager. Mr de Jager indicated the family cemetery to our fieldwork team. The burial ground consists of two recent graves dating from 2015. Both graves are still earth mounds. Only one has a small cross with an inscription as marker (Figure 30).</p> <p>Site extent: approx. 10x10m; located within 200m of a proposed drill site.</p>	High	IIIA



Figure 30 – View of the grave with grave marker

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF006	26,59373°S	27,94377°E	<p>The site is a possible informal burial ground situated some 100 meters to the west of KF005. A number of stone structures occur, with some of them aligned east west and consistent with stone packed grave dressing (Figure 31).</p> <p>Site extent: approx. 20x20m; located within 260m of a proposed drill site.</p>	Moderate	IIIB



Figure 31 – One of the possible graves at KF006

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF007	26,58799°S	27,94372°E	<p>The site is an informal burial ground. It is overgrown with grass and bushes (Figure 32 and Figure 33). A preliminary count indicates the presence of at least 81 graves. The grave dressings vary from formal dressings with headstones to stone packed dressings and in some cases only a rock as headstone.</p> <p>One headstone bears the date of 1945 for the date of burial. The burial ground and its graves are protected under s36 of the NHRA.</p> <p>Site extent: approx. 20x36m. Located within 239m of a proposed drill site</p>	High	IIIA



Figure 32 – View of the graves showing some of the formal dressings in the foreground



Figure 33 – View of the burial ground towards the north

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF008	26,58122°S	27,93403°E	<p>The heritage resource is a farmstead, consisting of a main house, sheds and rondawel as the core of the farmstead. Additional houses and workers cottages to the south of the main dwelling are recent historic additions.</p> <p>The owner of the farm, Mr Pieter Hamman, explained that the main house was finished in 1906, while the outbuildings date to the South African War (1899-1902) when the buildings were utilised as stables.</p> <p>The main house is beautifully restored and utilised as residential dwelling. It retains its original character with original wooden door and sash window frames, stone-built foundation and curved symmetrical gables of the façade. Later additions to the back portion of the house are indicated by the steel framed windows and lean-to roof.</p> <p>To the side of the house is the original rondavel that is currently used as storage space. This rondavel was most probably used originally as kitchen storage space such as a milk or meat room.</p> <p>The original barn, some 50 meters to the south of the main house, was constructed on a stone-built foundation. It seems that the original structure was a <i>waenhuis</i> that was later extended with a lean-to on both side elevations (Figure 37). A single room dwelling was added to the anterior of the <i>waenhuis</i> at some stage (Figure 38). In an attempt to add authenticity to the restored structure, wooden beam trusses were installed in the roof cavity to hide the steel roof trusses that provide the support for the corrugated iron roof (Figure 39).</p> <p>Site extent: approx. 150x100m. Located within 95-100m of one proposed drill site.</p>	High	IIIA



Figure 34 – Front façade of the main house



Figure 35 – View of the back of the house, note the steel framed windows and lean-to roof addition



Figure 36 – Rondavel at the side of main dwelling



Figure 37 – View of the original waenhuis with lean-to on both sides



Figure 38 – Anterior view of waenhuis, showing residential addition



Figure 39 – Interior view of the waenhuis with the decorative wooden beam hiding the steel trusses

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF009 and KF012	26,61010 °S	27,95778 °E	The area directly to the east from KF009 up to and including KF012 contains the remains of the original Klip Power Station. The history of the power station and Springfield Colliery is described in in section 8 of this document. The remains of the foundations of the cooling towers, evaporation ponds and other infrastructure, including the Springfield Colliery east shaft, cover an area of approximately 100 ha. The Redan residential area that was the Klip Power Station residential area covers an additional 30 hectares within the south-eastern section of the study area.	Low (KF009) to moderate (KF012)	KF009 IIIC
	26,61483°S	27,96092°E	The only buildings still remaining of the power station are the workshops (Figure 41) and main offices. The workshop is utilised as business premises for an engineering works while the offices seem to be a residence. The existing buildings, including the Redan residential area, are protected under s34 of the NHRA. The Redan residential area is still well maintained with a vibrant and active community. Site extent: approx. 100 ha. Located within 135m of at least one drill site.		KF012 IIIA



Figure 40 – Remaining structures of the power station infrastructure at KF009



Figure 41 – The original workshops of the Klip power station at KF012

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF010	-26,60311 °S	27,96358 °E	<p>The site is an informal burial ground situated to the south of the Waldrift Landfill site. The burial ground was shown to the PGS team by Mr Pieter Hamman. He indicated that human remains were found when the concrete palisading was erected for the landfill site. Only one grave with a formal headstone and dressing was identified (Figure 44). A walk through of the area revealed numerous small informal headstones (Figure 43).</p> <p>Further evaluation of historic Google Earth imagery revealed that the graves are discernible when the vegetation has been burnt (Figure 45). The aerial photography indicates at least 6 rows of graves with approximately 100 graves in each row.</p> <p>The graves most probably date from the historic mining operations at the Springfield colliery and as such are protected under s36 of the NHRA.</p> <p>Site extent: approx. 100x40m. Located between 100-127m of a proposed drill site.</p>	High	IIIA



Figure 42 – View of the burial ground at KF010



Figure 43 – Informal grave at KF010



Figure 44 – Formal headstone and dressing



Figure 45 – Google earth imagery showing the visibility of the graves in the burial ground (dated: 14 Feb 2019) (yellow block indicates approximate outline of the cemetery)

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF011	-26,60453 °S	27,96401 °E	<p>The site is the shaft and shaft collar of one of the vertical shafts associated with the historic Springfield Colliery (Figure 46). The inscribed date on the shaft collar is 1946.</p> <p>The site is generally protected under s34 of the NHRA.</p> <p>Site extent: approx. 5x5m.</p>	Low	NCW



Figure 46 – View of the shaft collar of the vertical shaft at KF011

Site number	Lat	Lon	Description	Heritage Significance	Heritage Rating
KF013	26,60011 °S	27,93948 °E	<p>The site is situated on the farmstead and surrounds of the farm Smaldeel. The owner, Mr William de Jager, indicated that most of the structures that are part of the farmstead were once part of the Springfield Colliery West mining infrastructure. Various structures have been converted into dwellings while some others are utilised as storage facilities (Figure 47).</p> <p>The only obvious mining infrastructure still visible is the coal tip and ash dumps (Figure 48).</p> <p>The structures date from the late 1930s and are protected under s34 of the NHRA.</p> <p>Site extent: approx. 200x150m. Located between 35m-100m of several proposed drill sites.</p>	Moderate	IIIB



Figure 47 – Original mine infrastructure now utilised as residential units



Figure 48 – The concrete coal tip of the Springfield Colliery West shaft

8.4 Palaeontology

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the **Palaeontological Desktop Assessment (PDA)** of the Kookfontein prospecting right study area. This study found that the geology of the proposed Kookfontein study area is primarily underlain by the Vryheid Formation (Ecca Group, Undifferentiated Karoo), Precambrian dolomites and associated marine sedimentary rocks that are allocated to the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup), as well as Quaternary superficial deposits (**Figure 49**). According to the PalaeoMap on the SAHRIS database, the Palaeontological Sensitivity of the Vryheid Formation (Ecca Group, Undifferentiated Karoo) is Very High, while that of the Malmani Subgroup and Quaternary deposits are both High (Almond and Pether 2008, SAHRIS website). Groenewald and Groenewald (2014) allocated a High Sensitivity to the Malmani Subgroup as they noted that, in addition to the stromatolites, potentially fossiliferous Late Cenozoic Cave breccias within the “Transvaal dolomite” outcrop area could be present. These breccias are not individually mapped on geological maps (Butler 2020).

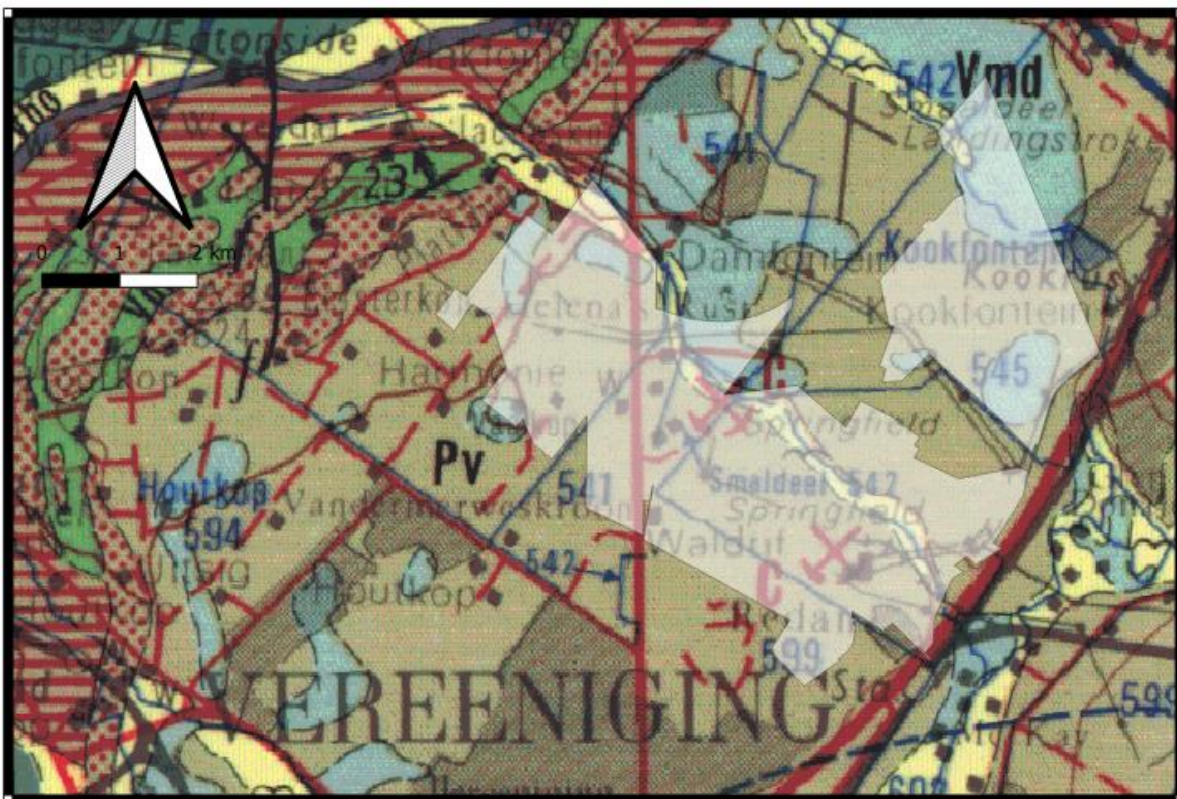


Figure 49 - Surface geology of the proposed Kookfontein Prospecting Project on the farms Kookfontein 545 IQ, Damfontein 541 IQ, Smaldeel 542 IQ, Waldruif 599 IQ and Vlakfontein 546IQ between Vereeniging and Meyerton in the Gauteng Province. Map was drawn by QGIS 2.18.28.

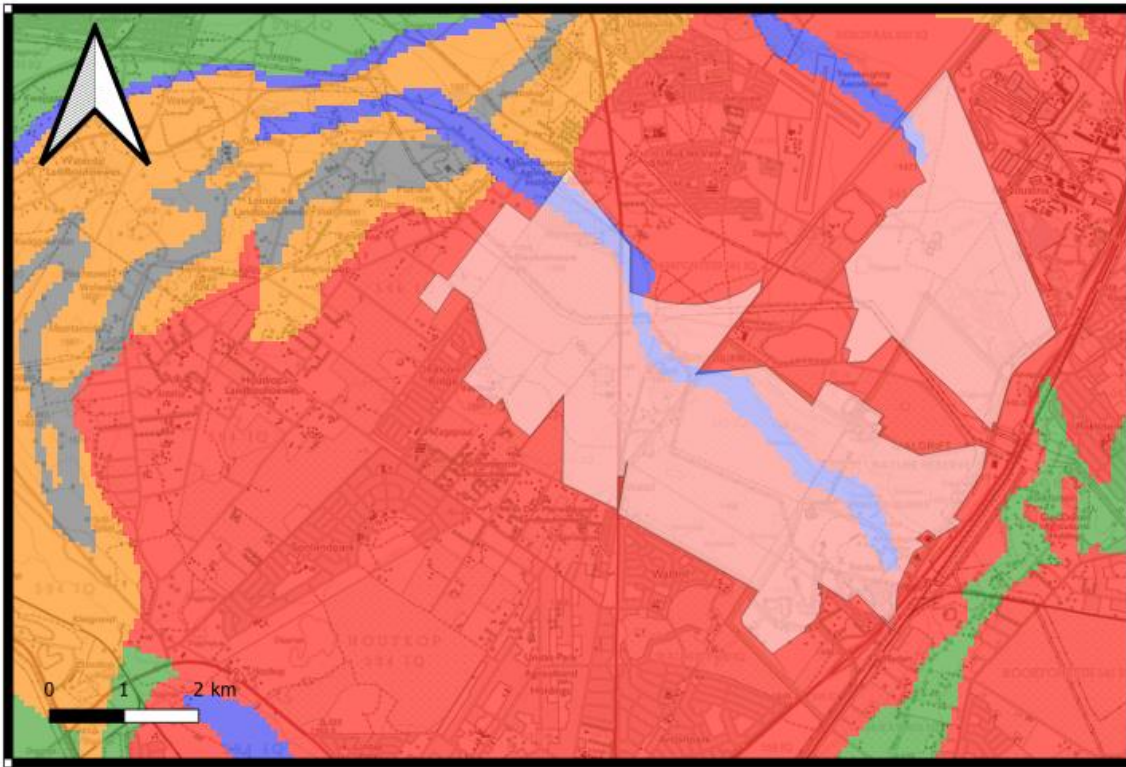


Figure 50 - Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed Kookfontein Prospecting Project on the farms Kookfontein 545 IQ, Damfontein 541 IQ, Smaldeel 542 IQ, Waldrift 599 IQ and Vlakfontein 546IQ between Vereeniging and Meyerton in the Gauteng Province.

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

According to the SAHRIS Palaeomap as the geology underlying most of the study area is rated as of Very High palaeontological sensitivity (**Figure 50**), a field assessment and protocol for finds is required. This is also the recommendation of the desktop study by Butler (2020).

9 Heritage sensitivity

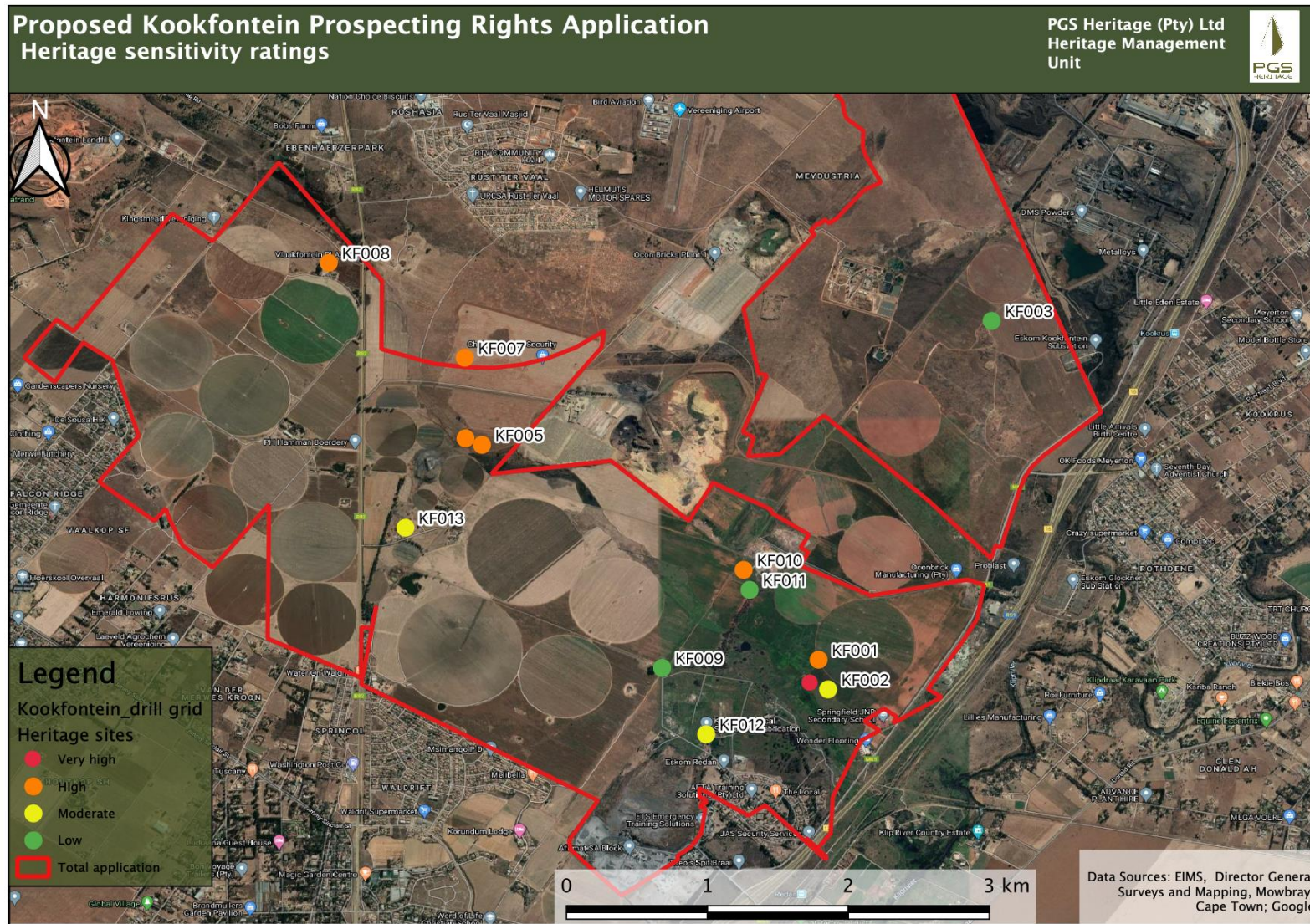


Figure 51 – Map showing heritage sensitivity rating of identified heritage resources

10 Impact Assessment

10.1 Impact Assessment Methodology

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for impacts identified.

10.1.1 Determination of Environmental Risk

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R) \times N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in *Table 6* below.

Table 6: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),

Aspect	Score	Definition
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined, the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table 7.

Table 7 : Probability Scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur)

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \times P$$

Table 8 : Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
	0	1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 9.

Table 9: Significance Classes

Environmental Risk Score	
Value	Description
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk).
≥9 - <17	Medium (i.e. where the impact could have a significant environmental risk),
≥17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

10.1.2 Impact Prioritisation

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

1. Cumulative impacts; and
2. The degree to which the impact may cause irreplaceable loss of resources.

To ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 10: Criteria for Determining Prioritisation

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 5. The impact priority is therefore determined as follows:

$$\text{Priority} = \text{CI} + \text{LR}$$

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to Table 11).

Table 11 : Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
2	Low	1
3	Medium	1.125
4	Medium	1.25
5	Medium	1.375
6	High	1.5

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is an attempt to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 12 : Final Environmental Significance Rating

Environmental Significance Rating	
Value	Description
≤ -20	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
> -20 ≤ -10	Medium negative (i.e. where the impact could influence the decision to develop in the area).
> -10	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
0	No impact
<10	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥ 10 < 20	Medium positive (i.e. where the impact could influence the decision to develop in the area).
≥ 20	High positive (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be

applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

10.2 Planning Phase Impacts

10.2.1 Burial Grounds and Graves

Six burial grounds and graves were identified in the fieldwork phase. All burial grounds and graves have high heritage significance.

The impact would be damage to identified graves and burial grounds due to earth-moving or vegetation clearance activities prior to the drill site establishment.

The pre-mitigation Environmental Risk impact significance is rated as Medium, but with the implementation of the required mitigation measures the post-mitigation ER impact will be Low. The overall Environmental significance will be Low negative.

10.2.1.1 Mitigation Measures

Mitigation measures would include fencing of the identified graves and burial grounds and strict avoidance of these sites with a buffer zone of at least 50m.

10.2.1.2 Cumulative Impacts

Cumulative impacts are unknown at this stage but are likely to be Medium.

10.2.1.3 Irreplaceable Loss of Resources

Any damage or destruction that occurs to a grave or burial ground is very likely to result in the irreplaceable loss of resources of high value to the community associated with the grave and or burial ground.

10.2.1.4 Impact on Alternatives Considered

As the proposed activity is prospecting which depends on the presence of specific mineral resources, no alternatives are considered.

10.2.2 Historical Structures

The fieldwork identified five sites containing historical structures within the Kookfontein study area.

The impact would be damage to identified historical structures due to earth-moving or vegetation clearance activities prior to the drill site establishment.

The pre-mitigation Environmental Risk impact significance is rated as Medium negative, and with the implementation of the required mitigation measures the post-mitigation ER impact will be Low. The overall Environmental significance would be Medium negative.

10.2.2.1 Mitigation Measures

Mitigation measures would include avoidance of these sites with a buffer zone of at least 50m, especially for site KF008.

10.2.2.2 Cumulative Impacts

Cumulative impacts would be the further damage or destruction to structures that are already in a demolished or dilapidated state, which is likely to be due to various previous activities. This is likely to be Low in the Planning phase

10.2.2.3 Irreplaceable Loss of Resources

Any damage or destruction that occurs to these historic structures is very likely to result in the irreplaceable loss of these resources.

10.2.2.4 Impact on Alternatives Considered

As the proposed activity is prospecting to confirm the presence of mineral resources, no alternatives are considered.

10.2.3 Archaeological Site (Redan engraving site)

The known formally protected Redan archaeological engraving site (a declared Provincial Heritage site) is located within the study area and at least one archaeological find spot was identified within the study area in a previous HIA study.

The impact would be damage to identified archaeological resources due to earth-moving or vegetation clearance activities prior to the drill site establishment.

The pre-mitigation Environmental Risk impact significance for the Provincial Heritage Site is rated as Medium negative, and with the implementation of the required mitigation measures the post-mitigation ER impact will be Low negative. The overall Environmental significance would be Low to medium negative.

10.2.3.1 Mitigation Measures

As Redan is a Provincial Heritage Site, this site should be flagged as a “no go” area and be demarcated with a buffer zone of at least 200m.

10.2.3.2 Cumulative Impacts

Cumulative impacts would be the further damage or destruction to both known and unknown archaeological resources that are already in a damaged state, which is likely to be due to various previous activities. This is likely to be High.

10.2.3.3 Irreplaceable Loss of Resources

Any damage or destruction that occurs to these archaeological resources will result in the irreplaceable loss of these resources.

10.2.3.4 Impact on Alternatives Considered

As the proposed activity is prospecting to confirm the presence of mineral resources, no alternatives are considered.

10.2.4 Palaeontology

No Impacts are expected to occur during the Planning Phase

10.3 Construction Phase Impacts

10.3.1 Burial Grounds and Graves

The impact would be damage to the six identified graves and burial grounds due to activities associated with the drill site establishment.

The pre-mitigation Environmental Risk impact significance is rated as Medium negative, and with the implementation of the required mitigation measures, the post-mitigation ER impact would become Low negative. The overall Environmental significance will be Low to Medium negative.

10.3.1.1 Mitigation Measures

Mitigation measures will be the same as for the Planning Phase.

10.3.1.2 Cumulative Impacts

Cumulative impacts would be the same as for the Planning Phase.

10.3.1.3 Irreplaceable Loss of Resources

This will be the same as for the Planning Phase.

10.3.1.4 Impact on Alternatives Considered

As the proposed activity is prospecting which depends on the presence of specific mineral resources, no alternatives are considered.

10.3.2 Historical Structures

The impact would be damage to identified historical structures due to activities associated with the drill site establishment.

It is anticipated that the construction phase impacts would be substantially the same as those for the planning phase.

10.3.2.1 Mitigation Measures

Mitigation measures would be substantially the same as for the Planning phase..

10.3.2.2 Cumulative Impacts

Cumulative impacts would be the further damage or destruction to structures that are already in a demolished or dilapidated state, which is likely to be due to various previous activities. This is likely to be Medium.

10.3.2.3 Irreplaceable Loss of Resources

Any damage or destruction that occurs to these historic structures is very likely to result in the irreplaceable loss of these resources.

10.3.2.4 Impact on Alternatives Considered

As the proposed activity is prospecting to confirm the presence of mineral resources, no alternatives are considered.

10.3.3 Archaeological Site (Redan engraving site)

There is one known formally protected archaeological site (Redan rock engraving site) located within the study area and at least one previously archaeological find spot was identified in a previous study. Thus, there is potential for an unknown number of archaeological sites or material to be present on the property.

The impact would be damage to identified or unknown archaeological resources due to activities associated with drill site establishment.

The pre-mitigation Environmental Risk impact significance for the Provincial Heritage Site (Redan) is rated as High negative, and with the implementation of the required mitigation measures the post-mitigation ER impact will be Low negative. The overall Environmental significance would be Medium negative.

10.3.3.1 Mitigation Measures

Mitigation measures would be substantially the same as for the Planning phase.

10.3.3.2 Cumulative Impacts

Cumulative impacts would be the further damage or destruction to a site that is already in a damaged state, which is likely to be due to various previous activities. This would be High.

10.3.3.3 Irreplaceable Loss of Resources

Any damage or destruction that occurs to the Redan Provincial Heritage Site will result in the irreplaceable loss of these resources.

10.3.3.4 Impact on Alternatives Considered

As the proposed activity is prospecting to confirm the presence of mineral resources, no alternatives are considered.

10.3.4 Palaeontology

The impact will destroy fossil heritage or permanently seal-in fossils at or below the ground surface. These fossils will no longer be available for research.

The drill site establishment activities on the Kookfontein study area will disturb and penetrate the underlying bedrock. According to the Geology of the project site there is a High to Very High possibility of finding fossils.

10.3.4.1 Mitigation measures

It is recommended that an EIA level palaeontology report should be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts identified during the scoping phase. A Phase 1 field-based assessment will be conducted and research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase

10.3.4.2 Cumulative Impacts

A few mining activities are present in the area and thus the cumulative impact is rated as Medium.

10.3.4.3 Irreplaceable Loss of Resources

Impacts on fossil heritage are irreversible. Scientifically all well-documented reports and palaeontological studies of any fossils uncovered during construction would be a positive impact. A negative impact on the fossil heritage can be limited by the application of adequate damage mitigation procedures. If damage mitigation is properly undertaken the benefit scale for the project will lie within the beneficial category.

10.3.4.4 Impact on Alternatives Considered

As the proposed activity is prospecting which depends on the presence of specific mineral resources, no alternatives are considered.

10.4 Operational Phase Impacts

10.4.1 Burial Grounds and Graves

It is anticipated that the operation phase impacts would be substantially the same as those for the Construction phase.

10.4.1.1 Mitigation Measures

Mitigation measures will be the same as for the Construction Phase.

10.4.1.2 Cumulative Impacts

Cumulative impacts would be the same as for the Construction Phase.

10.4.1.3 Irreplaceable Loss of Resources

This will be the same as for the Construction Phase.

10.4.1.4 Impact on Alternatives Considered

As the proposed activity is prospecting which depends on the presence of specific mineral resources, no alternatives are considered.

10.4.2 Historical Structures

It is anticipated that the operations phase impacts would be substantially the same as those for the Construction phase.

10.4.2.1 Mitigation Measures

Mitigation measures would be substantially the same as those for the Construction phase.

10.4.2.2 Cumulative Impacts

Cumulative impacts would be the further damage or destruction to structures that are already in a demolished or dilapidated state, which is likely to be due to various previous activities. This is likely to be Medium.

10.4.2.3 Irreplaceable Loss of Resources

Any damage or destruction that occurs to these historic/recent structures is very likely to result in the irreplaceable loss of these resources.

10.4.2.4 **Impact on Alternatives Considered**

As the proposed activity is prospecting to confirm the presence of mineral resources, no alternatives are considered.

10.4.3 **Archaeological Site (Redan engraving site)**

It is anticipated that the operations phase impacts would be substantially the same as those for the construction phase.

10.4.3.1 **Mitigation Measures**

Mitigation measures would be substantially the same as those for the Construction phase .

10.4.3.2 **Cumulative Impacts**

Cumulative impacts would be the further damage or destruction to structures that are already in a damaged state, which is likely to be due to various previous activities. This would be High.

10.4.3.3 **Irreplaceable Loss of Resources**

Any damage or destruction that occurs to the Redan Provincial Heritage Site will result in the irreplaceable loss of these resources.

10.4.3.4 **Impact on Alternatives Considered**

As the proposed activity is prospecting to confirm the presence of mineral resources, no alternatives are considered.

10.4.4 **Palaeontology**

It is anticipated that the operations phase impacts would be substantially the same as those for the construction phase.

10.5 **Decommissioning Phase Impacts**

10.5.1 **Burial Grounds and Graves**

It is anticipated that the decommissioning phase impacts would be substantially the same as those for the operation phase.

10.5.2 **Historical Structures**

It is anticipated that the decommissioning phase impacts would be substantially the same as those for the operational phase

10.5.3 **Archaeological Site (Redan engraving site)**

It is anticipated that the operations phase impacts would be substantially the same as those for the construction phase

10.5.4 **Palaeontology**

No Impacts will occur during the Decommissioning Phase.

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10.6 Rehabilitation and Closure Phase Impacts

10.6.1 Burial Grounds and Graves

It is anticipated that the Rehabilitation and closure phase impacts would be substantially the same as those for the Decommissioning phase.

10.6.2 Historical Structures

It is anticipated that the Rehabilitation and closure phase impacts would be substantially the same as those for the Decommissioning phase

10.6.3 Archaeological Site (Redan engraving site)

It is anticipated that the operations phase impacts would be substantially the same as those for the Decommissioning phase

10.6.4 Palaeontology

No Impacts will occur during the Rehabilitation and Closure Phase

Table 13: Impact table for heritage resources

IMPACT DESCRIPTION			Pre-Mitigation							Post Mitigation						Priority Factor Criteria					
Identifier	Impact	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
10.2.1 Burial Grounds and Graves	Damage/d estruction of graves	Planning	-1	1	5	5	5	3	-12	-1	1	4	2	4	2	-5,5	High	2	3	1,3 8	- 7, 56
(KF001, KF002, KF005, KF006, KF007, KF010)	Damage/d estruction of graves	Constru ction	-1	1	5	5	5	4	-16	-1	1	4	2	4	2	-5,5	High	2	3	1,3 8	- 7, 56
	Damage/d estruction of graves	Operati on	-1	1	5	5	5	4	-16	-1	1	4	2	4	2	-5,5	High	2	3	1,3 8	- 7, 56
	Damage/d estruction of graves	Decom missioning	-1	1	5	5	5	4	-16	-1	1	4	2	4	2	-5,5	High	2	3	1,3 8	- 7, 56
	Damage/d estruction of graves	Rehab and closure	-1	1	5	5	5	3	-12	-1	1	4	2	4	2	-5,5	High	2	3	1,3 8	- 7, 56
10.2.2 Historic al structu res- Klip Power & Springfi eld Colliery	Damage/d estruction to structures	Planning	-1	1	5	3	5	3	-10,5	-1	1	3	3	3	2	-5	High	2	2	1,2 5	- 6, 25
KF009, KF011, KF012, KF013)	Damage/d estruction to structures	Constru ction	-1	1	5	3	5	4	-14	-1	1	3	3	3	2	-5	High	2	2	1,2 5	- 6, 25

IMPACT DESCRIPTION			Pre-Mitigation							Post Mitigation						Priority Factor Criteria					
Identifier	Impact	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
	Damage/destruction to structures	Operation	-1	1	5	3	5	4	-14	-1	1	3	3	3	2	-5	High	2	2	1,25	-6,25
	Damage/destruction to structures	Decommissioning	-1	1	5	3	5	4	-14	-1	1	3	3	3	2	-5	High	2	2	1,25	-6,25
	Damage/destruction to structures	Rehab and closure	-1	1	5	3	5	3	-10,5	-1	1	3	3	3	2	-5	High	2	2	1,25	-6,25
10.2.3 Historical Structures - Farmstead (KF008)	Damage/destruction of structures	Planning	-1	1	5	4	5	3	-11,25	-1	1	5	5	5	2	-8	High	2	2	1,25	-10,00
	Damage/destruction of structures	Construction	-1	1	5	4	5	4	-15	-1	1	5	5	5	2	-8	High	2	2	1,25	-10,00
	Damage/destruction of structures	Operation	-1	1	5	4	5	4	-15	-1	1	5	5	5	2	-8	High	2	2	1,25	-10,00
	Damage/destruction of structures	Decommissioning	-1	1	5	4	5	4	-15	-1	1	5	5	5	2	-8	High	2	2	1,25	-10,00
	Damage/destruction of structures	Rehab and closure	-1	1	5	4	5	3	-11,25	-1	1	5	5	5	2	-8	High	2	2	1,25	-10,00

IMPACT DESCRIPTION			Pre-Mitigation							Post Mitigation						Priority Factor Criteria					
Identifier	Impact	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable loss	Priority Factor	Final score
10.2.3 Redan Archaeological Site (KF004)	Damage/destruction of site	Planning	-1	1	5	5	5	4	-16	-1	1	4	3	5	2	-6,5	High	3	3	1,50	-9,75
	Damage/destruction of site	Construction	-1	1	5	5	5	5	-20	-1	1	4	3	5	3	-9,75	High	3	3	1,50	-14,63
	Damage/destruction of site	Operation	-1	1	5	5	5	5	-20	-1	1	4	3	5	3	-9,75	High	3	3	1,50	-14,63
	Damage/destruction of site	Decommissioning	-1	1	5	5	5	5	-20	-1	1	4	3	5	3	-9,75	High	3	3	1,50	-14,63
	Damage/destruction of site	Rehab and closure	-1	1	5	5	5	4	-16	-1	1	4	3	5	2	-6,5	High	3	3	1,50	-9,75

11 HERITAGE MANAGEMENT PLAN FOR EMPR IMPLEMENTATION

Table 14: Identified Heritage Resources to be impacted during invasive prospecting activities

No.	Mitigation Measures	Phase	Timeframe	Responsible Party for Implementation	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
1. Burial Grounds and Graves							
A	The six identified grave and burial ground sites (KF001, KF002, KF005, KF006, KF007, KF010) could be impacted by the planned prospecting activities. All six sites should be avoided and retained in situ with a buffer zone of at least 50m. All graves and burial grounds are protected under Section 36 of the NHRA.	Planning Construction Operation Decommissioning	Prior to construction and ongoing through drilling operations	Applicant ECO Heritage Specialist	ECO (Monthly)	Ensure compliance with relevant legislation	(ECO Monthly Checklist/Report)
B	A "Chance Finds" procedure must be implemented during the proposed prospecting activities to manage the discovery of unmarked graves during the proposed prospecting activities.	Planning Construction Operation Decommissioning	Prior to construction and ongoing through drilling operations	Applicant ECO	ECO (Monthly)	Ensure compliance with relevant legislation	(ECO Monthly Checklist/Report)
2. Historical structures							
A	The five sites with historical structures (KF008, KF009, KF011, KF012, KF013) could be impacted by the planned prospecting activities. Such structures should be avoided with at least a 50 m buffer if activities should occur near them (especially site KF008). Structures older than 60 years are protected under Section 34 of the NHRA. If any additional structures are identified SAHRA should be contacted and a qualified archaeologist appointed to evaluate the structures and make appropriate recommendation on mitigation.	Construction Operation Decommissioning	Prior to construction and ongoing through drilling operations	Applicant Contractor	ECO (Monthly)	Ensure compliance with relevant legislation	(ECO Monthly Checklist/Report)
B	Structures that are younger than 60 years do not require mitigation (KF003).	Construction Operation Decommissioning	Prior to construction and ongoing through drilling operations	Applicant Contractor	ECO (Monthly)		
3. Archaeological Resources							
A	The identified Provincial Heritage site of Redan Rock Engravings (KF004) is protected under Section 27 of the	Construction Operation	Prior to construction and ongoing through drilling operations	Applicant Contractor	ECO (Monthly)	Ensure compliance	(ECO Monthly Checklist/Report)

No.	Mitigation Measures	Phase	Timeframe	Responsible Party for Implementation	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
	NHRA. It should be totally avoided and demarcated as a “no go” area with a buffer zone of at least 200m.	Decommissioning Rehab and closure				with relevant legislation	
B	All archaeological resources are protected under Section 35 of the NHRA. A “chance finds” procedure should be implemented to manage the discovery of archaeological resources during the proposed prospecting activities.	Construction Operation Decommissioning	Prior to construction and ongoing through drilling operations	Applicant Contractor	ECO (Monthly)		
4. Palaeontology							
A	An EIA level palaeontology report should be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage	Construction Operation	Prior to construction	Applicant Palaeontologist	ECO (Monthly)	Ensure compliance with relevant legislation	(ECO Monthly Checklist/Report)

12 Conclusion

12.1 Conclusions and Recommendations

The HIA identified thirteen heritage resources within the Kookfontein study area, including six informal burial grounds and possible grave sites, five sites containing historical structures and one known archaeological site which is a Provincial Heritage site (Redan Rock Engravings), some of which could be impacted during invasive prospecting activities.

12.1.1 Burial Grounds and Graves

The impact would be damage to the six identified graves and burial grounds due to activities associated with the drill site establishment. Mitigation measures would include avoidance of these sites with a buffer of at least 50m.

The pre-mitigation Environmental Risk impact significance is rated as Medium negative, and with the implementation of the required mitigation measures, the post-mitigation ER impact would become Low negative. The overall Environmental significance will be Low to Medium negative.

12.1.2 Historical Structures

The HIAS study identified five sites containing historical structures within the Kookfontein study area. Mitigation measures would include avoidance of these sites with a buffer of at least 50m (especially site KF008).

The pre-mitigation Environmental Risk impact significance is rated as Medium negative, and with the implementation of the required mitigation measures the post-mitigation ER impact will be Low. The overall Environmental significance would be Medium negative.

12.1.3 Archaeological Site (Redan engraving site)

There is one known formally protected archaeological site (Redan rock engraving site) located within the study area and at least one previously archaeological find spot was identified in a previous study. . This site should be demarcated as a “no go” area with a buffer zone of at least 200m.

The pre-mitigation Environmental Risk impact significance for the Provincial Heritage Site (Redan) is rated as High negative, and with the implementation of the required mitigation measures the post-mitigation ER impact will be Low negative. The overall Environmental significance would be Medium negative.

12.1.4 Palaeontology

Banzai Environmental was appointed by PGS Heritage (Pty) Ltd to conduct the Palaeontological Desktop Assessment (PDA) of the Kookfontein prospecting right study area. This study found that the geology of the proposed Kookfontein study area is primarily underlain by the Vryheid Formation (Ecca Group, Undifferentiated Karoo), Precambrian dolomites and associated marine sedimentary rocks that are allocated to the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup), as well as Quaternary superficial deposits. According to the PalaeoMap on the SAHRIS database, the Palaeontological Sensitivity of the Vryheid Formation (Ecca Group, Undifferentiated Karoo) is Very High, while that of the Malmani Subgroup and Quaternary deposits are both High (Almond and Pether 2008, SAHRIS website). Groenewald and Groenewald (2014) allocated a High Sensitivity to the Malmani Subgroup as they noted that, in addition to the stromatolites, potentially fossiliferous Late Cenozoic Cave breccias within the “Transvaal dolomite” outcrop area could be present. These breccias are not individually mapped on geological maps (Butler 2020).

It is thus recommended that an EIA level palaeontology report should be conducted to assess the value and prominence of fossils in the development area and the effect of the proposed development on the palaeontological heritage. The purpose of the EIA Report is to elaborate on the issues and potential impacts

identified during the scoping phase. A Phase 1 field-based assessment would be conducted with research in the site-specific study area as well as a comprehensive assessment of the impacts identified during the scoping phase.

12.1.5 General

The combined considered opinion of the heritage specialists is that the potential impacts on identified heritage resources could be mitigated sufficiently to allow the project to continue.

13 Assumptions, Uncertainties and Gaps in Knowledge

- This Heritage report is only applicable to the proposed Kookfontein Prospecting Application area as depicted in **Figure 2** above;
- Most of the study area was accessible for the fieldwork survey, except for the Ocon Bricks property.
- Therefore, should any heritage features and/or objects be located or observed outside the identified heritage sensitive areas during the prospecting activities, a heritage specialist must be contacted immediately.
- 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.

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15 Appendices

Appendix A: Specialist CVs

JENNIFER KITTO

Professional Heritage Specialist – PGS Heritage

EDUCATION:

Name of University or Institution: Dorset Institute for Higher Education (now Bournemouth University), Poole, United Kingdom

Degree obtained: :Higher National Diploma: Practical Archaeology

Year :1989

Name of University or Institution : University of the Witwatersrand

Degree obtained : BA

Major subjects :Archaeology and Social Anthropology

Year :1993

Name of University or Institution :University of the Witwatersrand

Degree obtained : BA [Hons]

Major subjects :Social Anthropology

Year : 1994

Professional Qualifications:

Member - Association of Southern African Professional Archaeologists – Technical Member No. 444

KEY QUALIFICATIONS

Cultural Resource Management and Heritage Impact Assessment Management, Historical and Archival Research, Archaeology, Anthropology, Applicable survey methods, Fieldwork and Project Management.

SUMMARY OF EXPERIENCE

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

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
- Heritage Audits and subsequent Compilation of Heritage Management Policy for various projects

HERITAGE ASSESSMENT PROJECTS

Below a selected list of Heritage Impact Assessments (HIA) and Heritage Audit and Management Projects completed:

- Heritage Screening Reports for Various Road Routes: Bronkhorstspuit, Carletonville and Randfontein and Eikenhof-Vaal Dam regions, Gauteng Department of Roads and Transport, Gauteng Province
- Heritage Audit and Management Policy, Sibanye Gold, Beatrix Mining area, Lejweleputswa District Municipality, Free State Province
- Heritage Audit and Management Policy, Sibanye Gold, Kloof and Driefontein Mining areas, West Rand District Municipality, Gauteng Province
- HIA Report, Dolos-Giraffe Substation, Hopefield-Bultfontein, Free State Province
- HIA Report and Phase 2 Mitigation Report, AEL Mining Services, Decontamination of AEL Detonator Campus, Modderfontein Factory, Modderfontein, City of Johannesburg Metropolitan Municipality, Gauteng

- HIA Report, Old Rand Leases Hostel redevelopment, Fleurhof Ext 10, Roodepoort, City of Johannesburg Metropolitan Municipality, Gauteng
- HIA Report, Watershed Substation, North-West Province
- HIA Report, Solid Waste Landfill Facility, Rhodes Village, Eastern Cape
- HIA Report, Solid Waste Landfill Facility, Rossouw, Eastern Cape
- Phase 2 Mitigation Report, Cass Farmstead, Optimum Colliery, Mpumalanga
- HIA Report, Kusile Ash Disposal Facility, Witbank, Mpumalanga
- Report on Rand Steam Laundries Background History, City of Johannesburg Metropolitan Municipality, Gauteng
- New Cemetery, Barkly East, Senqu Municipality, Eastern Cape (desktop/archival research for HIA report)
- Lady Slipper Country Estates, Nelson Mandela Metro Municipality, Eastern Cape (desktop/archival research for HIA report)
- Exxaro Resources Paardeplaats Project, Belfast, Mpumalanga (field survey and archival research for HIA report)
- Copperleaf Mixed Use Development, Farm Knoppieslaagte 385/Knopjeslaagte 140, Centurion, Gauteng (field survey and archival research for HIA report)
- Isundu-Mbewu Transmission Line Project, Pietermaritzburg, Kwazulu Natal (Initial Heritage Scan (survey) for Corridor 3 Alternative 1)

GRAVE RELOCATION PROJECTS

Below, a selection of grave relocation projects involvement:

- Mitigation Report on previous Grave Relocation and Permit applications for Test Excavation of two possible graves, Nkomati Mine, Mpumalanga
- Relocation of two graves Olievenhoutbosch, Tshwane, Gauteng (applications to SAHRA, Gauteng Dept. of Health and Local Authorities for relevant permits)
- Relocation of graves HL Hall Family, Nelspruit, Mpumalanga (applications to SAHRA, Mpumalanga Department of Health and Local Authorities for relevant permits)
- Relocation of two possible graves Noordwyk Ext 63, Midrand, Johannesburg, Gauteng (applications to SAHRA, Gauteng Dept. of Health and Local Authorities for relevant permits)
- Relocation of informal cemetery (50+) and additional unknown graves (50+) at Fleurhof Extension 5, Roodepoort, Gauteng (desktop research and applications to SAHRA, Gauteng Health Department and Local Government for relevant permits in terms of the applicable legislation)
- Relocation of informal graves (9) at Tselentis Colliery, Breyten, Mpumalanga (applications to SAHRA, Mpumalanga Department of Health and Local Authorities for relevant permits)
- Relocation of various informal cemeteries at New Largo Mine, Balmoral, Mpumalanga (as above)
- Relocation of graves at Mookodi Power Station, Vryburg, North-West Province (initial social consultation)
- Relocation of graves at Hendrina Power Station, Hendrina, Mpumalanga (social consultation, permit applications, etc)

EMPLOYMENT SUMMARY:

Positions Held

- 2011 – to date: Heritage Specialist - PGS Heritage (Pty) Ltd
- 2008 – 2011: Cultural Heritage Officer (National), Burial Grounds and Graves Unit: South African Heritage Resources Agency (SAHRA)
- 1998 – 2008: Cultural Heritage Officer (Provincial), Provincial Office – Gauteng: SAHRA

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, Mauritius, Malawi and the Democratic Republic of the Congo