

**Desktop Paleontological Impact Assessment of Application  
for a Prospecting Right on the Remaining Extent of the  
Farm Hartfell 172 and Remaining Extent, Portions 1 and 2  
of the Farm Bulls Run 164 in the administrative district of  
Hay, Northern Cape Province, South Africa.**

**6 February 2023**

**Report prepared for: M and S Consulting (Pty) Ltd  
By: Dr Sifelani Jirah & Dr Joseph Chikumbirike**

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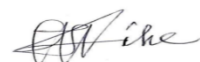
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**DECLARATION OF INDEPENDENCE**

We, Joseph Chikumbirike & Sifelani Jirah, declare that we act as independent specialist consultants. We do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. We have no interest in secondary or downstream developments as a result of the authorization of this project.



6 February 2023

## **Executive Summary**

At the request of M and S Consulting, a Desktop Palaeontological Impact Assessment was carried out on the Farms Bulls Run 164 and Hartfell 172, Hay District, located about 70 km northwest of Prieska and 60 km southeast of Groblershoop in the Northern Cape Province, where GEJ Resources (Pty) Ltd has applied for a prospecting right to prospect for Manganese and Iron ore. It is expected that the proposed prospecting activities could impact on early Proterozoic sedimentary strata which are not considered to be paleontologically sensitive. Given the scope of the proposed activities, the likelihood of palaeontological impact on early Proterozoic carbonate rocks is considered **LOW**, especially if prospecting by way of core drilling is considered. However, because of the thick sandy overburden (which are not considered to be palaeontologically significant in this case) and the lack of details regarding the position of the proposed prospecting and campsite localities, it is recommended that in the event of impact on fresh carbonate rocks that may result from trenching and pitting, new exposures should require brief monitoring by a palaeontologist. It is considered unlikely that prospecting by way of core drilling, trenching and pitting will have a detrimental effect on the Stone Age archaeological component and it is assigned a site rating of **Generally Protected C (GP.C)**. There is a **Low to Moderate** chance that trenching and pitting into the sandy overburden especially within the vicinity of natural drainage areas may impact on intact Stone Age archaeological remains and should be avoided where possible, whereas prospecting by way of core drilling is considered least likely to have a detrimental effect on potentially capped archaeological heritage resources. In this case, potential prospecting areas that are capped by well-developed wind-blown sand deposits are assigned a site rating of **Generally Protected B (GP.B)** and will require archaeological monitoring if trenching and pitting activities are to be conducted.

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## **LIST OF ABBREVIATIONS**

AIA - Archaeological Impact Assessment

DARD - Department of Agriculture and Rural Development

DEA - Department of Environmental Affairs (National)

DEADP - Department of Environmental Affairs and Development  
Planning

DENC - Department of Environment and Nature Conservation (Northern  
Cape)

DMR - Department of Mineral Resources (National)

HIA - Heritage Impact Assessment

MPRDA - Mineral and Petroleum Resources Development Act, no 28 of  
2002

NEMA - National Environmental Management Act, no 107 of 1998

NHRA - National Heritage Resources Act, no 25 of 1999

PIA - Palaeontological Impact Assessment

SAHRA - South African Heritage Resources Agency

SAHRIS - South African Heritage Resources Information System

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## Introduction

At the request of M and S Consulting, a Desktop Palaeontological Impact Assessment was carried out on the Remaining Extent, Portions 1 and 2 of Farm Bulls Run 164 and the Remaining Extent of the Farm Hartfell 172, Hay district, located about 70 km northwest of Prieska in the Northern Cape Province (**Fig. 2**). GEJ Resources (Pty) Ltd has applied for a prospecting right to prospect for Manganese and Iron ore. The region's unique and non-renewable archaeological and palaeontological heritage sites are 'Generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority.

According to the NHRA Act No. 25 of 1999, palaeontological resources are fossilised remains or traces of animals or plants which lived in the geological times other than fossil fuels or fossiliferous rock intended for industrial use. Therefore, palaeontology is the scientific study of life forms that existed in the earth's distant past through the examination of fossils of plants and animals organisms. The following are examples of fossil types: body fossils, tracks (ichnites), burrows, cast-off parts, coprolites, palynomorphs and chemical residues. The study of palaeontology is very important for reasons such as provision of evidence for the theory evolutionary (life-historical), establishment of long-term physical changes of paleogeography and paleoclimatology that affected the history of life, how ecosystems have responded to these changes and have changed the planetary environment in turn, and how these mutual responses have affected today's patterns of biodiversity.

The Taung child is an example of a fossil discovered in South Africa in 1924. This discovery has helped in understanding of the paths taken by evolution (specifically the theory of descent with modification). Palaeontological studies contribute to the understanding of the development of ecosystems and understanding of how the modern human beings emerged.

# GEOLOGIC TIME SCALE

EON ERA		PERIOD	EPOCH	Present	
<b>Phanerozoic</b>	<b>Cenozoic</b>	Quaternary	Holocene	0.01	
			Pleistocene	1.6	
		Tertiary	Neogene	Pliocene	5.3
				Miocene	23.7
				Oligocene	36.6
			Paleogene	Eocene	57.8
				Paleocene	66.4
					88.4
		<b>Mesozoic</b>	Cretaceous		144
	Jurassic			206	
	Triassic			245	
	<b>Paleozoic</b>	Carboniferous	Permian		286
			Pennsylvanian		320
			Mississippian		360
			Devonian		408
		Silurian		438	
		Ordovician		505	
		Cambrian		570	
<b>Precambrian</b>		<b>Proterozoic</b>			2500
	<b>Archean</b>			3800	
	<b>Hadean</b>			4550	

*Age in millions of years before present*

Fig 1: Table of Geological Time Scale

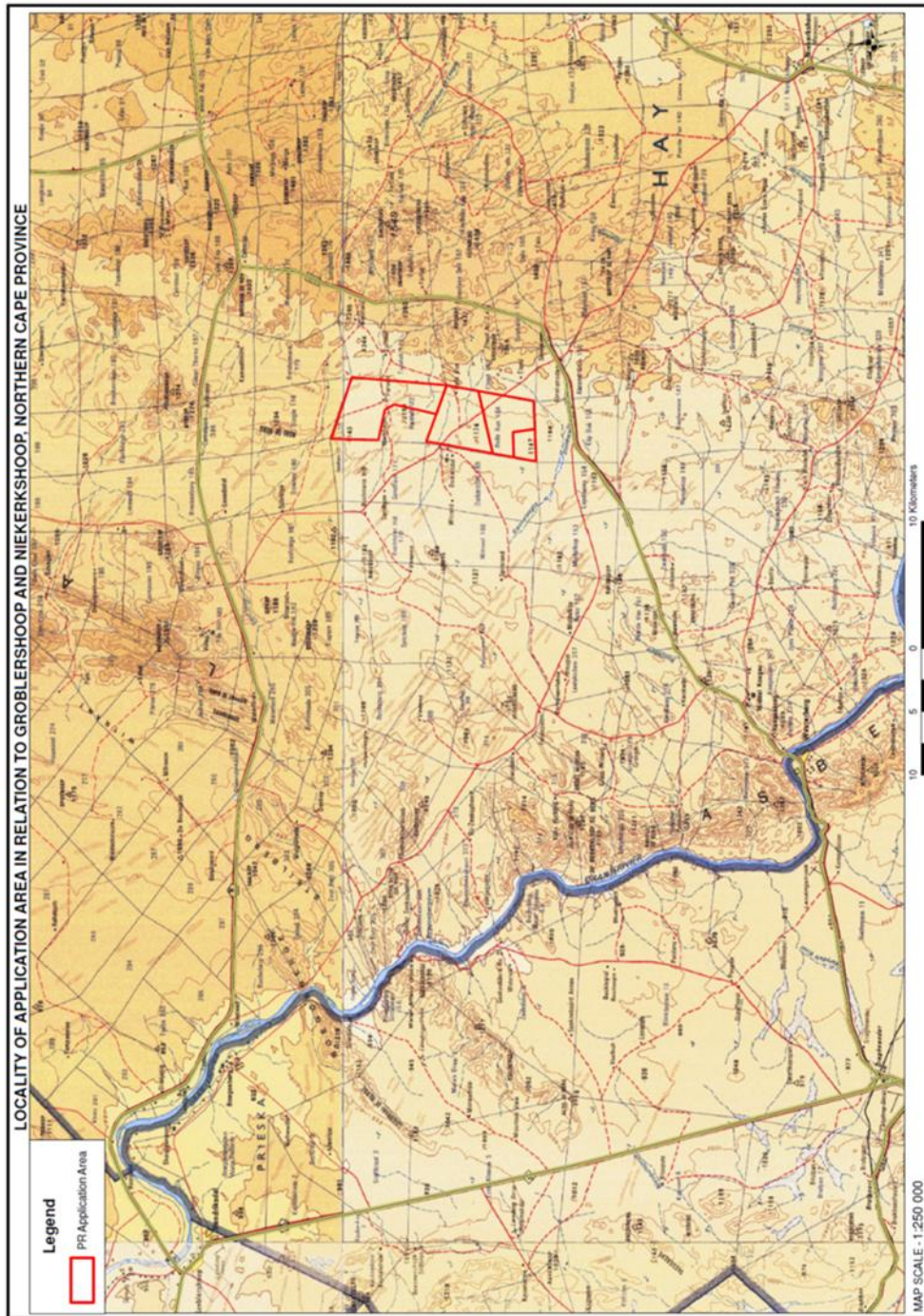


Figure 1. Extract from 1:250 000 topographical map 2922 Prieska showing the location of the application area in relation to Groblershoop and Niekershoop, Hay District, Northern Cape Province

**Figure 2:** The study area (Authors)

### Legislative framework

The primary legal trigger for identifying when heritage specialist involvement is required in the Environmental Impact Assessment process is the National Heritage Resources (NHR) Act (Act No 25 of 1999). The NHR Act requires that all heritage resources, that is, all places or objects of aesthetic, architectural, historical, scientific,



social, spiritual, linguistic or technological value or significance are protected. Thus, any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures over 60 years of age, living heritage and the collection of oral histories, historical settlements, landscapes, geological sites, palaeontological sites and objects.

The Act identifies what is defined as a heritage resource, the criteria for establishing its significance and lists specific activities for which a heritage specialist study may be required. In this regard, categories of development relevant to this study are listed in Section 34 (1), Section 35 (4), Section 36 (3) and Section 38 (1) of the NHR Act as follows:

**34. (1)** 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.

**35 (4)** No person may, without a permit issued by the responsible heritage resources authority—

- destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- *b)* destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

**36 36 (3)** No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

**38 (1)** Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50m in length; • Any development or other activity which will change the character of the site
  - a) exceeding 5000 m<sup>2</sup> in extent; or
  - b) involving three or more existing erven or subdivisions thereof; or
  - c) involving three or more subdivisions thereof which have been consolidated within the past five years;
- The rezoning of a site exceeding 10 000 m<sup>2</sup>; or
- Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).

A range of contexts can be identified which typically have high or potential cultural significance and which would require some form of heritage specialist involvement (**Table 1**). This may include formally protected heritage sites or unprotected, but potentially significant sites or landscapes (**Table 2**). The involvement of the heritage specialist in such a process is usually necessary when a proposed development may affect a heritage resource, whether it is formally protected or unprotected, known, or unknown. In many cases, the nature and degree of heritage significance is largely unknown pending further investigation (e.g., capped sites, assemblages or subsurface fossil remains). On the other hand, it is also possible that a site may contain heritage resources (e.g., structures older than 60 years), with little or no conservation value.

**Table 1:** Relationship between different heritage contexts, heritage resources likely to occur within these contexts, and likely sources of heritage impacts in the central interior of South Africa.

Heritage Context	Heritage Resources	Impact
<b>Palaeontology</b>	Precambrian shallow marine and lacustrine stromatolites, organic-walled microfossils, Ghaap Plateau (Transvaal Supergroup) Palaeozoic and Mesozoic fossil remain, e.g. Karoo Supergroup Neogene regolith	Road cuttings Quarry excavation Bridge and pipeline construction (Quaternary alluvial deposits)
<b>Archaeology</b> Early Stone Age Middle Stone Age LSA - Herder Historical	Types of sites that could occur in the Free State include Localized Stone Age sites containing lithic artifacts, animal and human remain found near <i>inter alia</i> the following: River courses/springs Stone tool making sites. Cave sites and rock shelters Freshwater shell middens Ancient, kraals and stonewalled complexes Abandoned areas of past human settlement Burials over 100 years old Historical middens Structural remains Objects including industrial machinery and aircraft.	Subsurface excavations including ground levelling, landscaping, foundation preparation, road building, bridge building, pipeline construction, construction of electrical infrastructure and alternative energy facilities, township development.
<b>History</b>	Historical townscapes, e.g., Kimberley Historical structures, i.e., older than 60 years Historical burial sites Places associated with social identity/displacement, e.g., Witsieshoek Cave, Oppermansgronde Historical mission settlements, e.g., Bethulie, Beersheba, Moffat Mission	Demolition or alteration work. New development.
<b>Natural Landscapes</b>	Formally proclaimed nature reserves Evidence of pre-colonial occupation Scenic resources, e.g., view corridors, viewing sites, Historical structures/settlements older than 60 years Geological sites of cultural significance.	Demolition or alteration work. New development.
<b>Relic Landscape Context</b>	Battle and military sites, e.g Magersfontein Precolonial settlement and burial sites Historical graves (marked or unmarked, known, or unknown) Human remains (older than 100 years) Associated burial goods (older than 100 years) Burial architecture (older than 60 years)	Demolition or alteration work. New development.

**Table 2.** Examples of heritage resources located in the central interior of South Africa.

<b>Historically, archaeologically and palaeontologically significant heritage sites &amp; landscapes</b>	<b>Examples</b>
Landscape with unique geological or palaeontological history	Karoo Basin Beaufort Group sedimentary strata Glacial striations on Ventersdorp andesites Vredefort Dome World Heritage Site. Taung World Heritage Site
Landscape characterised by certain geomorphological attributes where a range of archaeological and palaeontological sites could be located.	Vaal, Modder and Riet River valleys Pans, pandunes and natural springs of the Free State panveld. Ghaap Plateau
Relic landscape with evidence of past, now discontinued human activities	Wonderwerk Cave Stone Age deposits Cave sites and rock shelters in the Maluti Drakensberg region (rock art) Southern Highveld pre-colonial settlement complexes. Dithakong settlement complexes Rock engravings on Ventersdorp andesites
Landscape containing concentrations of historical structures.	Concentration camps & cemeteries from the South African War.
Historical towns, historically significant farmsteads, settlements & routes	Batho historical township area in Mangaung (Bloemfontein). Kimberley
Battlefield Sites, burial grounds and grave sites older than 60 years.	Sannaspos Magersfontein

## Methodology

Heritage significance was evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature.

Terms of reference:

- Identify and map possible heritage sites and occurrences using available resources.

- Determine and assess the potential impacts of the proposed development on potential heritage resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

The study area is rated according to field rating categories as prescribed by SAHRA (Table 3).

**Table 3.** Field rating categories as prescribed by SAHRA.

Field Rating	Grade	Significance	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.C)	-	Low significance	Destruction

**Table 3:** rated according to field rating categories as prescribed by SAHRA

## **Description of the Affected Area**

### **Locality data**

1: 250 000 scale topographic map 2922 Prieska (**Fig.2**)

1: 250 000 scale geological map 2922 Prieska (**Fig. 3**)

General Site coordinates:

Hartfell Farmstead: 29° 1'50.67"S 22°35'16.96"E

Bulls Run Farmstead: 29° 4'44.03"S 22°36'8.81"E

The study area is characterized by undulated rocky terrain that is primarily covered by well-developed aeolian sand and sand dunes along the low-lying areas.

### **Assumptions and Limitations**

The proposed prospecting localities have not been finalized prior to the archaeological field assessment and it is likely that an apparently well-developed aeolian sand overburden may hamper Stone Age archaeological visibility within the study area.

### **Planned activities**

The application is for a prospecting right for manganese and iron ore. It is planned to determine the mineral resource and distribution for this project by means of non-invasive as well as invasive prospecting methods. The information obtained during the initial non-invasive field survey and evaluation process of the geological maps and data, will then be used to determine the target area and planned positions of the intended invasive prospecting. Invasive prospecting will take place via:

#### Trenching and pitting

The planned prospecting would be performed by a Backhoe excavator. Once a body is exposed with a trench, a channel sample will be taken from the sidewall of the trench wall for quality and analysis purposes as well as mapping of the strata.

#### Core Drilling

In conjunction with the trenching, diamond drilling will be applied in the exploration program. For this purpose, drilling will make use of a triple-tube core barrel. Depending on the results from reconnaissance and geological mapping the drill holes will be laid out in a grid fashion to cover prospective ground. The position of the

trenches and holes will be planned only after field reconnaissance on the property and detailed studying of geological information available on the area is completed. The current road infrastructure on the properties will be utilized as far as possible for gaining access to the drill-hole positions. A significant amount of well traversed roads currently exists on the properties and as a result the disturbance of the surface area will be kept to a minimum.

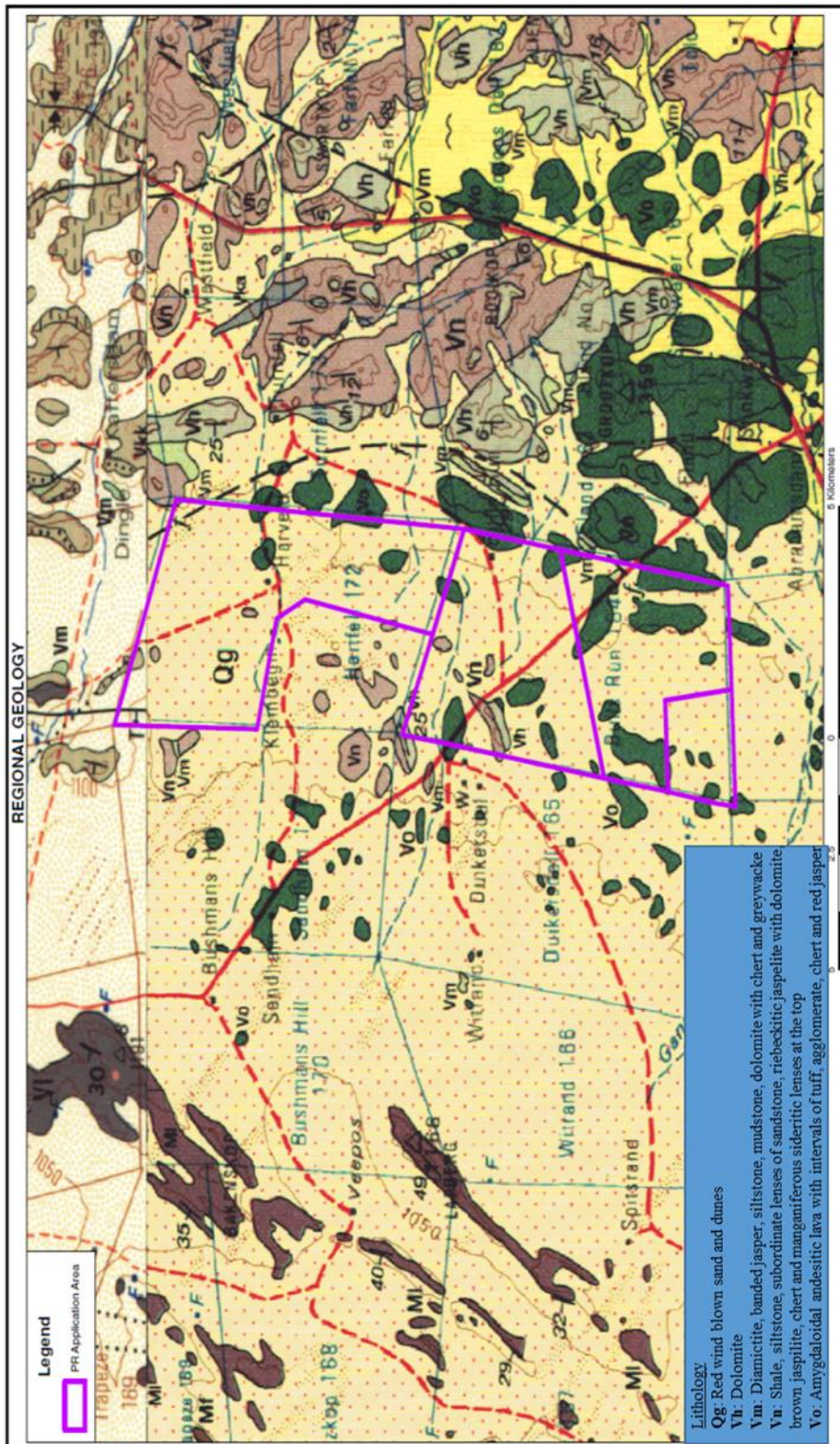
On completion of each drilled hole, it will be rehabilitated during the closing and rehabilitation of the nearby trench by means of filling the hole with the original excavated material. At any time during the prospecting program, no more than 1 trench and borehole and one campsite position will be left un-rehabilitated.

Campsite positions are planned within a radius of 500m of each drilling site. Once a new campsite is developed the old campsite will be rehabilitated.

## **Palaeontology**

### **Background**

According to the 1:250 000 geological map of Prieska, the study area primarily occurs within the outcrop area of the early Proterozoic Ongeluk Formation (**Vo**) (basaltic andesites) from the basal Postmasburg Group (c.2.2 Ga) (Beukes 1978, 1980; Harding 2004; Erikson *et al.* 2006), but older iron formations and siliciclastic rocks of the Naragas Formation (**Vn**) as well as small outcrop of the potentially sensitive dolomite bearing Rooinekke Formation (**Vh**) of the Koegas Subgroup have also been mapped at Hartfell 172 (**Fig. 2**). The Koegas Subgroup represents the top of the Ghaap Group and is unconformably overlain by the Postmasburg Group. Superficial sediments are made up of locally derived polymict gravels and Kalahari Group aeolian sand and sand dunes (**Qq**).



**Figure 3:** Geology of the study area (Authors)

### Impact Statement and Recommendation

It is expected that the proposed prospecting activities could impact on early Proterozoic sedimentary strata (c. 2.2 Ga) that are represented by siliciclastic rocks,

Figure 2. Extract from 1:250 000 geology sheet 2922 Prieska (Council for Geoscience, Pretoria) showing the geology underlying the study area for the proposed Prospecting Right, including bulk sampling for Iron Ore and Manganese Ore over the Remaining Extent of Portion a and Portion 2 of the Farm Bulls Run 164 and the Remaining Extent of the Farm Hartfell 172, Hay District, Northern Cape Province, South Africa



volcanic lavas and ironstones which are not considered to be paleontologically sensitive. Given the scope of the proposed activities, the likelihood of palaeontological impact on early Proterozoic carbonate rocks (e.g., Rooinekke Formation) is considered low, especially if prospecting by way of core drilling is considered. However, because of the thick sandy overburden (which is not considered to be palaeontologically significant in this case) and the lack of details regarding the position of the proposed prospecting and campsite localities, it is recommended that in the event of impact on fresh carbonate rocks that may result from trenching and pitting, new exposures should require brief monitoring by a palaeontologist. The superficial aeolian (Kalahari Group) overburden within the vicinity of the study area is not considered to be, palaeontologically significant.

## **Archaeology**

### **Background**

The Stone Age archaeological footprint in the region is represented by Early, Middle and Later Stone Age sites which are often associated with pans, while the landscape in general is characterized by low density surface scatters (Beaumont 1990, 1995; Kiberd 2006). Holocene deposits containing LSA artefacts are known from the rock shelters Blue Pool Cave, Ochre Cave, Powerhouse Cave, Witkrans Cave, Little Witkrans and Black Earth Cave, which are also located in Ghaap Plateau travertine at Norlim (Taung). Several MSA and LSA sites are documented around Witsand. The LSA sites have yielded Wilton assemblages with formal lithics dominated by backed pieces including segments and scrapers. Between Kimberley and Griekwastad (Dikbosch), a rock shelter located in travertine deposits of the Ghaap Plateau, has yielded LSA artefacts associated with some faunal remains. According to van Riet Low (1941), rock engravings have been recorded in the younger valley fills along the steeper slopes located near the eastern and south-eastern margins of Sandfontein 356. In addition, rock art sites have been recorded on several farms around Prieska, including Kleindoring, Omdraaisvlei and Wonderdraai. Historical ruins and graveyards associated with the asbestos mining industry during the first half of the 20<sup>th</sup> century are located at Kliphuis and Engeldewilgeboomfontein, north of Prieska. Archaeological and historical evidence suggest that the most southerly distribution of Late Iron Age Tswana settlements in the region during the 18<sup>th</sup> century AD ranged

between the Langeberge and what is known today as Witsand (Humphreys 1976). The farm Nokanna, situated about 35 km north of Witsand, equates with the former BaTlaping capital of Nokaneng, the place where Chief Mothibi was born around 1775 (Maingard 1933).

### **Impact Statement and Recommendation**

The rocky areas show an overall paucity of stone tools. It is considered unlikely that prospecting by way of core drilling, trenching and pitting will have a detrimental effect on this component, and it is assigned a site rating of **Generally Protected C (GP.C)**. Furthermore, the extent and position of the prospecting localities within the study is not pinned down yet, so it is difficult to assess potential negative impact, if any, with regards to the occurrence of subsurface remains, especially since Stone Age archaeological visibility is hampered by the aeolian sand overburden that covers large parts of the valleys between the rocky outcrops within the study area. There is a **Low to Moderate** chance that trenching and pitting into the sandy overburden especially within the vicinity of natural drainage areas may impact on intact Stone Age archaeological remains and should be avoided where possible, whereas prospecting by way of core drilling is considered **least likely** to have a detrimental effect on potentially capped archaeological heritage resources. In this case, potential prospecting areas that are capped by well-developed wind-blown sand deposits are assigned a site rating of Generally Protected B (**GP. B**) and will require archaeological monitoring if trenching and pitting activities are to be conducted.

It is advised that as a matter of prudence, the supposedly unmarked graves area near the Bulls Run farmstead, as well as the other three formal graveyards is to be avoided during the operational phase of the project. The graveyards are assigned a site rating of Local Significance Grade 3A.

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