



**EXXARO PAARDEPLAATS PROJECT**  
**Heritage Impact Assessment Report**

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FOR

ENVIRONMENTAL IMPACT MANAGEMENT SERVICES (PTY) LTD

## ACKNOWLEDGEMENT OF RECEIPT

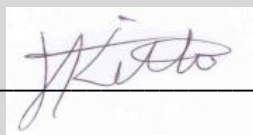
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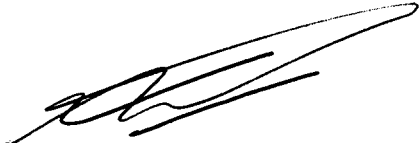
## Declaration of Independence

*The report has been compiled by PGS Heritage & Grave Relocation Consultants, an appointed Heritage Specialist for Environmental Impact Management Services (Pty) Ltd. 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*

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## EXECUTIVE SUMMARY

PGS Heritage & Grave Relocation Consultants was appointed by Environmental Impact Management Services (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed Exxaro Paardeplaats Colliery located near the town of Belfast, Mpumalanga Province.

Utilising the archival study completed for the HIA as a guide, the field work identified a total of **32 heritage sites, including 22 heritage structures, 7 cemeteries and 3 areas with historical mining shafts**, of which the following will require further mitigation:  
focussed off-set areas that incorporate the positions of the heritage resources.

### 1.1 Heritage Structures

- Destruction permits required for sites PP001, PP006, PP007, PP008, PP009, PP011, PP018, PP019, PP020, PP024, PP027. This will require that, specifically, site PP001, should be documented by photographs and drawings, before it can be demolished. In addition, any of these structures that are farmworker dwellings must be evaluated for the possible presence of infant burials through social consultation (see below)
- Site PP030, must be evaluated by a heritage architect in terms of its heritage significance. This will result in a detailed report with specific recommendations on proposed mitigation measures.
- The remaining dwelling structures (PP015, PP016, PP021, PP022, PP023, PP025, PP026, PP029, PP032), must be evaluated for the possible presence of infant burials through social consultation. Through experience of similar sites and the knowledge of cultural customs and traditions, it is known that stillborn babies and deceased infants occasionally were buried within the occupied settlements of African rural communities. These children were sometimes buried underneath the floors and walls of houses and huts. These burials were not marked, but were known to the immediate family.
- The more recent offices/store rooms (on the Hadeco farms) can be demolished with no further mitigation.



## **1.2 Cemeteries (PP002, PP003, PP004, PP005, PP010, PP016, PP028, PP031)**

Eight graves/cemeteries were identified in or close to the boundary of the study area (including the one at PP016). They will require the following mitigation:

1. Those cemeteries that will not be affected by the proposed mining, especially if only Portion 30 is to be used should be left in situ if at all possible: demarcate site with a fence and at least a 20 meter buffer.
2. For those cemeteries that are located in area directly affected by mining activities (eg portion 30), the graves should be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:
  - A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, which will be at least 60 days in length;
  - Site notices indicating the intent of the relocation
  - Newspaper Notice indicating the intent of the relocation
  - A permit from the local authority;
  - A permit from the Provincial Department of Health;
  - 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;
  - An exhumation process that keeps the dignity of the remains and family intact;
  - The whole process must be done by a reputable company that is well versed in relocations;
  - 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 development company.

## **1.3 Historical Mining Shafts (Sites PP012, PP013, PP0)**

- Two of these sites (PP012, PP013) are located on portion RE of Paardeplaats 425, which is indicated as not being affected by mining activities. These two sites should therefore be retained *in situ*. However, site PP017 is located on portion 2 of the Paardeplaats 425, which may be utilised for off-set activities. Therefore, if this site will be affected by mining activities, it is recommended that it shaft should be mapped and investigated further before it is destroyed.

- **NB:** since the archival research has indicated that mining activities were taking place in the Belfast area between 1895 and 1911 by the Transvaal Consolidated Coal Mines Limited, it is likely that these mining shafts are over 100 years old. This would qualify them as archaeological sites and therefore **a permit would have to be obtained from SAHRA before they could be destroyed.** SAHRA will require that all the shafts be mapped before a destruction permit can be issued.

#### *Possible Rock Art Site (PP 014)*

It is recommended that the site be demarcated as a no-go area and that a specialist on rock art be contracted to evaluate and confirm the existence of the rock art and if confirmed develop further management recommendations for the site.

#### *Belfast Municipal Cemetery and Belfast Concentration Camp Cemetery*

PGS was requested to investigate the possible impact of the existing blasting activities (Glisa Coal Mine) and future blasting activities on the graves at the Belfast Municipal Cemetery and the Concentration Camp Cemetery.

Evidence of damage to gravestones at both the Municipal Cemetery and Concentration Camp Cemetery was visible. It is not clear whether the damage may be due to existing blasting activities or to other causes. Although, the fact that the Municipal Cemetery is located very close to the entrance of the Glisa Mine and that there is clear evidence of damage to many graves in this cemetery could be indicative of a link.

### **1.4 Palaeontology**

A Palaeontological Desktop assessment of the bedrock types underlying the study area was undertaken by Dr Rose Prevec. This study found that the proposed Paardeplaats coal mining project will impact on bedrock of the Vryheid Formation, that has a high potential for containing plant fossils. Although little consideration has been afforded coal-associated fossils in the past, these are scientifically valuable and are protected as South African heritage. The recommendation presented here is for mitigation measures to be implemented throughout construction and mining, involving monitoring for fossil occurrences by a trained ECO, and documentation and retrieval by a qualified palaeontologist of any well-preserved plant fossils that are exposed.

### **1.5 Handling of chance finds**

A short induction on possible heritage resources that maybe found in the area should be included in the induction program for construction and mining employees. If a possible heritage site is discovered during mining activity, all operations in the vicinity of the discovery should stop and a qualified specialist contracted to evaluate and recommend appropriate actions. Depending on the type of site this can include initiating a grave relocation process, documentation of structures or archaeological excavations.

### **1.6 Statement**

The evaluation of the three alternatives provided has indicated barring the No-Go option, the Sensitivity Approach Alternative will have the least impact on heritage resources with a low cumulative rating as only 3 heritage sites will be impacted on. The number of grave to be impacted on in the Sensitivity Approach Alternative is only 3 as appose to the 100 in the Maximum Mine Production Alternative.

Although a large number of heritage sites fall inside the proposed off-set areas on Portion 2 and the remaining extent of Paardeplaats, the area is deemed to be large enough to handle focussed off-set areas that incorporate the positions of the heritage resources.

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## **2 INTRODUCTION**

PGS Heritage & Grave Relocation Consultants was appointed by Environmental Impact Management Services (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed Exxaro Paardeplaats Colliery, located near the town of Belfast, Mpumalanga Province.

### **2.1 Scope of the Study**

The aim of the study is to identify possible heritage sites and finds that occur in the proposed development area. The Heritage Impact Assessment aims to inform the EIA in the development of a comprehensive EMP 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).

### **2.2 Specialist Qualifications**

This Heritage Impact Report was compiled by PGS Heritage & Grave Relocation Consultants (PGS). The staff at PGS has a combined experience of nearly 40 years in the heritage consulting industry. PGS's staff has extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where their staff has the relevant expertise and experience to undertake that work competently. Wouter Fourie, the Principal Heritage Specialist, and Marko Hutton, Field Archaeologist, are both registered with the Association of Southern African Professional Archaeologists (ASAPA) and have CRM accreditation within the said organisation.

Jennifer Kitto, Heritage Specialist 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.

### **2.3 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 current dense vegetation cover (tree plantations) over some portions 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.

## **2.4 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. Environmental Management Plan (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. 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...” NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008b):

The NEMA 23(2)(b) states that an integrated environmental management plan should, “...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”.

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008b).

MPRDA defines ‘environment’ as it is in the NEMA and therefore acknowledges cultural resources as part of the environment. Section 39(3)(b) of this Act specifically refers to the evaluation, assessment and identification of impacts on all heritage resources as identified in Section 3(2) of the National Heritage Resources Act that are to be impacted on by activities governed by the MPRDA. Section 40 of the same Act requires the consultation with any State Department administering any law that has relevance on such an application through Section 39 of the MPRDA. This implies the evaluation of Heritage Assessment Reports in Environmental Management Plans or Programmes by the relevant heritage authorities (Fourie, 2008b).

In accordance with the legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and Association of Southern African Professional

Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive and legally compatible HIA report is compiled.

*Table 1 - Terminology*

<i>Abbreviations</i>	<i>Description</i>
<b>AIA</b>	Archaeological Impact Assessment
<b>ASAPA</b>	Association of South African Professional Archaeologists
<b>CRM</b>	Cultural Resource Management
<b>DEA</b>	Department of Environmental Affairs
<b>DWA</b>	Department of Water Affairs
<b>EIA practitioner</b>	Environmental Impact Assessment Practitioner
<b>EIA</b>	Environmental Impact Assessment
<b>ESA</b>	Early Stone Age
<b>GPS</b>	Global Positioning System
<b>HIA</b>	Heritage Impact Assessment
<b>I&amp;AP</b>	Interested & Affected Party
<b>LSA</b>	Late Stone Age
<b>LIA</b>	Late Iron Age
<b>MSA</b>	Middle Stone Age
<b>MIA</b>	Middle Iron Age
<b>NEMA</b>	National Environmental Management Act
<b>NHRA</b>	National Heritage Resources Act
<b>PHRA</b>	Provincial Heritage Resources Authority
<b>PSSA</b>	Palaeontological Society of South Africa
<b>ROD</b>	Record of Decision
<b>SADC</b>	Southern African Development Community
<b>SAHRA</b>	South African Heritage Resources Agency

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.

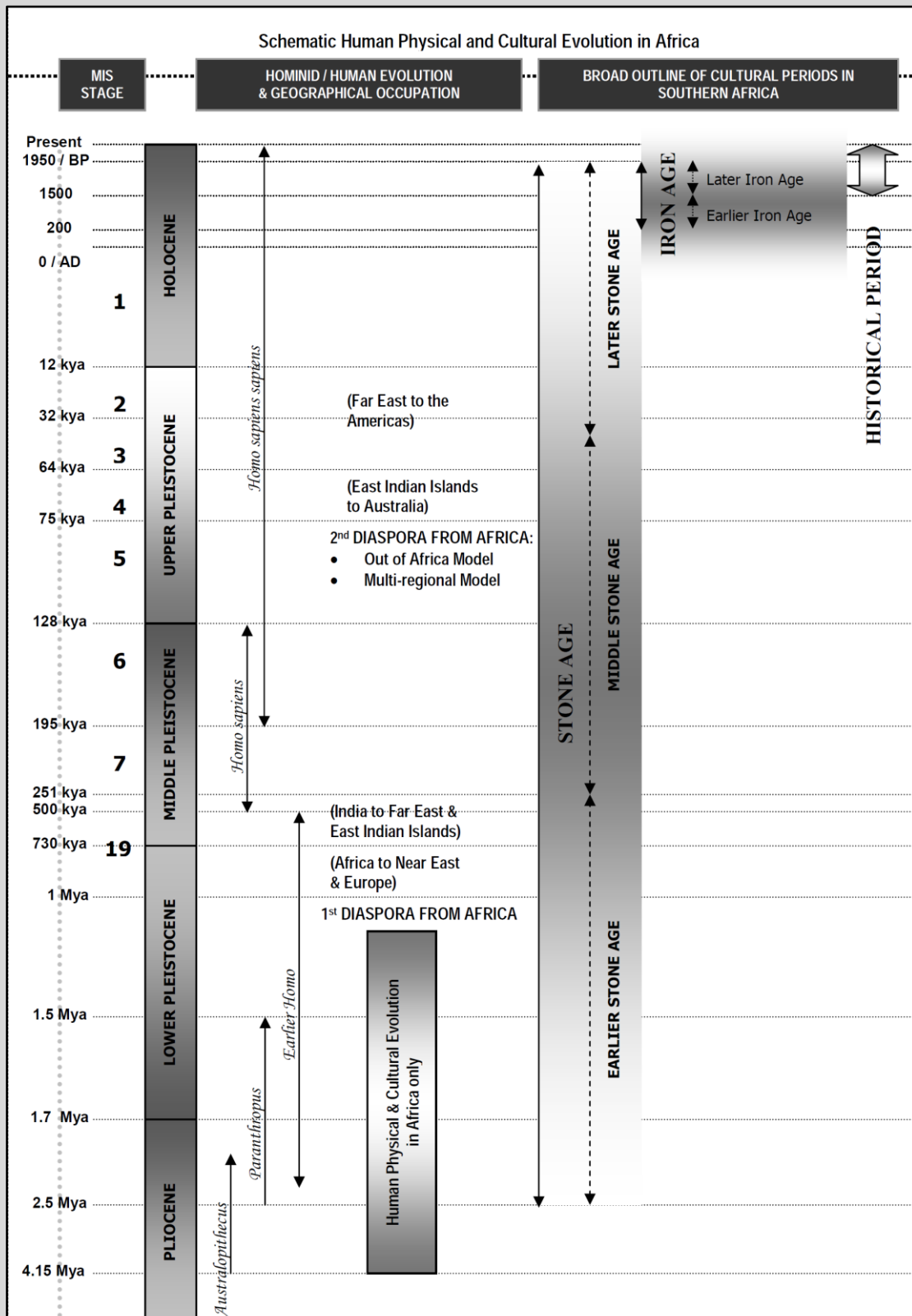


Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

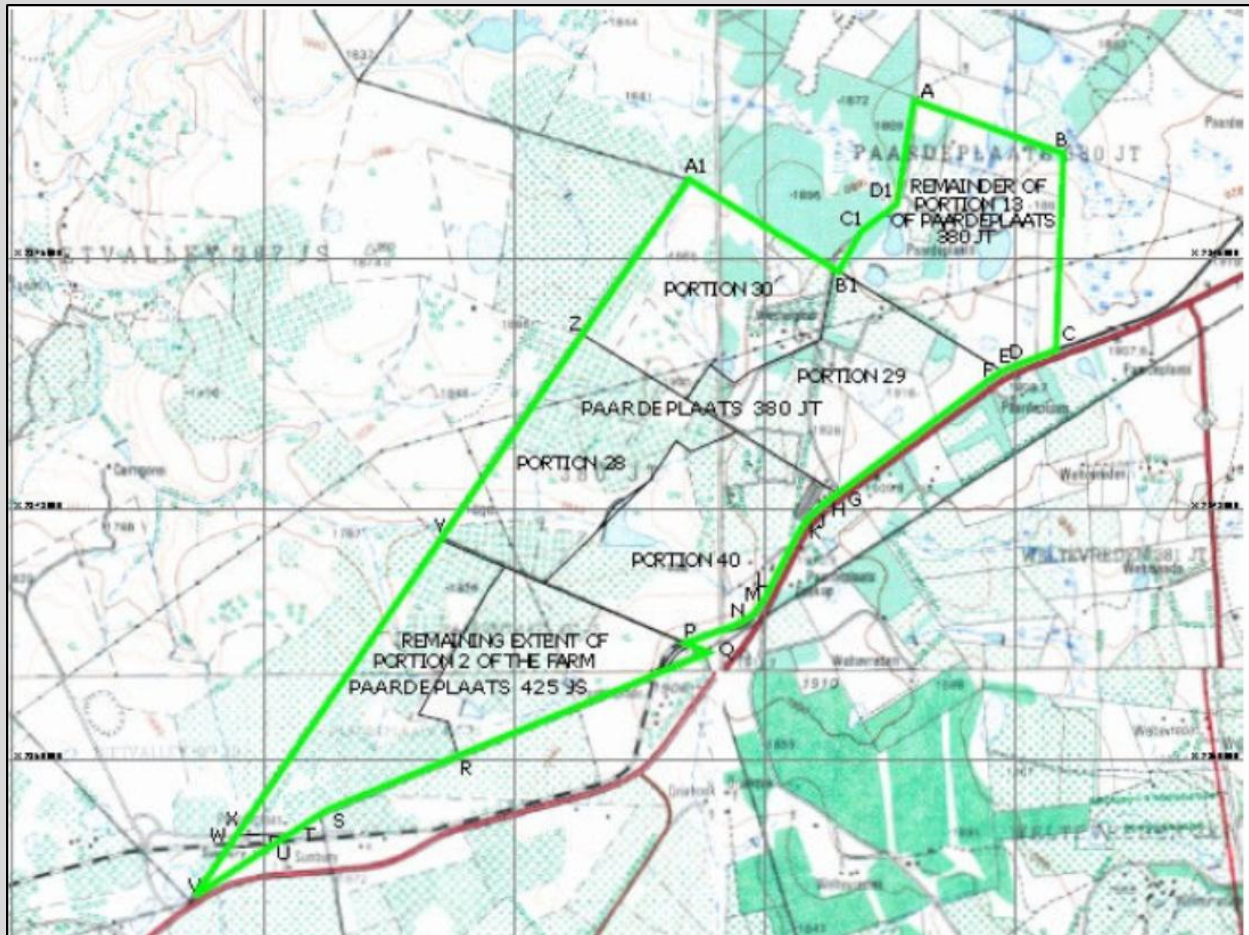
## 2.5 Site Location and Description

The Paardeplaats project is located on:

- Portions 28, 29, 30 and 40 of the farm Paardeplaats 380 JT;

- Remaining Extent (RE) of Portion 2 of the farm Paardeplaats 425 JS; and
- Portion 13 of Paardeplaats 380JT

The Paardeplaats project covers an area of approximately 1 415 ha and falls within the jurisdiction of the Nkangala District Municipality and Emakhazeni Local Municipality (ELM) (**Figure 2**)



*Figure 2 – Paardeplaats Locality (Paardeplaats study area with farm portions indicated (provided by Exxaro)*

## 2.6 Technical Project Description (from Exxaro Mining Works Program document)

The Paardeplaats project will supply coal (RoM) to the Glisa mine beneficiation plant at a rate of 4.2 – 4.4 mtpa and supply to Eskom at a rate of 2.4 mtpa. The mining method will be a hybrid between roll-over mining as well as bench mining. The roll-over mining will be used where only one seam is present, as well as where the overburden has a thickness less than 20m. The bench mining will be used where two or more seams are present and where the overburden has a thickness of more than 20m.

The stripping operation removes the topsoil and exposes the overburden of the next cut. The continuity of this process is essential in order to ensure that sufficient workroom is maintained. The initial topsoil



will be hauled to a designated area and be used for rehabilitation later on. When steady state is reached, topsoil is replaced in a continuous operation. The overburden will be drilled and blasted. The operation will be done in two phases. The top portion will be loaded and hauled; the lower portion will be done via a dozing process. This will ensure that the rehabilitation is adequately addressed by means of a backfilling process. Once the overburden has been removed, the coal (RoM) is transferred to the plant by means of a load and hauls operation. The mineral deposit consists of the No 2 seam of the Springs-Witbank Coalfield in Mpumalanga (proposed mining layout in **Figure 3**).

The Paardeplaats project area is within the Witbank Coalfield and is very close to the north-eastern edge of the main Karoo basin. The Karoo Sequence is represented by the Dwyka Formation, which consists of diamictite and the overlying Ecca Group. The coal seams of the Witbank Coalfield are found at the base of the Vryheid Formation of the Ecca Group. The strata in which the coal seam occurs consist predominantly of fine, medium and coarse grained sandstone with subordinate mudstone, shale, siltstone and carbonaceous.

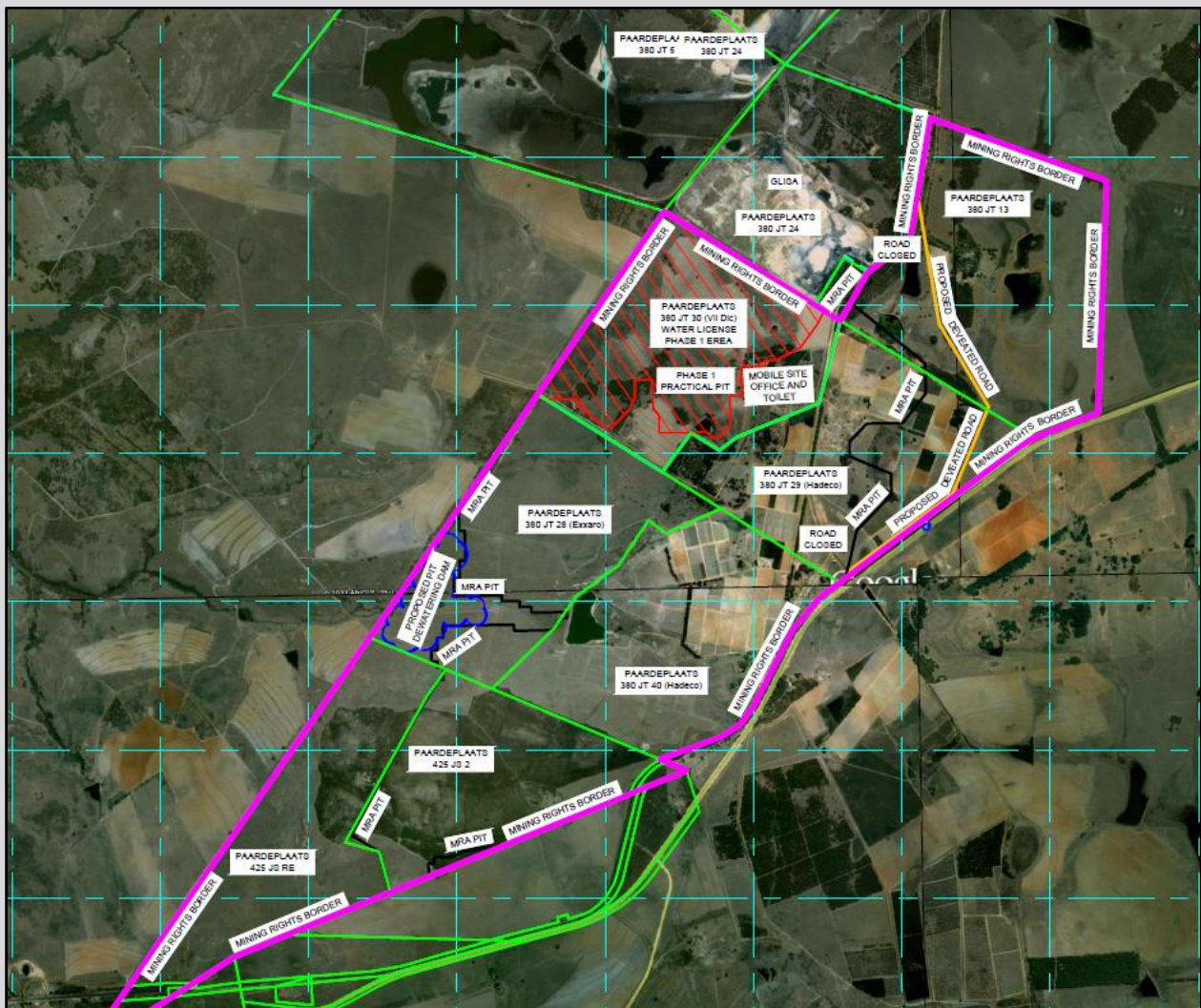


Figure 3 – Proposed mining layout as provided by Exxaro (Fourie and Kitto, 2012)



### 3 BACKGROUND INFORMATION USED AND DETAILS OF SITE VISITS UNDERTAKEN

#### 3.1 Background Information Used

The background information used drew heavily on the results of the archival and desktop research undertaken for the Scoping Level Report produced for EIMS in June 2012 (Fourie and Kitto, 2012). This report showed that the study area and surrounding areas have a rich historical and archaeological history and that there was potential for archaeological and historical sites and material to exist within the study area (including grave sites) (Figure 4).

The evaluation of topographical maps and satellite imagery for the Scoping Level report indicated the presence of numerous farmsteads, ruins and farm workers housing. Furthermore, the examination of the relevant literature indicated that archaeological sites and material (structures and man-made features older than 100 years) are very common in the general area. Although the existence of graves and cemeteries was not indicated during the archival research; based on previous experience, it was expected that such sites would be identified during the field survey.

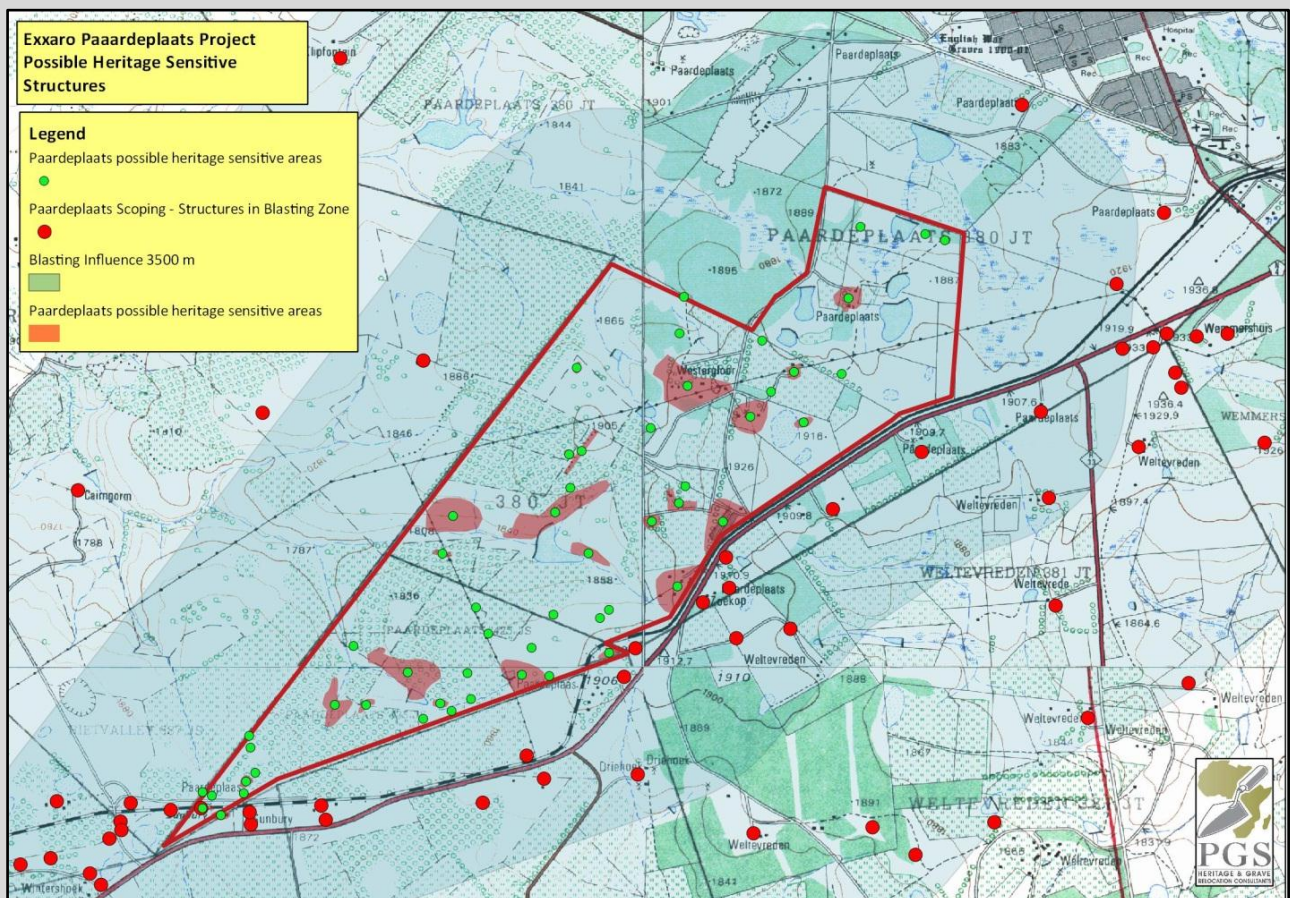


Figure 4 -- Heritage sensitivity map as produced for Heritage Scoping report (Fourie and Kitto, 2012)

Furthermore, there were some references in the literature (Van der Merwe, 1952) and the National Archives to the existence and operation of a historical coal mine located at Belfast. This was owned by the Transvaal Consolidated Coal Mines Ltd and operated from 1895 until 1910-11, when the company went into liquidation (National Archives, R7627/95 and MM3258/10).

### **3.2 Palaeontological background of area**

A palaeontological desktop assessment conducted by Dr Rose Previc (**Appendix E**) provided the background for addressing the possible palaeontological heritage in the study area.

#### *3.2.1 Geology of the study area*

As indicated in the (1:250 000) geological maps of the Barbarton (2530) and Pretoria (2528) regions (**Figure 5**), the geology is dominated by rocks of the Transvaal Supergroup, in particular the Pretoria and Rooiberg Groups (Vaalian in age, 2050+ million years old). In the study area, these basement rocks are unconformably overlain by deposits of the Vryheid Formation (Ecca Group, Karoo Supergroup), and patchy occurrences of Quaternary deposits, mostly associated with extant fluvial systems.

Since the development will impact mainly rocks of the Vryheid Formation (Ecca group, Early Permian) and potentially, to a minor extent, Quaternary deposits in the north-eastern parts of the development area (**Figure 5**), the much older rocks of the Transvaal Supergroup will not be considered further in this report.

The project area falls within the Witbank Coalfield, close to the north-eastern edge of the main Karoo Basin. Mining activities will specifically target the coal seams within the Vryheid Formation, in particular the No. 2 seam of the Springs-Witbank Coalfield in Mpumalanga.

#### **Quaternary Deposits**

As per the explanation to sheet 2530 Barbarton (Walraven, 1989), the quaternary deposits present in the region include residual soils, alluvial deposits and scree deposits. These deposits are found along active streams on the property, particularly in the northern to north-eastern parts of the study area (**Figure 5**).

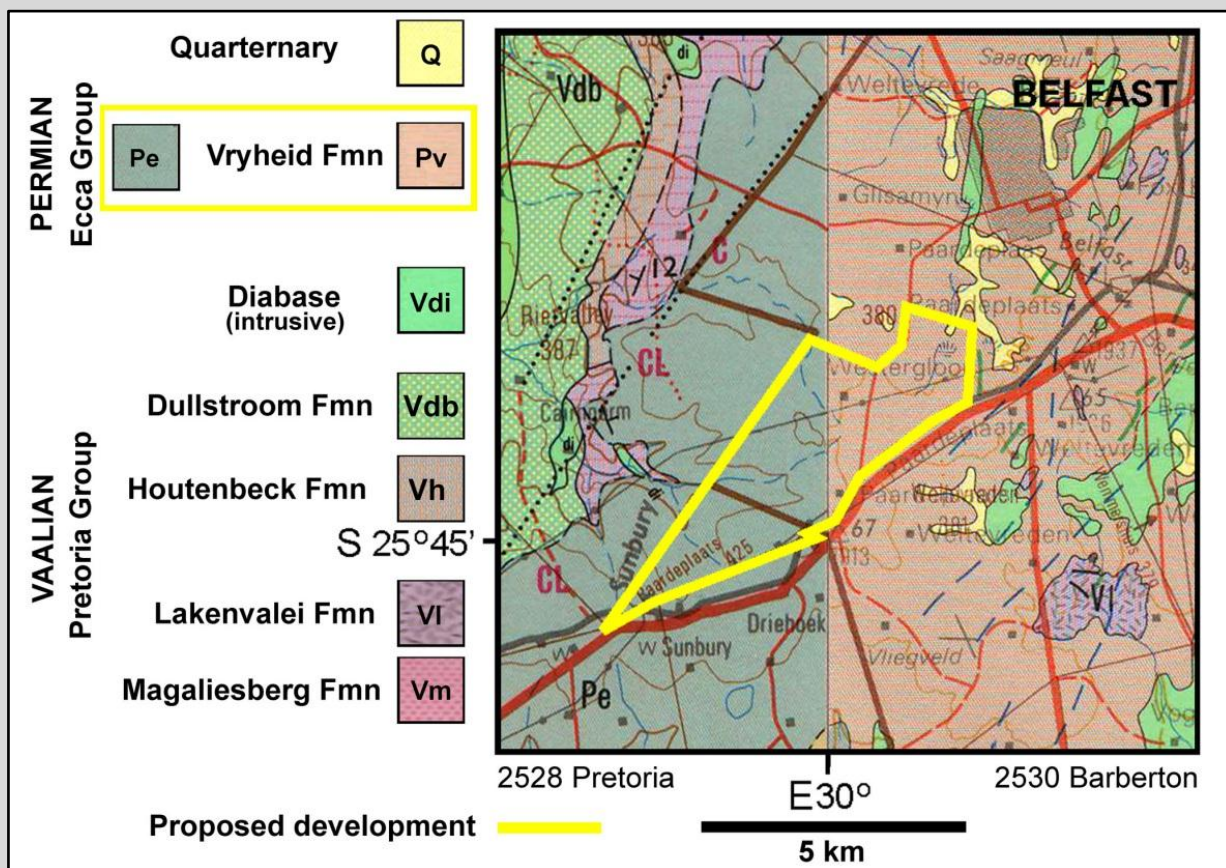


Figure 5 - Geological map of the Belfast area (from the 1:250 000 maps: 2530 Barberton and 2528 Pretoria, Council for Geoscience)

### Vryheid Formation

The Vryheid Formation (Ecca Group, Karoo Supergroup; **Figure 6**) underlies the entire study area, although surface exposures are poor due to the relatively low relief and extensive vegetation cover.

PERIOD		GROUP		FORMATION
TRIASSIC	Lower	Beaufort		
	Upper		L	Adelaide*
PERMIAN	Middle	Ecca	U	Volksrust
	Lower		M	Vryheid
		L	Pietermaritzburg	
		Dwyka		

\* Subgroup: includes Estcourt/Normandien Formations

Figure 6 - Major lithostratigraphic subdivisions (Lower Permian to Lower Triassic) of the Karoo Supergroup, Main Karoo Basin of South Africa



### 3.2.2 Palaeontological Heritage

The Quaternary deposits in the far north-east of the development area are unlikely to contain fossils and are considered to be of low palaeontological sensitivity. That said, fossils have been found occasionally in coeval deposits elsewhere, such as mammal bones and teeth, early humans, trace fossils, non-marine invertebrates.

*Any sedimentary rocks of the Vryheid Formation, and particularly those in close spatial proximity to coal seams, have a high potential for containing fossilised plants.*

The Early Permian, coal associated, Glossopteris-dominated floras of South Africa are World famous, and this reputation has been built on fossils described from only a handful of localities. The most well-known and best documented localities are the quarries near Vereeniging in the Gauteng Province, and at Hammanskraal, north of Pretoria in Mpumalanga Province.

Refer to **Appendix E** for the full description of the palaeontology of the study area.

### 3.3 Details of Site Visits Undertaken

Four PGS staff members visited the study area over a period of three consecutive days. The staff traversed the area via vehicle and conducted a controlled-exclusive surface survey by foot at various selected points. The survey was guided by the possible sites located during the initial archival and desktop research phase (Fourie and Kitto, 2012). GPS co-ordinates were taken of all identified heritage sites and the identified sites were recorded photographically.

### 3.4 Site Description

The study area comprises various portions (8) of the farms Paardeplaats 380 JT and Paardeplaats 425 JT. According to Exxaro the priority mining area is Portion 30 and it is possible that the other areas may be used only as offsets. Most of the study area is currently being used as farmland, for grazing purposes. There are also several tree plantations. Portions 29 and 40 of Paardeplaats 380 JT are currently being used as a flower bulb farm by Hadeco.

## 4 SITE SENSITIVITIES

### 4.1 Sites Inside Study Area

#### Site PP 001:

GPS: 25,72582 S  
30,00261 E

A farmstead with its associated buildings was identified at this location. The main house and other buildings were still intact and were occupied until recently before the property was sold to Exxaro (Pers.com). The main house measures approximately 20m x 20m and has a pitched corrugated iron roof (**Figure 7**). A kitchen and more rooms were added later to the back of the building. The original building has thick external walls which were plastered and painted. It also has a chimney for a coal stove. The house has wooden and metal door- and window frames. It also has external electricity and water systems on the older parts of the building and internal electricity and water systems on the later additional parts of the building.

A carport combined with a store room is situated next to the main house. This structure is brick-built and is constructed in the same architectural style as the main house, but it was evident from the materials used that this structure is of a much more recent origin than the main house. This structure also has a pitched corrugated iron roof, metal window frames and wooden doors and door frames.

A storeroom or shed with farm implements was also identified. This storeroom measures approximately 12m x 8m and has a low pitched corrugated iron roof. The building is brick-built and has metal window frames and wooden door frames with homemade doors. It has an external electrical system (**Figure 8**).

Another storeroom or shed is situated next to the first shed. It measures approximately 10m x 5m and is brick-built with a low pitched corrugated iron roof. A 5m x 10m extension was added at the back of the original structure and this extension has a sloping corrugated iron roof. The building has metal window frames and wooden doors and door frames. It also has an external electrical system.

A cattle shed or stables for horses is situated next to the two storerooms. The building is also brick-built and measures approximately 15m x 18m. It has a low pitched corrugated iron roof with a sloping corrugated iron roof on the one side, which was a later extension. This extension served as a feed storeroom. The building also has external electrical and water systems. The external water pipes were insulated to prevent the water from freezing in winter.

A pigsty was situated next to the cattle shed. The original structure is built with stone and mortar, but later extensions to raise the walls and additions are brick-built. The additions were most probably used as stables for horses. The building has a low pitched corrugated iron roof and external electrical and water systems. The building has no window or door frames and cement lintels were used for the window and door openings (**Figure 9**). The structure has a cement floor.

Site size: approximately 200m x 150m.



*Figure 7 – PP 001: Main farmhouse building*



*Figure 8 – PP 001: Main house and storeroom/shed*



*Figure 9 – PP001: Pigsty and two sheds/Storerooms*

**Site PP 002:**

GPS: 25,72989 S

30,00226 E

A cluster of four informal graves was identified at this location (**Figure 10**). The graves are situated in between a gravel road and a fence. The graves are placed next to each other along the fence and are orientated from west to east. One grave has a rectangular shaped cement outline as a dressing, with an inscribed granite headstone. This seems to be a double child's grave, as the headstone has two inscriptions painted on (**Figure 11**). Another grave is a double adult grave with a square shaped cement outline, which is filled with a layer of gravel. It also has an inscribed granite headstone. The fourth grave has an informal, elongated oval shaped mound of packed rocks as a dressing. It does not have an inscribed headstone. The graves are overgrown with vegetation, but it was evident that the graves had been cleared regularly as the vegetation was not overwhelming. The headstone inscriptions date the graves from the late 1960's and the 1970's and all the names on the graves are of the Mtweni family.

Site size: Approximately 10m x 4m.



*Figure 10 – PP 002: Cemetery*



*Figure 11 – PP 002: Inscription on double child's grave*



**Site PP 003:**

GPS: 25,71908 S

30,00414 E

Two informal graves were identified at this location. The graves are crudely fenced and are placed next to each other and orientated from west to east (**Figure 12**). The graves have large oval shaped outlines of packed rock as dressings. A flat rock serves as head stone for one grave. A plastic bottle and ceramic cup were placed on the graves as grave goods (**Figure 13**). The graves are not maintained and are overgrown with grass and other vegetation. The graves belong to the Maseko family, but their age was not known (local informant - Lina). The Maseko family apparently lives on the farm in the farmworkers houses located behind the farmstead (PP 001). Such graves are treated as being of 60 years or older unless evidence is obtained to the contrary.

Site size: Approximately 5m x 5m.



*Figure 12 – PP 003: Two Maseko graves*



*Figure 13 – PP 003: Close-up of grave goods*

**Site PP 004:**

GPS: 25,74415 S

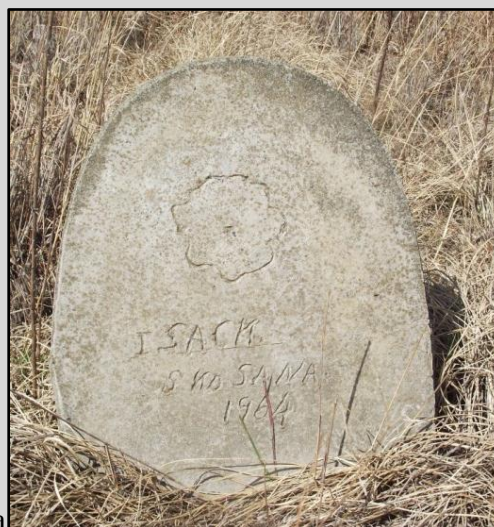
29,98579 E

An informal cemetery with approximately 81 graves was identified at this location (**Figure 14**). The cemetery is not fenced and is located in the open veld. The graves are placed in 5 unequal lines next to each other. The graves are placed along the boundary fence of the property and they are orientated from west to east. Most of the graves have informal oval or rectangular shaped mounds or outlines of packed rocks as dressings. Some of the graves had been cleaned recently, but most of them are overgrown with grass and other vegetation. A number of graves have granite inscribed headstones and one grave has a formal granite dressing with an inscribed granite headstone.

Site size: Approximately 25m x 40m.



*Figure 14 – PP 004: Farmworker cemetery*



*Figure 15 – Close-up of headstone*

**Site PP 005:**

GPS: 25,72521 S

30,01512 E

Another informal cemetery with approximately 40 graves was identified at this location. The cemetery is not fenced and is located amongst a plantation of blue-gum trees (**Figure 16**). The graves are placed in 5 unequal lines next to each other. The graves are also placed along the boundary fence of the property and they are orientated from west to east. Most of the graves have informal oval or rectangular shaped mounds or outlines of packed rocks as dressings. Most of the graves are overgrown with grass and other vegetation. Some graves have inscribed granite headstones and some graves have painted metal markers as headstones (**Figure 17**). Most of the graves have grave goods placed on the dressings.

Site size: Approximately 20m x 50m.



*Figure 16 – PP 005: View of graves*



*Figure 17 – PP 005: Grave with marker and grave goods*



**Site PP 006:**

GPS: 25,72800 S

30,01013 E

The remains of an old cattle kraal were identified at this location. The structure was built with stone and mortar and measures approximately 20m x 25m in size (**Figure 18**). The walls of the kraal are thick and measure approximately 0.75m thick and 2.2m high. The kraal has a storeroom attached to the one side and feeding troughs are placed along another wall (**Figure 19** and **Figure 20**). The storeroom is a later addition and is brick-built with a sloping corrugated iron roof. Three families had used parts of the old kraal structure to build their own homesteads. These families were working on the farm. The age of the kraal is not known.

Site size: Approximately 40m x 40m.



*Figure 18 – PP 006: View of kraal with dwelling additions*



*Figure 19 – PP 006: Close-up of dwelling addition*



*Figure 20 – PP 006: Close-up of dwelling addition*

**Site PP 007:**

GPS: 25,74327 S

30,00301 E

A large storeroom or shed was identified at this location. The storeroom measures approximately 20m x 12m in size and has a high pitched corrugated iron roof (**Figure 21**). It has large metal doors with metal door frames. These are most likely a later addition. The high windows have wooden frames and are open. The building also has an external electrical system. It has a cement floor and the building is still in use.

A small, square sandstone-built structure is situated next to the larger storeroom (**Figure 22**). This structure measures approximately 5m x 5m in size and also has a pitched corrugated iron roof. It is built with sandstone blocks and mortar and is in a rather weathered state. It does not have a door or door frame and a wooden lintel is used in the door opening. It has wooden window frames. The building has a dirt floor and does not have any water or electrical systems.

The age of these buildings is not known.

Site size: Approximately 30m x 25m.



*Figure 21 – PP 007: Storeroom/shed*



*Figure 22 – PP 007: Dilapidated square structure*

**Site PP 008:**

GPS: 25,74380 S

30,00236 E

The remains of a farm house and its associated buildings were identified at this location (**Figure 23**). The remains of the multi-roomed farm house measure approximately 20m x 20m in size. The building was constructed with sandstone blocks and mortar and later additions are brick-built. The walls of the building are thick and are mostly constructed with sandstone blocks and mortar. Some other sections had been constructed or repaired with mud-bricks. Most of the building is plastered with cement and is painted over. A wrought iron fireplace with red tile surround was still *in situ*, which could date the building to approximately the 1910s to 1930s [Edwardian period, <http://www.c20fireplaces.co.uk/information/history-twentieth-century-fireplaces-1905-1939>].

The building has no roof and all windows, doors and window and door frames had been removed. It has a sandstone chimney and some of the floors are tiled (**Figure 24**). The house had an internal electrical system which was a later addition.

A water reservoir are situated approximately 30m from the main house (**Figure 25**). Another sandstone building is situated approximately 40m on the other side of the farm house. This building was constructed with sandstone blocks and mortar and has a pitched corrugated iron roof. This structure measures approximately 5m x 10m in size and is in a semi-dilapidated state (**Figure 26** and **Figure 27**). This structure probably served as a storeroom or garage for the main building.

The age of this farmstead and its associated buildings is not known, however, it is highly likely that they are 60 years or older and they could be the original buildings for the Hadeco company.

Site size: Approximately 120m x 40m.



*Figure 23 – PP 008: Ruins of farmhouse*

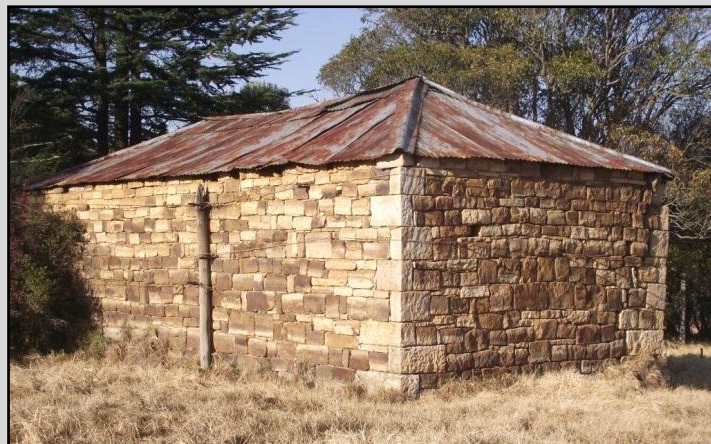




*Figure 24 – PP 008: Ruins of farmhouse*



*Figure 25 – PP 008: Sandstone reservoir*



*Figure 26 - PP 008: Sandstone storeroom/shed*



*Figure 27 - PP 008: Interior view of sandstone shed*

**Site PP 009:**

GPS: 25,74210 S

30,,00478 E

The remains of a small, square structure were identified at this location (**Figure 28**). The structure is built with sandstone blocks and cement and measures approximately 4m x 4m in size. The structure has no roof and has only one entrance with no windows. It also has a gravel floor. The function and age of this structure is unknown.

Site size: Approximately 5m x 5m.



*Figure 28 – PP 009: Square sandstone structure*

**Site PP 010:**

GPS: 25,75078 S

29,98994 E

A single, informal grave was identified at this location (**Figure 29**). The grave is situated approximately 40m from a farmstead, which has been identified as site PP 011 (below). The grave has an oval shaped outline of packed rocks as dressing and is orientated from west to east. A single rock is placed upright at the western end to serve as a headstone. The grave is not maintained and is overgrown with grass and other vegetation. The age of the grave is not known.

Site size: Approximately 2m x 2m.





*Figure 29 - PP 010: Single grave, near PP 011*

**Site PP 011:**

GPS: 25,75103 S  
29,98960 E

A farmstead with its associated buildings was identified at this location (**Figure 30**). The farmstead consists of two brick-built houses, located next to each other inside a fenced area. Both houses have pitched corrugated iron roofs with metal window and door frames. Both houses also have internal electrical and plumbing systems. Both houses are still occupied.

A large brick-built storeroom or shed is situated approximately 70m from the two houses (**Figure 31**). It has a pitched corrugated iron roof and wooden door and window frames. Large metal doors are used to close the door openings.

Another brick-built house is situated on the other side of the storeroom. This house is occupied by the farm labourers and their families. It also has a pitched corrugated iron roof and metal door and window frames. Several brick-built extensions have been added to the original structure. It also has external electrical and plumbing systems.

Two cement and mud-brick silos are situated next to the storeroom (**Figure 33**). The silos measure approximately 4m in diameter and approximately 5m high. The silos are in a ruined state and are not in use.

The remains of a cattle kraal were also identified near the houses (**Figure 34**). The kraal was built with sandstone blocks and mortar and measures approximately 25m x 8m in size. The kraal is in a ruined state and the walls had been replaced by fencing.

The remains of a double-rondawel workers' dwelling was also identified near the houses (**Figure 35**). The two rondawels were built of cement bricks and plastered. A brick curtain wall was added to join the two rondawels at a later date. The rondawel may be associated with the single grave (**PP010**). The age of this farmstead and its associated buildings was not known.

Site size: Approx. 300m x 300m.

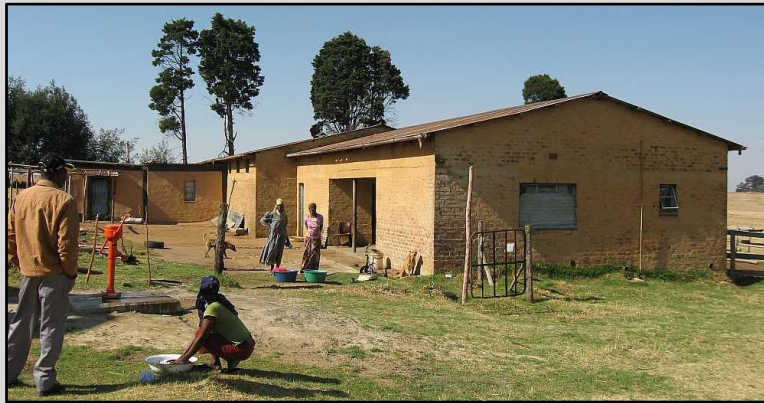


*Figure 30 – PP011: Farmstead (two houses)*



*Figure 31 - PP011: Brick shed*





*Figure 32 – Farmworker houses*



*Figure 33 – PP011: Two silos*



*Figure 34 – PP 011: Remains of kraal*



*Figure 35 – PP 011: Double rondawel*

**Site PP 012:**

GPS: 25,74595 S

29,97420 E

An abandoned coal mine shaft was identified at this location (**Figure 36**). The shaft measures approximately 2m x 5m and extends approximately 25m into the side of the hill. A second tunnel/shaft extended from the main shaft and its roof had collapsed at the end of this shaft/tunnel (**Figure 37**). Most of the shaft is flooded with water. Wooden supports to keep the roof of the shaft from collapsing are still in place. A ventilation hole had been dug in the roof which is visible on the surface of the rock outcrop. The age of this abandoned mine is not known. However, it is likely that it dates to over 100 years. Van der Merwe's book on the town of Belfast states that coal mining occurred in this area in historical times and was associated with Sammy Marks (1952).

Site size: Approximately 5m x 30m.



*Figure 36 – PP 012: Mineshaft entrance*



*Figure 37 – PP 012: Interior of mine shaft*



**Site PP 013:**

GPS: 25,74883 S

29,97470 E

Another abandoned mine shaft was identified at this location (**Figure 38** and **Figure 39**). The shaft also measures approximately 2m x 5m and extends approximately 25m into the side of the hill. Most of the shaft is flooded with water. Wooden supports to keep the roof of the shaft from collapsing are still in place. The age of this abandoned mine was not known. However, as noted above, it probably dates to the historical period. The coal spoil heap is also still present close to the entrance of the shaft.

Site size: Approximately 5m x 30m.



*Figure 38 – PP 013: General view of mine shaft*



*Figure 39 – PP 013: Close-up of shaft entrance*

**Site PP 014:**

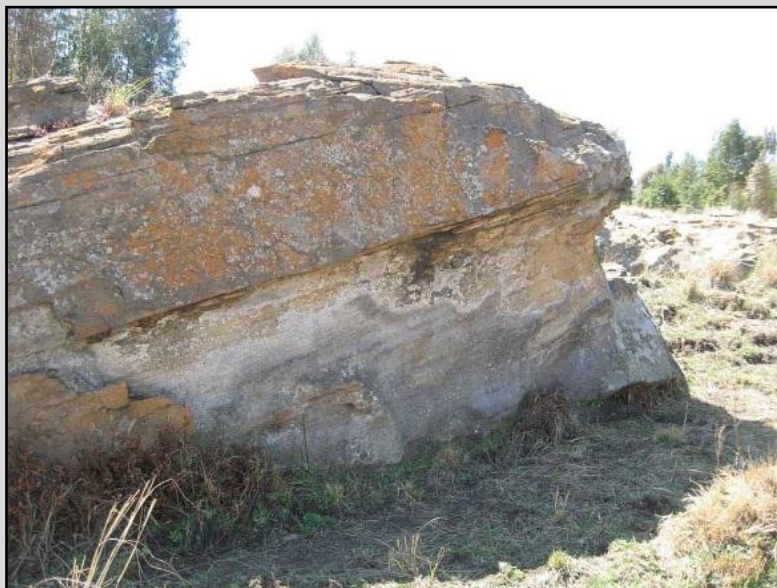
GPS: 25,75221 S

29,97899 E

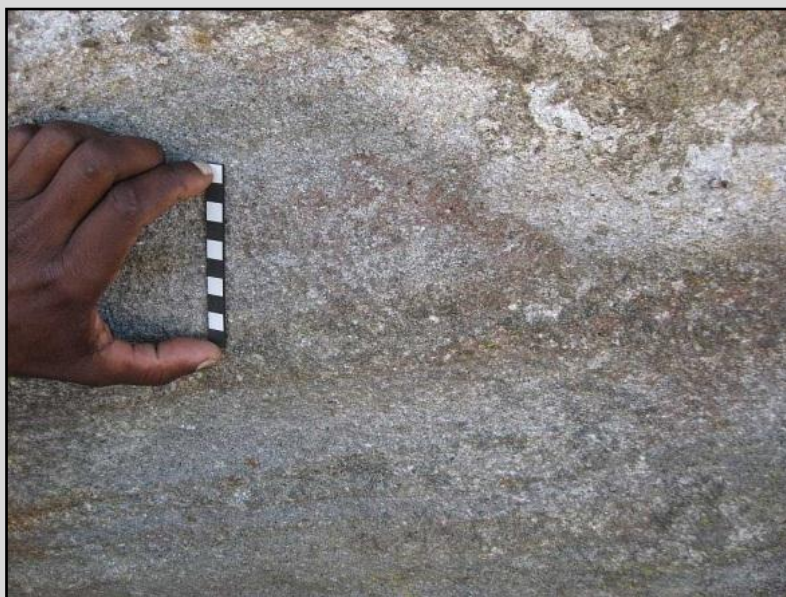
A possible rock art site was identified at this location (

**Figure 40**). The position of the panel is situated on the southern side of an exposed rock bank which formed a slight overhang. Two extremely faded figures were identified (**Figure 41**). These figures were red in colour, but could not be identified clearly. The figures measure approximately 20cm in size. The rock face is also deteriorating. No archaeological deposit was identified at the foot of the rock face.

Site size: Approximately 3m x 10m.



*Figure 40 – PP014: Rock outcrop with possible rock art*



*Figure 41 – PP014: Possible rock art figure/s*



**Site PP 015:**

GPS: 25,75435 S

29,98324 E

The remains of a mud brick homestead together with a stone walled cattle kraal were identified at this location. The remains of the mud brick homestead consist of the foundations of two rectangular structures, which each measure approximately 5m x 5m in size. Another circular structure measures approximately 4m in diameter. This structure was most probably the cooking hut. Rocks were used in the foundations to support the mud brick walls. Two lower grinding stones were also identified with the remains of the structures.

The ruined stone walled cattle kraal was situated approximately 35m to the west of the homestead (**Figure 42** and **Figure 43**). The kraal measures approximately 10m x 10m in size and the walls measure approximately 0.5m wide and 0.75m high.

Site size: Approximately 30m x 50m.



*Figure 42 – PP 015: Remains of kraal*



*Figure 43 – PP 015: Close-up of kraal wall*

**Site PP 016:**

GPS: 25,75299 S  
29,98291 E

The remains of a mud brick homestead with a stone walled cattle kraal were identified at this location (**Figure 44**). The remains of the mud brick homestead consist of the foundations of one rectangular structure, which measures approximately 7m x 4m in size, and a multi-roomed rectangular structure, which measured 8m x 10m each. Another circular structure measures approximately 4m in diameter. This structure was most probably the cooking hut. Rocks were used in the foundations to support the mud brick walls of the structures. A lower grinding stone was also identified with the remains of the structures. Several modern metal artefacts were such as wire, corrugated iron and cans were found scattered around the site.

The ruin of a stone walled cattle kraal is situated approximately 30m to the east of the homestead. The kraal measures approximately 10m x 12m in size but the walls had been robbed and the size of the walls could not be determined.

Two informal graves were also identified next to the kraal (**Figure 45**). They are placed next to each other and are orientated from west to east. The graves have oval shaped mounds of packed rocks as dressing. The graves have no headstones and their age could not be determined.

Site size: Approximately 60m x 60m.



*Figure 44 – PP 016: remains of kraal walling*





*Figure 45 – PP 016: Two graves*

**Site PP 017:**

GPS: 25,74883 S  
29,97470 E

An abandoned coal mine shaft was identified at this location (**Figure 46** and **Figure 47**). The shaft measures approximately 2m x 4m and extends approximately 15m into the side of the hill. Most of the shaft is flooded with water. The age of this abandoned mine is not known but it is likely to be of historical date (as discussed above).

Site size: Approximately 5m x 15m.



*Figure 46 - PP 017: Mine shaft entrance*



*Figure 47 – PP 017: Interior of mine shaft*

**Site PP 018:**

GPS: 25,76010 S  
29,96672 E

An old animal drinking trough was identified at this location (**Figure 48**). The trough is constructed with sandstone blocks and cement and is plastered. The trough measures approximately 5m x 1m and is approximately 0.75m high. No other structures or features are associated with the trough. The age of the trough is not known.

Site size: Approx. 1m x 5m.



*Figure 48 – PP 018: Water trough*



**Site PP 019:**

GPS: 25,75980 S

29,96623 E

A ruined stone-walled cattle kraal was identified at this location (**Figure 49**). The kraal measures approximately 20m x 10m in size and the walls measure approximately 0.5m wide and 1m high. Most of the sandstone blocks used in the walls of the kraal have been robbed (used somewhere else) and the original kraal is in a very dilapidated state (**Figure 50**).

Site size: Approximately 20m x 10m



*Figure 49 – PP 019: Remains of stone kraal*



*Figure 50 – PP 019: Close-up of remains of kraal wall*

**Site PP 020:**

GPS: 25,76151 S

29,96536 E

A brick and cement dam was identified at this location (**Figure 51**). The circular dam is brick-built and is plastered with cement. The dam measures approximately 10m in diameter and the dam wall is approximately 1.6m high.

A 6m x 6m square brick-built building is situated next to the cement dam (**Figure 52**). The building is plastered and has a wooden door frame. The building's roof, windows and doors had been removed. The age of this building is not known.

Site size: Approx. 30m x 30m.



*Figure 51 - PP 020: Cement Dam*



*Figure 52 – PP 020: Brick structure*



**Site PP 021:**

GPS: 25,76166 S

29,96465 E

The remains of a mud brick homestead were identified at this location. The remains of the mud brick homestead consist of the foundations of one rectangular structure (**Figure 53**), which measure approximately 7m x 4m in size, and a multi-roomed I-shaped structure, which measures 8m x 12. A further circular structure measures approximately 4m in diameter (**Figure 54**). This structure was most probably the cooking hut. Rocks were used in the foundations to support the mud brick walls of the structures. A lower grinding stone was also identified with the remains of the structures (**Figure 55**). Several modern metal artefacts were such as wire, corrugated iron and cans were found scattered around the site.

Site size: Approximately 30m x 30m



*Figure 53 – PP 021: Foundations of rectangular structure*



*Figure 54 – PP 021: Remains of circular structure*



Figure 55 – PP 021: Lower grindstone

**Site PP 022:**

GPS: 25,76169 S  
29,96375 E

The remains of a mud brick homestead were identified at this location. The remains of the mud brick homestead consist of the foundations of one rectangular multi-roomed structure, which measures approximately 10m x 15m in size; two rectangular shaped structures, which measure 4m x 6m each; and a square room, which measures 4m x 4m (**Figure 56**). There was also a circular structure, which measures approximately 4m in diameter. This structure was most probably the cooking hut. The structures are arranged in an open square which formed a central lapa area. Rocks were used in the foundations to support the mud brick walls of the structures. Several modern metal artefacts such as wire, corrugated iron and cans were found scattered around the site.

Site size: Approximately 30m x 30m.



Figure 56 – PP 022: Foundations of multi-roomed structure



**Site PP 023:**

GPS: 25,76166 S

29,96465 E

The remains of an old sandstone building were identified at this location (**Figure 57** and **Figure 58**). Most of the remains of the building had been removed and only the sandstone blocks which formed the foundations of the building are left. Several bricks were also found scattered across the site. There were no other features such as windows, doors or any floors to identify the structure with. These remains are most probably parts of an old farm house, which were broken down and removed from this site in the past. The structure measures approximately 18m x 20m in size. The exact function and age of this structure is not known.

Site size: Approximately 30m x 30m.



*Figure 57 – PP 023: Remains of sandstone building*



*Figure 58 – PP 023: Sandstone blocks*



**Site PP 024:**

GPS: 25,76272 S

29,96177 E

The ruined remains of the Sunbury railway station were identified at this location (**Figure 59**). The structure is constructed of red brick that was plastered and painted. The structure has been stripped of its roof, doors, windows and all other features. Only a few of its walls remain. The structure is in ruins and is overgrown with vegetation. The age of the station is not known.

Site size: Approximately 30m x 30m.



*Figure 59 - PP 024: Remains of Sunbury railway station building*

**Site PP 025:**

GPS: 25,73242 S

29,99351 E

The remains of farm labourer quarters were identified at this location (**Figure 60**). The structure is brick-built and plastered and measures approximately 10m x 5m in size. The roof, doors, windows and frames have been removed from the building. The building consisted of two rooms and a bathroom. A warm water system (donkey) is situated next to the bathroom of the building. A midden was also identified approximately 20m from the structure.

The remains of a cattle or pig shed were also identified approximately 50m to the west of the labourer quarters (**Figure 61**). A brick and cement drinking trough was identified near the remains of the cattle/pig shed (**Figure 62**).

Site size: Approximately 40m x 40m.



*Figure 60 – PP 025: Ruins of farmworker dwelling and “donkey” structure*



*Figure 61 – PP 025: Remains of shed*



*Figure 62 – PP 025: Close-up of shed wall*

**Site PP 026:**

GPS: 25,73428 S

29,99304 E

The remains of a mud brick homestead were identified at this location (**Figure 63**). The mud brick homestead consist of the foundations of two square structures, which measure approximately 4m x 4m in size each, and a multi-roomed rectangular structure, which measures 8m x 15m. Another circular structure measures approximately 4m in diameter. This structure was most probably the cooking hut. Rocks were used in the foundations to support the mud brick walls of the structures. Several modern metal artefacts were such as wire, corrugated iron and cans were found scattered around the site.

Site size: Approximately 30m x 30m.



*Figure 63 – PP 026: Foundation of homestead wall*



*Figure 64 – PP 026: Remains of circular structure*



**Site PP 027:**

GPS: 25,73508 S

29,99341 E

The remains of a sandstone building were identified at this location. The structure measures approximately 12m x 5m and is constructed with sandstone blocks without mortar or cement (**Figure 65**). The original entrance to the structure has been filled up with other sandstone blocks. The walls of this structure measure approximately 0.5m wide and approximately 2m high. The structure was most probably a shed or a storeroom.

The remains of a stone walled kraal were identified next to the sandstone structure (**Figure 66**). Most of the walling for the kraal has been removed and only some sandstone blocks from the foundations are left. The kraal measures approximately 10m x 25m.

Site size: Approximately 30m x 40m.



*Figure 65 – PP 027: Ruins of sandstone shed*



*Figure 66 – PP 027: Remains of kraal walls attached to shed*

**Site PP 028:**

GPS: 25,73605 S

29,99331 E

A small informal cemetery with eight graves was identified at this location (**Figure 67**). The cemetery is fenced and is situated in the open veld. The graves are placed in one line next to each other and all are orientated from west to east. Seven of the graves have informal, oval shaped outlines of packed rocks which are filled with soil. Rocks are placed upright at the western ends to serve as headstones. One grave has a formal granite dressing and an inscribed granite headstone (**Figure 68**). This grave dates from the early 1960's and belongs to the Skhosana family. Most of the graves are overgrown with grass and other vegetation. No grave goods were found with these graves.

Site size: Approximately 3m x 20m.



*Figure 67 – PP 028: Skhosana Cemetery*



*Figure 68 - PP 028: Close-up of formal grave (Skhosana, 1961)*



**Site PP 029:**

GPS: 25,72698 S

29,98967 E

The remains of an extended mud brick settlement were identified at this location. The remains of this mud brick settlement cover an area of approximately 200m x 200 and consist of at least nine different homesteads or structures which formed part of the larger settlement (**Figure 69**). Most of the structures are ruined and were very difficult to identify. The numbers, sizes and shapes of these structures of this settlement are not clearly identifiable. Rocks were used in the foundations to support the mud brick walls of the structures. Several modern metal artefacts such as wire, corrugated iron and cans were found scattered around the site.

Site size: Approximately 200m x 200m.



*Figure 69 – PP 029: General view of foundation remains*

**Site PP 030:**

GPS: 25,71853 S

30,01722 E

A farmstead with its associated buildings was identified at this location. The main house and other buildings are still intact and are still being occupied (**Figure 70**). The main house has been extended over the years and several extensions are visible. These additions are all done in the same architectural style as the original building. The original house has a pitched thatched roof and wooden door and window frames. It has thick walls which are plastered and whitewashed or painted white (**Figure 71** and **Figure 72**). According to the owner, Mr. Wilkie, the house is more than a hundred years old. The house has many different features and a detailed study by a heritage architect would be necessary to document them all.

A second, more modern, house is situated opposite the original old house (**Figure 74** and **Figure 75**). This house is brick-built and has a pitched corrugated iron roof. It measures approximately 25 m x 30m in size and actually consists of two separate buildings which have been joined. According to the owner, Mr. Wilkie, this house is more than 60 years old. The house has metal window frames and wooden door frames and doors. It also has internal electrical and plumbing systems.

A storeroom or shed with farm implements was also identified (**Figure 73**). This storeroom measures approximately 12m x 8m and has a low pitched corrugated iron roof. The building is built with sandstone blocks and mortar and has wooden window frames and wooden door frames with homemade doors. It has an external electrical system.

Another storeroom or shed is situated next to the first shed. It measures approximately 10m x 5m and is also constructed with sandstone blocks and mortar, with a low pitched corrugated iron roof. This building is in a rather poor state and more recent brick and cement supports had been placed there to extend the life of the building. The building has wooden window frames and wooden doors and door frames.

Site size: Approximately 200m x 150m.





*Figure 70 – PP 030: Wilkie farmhouse, historical building with additions*



*Figure 71 - PP 030: View of Wilkie farmhouse*



*Figure 72 – PP 030: View of rear of main farmhouse*





*Figure 73 – PP 030: Two sandstone sheds*



*Figure 74 - PP 030: Second farmhouse, original building*



*Figure 75 – PP 030: Modern addition to rear of second farmhouse*



**Site PP 031:**

GPS: 25,71133 S

30,01645 E

An informal cemetery with approximately 39 graves was identified at this location (**Figure 76**). The cemetery is not fenced and is located in a ploughed and planted field. The graves are placed in 3 unequal lines next to each other aligned east-west (**Figure 77**). Most of the graves have informal oval or rectangular shaped mounds or outlines of packed rocks as dressings. One grave has a formal granite dressing and an inscribed granite headstone. Some of the graves had been cleaned recently, but most of them are overgrown with grass and other vegetation. Some graves have granite inscribed headstones (**Figure 78** and **Figure 79**). According to a locals, the graves are farmworker graves. Some families still live on the farm and others live in the local township (Siyathuthuka).

Site size: Approximately 30m x 40m.



*Figure 76 – PP 031: View of farmworker cemetery*



*Figure 77 – PP 031: View of grave*



*Figure 78 – PP 031: Close-up of grave with inscribed headstone*



Figure 79 – PP 031: Close-up of grave with formal headstone

**Site PP 032:**

GPS: 25,72307 S  
30,01585 E

The remains of another mud brick homestead were identified at this location (**Figure 80**). The remains of the mud brick homestead consist of the foundations of four square structures, which each measure approximately 4m x 4m in size, and a circular structure which measured approximately 4m in diameter. This structure was most probably the cooking hut. The structures are all placed around a central lapa area. Rocks were used in the foundations to support the mud brick walls of the structures (**Figure 81**). Several modern metal artefacts such as wire, corrugated iron and cans were found scattered around the site.

Site size: Approximately 30m x 30m.





*Figure 80 – PP 032: Foundation remains of homestead*



*Figure 81 – PP 032: Close-up of wall foundations*

#### **4.2 Sites Outside Study Area (Belfast Cemeteries)**

##### *Belfat Municipal Cemetery and Belfat Concentration Camp Cemetery*

PGS was requested to investigate the possible impact of the existing blasting activities (Glisa Coal Mine) and future blasting activities on the graves at the Belfast Municipal Cemetery and the Concentration Camp Cemetery (**Figure 82**).

Evidence of damage to gravestones at both the Municipal Cemetery and Concentration Camp Cemetery was visible. It is not clear whether the damage may be due to existing blasting activities or to other causes. Although, the fact that the Municipal Cemetery is located very close to the entrance of the Glisa Mine, together with the clear evidence of damage to many graves in this cemetery is likely to indicate a link.



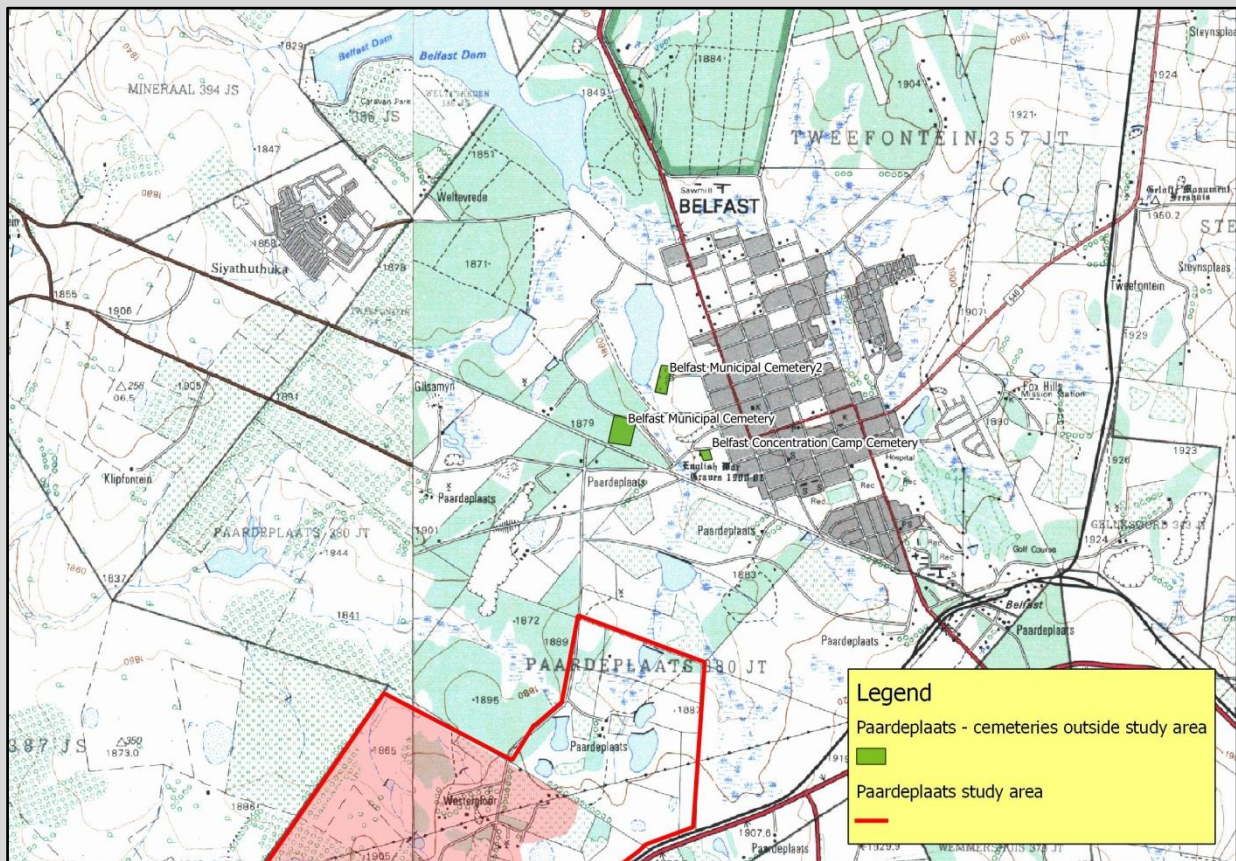


Figure 82 – Position of cemeteries in relation to study mining area

Belfast Concentration Camp Graves (all of these graves are 60-100 years old)

This cemetery is no longer used and contains the graves of both British Military personnel and Boer civilians who were interned in the concentration camp during the Second South African War (“Anglo-Boer” War), between 1899-1902, as well as local Belfast civilians (**Figure 83, Figure 85, Figure 86**). The graves of the O’Neil family, who played a significant role in the founding of the town of Belfast, are also located in this cemetery (**Figure 84**). The cemetery is located on Wes street, on the outskirts of Belfast Town.

Evidence of damage to the headstones of several graves, both military and civilian is evident. Some of the damage seems to be recent (relatively unweathered broken surfaces) while past damage has been repaired on several occasions (**Figure 87 to Figure 90**).



*Figure 83 – Boer Concentration Camp Memorial*



*Figure 84 – O'Neil Family Graves (Richard Charles & wife)*



*Figure 85 – British Military Graves (Anglo-Boer War)*





Figure 86 – British Military graves: Repaired marble crosses



Figure 87 – Damaged headstone: civilian grave (1918)



Figure 88 – Damaged civilian grave



*Figure 89 - Damaged civilian grave*



*Figure 90 – Headstone with repaired breaks*

### *Belfast Municipal Cemetery*

This cemetery is the existing town cemetery and is located very close to the entrance of the existing Glisa Coal Mine. The cemetery is still operational and the oldest graves do not seem to date back further than around the 1970s or 1960s. There is evidence of damage to many graves in the cemetery.

However, since most of the damage seems to be due to subsidence, it is not clear if there is a connection with the blasting activities at the Glisa Mine or not (**Figure 91** to **Figure 97**)





*Figure 91 – Plaque at Cemetery Entrance*



*Figure 92 – Damaged slabs and headstone*



*Figure 93 – Evidence of subsidence*



*Figure 94 – Extent of visible subsidence*



*Figure 95 – Damaged and subsiding grave slab*



*Figure 96 – Recent grave (2012) with subsidence*





Figure 97 – Recent grave, close-up

## 5 SITE CONSTRAINTS

Following from Section 3 above the **Figure 98** indicates the sites identified during the field work. The red shaded area indicates the direct mining footprint as planned for the Paardeplaats project as derived from the projected mining plan (**Figure 99**).

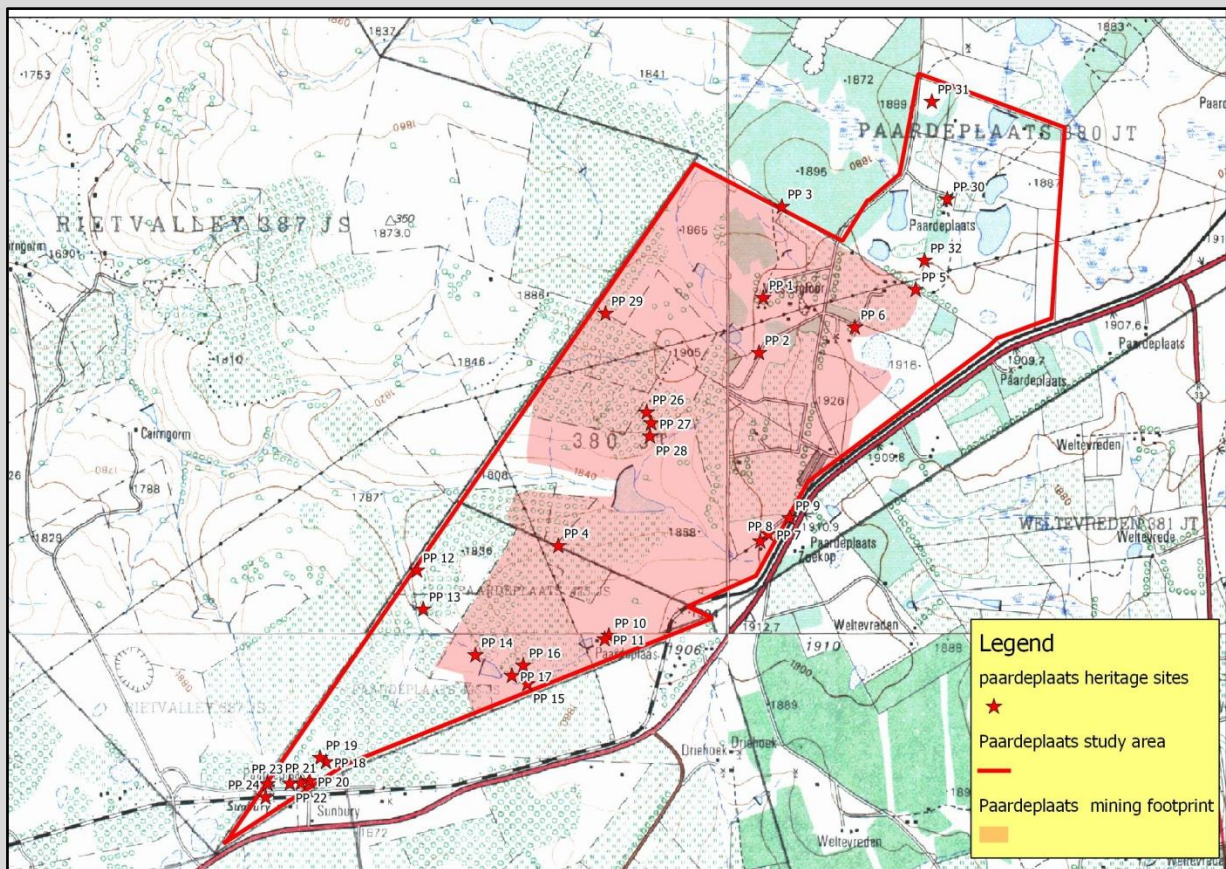


Figure 98 - Heritage Site Map

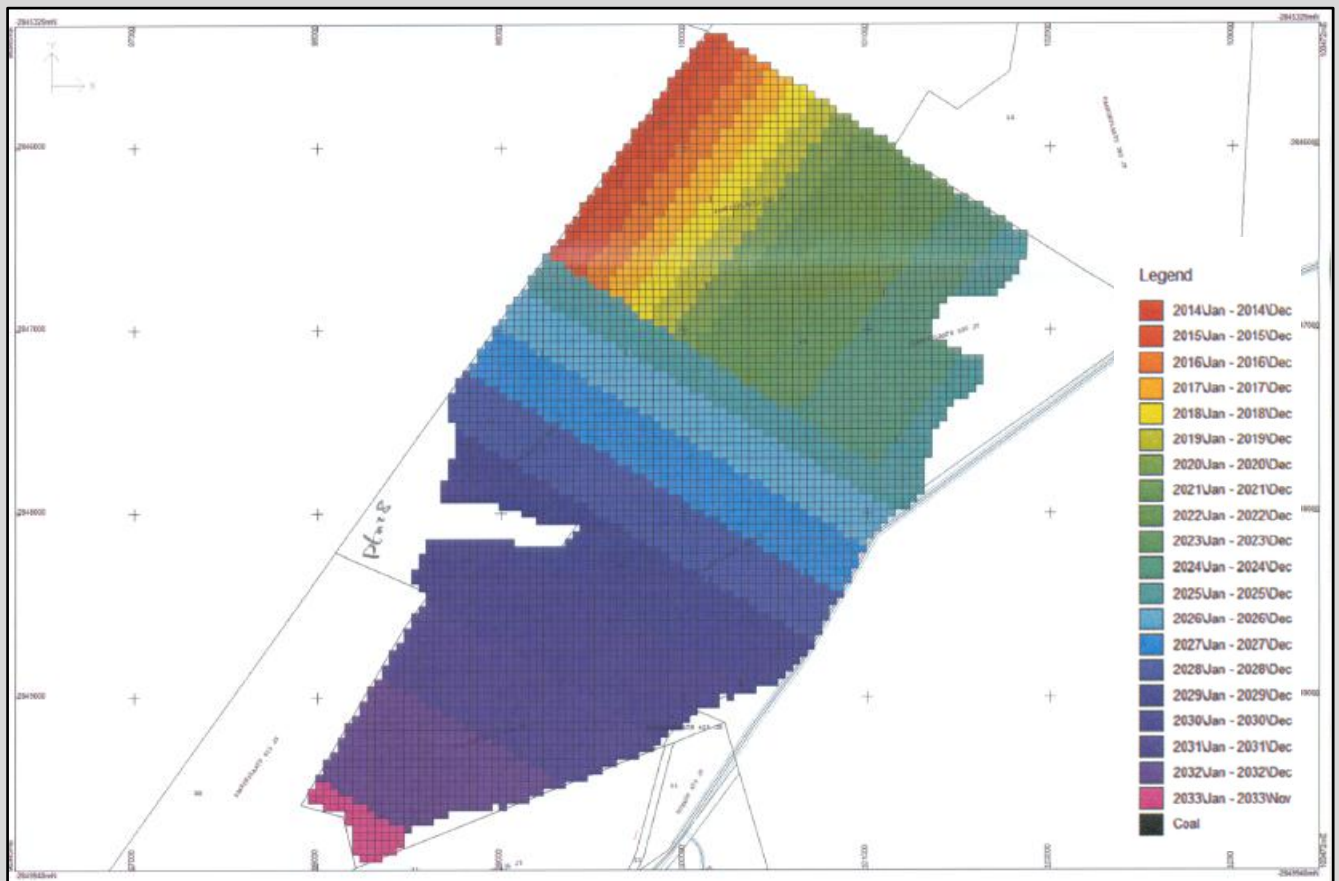


Figure 99 – Proposed mining timeframes

## 6 IMPACT ASSESSMENT

The impact assessment is based on the following set of alternatives provided for the proposed project:

- Least Preferred: No Go option
- Less Preferred : Mining as per the Mining Schedule (Maximum Mine Production)
- Most Preferred: Mining only Portion 30 (Sensitivity Planning Approach)

### ***The No Go Alternative***

This alternative will imply that no development takes place and that the environment remains unchanged and unaltered. ***For this alternative the assumption stays that no heritage resources will be impacted on and no further evaluation of impacts will be done for this option.***

### ***The Sensitivity Approach Alternative – Portion 30 (Practical Pit)***

This alternative will emphasise resource protection and use stringent mitigation measures to minimise identified adverse impacts.



This alternative will allow for the proposed development of the Paardeplaats coal mine whilst protecting identified consolidated high sensitive environmental features which will be identified during the specialist EIA investigation. The concept of in-situ conservation and biodiversity off-sets to account for significant residual impacts may also be explored.

### ***The Maximum Mine Production Alternative (As indicated in Figure 99)***

In this alternative, the mining and production of coal is emphasised. Less restrictive mitigation measures will be used to protect the environmental features, thus allowing for maximum coal production. This approach will increase the financial viability of the proposed Paardeplaats coal mine at the potential cost of impacting on more environmental features than the sensitivity planning approach. This alternative is likely to increase landscape character changes and impact on hydrology and biodiversity, as mining operations will likely move through sensitive environmental features.

## **6.1 Sites Inside The Study Area**

### *6.1.1 Palaeontology*

The fossil coal floras of South Africa are of international interest, and represent an important part of our local heritage. Any loss of this heritage due to mining or construction activities is permanent, and should be regarded as a highly significant negative impact.

Alternatively, discovery of fossils during excavation, followed by effective mitigation in collaboration with a palaeontologist, would result in the curation of new and important fossil material – therefore the development could potentially have a positive, beneficial impact on South Africa’s palaeontological heritage.

### Assessment

In palaeontological terms any destruction of fossils is a permanent negative impact and must be regarded as potentially high impact significance. New taxa are fairly regularly encountered in plant fossil studies, and destruction of well-preserved, undescribed fossil beds could represent a heavy loss in terms of our understanding of historical biodiversity.

***This assessment holds true for both mining alternatives during construction as well as operational phases of both alternatives.***

Refer to **Table 2** for impact evaluation on palaeontological resources

Table 2 – Impact table for palaeontological resources

<b>Impact name:</b>	<i>Impact on Palaeontological Resources</i>				
<b>Phase:</b>	<ul style="list-style-type: none"> <li>Construction and Operational Phase</li> </ul>				
<ul style="list-style-type: none"> <li>Alternative:</li> </ul>	<ul style="list-style-type: none"> <li>Mining area</li> </ul>				
<ul style="list-style-type: none"> <li>Description of impact:</li> </ul>	<ul style="list-style-type: none"> <li>During the operational phase of the mine, the mining direction and subsequent box cutting possibly impact on palaeontological resources.</li> </ul>				
<ul style="list-style-type: none"> <li>Environmental Risk</li> </ul>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
<ul style="list-style-type: none"> <li>Nature of Impact</li> </ul>	-1	-1			
<ul style="list-style-type: none"> <li>Extent of Impact</li> </ul>	2	2			
<ul style="list-style-type: none"> <li>Duration of Impact</li> </ul>	5	5			
<ul style="list-style-type: none"> <li>Magnitude of Impact</li> </ul>	4	4			
<ul style="list-style-type: none"> <li>Reversibility of Impact</li> </ul>	5	5			
<ul style="list-style-type: none"> <li>Probability</li> </ul>	4	4			
<ul style="list-style-type: none"> <li>Environmental Risk (Pre-mitigation)</li> <li>Environmental Risk (Post-mitigation)</li> <li>Degree of confidence in impact prediction:</li> </ul>					
<b>Recommended Mitigation Measures</b>					
<ul style="list-style-type: none"> <li>When the potential exists for new fossils to be exposed through excavations, it is the responsibility of the on-site Environmental Officer (ECO) to monitor excavation activities and report the occurrence of any fossiliferous material to SAHRA and an appropriate authority to allow the material to be thoroughly assessed, recorded and professionally excavated or sampled.</li> </ul> <p>Effective conservation of fossil heritage in a mining situation would entail the following mitigation measures:</p> <p>1) regular inspection of excavation sites by an ECO capable of searching for and recognising plant fossils: inspections should be performed on excavations that disturb bedrock, and between blasting cycles in open cast mines, when the face wall and floor of the pit are exposed; in underground mining activities, it would be particularly the roof of the shaft that would be examined for evidence of fossil floras;</p> <p>2) when lenses of sedimentary rocks containing well-preserved plant fossils are found, a palaeontologist must be afforded the opportunity to collect a representative sample of the flora, and to document the depositional context as reflected by the adjacent rocks and coal seams; a palaeobotanical collection must be made. There is little value in collecting a few blocks of the material – this is not a representative sample. A strategy of bulk collecting must be employed, whereby a relatively large and unbiased sample of the flora is collected, with collection attention to those elements that are attractive, well-preserved or rare. The associated geology, which will also be destroyed during excavation, must be documented photographically (with scale). Floras with no context are increasingly coming to be considered of limited palaeontological value.</p> <p>3) to avoid delays, the mine must be prepared to assist in the removal of blocks containing high quality plant fossil material, and in the storage of unprepared fossiliferous blocks until such a time as the material can be properly processed by a palaeontologist. Storage areas must be such that the blocks are not exposed directly to the elements.</p>					
<b>Impact Prioritisation</b>					
<ul style="list-style-type: none"> <li>Public Response</li> </ul>					
<ul style="list-style-type: none"> <li><b>EIMS WILL COMPLETE</b></li> </ul>					
<b>Cumulative Impacts</b>					

<ul style="list-style-type: none"> <li>▪ <i>The potential to impact negatively on fossil floras will remain as long as mining continues to expose and destroy fossiliferous</i></li> </ul>				
<ul style="list-style-type: none"> <li>▪ Degree of potential irreplaceable loss of resources</li> </ul>				
<ul style="list-style-type: none"> <li>▪ <i>In palaeontological terms any destruction of fossils is a permanent negative impact and must be regarded as potentially irreversible. New taxa are fairly regularly encountered in plant fossil studies, and destruction of well-preserved, undescribed fossil bears a significant loss in terms of our understanding of historical biodiversity.</i></li> </ul>				
Prioritisation Factor				
<ul style="list-style-type: none"> <li>▪ <b>Final Significance</b></li> </ul>				

### 6.1.2 PAARDEPLAATS 380 JT, PORTION 30 - *The Sensitivity Approach Alternative*

According to the information from EIMS/Exxaro, this portion is the priority mining area for the Paardeplaats Colliery, and is the alternative referred to at the start of Section 5 as – “**The Sensitivity Approach Alternative**”. Therefore any heritage sites located on this portion will be negatively impacted by the proposed mining activities.

The following **three heritage sites** occur on this portion:

#### *PP 001*

A farmstead with its associated buildings was identified at this location. The main house and other buildings were still intact. The main house consists of an original core building with thick external walls and wooden floors and ceilings. It also has a chimney for a coal stove. A kitchen and more rooms were added later to the back of the building. This would indicate that the core building is likely to be 60 years or older.

The associated buildings comprise four sheds, three of which are brick-built and one which was originally built with stone and had a brick section added later. The brick sheds are likely to be 60 years or older and the stone shed may be between 60-100 years old.

#### Assessment

Since all the buildings are still intact and comprise a complete farmstead, as well as being likely to date between 60-100 years, a permit from the Provincial Heritage Resources Authority Mpumalanga would be required if they need to be demolished. This would in turn require that a heritage evaluation of all the buildings be undertaken by a heritage architect (including historical research, and documentation by photographs and drawings). The site is provisionally **Graded as 3B** and of local heritage significance, pending the evaluation of the heritage architect.



### PP 003

Two informal graves were identified at this location. The graves are crudely fenced and have large oval shaped outlines of packed rock as dressings. A flat rock serves as head stone for one grave. A plastic bottle and ceramic cup were placed on the graves as grave goods. The graves are not maintained and are overgrown with grass and other vegetation. The graves belong to the Maseko family, but their age was not known (local informant). The Maseko family apparently lives on the farm in the farmworkers houses located behind the farmstead (PP 001). Such graves are treated as being of 60 years or older unless evidence is obtained to the contrary.

#### Assessment

As is the case for all graves that would be negatively affected, and since these are located in the priority mining area, the graves should be relocated after a full grave process that includes comprehensive social consultation. Permits from the Burial Ground Unit of SAHRA and from the Mpumalanga Department of Health will be required for the relocation. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance.

### PP 029

The remains of an extended mud brick settlement, which cover an area of approximately 200m x 200. At least nine different homesteads or structures were identified, which formed part of the larger settlement. Most of the structures survive only as foundation traces and were very difficult to identify.

#### Assessment

These remains can be demolished without a permit, **but must be evaluated for the possible presence of infant burials through social consultation**. As mentioned above, it is known that stillborn babies and deceased infants occasionally were buried within the occupied settlements of African rural communities. These children were sometimes buried underneath the floors and walls of houses and huts and were not marked. The site is given a heritage significance grading of – **Generally Protected C**.

#### 6.1.3 Impact Tables for sites within “The Sensitivity Approach Alternative”

The following section provides the evaluation of the impacts on the heritage resources located directly inside the proposed mining footprint area for the **Sensitivity Approach Alternative**

*Table 3 – Impact table for graves and cemeteries inside Sensitivity Approach Alternative - Construction*

<b>Impact name:</b>	<i>Impact on graves and cemeteries</i>				
<b>Phase:</b>	▪ <i>Construction</i>				
▪ <b>Alternative:</b>	▪ <i>Sensitivity Approach Alternative</i>				
▪ <b>Description of impact:</b>	▪ <i>Destruction of graves and cemeteries situated within mining pit areas</i>				
<b>Environmental Risk</b>	▪				
<b>Attribute</b>	▪ <b>Pre-mitigation</b>	▪ <b>Post-mitigation</b>	▪	▪	
▪ <b>Nature of Impact</b>	▪ -1	▪ -1	▪	▪	
▪ <b>Extent of Impact</b>	▪ 2	▪ 2	▪	▪	
▪ <b>Duration of Impact</b>	▪ 5	▪ 2	▪	▪	
▪ <b>Magnitude of Impact</b>	▪ 4	▪ 3	▪		
▪ <b>Reversibility of Impact</b>	▪ 5	▪ 3	▪		
▪ <b>Probability</b>	▪ 4	▪ 4	▪		
▪ <b>Environmental Risk (Pre-mitigation)</b>					
▪ <b>Environmental Risk (Post-mitigation)</b>					
▪ <b>Degree of confidence in impact prediction:</b>	▪				
▪ <b>Recommended Mitigation Measures</b>	▪				
<ul style="list-style-type: none"> <li>▪ <i>The graves should be relocated after a full grave relocation process that includes comprehensive social consultation. process must include:</i> <ul style="list-style-type: none"> <li>• <i>A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the grave at least 60 days in length;</i></li> <li>• <i>Site notices indicating the intent of the relocation</i></li> <li>• <i>Newspaper Notice indicating the intent of the relocation</i></li> <li>• <i>A permit from the local authority;</i></li> <li>• <i>A permit from the Provincial Department of Health;</i></li> <li>• <i>A permit from the South African Heritage Resources Agency, if the graves are older than 60 years, or unidentified and thus older than 60 years;</i></li> <li>• <i>An exhumation process that keeps the dignity of the remains and family intact;</i></li> <li>• <i>The whole process must be done by a reputable company that is well versed in relocations;</i></li> <li>• <i>The exhumation process must be conducted in such a manner as to safeguard the legal rights of the families as well as the company.</i></li> </ul> </li> </ul>					
<b>Impact Prioritisation</b>	▪				
▪ <b>Public Response</b>	▪				
▪ <b>EIMS WILL COMPLETE</b>					
▪ <b>Cumulative Impacts</b>	▪				
▪ <i>Only two graves are impacted by this alternative and the cumulative impact is seen as low</i>					

Degree of potential irreplaceable loss of resources	■	■	■	■
<ul style="list-style-type: none"> <li>■ The graves are irreplaceable but can be relocated by doing so minimising the impact</li> </ul>				
Prioritisation Factor	■	■	■	■
Final Significance	■	■	■	■

Table 4 – Impact table for graves and cemeteries inside Sensitivity Approach Alternative – Operation and Decommissioning

<b>Impact name:</b>	<i>Impact on graves and cemeteries</i>				
<b>Phase:</b>	<ul style="list-style-type: none"> <li>■ Operation and decommissioning</li> </ul>				
Alternative:	<ul style="list-style-type: none"> <li>■ Sensitivity Approach Alternative</li> </ul>				
<b>Description of impact:</b>	<ul style="list-style-type: none"> <li>■ Destruction of graves and cemeteries situated within mining pit area</li> </ul>				
<b>Environmental Risk</b>	■	■	■	■	■
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>	■	■	■
Nature of Impact	■ -1	■ -1	■	■	■
Extent of Impact	■ 1	■ 1	■	■	■
Duration of Impact	■ 5	■ 5	■	■	■
Magnitude of Impact	■ 4	■ 4	■	■	■
Reversibility of Impact	■ 5	■ 5	■	■	■
Probability	■ 2	■ 2	■	■	■
<ul style="list-style-type: none"> <li>■ Environmental Risk (Pre-mitigation)</li> <li>■ Environmental Risk (Post-mitigation)</li> <li>■ Degree of confidence in impact prediction: ■ ■</li> </ul>					
<ul style="list-style-type: none"> <li>■ Recommended Mitigation Measures ■ ■ ■</li> </ul>					
<p><i>The graves should be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process should include:</i></p> <ul style="list-style-type: none"> <li>● A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves within 60 days in length;</li> <li>● Site notices indicating the intent of the relocation</li> <li>● Newspaper Notice indicating the intent of the relocation</li> <li>● A permit from the local authority;</li> <li>● A permit from the Provincial Department of Health;</li> <li>● A permit from the South African Heritage Resources Agency, if the graves are older than 60 years, or unidentified and thus older than 60 years;</li> <li>● An exhumation process that keeps the dignity of the remains and family intact;</li> <li>● The whole process must be done by a reputable company that is well versed in relocations;</li> <li>■ The exhumation process must be conducted in such a manner as to safeguard the legal rights of the families as well as the community.</li> </ul>					



<i>company.</i>			
<b>Impact Prioritisation</b>	▪	▪	▪
▪ Public Response	▪	▪	▪
▪ <i>EIMS WILL COMPLETE</i>			
▪ Cumulative Impacts	▪	▪	▪
▪ <i>No known graves are to be impacted during operation and decommissioning</i>			
▪ Degree of potential irreplaceable loss of resources		▪	▪
▪ <i>The graves are irreplaceable but can be relocated by doing so minimising the impact</i>			
Prioritisation Factor	▪	▪	▪
▪ Final Significance	▪	▪	▪

Table 5 – Impact table for buildings and structures inside Sensitivity Approach Alternative - Construction

<b>Impact name:</b>	<b><i>Impact on buildings and structures</i></b>				
<b>Phase:</b>	<i>Construction and mining</i>				
<b>Alternative:</b>	<i>Sensitivity Approach Alternative</i>				
<b>Description of impact:</b>	<i>Destruction of buildings and structures</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	2	2			
Duration of Impact	5	5			
Magnitude of Impact	3	2			
Reversibility of Impact	5	2			
Probability	4	4			
Environmental Risk (Pre-mitigation)					<b>-15</b>
Environmental Risk (Post-mitigation)					<b>-11</b>
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					

<ul style="list-style-type: none"> <li>• Destruction permits required for sites PP00. This will require that, specifically, site PP001, should be documented by photographs and drawings, before it can be demolished. In addition, any of these structures that are farmworker dwellings must be evaluated for the possible presence of infant burials through social consultation</li> <li>• The remaining dwelling structures (PP029) must be evaluated for the possible presence of infant burials through social consultation. Through experience of similar sites and the knowledge of cultural customs and traditions, it is known that stillborn babies and deceased infants occasionally were buried within the occupied settlements of African rural communities. These children were sometimes buried underneath the floors and walls of houses and huts. These burials were not marked, but were known to the immediate family.</li> </ul>	
<b>Impact Prioritisation</b>	
Public Response	3
<i>EIMS WILL COMPLETE</i>	
Cumulative Impacts	1
<i>The destruction of all the structures within the mining are will result in a loss of structures adding to the cultural fabric of the landscape</i>	
Degree of potential irreplaceable loss of resources	2
<i>Documentation of the cultural characteristics of the structures will minimize the complete loss of information on the resource</i>	
Prioritisation Factor	1.5
<b>Final Significance</b>	<b>-16.5</b>

Table 6 – Impact table for buildings and structures inside Sensitivity Approach Alternative - Operation and Decommissioning

<b>Impact name:</b>	Impact on buildings and structures			
<b>Phase:</b>	<ul style="list-style-type: none"> <li>▪ Construction and mining</li> </ul>			
<ul style="list-style-type: none"> <li>▪ Alternative:</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sensitivity Approach Alternative</li> </ul>			
<ul style="list-style-type: none"> <li>▪ Description of impact:</li> </ul>	<ul style="list-style-type: none"> <li>▪ Destruction of buildings and structures</li> </ul>			
<ul style="list-style-type: none"> <li>▪ Environmental Risk</li> </ul>				
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>		
<ul style="list-style-type: none"> <li>▪ Nature of Impact</li> </ul>	<ul style="list-style-type: none"> <li>▪ -1</li> </ul>	<ul style="list-style-type: none"> <li>▪ -1</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Extent of Impact</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Duration of Impact</li> </ul>	<ul style="list-style-type: none"> <li>▪ 5</li> </ul>	<ul style="list-style-type: none"> <li>▪ 5</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Magnitude of Impact</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Reversibility of Impact</li> </ul>	<ul style="list-style-type: none"> <li>▪ 5</li> </ul>	<ul style="list-style-type: none"> <li>▪ 5</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Probability</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1</li> </ul>		
<ul style="list-style-type: none"> <li>▪ Environmental Risk (Pre-mitigation)</li> <li>▪ Environmental Risk (Post-mitigation)</li> <li>▪ Degree of confidence in impact prediction:</li> </ul>				
<ul style="list-style-type: none"> <li>▪ Recommended Mitigation Measures</li> </ul>				

<ul style="list-style-type: none"> <li>No further mitigation after the implementation of the preconstruction mitigation measures</li> </ul>				
<b>Impact Prioritisation</b>				
<ul style="list-style-type: none"> <li>Public Response</li> </ul>				
<ul style="list-style-type: none"> <li><b>EIMS WILL COMPLETE</b></li> </ul>				
<b>Cumulative Impacts</b>				
<ul style="list-style-type: none"> <li>The destruction of all the structures within the mining are will result in a loss of structures adding to the cultural fabric effects on structures inside the Portion is foreseen.</li> </ul>				
<ul style="list-style-type: none"> <li>Degree of potential irreplaceable loss of resources</li> </ul>				
<ul style="list-style-type: none"> <li>Documentation of the cultural characteristics of the structures will minimize the complete loss of information on the resource</li> </ul>				
<ul style="list-style-type: none"> <li>Prioritisation</li> </ul>				
<ul style="list-style-type: none"> <li>Factor</li> </ul>				
<ul style="list-style-type: none"> <li>Final Significance</li> </ul>				

Table 7– Impact table: Damage/Destruction of undiscovered Heritage structures/resources Sensitivity Approach Alternative – Construction and operational Phase

<b>Impact name:</b>	<i>Damage/Destruction of undiscovered Heritage structures/resources</i>				
<b>Phase:</b>	<ul style="list-style-type: none"> <li>Construction and Operational Phase</li> </ul>				
<ul style="list-style-type: none"> <li>Alternative:</li> </ul>	<ul style="list-style-type: none"> <li>Sensitivity Approach Alternative</li> </ul>				
<ul style="list-style-type: none"> <li>Description of impact:</li> </ul>	<ul style="list-style-type: none"> <li>Damage/Destruction of undiscovered Heritage structures/resources</li> </ul>				
<ul style="list-style-type: none"> <li>Environmental Risk</li> </ul>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
<ul style="list-style-type: none"> <li>Nature of Impact</li> </ul>	-1	-1			
<ul style="list-style-type: none"> <li>Extent of Impact</li> </ul>	1	1			
<ul style="list-style-type: none"> <li>Duration of Impact</li> </ul>	5	5			
<ul style="list-style-type: none"> <li>Magnitude of Impact</li> </ul>	3	3			
<ul style="list-style-type: none"> <li>Reversibility of Impact</li> </ul>	5	5			
<ul style="list-style-type: none"> <li>Probability</li> </ul>	2	2			
<ul style="list-style-type: none"> <li>Environmental Risk (Pre-mitigation)</li> </ul>					
<ul style="list-style-type: none"> <li>Environmental Risk (Post-mitigation)</li> </ul>					
<ul style="list-style-type: none"> <li>Degree of confidence in impact prediction:</li> </ul>					
<ul style="list-style-type: none"> <li>Recommended Mitigation Measures</li> </ul>					

<ul style="list-style-type: none"> <li>A short induction on possible heritage resources that maybe found in the area should be included in the induction program for mining employees. If a possible heritage site is discovered during mining activity, all operations in the vicinity of the site should be supervised by a qualified specialist contracted to evaluate and recommend appropriate actions. Depending on the type of site this can range from relocation process, documentation of structures or archaeological excavations.</li> </ul>				
<ul style="list-style-type: none"> <li><b>Impact</b></li> </ul>				
<ul style="list-style-type: none"> <li><b>Prioritisation</b></li> </ul>				
<ul style="list-style-type: none"> <li>Public Response</li> </ul>				
<ul style="list-style-type: none"> <li><i>EIMS WILL COMPLETE</i></li> </ul>				
<ul style="list-style-type: none"> <li>Cumulative</li> </ul>				
<ul style="list-style-type: none"> <li>Impacts</li> </ul>				
<ul style="list-style-type: none"> <li>The discovery of new heritage resources can add to the cumulative impact rating</li> </ul>				
<ul style="list-style-type: none"> <li>Degree of potential irreplaceable loss of resources</li> </ul>				
<ul style="list-style-type: none"> <li>As the heritage resources are irreplaceable</li> </ul>				
<ul style="list-style-type: none"> <li>Prioritisation</li> </ul>				
<ul style="list-style-type: none"> <li>Factor</li> </ul>				
<ul style="list-style-type: none"> <li><b>Final Significance</b></li> </ul>				

#### 6.1.4 PAARDEPLAATS 380 JT, PORTION 29 – *Included in The Maximum Mine Production Alternative*

According to the mining plan provided by Exxaro, most of this portion will be used for the Mining Rights Area pit, and is included in the “*The Maximum Mine Production Alternative*”. This indicates that any heritage sites located within the MRA Pit boundary on this portion will be negatively impacted by the proposed mining activities.

The following **three heritage sites** are located on this property:

##### *PP 002*

A cluster of four informal graves is situated in between a gravel road and a fence. The graves are placed next to each other along the fence and are orientated from west to east. One grave has a rectangular shaped cement outline as a dressing, with an inscribed granite headstone. This seems to be a double child’s grave as the headstone has two inscriptions painted on. Another grave is a double adult grave with a square shaped cement outline and an inscribed



granite headstone. The fourth grave has an informal, elongated oval shaped mound of packed rocks as a dressing, without an inscribed headstone. The headstone inscriptions date the graves from the late 1960's and the 1970's and all the names on the graves are of the Mtweni family.

#### Assessment

As is the case for all graves that would be negatively affected, and since these are located in the priority mining area, the graves should be relocated after a full grave process that includes comprehensive social consultation. Since the headstone inscriptions date the graves from the late 1960's and the 1970's and they are less than 60 years old, a permit from SAHRA would not be required. However, any relocation would require a permit from the Mpumalanga Health Department. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance.

#### *PP 005*

An informal cemetery with approximately 40 graves was identified at this location. The cemetery is not fenced and is located amongst a plantation of blue-gum trees. Most of the graves have informal oval or rectangular shaped mounds or outlines of packed rocks as dressings. Some graves have inscribed granite headstones and some graves have painted metal markers as headstones. The names on the inscribed headstones/markers include several marked as Nkosi and Masina. Since most of the graves are informal and don't have inscribed headstones, it is likely that they are 60 years or older.

#### Assessment

As is the case for all graves that would be negatively affected, and since these are located in the area immediately adjacent to priority mining area, the graves should be relocated after a full grave process that includes comprehensive social consultation. Permits from the Burial Ground Unit of SAHRA and from the Mpumalanga Department of Health will be required for the relocation. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance.

#### *PP 006*

The remains of an old cattle kraal were identified at this location. The structure was built with stone and mortar and measures approximately 20m x 25m in size. Three families had used parts of the old kraal structure to build their own homesteads. These families were working on the

farm. The age of the kraal is not known. However, due to its construction of stone and mortar, it is likely that it is 60 years or older.

#### Assessment

If the structure will be negatively impacted by the mining activities, a destruction permit will be required for its demolition. In addition, since farmworker dwellings have been added onto the structure, these must be evaluated for the possible presence of infant burials through social consultation. The site is given a heritage significance grading of – **Generally Protected B** and of Local Significance.

#### **6.1.5 PAARDEPLAATS 380 JT, PORTIONS 28 AND 40 - Included in The Maximum Mine Production Alternative**

Most of these two portions could be used for the Mining Rights Area Pit (MRA) and is included in the “**The Maximum Mine Production Alternative**”. Any heritage sites located on these portions may be negatively impacted and would require mitigation.

The following **seven heritage sites** are located on these two portions:

#### **PORTION 40**

This portion is part of the Hadeco tulip farm property. Various buildings forming the main offices are situated on this portion, at the end of the main access road. The company known as Hadeco, was established by two young Dutch men, Floor Barnhoorn and Harry de Leeuw, when they emigrated to South Africa in 1946. Apparently, the company began producing cut-flowers from bulbs in 1947. According to the company website, Hadeco® is one of the largest flower bulb growers in the world (<http://hadeco.co.za/from-humble-beginnings>).

Most of the existing office buildings are still in use and probably date to the recent historical period. However, there is a possibility that some of these the more recent buildings date to 1952 or after, they would be protected as 60 year or older buildings and would require a permit from the Mpumalanga Provincial Heritage Authority before they could be demolished. However, several structures close to the offices were identified as structures that are highly likely to be 60 years or older based on their construction materials and style (sites **PP 007, PP 008 and PP 009**).

The following four heritage sites were identified on this property:

*PP 004*

An informal cemetery with approximately 81 graves was identified at this location. The cemetery is not fenced and is located in the open veld next to the boundary line of the property. Most of the graves have informal oval or rectangular shaped mounds or outlines of packed rocks as dressings. Some graves have granite inscribed headstones and one grave has a formal granite dressing with an inscribed granite headstone. However, the majority of the graves do not have inscribed headstones or dates. The few dates that are present date to the 1960s and one dates to 1986. Names on the graves include Skosana, Ngwenya, and Mhlanga. The informal graves with no dates should be assumed to be likely to be 60 years or older.

Assessment

As is the case for all graves that would be negatively affected, and since these are located in the area immediately adjacent to priority mining area, the graves should be relocated after a full grave process that includes comprehensive social consultation. Permits from the Burial Ground Unit of SAHRA and from the Mpumalanga Department of Health will be required for the relocation. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance.

*PP 007*

This site comprises a large storeroom or shed, mostly constructed with sandstone blocks and mortar. However, some sections had been constructed or repaired with mud-bricks. This building is still in use. There is a small, square sandstone-built structure situated next to the large shed. This structure is also built with sandstone blocks and mortar and is in a ruined state.

Assessment

Since the large shed building is still intact, even though the small square structure is quite dilapidated, and because they are both likely to date between 60-100 years, a permit from the Provincial Heritage Resources Authority Mpumalanga would be required if they need to be demolished. This would in turn require that the remains of the buildings should be mapped and documented by photographs and drawings. The site is given a heritage significance grading of – **Generally Protected B** and of Local Significance.

#### *PP 008*

The remains of a multi-roomed farm house are located a short distance (50/60m) away from the structures at PP 007. The building was constructed with a combination of sandstone blocks and mortar and brick. A wrought iron fireplace with red tile surround was still *in situ*, which could date the building to approximately the 1910s to 1930s [Edwardian period, <http://www.c20fireplaces.co.uk/information/history-twentieth-century-fireplaces-1905-1939>]. Another sandstone building is situated approximately 40m to one side of the farmhouse. This building was constructed with sandstone blocks and mortar and was probably used as a shed. It is highly likely that these buildings are 60 years or older and they could be the original buildings for the Hadeco company. This could make them of local significance, specifically to the Hadeco company.

#### Assessment

Even though the buildings are quite weathered, they are likely to date between 60-100 years, and could be of local significance, a permit from the Provincial Heritage Resources Authority Mpumalanga would be required if they need to be demolished. This would in turn require that the remains of the buildings should be mapped and documented by photographs and drawings. The site is given a heritage significance grading of – **Generally Protected B** and of Local Significance.

#### *PP 009*

The remains of a small, square sandstone structure were identified. The structure has no roof and has only one entrance with no windows. It also has a gravel floor. The function and age of this structure is unknown, although the fact that the mortar has been 'pointed', indicates that it is likely to be 60 years or older.

#### Assessment

Even though the structure is quite weathered, it is likely to be older than 60 years, a permit from the Provincial Heritage Resources Authority Mpumalanga would be required if it needs to be demolished. This would in turn require that the structure should be mapped and documented by photographs and drawings and spatially linked to the documentation of **PP008**. The site is given a heritage significance grading of – **Generally Protected B** and of Local Significance.



## **PORTION 28**

This property is owned by Exxaro and currently used for farming activities (mostly grazing). The following three heritage sites were identified:

### *PP 026*

The remains of a mud brick homestead which consists of the foundations of two square structures and a multi-roomed rectangular structure as well as a circular structure.

### Assessment

The structure can be demolished without a permit. However, since it was probably a farmworker homestead, ***the site must be evaluated for the possible presence of infant burials through social consultation***. The site is given a heritage significance grading of – **Generally Protected C** and of Local Significance.

### *PP 027*

The remains of a rectangular building constructed with sandstone blocks without mortar or cement. The structure was most probably a shed or a storeroom. The remains of a stone walled kraal were identified next to the ruined sandstone structure. Only the foundations of the walls remain. These two structures are likely to be 60 years or older.

### Assessment

Even though the structures are extremely dilapidated, since they could be older than 60 years, a permit from the Provincial Heritage Resources Authority Mpumalanga would be required if they need to be demolished. This may in turn require that the structures should be mapped and documented by photographs and drawings. The site is given a heritage significance grading of – **Generally Protected B** and of Local Significance.

### *PP028*

A small informal cemetery with eight graves was identified at this location. The cemetery is fenced and is situated in the open veld. Seven of the graves have informal, oval shaped outlines of packed rocks which are filled with soil. One grave has a formal granite dressing and an inscribed granite headstone which provides a date (1961) and a name (Skhosana). However, the other graves are likely to be 60 years or older

### Assessment

As is the case for all graves that would be negatively affected, and since these are located in the area immediately adjacent to priority mining area, the graves should be relocated after a full grave process that includes comprehensive social consultation. Permits from the Burial Ground Unit of SAHRA and from the Mpumalanga Department of Health will be required for the relocation. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance.

#### 6.1.6 PAARDEPLAATS 425 JS, PORTION 2

Most of the property comprising this portion is marked for use for the Mining Rights Area Pit (MRA) and is included in the “*The Maximum Mine Production Alternative*”. Any heritage sites located on this portion may be negatively impacted and would require mitigation. However, it is possible that this property may be used for off-set activities rather than direct mining activities in the case that only Portion 30 the *Sensitivity Approach Alternative*, is implemented.

The following *six heritage sites* were identified on this property:

#### PP 010

A single, informal grave was identified at this location. The grave is situated approximately 40m from a farmstead, which has been identified as site PP 011 (below). The grave has an oval shaped outline of packed rocks as dressing a single rock is placed upright at the western end to serve as a headstone. The age and name of the grave is unknown. It is likely that it could be 60 years or older.

### Assessment

As is the case for all graves that could be negatively affected, the grave may be relocated, if necessary, after a full grave process that includes comprehensive social consultation. Permits from the Burial Ground Unit of SAHRA and from the Mpumalanga Department of Health will be required for the relocation. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance.

#### PP 011

A farmstead which consists of two adjacent brick-built houses was identified at this location. Various other structures are associated with the farmstead. A large brick-built storeroom or

shed is located near to the farmstead. Two cement and mud-brick silos are situated next to this shed. A third brick house, which has been extended several times, is located on the other side of the shed/store. The remains of a cattle kraal were also identified near the houses. The kraal was built with sandstone blocks and mortar. Only the foundations of some of the walls remain. The sandstone blocks of the kraal indicate that the farm buildings may be 60 years or older. The remains of a double-rondawel was also identified, located a short distance away from the other buildings. The two rondawels, built of cement bricks and plastered, are joined by a brick curtain wall. The rondawel may be associated with the single grave.

#### Assessment

The existing brick-built structures (two farm houses, workers' housing, shed and silos) will require a permit, since they could be older than 60 years, from the Provincial Heritage Resources Authority Mpumalanga if they need to be demolished. This may in turn require that the structures should be mapped and documented by photographs and drawings. The site is given a heritage significance grading of – **Generally Protected B** and of Local Significance.. However, the rondawel site should not need a destruction permit, although it must be evaluated for the possible presence of infant burials through social consultation.

#### *PP 014*

A possible rock art site was identified at this location. The possible art is very faded and is situated on the southern side of an exposed rock bank which formed a slight overhang. An unusual isolated reddish marking, which could be the faded remains of two possible figures was identified. However, the marking was not very clear.

#### Assessment

It is recommended that the site be demarcated as a no-go area and that a specialist on rock art be contracted to evaluate and confirm the existence of the rock art and if confirmed develop further management recommendations for the site.

The site is tentatively given a heritage significance of **Grade 2 Provincial Significance**.

#### *PP 015*

The remains of a mud brick homestead together with a stone walled cattle kraal were identified at this location. The remains of the mud brick homestead consist of the foundations of two rectangular structures and a circular structure.

### Assessment

The remains of the kraal and homestead structures can be demolished without a permit. However, the dwelling structures should be evaluated for the possible presence of infant burials through social consultation. The site is given a heritage significance grading of – **Generally Protected C** and of Local Significance.

### *PP 016*

The remains of a mud brick homestead with a stone walled cattle kraal were identified at this location. The remains of the mud brick homestead consist of the foundations of one rectangular structure, a multi-roomed rectangular structure, and a circular structure. Two informal graves were also identified next to the kraal. The graves have oval shaped mounds of packed rocks as dressing, with no headstones.

### Assessment

The remains of the kraal and homestead structures can be demolished without a permit. However, the dwelling structures should be evaluated for the possible presence of infant burials through social consultation. As is the case for all graves that could be negatively affected, the two graves may be relocated, if necessary, after a full grave process that includes comprehensive social consultation. Permits from the Burial Ground Unit of SAHRA and from the Mpumalanga Department of Health will be required for the relocation. The graves site is given a heritage significance grading of – **Generally Protected A** and of Local Significance, while the homestead structure is graded as **Generally Protected C**.

### *PP 017*

An abandoned incline shaft was identified at this location. Most of the shaft is flooded with water. The age of this abandoned mine is not known but it is likely to be of historical date.

### Assessment

If this site will be negatively affected by mining activities, it is recommended that the shaft should be mapped and investigated further before it is destroyed. Because the shaft is highly likely to be over 100 years old, a destruction permit from SAHRA would be required. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance.



### 6.1.7 Impact Tables for sites within The Maximum Mine Production Alternative

The following section provides the evaluation of the impacts on the heritage resources located directly inside the proposed mining footprint area for the **Maximum Mine Production Alternative**.

Table 8 – Impact table for graves and cemeteries inside Maximum Mine Production Alternative - Construction

<b>Impact name:</b>	<i>Impact on graves and cemeteries</i>				
<b>Phase:</b>	<i>Construction</i>				
<b>Alternative:</b>	<i>The Maximum Mine Production Alternative</i>				
<b>Description of impact:</b>	<i>Destruction of graves and cemeteries situated within mining pit areas</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	2	2			
Duration of Impact	5	2			
Magnitude of Impact	4	3			
Reversibility of Impact	5	3			
Probability	4	4			
Environmental Risk (Pre-mitigation)					-16
Environmental Risk (Post-mitigation)					-10
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					
<p><i>The graves should be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:</i></p> <ul style="list-style-type: none"> <li>• <i>A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, which will be at least 60 days in length;</i></li> <li>• <i>Site notices indicating the intent of the relocation</i></li> <li>• <i>Newspaper Notice indicating the intent of the relocation</i></li> <li>• <i>A permit from the local authority;</i></li> <li>• <i>A permit from the Provincial Department of Health;</i></li> <li>• <i>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;</i></li> <li>• <i>An exhumation process that keeps the dignity of the remains and family intact;</i></li> <li>• <i>The whole process must be done by a reputable company that is well versed in relocations;</i></li> <li>• <i>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 development company.</i></li> </ul>					
<b>Impact Prioritisation</b>					
Public Response					3
<i>EIMS WILL COMPLETE</i>					
Cumulative Impacts					3
<i>The total amount of cemeteries directly impacted by the proposed mining foot print is 6 with accounting for 100 of a total of 141 graves identified inside the study area</i>					
Degree of potential irreplaceable loss of resources					3
<i>The graves are irreplaceable but can be relocated by doing so minimising the impact</i>					
Prioritisation Factor					2
<b>Final Significance</b>					-20

Table 9 – Impact table for graves and cemeteries inside Maximum Mine Production Alternative –  
Operation and Decommissioning

<b>Impact name:</b>	<i>Impact on graves and cemeteries</i>				
<b>Phase:</b>	<i>Operation and decommissioning</i>				
<b>Alternative:</b>	<i>The Maximum Mine Production Alternative</i>				
<b>Description of impact:</b>	<i>Destruction of graves and cemeteries situated within mining pit areas</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	1	1			
Duration of Impact	5	5			
Magnitude of Impact	4	4			
Reversibility of Impact	5	5			
Probability	2	2			
Environmental Risk (Pre-mitigation)					-7.5
Environmental Risk (Post-mitigation)					-7.5
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					
<p><i>The graves should be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:</i></p> <ul style="list-style-type: none"> <li>• <i>A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, which will be at least 60 days in length;</i></li> <li>• <i>Site notices indicating the intent of the relocation</i></li> <li>• <i>Newspaper Notice indicating the intent of the relocation</i></li> <li>• <i>A permit from the local authority;</i></li> <li>• <i>A permit from the Provincial Department of Health;</i></li> <li>• <i>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;</i></li> <li>• <i>An exhumation process that keeps the dignity of the remains and family intact;</i></li> <li>• <i>The whole process must be done by a reputable company that is well versed in relocations;</i></li> </ul> <p><i>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 development company.</i></p>					
<b>Impact Prioritisation</b>					
Public Response					3
<i>EIMS WILL COMPLETE</i>					
Cumulative Impacts					1
<i>No known graves are to be impacted during operation and decommissioning</i>					
Degree of potential irreplaceable loss of resources					1
<i>The graves are irreplaceable but can be relocated by doing so minimising the impact</i>					
Prioritisation Factor					1.333333333
<b>Final Significance</b>					-10

Table 10 – Impact table for buildings and structures inside Maximum Mine Production Alternative -  
Construction

<b>Impact name:</b>	<b><i>Impact on buildings and structures</i></b>
<b>Phase:</b>	<b><i>Construction and mining</i></b>

<b>Alternative:</b>	<i>Maximum Mine Production Alternative</i>				
<b>Description of impact:</b>	<i>Destruction of buildings and structures</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	2	2			
Duration of Impact	5	5			
Magnitude of Impact	3	2			
Reversibility of Impact	5	2			
Probability	4	4			
Environmental Risk (Pre-mitigation)					-15
Environmental Risk (Post-mitigation)					-11
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					
<ul style="list-style-type: none"> <li>• <i>Destruction permits required for sites P006, PP007, PP008, PP009, PP011, PP018, PP019, PP020, PP024, PP027. This will require that, specifically, site PP001, should be documented by photographs and drawings, before it can be demolished. In addition, any of these structures that are farmworker dwellings must be evaluated for the possible presence of infant burials through social consultation</i></li> <li>• <i>The remaining dwelling structures (PP015, PP016, PP026, PP029), must be evaluated for the possible presence of infant burials through social consultation. Through experience of similar sites and the knowledge of cultural customs and traditions, it is known that stillborn babies and deceased infants occasionally were buried within the occupied settlements of African rural communities. These children were sometimes buried underneath the floors and walls of houses and huts. These burials were not marked, but were known to the immediate family.</i></li> <li>• <i>The more recent offices/store rooms (on the Hadeco farms) can be demolished with no further mitigation.</i></li> </ul>					
<b>Impact Prioritisation</b>					
Public Response					3
<i>EIMS WILL COMPLETE</i>					
Cumulative Impacts					2
<i>The destruction of all the structures within the mining are will result in a loss of structures adding to the cultural fabric of the landscape</i>					
Degree of potential irreplaceable loss of resources					2
<i>Documentation of the cultural characteristics of the structures will minimize the complete loss of information on the resource</i>					
Prioritisation Factor					1.666666667
<b>Final Significance</b>					<b>-18.33333333</b>

*Table 11 – Impact table for buildings and structures inside Maximum Mine Production Alternative -  
Operation and Decommissioning*

<b>Impact name:</b>	<b><i>Impact on buildings and structures</i></b>				
<b>Phase:</b>	<i>Construction and mining</i>				
<b>Alternative:</b>	<i>Maximum Mine Production Alternative</i>				
<b>Description of impact:</b>	<i>Destruction of buildings and structures</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	2	2			
Duration of Impact	5	5			
Magnitude of Impact	3	2			
Reversibility of Impact	5	2			
Probability	4	4			

Environmental Risk (Pre-mitigation)	-15
Environmental Risk (Post-mitigation)	-11
Degree of confidence in impact prediction:	Medium
<b>Recommended Mitigation Measures</b>	
<ul style="list-style-type: none"> <li>• Destruction permits required for sites P006, PP007, PP008, PP009, PP011, PP018, PP019, PP020, PP024, PP027. This will require that, specifically, site PP001, should be documented by photographs and drawings, before it can be demolished. In addition, any of these structures that are farmworker dwellings must be evaluated for the possible presence of infant burials through social consultation</li> <li>• The remaining dwelling structures (PP015, PP016, PP026, PP029), must be evaluated for the possible presence of infant burials through social consultation. Through experience of similar sites and the knowledge of cultural customs and traditions, it is known that stillborn babies and deceased infants occasionally were buried within the occupied settlements of African rural communities. These children were sometimes buried underneath the floors and walls of houses and huts. These burials were not marked, but were known to the immediate family.</li> <li>• The more recent offices/store rooms (on the Hadeco farms) can be demolished with no further mitigation.</li> </ul>	
<b>Impact Prioritisation</b>	
Public Response	3
<i>EIMS WILL COMPLETE</i>	
Cumulative Impacts	2
<i>The destruction of all the structures within the mining are will result in a loss of structures adding to the cultural fabric of the landscape</i>	
Degree of potential irreplaceable loss of resources	2
<i>Documentation of the cultural characteristics of the structures will minimize the complete loss of information on the resource</i>	
Prioritisation Factor	1.666666667
<b>Final Significance</b>	<b>-18.33333333</b>

Table 12– Impact table: Damage/Destruction of undiscovered Heritage structures/resources Maximum  
Mine Production Alternative – Construction and operational Phase

<b>Impact name:</b>	Damage/Destruction of undiscovered Heritage structures/resources			
<b>Phase:</b>	Construction and Operational Phase			
<b>Alternative:</b>	Maximum Mine Production Alternative			
<b>Description of impact:</b>	Damage/Destruction of undiscovered Heritage structures/resources			
<b>Environmental Risk</b>				
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>		
Nature of Impact	-1	-1		
Extent of Impact	1	1		
Duration of Impact	5	5		
Magnitude of Impact	3	3		
Reversibility of Impact	5	5		
Probability	2	2		
Environmental Risk (Pre-mitigation)				-7
Environmental Risk (Post-mitigation)				-7
Degree of confidence in impact prediction:				Medium
<b>Recommended Mitigation Measures</b>				
<p>A short induction on possible heritage resources that maybe found in the area should be included in the induction program for construction and mining employees. If a possible heritage site is discovered during mining activity, all operations in the vicinity of the discovery should stop and a qualified specialist contracted to evaluate and recommend appropriate actions. Depending on the type of site this can include initiating a grave relocation process, documentation of structures or archaeological excavations.</p>				
<b>Impact Prioritisation</b>				



Public Response	3
<i>EIMS WILL COMPLETE</i>	
Cumulative Impacts	2
<i>The discovery of ne heritage resources can add to the cumulative impact rating</i>	
Degree of potential irreplaceable loss of resources	2
<i>As the heritage resources are irreplaceable</i>	
Prioritisation Factor	1.66666667
<b>Final Significance</b>	<b>-11.6666667</b>

Table 13– Impact table: Rock Art: Maximum Mine Production Alternative – Construction and operational Phase

<b>Impact name:</b>	<b>Impact on Rock Art</b>			
<b>Phase:</b>	Construction and Operational Phase			
<b>Alternative:</b>	Maximum Mine Production Alternative			
<b>Description of impact:</b>	Destruction of rock art site during mining			
<b>Environmental Risk</b>				
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>		
Nature of Impact	-1	1		
Extent of Impact	2	2		
Duration of Impact	5	2		
Magnitude of Impact	4	2		
Reversibility of Impact	5	2		
Probability	4	2		
Environmental Risk (Pre-mitigation)				<b>-16</b>
Environmental Risk (Post-mitigation)				<b>-4</b>
Degree of confidence in impact prediction:				Medium
<b>Recommended Mitigation Measures</b>				
<i>It is recommended that the site be demarcated as a no-go area and that a specialist on rock art be contracted to evaluate and confirm the existence of the rock art and if confirmed develop further management recommendations for the site.</i>				
<b>Impact Prioritisation</b>				
Public Response				3
<i>EIMS WILL COMPLETE</i>				
Cumulative Impacts				2
<i>The potential to impact negatively on the rock art site is high if not a no-go area</i>				
Degree of potential irreplaceable loss of resources				3
<i>Rock art is seen as one of the most rare of heritage resources and irreplaceable</i>				
Prioritisation Factor				1.83333333
<b>Final Significance</b>				<b>-7.33333333</b>

### 6.1.8 PAARDEPLAATS 425 JS, PORTION RE

According to the mining plan information from Exxaro, this portion will not be affected by any direct mining activities. Therefore, any heritage sites identified on this property will probably not be affected negatively and little mitigation will be required. However, it is possible that this property may be used for off-set activities rather than direct mining activities in the case that only Portion 30 the **Sensitivity Approach Alternative**, is implemented.

The following **nine heritage sites** were identified:

#### PP 012

An abandoned coal mine shaft was identified at this location. The shaft is an incline shaft. A second tunnel/shaft extended from the main shaft and its roof had collapsed at the end of this shaft/tunnel. Most of the shaft is flooded with water. The age of this abandoned mine is not known. However, it is likely that it dates to over 100 years.

#### Assessment

Since this portion of the study area may not be affected directly by the mining activities, and because the shaft is probably over 100 years old, it should therefore be retained *in situ*. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance. *If mining activities is later expanded to this portion and the site negatively affected by mining activities, it is recommended that the shaft should be mapped and investigated further before it is destroyed. Because the shaft is highly likely to be over 100 years old, a destruction permit from SAHRA would be required.*

#### PP 013

Another abandoned incline mine shaft was identified at this location.. Most of the shaft is flooded with water. The age of this abandoned mine was not known. However, as noted above, it probably dates to the historical period

#### Assessment

Since this portion of the study area may not be affected directly by the mining activities, and because the shaft is probably over 100 years old, it should therefore be retained *in situ*. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance. *If mining activities is later expanded to this portion and the site negatively affected by mining activities, it is recommended that the shaft should be mapped and investigated further before it*

*is destroyed. Because the shaft is highly likely to be over 100 years old, a destruction permit from SAHRA would be required.*

#### *PP 018*

An old animal drinking trough was identified at this location. The trough is constructed with sandstone blocks and cement and is plastered. No other structures or features are associated with the trough. The age of the trough is not known, although it could be 60 years or older.

#### Assessment

Since the property may not be affected directly by the mining activities, and because the structure is probably 60 years or older, it can be retained *in situ*. However, if it will be negatively impacted, a destruction permit will have to be obtained from the Mpumalanga PHRA. The site is given a heritage significance grading of – **Generally Protected C**.

#### *PP019*

The ruin of a stone-walled cattle kraal was identified at this location. Most of the sandstone blocks used in the walls of the kraal have been removed and only one wall remains.

#### Assessment

Since the property may not be affected directly by the mining activities, and because the structure is probably 60 years or older, it can be retained *in situ*. However, if it will be negatively impacted, a destruction permit will have to be obtained from the Mpumalanga PHRA. The site is given a heritage significance grading of – **Generally Protected C**.

#### *PPO20*

A brick and cement, circular dam was identified at this location. A square brick-built building is situated next to the dam. The building is plastered and has a wooden door frame. The building is in a dilapidated condition. The age of these structures is not known but they may be 60 years or older.

#### Assessment

Since the property may not be affected directly by the mining activities, and because the structures may be 60 years or older, they can be retained *in situ*. However, if they will be negatively impacted, a destruction permit will have to be obtained from the Mpumalanga PHRA. The site is given a heritage significance grading of – **Generally Protected C**.

*PP 021*

The remains of a mud brick homestead were identified at this location. The remains of the mud brick homestead consist of the foundations of one rectangular structure and a multi-roomed I-shaped structure. A further circular structure probably indicates the cooking hut.

Assessment

The remains of the homestead structures can be demolished without a permit. However, the dwelling structures should be evaluated for the possible presence of infant burials through social consultation. The site is given a heritage significance grading of – **Generally Protected C.**

*PP 022*

The remains of a mud brick homestead were identified at this location. The homestead consists of the foundations of one rectangular multi-roomed structure, two rectangular shaped structures and a square room. A further circular structure probably indicates the cooking hut.

Assessment

The remains of the homestead structures can be demolished without a permit. However, the dwelling structures should be evaluated for the possible presence of infant burials through social consultation. The site is given a heritage significance grading of – **Generally Protected C.**

*PP 023*

The remains of an old sandstone building were identified at this location. Most of the remains of the building had been removed and only the sandstone blocks which formed the foundations of the building are left. These remains are probably parts of an old farm house, which were broken down and removed over the past years. It is probable that this structure could be 60 years or older.

Assessment

Due to the weathered state of the structure, the remains can be demolished without a permit. However, the dwelling structures should be evaluated for the possible presence of infant burials through social consultation. The site is given a heritage significance grading of – **Generally Protected C.**



#### *PP 024*

The ruin of the Sunbury railway station building were identified at this location. The structure is constructed of red brick that was plastered and painted. It has been stripped of its roof, doors, windows and all other features. Only a few of its walls remain. The age of the station building is unknown but it could be 60 years or older.

#### Assessment

Since the property may not be affected directly by the mining activities, and because the structures may be 60 years or older, they can be retained *in situ*. However, if they will be negatively impacted, a destruction permit will have to be obtained from the Mpumalanga PHRA. The site is given a heritage significance grading of – **Generally Protected C**.

#### *6.1.9 PAARDEPLAATS 380 JT PORTION 13*

This property is indicated on the mining plan as not being directly affected by the proposed mining activities, unless it may be used for off-set activities. Therefore, any heritage sites identified on this property will probably not be affected negatively and little mitigation will be required.

The following **three heritage sites** were identified on this property:

#### *PP 030*

A farmstead with its associated buildings was identified at this location. The main house and other buildings are intact and are currently occupied. The main house has been extended over the years and several extensions are visible. According to the owner, Mr. Wilkie (whose family has owned the property since before the South Africa War of 1899), the main house is more than a hundred years old. A second house that was built later, is situated opposite the original old house. This house is brick-built, with a front stoep and corrugated iron roof with two chimneys. The original house has been joined to a more recent addition. The style and materials used indicate that the original house is probably 60 years or older. Two storerooms or sheds were also identified. They building are built with sandstone blocks and mortar and are located next to each other. These sheds are probably between 60-100 years old.

#### Assessment

Due to the age of the various buildings, and the indication that the property may not be impacted directly by the proposed mining activities, it is recommended that the entire farmstead should be retained *in situ*. In addition, the farmstead, including all existing structures, should be evaluated by a heritage architect in terms of its heritage significance. This will result in a detailed report with specific recommendations on proposed mitigation measures to be implemented in the case of direct negative impact. The site is provisionally **Graded as 3B** and of local heritage significance, pending the evaluation of the heritage architect.

#### *PP 031*

An informal cemetery with approximately 39 graves was identified at this location. The cemetery is not fenced and is located in a ploughed and planted field. Most of the graves have informal oval or rectangular shaped mounds or outlines of packed rocks as dressings. Some graves have granite inscribed headstones, one recent grave has a formal granite dressing and an inscribed granite headstone.

#### Assessment

Since it seems that this property will not be directly affected by the mining activities, this cemetery should be left *in situ* if at all possible and demarcated with a fence and at least a 20 meter buffer. The site is given a heritage significance grading of – **Generally Protected A** and of Local Significance.

However, if it should become likely that the graves will be negatively affected by the mining activities, the graves should be relocated after a full grave process that includes comprehensive social consultation. Permits from the Burial Ground Unit of SAHRA and from the Mpumalanga Department of Health will be required for the relocation.

#### *PP 032*

The remains of another mud brick homestead were identified at this location. The remains consist of the foundations of four square structures, and a circular structure.

#### Assessment

Since the property may not be affected directly by the mining activities, the remains can be left *in situ*. However, if the property will be affected by the mining activities, the dwelling structures

should be evaluated for the possible presence of infant burials through social consultation. The site is given a heritage significance grading of – **Generally Protected C**.

#### 6.1.10 Impact Tables for sites within Off-set areas

The following section provides the evaluation of the impacts on the heritage resources located directly inside the proposed off-set areas in the case of the project going the Sensitivity Approach Alternative route.

Table 14 – Impact table for graves and cemeteries inside off-set areas - Construction

<b>Impact name:</b>	<i>Impact on graves and cemeteries</i>				
<b>Phase:</b>	<i>Construction</i>				
<b>Alternative:</b>	<i>Off-set areas</i>				
<b>Description of impact:</b>	<i>Destruction of graves and cemeteries situated within mining pit areas</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	2	2			
Duration of Impact	5	2			
Magnitude of Impact	4	3			
Reversibility of Impact	5	3			
Probability	4	4			
Environmental Risk (Pre-mitigation)					-16
Environmental Risk (Post-mitigation)					-10
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					
<p><i>The graves should be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:</i></p> <ul style="list-style-type: none"> <li>• <i>A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, which will be at least 60 days in length;</i></li> <li>• <i>Site notices indicating the intent of the relocation</i></li> <li>• <i>Newspaper Notice indicating the intent of the relocation</i></li> <li>• <i>A permit from the local authority;</i></li> <li>• <i>A permit from the Provincial Department of Health;</i></li> <li>• <i>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;</i></li> <li>• <i>An exhumation process that keeps the dignity of the remains and family intact;</i></li> <li>• <i>The whole process must be done by a reputable company that is well versed in relocations;</i></li> <li>• <i>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 development company.</i></li> </ul>					
<b>Impact Prioritisation</b>					
Public Response					3
<b>EIMS WILL COMPLETE</b>					

Cumulative Impacts	3
<i>The total amount of cemeteries directly impacted by the proposed possible off-set foot print is 3 accounting for 84 of a total of 141 graves identified inside the study area</i>	
Degree of potential irreplaceable loss of resources	3
<i>The graves are irreplaceable but can be relocated by doing so minimising the impact</i>	
Prioritisation Factor	2
<b>Final Significance</b>	<b>-20</b>

Table 15 – Impact table for graves and cemeteries inside Maximum Mine Production Alternative –  
Operation and Decommissioning

<b>Impact name:</b>	<i>Impact on graves and cemeteries</i>				
<b>Phase:</b>	<i>Operation and decommissioning</i>				
<b>Alternative:</b>	<i>Off-set areas</i>				
<b>Description of impact:</b>	<i>Destruction of graves and cemeteries situated within mining pit areas</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	1	1			
Duration of Impact	5	5			
Magnitude of Impact	4	4			
Reversibility of Impact	5	5			
Probability	2	2			
Environmental Risk (Pre-mitigation)					<b>-7.5</b>
Environmental Risk (Post-mitigation)					<b>-7.5</b>
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					
<i>The graves should be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:</i>					
<ul style="list-style-type: none"> <li>• <i>A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, which will be at least 60 days in length;</i></li> <li>• <i>Site notices indicating the intent of the relocation</i></li> <li>• <i>Newspaper Notice indicating the intent of the relocation</i></li> <li>• <i>A permit from the local authority;</i></li> <li>• <i>A permit from the Provincial Department of Health;</i></li> <li>• <i>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;</i></li> <li>• <i>An exhumation process that keeps the dignity of the remains and family intact;</i></li> <li>• <i>The whole process must be done by a reputable company that is well versed in relocations;</i></li> </ul>					
<i>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 development company.</i>					
<b>Impact Prioritisation</b>					
Public Response					3
<i>EIMS WILL COMPLETE</i>					
Cumulative Impacts					1
<i>No known graves are to be impacted during operation and decommissioning</i>					
Degree of potential irreplaceable loss of resources					1



<i>The graves are irreplaceable but can be relocated by doing so minimising the impact</i>	
Prioritisation Factor	1.333333333
<b>Final Significance</b>	<b>-10</b>

Table 16 – Impact table for buildings and structures inside Maximum Mine Production Alternative -

Construction

<b>Impact name:</b>	<b>Impact on buildings and structures</b>				
<b>Phase:</b>	Construction				
<b>Alternative:</b>	Off-set Areas				
<b>Description of impact:</b>	Destruction of buildings and structures				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	2	2			
Duration of Impact	5	5			
Magnitude of Impact	3	2			
Reversibility of Impact	5	2			
Probability	4	4			
Environmental Risk (Pre-mitigation)					<b>-15</b>
Environmental Risk (Post-mitigation)					<b>-11</b>
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					
<ul style="list-style-type: none"> <li>• Destruction permits required for sites P006, PP007, PP008, PP009, PP011, PP018, PP019, PP020, PP024, PP027. This will require that, specifically, site PP001, should be documented by photographs and drawings, before it can be demolished. In addition, any of these structures that are farmworker dwellings must be evaluated for the possible presence of infant burials through social consultation</li> <li>• The remaining dwelling structures (PP015, PP016, PP026, PP029), must be evaluated for the possible presence of infant burials through social consultation. Through experience of similar sites and the knowledge of cultural customs and traditions, it is known that stillborn babies and deceased infants occasionally were buried within the occupied settlements of African rural communities. These children were sometimes buried underneath the floors and walls of houses and huts. These burials were not marked, but were known to the immediate family.</li> <li>• The more recent offices/store rooms (on the Hadeco farms) can be demolished with no further mitigation.</li> </ul>					
<b>Impact Prioritisation</b>					
Public Response					3
<i>EIMS WILL COMPLETE</i>					
Cumulative Impacts					2
<i>The destruction of all the structures within the mining are will result in a loss of structures adding to the cultural fabric of the landscape</i>					
Degree of potential irreplaceable loss of resources					2
<i>Documentation of the cultural characteristics of the structures will minimize the complete loss of information on the resource</i>					
Prioritisation Factor					1.666666667
<b>Final Significance</b>					<b>-18.33333333</b>

Table 17 – Impact table for buildings and structures inside Maximum Mine Production Alternative -

Operation and Decommissioning

<b>Impact name:</b>	<b>Impact on buildings and structures</b>
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<b>Phase:</b>	<i>Construction and mining</i>				
<b>Alternative:</b>	<i>Off-set areas</i>				
<b>Description of impact:</b>	<i>Destruction of buildings and structures</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	2	2			
Duration of Impact	5	5			
Magnitude of Impact	3	2			
Reversibility of Impact	5	2			
Probability	4	4			
Environmental Risk (Pre-mitigation)					<b>-15</b>
Environmental Risk (Post-mitigation)					<b>-11</b>
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					
<ul style="list-style-type: none"> <li>• <i>Destruction permits required for sites. In addition, any of these structures that are farmworker dwellings must be evaluated for the possible presence of infant burials through social consultation</i></li> </ul>					
<b>Impact Prioritisation</b>					
Public Response					3
<i>EIMS WILL COMPLETE</i>					
Cumulative Impacts					2
<i>The destruction of all the structures within the mining are will result in a loss of structures adding to the cultural fabric of the landscape</i>					
Degree of potential irreplaceable loss of resources					2
<i>Documentation of the cultural characteristics of the structures will minimize the complete loss of information on the resource</i>					
Prioritisation Factor					1.666666667
<b>Final Significance</b>					<b>-18.33333333</b>

Table 18– Impact table: Damage/Destruction of undiscovered Heritage structures/resources Maximum  
Mine Production Alternative – Construction and operational Phase

<b>Impact name:</b>	<i>Damage/Destruction of undiscovered Heritage structures/resources</i>				
<b>Phase:</b>	<i>Construction and Operational Phase</i>				
<b>Alternative:</b>	<i>Off-set areas</i>				
<b>Description of impact:</b>	<i>Damage/Destruction of undiscovered Heritage structures/resources</i>				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	1	1			
Duration of Impact	5	5			
Magnitude of Impact	3	3			
Reversibility of Impact	5	5			
Probability	2	2			
Environmental Risk (Pre-mitigation)					<b>-7</b>
Environmental Risk (Post-mitigation)					<b>-7</b>
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					

<i>A short induction on possible heritage resources that maybe found in the area should be included in the induction program for construction and mining employees. If a possible heritage site is discovered during mining activity, all operations in the vicinity of the discovery should stop and a qualified specialist contracted to evaluate and recommend appropriate actions. Depending on the type of site this can include initiating a grave relocation process, documentation of structures or archaeological excavations.</i>	
<b>Impact Prioritisation</b>	
Public Response	3
<i>EIMS WILL COMPLETE</i>	
Cumulative Impacts	2
<i>The discovery of ne heritage resources can add to the cumulative impact rating</i>	
Degree of potential irreplaceable loss of resources	2
<i>As the heritage resources are irreplaceable</i>	
Prioritisation Factor	1.66666667
<b>Final Significance</b>	<b>-11.66666667</b>

## 6.2 Sites outside the study area

*Belfast Concentration Camp Cemetery* (all of these graves are 60-100 years old)

This cemetery is no longer used and contains the graves of both British Military personnel and Boer civilians who were interned in the concentration camp during the Second South African War (“Anglo-Boer” War) between 1899-1902, as well as local Belfast civilians. The graves of the O’Neil family, who played a significant role in the founding of the town of Belfast, are also located in this cemetery (Van der Merwe, 1952). The cemetery is located Wes street, on the outskirts of Belfast Town.

Evidence of damage to the headstones of several graves, both military and civilian is evident. Some of the damage seems to be recent (relatively unweathered broken surfaces) while past damage has been repaired on several occasions.

### Assessment

Since the graves in this cemetery are all 60 years or older and include graves from the Second South African War (1899-1902) which are over 100 years old and protected as graves of “victims of conflict” (NHRA, Section 36(3a )), their significance will be HIGH in cultural-historic terms. This applies on a local, and national level. The Second South African War was a significant event in the history of South Africa, as well on the international scale (since it involved citizens of all of Great Britain’s colonies, including Canada and Australia). The graves of the British soldiers who died in this War are considered to be of High significance to certain sections of the British population who often visit such sites, especially if a family member died in the conflict. The graves of the Boer citizens who died in the War, both burgher

commandos and inmates of the concentration camp, are considered by the Afrikaans people to have a High significance. In addition, the family graves that are associated with the history of Belfast will be considered significant on the local level, especially those of the O'Neil family, who are closely associated with the founding of Belfast (Van der Merwe, 1952).

The fact that evidence of damage to several of the graves in the cemetery (mostly headstones) was noted and recorded during the heritage survey is a serious concern, since all of these graves are protected in terms of the National Heritage Resources Act from damage and alteration, etc, without a permit from SAHRA.

Therefore, it is recommended that there should be a base line documentation of the headstones and memorials before mining commence and on-going monitoring of the situation at the cemetery before during the operation of the Paardeplaats mine. If it becomes evident that the damage to the graves is likely to be due to blasting activities at either or both the Glisa Coal Mine and the new Paardeplaats Colliery, measures should be developed to mitigate the situation (in close consultation with a heritage consultant and the affected families).

#### *Belfast Municipal Cemetery*

This cemetery is the existing town cemetery and is located very close to the entrance of the existing Glisa Coal Mine. The cemetery is still operational and the oldest graves do not seem to date back further than around the 1970s or 1960s. There is evidence of damage to many graves in the cemetery. However, since most of the damage seems to be due to subsidence, it is not clear if there is a connection with the blasting activities at the Glisa Mine or not.

#### Assessment

All graves have a High significance to the families they belong to and are protected under the NHRA from any damage or exhumation without a permit from the relevant provincial Health authority. Therefore, the fact that evidence of damage to several of the graves in the cemetery (mostly the grave slabs and dressings) was noted and recorded during the heritage survey is a serious concern.

Therefore, it is recommended that there should be a base line documentation of the headstones and memorials before mining commence and on-going monitoring of the situation at the cemetery before during the operation of the Paardeplaats mine. If it becomes evident that the damage to the graves is likely to be due to blasting activities at either or both the Glisa Coal Mine and the new Paardeplaats



Colliery, measures should be developed to mitigate the situation (in close consultation with a heritage consultant and the affected families).

6.2.1 Impact Tables for sites outside mining footprint and study area

The following section provides the evaluation of the impacts on the heritage resources located outside the proposed mining footprint areas.

Table 19 – Impact table for graves and cemeteries outside mining areas

<b>Impact name:</b>	<b>Impact on graves and cemeteries</b>			
<b>Phase:</b>	Construction and mining			
<b>Alternative:</b>	Outside mining area			
<b>Description of impact:</b>	Damage of graves and cemeteries situated within mining pit areas			
<b>Environmental Risk</b>				
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>		
Nature of Impact	-1	-1		
Extent of Impact	3	2		
Duration of Impact	3	3		
Magnitude of Impact	3	3		
Reversibility of Impact	3	2		
Probability	3	3		
Environmental Risk (Pre-mitigation)				-9
Environmental Risk (Post-mitigation)				-7.5
Degree of confidence in impact prediction:				Medium
<b>Recommended Mitigation Measures</b>				
<i>Therefore, it is recommended that there should be a base line documentation of the headstones and memorials before mining commence and on-going monitoring of the situation at the cemetery before during the operation of the Paardeplaats mine. As well as a fenced buffer of at least 20 metres around cemeteries inside the project area but outside the pit areas.</i>				
<b>Impact Prioritisation</b>				
Public Response				3
<i>EIMS WILL COMPLETE</i>				
Cumulative Impacts				1
<i>Possible long term impact on tombstones due to blasting and vibrations</i>				
Degree of potential irreplaceable loss of resources				1
<i>The graves are irreplaceable but can be relocated by doing so minimising the impact</i>				
Prioritisation Factor				1.333333333
<b>Final Significance</b>				<b>-10</b>

Table 20 – Impact table for buildings and structures outside mining areas

<b>Impact name:</b>	<b>Impact on buildings and structures</b>			
<b>Phase:</b>	Construction and mining			

<b>Alternative:</b>	Outside mining area				
<b>Description of impact:</b>	Destruction of buildings and structures				
<b>Environmental Risk</b>					
<b>Attribute</b>	<b>Pre-mitigation</b>	<b>Post-mitigation</b>			
Nature of Impact	-1	-1			
Extent of Impact	3	3			
Duration of Impact	3	3			
Magnitude of Impact	3	2			
Reversibility of Impact	4	3			
Probability	4	3			
Environmental Risk (Pre-mitigation)					-13
Environmental Risk (Post-mitigation)					-8.25
Degree of confidence in impact prediction:					Medium
<b>Recommended Mitigation Measures</b>					
<i>Recommended that there should be a base line documentation of the structures associated with farmsteads, homesteads and ruins within the blasting radius as identified in the blasting evaluation study, before mining commence and on-going monitoring the structural integrity of these sites during the operation of the Paardeplaats mine.</i>					
<b>Impact Prioritisation</b>					
Public Response					3
<i>EIMS WILL COMPLETE</i>					
Cumulative Impacts					1
<i>The destruction and loss of integrity of the structures within the blasting zone will result in a loss of structures adding to the cultural fabric of the landscape</i>					
Degree of potential irreplaceable loss of resources					1
<i>Documentation of the cultural characteristics of the structures will minimize the complete loss of information on the resource, and guide management of blasting during mining operations</i>					
Prioritisation Factor					1.333333333
<b>Final Significance</b>					<b>-11</b>

## 7 MITIGATION MEASURES SUGGESTED

The following table a list of mitigation measures for each site with approximate costs and timelines for such mitigation.

Site Number	Type	X	Y	Portion	Heritage Significance	Mitigation
PP001	Farmstead	30.00261	- 25.7 258	30	3B	

<b>PP002</b>	▪ Cemetery	▪ 30.00226	▪ - 25.7 299	▪ 29	▪ GP.A	
<b>PP003</b>	▪ Cemetery	▪ 30.00414	▪ - 25.7 191	▪ 30	▪ GP.A	
<b>PP004</b>	▪ Cemetery	▪ 29.98579	▪ - 25.7 442	▪ 40	▪ GP.A	
<b>PP005</b>	▪ Cemetery	▪ 30.01512	▪ - 25.7 252	▪ 29	▪ GP.A	

Site Number	Type	X	Y	Portion	Heritage Significance
PP006	▪ Homestead	▪ 30.01013	▪ - 25.7 28	▪ 29	▪ GP.B
PP007	▪ Sheds	▪ 30.00301	▪ - 25.7 433	▪ 40	▪ GP.B



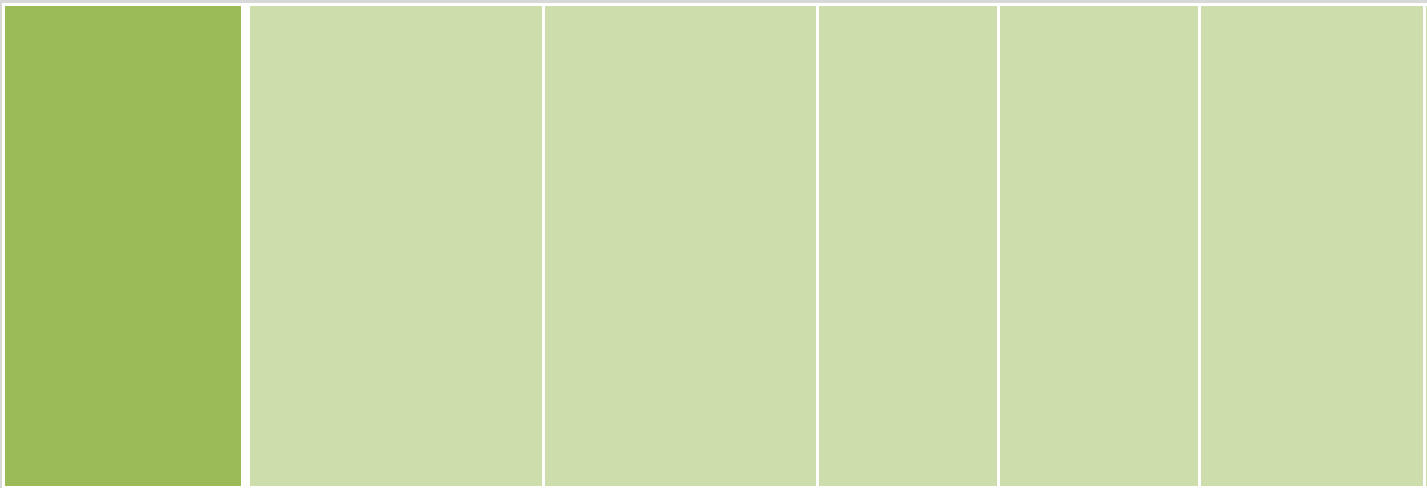
▪ PP008	▪ Farmstead	▪ 30.00236	▪ - 25.7 438	▪ 40	▪ GP.B
▪ PP009	▪ Structure	▪ 30.00478	▪ - 25.7 421	▪ 40	▪ GP.B

Site Number	Type	X	Y	Portion	Heritage Significance
<b>PP010</b>	▪ Grave	▪ 29.98994	▪ - 25.7 508	▪ 2	▪ GP.A
▪ <b>PP011</b>	▪ Farmstead	▪ 29.9896	▪ - 25.7 51	▪ 2	▪ GP.B
▪ <b>PP012</b>	▪ Shaft	▪ 29.9742	▪ - 25.7 46	▪ RE	▪ GP.A

▪ PP013	▪ Shaft	▪ 29.9747	▪ - 25.7 488	▪ RE	▪ GP.A
▪ PP014	▪ Rock Art Site	▪ 29.97899	▪ - 25.7 522	▪ 2	▪ Grade 2

Site Number	Type	X	Y	Portion	Heritage Significance
PP015	▪ Homestead	▪ 29.98324	▪ - 25.7 544	▪ 2	▪ GP.C
▪ PP016	▪ Homestead	▪ 29.98291	▪ - 25.7 53	▪ 2	▪ GP.C

▪ PP016	▪ Graves	▪ 29.98291	▪ - 25.7 53	▪ 2	▪ GP.A
▪ PP017	▪ Shaft	▪ 29.98198	▪ - 25.7 537	▪ 2	▪ GP.A
▪ PP018	▪ Drinking trough	▪ 29.96672	▪ - 25.7 601	▪ RE	▪ GP.C





Site Number	Type	X	Y	Portion	Heritage Significance
PP019	▪ Stone kraal	▪ 29.96623	▪ - 25.7 598	▪ RE	▪ GP.C
▪ PP020	▪ Farm buildings	▪ 29.96536	▪ - 25.7 615	▪ RE	▪ GP.C

▪ PP021	▪ Homestead	▪ 29.96465	▪ - 25.7 617	▪ RE	▪ GP.C
▪ PP022	▪ Homestead	▪ 29.96375	▪ - 25.7 617	▪ RE	▪ GP.C
▪ PP023	▪ Homestead	▪ 29.96192	▪ - 25.7 617	▪ RE	▪ GP.C

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Site Number	Type	X	Y	Portion	Heritage Significance
<b>PP024</b>	▪ Sunbury Station	▪ 29.96177	▪ - 25.7 627	▪ RE	▪ GP.C
▪ <b>PP026</b>	▪ Homestead	▪ 29.99304	▪ - 25.7 343	▪ 28	▪ GP.C

▪ PP027	▪ Shed and kraal	▪ 29.99341	▪ - 25.7 351	▪ 28	▪ GP.B
▪ PP028	▪ Cemetery	▪ 29.99331	▪ - 25.7 361	▪ 30	▪ GP.A
▪ PP029	▪ Homestead	▪ 29.98967	▪ - 25.7 27	▪ 30	▪ GP.C

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Site Number	Type	X	Y	Portion	Heritage Significance
PP030	▪ Farmstead	▪ 30.01772	▪ - 25.7 185	▪ 13	▪ 3B
▪ PP031	▪ Cemetery	▪ 30.01645	▪ - 25.7 113	▪ 13	▪ GP.A



▪ PP032	▪ Homestead	▪ 30.01585	▪ - 25.7 231	▪ 13	▪ GP.C
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## 7.1 Palaeontology

When the potential exists for new fossils to be exposed through excavations, it is the responsibility of the on-site Environmental Control Officer (ECO) to monitor excavation activities and report the occurrence of any fossiliferous material to SAHRA and an appropriate palaeontological expert, to allow the material to be thoroughly assessed, recorded and professionally excavated or sampled.

Effective conservation of fossil heritage in a mining situation would entail the following mitigation measures:

1) regular inspection of excavation sites by an ECO capable of searching for and recognising plant fossils: inspections should be performed during any excavations that disturb bedrock, and between blasting cycles in open cast mines, when the face wall and floor of the pit are exposed; in the case of underground mining activities, it would be particularly the roof of the shaft that would be examined for evidence of fossil floras;

2) when lenses of sedimentary rocks containing well-preserved plant fossils are found, a palaeontologist must be afforded the opportunity to excavate a representative sample of the flora, and to document the depositional context as reflected by the adjacent rocks and coal seams; a scientifically useful palaeobotanical collection must be made. There is little value in collecting a few blocks of the material – this is not a representative sample of a fossil flora. A strategy of bulk collecting must be employed, whereby a relatively large and unbiased sample of the flora is collected, with collectors not giving undue attention to those elements that are attractive, well-preserved or rare. The associated geology, which will also be destroyed during mining must be documented photographically (with scale). Floras with no context are increasingly coming to be considered of limited palaeontological value.

3) to avoid delays, the mine must be prepared to assist in the removal of blocks containing high quality plant fossil material, and in the storage on the mine property of unprepared fossiliferous blocks until such a time as the material can be properly processed by a palaeontologist. Storage facilities must be such that the blocks are not exposed directly to the elements.

*Table 21– Palaeontological Mitigation, costing and timeframes*

Site Number	Type	Heritage Significance	Mitigation	Approximate Cost	Timeframes
<b>Palaeontology</b>	Palaeontology	3A	As set out in 7.1	R 500 000	36 months

## 8 CONCLUSIONS

Utilising the archival study completed for the HIA as a guide, the field work identified a total of **32 heritage sites, including 22 heritage structures, 7 cemeteries and 3 areas with historical mining shafts**, of which the following will require further mitigation:

### 8.1 Heritage Structures

- Destruction permits required for sites PP001, PP006, PP007, PP008, PP009, PP011, PP018, PP019, PP020, PP024, PP027. This will require that, specifically, site PP001, should be documented by photographs and drawings, before it can be demolished. In addition, any of these structures that are farmworker dwellings must be evaluated for the possible presence of infant burials through social consultation (see below)
- Site PP030, must be evaluated by a heritage architect in terms of its heritage significance. This will result in a detailed report with specific recommendations on proposed mitigation measures.
- The remaining dwelling structures (PP015, PP016, PP021, PP022, PP023, PP025, PP026, PP029, PP032), must be evaluated for the possible presence of infant burials through social consultation. Through experience of similar sites and the knowledge of cultural customs and traditions, it is known that stillborn babies and deceased infants occasionally were buried within the occupied

settlements of African rural communities. These children were sometimes buried underneath the floors and walls of houses and huts. These burials were not marked, but were known to the immediate family.

- The more recent offices/store rooms (on the Hadeco farms) can be demolished with no further mitigation.

## **8.2 Cemeteries (PP002, PP003, PP004, PP005, PP010, PP016, PP028, PP031)**

Eight graves/cemeteries were identified in or close to the boundary of the study area (including the one at PP016). They will require the following mitigation:

3. Those cemeteries that will not be affected by the proposed mining, especially if only Portion 30 is to be used should be left in situ if at all possible: demarcate site with a fence and at least a 20 meter buffer.
4. For those cemeteries that are located in area directly affected by mining activities (eg portion 30), the graves should be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:
  - A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, which will be at least 60 days in length;
  - Site notices indicating the intent of the relocation
  - Newspaper Notice indicating the intent of the relocation
  - A permit from the local authority;
  - A permit from the Provincial Department of Health;
  - 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;
  - An exhumation process that keeps the dignity of the remains and family intact;
  - The whole process must be done by a reputable company that is well versed in relocations;
  - 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 development company.

## **8.3 Historical Mining Shafts (Sites PP012, PP013, PP0)**

- Two of these sites (PP012, PP013) are located on portion RE of Paardeplaats 425, which is indicated as not being affected by mining activities. These two sites should therefore be retained *in situ*. However, site PP017 is located on portion 2 of the Paardeplaats 425, which may be utilised for off-

set activities. Therefore, if this site will be affected by mining activities, it is recommended that it shaft should be mapped and investigated further before it is destroyed.

- **NB:** since the archival research has indicated that mining activities were taking place in the Belfast area between 1895 and 1911 by the Transvaal Consolidated Coal Mines Limited, it is likely that these mining shafts are over 100 years old. This would qualify them as archaeological sites and therefore **a permit would have to be obtained from SAHRA before they could be destroyed.** SAHRA will require that all the shafts be mapped before a destruction permit can be issued.

#### *Possible Rock Art Site (PP 014)*

It is recommended that the site be demarcated as a no-go area and that a specialist on rock art be contracted to evaluate and confirm the existence of the rock art and if confirmed develop further management recommendations for the site.

#### *Belfast Municipal Cemetery and Belfast Concentration Camp Cemetery*

PGS was requested to investigate the possible impact of the existing blasting activities (Glisa Coal Mine) and future blasting activities on the graves at the Belfast Municipal Cemetery and the Concentration Camp Cemetery.

Evidence of damage to gravestones at both the Municipal Cemetery and Concentration Camp Cemetery was visible. It is not clear whether the damage may be due to existing blasting activities or to other causes. Although, the fact that the Municipal Cemetery is located very close to the entrance of the Glisa Mine and that there is clear evidence of damage to many graves in this cemetery could be indicative of a link.

## **8.4 Palaeontology**

A Palaeontological Desktop assessment of the bedrock types underlying the study area was undertaken by Dr Rose Prevec. This study found that the proposed Paardeplaats coal mining project will impact on bedrock of the Vryheid Formation, that has a high potential for containing plant fossils. Although little consideration has been afforded coal-associated fossils in the past, these are scientifically valuable and are protected as South African heritage. The recommendation presented here is for mitigation measures to be implemented throughout construction and mining, involving monitoring for fossil occurrences by a trained ECO, and documentation and retrieval by a qualified palaeontologist of any well-preserved plant fossils that are exposed.

## **8.5 Handling of chance finds**

A short induction on possible heritage resources that maybe found in the area should be included in the induction program for construction and mining employees. If a possible heritage site is discovered during mining activity, all operations in the vicinity of the discovery should stop and a qualified specialist contracted to evaluate and recommend appropriate actions. Depending on the type of site this can include initiating a grave relocation process, documentation of structures or archaeological excavations.

## **8.6 Statement**

The evaluation of the three alternatives provided has indicated barring the No-Go option, the Sensitivity Approach Alternative will have the least impact on heritage resources with a low cumulative rating as only 3 heritage sites will be impacted on. The number of grave to be impacted on in the Sensitivity Approach Alternative is only 3 as appose to the 100 in the Maximum Mine Production Alternative.

Although a large number of heritage sites fall inside the proposed off-set areas on Portion 2 and the remaining extent of Paardeplaats, the area is deemed to be large enough to handle focussed off-set areas that incorporate the positions of the heritage resources.

## **9 LIST OF PREPARERS**

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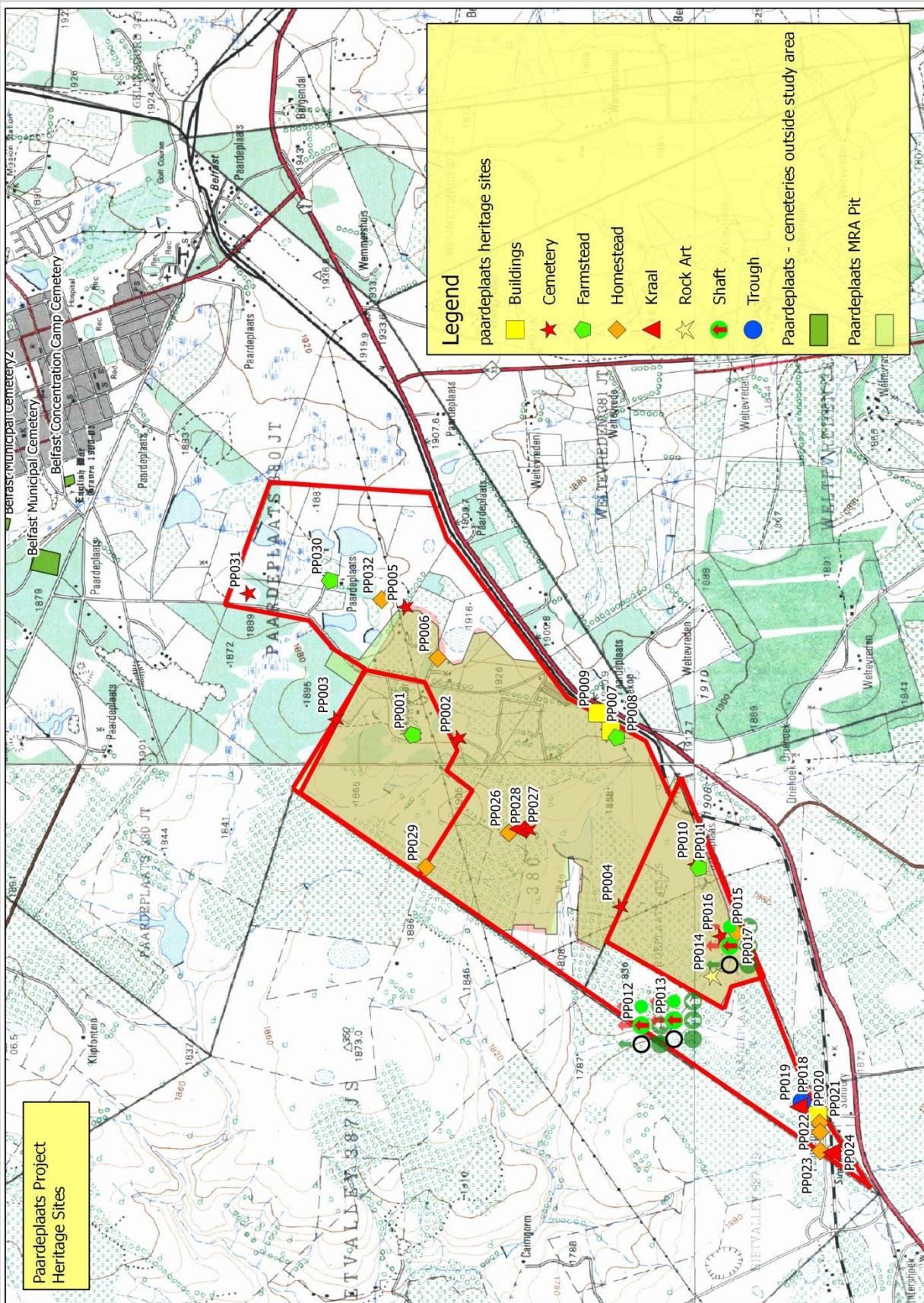
#### **Archival Sources**

National Archives, R7627/95 and MM3258/10

#### **Internet Sources**

<http://www.c20fireplaces.co.uk/information/history-twentieth-century-fireplaces-1905-1939>

APPENDIX A  
SITE DISTRIBUTION MAP



## 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 to.

## HERITAGE ASSESSMENT METHODOLOGY

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

The Heritage Impact Assessment (HIA) report to be compiled by PGS Heritage and Grave Relocation Consultants (PGS) for the proposed Copperleaf Project will assess the heritage resources found on site. This report will contain the applicable maps, tables and figures as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002). The HIA process consisted of three steps:

- Step I – Literature Review: The background information to the field survey leaned greatly on the initial Heritage Impact Assessment Report completed by Matakoma for the Gardener Ross Residential Golf Estate in 2004.
- Step II – Physical Survey: A physical survey was conducted by vehicle and on foot through the proposed project area by a qualified archaeologist and experienced staff, 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, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and constructive recommendations

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

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
  - Density of scatter (dispersed scatter)
    - Low - <10/50m<sup>2</sup>
    - Medium - 10-50/50m<sup>2</sup>
    - High - >50/50m<sup>2</sup>
- **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 mitigation

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

E - Preserve site

- Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report.

**Table 22:** 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

IMPACT ASSESSMENT METHODOLOGY – AS PROVIDED BY EIMS

## 1. METHOD OF ASSESSING IMPACTS

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S).

### 1.1 Determination of Environmental Risk:

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

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

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

4

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 23:

**Table 23: Criteria for determination of impact consequence.**

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

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

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P (refer to Figure 100). Probability is rated/scored as per Table 24.

**Table 24: Probability scoring.**

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

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

$$ER = C \times P.$$

**Figure 100: Determination of environmental risk.**

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

**Table 25: Significance classes.**

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

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation

measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/ mitigated.

### 1.1.1 Impact Prioritisation

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented in Section 1.1 it is necessary to assess each potentially significant impact in terms of:

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

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

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

<b>Consequence</b>	5	5	10	15	20	25
	▪ 4	▪ 4	▪ 8	▪ 12	▪ 16	▪ 20
	▪ 3	▪ 3	▪ 6	▪ 9	▪ 12	▪ 15
	▪ 2	▪ 2	▪ 4	▪ 6	▪ 8	▪ 10
	▪ 1	▪ 1	▪ 2	▪ 3	▪ 4	▪ 5
	▪ 1	▪ 2	▪ 3	▪ 4	▪ 5	
▪ Probability						

Table 26: Criteria for the determination of prioritisation.

<b>Public response (PR)</b>	Low (1)	Not raised as a concern by the I&AP's
	▪ Medium (2)	▪ Issue/ impact raised by the I&AP's
	▪ High (3)	▪ Significant and meaningful response from the I&AP's
▪ <b>Cumulative Impact (CI)</b>	▪ Low (1)	▪ Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	▪ Medium (2)	▪ Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.



	<ul style="list-style-type: none"> <li>High (3)</li> </ul>	<ul style="list-style-type: none"> <li>Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.</li> </ul>
<ul style="list-style-type: none"> <li>Irreplaceable loss of resources (LR)</li> </ul>	<ul style="list-style-type: none"> <li>Low (1)</li> </ul>	<ul style="list-style-type: none"> <li>Where the impact is unlikely to result in irreplaceable loss of resources.</li> </ul>
	<ul style="list-style-type: none"> <li>Medium (2)</li> </ul>	<ul style="list-style-type: none"> <li>Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.</li> </ul>
	<ul style="list-style-type: none"> <li>High (3)</li> </ul>	<ul style="list-style-type: none"> <li>Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).</li> </ul>

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 26. The impact priority is therefore determined as follows:

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

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (refer to Table 27 ).

**Table 27: Determination of prioritisation factor.**

Priority	Ranking	Prioritisation Factor
= 3	Low	1
3 – 9	Medium	1.5
= 9	High	2

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

Environmental Significance Rating	
Value	Description
< 9	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥9; <17	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 17	High (i.e. where the impact must have an influence on the decision process to develop in the area).

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

**APPENDIX D**  
**PALAEONTOLOGICAL DESKTOP ASSESSMENT REPORT**

# PALAEONTOLOGICAL IMPACT ASSESSMENT

## Desktop scoping level report:

### Paardeplaats coal mining project, Belfast, Mpumalanga

*Specialist report by:*

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**July 2012**

## 1. SUMMARY

This specialist evaluation represents a Desktop Study for a Scoping Level Report on the potential impacts on palaeontological heritage, by the proposed coal mining activities at Paardeplaats Farm near Belfast, Mpumalanga. Mining activities will expose and destroy bedrock of the (Early Permian) Vryheid Formation, that is of high palaeontological sensitivity, with a strong probability of containing well-preserved fossil plant material, and may also impact on limited Quaternary deposits with a much lower probability of containing fossils.

**Summary impact significance rating table**

SIGNIFICANCE RATING					
Rock Unit	Temporal Scale	Spatial Scale	Degree of confidence	Impact severity	
				with mitigation	without mitigation
Quaternary	permanent	international	unsure	beneficial	moderate negative
Vryheid Formation	permanent	international	probable	beneficial	high negative

Damage to or destruction of any fossil during mining or construction activities would be a highly negative, permanent impact. Discovery of fossils during excavation, followed by effective mitigation in collaboration with a palaeontologist however, would result in the curation of new and important fossil material, and therefore the development could potentially have a positive, beneficial impact on South Africa's palaeontological heritage.

Mitigation measures should be implemented, commencing with a continuous monitoring programme by a qualified Environmental Control Officer throughout construction and mining activities that result in the exposure of bedrock. Fossil occurrences must be reported to the South African Heritage Resources Agency and a qualified palaeontologist must be provided the opportunity to document and excavate the fossils concerned.



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### **3. ABBREVIATIONS**

ECO - environmental control officer  
SARHA - South African Heritage Resource Agency  
PGS - Professional Grave Solutions (Pty) Ltd T/A  
DEA - Department of Environmental Affairs  
NEMA - National Environmental Management Act  
HIA - Heritage Impact Assessment  
PIA - Palaeontological Impact Assessment

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### **5. INTRODUCTION AND BRIEF**

The purpose of this specialist palaeontological study is to provide a brief Scoping Level Report on the proposed coal mining and ancillary service activities to take place on the Paardeplaats Farm near Belfast, Mpumalanga (Figs 1-3).

The Paardeplaats project is located on Portions 13, 28, 29, 30 and 40 of the farm Paardeplaats 380 JT and the Remaining Extent of Portion 2 of the farm Paardeplaats 425 JS (Figs 2, 3). It covers an area of approximately 1 415 ha and falls within the jurisdiction of the Nkangala District Municipality and Emakhazeni Local Municipality (ELM).

#### **Project details**

The purpose of the proposed Paardeplaats Project is to provide coal to the Glisa mine beneficiation plant at a rate of 4.2-4.4 mtpa and to Eskom at a rate of 2.4 mtpa.

Proposed mining activities will involve a hybrid process between roll-over mining and bench mining. (Roll-over when only one seam is present, and where overburden <20m thick; bench mining when two or more seams are present and where overburden >20m thick).

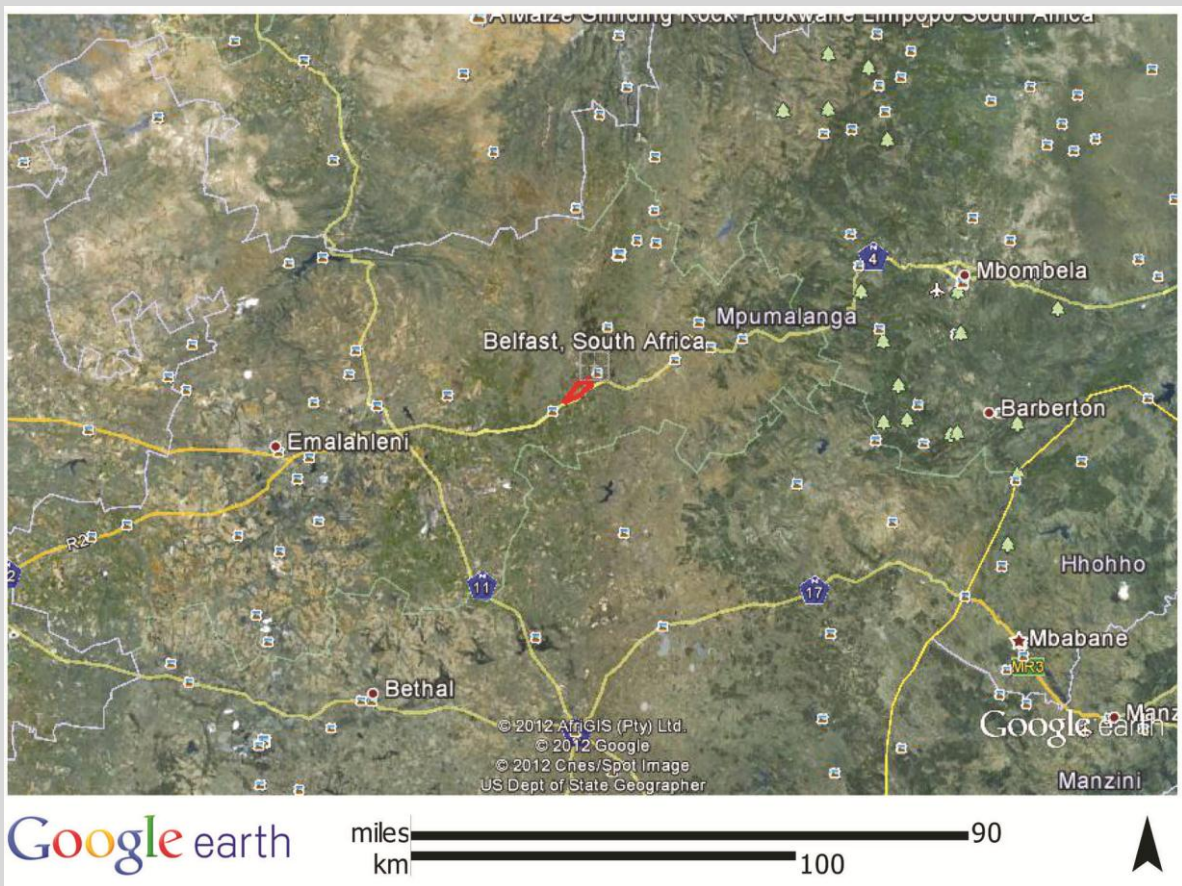


Figure 1. Google map indicating the location of the study area (red outline) in a regional context.

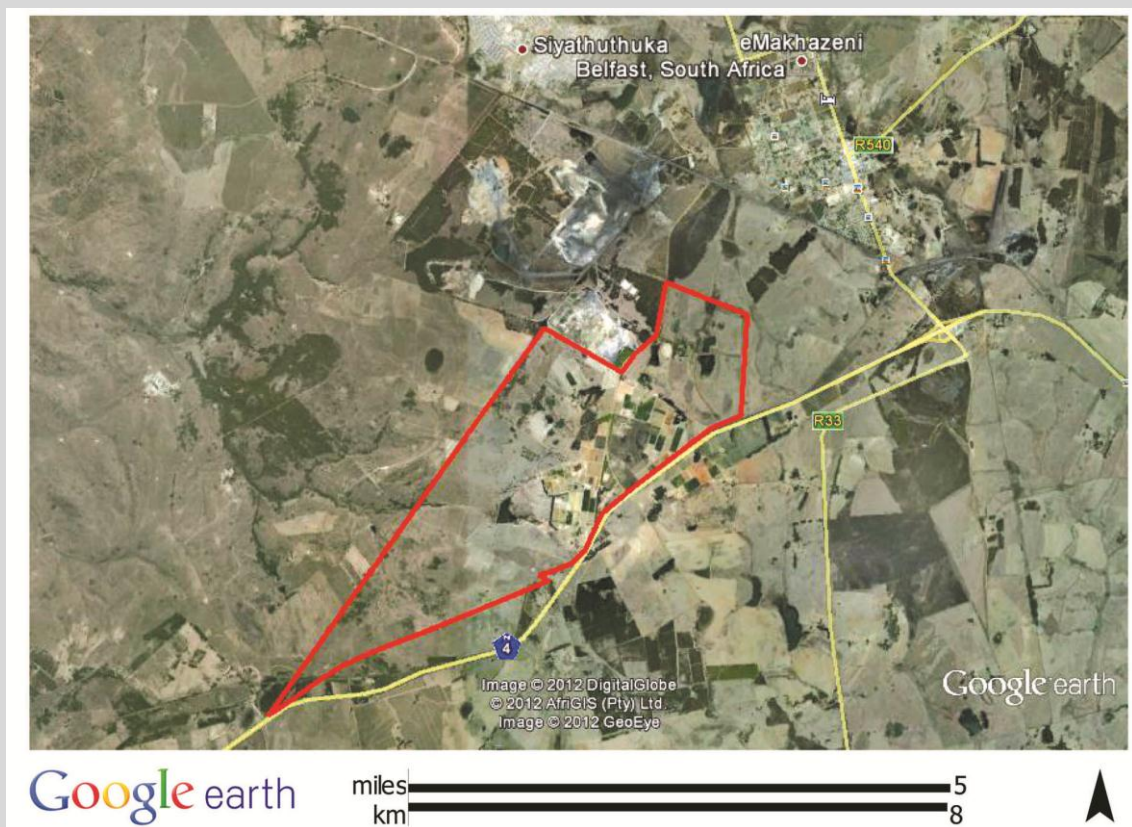


Figure 2. Google map indicating the location of the proposed Paardeplaats Project.



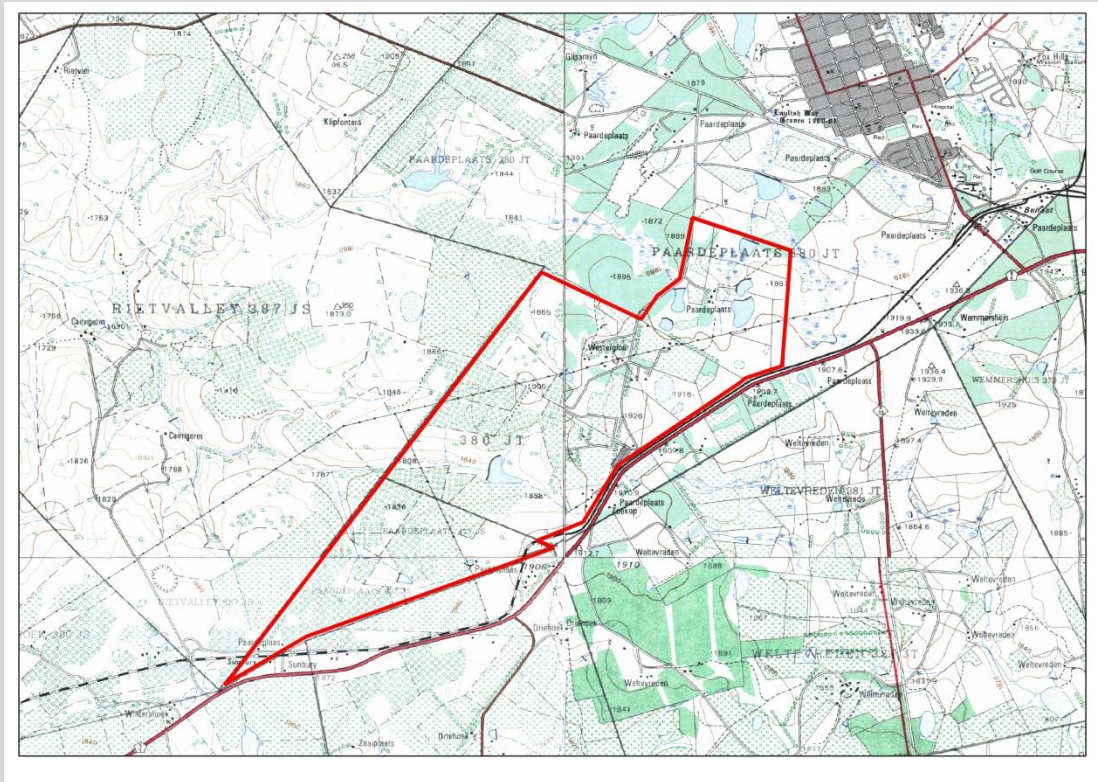


Figure 3. Topographic map of the site area on the Paardeplaats Farm (provided by PGS).

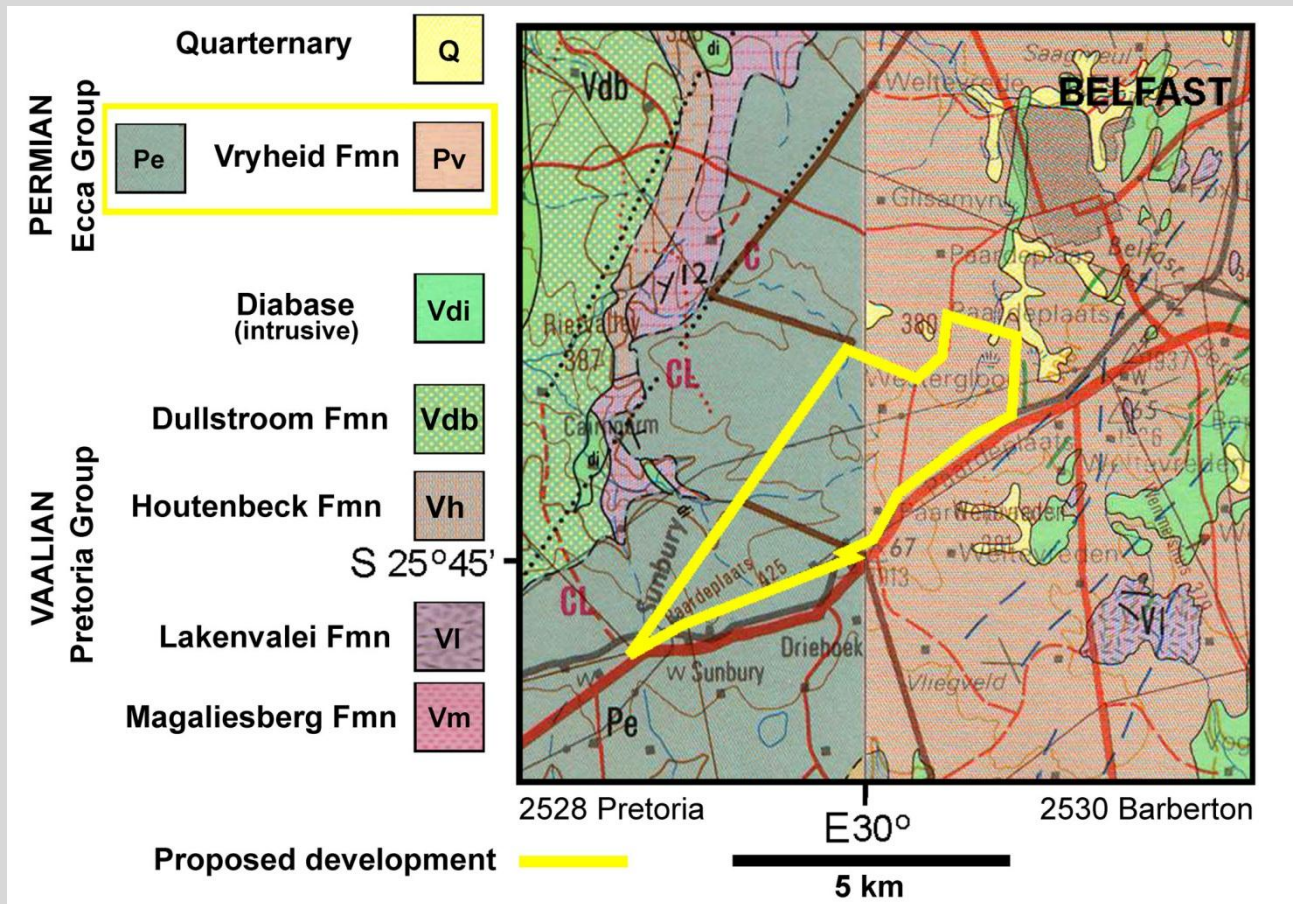


Figure 4. Geological map of the Belfast area (from the 1:250 000 maps: 2530 Barberton and 2528 Pretoria, Council for Geoscience).

## 6. LEGISLATIVE CONTEXT

Protection of South Africa's environmental resources is regulated by the Department of Environmental Affairs (DEA), in part through the National Environmental Management Act ("NEMA" Act 107 of 1998). In accordance with the Act, developers must apply to the competent authority for approval of their plans, which, depending on the nature of the development, are subject to an assessment of the anticipated impacts these activities will have on the environment.

The primary piece of legislation protecting national heritage in South Africa, is the South African Heritage Resources Act (Act No. 25) of 1999. In accordance with Section 38 (Heritage Resources Management) of the act, developers must apply to the relevant authority (South African Heritage Resources Agency - SAHRA) for authorisation to proceed with their planned activities. This application must be accompanied by documentation detailing the expected impact this will have on national heritage in particular.

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 among other categories:

- ⤴ 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.

To address concerns relating to the protection of these particular heritage resources, a Heritage Impact Assessment (HIA) may be required to assess any potential impacts to archaeological and palaeontological heritage within the footprint of the proposed development.

## 7. TERMS OF REFERENCE

This report represents a literature-based palaeontological desktop study (no field component), that aligns with the guidelines in the latest version of the SAHRA guidelines (May 2007, revised 2009), to:

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

with the purpose of assessing the exposed and potential palaeontological heritage of the area targeted for development.



## **8. GENERAL APPROACH AND METHODOLOGY USED FOR DESKTOP PALAEOLOGICAL IMPACT ASSESSMENTS**

Geological maps (1:250 000) of the development area are consulted to gain an understanding of the local and regional geology. Various sources such as the scientific literature, previous heritage impact assessments, institutional collections and prior personal experience, are drawn upon to identify potentially fossiliferous rock units and the fossil taxa that have been previously recorded from these units. This information is then used to assess the palaeontological sensitivity of the rock units.

Topographic maps and Google Earth images of the development site are examined to assess the topography and potential for surface outcrops of palaeontologically sensitive rock strata.

The nature of the proposed development is considered, and activities where bedrock will be impacted are identified. If the affected bedrock is deemed to be palaeontologically sensitive, the degree of anticipated impact on fossil heritage is assessed and appropriate mitigation measures are proposed.

## **9. ASSUMPTIONS AND LIMITATIONS**

A heritage desktop survey does not obviate the need for a field examination of the site. This report represents a preliminary, scoping phase assessment of the potential of the development to impact of fossil heritage. A field examination may reveal high quality fossil material exposed at surface, but it is far more likely that the majority of the envisioned impacts, both positive and negative, will occur during the mining process itself, and for the entire duration of the mining activity.

The distribution of fossil plant material within coal mines is in many cases extremely localised, so for effective mitigation measures to be employed repeated evaluation of exposed bedrock would be required as mining efforts progress.

## **10. GEOLOGY OF THE STUDY AREA**

As indicated in the (1:250 000) geological maps of the Barbarton (2530) and Pretoria (2528) regions (Fig. 4), the geology is dominated by rocks of the Transvaal Supergroup, in particular the Pretoria and Rooiberg Groups (Vaalian in age, 2050+ million years old). In the study area, these basement rocks are unconformably overlain by deposits of the Vryheid Formation (Ecca Group, Karoo Supergroup), and patchy occurrences of Quaternary deposits, mostly associated with extant fluvial systems.

Since the development will impact mainly rocks of the Vryheid Formation (Ecca group, Early Permian) and potentially, to a minor extent, Quaternary deposits in the north-eastern parts of the development area (Fig. 4), the much older rocks of the Transvaal Supergroup will not be considered further in this report.

The project area falls within the Witbank Coalfield, close to the north-eastern edge of the main Karoo Basin. Mining activities will specifically target the coal seams within the Vryheid Formation, in particular the No. 2 seam of the Springs-Witbank Coalfield in Mpumalanga.

## Quaternary Deposits

As per the explanation to sheet 2530 Barberton (Walraven, 1989), the quaternary deposits present in the region include residual soils, alluvial deposits and scree deposits. These deposits are found along active streams on the property, particularly in the northern to north-eastern parts of the study area (Fig. 4).

## Vryheid Formation

The Vryheid Formation (Ecca Group, Karoo Supergroup; Fig. 5) underlies the entire study area, although surface exposures are poor due to the relatively low relief and extensive vegetation cover. Most of the Paardeplaats property appears to be used currently for pasture and crop cultivation.

As described by Walraven (1989) the Vryheid Formation in this area comprises grit, sandstone and shale and contains several coal seams. Intercalations of siltstone and mudstone are common in the sandstone, particularly in the upper part of the Formation, and lenses of calcareous sandstone and sandy limestone occur fairly regularly. Upward fining cycles are typical of the coal-bearing strata, manifesting as repeating sequences of conglomerate and grit overlain by sandstone, shale and finally coal seams, and representing channel-lag, point-bar and overbank deposits respectively, of meandering river systems (Walraven, 1989).

PERIOD		GROUP		FORMATION
TRIASSIC	Lower	Beaufort		
	Upper		L	Adelaide*
PERMIAN	Middle	Ecca	U	Volksrust
	Lower		M	Vryheid
			L	Pietermaritzburg
		Dwyka		

\* Subgroup: includes Estcourt/Normandien Formations

Figure 5. Major lithostratigraphic subdivisions (Lower Permian to Lower Triassic) of the Karoo Supergroup, Main Karoo Basin of South Africa.

## 11. PALAEOLOGICAL HERITAGE

The **Quaternary deposits** in the far north-east of the development area are unlikely to contain fossils and are considered to be of low palaeontological sensitivity. That said, fossils have been found occasionally in coeval deposits elsewhere, such as mammal bones and teeth, early humans, trace fossils, non-marine invertebrates.

*Any sedimentary rocks of the **Vryheid Formation**, and particularly those in close spatial proximity to coal seams, have a **high potential** for containing fossilised plants.*

The Early Permian, coal associated, *Glossopteris*-dominated floras of South Africa are World famous, and this reputation has been built on fossils described from only a handful of localities. The most well-known and best documented localities are the quarries near Vereeniging in the Gauteng Province, and at Hammanskraal, north of Pretoria in Mpumalanga Province. The spectacular fossil floras from these localities have been documented by a number of palaeobotanists over the years (e.g. Leslie, 1903; Plumstead, 1952, 1956a,b, 1958, 1969; Kovacs-Endrody, 1976, 1991; Le Roux & Anderson, 1977; Smithies, 1977; Anderson & Anderson, 1985), and elements of this flora continue to stimulate palaeontological debate on the *Glossopteris* plant and associated elements (e.g. Adendorff *et al.*, 2002, 2003; Prevec *et al.*, 2008; Prevec, 2011). Compared to other areas of palaeontological endeavour in South Africa, remarkably little has been done to understand the floras that provided us with our primary energy source, and this represents an area of major potential growth in the field. This lack of research is not due to a paucity of fossil material, which is abundant and being destroyed daily in mining activities, but to a lack of human resources.

**Table 1. Fossil floral elements previously recorded from coal deposits of the Vryheid Formation (and equivalents) of South Africa (only key and recent references included).**

Plant group	Taxon	Localities	References
Lycopods	<i>Azaniodendron fertile</i>	Vereeniging, Hammanskraal	Anderson & Anderson, 1985
	<i>Cyclodendron leslii</i>	Vereeniging, Hammanskraal, Ermelo, Hlobane	Anderson & Anderson, 1985
Sphenophytes (horsetail ferns)	<i>Sphenophyllum hammanskraalense</i> , <i>S. mesoeccaense</i>	Hammanskraal	Smithies, 1977; Anderson & Anderson, 1985
	<i>Annularia hammanskraalensis</i>	Hammanskraal	Anderson & Anderson, 1985
Ferns	<i>Asterotheca hammanskraalensis</i>	Hammanskraal,	Anderson & Anderson, 1985
	<i>Asterotheca leeukuilensis</i>	Vereeniging	Anderson & Anderson, 1985
	<i>Sphenopteris lobifolia</i>	Vereeniging, Hammanskraal	Anderson & Anderson, 1985
	<i>Liknopetalon enigmata</i>	Vereeniging, Hammanskraal	Anderson & Anderson, 1985; Adendorff <i>et al.</i> , 2003
Glossopterid and affiliated leaves	<i>Palaeovittaria kurtzii</i> ; 'Gangamopteris'; <i>Glossopteris</i> (multiple species)	Ermelo, Hlobane, Vereeniging, Hammanskraal	Kovács-Endrödy, 1976, 1991; Anderson & Anderson, 1985
Glossopterid fertile organs (see Prevec 2005 for a review)	<i>Arberia madagascariensis</i>	Hammanskraal	Smithies, 1977; Anderson & Anderson, 1985
	<i>Arberia hlobanensis</i>	Hlobane	Plumstead, 1969; Anderson & Anderson, 1985; Plumstead, 1969
	<i>Arberia leeukuilensis</i>	Vereeniging	Plumstead, 1969; Anderson & Anderson, 1985
	<i>Bifaria (Hirsutum) intermittens</i>	Vereeniging	Plumstead, 1952, 1956a, 1958; Anderson & Anderson, 1985; Prevec <i>et al.</i> , 2008
	<i>Gladiopomum elongatum</i>	Rietspruit	Adendorff <i>et al.</i> 2002
	<i>Gladiopomum (Hirsutum) dutoitides</i>	Vereeniging, Hlobane	Plumstead, 1952, 1956a, 1958; Anderson & Anderson, 1985; Adendorff <i>et al.</i> 2002
	<i>Ottokaria buriadica</i>	Vereeniging,	Plumstead, 1956b, 1969;

		Hlobane	Smithies, 1978; Anderson & Anderson, 1985
	<i>Ottokaria hammanskraalensis</i>	Hammanskraal	Smithies, 1978; Anderson & Anderson, 1985
	<i>Ottokaria transvaalensis</i>	Vereeniging	Smithies, 1978; Plumstead, 1956b; Anderson & Anderson, 1985
	<i>Plumsteadia (Lanceolatus) lerouxii</i>	Vereeniging	Plumstead, 1952, 1956a, 1969; Anderson & Anderson, 1985
	<i>Gonophylloides (Lanceolatus) strictum</i>	Vereeniging, Hammanskraal	Plumstead, 1952, 1956a, 1969; Smithies, 1978; Anderson & Anderson, 1985
	<i>Gonophylloides (Lanceolatus) waltonii</i>	Vereeniging	Plumstead, 1952, 1956a, 1969; Anderson & Anderson, 1985
	<i>Elatra (Hirsutum) leslii</i>	Vereeniging, Hammanskraal	Smithies, 1978; Anderson & Anderson, 1985
	<i>Scutum leslii</i>	Vereeniging, Ermelo	Plumstead, 1952, 1956a, 1958, 1969; Anderson & Anderson, 1985; Prevec, 2011
Ginkgoalean elements	<i>Sphenobaeira eccaensis</i> , <i>Metreophyllum lerouxii</i> , <i>Ginkgophyllum kidstonii</i> , <i>Ginkgophyllum spatulifolia</i> , <i>Flabellofolium leeukuilensis</i>	Vereeniging	Plumstead, 1969; Anderson & Anderson, 1985
Conifers	<i>Noeggerathiopsis hislopii</i>	Vereeniging, Hammanskraal, Ermelo, Hlobane	Anderson & Anderson, 1985
	<i>Walkomiella transvaalensis</i>	Vereeniging	Plumstead, 1969; Anderson & Anderson, 1985
	<i>Podozamites hlobanensis</i>	Hlobane	Anderson & Anderson, 1985
<i>incertae sedis</i>	<i>Botrychiopsis valida</i>	Vereeniging, Hammanskraal	Plumstead, 1969; Anderson & Anderson, 1985

## 12. IMPACT RATING

Table 2. Impact significance rating table\*

Criteria		Status	Comments
Temporal Scale		Permanent	Destruction of a fossil represents loss of an irreplaceable heritage resource
Spatial Scale		study area	<ul style="list-style-type: none"> <li>⤴ physical effects limited to development footprint;</li> <li>⤴ destruction of fossil heritage registers at the national or international level depending on the type and quality of fossil destroyed</li> </ul>
Frequency		ongoing, cumulative	The potential to impact negatively on fossil floras will remain as long as mining continues to expose and destroy fossiliferous strata
Severity	without mitigation	high; unpredictable	<ul style="list-style-type: none"> <li>⤴ destruction of well-preserved coal floras during construction and mining activities represents a high negative impact;</li> <li>⤴ the occurrence of these floras is patchy, making the likelihood and extent of the impact difficult to define</li> </ul>
	with mitigation	beneficial	Monitoring by a trained ECO and recording and collecting of fossil material by a professional palaeontologist could result in a high positive impact.
Likelihood		probable	Since these deposits are by definition coal-associated, there is a strong possibility of encountering well-preserved plant fossils
Confidence		high	Coal floras in the Vryheid Formation are known from other areas in this province.
Reversibility		irreversible	<ul style="list-style-type: none"> <li>⤴ destruction of fossil heritage is permanent;</li> <li>⤴ destruction of rare fossil forms could mean a significant loss to our scientific knowledge base.</li> </ul>
Significance		high negative	<ul style="list-style-type: none"> <li>⤴ mitigation measures are required to reduce high negative impact of fossil heritage destruction;</li> <li>⤴ specialist intervention could make a significant contribution to the understanding of South Africa's coal floras.</li> </ul>

\* format and categories modified from Almond (2012)

<i>Impact significance and duration</i>	In palaeontological terms any destruction of fossils is a <b>permanent negative impact</b> and must be regarded as potentially a <b>high impact significance</b> . New taxa are fairly regularly encountered in plant fossil studies, and destruction of well-preserved, undescribed fossil beds could represent a heavy loss in terms of our understanding of historical biodiversity.	
<i>Certainty</i>	Definite	More than 90% sure of a particular fact. Substantial supportive data exist to verify the assessment.
	Probable	Over 70% sure of a particular fact, or of the likelihood of impact occurring.
	Possible	Only over 40% sure of a particular fact or of the likelihood of an impact occurring.
	Unsure	Less than 40% sure of a particular fact or likelihood of an impact occurring.

The fossil coal floras of South Africa are of international interest, and represent an important part of our local heritage. Any loss of this heritage due to mining or construction activities is permanent, and should be regarded as a highly significant negative impact.

Alternatively, discovery of fossils during excavation, followed by effective mitigation in



collaboration with a palaeontologist, would result in the curation of new and important fossil material – therefore the development could potentially have a positive, beneficial impact on South Africa’s palaeontological heritage.

### **13. MITIGATION**

Official guidelines specifically for mitigation of damage to and destruction of fossil heritage during mining of coal deposits are currently not in place, and this is a matter that needs to be raised with SAHRA. A commonly encountered attitude with regard to the palaeobotanical heritage associated with coal mines (as evidenced in a disappointingly high number of Heritage Impact Assessments currently being produced), is that since coal is itself a fossil of sorts, there is no need to attempt any form of heritage conservation. This does not align with the goals of current legislation, which serves to protect the fossil heritage of South Africa. A more constructive approach would be to forge a strategy that allows for regular monitoring and occasional intervention when fossiliferous deposits of exceptional quality are exposed during mining activities.

Coal itself is classified as a compaction fossil, and apart from the information that can be derived at the microscopic or sub-microscopic level from macerals (including cuticle, pollen, spores) and from charcoal inclusions, it is of limited value paleontologically. Generally the material of greatest interest palaeontologically is contained within the fine-grained shale partings between coal seams. Personal experience has indicated that good quality plant compression and impression fossils are not overly abundant, and may be quite localised, occurring in lenses of fine-grained mudrock, although impressions, casts, charcoalfied wood or permineralised sections of tree trunks may be found in the sandstones associated with the coal seams.

It should also be noted that it is not just the actual bone/plant material/shell etc. itself that is of interest and importance to a palaeontologist. Increasingly, scientists appreciate the value of information evident in the immediate vicinity of fossils that is not necessarily inherent to the fossil itself, such as the geology of the host rock stratum, the orientation of individual fossil organs, organism associations, preservational aspects etc. These types of information can provide important clues about past environments, and can help to place fossils within their original context. These types of information can be lost through indiscriminate sampling by untrained parties.

When the potential exists for new fossils to be exposed through excavations, it is the responsibility of the on-site Environmental Control Officer (ECO) to monitor excavation activities and report the occurrence of any fossiliferous material to SAHRA and an appropriate palaeontological expert, to allow the material to be thoroughly assessed, recorded and professionally excavated or sampled.

Effective conservation of fossil heritage in a mining situation would entail the following mitigation measures:

1) regular inspection of excavation sites by an ECO capable of searching for and recognising plant fossils: inspections should be performed during any excavations that disturb bedrock, and between blasting cycles in open cast mines, when the face wall and floor of the pit are exposed; in the case of underground mining activities, it would be particularly the roof of the shaft that would be examined for evidence of fossil floras;

2) when lenses of sedimentary rocks containing well-preserved plant fossils are found, a palaeontologist must be afforded the opportunity to excavate a representative sample of

the flora, and to document the depositional context as reflected by the adjacent rocks and coal seams; a scientifically useful palaeobotanical collection must be made. There is little value in collecting a few blocks of the material – this is not a representative sample of a fossil flora. A strategy of bulk collecting must be employed, whereby a relatively large and unbiased sample of the flora is collected, with collectors not giving undue attention to those elements that are attractive, well-preserved or rare. The associated geology, that will also be destroyed during mining, must be documented photographically (with scale). Floras with no context are increasingly coming to be considered of limited palaeontological value.

3) to avoid delays, the mine must be prepared to assist in the removal of blocks containing high quality plant fossil material, and in the storage on the mine property of unprepared fossiliferous blocks until such a time as the material can be properly processed by a palaeontologist. Storage facilities must be such that the blocks are not exposed directly to the elements.

## 14. CONCLUSIONS

The proposed Paardeplaats coal mining project will impact on bedrock of the Vryheid Formation, that has a high potential for containing plant fossils. Although little consideration has been afforded coal-associated fossils in the past, these are scientifically valuable and are protected as South African heritage. The recommendation presented here is for mitigation measures to be implemented throughout construction and mining, involving monitoring for fossil occurrences by a trained ECO, and documentation and retrieval by a qualified palaeontologist of any well-preserved plant fossils that are exposed.

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## **16. SPECIALIST QUALIFICATIONS**

Dr Rose Prevec has PhDs in Palaeontology and Plant Pathology from the University of the Witwatersrand (2005) and University of KwaZulu-Natal (1998) respectively. She specialises in research on South African Permian macrofossil floras, with an interest in taxonomy, biostratigraphy, and palaeoecological aspects such as insect-plant interactions. She has held four postdoctoral fellowships, at Wits and Rhodes University, and is currently a Research Associate at the Albany Museum in Grahamstown and in the Geology Department at Rhodes University. Dr Prevec has more than 10 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, eastern and north-eastern parts of the country. Her publication record includes multiple articles in internationally recognized journals. Dr Prevec is accredited by the Palaeontological Society of Southern Africa (society member for 13 years, and a member of the Executive Committee for 5 years).

### **Declaration of Independence**

I, Rosemary Prevec, 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.

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