EXPANSION OF MINING ACTIVITIES ON PORTION 25 OF THE FARM WITBANK NO 262 IT, FERREIRA'S EXTENSION OF PENUMBRA MINE, NEAR ERMELO, GERT SIBANDE DISTRICT MUNICIPALITY, MPUMALANGA PROVINCE

Heritage Impact Assessment Report

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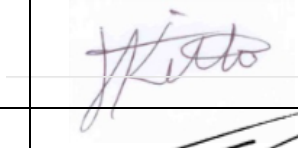
Client: Mashala Resources

Professional Grave Solutions (Pty) Ltd T/A PGS Heritage
PO Box 32542 Totiusdal 0134, T +27 12 332 5305 F: +27 86 675 8077
Reg No 2003/008940/07

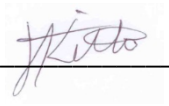
Report Title	***Heritage Impact Assessment for the proposed expansion of mining activities on the Penumbra Mine, Ferreira's Extension, Portion 25 of the farm Witbank No 262 IT, near Ermelo in the Gert Sibande District Municipality, Mpumalanga Province***		
Control	**Name**	**Signature**	**Designation**
Author	**J Kitto**		**Heritage Specialist**
Reviewed	**W Fourie**		**Heritage Specialist/ Principal Investigator**
Reviewed			

Declaration of Independence

The report has been compiled by PGS Heritage, an appointed Heritage Specialist for Mashala Resources. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in the Heritage Impact Assessment Process

HERITAGE CONSULTANT: PGS Heritage

CONTACT PERSON: Jennifer Kitto
Tel: +27 (0)12 332 5305
Cell: +27 (0)76 560 4114
Email: jennifer@gravesolutions.co.za

SIGNATURE: 

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CLIENT: Mashala Resources

CONTACT PERSON: Adri Joubert
Email: adri@geosoilwater.co.za
Tel: 082 926 8460
Fax: 086 654 3631

SIGNATURE: _____

EXECUTIVE SUMMARY

PGS Heritage was appointed by Mashala Resources to undertake a Heritage Impact Assessment (HIA) in advance of the proposed expansion of mining activities into the area known as Ferreira's Extension on Portion 25 of the farm Witbank No 262 IT, Penumbra Mine, Ermelo, Gert Sibande District Municipality, Mpumalanga Province.

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

Archival and Historical Maps

The following observations can be made as a result of the study of archival and historical maps of the study area:

- In 1901 the study area was entirely undeveloped and was likely characterised by farming activities.
- By 1970 considerable development had taken place within the study area and direct surroundings. This includes mining, as well as infrastructural development such as the construction of the railway line.

History

The archival and historical research has revealed a long and significant history in terms of the surroundings of the study area. However, even though this historical study was quite intensive and detailed, very little historical information with regard to the study area itself could be located.

No specific events from the historic overview can be linked to the study area itself.

Archaeology

No sites dating to the **Early or Middle Stone Age** are known from the Ermelo area.

Some shelters dating to the **Later Stone Age** in the present-day areas of Ermelo, Witbank and the rest of Mpumalanga have been investigated by archaeologists (Delius and Hay, 2009). However, no such sites are known in the study area.

No sites from the **Early Iron Age** period are known from the Ermelo area.

Welgelegen Shelter on the banks of the Vaal River near Ermelo, is a site dating to the **Middle Iron Age** which contained evidence that early farming and hunter-gatherer communities coexisted. Layers dating to AD 1200 provide evidence that the farmers with metal tools occupied the shelter while, what appears to be a dependent hunter-gatherer group, making typical LSA tools, and using pottery but no iron tools, occupied the less desirable overhang area (Esterhuysen and Smith, 2007).

Several rock art sites are known from the general Ermelo and surrounding area, however, none are known from the specific study area.

Palaeontology

Portion 25 of the farm Witbank 262 IT is entirely underlain by Permian aged sedimentary rocks of the Vryheid Formation (Pv) of the Ecca Group which forms part of the Karoo Supergroup. Some Jurassic aged Dolerite (Jd) sills are present towards the south and west of the study area.

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described.

There is a high and moderate possibility that fossils could be encountered during excavation of the Vryheid Formation. These fossil finds would be of international significance. The damage and/or loss of these fossils due to inadequate mitigation would be a highly negative palaeontological impact. The exposure and subsequent reporting of fossils (that would otherwise have remained undiscovered) to a qualified palaeontologist for excavation will be a beneficial palaeontological impact.

It is therefore recommended that a SAHRA Phase 1 Palaeontological Field Assessment of the identified high sensitive areas be done to:

- assess the immediate risk of potential exposed fossils as well as to document and sample these localities through an on-site field investigation;
- comment on the impact of the development on these exposed and/or potential fossil resources;
- make recommendations as to how the developer should conserve or mitigate damage to these resources.

Identified Heritage Sites

Utilising the archival study completed for the desktop study as a guide, the field work identified **four cultural-heritage sites, including three grave/cemetery sites,** of which the following will require further mitigation:

Historical Structures (FX-03; FX-04)

- Site **FX-03** contains the foundation remains of several structures, which may have been sheds or homesteads. No mitigation is required before demolition, except for possible infant burials under the foundations.
- Site **FX-04** consists of the remains of a homestead and kraal located close to the single grave (**FX-01**). There could be an association between these two sites. No mitigation is required before demolition, except for possible infant burials under the foundations.

Grave/Cemetery Sites

The three grave/ce*me*tery sites (FX-01; FX-02; FX-03) identified will require a process of public consultation and application for permits to be undertaken if they are planned to be relocated.

- **FX-01**: This site consists of a single small grave surrounded by a fence. The grave is stone-packed and has a headstone. This grave has been relocated in 29 April 2013.
- **FX-02**: This site consists of an informal cemetery, which contains ±55 graves. The graves are all stone-packed and probably belong to African farm workers. Some graves have headstones or metal markers. However, most of them do not have legible inscriptions. The cemetery has been surrounded by an earthen berm to mark and protect the graves.
- **FX-03**: Also at this site is an informal cemetery of 10-11 graves, which are stone-packed. It is located to the north-west of **site FX-02**. The remains of several structures are associated with these graves.

Conclusions and Recommendations

Further to these recommendations, the general Heritage Management Guidelines in **Section 7** need to be incorporated into the EMP for the project.

The overall impact of the development on heritage resources is seen as acceptably low and impacts can be mitigated to acceptable levels.

CONTENTS Page

LIST OF FIGURES

List of Appendices

1 INTRODUCTION

PGS Heritage was appointed by Mashala Resources to undertake a Heritage Impact Assessment (HIA) in advance of the proposed expansion of mining activities into the area known as Ferreira's Extension on Portion 25 of the farm Witbank No 262 IT, Penumbra Mine Ermelo, Mpumalanga Province.

1.1 Scope of the Study

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

1.2 Specialist Qualifications

This Heritage Impact Report was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 40 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.

Wouter Fourie, the principal Archaeologist, 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).

Jennifer Kitto, Heritage Specialist and Project Coordinator for this project, has 15 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.

Dr Gideon Groenewald, the appointed Palaeontologist for this project, holds a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technikon RSA (the University of South Africa) (1989). He specialises in

research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the existing dense vegetation in some parts of the study area. As such, should any heritage features and/or objects not included in the present inventory be located or observed, 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. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply, as set out below.

1.4 Legislative Context

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

i. National Environmental Management Act (NEMA) Act 107 of 1998
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
iv. Development Facilitation Act (DFA) Act 67 of 1995

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

i. National Environmental Management Act (NEMA) Act 107 of 1998
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)

c. Environmental Impacts Assessment (EIA) – Section (32)(2)(d)

d. EMP (EMP) – Section (34)(b)

ii. National Heritage Resources Act (NHRA) Act 25 of 1999

a. Protection of Heritage resources – Sections 34 to 36; and

b. Heritage Resources Management – Section 38

iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002

a. Section 39(3)

iv. Development Facilitation Act (DFA) Act 67 of 1995

a. The GNR.1 of 7 January 2000: Regulations and rules in terms of the Development Facilitation Act, 1995. Section 31.

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Among others, Section 34 (1) of the NHRA states that, "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…". The NEMA (No 107 of 1998) 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 accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive and legally compatible HIA report is compiled.

1.5 Terminology and Abbreviations

The following definitions are taken from the National Heritage Resources Act, No 25 of 1999 (Section 2. Definitions):

Archaeological resources

This includes:

i. 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;

ii. 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;

iii. 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;

iv. 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 the change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

i. construction, alteration, demolition, removal or change in use of a place or a structure at a place;
ii. carrying out any works on or over or under a place;
iii. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
iv. constructing or putting up for display signs or boards;
v. any change to the natural or existing condition or topography of land; and
vi. any removal or destruction of trees, or removal of vegetation or topsoil

Early Stone Age

The archaeology of the Stone Age between 400 000 and 2500 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 which 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

Holocene

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

Late Stone Age

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

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

The archaeology of the Stone Age between 30-300 000 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.

***T**erminology*

ABBREVIATIONS	DESCRIPTION
ASAPA	Association of Southern African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
ROD	Record of Decision
SAHRA	South African Heritage Resources Agency

Refer to **Appendix C** for further discussions on heritage management and legislative frameworks.

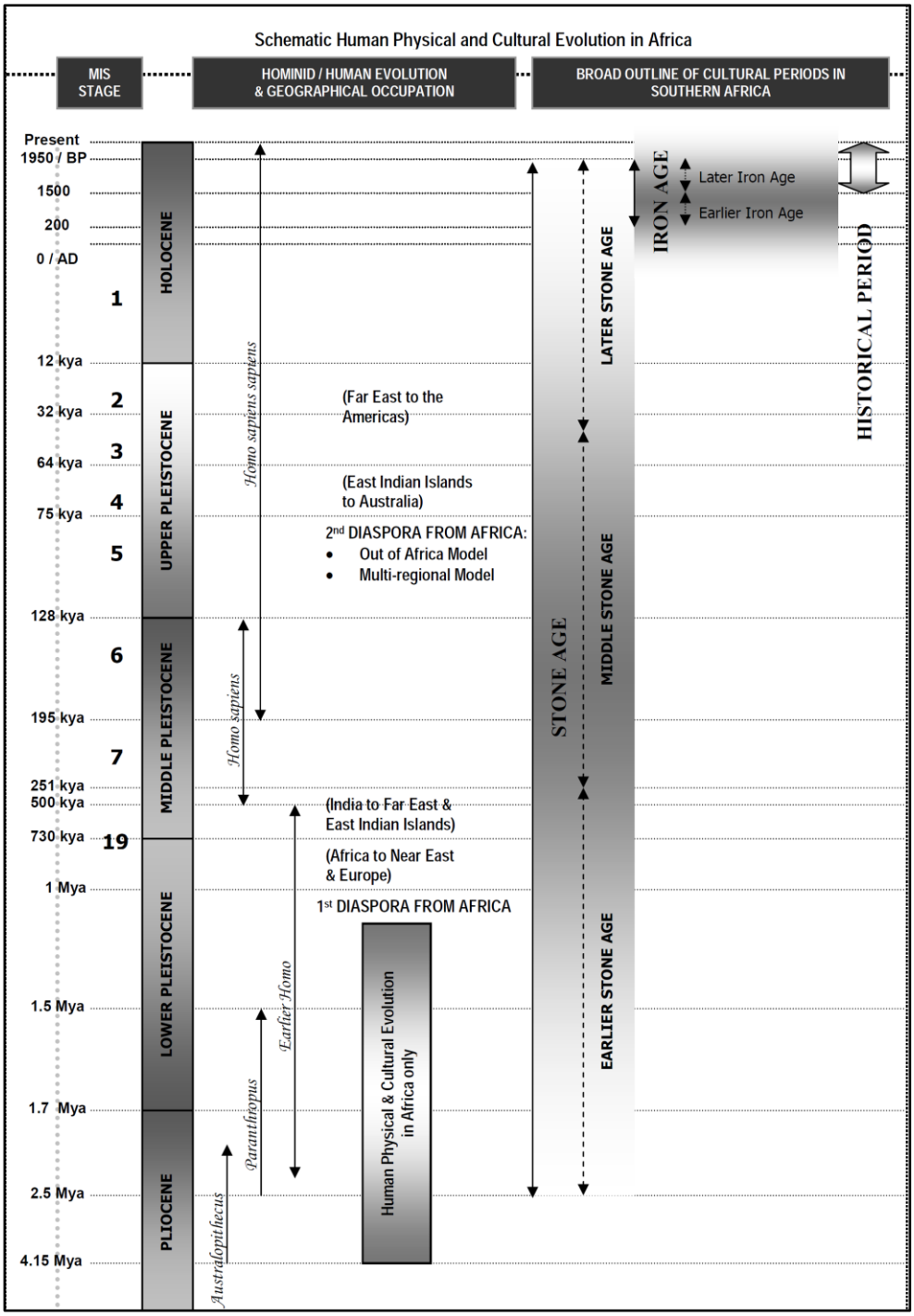

Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location

Location	Approximate Centre Point: S26°33'20.94" E30° 2'53.16" The proposed mining expansion site is situated on the Ferreira's Extension of the Penumbra Mine located approximately 7.2 km south-east of the town of Ermelo. The study area is located on Portion 25 of the farm Witbank No 262 IT, within the Gert Sibande District Municipality, Msukaligwa Local Municipality in the Mpumalanga Province.
Land	The study area is 26 Hectares of land in extent.
Land Description	The land is not currently utilised and comprises previously ploughed fields with secondary grass cover, as well as dense pockets containing planted vegetation in the form of black wattles, scattered over the study area.

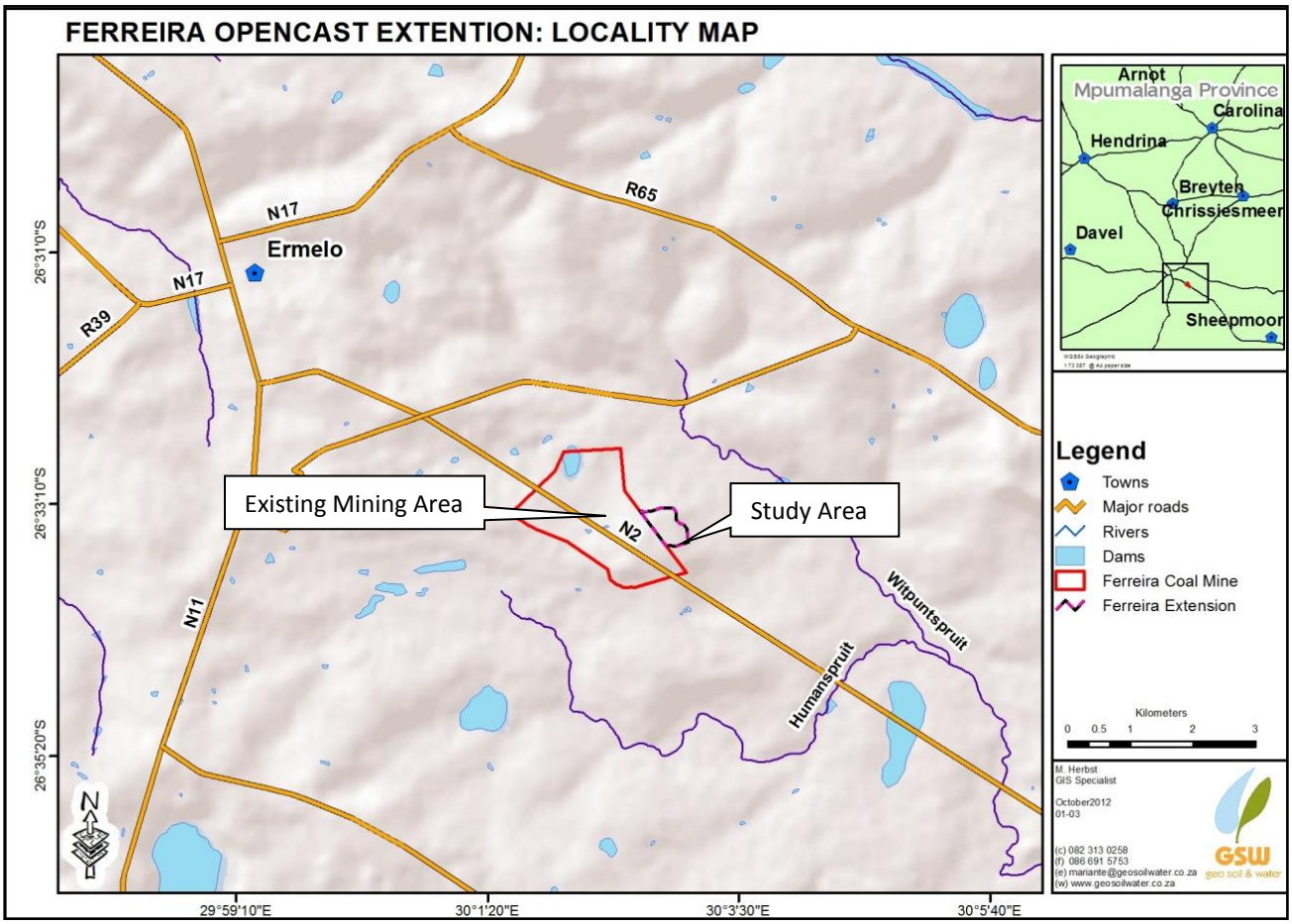

Figure 2 - Existing Mining Area (red polygon) showing study area (purple polygon) on the eastern boundary

2.2 Site Description

The current study area, proposed for the mining expansion site, is situated on the Ferreira's Extension of the Penumbra Mine and is located 7.2 kilometres to the south-east of the town of Ermelo, on Portion 25 of the farm Witbank No 262 IT, within the Gert Sibande District Municipality, Msukaligwa Local Municipality in the Mpumalanga Province.

The study area is located on fairly flat terrain that was previously used for farming and is now covered with secondary grassland, with several stands of trees scattered over the study area (**Figure 3** to **Figure 5**).

Figure 3 – General view of area, from north-east to south east

Figure 4 – General view across dry earth dam from west to east

Figure 5 – General view, showing stands of dense black wattle

2.3 Technical Project Description

The client proposes to expand the existing mining activities on the property, which consists of an opencast mining pit for extracting coal. The main area of the property to be affected is the western portion of the extension area (**Figure 6**).

Figure 6 – Location of the study area within its local context. (Modified version of a Google Earth map supplied by client)

3 ASSESSMENT METHODOLOGY

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

3.1 Methodology for Assessing Heritage Site significance

This Heritage Impact Assessment (HIA) report was compiled by PGS Heritage (PGS) in advance of the proposed expansion of mining activities into the area known as Ferreira's Extension on Portion 25 of the farm Witbank No 262 IT, Penumbra Mine, Ermelo, Mpumalanga Province. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:

Step I – Literature Review: The background information to the field survey relies greatly on the Heritage Background Research.

Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by a qualified archaeologist and other staff, which aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

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

The significance of identified 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:

Site Significance

Site significance classification standards prescribed by the SAHRA (2006) and approved by the ASAPA for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 1: Site significance classification standards as prescribed by SAHRA.

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	-	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	-	Low Significance	Destruction

3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

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

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 2**.

Table 2: Quantitative rating and equivalent descriptors for the impact assessment criteria

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

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

Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed, the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 3** below.

Table 3: Description of the significance rating scale

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.

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

Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 4**.

Table 4: Description of the significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect a route corridor / site not exceeding the boundary of the site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

Duration Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table** 5.

Table 5: Description of the temporal rating scale

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

Degree of Probability

The probability or likelihood of an impact occurring will be described as shown in **Table 6** below.

Table 6: Description of the degree of probability of an impact occurring

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

Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used, as discussed in **Table 7**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 7: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.

RATING	DESCRIPTION
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

Quantitative Description of Impacts

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

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

An example of how this rating scale is applied is shown below:

Table 8: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	Local	Medium Term	Could Happen	
Impact to heritage	2	3	3	3	1.6

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

The impact risk is classified according to 5 classes as described in the table below.

Table 9: Impact Risk Classes

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

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

4 CURRENT STATUS QUO

4.1 Archival findings

The aim of the archival background research is to identify possible heritage resources that could be encountered during the field work, as set out below and summarised in **Table 10**.

4.1.1 Cartographic and Archival Information

The archival research focused on available information sources (historical maps, literature survey, etc.) that were used to compile a background history of the study area and surrounds. This data then informed the possible heritage resources to be expected during field surveying of the current study area.

The Major Jackson series, "Amersfort" (sic) map, dating to 1900/1901, was consulted for any structures or graves that would be 60 years or older. No structures are marked in the study area on this map (**Figure 7**).

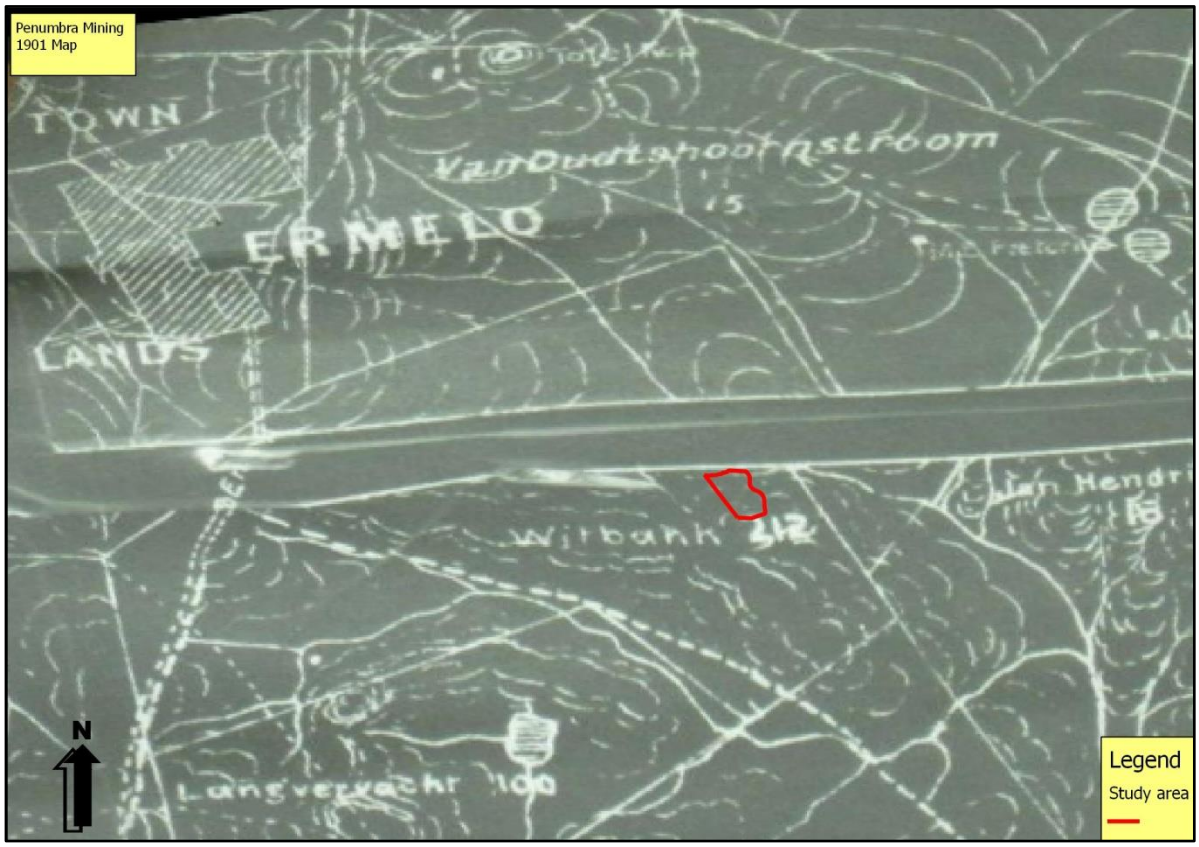

Figure 7 – Study area shown on Major Jackson Series, "Amersfort" Map, dated 1901

The 1:50 000 topographic map, 2630CA Camden First Edition, (aerial photography 1963, surveyed in 1968 and drawn in 1970) was examined for information on structures that are 60 years or older. This map does indicate at least one structure in the study area which may be 60 years or older (shown

circled in purple on Figure 8). However, that structure was no longer extant at the time of the current survey. These structures were demolished in 2011 after an application for destruction was lodged with the Mpumalanga provincial Heritage Authority. We were unable to locate a map for the study area that dates between 1901 and 1970.

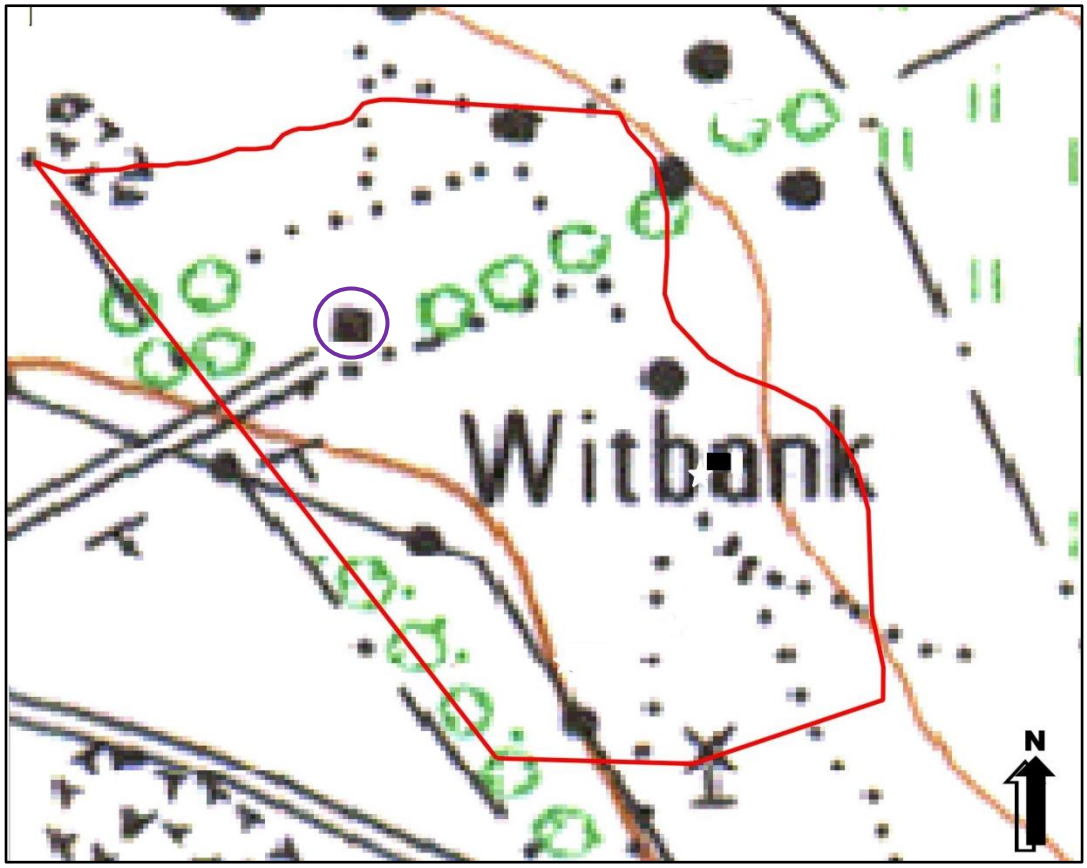

Figure 8 – The study area shown on the 1:50 000 topographic map, 2630CA Camden First Edition (with single structure circled in purple)

4.1.2 Archaeological and Historical Information

The archaeological and historical literature search provided the following information, which has been compiled into an overview of the significant archaeological and historical sites and events relevant to the study area and surrounding landscape.

Table 10: Historical and Archaeological Overview of the Study Area and Surroundings

DATE	DESCRIPTION
2.5 million to 250,000 years ago	The **Earlier Stone Age (ESA)** is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these technological phases is known as Oldowan and is associated with crude flakes and hammer stones which date to approximately 2 million

	years ago. The second technological phase in the Earlier Stone Age of Southern Africa is known as the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial handaxe. The Acheulian phase dates back to approximately 1.5 million years ago. The site of Maleoskop on the farm Rietkloof in Groblersdal is one of only a few places in Mpumalanga where ESA artefacts have been found to date. Erosion gullies along the Rietspruit revealed concentrations of ESA stone tools. These stone tools consisted of choppers (Olduwan), hand axes, and cleavers (Acheulean). (Esterhuysen and Smith, 2007) No sites from this period are known from the Ermelo area.
250,000 to 40,000 years ago	The **Middle Stone Age** is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called prepared-core technique. Evidence for this period has been excavated from Bushman Rock Shelter, a well-known site situated on the farm Klipfonteinhoek in the Ohrigstad District (Esterhuysen and Smith, 2007). No sites from this period are known from the Ermelo area.
40,000 years ago to the historic past	The **Later Stone Age** is the third phase identified in South Africa's Stone Age history. This phase in human history is associated with an abundance of very small stone artefacts or microliths. Archaeologists have investigated some of the old shelters in the present-day areas of Witbank, Ermelo, Barberton, Nelspruit, White River, Lydenburg, and Ohrigstad. (Delius and Hay, 2009).
AD 200 – AD 900	The earliest phase in the Iron Age history of Southern African is known as the **Early Iron Age**. No sites from this period are known from the Ermelo area.
AD 900 – AD 1300	The second phase in the Iron Age history of Southern Africa is known as the **Middle Iron Age**. Evidence from Welgelegen Shelter on the banks of the Vaal River near Ermelo, suggests early farming and hunter-gatherer communities coexisted. Layers dating to AD 1200 provide evidence that the farmers with metal tools occupied the shelter, while what appears to be a dependent hunter-gatherer group, making typical LSA tools, and using pottery but no iron tools, occupied the less desirable overhang area. (Esterhuysen and Smith, 2007)
AD 1300 – AD 1850	The third and final phase in the Iron Age history of Southern Africa is known as the **Late Iron Age**. Bergh (1999) identifies two main Late Iron Age groups within the wider vicinity of the Ermelo area, namely the Phuthing and the Khumalo Ndebele (Matabele).

	Furthermore, Lombard (1980) states that corbelled stone huts (which are also associated with the Late Iron Age) are found on the farms Tafelkop 270 and Middelplaat 271. These farms are located some 14 kilometres north-west of the present study area. According to Huffmann (2007), corbelled stone huts appear to be associated with the so-called Type V Iron Age sites. These Type V settlements date from the period 1700 to 1850. Lombard (1980) also mentions a Late Iron Age group he refers to as the Nhlapo people and indicates that when the first white people came to stay in the Ermelo district they already found the Nhlapo people in the vicinity of Maviristad. Myburgh (1956) also refers to the followers of George Nhlapo, who resided on the farm Witbank in the Ermelo District.
1821	In this year the Matabele of Mzilikazi moved out of present-day KwaZulu Natal and encountered the Phuthing along the upper reaches of the Vaal and Olifants Rivers. This area was located north-west of present-day Ermelo, roughly between this town and Hendrina. After the Phuthing were attacked and defeated by the Matabele, they were forced to flee in a southern direction over the Vaal River. In turn, the Matabele moved to the banks of the Vaal River where they established themselves between 1823 and 1827 (Bergh, 1999).
Early 1860s	During the early 1860s, the first Voortrekker families started establishing themselves in the present-day Ermelo area. Some of these early white residents include Hendrik Teodor Bührmann, Nicolaas Jacobus Breytenbach and F.P. van Rhede van Oudtshoorn (Lombard, 1980).
12 February 1880	The town of Ermelo was officially proclaimed on this day by the Administrator of the Transvaal, William Owen Lanyon (Lombard, 1980).
26 October 1882	The District of Ermelo was officially proclaimed on this day (Bergh, 1999).
1899 – 1902	Although no evidence for battles or skirmishes within or in the direct vicinity of the study area during the South African War could be found, Van der Westhuizen (2000) refers to the fact that the hill known as Bührmannstafelkop was used by the British as a military hospital during the war. The hill is located approximately 3 km north by north-east of the study area. The closest known battle of the South African War took place at the farm

	Onverwacht, on a ridge of the Bankkop Hills, about 30km east of Ermelo. The battle took place on 4 January 1902. During the previous month eight British columns under the leadership of Major General Bruce Hamilton had been searching for General Louis Botha who was known to be in the area with a force of about 700 men. A couple of incidents in the days preceding 4 January gave the British a clear indication that Botha's force might be hiding in the Bankkop hills. In the morning of 4 January, General Botha told his generals Brits, Opperman and Chris Botha that he had received information that the advance guard of a British column was approaching. His generals advocated a strike against the enemy. Brits planned the attack and the placing of the commandos. They were from Wakkerstroom, Swaziland, Standerton and Ermelo. The Boer forces were hidden in various kloofs and ravines around the ridge and a decoy was arranged, with a few Boers driving some cattle over the ridge, within sight of the British forces. When some of the British advance guard followed the Boer decoy over the ridge, the rest of the Boers opened fire and emerged from the ravine where they had been hiding. The Boers heavily outnumbered the membes of the advance guard and managed to isolate a small group on a spur of the ridge. However, the British managed to send a galloper to summon the two main British columns. General Opperman was killed during the action and the young burgher who was in charge of Louis Botha's young son was fatally wounded. By the end of the assault the Boers had captured thirty unwounded horses, but very few rifles and little ammunition. Boer casualties were heavy and almost certainly more than the 23 killed on the British side. By the time the advance element of the main Brfitish column arrived the Boers had retreated and scattered in all directions. Onverwacht was the last aggressive action of Botha's commando in the eastern Transvaal. (Smith, 2004)
1914	The Bellevue coal mine was opened in this year. On 7 July 1916 the Bellevue Colliers Company Limited was registered (Lombard, 1980). The mine is approximately 1.3 km north-west of the study area.

4.2 Palaeontology of the area

The following section is an extract from the Palaeontological Desktop Study, attached as **Appendix B**.

Portion 25 of the farm Witbank 262 IT is entirely underlain by Permian aged sedimentary rocks of the Vryheid Formation (Pv) of the Ecca Group which forms part of the Karoo Supergroup. Some Jurassic aged Dolerite (Jd) sills are present towards the south and west of the study area.

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described.

There is a high and moderate possibility that fossils could be encountered during excavation of the Vryheid Formation. These fossil finds would be of international significance. The damage and/or loss of these fossils due to inadequate mitigation would be a highly negative palaeontological impact. The exposure and subsequent reporting of fossils (that would otherwise have remained undiscovered) to a qualified palaeontologist for excavation will be a beneficial palaeontological impact.

It is therefore recommended that a SAHRA Phase 1 Palaeontological Field Assessment of the identified high sensitive areas be done to:

- assess the immediate risk of potential exposed fossils as well as to document and sample these localities through an on-site field investigation;
- comment on the impact of the development on these exposed and/or potential fossil resources;
- make recommendations as to how the developer should conserve or mitigate damage to these resources.

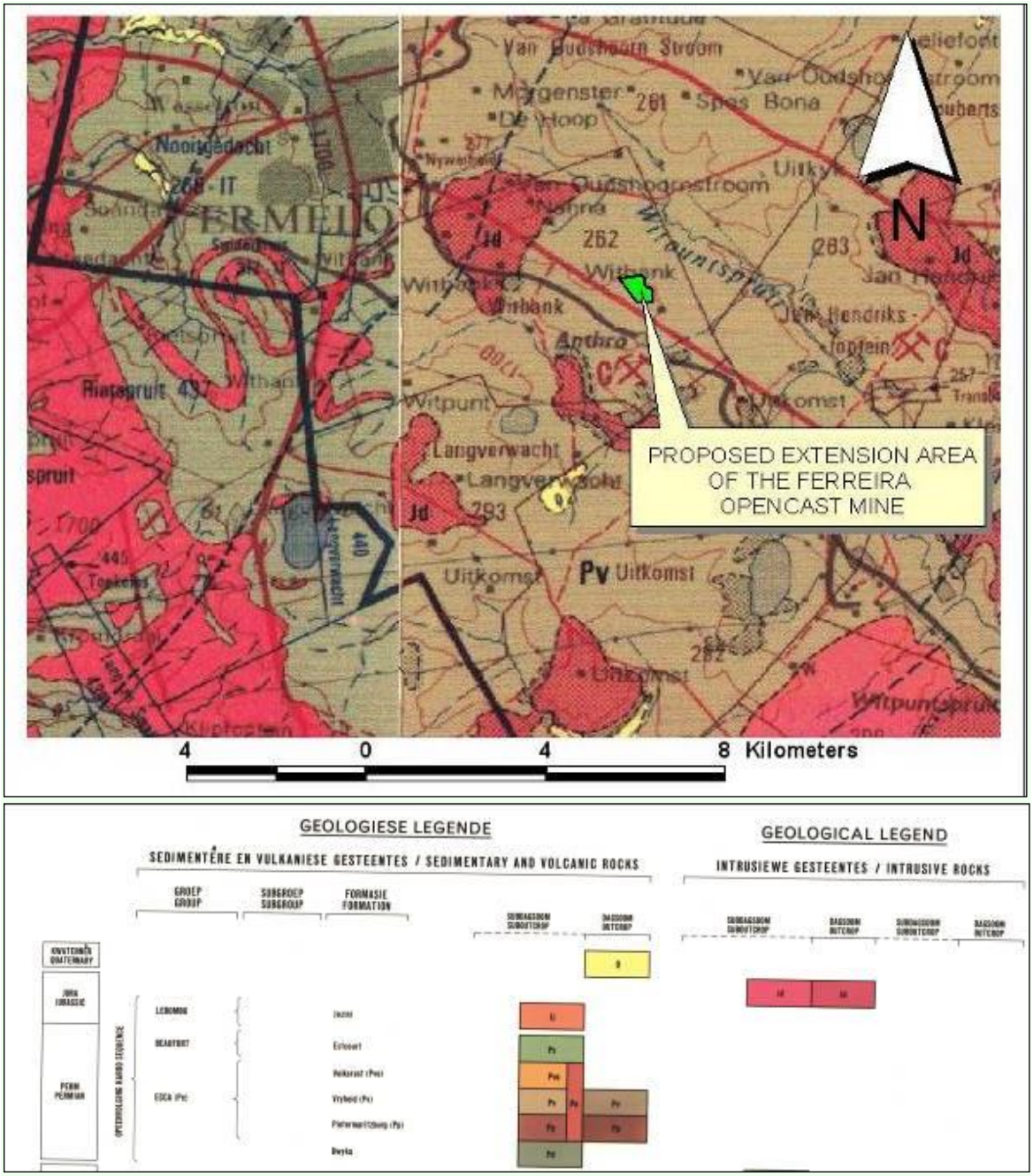

Figure 9 - Geology of the Study Area (Geo Map 2630 Mbabane)

5 FIELDWORK FINDINGS

Methodology

Two PGS staff members surveyed the study area over two separate days. The staff traversed the area via vehicle and conducted a controlled-exclusive surface survey by foot. GPS co-ordinates were taken and the identified sites were recorded photographically.

During the survey, three grave/cemetery sites were located, as well as the demolished remains of several ruined buildings and worker homesteads. Four cultural-heritage sites in total were identified. Three of these sites are located inside the study area and one is located outside the study area. The sites of some of the ruined buildings match up to the ones recorded on the 1963 topographical map.

5.1 Sites Identified From The Survey

5.1.1 Site FX-01

GPS: S26.55786 E30.04843

This is a single small grave (probably a child) which is stone-packed and has the remains of a headstone, but no inscription. It is surrounded by a metal fence and by an earthen berm. The grave is situated in an area which is very close to the edge of the opencast mining pit.

Figure 10 – Site FX-01, View of single grave

Figure 11 – Site FX-01, Close-up view showing broken headstone (arrow)

Significance and Impact rating:

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Negative	VERY HIGH	Isolated Sites / proposed site	Permanent	Very Likely	
Impact to grave	5	1	5	4	2.93

Recommendation:

This grave has been relocated on 29 April 2013, after an extensive social consultation process where the family gave permission for the relocation.

5.1.2 Site FX-02:

GPS: S26.55631 E30.04953

This site consists of an informal cemetery which contains ±55 graves, which are all stone-packed graves. These graves are placed in several lines, with one group of 4-5 which has been separated from the rest by four lines of stones. These graves probably belong to African farm workers. Some graves have headstones or metal markers. However, most of them do not have legible inscriptions. The cemetery has been surrounded by an earthen berm to mark and protect the graves.

Figure 12 – Site FX-02, Informal cemetery, general view

Figure 13 – Site FX-02, View of graves

Figure 14 – Site FX-02, Separate group of graves within larger cemetery

Significance and Impact rating:

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Negative	VERY HIGH	Isolated Sites / proposed site	Permanent	Very Likely	
Impact to grave	5	1	5	4	2.93

Recommendation:

The cemetery will require a process of public consultation and application for permits to be undertaken if the graves are planned to be relocated. This should only happen if the cemetery will be negatively impacted by the proposed expansion of the mining activities.

5.1.3 Site FX-03

GPS: S26.55344 E30.04977

This site, with some additional graves (±10-11) and the possible remains of a structure/s (***FX-03/1)***, was identified in the area to the north-west of the informal cemetery site (***FX-02***). A further site with the remains of a house foundation, farm buildings and a midden (***FX-03/2***) was also identified in this area. This site is located just outside the study area (**Figure 18**) but may be impacted by a further expansion of the mining area in the future.

Figure 15 – Site FX-03/1, View of graves

Significance and Impact rating:

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Negative	VERY HIGH	Isolated Sites / proposed site	Permanent	Very Likely	
Impact to grave	5	1	5	4	2.93

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Negative	LOW	Isolated Sites / proposed site	Permanent	Very Likely	
Impact to structures	2	1	5	4	2.13

Recommendation:

Graves

The graves located here will require a process of public consultation and application for permits to be undertaken, if they are planned to be relocated.

Structure

Although it is likely that the building remains and the associated midden are likely to be 60 years or older, the hardly anything remains of the structures except for the foundations, therefore no further mitigation will be required before any proposed destruction. However, previous experience has shown that it is highly likely that there could be infant (stillborn) burials under the walls or floor foundations of

the building remains. Therefore, if this site is to be demolished or cleared at some future stage, provision should be made for these should be removed and relocated, along with the existing graves.

5.1.4 FX-04

GPS: S26.55757 E30.04931

The remains of a homestead and kraal were identified close to the location of the single grave. There could be an association between these two sites. The homestead remains have been overgrown by black wattle trees and the kraal is only visible as a grassed mound with a few stones remaining. Several stones and bricks as well as a few pieces of cultural material (rusted metal) were noted inside the homestead area (**Figure 16** and **Figure 17**).

Figure 16 – Site FX-04, View of homestead foundation remains

Figure 17 – Site FX-04, View of grassy mound indicating kraal remains

Significance and Impact rating:

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Negative	LOW	Isolated Sites / proposed site	Permanent	Very Likely	
Impact to structures	2	1	5	4	2.13

Recommendation:

Although it is likely that the homestead remains and the associated kraal remains are likely to be 60 years or older, hardly anything remains of the structures except for the foundations, and therefore no further mitigation will be required before any destruction. However, previous experience has shown that it is highly likely that there could be infant (stillborn) burials under the walls or floor foundations of the building remains. Therefore, if this site is to be demolished or cleared at some future stage, provision should be made for these should be removed and relocated, along with the existing graves.

An evaluation of the available information together with the site visit data enabled the development of a heritage site map. **Figure 18** depicts all the sensitive heritage sites on inside the expansion area.

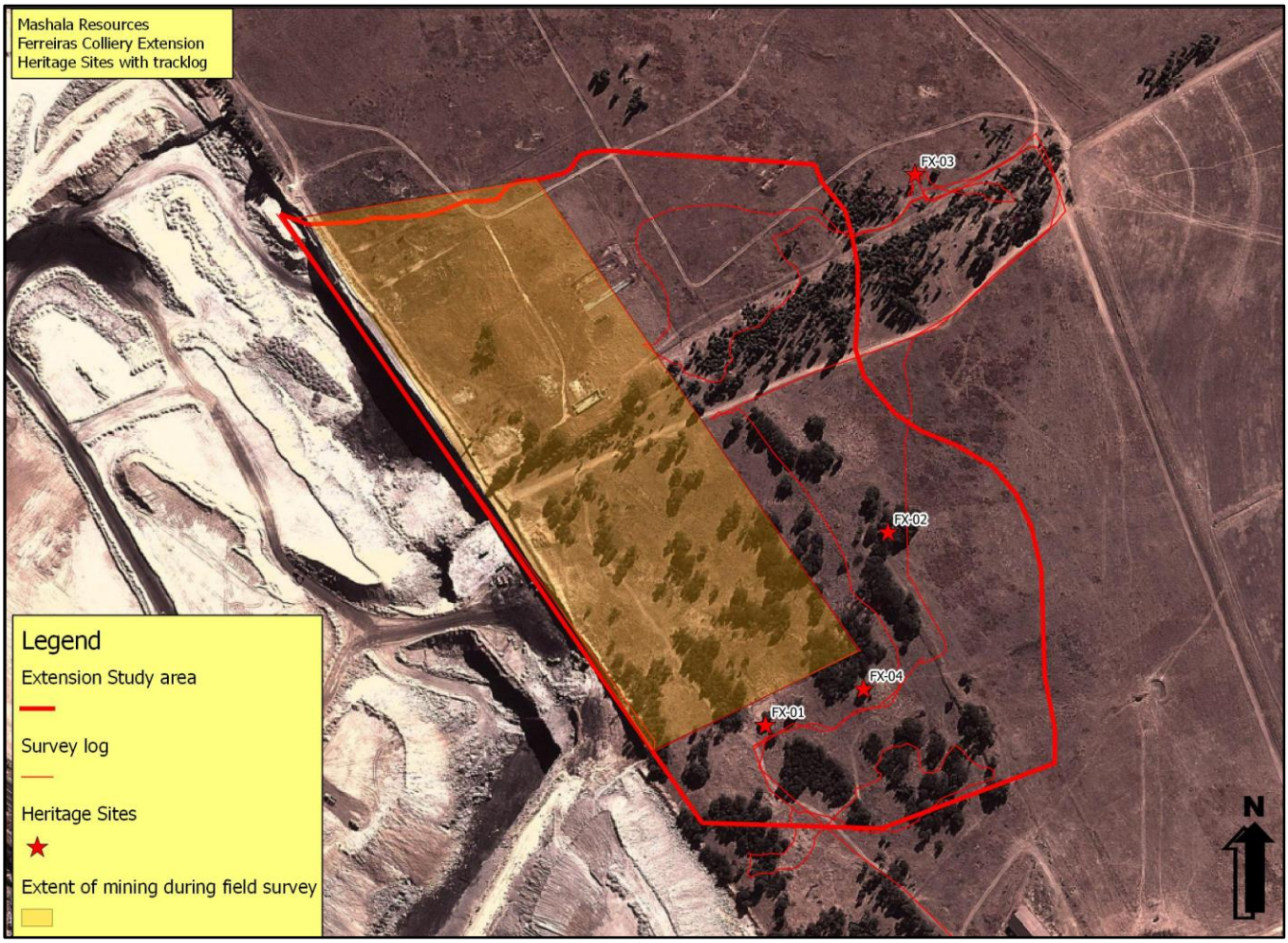

Figure 18 – Map of Identified Sites (GoogleEarth Image)

5.2 Palaeontology

The palaeontological sensitivity is predicted after identifying potentially fossiliferous rock units; ascertain the fossil heritage from the literature and evaluating the nature and scale of the development itself. The palaeontological sensitivity is summarised in **Table 11** and illustrated in **Figure 19** below.

Table 11- Palaeontological Sensitivity of Geological Units on Site

Geological Unit	Rock Type and Age	Fossil Heritage	Vertebrate Biozone	Palaeontological Sensitivity
Vryheid Formation	Grey to black mudstone & sandstone PERMIAN	Abundant plant fossils of *Glossopteris* and other plants trace fossils	*None*	High sensitivity

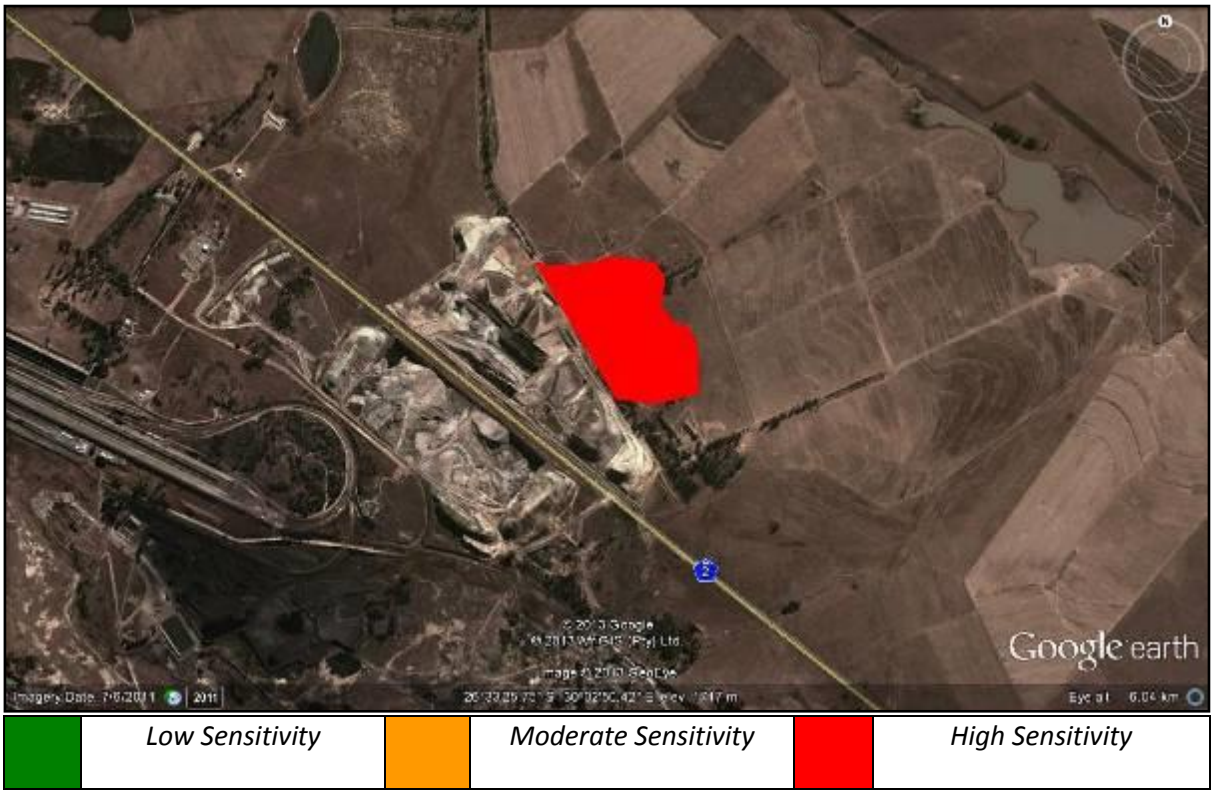

Figure 19 – Palaeontological Sensitivity Map

The study area is entirely underlain by Permian aged sedimentary rocks of the Vryheid Formation of the Ecca Group which forms part of the Karoo Supergroup.

There is a high to moderate possibility that fossils could be encountered during excavation of the Vryheid Formation. These fossil finds would be of international significance. The damage and/or loss of these fossils due to inadequate mitigation would be a highly negative palaeontological impact. The exposure and subsequent reporting of fossils (that would otherwise have remained undiscovered) to a qualified palaeontologist for excavation will be a beneficial palaeontological impact.

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	HIGH	Study Area	Permanent	Could happen	
Impact to palaeontology	4	2	5	3	2.20

Recommendations:

It is therefore recommended that a SAHRA Phase 1 Palaeontological Field Assessment of the identified high sensitive areas be done to:

- assess the immediate risk of potential exposed fossils as well as to document and sample these localities through an on-site field investigation;
- comment on the impact of the development on these exposed and/or potential fossil resources;

- make recommendations as to how the developer should conserve or mitigate damage to these resources.

6 CONCLUSIONS AND RECOMMENDATIONS

Utilising the archival study completed for the desktop study as a guide, the field work identified a total of **four cultural-heritage sites, including three grave/cemetery sites,** of which the following will require further mitigation:

Historical Structures (FX-03; FX-04)

- Site **FX-03** contains the foundation remains of several structures, which may have been sheds or homesteads. No mitigation required before demolition, except for possible infant burials under the foundations.
- Site **FX-04** consists of the remains of a homestead and kraal located close to the single grave (FX-01). There could be an association between these two sites. No mitigation required before demolition, except for possible infant burials under the foundations.

Grave/Cemetery Sites

The three grave/cemetery sites (FX-01; FX-02; FX-03) identified will require a process of public consultation and application for permits to be undertaken if they are planned to be relocated.

- **FX-01**: This site consists of a single small grave surrounded by a fence. The grave is stone-packed and has a headstone. This grave has been relocated in 29 April 2013.
- **FX-02**: This site consists of an informal cemetery, which contains ±55 graves. The graves are all stone-packed and probably belong to African farm workers. Some graves have headstones or metal markers. However, most of them do not have legible inscriptions. The cemetery has been surrounded by an earthen berm to mark and protect the graves.
- **FX-03**: This site is an informal cemetery of 10-11 graves, which are stone-packed. It is located to the north-west of site FX-02. The remains of several structures (FX-03/1) are associated with these graves.

Palaeontology

Portion 25 of the farm Witbank 262 IT is entirely underlain by Permian aged sedimentary rocks of the Vryheid Formation (Pv) of the Ecca Group which forms part of the Karoo Supergroup. Some Jurassic aged Dolerite (Jd) sills are present towards the south and west of the study area.

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described.

There is a high and moderate possibility that fossils could be encountered during excavation of the Vryheid Formation. These fossil finds would be of international significance. The damage and/or loss of these fossils due to inadequate mitigation would be a highly negative palaeontological impact. The exposure and subsequent reporting of fossils (that would otherwise have remained undiscovered) to a qualified palaeontologist for excavation will be a beneficial palaeontological impact.

It is therefore recommended that a SAHRA Phase 1 Palaeontological Field Assessment of the identified high sensitive areas be done to:

- assess the immediate risk of potential exposed fossils as well as to document and sample these localities through an on-site field investigation;
- comment on the impact of the development on these exposed and/or potential fossil resources;
- make recommendations as to how the developer should conserve or mitigate damage to these resources.

Further to these recommendations, the general Heritage Management Guidelines in **Section 7** need to be incorporated into the EMPr for the project.

The overall impact of the development on heritage resources is seen as acceptably low and impacts can be mitigated to acceptable levels.

7 HERITAGE MANAGEMENT GUIDELINES

7.1 General Management Guidelines

1. The National Heritage Resources Act (Act 25 of 1999) states that, any person who intends to undertake a development categorised as-
   (a) the construction of a road, wall, transmission line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
   (b) the construction of a bridge or similar structure exceeding 50m in length;
   (c) any development or other activity which will change the character of a site-
      (i) exceeding 5 000 m^2 in extent; or
      (ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In the event that an area previously not included in an archaeological or cultural resources survey is to be disturbed, the South African Heritage Resources Agency (SAHRA) needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment.

2. In the event that a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner, preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA).

   This survey and evaluation must include:

   (a) The identification and mapping of all heritage resources in the area affected;

   (b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Heritage Resources Act;

   (c) An assessment of the impact of the development on such heritage resources;

   (d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

   (e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

   (f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

   (g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.

3. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:

   a. Heritage;

   b. Graves;

c. Archaeological finds; and

d. Historical Structures.

This module must be tailor made to include all possible finds that could be expected in that area of construction.

4. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
5. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
6. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
7. After mitigation, an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
8. If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.
9. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made.
10. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. This includes an extensive social consultation process.

Archaeological Monitoring

The definition of an archaeological monitoring programme is a formal program of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, in the inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

The purpose of an archaeological monitoring programme[1] is:

- To allow, within the resources available, the preservation by recording of archaeological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works

[1] The definition of an archaeological/palaeontological monitoring programme is a formal program of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, in the inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.
- A monitoring programme is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.
- The objective of the monitoring programme is to establish and make available information about the archaeological resource existing on a site.

PGS can be contacted on the way forward in this regard.

***Table 12**: Roles and responsibilities of archaeological and heritage management*

ROLE	RESPONSIBILITY	IMPLEMENTATION
A responsible specialist needs to be allocated and should sit in at all relevant meetings, especially when changes in design are discussed, and liaise with SAHRA.	The client	Archaeologist and a competent archaeology support team
If chance finds and/or graves or burial grounds are identified during construction or operational phases, a specialist must be contacted in due course for evaluation.	The client	Archaeologist and a competent archaeology support team
Comply with defined national and local cultural heritage regulations on management plans for identified sites.	The client	Environmental Consultancy and the Archaeologist
Consult the managers, local communities and other key stakeholders on mitigation of archaeological sites.	The client	Environmental Consultancy and the Archaeologist
Implement additional programs, as appropriate, to promote the safeguarding of our cultural heritage. (i.e. integrate the archaeological components into the employee induction course).	The client	Environmental Consultancy and the Archaeologist,
If required, conservation or relocation of burial grounds and/or graves according to the applicable regulations and legislation.	The client	Archaeologist, and/or competent authority for relocation services
Ensure that recommendations made in the Heritage Report are adhered to.	The client	The client
Provision of services and activities related to the management and monitoring of significant archaeological sites.	The client	Environmental Consultancy and the Archaeologist
After the specialist/archaeologist has been appointed, comprehensive feedback reports should be submitted to relevant authorities during each phase of development.	Client and Archaeologist	Archaeologist

7.2 All phases of the project

Archaeology

Based on the findings of the HIA, all stakeholders and key personnel should undergo an archaeological induction course during this phase. Induction courses generally form part of the employees' overall training and the archaeological component can easily be integrated into these training sessions. Two courses should be organised – one aimed more at managers and supervisors, highlighting the value of this exercise and the appropriate communication channels that should be followed after chance finds, and the second targeting the actual workers and getting them to recognize artefacts, features and significant sites. This needs to be supervised by a qualified archaeologist. This course should be reinforced by posters reminding operators of the possibility of finding archaeological sites.

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

It is possible that cultural material will be exposed during operations and may be recoverable, but this is the high-cost front of the operation, and so any delays should be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, but construction trenches do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure is often changed or added to during the subsequent history of the project. In general these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction phase, it is important to recognize any significant material being unearthed, and to make the correct judgment on which actions should be taken. A responsible archaeologist/palaeontologist must be appointed for this commission. This person does not have to be a permanent employee, but needs to sit in at relevant meetings, for example when changes in design are discussed, and notify SAHRA of these changes. The archaeologist would inspect the site and any development on a recurrent basis, with more frequent visits to the actual workface and operational areas.

In addition, feedback reports can be submitted by the archaeologist to the client and SAHRA to ensure effective monitoring. This archaeological monitoring and feedback strategy should be incorporated into the Environmental Management Plan (EMP) of the project. Should an archaeological site or cultural material be discovered during construction (or operation), such as burials or grave sites, the project needs to be able to call on a qualified expert to make a decision on what is required and if it is necessary to carry out emergency recovery. SAHRA would need to be informed and may give advice on procedure. The developers therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. The project thus needs to have an archaeologist available to do such work. This provision can be made in an archaeological monitoring programme.

Graves

In the case where a grave is identified during construction the following measures must be taken:

- Mitigation of graves will require a fence around the cemetery with a buffer of at least 20 meters.

- If graves are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the remains a rescue permit must be applied for with SAHRA and the local South African Police Services must be notified of the find.
- Where it is then recommended that the graves be relocated a full grave relocation process that includes comprehensive social consultation must be followed.

The grave relocation process must include:

i. A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
ii. Site notices indicating the intent of the relocation
iii. Newspaper notices indicating the intent of the relocation
iv. A permit from the local authority;
v. A permit from the Provincial Department of Health;
vi. A permit from the South African Heritage Resources Agency, if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
vii. An exhumation process that keeps the dignity of the remains intact;
viii. The whole process must be done by a reputable company that is well versed in relocations;
ix. The exhumation process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the developing company.

8 LIST OF PREPARERS

Jennifer Kitto, Heritage Specialist
Wouter Fourie, Accredited Professional Archaeologist (ASAPA), Principal Investigator (CRM Accredited)
Gideon Groenewald, Palaeontologist, Accredited by the Palaeontology Society of South Africa (PSSA)

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APPENDIX A
PALAEONTOLOGICAL IMPACT ASSESSMENT

PALAEONTOLOGICAL DESKTOP ASSESSMENT FOR THE PROPOSED EXTENSION OF THE MINING ACTIVITIES AT THE PENUMBRA OPENCAST MINE (FERREIRA'S EXTENSION), ON PORTION 25 OF THE FARM WITBANK NO. 262, NEAR ERMELO IN THE MPUMALANGA PROVINCE

FOR

HIA CONSULTANTS

DATE: 01 MARCH 2013

By

Gideon Groenewald

EXECUTIVE SUMMARY

Gideon Groenewald was appointed by PGS Heritage to undertake a desktop survey, assessing the potential palaeontology impact of the proposed extension of the Penumbra Opencast mine situated on Portion 25 of the farm Witbank No 262 IT, south-east of Ermelo within the Gert Sibande District Municipality, Msukaligwa Local Municipality in the Mpumalanga Province.

This report forms part of the Environmental Impact Assessment and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the mine extension.

A basic desktop assessment of the topography and geology of the area was made by using 1:250 000 geological maps (2630 Mbabane) in conjunction with Google Earth. The known fossil heritage within each rock unit was determined from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience. The major limitation of this study is that no supporting field assessment was made and the assumption that existing geological maps and datasets used to assess site sensitivity are correct and reliable.

The Penumbra Opencast Mine is situated towards the south-east of Ermelo, Mpumalanga Province, next to the N2 Highway. The Ferreira's Extension area is situated towards the north-east of the current mining operations. The area to be extended is approximately 26 Ha.

Portion 25 of the farm Witbank 262 IT is entirely underlain by Permian aged sedimentary rocks of the Vryheid Formation (Pv) of the Ecca Group which forms part of the Karoo Supergroup. Some Jurassic aged Dolerite (Jd) sills are present towards the south and west of the study area.

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described.

There is a high and moderate possibility that fossils could be encountered during excavation of the Vryheid Formation. These fossil finds would be of international significance. The damage and/or loss of these fossils due to inadequate mitigation would be a highly negative palaeontological impact. The exposure and subsequent reporting of fossils (that would otherwise have remained undiscovered) to a qualified palaeontologist for excavation will be a beneficial palaeontological impact.

It is therefore recommended that a SAHRA Phase 1 Palaeontological Field Assessment of the identified high sensitive areas be done to:

- assess the immediate risk of potential exposed fossils as well as to document and sample these localities through an on site field investigation;
- comment on the impact of the development on these exposed and/or potential fossil resources;
- make recommendations as to how the developer should conserve or mitigate damage to these resources.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Background

Gideon Groenewald was appointed by PGS Heritage to undertake a desktop survey, assessing the potential palaeontology impact of the proposed extension of the Penumbra Opencast mine situated on Portion 25 of the farm Witbank No 262 IT, south-east of Ermelo within the Gert Sibande District Municipality, Msukaligwa Local Municipality in the Mpumalanga Province.

This report forms part of the Environmental Impact Assessment and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 (Heritage Resources Management), a Heritage Impact Assessment (HIA) is required to assess any potential impacts to palaeontological heritage within the development footprint of the mine extension.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

1.2 Aims and Methodology

Following the *"SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports",* the aims of the palaeontological impact assessment are:

- to identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assess the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources; and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

In preparing a palaeontological desktop study, the potential fossiliferous rock units (groups, formations, etc) represented within the study area are determined from geological maps. The

known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1.1 below.

Table 0.1 Palaeontological Sensitivity Analysis Outcome Classification

Sensitivity	Description
Low Sensitivity	Areas where there is likely to be a negligible impact on the fossil heritage. This category is reserved largely for areas underlain by igneous rocks. However, development in fossil bearing strata with shallow excavations or with deep soils or weathered bedrock can also form part of this category.
Moderate Sensitivity	Areas where fossil bearing rock units are present but fossil finds are localised or within thin or scattered sub-units. Pending the nature and scale of the proposed development the chances of finding fossils are moderate. A field-based assessment by a professional palaeontologist is usually warranted.
High Sensitivity	Areas where fossil bearing rock units are present with a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops and the chances of finding fossils during a field-based assessment by a professional palaeontologist are very high. Palaeontological mitigation measures need to be incorporated into the Environmental Management Plan

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a field-based assessment by a professional palaeontologist is usually warranted.

1.3 Scope and Limitations of the Desktop Study

The study will include: i) an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units; ii) a review of all relevant palaeontological and geological literature, including geological maps, and previous palaeontological impact reports; iii) data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged); and iv) where feasible, location and examination of any fossil collections from the study area (e.g. museums).

The key assumption for this scoping study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not

intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing. There are also inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologists carrying out fieldwork in RSA. Most development study areas have never been surveyed by a palaeontologist.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and without supporting field assessments may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by tectonism or weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium etc).

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The Penumbra Opencast Mine is situated towards the south-east of Ermelo, Mpumalanga Province, next to the N2 Highway. The Ferreira's Extension area is situated towards the north-east of the current mining operations. The area to be extended is approximately 26 Ha (Figure 2.1).

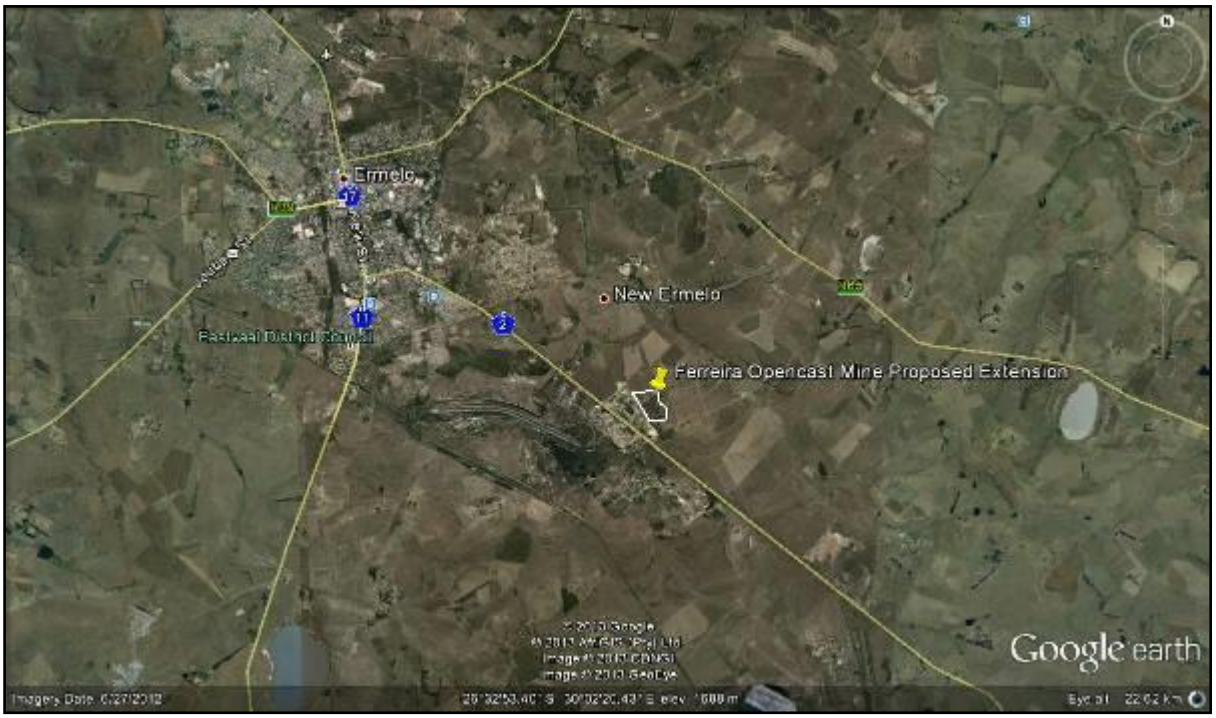

Figure 2.1 Locality of the Proposed Penumbra Opencast Mine Ferreira's Extension area

3 GEOLOGY OF THE AREA

Portion 25 of the farm Witbank 262 IT is entirely underlain by Permian aged sedimentary rocks of the Vryheid Formation (Pv) of the Ecca Group which forms part of the Karoo Supergroup. Some Jurassic aged Dolerite (Jd) sills are present towards the south and west of the study area (Figure 3.1).

Vryheid Formation (Pv)

The Vryheid Formation of the Ecca Group of the Karoo Supergroup consists of inter-bedded grey to black shales, siltstones and sandstones of various thicknesses which were deposited under fluvial deltaic conditions. Thick coal beds are also present throughout the formation.

Dolerite (Jd)

Dolerite is a very hard igneous rock occurring as sills and dykes.

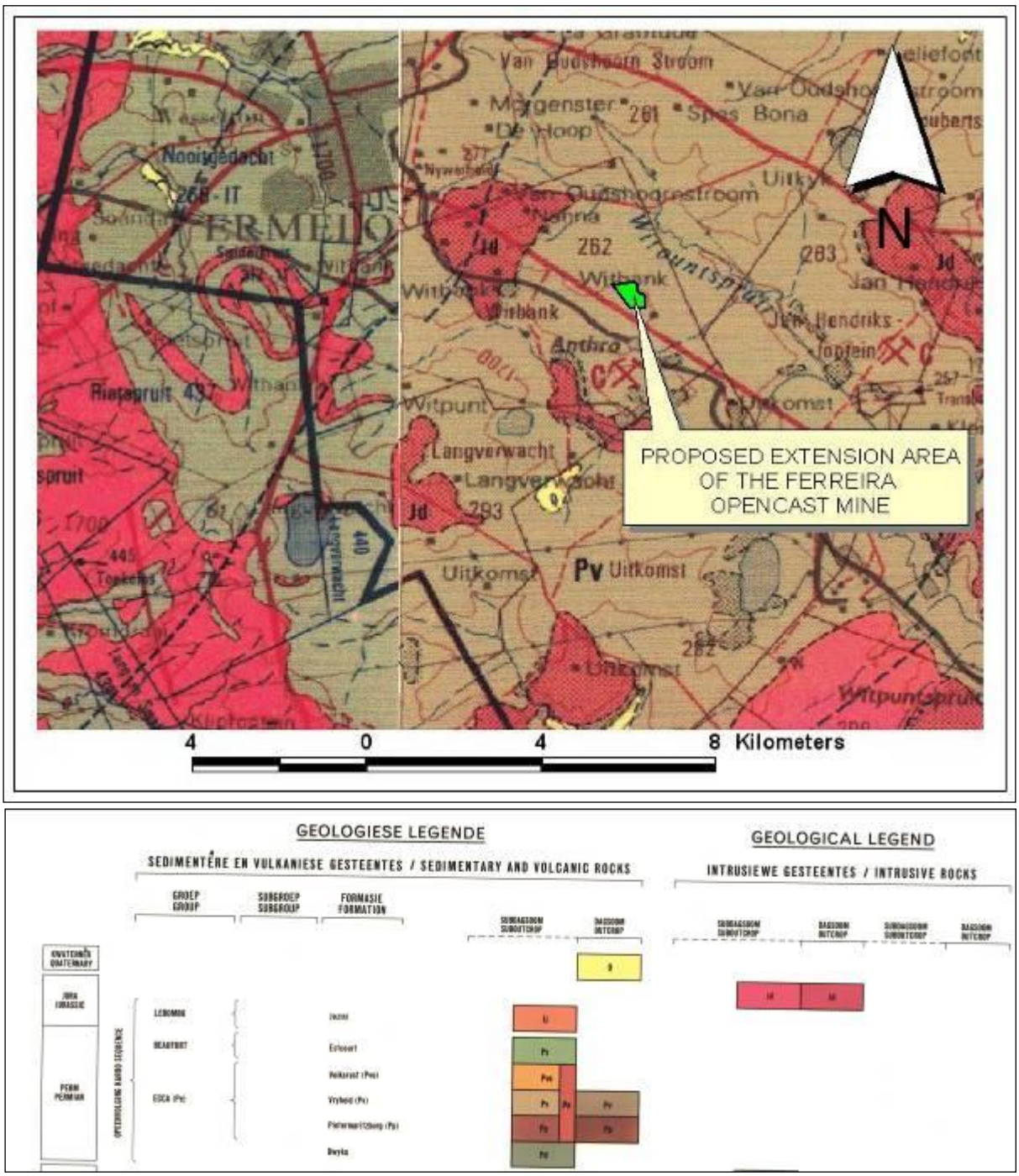

Figure 3.1 Geology of the Study Area (Geo Map 2630 Mbabane)

4 PALAEONTOLOGY OF THE AREA

4.1 Vryheid Formation (Pv)

The Vryheid Formation is well-known for the occurrence of coal beds that resulted from the accumulation of plant material over long periods of time. Plant fossils described by Bamford (2011) from the Vryheid Formation are; *Azaniodendron fertile, Cyclodendron leslii, Sphenophyllum hammanskraalensis, Annularia sp., Raniganjia sp., Asterotheca spp., Liknopetalon enigmata,*

Glossopteris > 20 species, Hirsutum 4 spp., Scutum 4 spp., Ottokaria 3 spp., Estcourtia sp., Arberia 4 spp., Lidgetonnia sp., Noeggerathiopsis sp. and Podocarpidites sp.

According to Bamford (2011), "Little data have been published on these potentially fossiliferous deposits. Around the coalmines there is most likely to be good material and yet in other areas the exposures may be too poor to be of interest. When they do occur fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites, however, in the interests of heritage and science such sites should be well recorded, sampled and the fossils kept in a suitable institution."

Although no vertebrate fossils have been recorded from the Vryheid Formation, invertebrate trace fossils have been described in some detail by Mason and Christie (1985).

The late Carboniferous to early Jurassic Karoo Supergroup of South Africa includes economically important coal deposits within the Vryheid Formation of Natal. The Karoo sediments are almost entirely lacking in body fossils but ichnofossils are locally abundant. Modern sedimentological and ichnofaunal studies suggest that the north-eastern part of the Karoo basin was marine. In KwaZulu-Natal a shallow basin margin accommodated a prograding fluviodeltaic complex forming a broad sandy platform on which coal-bearing sediments were deposited. Ichnofossils include U-burrows (formerly *Corophioides*) which are assigned to ichnogenus *Diplocraterion* (Mason and Christie, 1985).

4.2 Dolerite (Jd)

Due to the igneous nature of the rock type, no fossil material will be encountered.

5 PALAEONTOLOGICAL SENSITIVITY

The palaeontological sensitivity is predicted after identifying potentially fossiliferous rock units; ascertain the fossil heritage from the literature and evaluating the nature and scale of the development itself. The palaeontological sensitivity is summarised in Table 4.1 and illustrated in Figure 4.1 below.

Table 0.2 Palaeontological Sensitivity of Geological Units on Site

Geological Unit	Rock Type and Age	Fossil Heritage	Vertebrate Biozone	Palaeontological Sensitivity
Vryheid Formation	Grey to black mudstone & sandstone PERMIAN	Abundant plant fossils of *Glossopteris* and other plants trace fossils	*None*	High sensitivity

Figure 4.1 Palaeontological Sensitivity Localities

6 CONCLUSION AND RECOMMENDATIONS

The study area is entirely underlain by Permian aged sedimentary rocks of the Vryheid Formation of the Ecca Group which forms part of the Karoo Supergroup.

There is a high and moderate possibility that fossils could be encountered during excavation of the Vryheid Formation. These fossil finds would be of international significance. The damage and/or loss of these fossils due to inadequate mitigation would be a highly negative palaeontological impact. The exposure and subsequent reporting of fossils (that would otherwise have remained undiscovered) to a qualified palaeontologist for excavation will be a beneficial palaeontological impact.

It is therefore recommended that a SAHRA Phase 1 Palaeontological Field Assessment of the identified high sensitive areas be done to:

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- make recommendations as to how the developer should conserve or mitigate damage to these resources.

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8 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technikon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

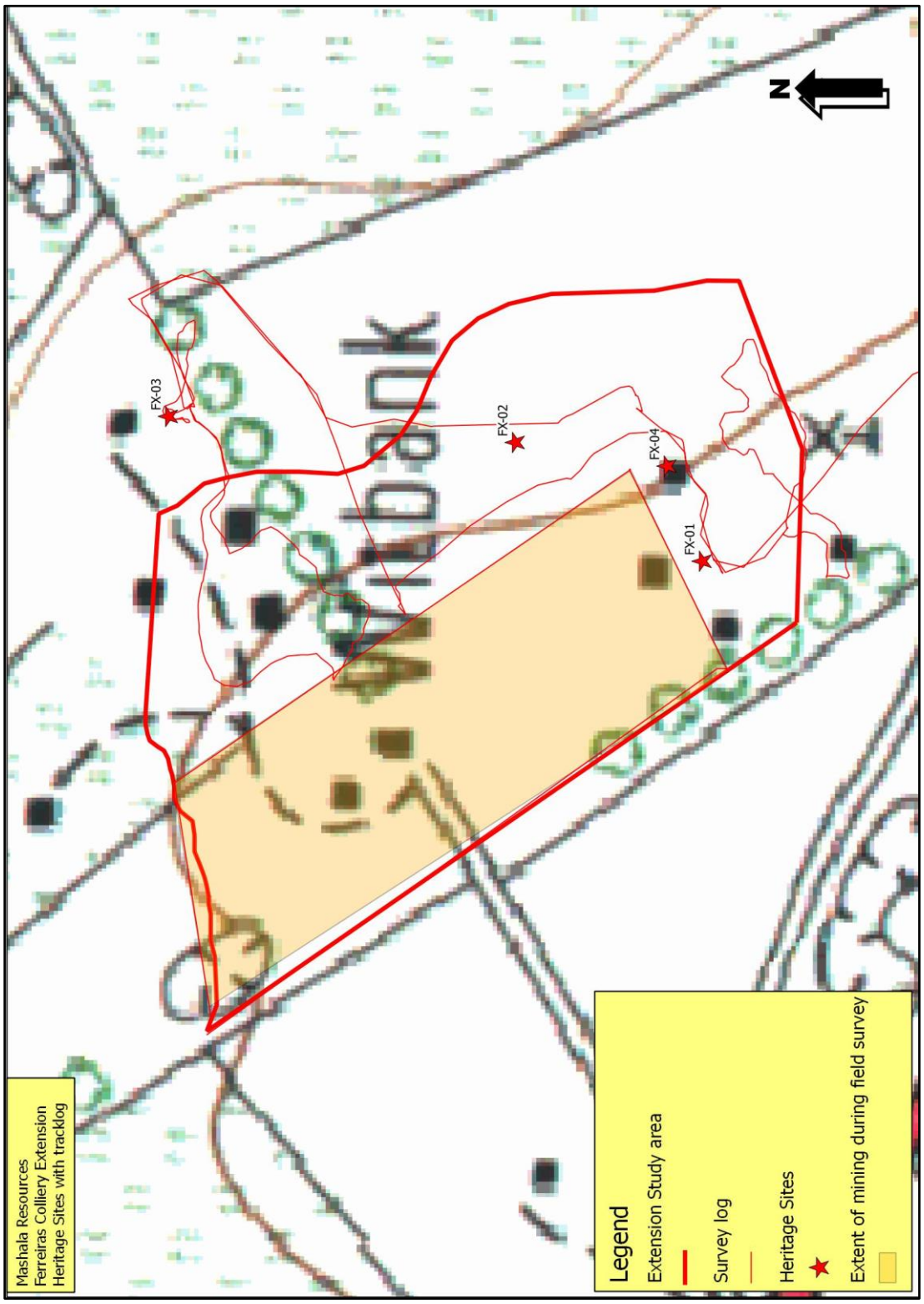
9 DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Dr Gideon Groenewald

Geologist

APPENDIX B
SITE DISTRIBUTION MAPS WITH TRACKLOG


Mashala Resources
Ferreiras Colliery Extension
Heritage Sites with tracklog
Legend
Extension Study area
Survey log
Heritage Sites
Extent of mining during field survey
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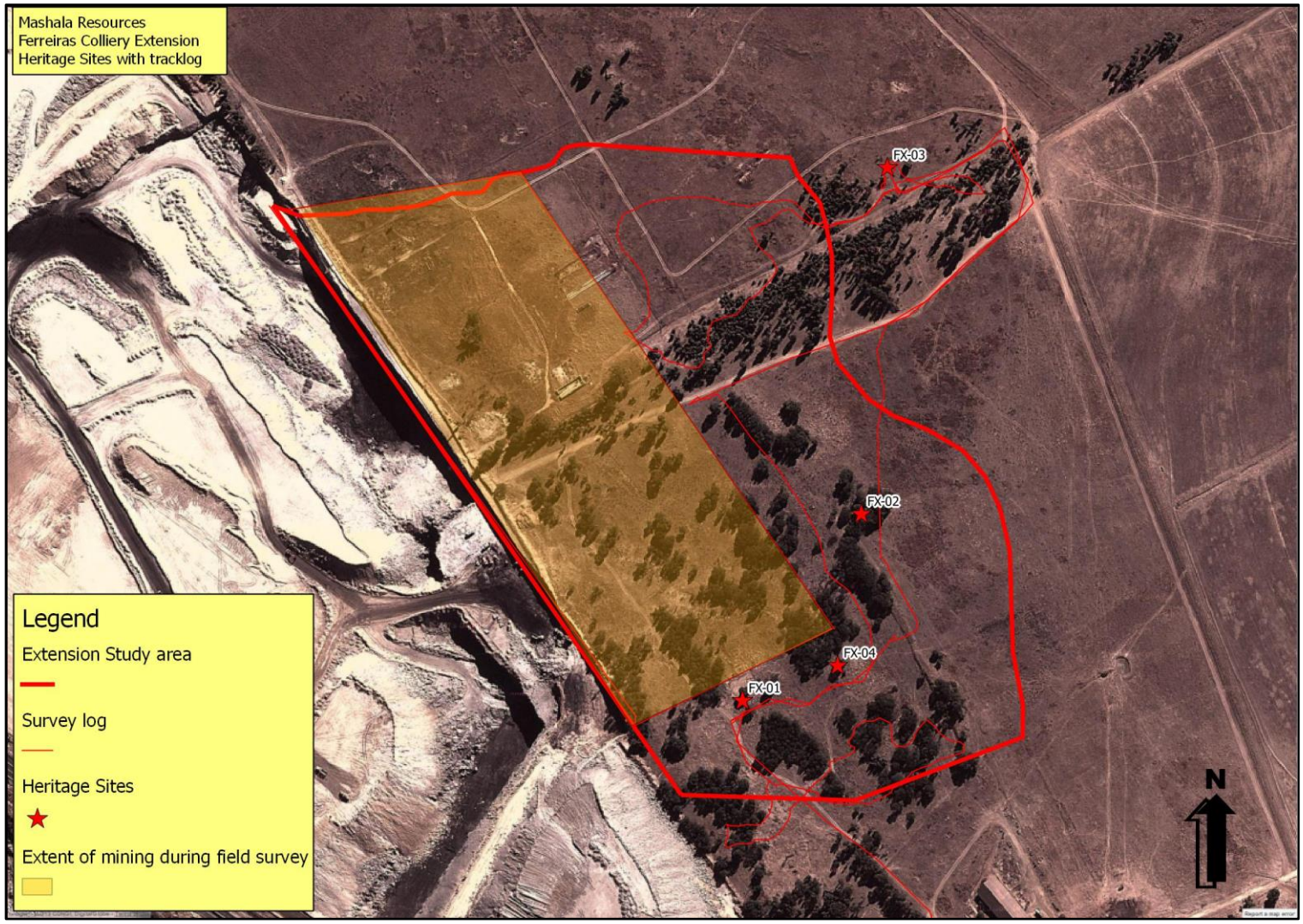
Mashala Resources
Ferreiras Colliery Extension
Heritage Sites with tracklog
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Legend
Extension Study area
Survey log
Heritage Sites
Extent of mining during field survey
N

APPENDIX C

LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

1 General Principles

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In the new legislation, permits are required to damage, destroy, alter, or disturb them. People who already possess material are required to register it. The management of heritage resources are integrated with environmental resources and this means that before development takes place heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves, which are older than 60 years and are not in a cemetery (such as ancestral graves in rural areas), are protected. The legislation protects the interests of communities that have interest in the graves: they may be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle will be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resource authority and if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the construction company's cost. Thus, the construction company will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:
An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;

- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection, to all historic and pre-historic cultural remains, including graves and human remains.

2 Graves and cemeteries

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinterment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are the jurisdiction of the South African Heritage Resource Agency (SAHRA). The procedure for Consultation Regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered