



Tshipi é Ntle Manganese Mining

Prospecting on Remaining extent of the farm Wessels 227 and Portions 1 and 2 and the remaining extent of the farm Dibiaghomo 226, near Black Rock in the Northern Cape Province

Heritage Impact Assessment

Issue Date: 15 May 2013
Revision No.: 1
Project No.: DMR Reference: NC30/5/1/1/3/2/1/1251 EM

Declaration of Independence

The report has been compiled by PGS Heritage an appointed Heritage Specialist for SLR Consulting (Africa) (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 which includes this Heritage Impact Assessment Report.

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Report Title	<i>Heritage Impact Assessment for the proposed prospecting activities for Tshipi é Ntle Manganese Mining on the Remaining extent of the farm Wessels 227 and portions 1 and 2 and the remaining extent of the farm Dibiaghomo 226 in the Northern Cape Province</i>		
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EXECUTIVE SUMMARY

PGS Heritage was appointed by SLR Consulting (Africa) (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Management Plan (EMPr) for the proposed prospecting activities of Tshipi é Ntle Manganese Mining on the Remaining extent of the farm Wessels 227 and Portions 1 and 2 and the remaining extent of the farm Dibiaghomo 226, near Black Rock in the Northern Cape Province.

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

Palaeontology

Although the palaeontological sensitivity of the study area is found to be low, the possibility of encountering “Stromatolites” during drilling does exist. These heritage resources are protected under Section 35 of the National Heritage Resources Act (NHRA).

Mitigation

The developer and the ECO must be made aware of the possible presence of stromatolites in the pre-Kalahari Formations and if recorded in future drilling operations, a palaeontologist must be informed and appropriate actions taken in the event of future mining of the stratigraphic units.

Archaeology

Previous studies conducted in the larger Hotazel and Black Rock areas has shown that the archaeological record is temporally confined to the Middle and Later Stone Age, while spatially distribution of such sites is concentrated around the riverine edges due to the harsh climate of the area.

Field work has confirmed the presence of 13 archaeological site associated with Middle Stone Age (MSA) as well as Later Stone Age (LSA) site linked with hunter gatherer communities. These heritage resources are protected under Section 35 of the National Heritage Resources Act (NHRA).

The sites identified to be associated with LSA communities are of great significance as very few studies conducted in the Hotazel and Blackrock areas have previously identified LSA concentrations associated with other artefacts such as bone, pottery and ostrich egg shell fragments.

Mitigation

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If it is found that mining activity cannot be altered to avoid the site, a destruction permit will be required from SAHRA, backed by a mitigation report that must include documentation of the site layout, analysis of the material and compiled as a final report on the archaeological site.

Historical

The archival research has shown that the area was settled as early as the late 1700's with activity and settlements increasing into the mid-1800's with the establishment of the Lower Kuruman Native Reserve with its northern most limits less than 15 kilometres to the south of the study area. Furthermore, the settlement of white farmers from around 1897 to the early 1920 on the Kuruman River at places with names such as Boerdraai (just north of the study area), Wessels 227 (1917), Dibiaghomo 226 (1914, but already settled by 1899) and Dikgathlong 268 (as early as 1894), is an indication that farmsteads and structures of significance can be present in the study area.

Two farmsteads were identified in the study area, both dating from the early part of the 20th century and thus protected under Section 34 of the NHRA.

Mitigation

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.

- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If at any stage the site cannot be excluded from the mining activities a destruction permits required from the Northern Cape provincial Heritage Authority. This will require that all structures on site 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.

Cemeteries and Graves

Three cemeteries were also identified and documented. These cemeteries are associated with the farmstead and in most cases date from the early 1930. These heritage resources are protected under Section 36 of the National Heritage Resources Act (NHRA).

Mitigation

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- In the event that the sites cannot be excluded from the development footprint, a grave relocation process as described in Section 5 of this report needs to be implemented.

General

Further to these recommendations the general Heritage Management Guidelines in Section 5, need to be incorporated into the EMP for the project.

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

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1 INTRODUCTION

PGS Heritage was appointed by SLR Consulting (Africa) (Pty) Ltd to undertake a Heritage Impact Assessment (HIA) that forms part of the Environmental Management Plan (EMPr) for the proposed prospecting activities of Tshipi é Ntle Manganese Mining on the Remaining extent of the farm Wessels 227 and portions 1 and 2 and the remaining extent of the farm Dibiaghomo 226, near Black Rock in the Northern Cape Province.

1.1 Scope of the Study

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

1.2 Specialist Qualifications

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

The staff at PGS has a combined experience of nearly 40 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

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

Dr Gideon Groenewald, the appointed external Palaeontologist for this project, has a PhD in Geology from the Nelson Mandela Metropolitan University (1996) and the National Diploma in Nature Conservation from the University of South Africa (1990). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in

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

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

1.4 Legislative Context

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

- i. National Environmental Management Act (NEMA), Act 107 of 1998
- ii. National Heritage Resources Act (NHRA), Act 25 of 1999
- iii. Mineral 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 Impact 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. Mineral 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...” The 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, 2008).

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, 2008).

Terminology and Abbreviations

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 a 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 700 000 and 2 500 000 years ago.

Fossil

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

Heritage

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

Heritage resources

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

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

Holocene

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

Late Stone Age

The archaeology of the last 20 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

The archaeology of the Stone Age between 20 000-300 000 years ago, associated with early modern humans.

Palaeontology

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

ABBREVIATIONS	DESCRIPTION
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act

ABBREVIATIONS	DESCRIPTION
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

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

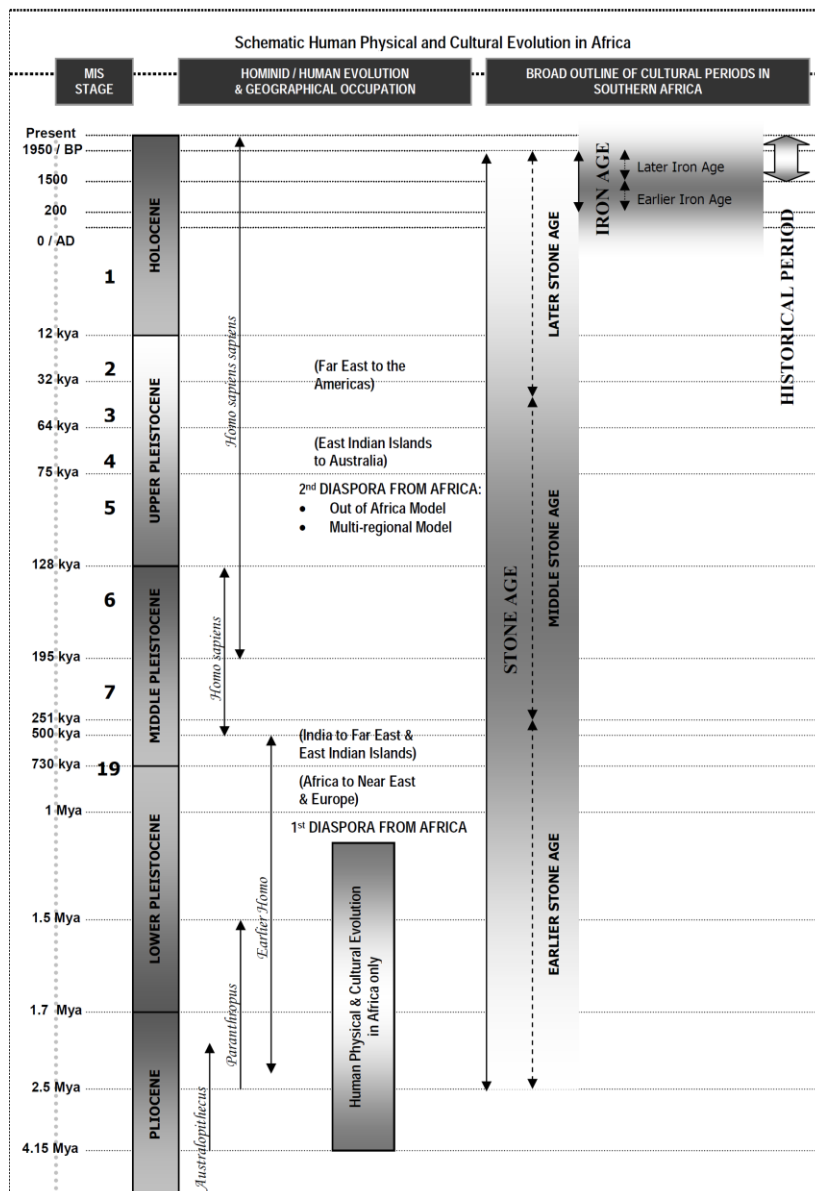


Figure 1 – Human and Cultural Time line in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Location	E22.8843,S27.1016 The proposed development site is situated an approximate 3 kilometres outside of the town Black Rock.
Land	2900 Hectares of land owned by Tshipi é Ntle Manganese Mining (;ty) Ltd.
Land Description	The land is currently utilised for prospecting activity. It consists of grass and bush cover, with the northern section bordered by the Kuruman River.

2.2 Technical Project Description

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

Tshipi é Ntle Manganese Mining currently undertakes prospecting related activities in accordance with its approved environmental management plan (EMP) (NC30/5/1/1/3/2/1/1251 EM) for the Remaining extent of the farm Wessels 227 and Portions 1 and 2 and the Remaining extent of the farm Dibiaghomo 226 in the Northern Cape province. It should be noted that even though the farm Dibiaghomo was included in the prospecting rights area, the approved prospecting EMP did not make provision for boreholes to be drilled on the farm Dibiaghomo.

The approved EMP was amended in September 2012 to cater for approximately 120 boreholes and to include the drilling of boreholes on the farm Dibiaghomo. To date 10 boreholes have been drilled on the farm Wessels 227. Tshipi é Ntle Manganese Mining is proposing to drill four new boreholes within the next three years.

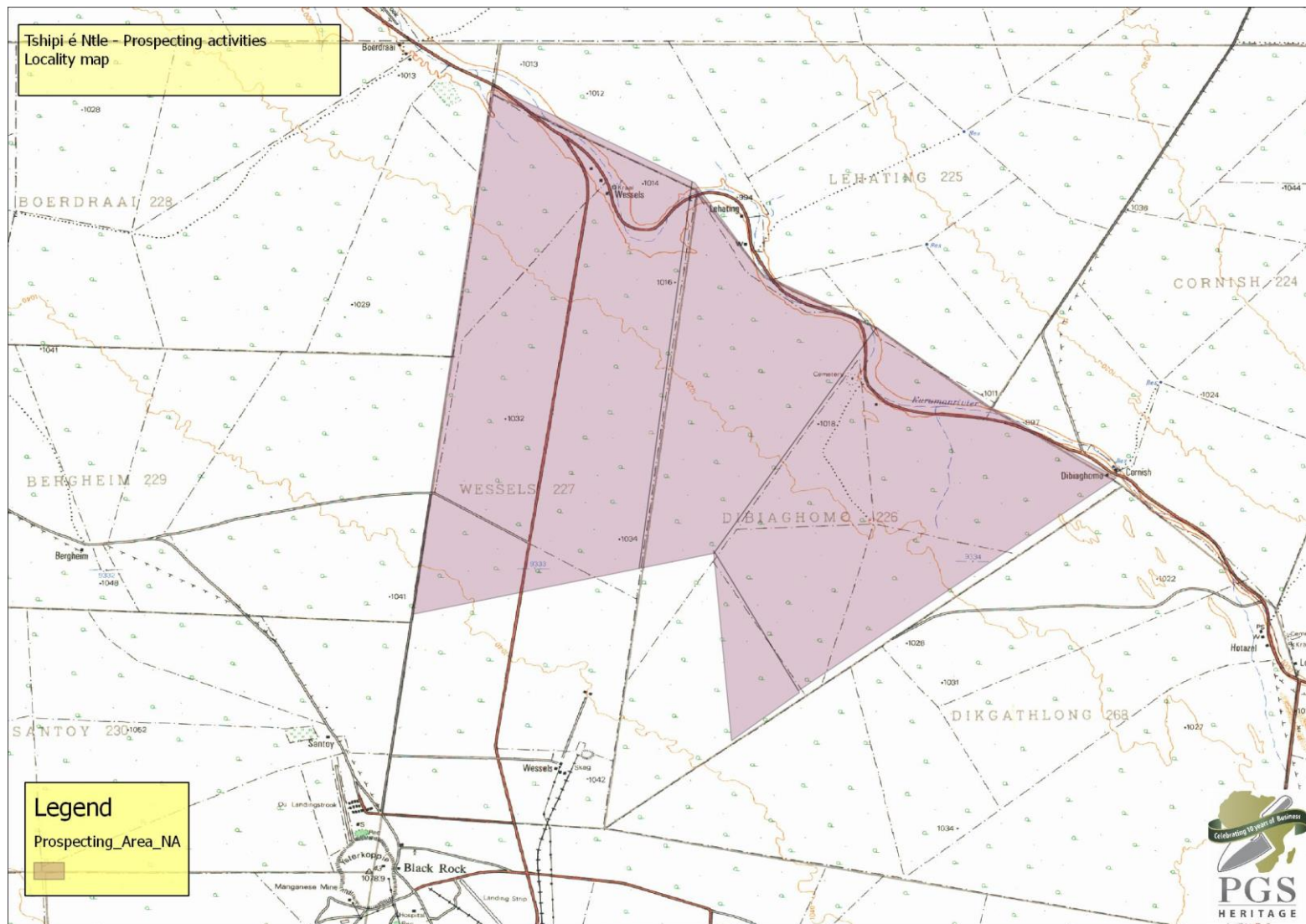


Figure 2 – Application Area locality

3 CURRENT STATUS QUO

3.1. Site Description

The study area is located in very flat-lying terrain at 1020-1040m amsl, rising from the Ga-Mogara River on the eastern boundary westwards.

The general condition of the property ranges from wooded grass land to sandy riverine areas (Figure 3).



Figure 3 – General view of wooded grass land

3.1 Archival findings

The archival research focused on available information sources that were used to compile a background history of the study area and surrounds. This data then informed the possible heritage resources to be expected during field surveying.

3.2 Palaeontology of the area

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

Literature reviews and reports associated with Heritage Conservation make no mention of any palaeontological finds in the Kalahari Formation in this region. Although it is known that certain facies in the Dwyka Formation contains trace fossils and vertebrate fossils, highly brecciated nature of the formation in this area will exclude fossils. Algal growth structures, known as “Stromatolites” are well-known fossil structures, described from the dolomites of the Transvaal Supergroup (Figure 4).

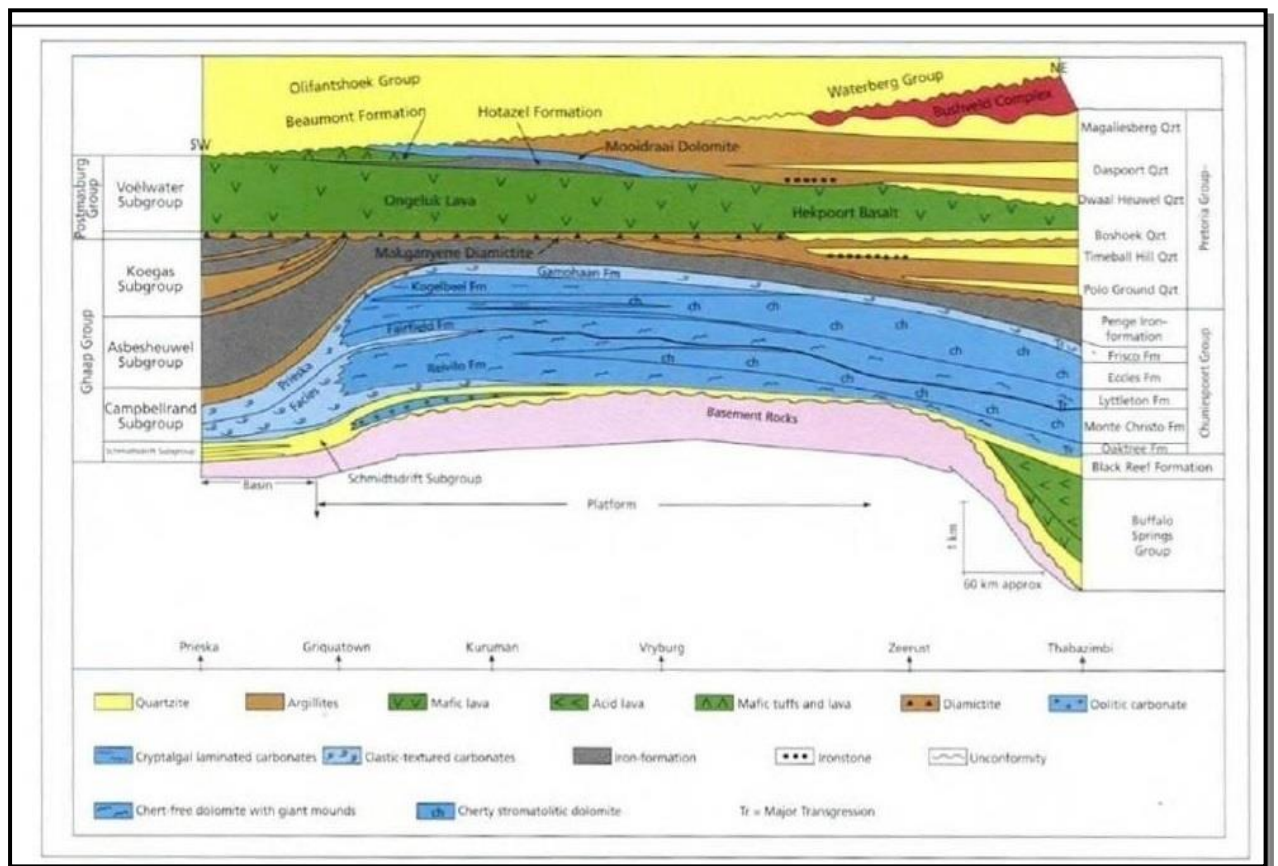


Figure 4 - Generalised plan of the geology of the Transvaal Supergroup is provided by Beukes (1983) and Van der Merwe (1997).

3.2.1 Kalahari Formation

No fossils have been recorded from the Kalahari Formation. It is, however, likely that fossils might be present in the calcareous deposits of this formation.

Relicts of possible bone structure were observed by the author, but the structures are completely replaced by calcium and silica, making it virtually impossible to determine with any certainty what the original material was.

3.2.2 Pre-Kalahari Formations

The palaeontological importance of the Proterozoic Transvaal Supergroup is mainly associated with well-defined stromatolite structures in the dolomite deposits.

Figure 4.1 Typical stromatolite structures usually associated with dolomite deposits such as the dolomite of the Mooidraai Formation that overlies the Hotazel Formation. It is highly likely that structures such as in this photograph, might be exposed during exposure of the dolomite and Banded Iron Units in the Hotazel Formation (Photograph from Wikipedia 201) en.wikipedia.org/wiki/Stromatolite.

There are no outcrops of Pre-Kalahari Dwyka or older Transvaal Supergroup rocks in the study area and outcrops of the banded shale and thin dolomite zones that crop out on the main road between Hotazel and Kuruman shows very poorly defined algal structures that probably represent micro-stromatolites.

Small scale algal structures were observed by the author in boreholes from the area. The structures in the borehole logs are mostly of small (cm) scale and associated with banded iron formation of the Hotazel Formation or the overlying dolomite of the Mooidraai Formation.

Refer to **Appendix A** for the detailed Palaeontological Desktop Study

The following section leans heavily on previous archival studies conducted by PGS Heritage in the Hotazel/Black Rock Areas (PGS Heritage, 2009; PGS Heritage, 2010; PGS Heritage, 2010).

3.3 Archaeological background

Most archaeological material in the Northern Cape is found near water sources such as rivers, pans and springs, as well as on hills and in rock shelters. Sites usually comprise of open sites where the majority of evidence of human occupation is scatters of stone tools (Parsons 2003).

3.3.1 Early Stone Age (400 000 – 2 million years Before Present/BP)

An important archaeological site in the region is the Wonderwerk Cave, located approximately x km away. The Early Stone Age (ESA) levels at Wonderwerk Cave date to approximately 780 000 years old and are characterised by Acheulean stone tools such as prepared cores, bifacial cleavers and refined hand axes. A few pieces of haematite were also found in the uppermost MSA layers. Bedding material recovered indicates that the site was used as a home base by the end of the ESA. A few small irregular flakes and cores may belong to the older Oldowan era, but the dating of this material is uncertain (Beaumont & Vogel 2006).

3.3.2 Middle Stone Age (30 000 – 300 000 BP)

Middle Stone Age(MSA) artefacts belonging to the Fauresmith industry are also found in the region. The Fauresmith is characterised by prepared cores, long, narrow flake blades, convergent points and small, broad hand axes (Mitchell 2002). Also at Wonderwerk, layers with Fauresmith tools were dated to 276 00 – 510 000 BP. Associated with the MSA materials were several incised stone slabs, most with curved parallel lines. Pieces of haematite were also found. The cave was abandoned between 70 000 and 12 500 BP due to significantly drier conditions. During this time, much of the region was abandoned and settlement only occurred at a few sites near permanent water sources (Beaumont & Vogel 2006).

3.3.3 Later Stone Age (30 000 BP – recent times)

The earlier LSA industry of the region forms part of the Oakhurst industry (some have labelled this local variant the Kuruman), characterised by rare retouched artefacts, most of which are large scrapers that are oblong with retouch on the side. The predominant raw materials are banded ironstone and dolomite. Very few adzes and blades are found, while backed artefacts and bone tools are absent. Ostrich eggshell beads and fragments are found (Humphreys & Thackeray 1983). At Wonderwerk, Oakhurst assemblages were dated to 8000 – 10 500 BP (Beaumont & Vogel 2006).

This was followed by the Wilton industry, characterised by the use of various raw materials including banded ironstone, chert, chalcedony, jasper and quartz. The main retouched tools are elongated scrapers with retouch on the end and backed artefacts such as segments and

blades. Other retouched tools include adzes, unifacial points, borers and notched artefacts. At other sites, bifacial points and bifacial tanged and barbed arrowheads are found. At Wonderwerk, a few bone points have been found. Ostrich eggshell beads, pendants and decorated fragments, as well as stone rings were found (Humphreys & Thackeray 1983). Wilton layers at Wonderwerk have been dated to 2000 – 8000 BP. Associated with the LSA materials were 20 fine-line incised engraved stone slabs, most with schematic motifs. One example of a mammal depiction has been found. Pieces of haematite and specularite were also found in these layers (Beaumont & Vogel 2006).

Pottery made its appearance in the region by approximately 1400 BP and at Wonderwerk, Ceramic Later Stone Age layers have been dated to 900 – 2000 BP (Humphreys & Thackeray 1983; Beaumont & Vogel 2006). Two discrete, contemporary stone tool industries are associated with pottery remains in the Northern Cape: Swartkop and Doornfontein (Beaumont *et al.* 1995). Swartkop is a Wilton industry characterised by circular blades, a high proportion of backed blades, coarse undecorated pottery sherds that commonly contain grass temper, and a few iron items. It seems scrapers were favoured over blades on the Ghaap plateau (Humphreys & Thackeray 1983). These sites are usually found near water sources, such as pans and springs, or on the sides of low hills. Stone circles and ovals are sometimes also found and may represent the bases of dwellings. A late phase of this industry can be linked with the */Xam* San who lived in the Karoo. Doornfontein is characterised by the predominance of coarse irregular flakes, frequent use of quartz as a raw material, and very little retouch. Many ceramics are found, which are amphora-like in shape with grit temper and decoration on the necks and rims. Later sites contain some large ostrich eggshell beads, iron objects, and coarser sherds with grass temper. These sites are found along the Orange River and nearby permanent water sources. This tradition is probably associated with Khoekhoen groups (Beaumont *et al.* 1995).

Two prehistoric specularite mines have been excavated near Postmasburg–Doornfontein (Beaumont & Boshier 1974) and Blinklipkop (Thackeray *et al.* 1983). These sites show that specularite mining started before 1200 BP. This substance was prized as a cosmetic by hunter-gatherers, Khoekhoen pastoralists and Iron Age peoples, making it an important trade item. At Blinklipkop, there is evidence of either trade with or occupation by Iron Age peoples by the seventeenth century. Historical sources indicate that Tlhaping Sotho-Tswana peoples occupied the mine in 1801 (Thackeray *et al.* 1983).

3.3.4 Rock Art

Rock engravings are principally found in the interior of South Africa and are plentiful in the Northern Cape. Engravings are found on rocky outcrops, river beds and boulders. They are made by pecking away the surface of the rock with another rock, incising it with a sharp stone or scraping it off with another stone. Unfortunately, there are no scientific methods for securely dating engravings and research into this is still at an experimental stage.

Most engravings were made by the San and were associated with their religious beliefs and rituals. San shamans went into trance to perform certain tasks such as controlling game, protecting the group and rainmaking. Certain animals were believed to hold supernatural power and thus many of the engraved animals can be seen as both sources and symbols of supernatural power. The places where engravings were made were also sources of supernatural power, especially in rainmaking rituals. Certain geometrics such as zigzags and dots are likely to have been associated with forms called entoptics seen whilst in trance (Dowson 1992).

Some engravings—particularly those featuring nonentoptic geometrics and aprons—were probably made by Khoekhoen people. Similar motifs are found in finger painted Khoekhoen rock art sites in certain regions of the Northern Cape, especially in the Vaal-Harts region to the east. Khoekhoen rock art is typified by finger paintings and roughly pecked engravings of geometrics that are located near water sources (Smith & Ouzman 2004). The rock paintings found in the Kuruman hills (Morris 1988) are probably of Khoekhoen authorship. Korana rock art—mostly painted—has also been identified in the Vaal-Harts region but may stretch into the Daniëlskuil region (Ouzman 2005). These depictions are characterised by finger painted and rough brush painted horses, human figures, geometrics, aprons, guns and finger dots. They are painted in shelters that are either hidden or not easily accessible. The complex issues of ethnicity and authorship of rock art—especially engravings—are still being researched.

3.4 Archival/historical maps

A number of maps depicting the study area were located. Enlarged sections of these maps are presented below. A short discussion on each of these maps is also made.

3.4.1 Merensky Map, 1887

(National Archives, Maps, 3/302)

The map depicted in **Figure 4** below is titled “*Original Map of South Africa*”. It was compiled by Reverend A. Merensky and dates from 1887. The map does not appear to be all that accurate, but provides some idea as to the characteristics of the study area at the time (refer **Figure 4**).

It is evident from the enlarged map component below that many of the settlements in the general vicinity of the study area were located on the existing rivers. See for example ‘*Ga Maperi*’, ‘*Batlaros*’, ‘*Old Lattaku*’ and so forth.

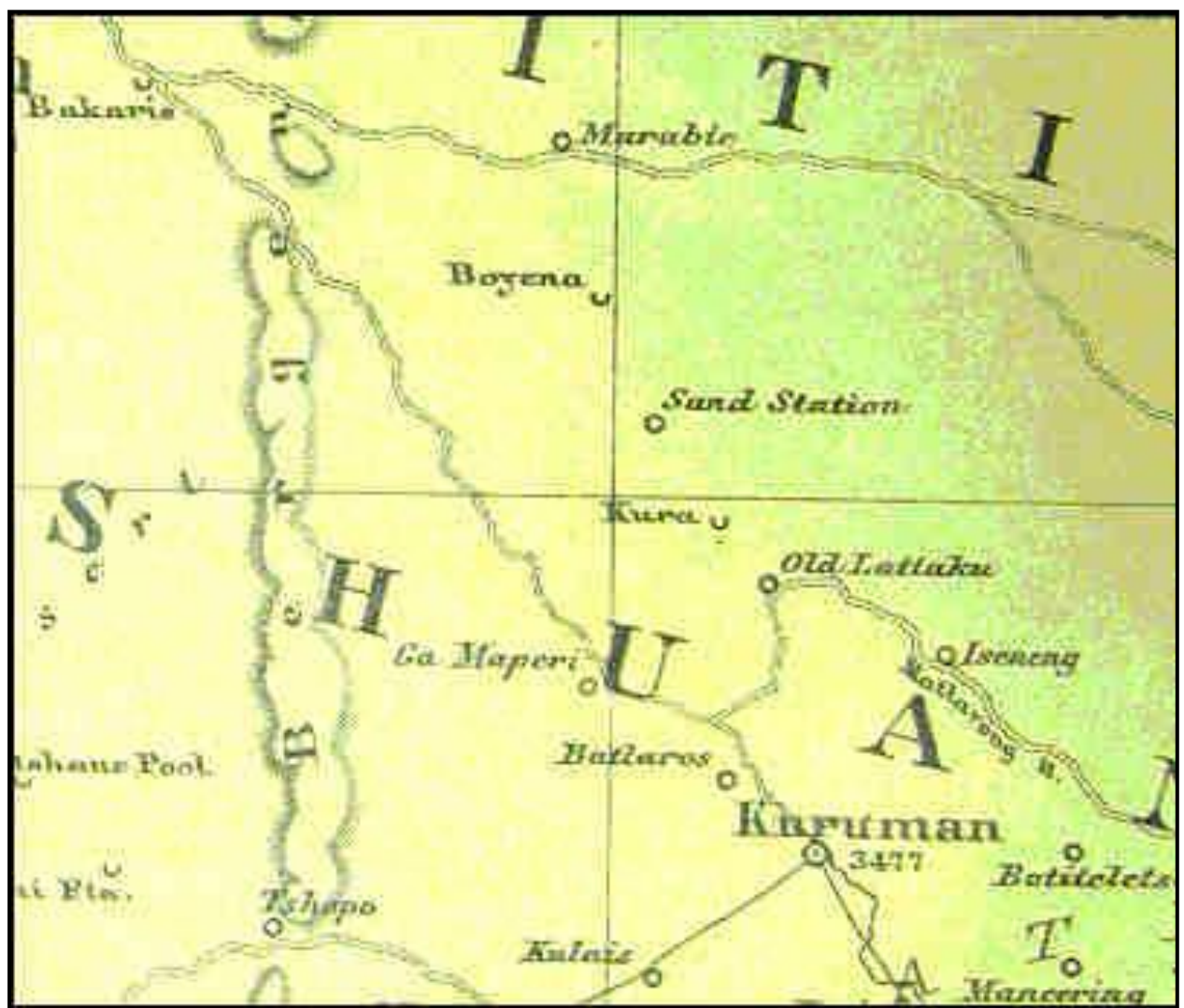


Figure 5 - Map depicting the study area and surrounding region. Note that almost all the towns are situated on or near the main rivers (National Archives, Maps, 3/302).

3.4.2 “Kuruman”, Undated

(National Archives, Maps, 3/533)

This map is simply titled “Kuruman”, and contains no other information.

An important observation made from this map and which is supported by the other data, is that the proclaimed farms at the time extended only to the vicinity of the Kuruman River, with no proclaimed farms to the west of it. Although settlements are shown to the west of the said river, these are all located on the banks of rivers.

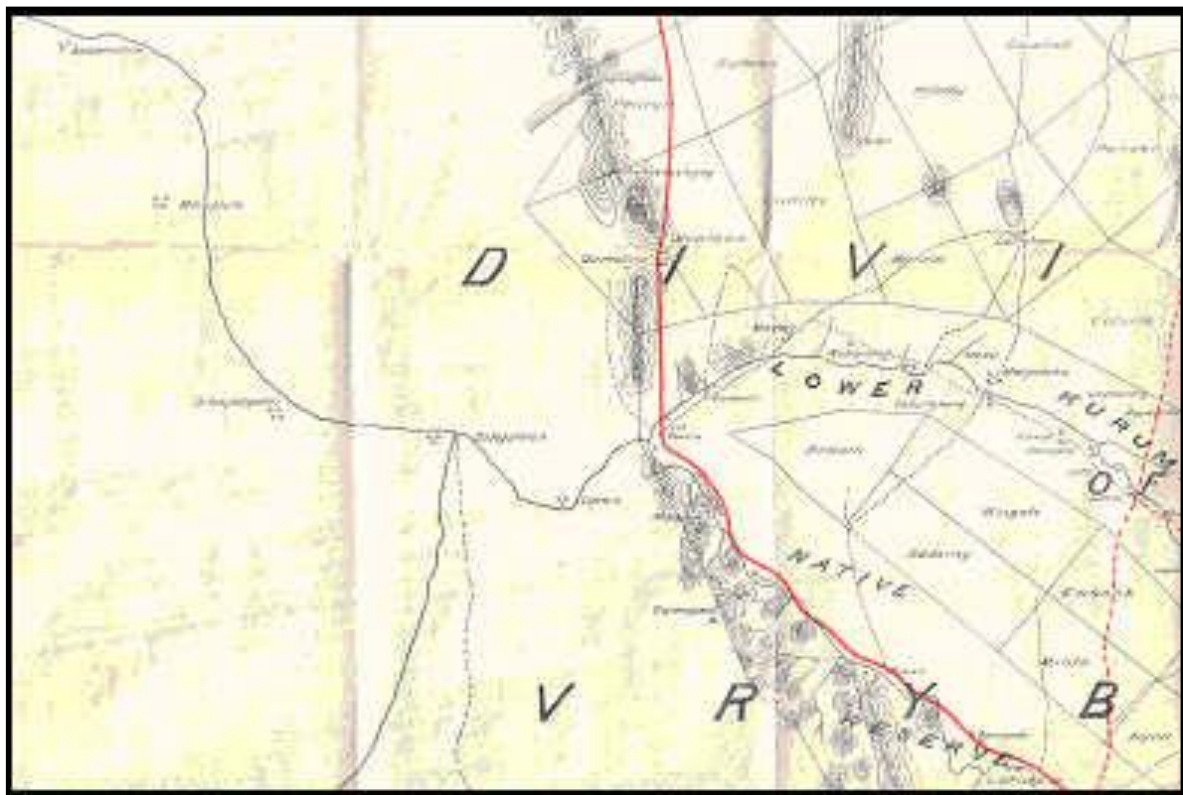


Figure 6 - Depiction of the wider landscape surrounding the study area (National Archives, Maps, 3/533). The so-called Lower Kuruman Native Reserve is shown on the right.

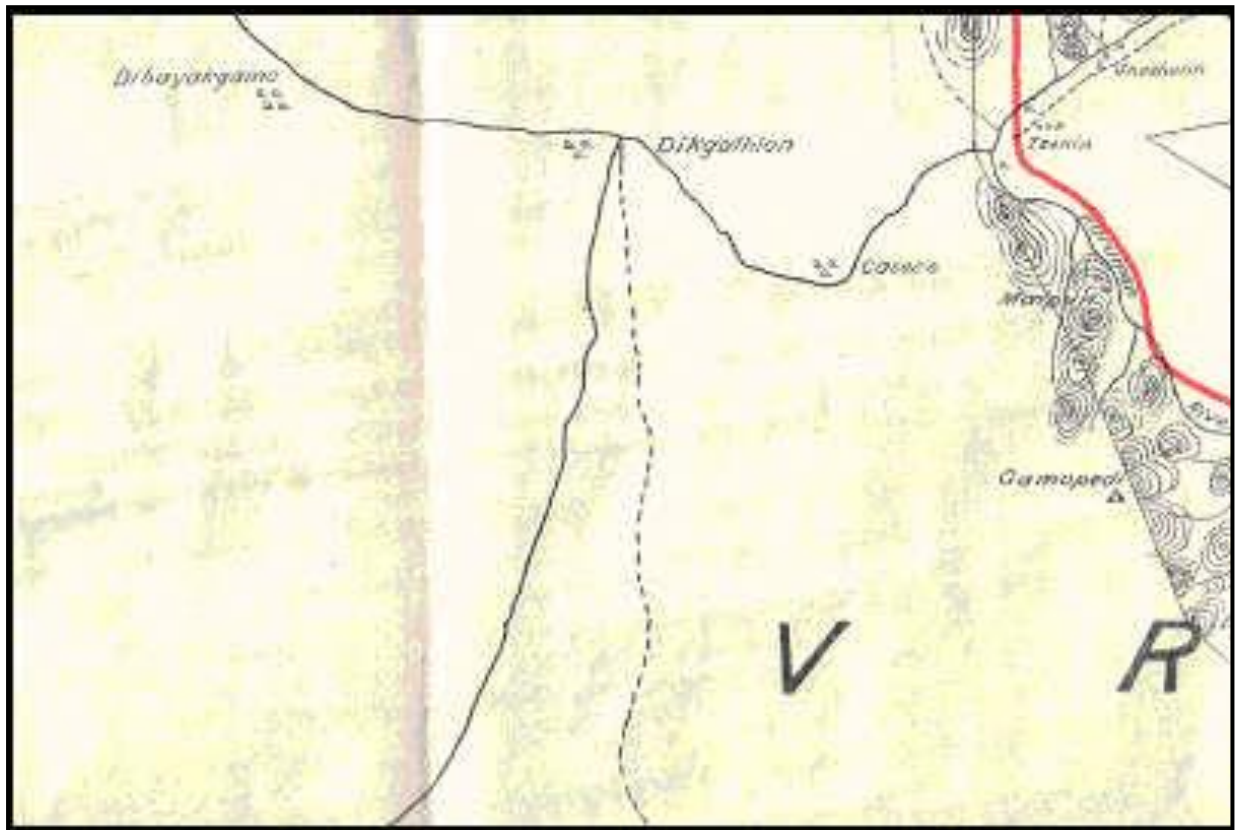


Figure 7 - Close-up view of the study area and surroundings. Note the location of the towns close to river courses (demarcated in black line). A road (stippled line) can also be seen crossing over the vicinity of the study area from Dikgathlon southwards. (National Archives, Maps, 3/533).

3.4.3 British Bechuanaland Map, 1894

(National Archives, Maps, 1/441)

“Map of the Surveyed Portion of British Bechuanaland” was compiled by the Surveyor-General’s Office in Vryburg. It is a relatively accurate map and, importantly, indicates the extent to which farms in the area have been proclaimed and demarcated. Note that the entire section in which the study area is located was still unsurveyed at the time with no farm boundaries shown.

No settlement features or human activity centres are shown for the areas in which the farms under discussion are located. Almost all the settlements shown on this map are located on or near the rivers.

3.4.4 Geological Map, 1925

(National Archives, Maps, 2/304)

This map was made in 1925, and is titled the “*Geological Map of the Union of South Africa*”. It was produced by the Geological Survey of the Department of Mines and Industries.

No settlement features or human activity centres are shown for the areas in which the farms under discussion are located. Note that all the indicated settlements in the wider region are located adjacent to rivers. These include settlements such as Dikgatlon, Batlaros and Gamopedi. Also note the demarcation of the Lower Kuruman Native Reserve on this map.

3.4.5 Orange River Sheet 3, 1945

(National Archives, Maps, 2/1085)

This map is titled is titled “*Orange River Sheet 3*”, and dates from 1945. It was produced by the Union Defence Force (U.D.F.), and although this edition is dated 1945, it appears to have been drawn during 1942. The map provides a general view on the study area and the surrounding region.

No settlement features or human activity centres are shown for the areas in which the farms under discussion are located. Note the way in which the secondary road (thin brown line) follows the rivers. Only the smaller roads (brown stippled line) cross over the waterless areas. Furthermore, three Post Offices are shown, all located on the rivers. Although three mines are indicated, these are all situated closer to Kuruman. No mines are shown for the areas under discussion.

3.5 Aspects of the area’s history as revealed by the archival/desktop study

3.5.1 Settlement during the Later Stone Age

A number of Stone Age sites are known for the area surrounding Kuruman as well as along the Kuruman River (Humphreys & Thackeray, 1983; Beaumont & Morris, 1990; Parsons, 2003). Some of these sites contain rock engravings as well, such as Nchwaneng and Tsineng (Beaumont & Morris, 1990; Morris, 1988, 2002, 2003).

As the wider landscape became increasingly inhabited, the San were forced to move further west and northwest to remain in the vicinity of wild game (Snyman, 1992).

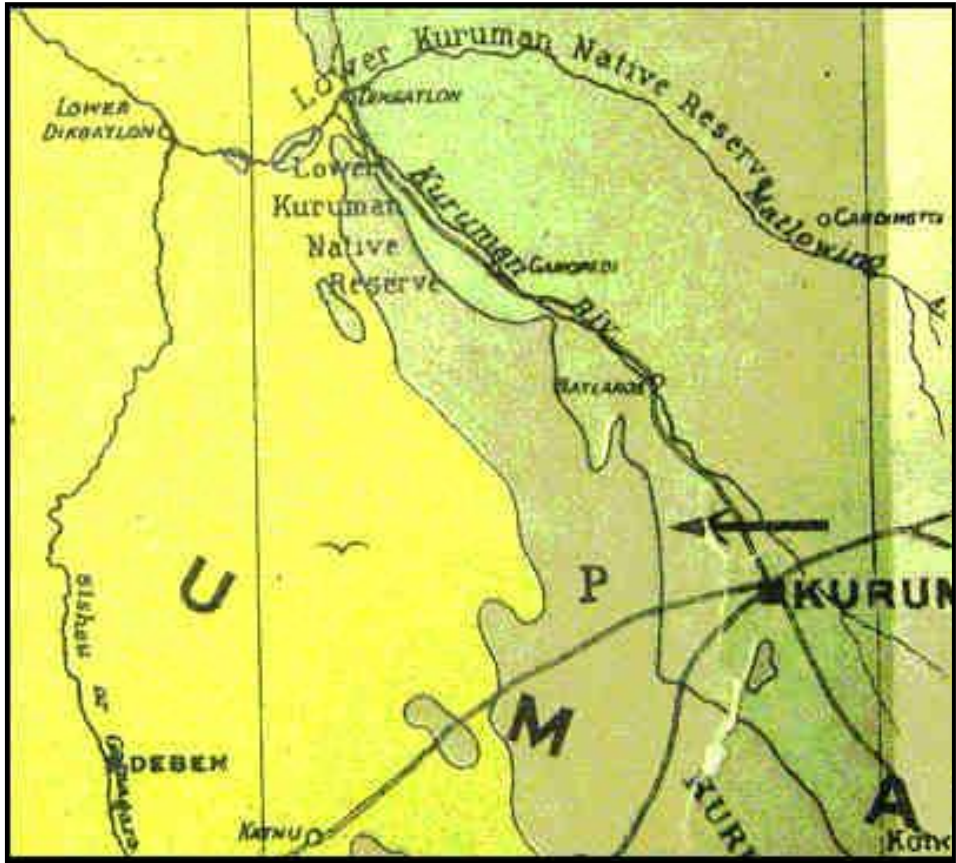


Figure 8 - Geological map of the study area and surrounding region (National Archives, Maps, 2/304).

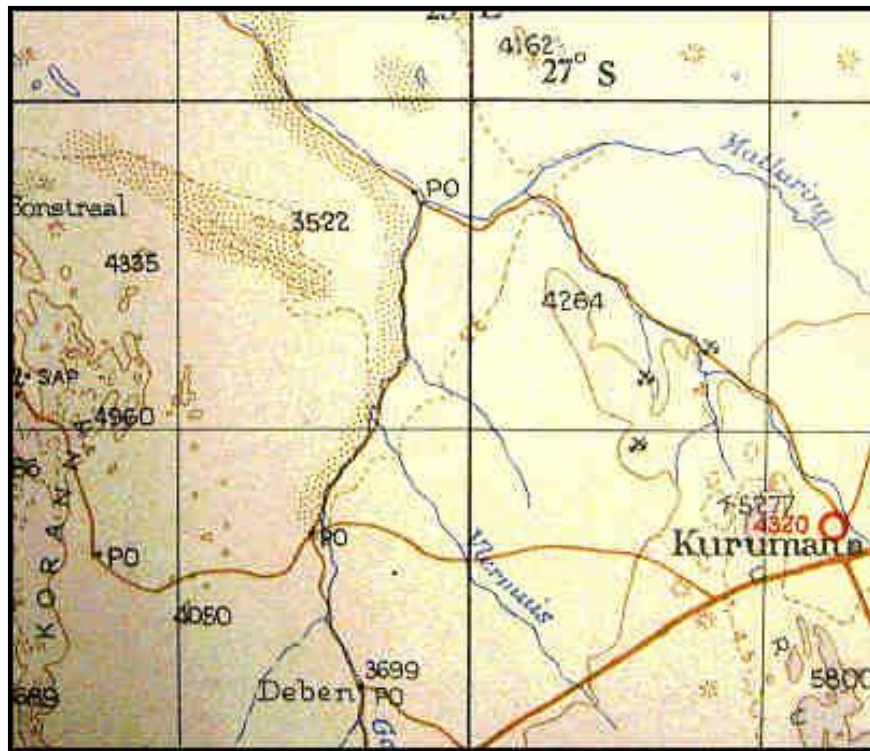


Figure 9 - Map depicting the study area and surrounding region (National Archives, Maps, 2/1085).

3.5.2 Early Black Settlement during the Late Iron Age and Historic Period

The Tlharo seems to have been the first Tswana group to enter the Kuruman area. They originated from the Hurutshe group further to the north-east, and after splitting from this group during the end of the 17th century, moved in a southern direction down the Molopo River. Their early settlements included Khuis, Madibeng, Heuningvlei, Langeberg and Tsineng (Snyman, 1992). As mentioned earlier, the town of Tsineng (Tsenin) is located in the general vicinity of the present study area.



Figure 10 - "Tlharo of the Kalahari Desert" A sketch that appeared in Dr. Andrew Smith's travel journal (Lye, 1975:171).

The second important Tswana group from the wider area is the Tlhaping. They originated from the Rolong group and during the mid-1700s moved southward along the Harts and Vaal Rivers to the vicinity of Campbell, from where they travelled westwards into the area falling between Tsantsabane and Majeng on the edge of the Kalahari Desert. The Tlhaping established a capital on a perennial river known as Nokaneng. Their ruler during this time was King Maswe. Although the exact locality of Nokaneng is not known, one possibility is that the present non-perennial river Ga-Mogara used to be the Nokaneng River. This possibility was supported by the missionary John Campbell, who in 1820 referred to the Ga-Mogara River as the Nokaneng (Campbell, 1922: Vol II:125; Snyman, 1992). Interestingly, Robert Moffat indicated Nokaneng to have been situated to the east of the Langeberg, but see also map accompanying Campbell (1922:Vol. II). This said, it is important to note that

Breutz (1992) stresses the point that the actual capital Nokaneng was in fact located in the direct vicinity of Postmasburg.

During the reign of Molehabangwe, who had succeeded his father Maswe in 1775, a confederation was formed which consisted of a stratified society comprised of the Tlhaping, Rolong, Tlharo, Kgalagadi and San groups. While the Tlhaping was seen as the ruler class, the Kgalagadi and San were viewed as vassals (Snyman, 1992).

The Tlhaping conducted extensive trading activities with the Korana to the south and the Tswana to the north. During 1770 some of the Korana groups crossed the Orange River and came to the land of the Tlhaping. Although the initial contact was peaceful, conflict soon erupted. The better-armed Korana managed to force the Tlhaping out of the area in approximately 1790. This move was further augmented by the fact that the Nokaneng River had dried up. Campbell (1922: Vol. II:125) on his visit in 1820 also remarked that both the Nokaneng and Kuruman Rivers then had dried up, but that deep wells dug into the river beds supplied water. The Tlhaping first moved to Kathu and then to Ga-Mopedi on the Kuruman River. The Tlhaping eventually established themselves at Dithakong on the Moshaweng River (Snyman, 1992).

3.5.3 European Explorers and Visitors

Two of the more well-known early European explorers to these areas were Dr. Hinrich Lichtenstein in 1805 and Dr. Andrew Smith during 1835.

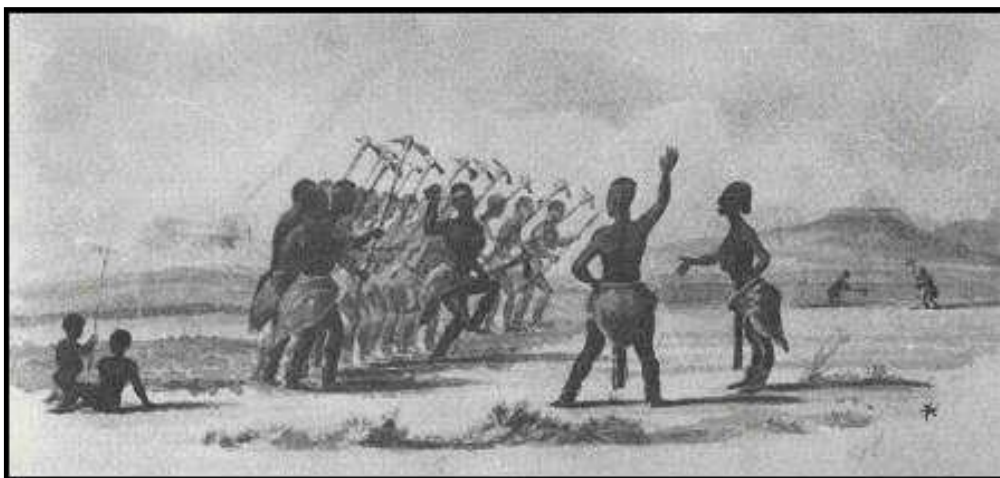


Figure 11 - "Tlhaping women cultivating gardens and singing" One of the sketches appearing in Dr. Andrew Smith's journal (Lye, 1975:171).

3.5.4 The journey of Lichtenstein (1805)

After crossing the Orange River in the vicinity of present-day Prieska, Lichtenstein's party visited present-day Danielskuil, and by June 1805 they were at Blinkklip (Postmasburg), a well-known source for obtaining specular haematite. Archaeological investigations at Blinkklipkop (also known as Nauga) established a date of AD 800 for the utilization of this particular rich source (Thackeray, et al 1983; Beaumont & Morris, 1990). From here they travelled further north and reached the Kuruman River where they met Tswana-speaking people. They followed the river downstream for three days, after which they followed a tributary to reach Lattakoe. From here they turned south and reached the Orange River on 11 July 1805.

While on their way to the Kuruman River (and to the south thereof), Lichtenstein and his fellow travellers visited a small settlement consisting of "*...about thirty flat spherical huts.*" Although the people who stayed here were herdsman who looked after the cattle of richer people living on the Kuruman River, they indicated that San (Bushmen) were also present in the area.

Lichtenstein's party subsequently travelled further north to visit the capital of King Muliawang located on a plain in the vicinity of the Kuruman River. He described the town as consisting of six hundred houses with 5 000 inhabitants. The individual dwellings were described as follows: "*The houses were all of a circular form, with the roof running up to a point; the roof rests on a circle of poles, which are united together below by thin walls of loam; above, for a little way below the roof, they are left open to admit light and air.*" (Lichtenstein, 1930:373). Lichtenstein also indicated that hedges were used as cattle enclosures.

3.5.5 Andrew Smith's journey (1835)

Dr. Andrew Smith's expedition into the interior of Southern Africa can be seen as one of the highlights of the era of exploration and travel into these regions of Africa. After some travelling, which included a visit to Mosjesj, Smith's party crossed over the Vaal River and after reaching this river's confluence with the Harts, followed it to Boetsap and subsequently reached Kuruman (Bergh, 1999).

Smith met Robert Moffat at Kuruman, and during this time made a journey all along the Kuruman River to Tsineng from where he travelled south to the Langeberg. Returning to Tsineng, Smith travelled north to Heuningvlei before returning back to Kuruman (Bergh, 1999).

For the aims of the present study, it is especially Smith's journey from Tsineng to the Langeberg and back which is most interesting. The route followed by Smith seems to have been the Ga-Mogara River, and as such his route crossed over portions of the present study area.

In the vicinity of Tsineng Smith found a number of springs which the local people called Malichana. He observed a small group of Tswanas (*Bituanas*) as well as a Griqua family staying near the springs, and indicated that the Tswana group conducted agricultural activities in gardens laid out near the springs.

From Tsineng Smith's party travelled all along the bank of the Kuruman River, presumably to the confluence of the Ga-Mogara River. On this stretch of the journey Smith observed "*...a number of almost naked natives in the distance carrying ostrich shells and something resembling leather sacks upon their shoulders...*" (Lye, 1975:181). These people were on their way to a water hole, which had been excavated some seven meters deep. Anyone wishing to obtain water had to climb down the hole making use of footholds along the sides.

3.5.6 British Protectorate

On 23 March 1885 Britain declared a Protectorate over Bechuanaland and the Kalahari. On 30 September 1885 the Protectorate was divided into two parts. The area north of the Molopo River remained the Bechuanaland Protectorate and up to 1895 was administered from Vryburg, after which the capital was moved to Mafeking. The area south of the Molopo became the Crown Colony of British Bechuanaland with its capital at Vryburg (Tlou & Campbell, 1997). This area included the present study area as well as Kuruman.

In accordance to Act 31 of 1895 the area south of the Molopo River, namely British Bechuanaland, was included in the Cape Colony. This took place during November 1895 (Smit, 1966).

3.6 Historic Black Settlement

3.6.1 Situation at the beginning of the 19th century

When Reverend Robert Moffat first arrived in the Kuruman area in 1819 he found the Tlhaping settled at Maropin in the Kuruman Valley under their ruler Mothibi. They subsequently moved upstream to the vicinity of present-day Kuruman.

During the same time Moffat found the BaTlharo established at Tsening.

In a document written by the Superintendent of Natives on 3 November 1921, it is indicated that before the farms to the west of the Lower Kuruman Native Reserve were surveyed and ceded to different white farmers, the black people of the area “...had the run of the whole country to the Moshewing River on the one side and the Gamagara River on the other...” and grazed their livestock and conducted agricultural activities over these vast tracts of land. In an associated petition document drawn up by the Tlharo people of Bathlaros, they indicated that their agricultural lands and cattle posts used to stretch in a westward direction all the way to the “*Dibeng*” River, which appears to be the present-day Ga-Mogara River (NTS, 7752, 22/335).

3.6.2 Lower Kuruman Native Reserve

On 4 May 1895 the Lower Kuruman Native Reserves well as a number of other so-called native reserves were established by virtue of Bechuanaland Proclamation No. 220 of 1895. These reserves were demarcated as part of a commission which investigated land claims and land settlement in British Bechuanaland. A subsequent report titled “*Report of the Commissioners appointed to determine land claims and to the effect of a land settlement in British Bechuanaland*” and published in 1896, contained all the findings of the commission (Breutz, 1963).

At the time of its establishment, the Lower Kuruman Native Reserve had a population of 5425, and being 225 square miles in extent, had a population density of 26.5 acres per individual. With time, the population density increased. Livestock numbers also increased drastically. As a result of these pressures the size of the reserve was subsequently extended.

During negotiations and discussions on such an expansion of the reserve, it was indicated that a number of black people were residing outside the boundaries of the reserve. In a police report dated 22 January 1908 a list is provided of all the people, white and black, residing “...on the banks of the Kuruman River north of the surveyed farms in the Sishen Valley.” This document provides an indication of human habitation in the direct vicinity of the study area during the early 1900s. One interesting observation to be made from the document is that some of the persons who acted as borehole watchmen were black. For example, Hans Gaboerkwe had been living at Dibiachomo since 1899 and was tasked with keeping the well open (NTS, 7752, 22/335).

3.6.3 The Langeberg Rebellion

During 1897 conflict broke out between the authorities and a Thlaping leader from Taung, Galeshewe. The conflict arose after some of Galeshewe’s cattle that were infected by Rinderpest had to be destroyed. After killing an officer, Galishewe fled to the Thlaro leader, Toto, of the Langeberg. Subsequently, a full-scale rebellion broke out that was eventually suppressed (Breutz, 1963).

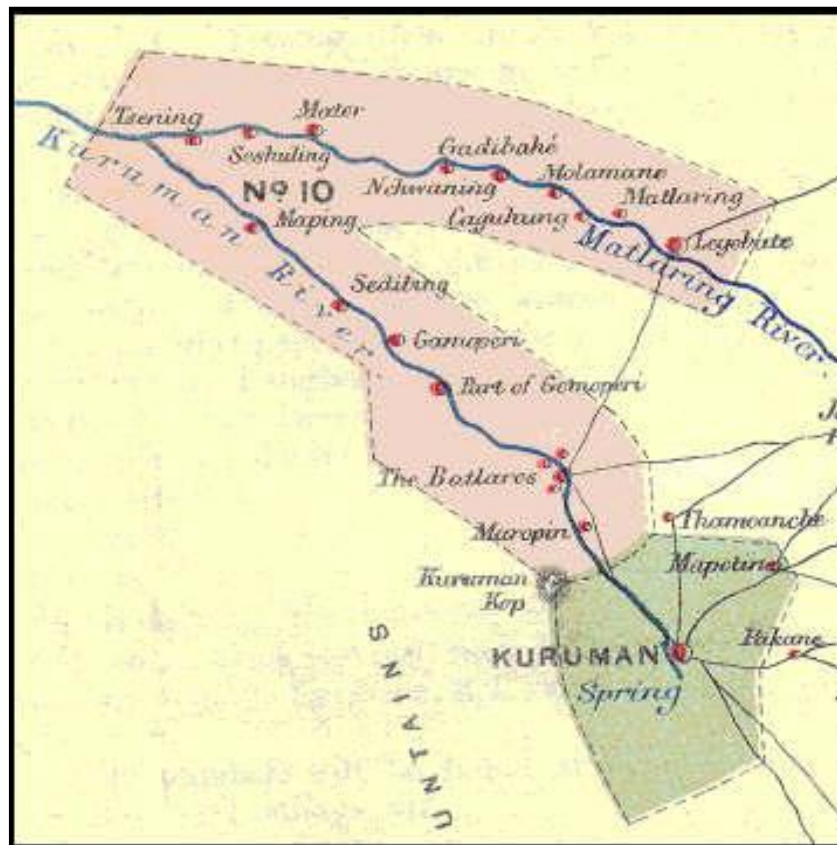


Figure 12 - Map showing the original demarcation of the Lower Kuruman Native Reserve.



Figure 13 – Photograph of Galeshewe (National Archives, TAB, 36277).

Although most of the activities associated with the rebellion took place away from the study area and surrounding region, it is evident from the historical records documenting the rebellion that some activities did take place in the vicinity. On 13 June 1897, for example, a battle took place between Inspector Berrangé's Cape Police and a large force under Galishewe at Tsineng (Dalgerty, 1898).

Another incident which took place in the area was the killing of J.P. and Edward Drotskie in the vicinity of Boeredraai (Snyman, 1992). It can be expected that the movement of military units must have taken place a number of times in the area as well. From the British records, for example, it is known that military patrols traversed the area between Kuruman and Tsineng, as well as along the Ga-Mogara river. Furthermore, on 20 June 1897 a large force of "rebel reinforcements" were observed between Upper and Lower Dikgathlong on their way to the Langeberg.

3.7 Settlement of White Farmers

3.7.1 Background information on the settlement of white farmers in the area

According to Smit (1966) the farm Boerdraai 228, which is adjacent and to the west of the farm Wessels 227, was always seen as situated on the edge of the real desert.

Although some white farmers did travel down the Kuruman River to settle in the vicinity of Boeredraai during the latter part of the 19th century, by 1897 most of them had moved away again.

The first white people to settle on a permanent basis in the area were the Le Roux family who established themselves at Dikgathlon. More families followed and subsequently also settled in the area. During a period of great drought between 1907 and 1908 many farmers of the then Cape Colony moved into these areas along the edge of the Kalahari Desert in search of better grazing for their cattle (Smit, 1966).

When the First World War (1914-1918) broke out, and the South African Union Government decided to attack German South West Africa, the Union troops needed water to sustain them along the way. As a result a number of boreholes were dug all along the banks of the Kuruman River. These boreholes were drilled at places such as Eensaam, Kameelrus, Murray, Springputs and Van Zylsrus (Smit, 1966; Van der Merwe, 1949).

After the war, farmers established themselves at these localities as borehole watchmen, and in exchange for these duties were allowed free grazing rights on the surrounding land. Subsequently, even more boreholes were sunk by the Department of Lands (Smit, 1966; Van der Merwe, 1949).

Since the formulation of the Land Settlement Act No. 12 of 1912 as amended by Act No. 23 of 1917, numerous farms in the vicinity of the study area had been allocated to white farmers. By 1921 almost all of the land surrounding the *Lower Kuruman Native Reserve* had become occupied.

At the end of the First World War the Department of Lands started distributing the farms on application under very lenient conditions. Many of the people who was already established

as borehole watchmen and tenants were given first choice to apply for the farms on which they were residing (Smit, 1966).

Many farms were distributed during this time, so much so that by 1929 all the farms up to Vanzyrstur were already handed out (Smit, 1966).

3.7.2 Farm Surveys

During the 1910s a full scale survey of large portions of the region was undertaken by Dirk Roos and Hendrik Wessels. While Wessels was concerned with surveying the farms from Dingle and Sishen up to Cobham and Shirley, Dirk Roos was responsible for the surveying of the farms from Mamatwan in the south to areas further north of the Kuruman River (Samangan, 1977).

Many stories are told about these two pioneering characters. As they were allowed to name the farms they surveyed, most of the farms names appearing on maps of the area were created by them. The farm Wessels, for example, was named by Dirk Roos in honour of his colleague Hendrik Wessels. Mamatwan, another farm forming part of this study, was derived from the Tswana name for a bat.

One of the more well-known stories relates to the naming of the farm Hotazel. Dirk Roos was assisted at the time by Veldcornet J.U. Waldeck. One evening, after a long day's work in the hot Kalahari sun Roos sat down at the camp and remarked: "*What about a name for the farm? Phew! What a day! What a place! Hot as hell.*" Waldeck replied with the words "*That's it. The perfect name for it – hot as hell*" (Samangan, 1977:19 & 20). The wording was slightly changed to "*Hotazel*" and this version was used as the farm name on the survey diagram.

Schedule of persons living on banks of the Kuruman River north of surveyed farms in Sishen Valley.

Name of spot	Name of occupier	Nation-ality	Resident since what date	Authority
Gasese	F. von Krudenberg	E	Sept. 1907	Grazing licence
"	J. Thomas	E	Sept. 1907	"
"	J. Drotaki	E	March 1904	"
Ruchea	E.L.Drotaki	E	1893	"
Upper Dikgatlou	Z.P. le Roux	E	March 1905	"
"	J. le Roux	E	Aug. 1906	"
"	E. Korsens	E	Aug. 1907	"
"	P. Jacobs	E	Dec. 1907	In charge of Z.P. le Roux's stock, Z.P. le Roux (Grazing licensee) absent temporarily
"	40 Natives		1894	Occupying 10 huts. Pay hut tax.
Dibeakgomo	Hans Gabeerlwe	N	1899	Permission to live there to keep wells open.
Boerdraai	Hans Goliath	N	May 1906	
Mphepha	Poleal and 59 others	N	1894	Permission to live there to keep water open
Lower Dikgatlou (Lathakane)	Kanyan and 69 others	N	1894	Permission to reside there pending the surveying of a Native Reserve. Pay hut tax.
Matlapaning	30 persons	N		Squat there during rainy season, 3 to 4 months in each year. Pay hut tax.

Figure 14 - Police document listing all the people who resided on the banks of the Kuruman River at the time of an inspection in 1908. The names of a number of the early white pioneers in the area are also listed here.

FARM NAME	DATE
Dibiaghomo 226	1914
Dikgathlong 268	1924
Goold 329	1928
Hotazel 280	1914
Mamatwan 331	1914
Middelplaats 730	1929
Wessels 227	1914
York 279	1914

3.8 Mining

The study area and surrounding region is today well known for its manganese mines. The importance of manganese lies in the fact that it is used in the manufacture of carbon steel.

The history of modern manganese mining in the area can be traced back to Dr. A.W. Rogers, who published a record of the geology of present-day Botswana and Griqualand West as part of the annual report of the Geological Commission of the Cape Colony in 1906. What is significant about his publication is that Rogers found that the well-known hill from the area known as Black Rock consisted largely of manganese, a mineral ore previously undiscovered in the Cape Colony.

The next important person to appear on the scene was Dr. L.G. Boardman. While employed by the Government Geological Survey as a geologist, Dr. Boardman investigated the manganese deposits at Black Rock during or directly after 1940. He was very excited by the extent of the manganese, and published his findings in a paper he wrote for the Geological Society of South Africa.

Even before the visit by Dr. Boardman, a prospector by the name of A.T. Fincham had felt that the area surrounding the Black Rock outcrop may also contain manganese. As a result he obtained options on a number of farms surrounding Black Rock. He approached the mining company S.A. Manganese with these farm options, but they felt that the Black Rock area was too isolated at the time. Fincham approached Ammosal as well, who took over his options on three farms and after a further assessment by geophysicist Oscar Weiss, decided to mine the Black Rock area during mid-1940.

During 1950 S.A. Manganese was again approached by Fincham regarding new options on farms surrounding Black Rock. Although the mining company was not interested Dr. Boardman, who had joined their ranks earlier, convinced the board to at least investigate the Black Rock area. Boardman subsequently surveyed a large tract of land, including the farms Wessels, Mamatwan, Dikgathlong and Dibiaghomo. He found very promising results over large sections of land, and a drilling rig soon arrived. The first borehole was drilled on Wessels, and after disappointing results it was moved to Dibiaghomo. Here, at a depth of 280 meters, ore containing a very high manganese percentage was reached. Other boreholes in the area yielded similar results and the freehold to a number of farms was

obtained. When information about these discoveries leaked out and reached Ammosal, a tussle broke out between the two companies to obtain freeholds to as many farms in the mineral-rich area as possible.

Although mining operations started in earnest on Smartt, S.A. Manganese's attention was soon drawn to the farm Hotazel where very promising results were also found. A whole village was constructed on the farm, and the Hotazel mine was officially opened on 19 November 1959.

During the early 1960s S.A. Manganese Limited (Samangan) at the time had options on 18 farms, including the farms Mamatwan and Goold on the southern edge of the ore body. Although Mamatawan had been prospected, only low grade manganese ore could be found. However, the ratio between iron and manganese from Mamatwan was believed to be excellent. During this time Ammosal had started mining on the adjacent farms of Devon and Adams, and it was not long before the decision was made to commence mining operations on Mamatwan as well.

After a crushing and screening plant was erected at Mamatwan the mine began producing in November 1963. During the 1970s the mine reached a production output of more than one million tons a year (Samangan, 1977).

Although the mining rights of the farm Wessels had been acquired by S.A. Manganese in 1952, and even though some prospecting work had taken place, it was not until 1965 that the farm was again investigated.

By January 1969 20 boreholes had been sunk on the farm Wessels, Dibiaghomo and Dikgathlong, which revealed three bands of manganese ore, of which the top and bottom bands were considered mineable.

The official opening of Wessels mine took place on 2 May 1973. By 1976 the mine was producing 750 000 tons of ore a year (Samangan, 1977).



Figure 15 "A view of the huge open-cast manganese ore mine of Samancor at Mamatwan..." The photograph was taken during August 1982 (National Archives, TAB, 16396).

3.9 Possible heritage sites

As mentioned elsewhere, a number of old houses are shown on the old survey diagrams for the farms Wessels and Middelplaats. These houses represent some of the earliest white settlement in the area and as such are of historic significance. Any remaining houses should therefore be documented and mitigated.

It should also be noted that many of the archival maps show an old road following the Ga-Mogara River. This road seems to at least have existed during the 1890s. It is possible that the old road transects some of the properties included in this study.



Figure 16 - Historic photograph of an early farmer's dwelling along the Kuruman River (Van der Merwe, 1949).

3.10 Conclusions

This archival study has revealed important aspects about the history of the area. Certainly some of the key aspects emanating from this study are firstly, the relative low human presence for the dry regions surrounding the study area and, secondly, a tendency for human settlements in these areas to be located on or near the water courses.

3.10.1 Findings of the Heritage Scoping Document

The findings can be compiled as follow and have been combined to produce a heritage sensitivity map for the project:

Archaeology

Previous studies conducted in the larger Hotazel and Black Rock areas have shown that the archaeological record is temporally confined to the Middle and Later Stone Age, while spatially distribution of such sites are concentrated around the riverine edges due to the harsh climate of the area.

Impacts on archaeological site can be expected if areas closer to the low lying riverine areas are to be disturbed during mining.

Historical

The archival research has shown that the area was settled as early as the late 1700's with activity and settlements increasing into the mid-1800's with the establishment of the Lower Kuruman Native Reserve with its northern-most limits less than 15 kilometres to the south of the study area. Furthermore, the settlement of white farmers from around 1897 to the early 1920s on the Kuruman River at places with names such as Boerdraai (17km north of the study area), Wessels 227 (1917), Dibiaghomo 226 (1914, but already settled by 1899) and Dikgathlong 268 (as early as 1894), is an indication that farmsteads and structures of significance can be present in the study area.

Analysis of maps and satellite imagery enabled the development of a heritage sensitivity map (**Figure 17**) that will assist the field work during the HIA to identify and assess heritage resources in the landscape.

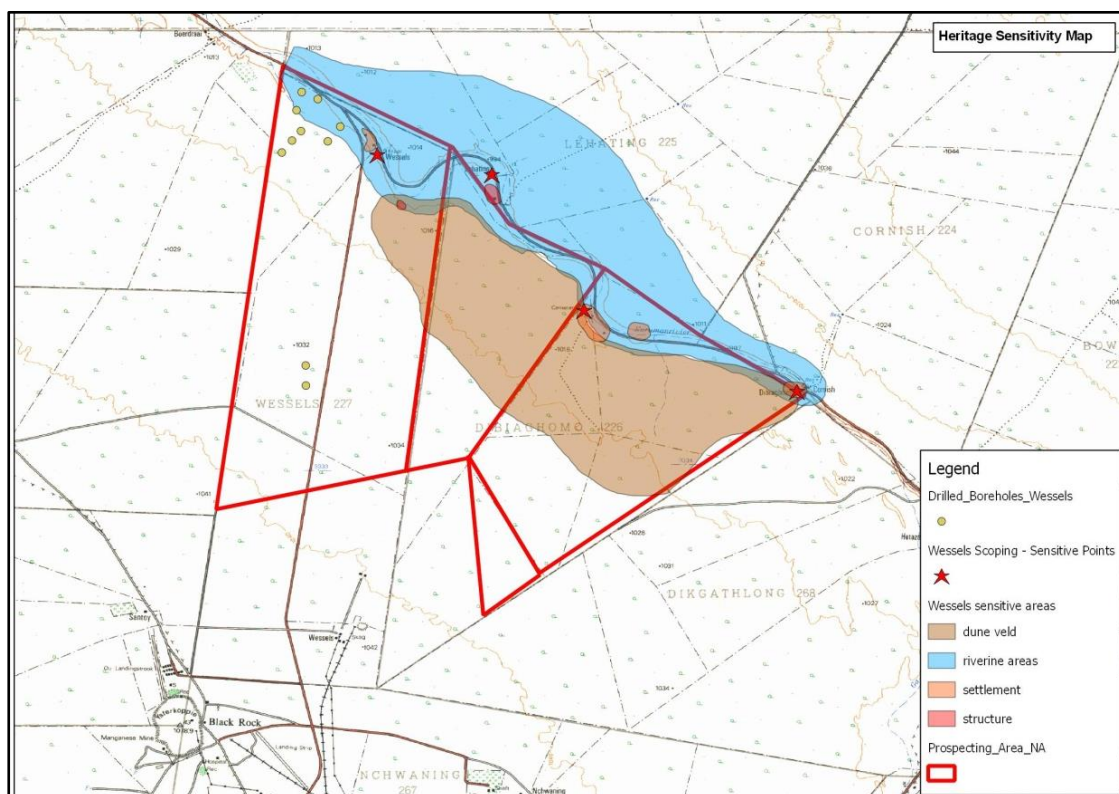


Figure 17 – Heritage Sensitivity Map (based on satellite imagery and topographical maps)

4 IMPACT ASSESSMENT

The impact assessment rating is based on the rating scale as contained in **Appendix D and E**.

4.1 Field work Methodology

The field work was conducted by archaeologists of PGS through controlled exclusive survey of the study area on the farms Wessels 227 and Dibiaghomo 226. Tracklogs of the fieldwork was logged and is depicted in **Figure 18**. **Figure 19** shows all the heritage resources identified during the field work.

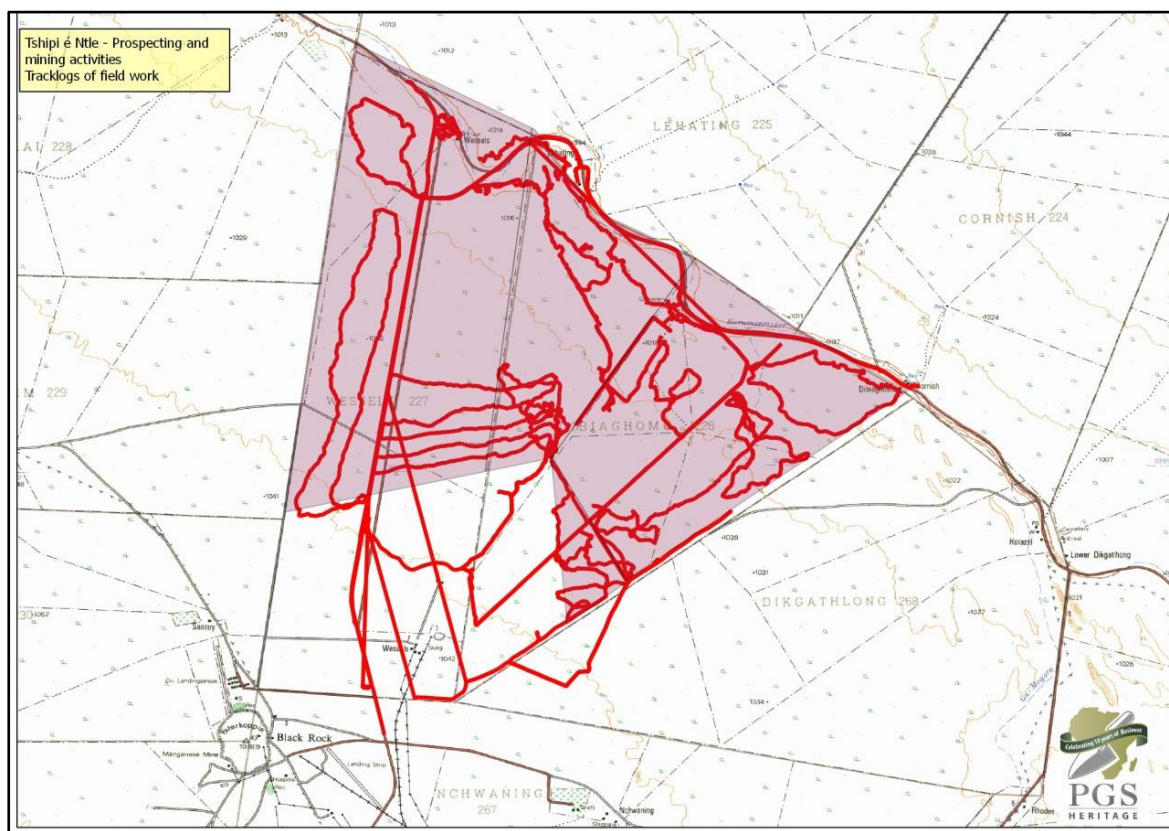


Figure 18 – Map with track logged survey

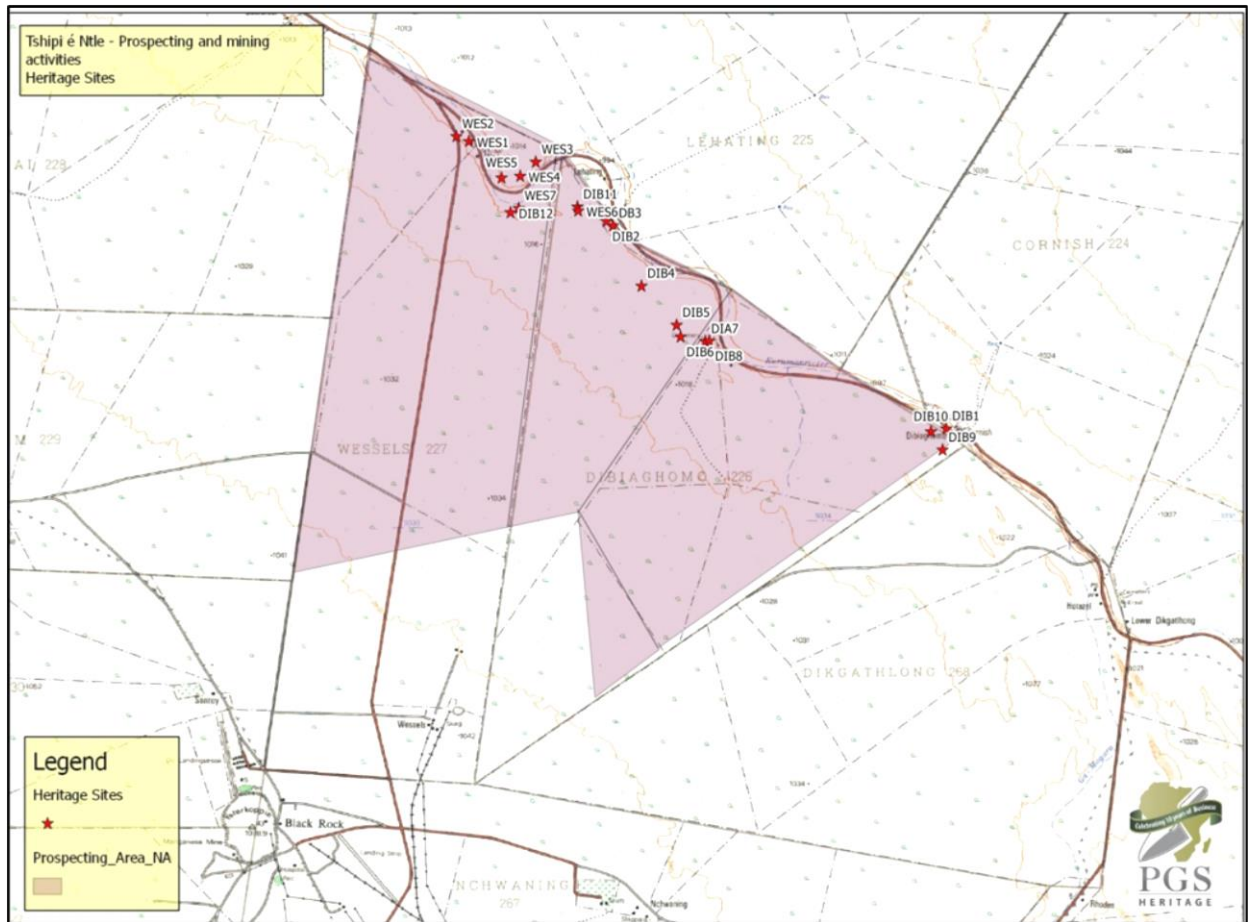


Figure 19 – Map of heritage sites identified during field work

4.1.1 Historical Site - DIB1

GPS Coordinates:

DIB1- S27.08210 E22.91569

Farmstead on the farm Cornish outside the study area.

4.1.2 Cemetery - DIB2

GPS Coordinates:

DIB2 - S27.05868 E22.87549

The site consist of 4 graves (at least 2 being that of children) all aligned east west and is situated some 200 meters to the east of the farmstead situated on the farm Lehating 225. The graves are that of the Van der Walt families dating from 1934 to 1941.

The extent of the site is approximately 10x10m.

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the site is graded as **Grade 3B** and of high heritage significance.



Figure 20 – Cemetery at DIB2



Figure 21 – Headstone with inscription at DIB2

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of cemetery site	High	Low	High	High	Medium	High

The impact significance is rated as high (the rating is influenced by the significance of the site as well, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as cemeteries and grave, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.

- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- In the event that the site cannot be excluded from the development footprint, a grave relocation process as described in Section 5 of this report needs to be implemented.

4.1.3 Archaeological Site - DIB3

GPS Coordinates:

DIB3 - S27.05916 E22.87626 -

The sites consist of a medium to high density scatter of lithics are found at the base of a fluvial pebble bed and calcrete forming a small koppie towards Kuruman River. Artefacts include: flakes, retouched flakes, blades and cores.

Most of raw material found on site consisted of Crypto-Crystalline Silicate (ccs) and fine grained quartzites.

The extent of the site is approximately 100 meters in from the dIB3 coordinate eastwards on the calcrete pebble contact zone.

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the evaluation of the density and extent of the site – gives the site medium heritage significance and graded as **Generally Protected - GP.B**.



Figure 22 – View site DIB3



Figure 23 – MSA lithics from DIBB3

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of archaeological site	Moderate	Low	High	Medium	Medium	Medium

The impact significance is rated as medium, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as archaeological sites, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If it is found that mining activity cannot be altered to avoid the site, a destruction permit will be required from SAHRA, backed by a mitigation report that must include documentation of the site layout, analysis of the material and compiled as a final report on the archaeological site.

4.1.4 Archaeological Site - DIB4 – DIB6

GPS Coordinates:

DIB4 – S27.06598 E22.87964

DIB5 – S27.07040 E22.88379

DIB6 - S27.07172 E22.88426

The sites are situated in the northern most section of the study area, on a red Kalahari dune towering some 30 meters above a horseshoe bend in the Kuruman River. The sites consist of

medium to high densities of LSA lithics and micro lithics scattered over an area of 50m² on average for all 3 sites.

Other artefacts associated with the site are ostrich egg shell fragments, bone fragments and coarse ceramic shards. The composition of the artefacts on site indicates an association with hunter gatherer groups (Deacon, 1999 and Klein, 1984).

Most of raw material found on site consisted of Crypto-Crystalline Silicate (ccs).

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the evaluation of the density and extent of the site – gives the site low heritage significance and graded as **Generally Protected – GP.A** and of medium heritage significance.



Figure 24 –View of site DIB4



Figure 25 – High density scatter of microlithics and debitage (DIB4)



Figure 26 – Coarse pottery at site DIB4



Figure 27 – View of site DIB5



Figure 28 – Core and snapped blade at DIB5



Figure 29 – View of site DIB6



Figure 30 – High density scatter of bone and ostrich egg fragments at DIB6

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of archaeological site	Moderate	Low	High	Medium	Medium	Medium

The impact significance is rated as medium, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as archaeological sites, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.

4.1.5 Cemetery - DIB7

DIB - GPS Coordinates: S27.07223 E22.88718

The site consist of 3 stone packed graves all aligned east west and is situated some 60 meters to the northwest of **DIB8**. The graves have no headstones or inscriptions.

The extent of the site is approximately 10x10m.

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the site is graded as **Grade 3B** and high significance.



Figure 31 – Cemetery at WES2

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of cemetery site	High	Low	High	High	Medium	High

The impact significance is rated as high (the rating is influenced by the significance of the site as well, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as cemeteries and grave, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.

- In the event that the site cannot be excluded from the development footprint, a grave relocation process as described in Section 5 of this report needs to be implemented.

4.1.6 Historical Site - DIB8

GPS Coordinates:

Cemetery - S27.07218 E22.88765

Homestead - S27.07262 E22.88821

The site consist of 3 graves all aligned east west and is situated some 100 meters to the northwest of the homestead associated with the graves. The graves are that of the Grobbelaar families dating from 1932.

The farmstead consists of a main house, outbuilding and livestock enclosures. The main house is constructed from large calcrete block, finished with a corrugated iron roof.

The extent of the site is approximately 1 hectare, while the cemetery covers an area of 10mx10m.

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the site is graded as **Grade 3B** and of high significance.

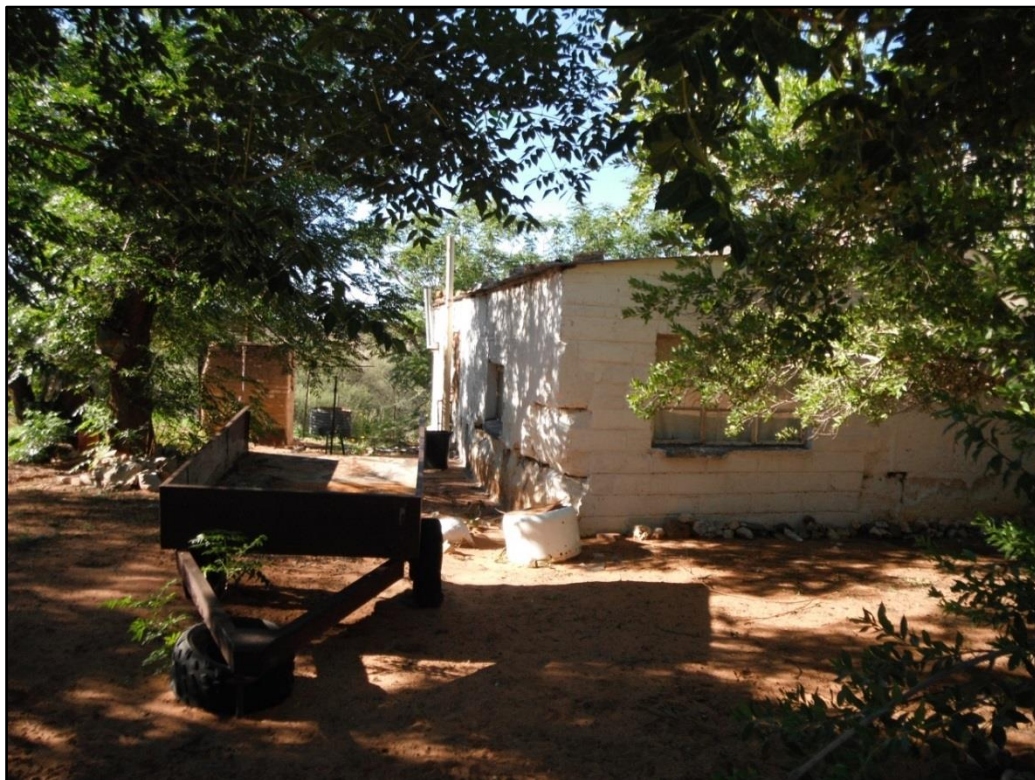


Figure 32 – View of house associated with DIB8



Figure 33 – View of cemetery at DIB8



Figure 34 – Inscription on headstone (DIB8)

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of cemetery site	High	Low	High	High	Medium	High

The impact significance is rated as high (the rating is influenced by the significance of the site as well, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as cemeteries and grave, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- In the event that the site cannot be excluded from the development footprint, a grave relocation process as described in Section 5 of this report needs to be implemented.

4.1.7 Archaeological Site - DIB9 – DIB10

GPS Coordinates:

DIB9- S27.08451 E22.91526

DIB10 - S27.08245 E22.91388

The sites are situated in the eastern section of the study area, on a red Kalahari dune behind DB1 (situated on the farm Cornish). The sites consist of medium to high densities of LSA lithics and micro lithics scattered over an area of 50m² on average for both sites.

DIB9 is disturbed by an old access road from the Cornish farmstead on to the Dibiaghomo farm.

Other artefacts associated with site **DIB10** are ostrich egg shell fragments, bone fragments and coarse ceramic shards.

Most of raw material found on site consisted of Crypto-Crystalline Silicate (ccs).

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the evaluation of the density and extent of the site – gives the site medium heritage significance and graded as **Generally Protected B – GP.B** medium significance.



Figure 35 – View of disturbed area DIB9



Figure 36 – Flakes and cores found on site (DIB9)



Figure 37 – View of DIB10



Figure 38 – Pottery and ostrich egg shell found at DIB10

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of archaeological site	Moderate	Low	High	Medium	Medium	Medium

The impact significance is rated as medium, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as archaeological sites, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.

- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If it is found that mining activity cannot be altered to avoid the site, a destruction permit will be required from SAHRA, backed by a mitigation report that must include documentation of the site layout, analysis of the material and compiled as a final report on the archaeological site.

4.1.8 Archaeological Site - DIB11– DIB12

GPS Coordinates:

DIB11 - S27.05703 E22.87206

DIB12 - S27.05747 E22.87214

The sites consist of a medium to high density scatter of lithics are found at the base of a fluvial pebble bed and calcrete forming a small koppie towards Kuruman River. Artefacts include: flakes, retouched flakes and small cores.

Most of raw material found on site consisted of Crypto-Crystalline Silicate (ccs) and fine grained quartzites.

The extent of the site is approximately 20 meters in diameter.

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the evaluation of the density and extent of the site – gives the site medium heritage significance and graded as **Generally Protected B – GP.B** and of medium significance.



Figure 39 – View site DIB11



Figure 40 – MSA lithics (DIB11)

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of archaeological site	Moderate	Low	High	Medium	Medium	Medium

The impact significance is rated as medium, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as archaeological sites, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If it is found that mining activity cannot be altered to avoid the site, a destruction permit will be required from SAHRA, backed by a mitigation report that must include documentation of the site layout, analysis of the material and compiled as a final report on the archaeological site.

4.1.9 Historical Site - WES1

GPS Coordinates:

WES1 - S27.04963 E22.85921

The site is the original farmstead of the farm Wessels and dates from around 1910 when the settlement of the farms along the Kuruman River started. The site consists of a main dwelling, outside buildings, livestock enclosures and farm workers houses covering an area of approximately 1 hectare.

The main dwelling was constructed with plastered mud brick on a calcrete foundation and finished with a corrugated iron roof. It has a front and back porch typical of the architectural vernacular of the farm houses dating from the period.

The extent of the site is approximately 20 meters in diameter.

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the site is graded as **General Protected GP.A** and of medium heritage significance.



Figure 41 – Main house at WES1



Figure 42 – Foundation constructed from locally sourced calcrete (WES1)

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of archaeological site	Moderate	Low	High	Medium	Medium	Medium

The impact significance is rated as medium, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as historical sites, are non-renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.

- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If at any stage the site cannot be excluded from the mining activities a destruction permits required from the Northern Cape provincial Heritage Authority. This will require that all structures on site 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.

4.1.10 Cemetery - WES2

GPS Coordinates:

WES2 - S27.04907 E22.85774

The site consist of 3 graves all aligned east west and is situated some 160 meters to the northwest of WES1. The graves are that of the Lombard and Wiid families dating from 1932. According to Mr Straus, the current tenant, the Lombard family was the original owners of the farm.

The extent of the site is approximately 10x10m.

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the site is graded as **Grade 3B** and of high heritage significance.



Figure 43 – Cemetery at WES2



Figure 44 – Head stone at WES2

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of cemetery site	High	Low	High	High	Medium	High

The impact significance is rated as high (the rating is influenced by the significance of the site as well, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as cemeteries and grave, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.

- In the event that the site cannot be excluded from the development footprint, a grave relocation process as described in Section 5 of this report needs to be implemented.

4.1.11 Archaeological Site - WES3-WES5

GPS Coordinates:

WES3 - S27.05196 E22.86712

WES4 - S27.05355 E22.86529

WES5 - S27.05375 E22.86308

The sites are situated in the northern most section of the study area, on a red Kalahari dune towering some 30 meters above a horseshoe bend in the Kuruman River. The sites consist of medium to high densities of LSA lithics and micro lithics scattered over an area of 50m² on average for all 3 sites.

Other artefacts associated with the site are ostrich egg shell fragments, bone fragments and coarse ceramic shards. The composition of the artefacts on site indicates an association with hunter gatherer groups (Deacon, 1999 and Klein, 1984).

Most of raw material found on site consisted of Crypto-Crystalline Silicate (ccs).

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the evaluation of the density and extent of the site – gives the site is a medium heritage significance and graded as **Generally Protected – GP.A** and of medium heritage significance.



Figure 45 – View of Site WES3



Figure 46 – Lithics of WES3



Figure 47 – Site WES4 (exposed by wind erosion)

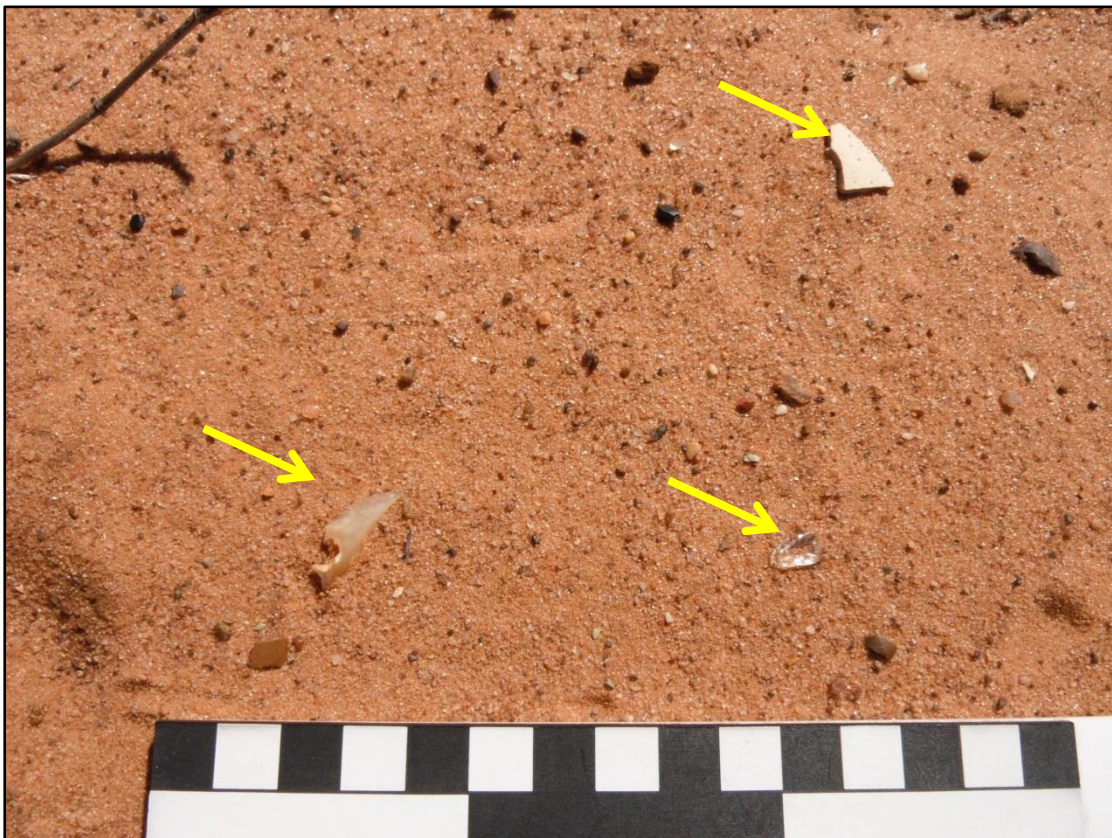


Figure 48 – Microlithics and ostrich shell fragments at WES4



Figure 49 – WES4 material in situ at site



Figure 50 – View of Site WES5

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of archaeological site	Moderate	Low	High	Medium	Medium	Medium

The impact significance is rated as medium, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as archaeological sites, are none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.

4.1.12 Archaeological Site - WES6-WES7

GPS Coordinates:

WES6 - S27.05767 E22.86414

WES7 - S27.05719 E22.86511

The sites are situated at the base of a fluvial pebble bed and calcrete forming exposed during mining operations of a borrow pit. The medium density scatter of lithics includes MSA: flakes, retouched flakes and small cores.

Most of raw material utilised on site consisted of Crypto-Crystalline Silicate (ccs) and fine grained quartzites.

The extent of the site is approximately 30 meters in diameter.

In accordance to the classification standards as prescribed by SAHRA (Appendix D), the evaluation of the density and extent of the site – gives the site medium heritage significance and graded as **Generally Protected - GP.B**.



Figure 51 – View of disturbed area at WES6



Figure 52 – MSA lithics (collected around the site) (WES7)

Impact Evaluation:

The impact rating provided below is based on the methodology described in Appendix E. The impact rating below assumes that no mitigation measures have been implemented.

IMPACT	SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	PROBABILITY	SIGNIFICANCE
Destruction of archaeological site	Moderate	Low	High	Medium	Medium	Medium

The impact significance is rated as medium, as it may be possible that the site can be impacted by prospecting activity if not demarcated. Heritage Resources, such as archaeological sites, is none renewable and an impact on such a site can lead to permanent destruction of the site.

Mitigation:

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If it is found that mining activity cannot be altered to avoid the site, a destruction permit will be required from SAHRA, backed by a mitigation report that must include documentation of the site layout, analysis of the material and compiled as a final report on the archaeological site.

4.1.13 Palaeontology

An independent palaeontological specialist was appointed by PGS to undertake the necessary work to determine whether or not any significant paleontological resources were located on the farms Wessels 227 and Dibiaghomo 226. A summary of the result of the palaeontological report are provided below. Refer to Appendix A for the complete palaeontological study.

The palaeontological sensitivity is predicted after identifying potentially fossiliferous rock units; ascertaining the fossil heritage from the literature and evaluating the nature and scale of the development itself.

The palaeontological sensitivity of the Kalahari Formation can be described as low and it is not foreseen that the proposed drilling of more boreholes will have any significant palaeontological impact.

The palaeontological sensitivity of pre-Kalahari formations can also be regarded as low, with no exposures in the study area.

The proposed boreholes have the potential to cut into algal structures, called “Stromatolites”, and if these are present, it will be of a high significance for palaeontology.

The following colour coding method is used to classify a development area’s palaeontological impact as illustrated in

Figure 53:

- **Red colouration** indicates a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops on the site/route and the chances of finding fossils during the construction phase are very high.
- **Orange colouration** indicates a possibility of finding fossils of a specific assemblage zone either in outcrops or in bedrock on the site/route. Fossils will probably be present on the site/route and the chances of finding fossils during the excavation phase are high.
- **Green colouration** indicates that there is no possibility of finding fossils in that section of the site/route development.

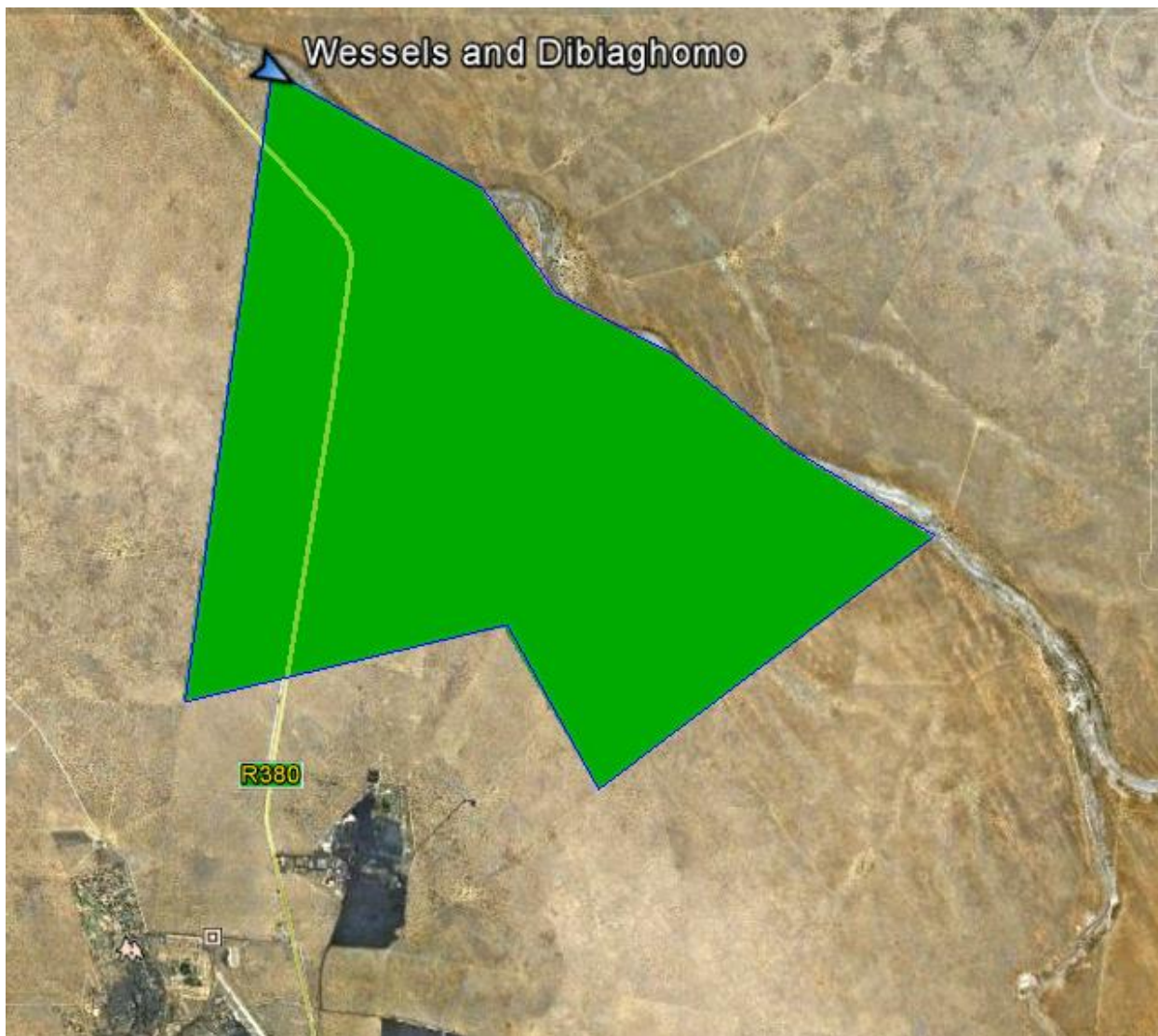


Figure 53 – Palaeontological Sensitivity

Impact Evaluation

Based on the findings of the palaeontological study, no palaeontological resources are expected to occur on the farms Wessels 227 and Dibiaghomo 226 so no impacts are considered.

Mitigation:

The developer and the ECO must be made aware of the possible presence of stromatolites in the pre-Kalahari Formations and if recorded in future drilling operations, a palaeontologist

must be informed and appropriate actions taken in the event of future mining of the stratigraphic units.

5 HERITAGE MANAGEMENT GUIDELINES

5.1 General Management Guidelines

1. The National Heritage Resources Act (Act 25 of 1999) states that, any person who intends to undertake a development categorised as-
 - (a) the construction of a road, wall, transmission line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
 - (b) the construction of a bridge or similar structure exceeding 50m in length;
 - (c) any development or other activity which will change the character of a site-
 - (i) exceeding 5 000 m² in extent; or
 - (ii) involving three or more existing erven or subdivisions thereof; or
 - (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA;
 - (d) the re-zoning of a site exceeding 10 000 m² in extent; or
 - (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

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

2. If a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner, preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA) and or the Association of Professional Heritage Practitioners (APHP).

This survey and evaluation must include:

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

- (b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Heritage Resources Act;
 - (c) An assessment of the impact of the development on such heritage resources;
 - (d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
 - (e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
 - (f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
 - (g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.
3. It is advisable that an information section on cultural resources be included in the **SHEQ training** given to contractors involved in surface earthmoving activities. These sections must include basic information on:
- a) Heritage;
 - b) Graves;
 - c) Palaeontology;
 - d) Archaeological finds; and
 - e) Historical Structures.

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

- 4. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
- 5. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
- 6. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
- 7. After mitigation, an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
- 8. If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or

destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.

9. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made.
10. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. This includes an extensive social consultation process.

The purpose of an archaeological/palaeontological monitoring programme¹ is:

- To allow, within the resources available, the preservation by recording of archaeological/palaeontological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological/palaeontological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.
- A monitoring programme is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.
- The objective of the monitoring programme is to establish and make available information about the archaeological resource existing on a site.

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

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

5.2 All phases of the project

5.2.1 Archaeology

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

Table 1: Roles and responsibilities of archaeological and heritage management

ROLE	RESPONSIBILITY	IMPLEMENTATION
A responsible specialist needs to be allocated and should attend all relevant meetings, especially when changes in design are discussed, and liaise with SAHRA.	The client	Archaeologist and a competent archaeology support team
If chance finds and/or graves or burial grounds are identified during construction or operational phases, a specialist must be contacted in due course for evaluation.	The client	Archaeologist and a competent archaeology support team
Comply with defined national and local cultural heritage regulations on management plans for identified sites.	The client	Environmental Consultancy and the Archaeologist
Consult the managers, local communities and other key stakeholders on mitigation of archaeological sites.	The client	Environmental Consultancy and the Archaeologist
Implement additional programs, as appropriate, to promote the safeguarding of our cultural heritage. (i.e. integrate the archaeological components into the employee induction course).	The client	Environmental Consultancy and the Archaeologist,
If required, conservation or relocation of burial grounds and/or graves according to the applicable	The client	Archaeologist, and/or competent authority for relocation services

regulations and legislation.		
Ensure that recommendations made in the Heritage Report are adhered to.	The client	The client
Provision of services and activities related to the management and monitoring of significant archaeological sites.	The client	Environmental Consultancy and the Archaeologist
After the specialist/archaeologist has been appointed, comprehensive feedback reports should be submitted to relevant authorities during each phase of development.	Client and Archaeologist	Archaeologist

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

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

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

In addition, feedback reports can be submitted by the archaeologist to the client and SAHRA to ensure effective monitoring. This archaeological monitoring and feedback strategy should

be incorporated into the Environmental Management Plan (EMP) of the project. Should an archaeological site or cultural material be discovered during construction (or operation), such as burials or grave sites, the project needs to be able to call on a qualified expert to make a decision on what is required and if it is necessary to carry out emergency recovery.

SAHRA would need to be informed and may give advice on procedure. The developers therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. The project thus needs to have an archaeologist available to do such work.

5.2.2 Procedure

In the case where archaeological finds are identified during construction the following measures must be taken:

- Upon the accidental discovery of archaeological finds, a buffer of at least 20 meters should be implemented.
- If archaeological finds are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find.
- If the evaluation of the finds require further documentation and mitigation such as excavations, surface collections and/or in situ documentation, a permit must be applied from SAHRA.
- This documentation and mitigation must conform to the guidelines and requirements of SAHRA and international accepted standards and must include as a minimum:
 - *Non-technical summary*

This should outline in plain, non-technical language the principal reason for the work, its objectives and main results. It should include reference to authorship and commissioning body.
 - *Introductory statements*

These could include acknowledgements, circumstances of the project such as planning background, the archaeological background, an outline nature of work, the site description (including size, geology and topography, location), when the project was undertaken and by whom.

- *Aims and objectives*

These should reflect or reiterate the aims set out in the project design or specification.
- *Methodology*

The methods used, including the detail of any variation to the agreed project design or specification should be set out carefully, and explained as appropriate. These should be set out as a series of summary statements, organised clearly in relation to the methods used, and describing structural data, associated finds and/or environmental data recovered. Descriptive material should be clearly separated from interpretative statements. Technical terminology (including dating or period references) should be explained where necessary if the report is aimed at a largely non-archaeological audience. The results should be amplified where necessary by the use of drawings and photographs; and by supporting data contained in appendices (below).
- *Conclusions*

It is appropriate to include a section, which sums up and interprets the results and puts them into context (local, national or otherwise). Other elements should include a confidence rating on techniques used, or on limitations imposed by particular factors (e.g. weather or problems of access).
- *Archive location*

The final destination of the archive (records and finds) should be noted in the report.
- *Appendices*

These should contain essential technical and supporting detail, including for example lists of artefacts and contexts or details of measurements, gazetteers etc. It may also be appropriate to include the project design or specification for ease of reference.
- *Illustrations*

Most reports will need the inclusion of one or more illustrations for clarity; as a minimum a location plan should be included. Any plans or sections should be clearly numbered and easily referenced to the National Grid and related to the specified area.

- *References and bibliography*

A list of all sources used should be appended to the report.

- *Other*

Contents list, disclaimers.

5.2.3 Procedure for discovery of human remains / graves

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

- Upon the accidental discovery of graves, a buffer of at least 20 meters should be implemented.
- If graves are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the remains a permit must be applied for from SAHRA and other relevant authorities. The local South African Police Services must immediately be notified of the find.
- Where it is recommended that the graves be relocated, a full grave relocation process that includes comprehensive social consultation must be followed.

The grave relocation process must include:

- i. A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
- ii. Site notices indicating the intent of the relocation;
- iii. Newspaper notices indicating the intent of the relocation;
- iv. A permit from the local authority;
- v. A permit from the Provincial Department of Health;
- vi. A permit from the South African Heritage Resources Agency, if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
- vii. An exhumation process that keeps the dignity of the remains intact;

- viii. The whole process must be done by a reputable company that is well versed in relocations;
- ix. The exhumation process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the developing company.

6 CONCLUSIONS AND RECOMMENDATIONS

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

Palaeontology

Although the palaeontological sensitivity of the study area is found to be low, the possibility of encountering “Stromatolites” during drilling does exist. These heritage resources are protected under Section 35 of the National Heritage Resources Act (NHRA).

Mitigation

The developer and the ECO must be made aware of the possible presence of stromatolites in the pre-Kalahari Formations and if recorded in future drilling operations, a palaeontologist must be informed and appropriate actions taken in the event of future mining of the stratigraphic units.

Archaeology

Previous studies conducted in the larger Hotazel and Black Rock areas has shown that the archaeological record is temporally confined to the Middle and Later Stone Age, while spatially distribution of such sites is concentrated around the riverine edges due to the harsh climate of the area.

Field work has confirmed the presence of 13 archaeological site associated with Middle Stone Age (MSA) as well as Later Stone Age (LSA) site linked with hunter gatherer communities. These heritage resources are protected under Section 35 of the National Heritage Resources Act (NHRA).

The sites identified to be associated with LSA communities are of great significance as very few studies conducted in the Hotazel and Blackrock areas have previously identified LSA concentrations associated with other artefacts such as bone, pottery and ostrich egg shell fragments.

Mitigation

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.

- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If it is found that mining activity cannot be altered to avoid the site, a destruction permit will be required from SAHRA, backed by a mitigation report that must include documentation of the site layout, analysis of the material and compiled as a final report on the archaeological site.

Historical

The archival research has shown that the area was settled as early as the late 1700's with activity and settlements increasing into the mid-1800's with the establishment of the Lower Kuruman Native Reserve with its northern most limits less than 15 kilometres to the south of the study area. Furthermore, the settlement of white farmers from around 1897 to the early 1920 on the Kuruman River at places with names such as Boerdraai (just north of the study area), Wessels 227 (1917), Dibiaghomo 226 (1914, but already settled by 1899) and Dikgathlong 268 (as early as 1894), is an indication that farmsteads and structures of significance can be present in the study area.

Two farmsteads were identified in the study area, both dating from the early part of the 20th century and thus protected under Section 34 of the NHRA.

Mitigation

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- If at any stage the site cannot be excluded from the mining activities a destruction permits required from the Northern Cape provincial Heritage Authority. This will require that all structures on site 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.

Cemeteries and Graves

Three cemeteries were also identified and documented. These cemeteries are associated with the farmstead and in most cases date from the early 1930. These heritage resources are protected under Section 36 of the National Heritage Resources Act (NHRA).

Mitigation

- Demarcate as no-go area with a 20 meter buffer if prospecting activities are to be conducted closer than 100 meters from the site and monitor for disturbance by ECO.
- If at any stage the site is disturbed a qualified archaeologist must be contracted to evaluate the damage and make recommendations on the appropriate mitigation measures.
- In the event that the sites cannot be excluded from the development footprint, a grave relocation process as described in Section 5 of this report needs to be implemented.

General

Further to these recommendations the general Heritage Management Guidelines in Section 5, need to be incorporated into the EMP for the project.

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

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PALAEONTOLOGICAL DESKTOP STUDY

**PALAEONTOLOGICAL DESKTOP
ASSESSMENT OF THE FARM WESSELS 227
AND PORTIONS 1 AND 2 AND THE REMAINING
EXTENT OF THE FARM DIBIAGHOMO 226,
NEAR HOTAZEL TOWN IN THE JOHN TOALO
GAETSEWE DISTRICT MUNICIPALITY IN THE
NORTHERN CAPE PROVINCE**

Developer: Tshipi é Ntle

For:

HIA CONSULTANTS



DATE: 09 April 2013

By

GIDEON GROENEWALD

EXECUTIVE SUMMARY

Gideon Groenewald was appointed by PSG Heritage and Grave Relocation Consultants to undertake a desktop survey, assessing the potential palaeontological impact of the proposed drilling of additional boreholes for related prospecting and future mining activities on the farm Wessels 227 and Portions 1 and 2 and the remaining extent of the farm Dibiaghomo 226, situated near Black Rock in the John Toalo Gaetsewe District Municipality in the Northern Cape Province.

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

Tshipi é Ntle currently undertakes prospecting related activities in accordance to its approved environmental management plan (EMP) (NC30/5/1/1/3/2/1/1251 EM) for the Remaining extent of the farm Wessels 227 and Portions 1 and 2 and the remaining extent of the farm Dibiaghomo 226 in the Northern Cape province. It should be noted that even though the farm Dibiaghomo was included into the prospecting rights area, the approved prospecting EMP did not make provision for boreholes to be drilled on the farm Dibiaghomo.

The approved EMP was amended in September 2012 to cater for approximately 120 boreholes and to include the drilling of boreholes on the farm Dibiaghomo. To date 10 boreholes have been drilled on the farm Wessels 227. Tshipi é Ntle is proposing to drill four new boreholes within the next three years

The proposed development site is underlain by claystone, calcrete and dune sand of the Cretaceous to Tertiary Kalahari Formation, which is in turn underlain by remnants of the Dwyka tillite of the Karoo Supergroup and Proterozoic aged Hotazel Iron Formation and underlying Ongeluk lava Formation

Literature reviews and reports associated with Heritage Conservation make no mention of any palaeontological finds in the Kalahari Formation in this region. Although it is known that certain facies in the Dwyka Formation contains trace fossils and vertebrate fossils, the highly brecciated nature of the formation in this area will exclude fossils. Algal growth structures, known as "Stromatolites" are well-known fossil structures, described from the dolomites of the Transvaal Supergroup.

Recommendation:

The developer and the ECO must be made aware of the possible presence of "Stromatolites" in the pre-Kalahari Formations and if recorded in future drilling operations, a palaeontologist must be informed and appropriate actions taken in the event of future mining of the stratigraphic units.

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1 INTRODUCTION

1.1 Background

Gideon Groenewald was appointed by PSG Heritage and Grave Relocation Consultants to undertake a desktop survey, assessing the potential palaeontological impact of the proposed drilling of additional boreholes for related prospecting and future mining activities on the farm Wessels 227 and Portions 1 and 2 and the remaining extent of the farm Dibiaghomo 226, situated near Black Rock in the John Toalo Gaetsewe District Municipality in the Northern Cape Province.

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

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

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

1.2 Aims and Methodology

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

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

In preparing a palaeontological desktop study the potential fossiliferous rock units (groups, formations etc) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

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

Table 1.1: Palaeontological Sensitivity Analysis Outcome Classification

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

1.3 Scope and Limitations of the Desktop Study

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

The key assumption for this scoping study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing. There is also an inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologists carrying out fieldwork in RSA. Most development study areas have never been surveyed by a palaeontologist.

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

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

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

Tshipi é Ntle currently undertakes prospecting related activities in accordance to its approved environmental management plan (EMP) (NC30/5/1/1/3/2/1/1251 EM) for the Remaining extent of the farm Wessels 227 and Portions 1 and 2 and the Remaining extent of the farm Dibiaghomo 226 in the Northern Cape province. It should be noted that even though the farm Dibiaghomo was included into the prospecting rights area, the approved prospecting EMP did not make provision for boreholes to be drilled on the farm Dibiaghomo.

The approved EMP was amended in September 2012 to cater for approximately 120 boreholes and to include the drilling of boreholes on the farm Dibiaghomo. To date 10 boreholes have been drilled on the farm Wessels 227. Tshipi é Ntle is proposing to drill four new boreholes within the next three years.

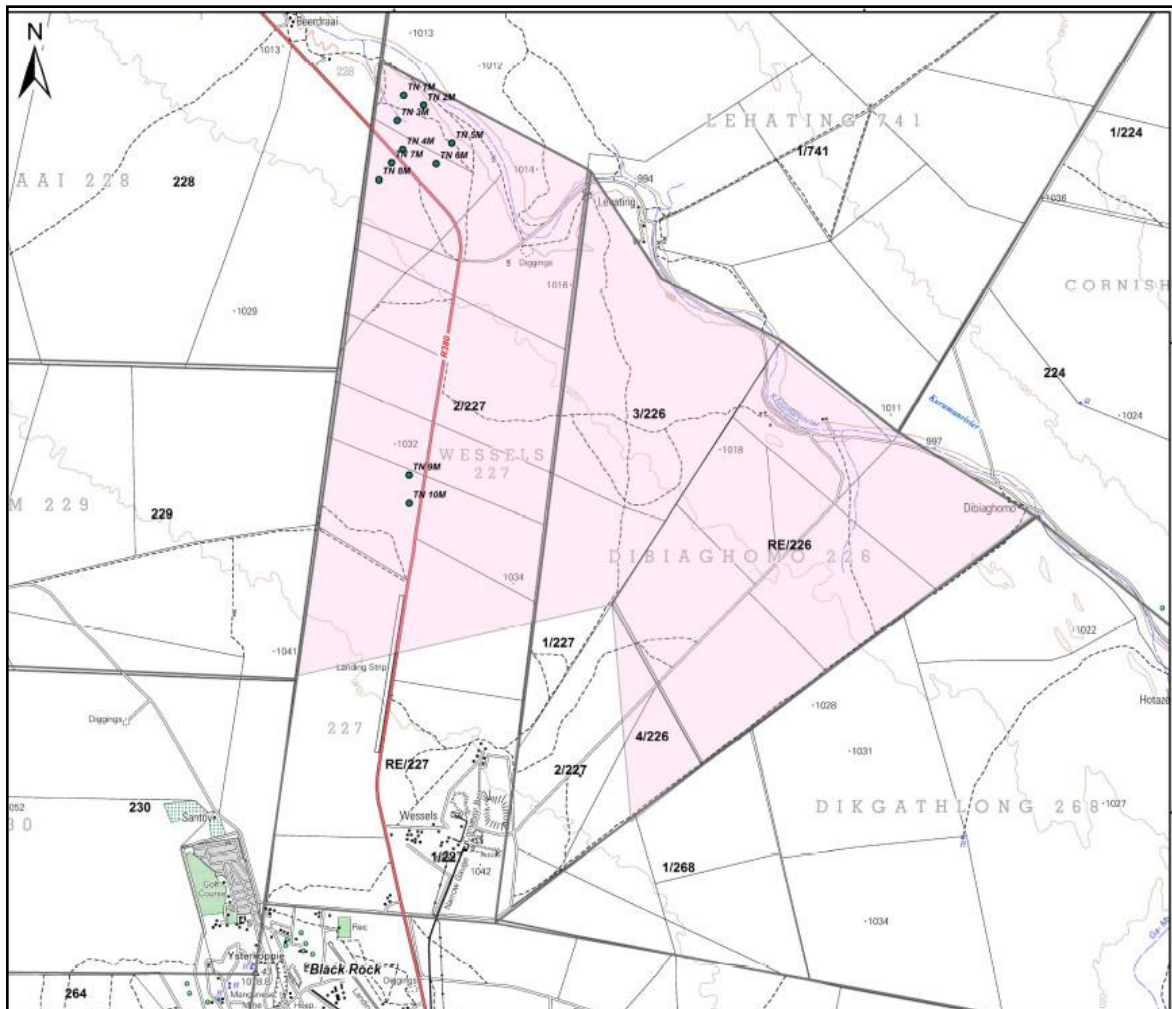


Figure Error! No text of specified style in document..54 Location of study area showing localities of existing boreholes.



Figure 2.2 Google image of the study area

3 GEOLOGY

The proposed development site is underlain by claystone, calcrete and dune sand of the Cretaceous to Tertiary Kalahari Formation, which is in turn underlain by remnants of the Dwyka tillite of the Karoo Supergroup and Proterozoic aged Hotazel Iron Formation and underlying Ongeluk lava Formation (Table 3.1) (Beukes, 1983 in Van der Merwe, 1997).

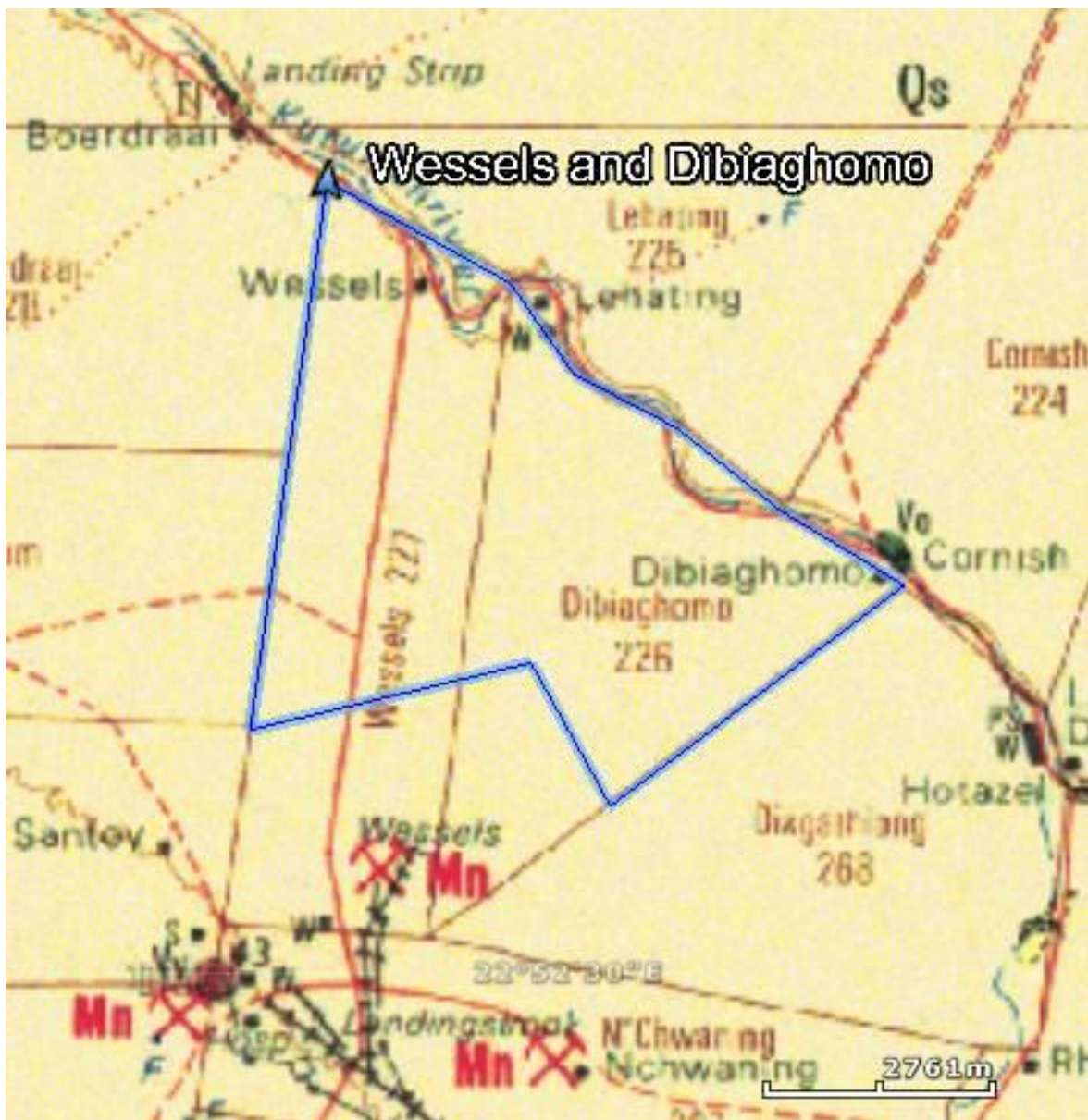


Figure Error! No text of specified style in document..55 The study area is underlain by the Cretaceous to Tertiary Kalahari Formation

Table 3.1: Generalised Stratigraphic Column and Associated Geology

Stratigraphy			Lithology	
Kalahari Formation			Sand, Clay, Limestone	
Karoo Supergroup			Dwyka Tillite	
Olifantshoek Supergroup			Lucknow Formation	Quartzite
			Mapedi Formation	
Transvaal Supergroup	Postmansburg Group	Voëlwater Subgroup	Moodraai Formation	Dolomite
			Hotazel Formation	Iron formation
				Upper Mn ore body
				Middle Mn ore body
				Iron formation
				Lower Mn ore body
				Mn-rich iron formation
				Iron formation
		Ongeluk Formation	Basaltic lava	

3.1 Kalahari Formation

The Kalahari Formation is characterised by extensive sand dune deposits, with extensive outcrops of limestone along the banks of the Kuruman River. The limestone is interbedded with prominent calcareous conglomerate beds with predominantly clasts of Ongeluk lava and scattered clasts of banded iron stone and Jaspelite (Personal observation of the author)

3.2 Pre-Kalahari Geology

The underlying geology of the Karoo and Transvaal Supergroups is not exposed, and borehole evidence from the region confirms that the area is underlain by rocks of the Ongeluk lava and banded iron formations.

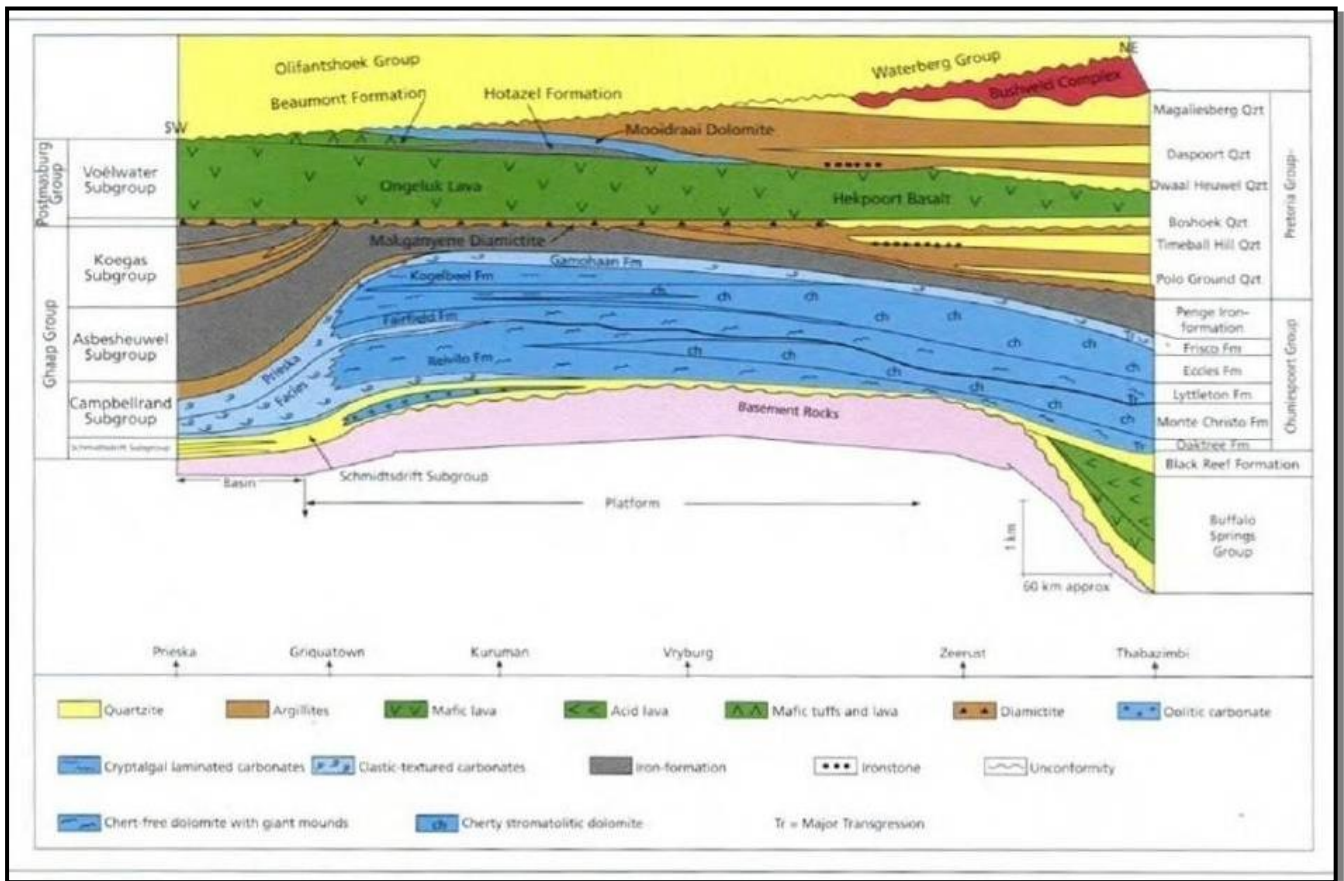


Figure Error! No text of specified style in document..56 Generalised plan of the geology of the Transvaal Supergroup is provided by Beukes (1983) and Van der Merwe (1997).

4 PALAEOONTOLOGY OF THE AREA

Literature reviews and reports associated with Heritage Conservation make no mention of any palaeontological finds in the Kalahari Formation in this region. Although it is known that certain facies in the Dwyka Formation contains trace fossils and vertebrate fossils, the highly brecciated nature of the formation in this area will exclude fossils. Algal growth structures, known as “Stromatolites” are well-known fossil structures, described from the dolomites of the Transvaal Supergroup.

4.1 Kalahari Formation

No fossils have been recorded from the Kalahari Formation. It is, however, likely that fossils might be present in the calcareous deposits of this formation.

Relicts of possible bone structures were observed by the author, but the structures are completely replaced by calcium and silica, making it virtually impossible to determine with any certainty what the original material was.

4.2 Pre-Kalahari Formations

The palaeontological importance of the Proterozoic Transvaal Supergroup is mainly associated with well-defined stromatolite structures in the dolomite deposits (Figure 4.1).



Figure 4.1 Typical stromatolite structures usually associated with dolomite deposits such as the dolomite of the Mooidraai Formation that overlies the Hotazel Formation. It is highly likely that structures such as in this photograph, might be exposed during exposure of the dolomite and Banded Iron Units in the Hotazel Formation (Photograph from Wikipedia 201) en.wikipedia.org/wiki/Stromatolite.

There are no outcrops of Pre-Kalahari Dwyka or older Transvaal Supergroup rocks in the study area and outcrops of the banded shale and thin dolomite zones that crop out on the main road between Hotazel and Kuruman shows very poorly defined algal structures that probably represent micro-stromatolites (Figure 4.2).

Small scale algal structures were observed by the author in boreholes from the area. The structures in the borehole logs are mostly of small (cm) scale and associated with banded iron formation of the Hotazel Formation or the overlying dolomite of the Mooidraai Formation.



Figure 4.2 Poorly defined algal structures in outcrops of the Transvaal Supergroup between Hotazel and Kuruman

5 PALAEOLOGICAL SENSITIVITY

The palaeontological sensitivity is predicted after identifying potentially fossiliferous rock units; ascertaining the fossil heritage from the literature and evaluating the nature and scale of the development itself.

The palaeontological sensitivity of the Kalahari Formation can be described as low and it is not foreseen that the proposed drilling of more boreholes will have any significant palaeontological impact.

The palaeontological sensitivity of pre-Kalahari formations can also be regarded as low, with no exposures in the study area.

The proposed boreholes have the potential to cut into the formations containing algal structures, called “Stromatolites”, and if these are present, it will be of a high significance for palaeontology.

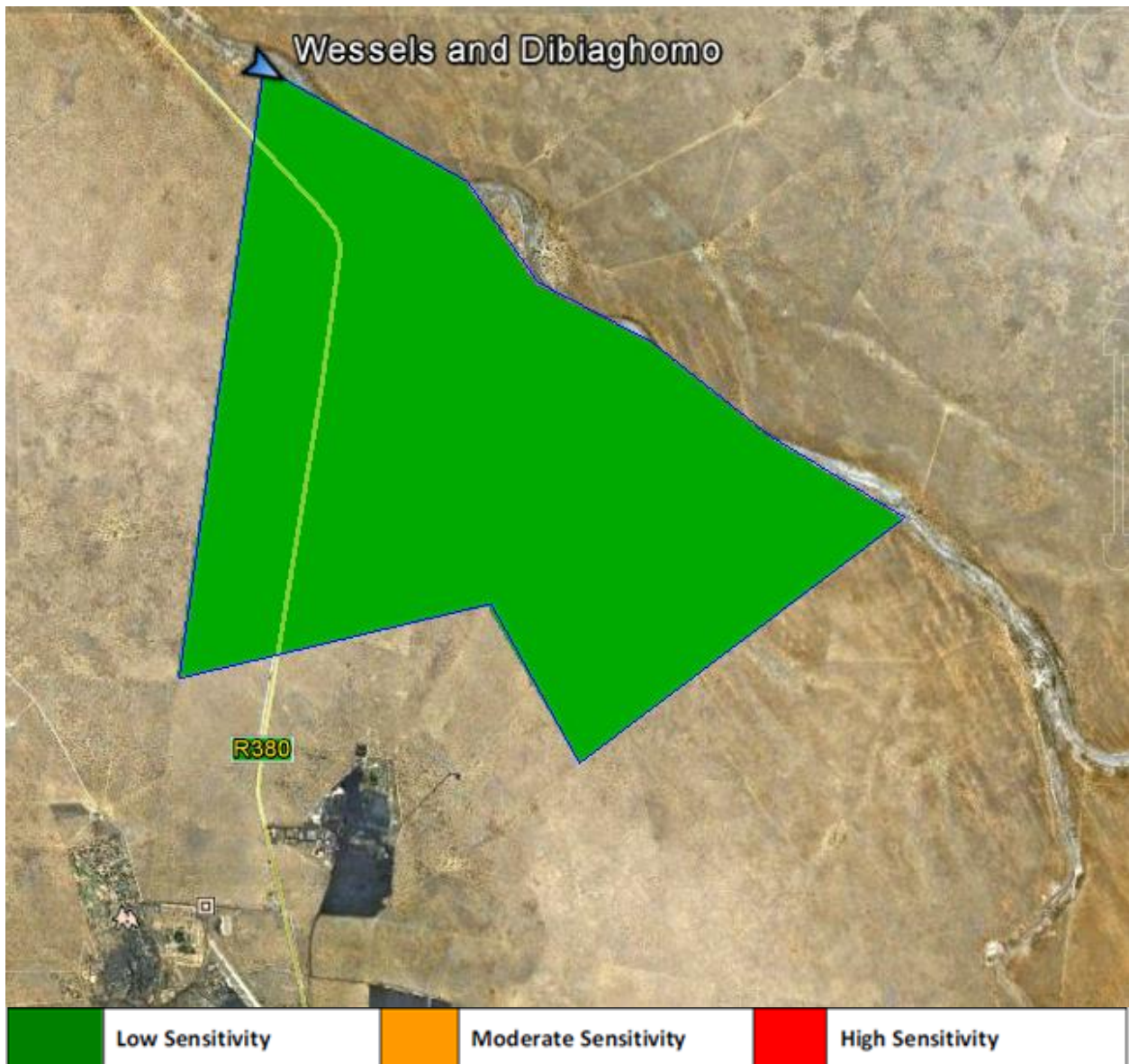


Figure Error! No text of specified style in document..57 Palaeosensitivity of the study area

6 CONCLUSION AND RECOMMENDATIONS

The Cretaceous to Tertiary Kalahari Formation overlies the entire study area and outcrops of the more resistant limestone are restricted to the banks of the Kuruman River.

No conclusive evidence of fossils have been recorded in either of the red claystone, conglomeratic limestone, calcareous sandstone or sand dunes of the Kalahari Formation.

The Proterozoic aged Hotazel Formation within the Kalahari Manganese Basin is host to the world's largest land based manganese deposit. Three manganese-rich units are present within a banded iron formation (BIF) (Van der Merwe, 1997).

The mineralogical associations within the different iron formation facies reflect the chemistry of the environment during precipitation, leading to the possible formation of stromatolite structures when associated with algal growth.

“Stromatolites” might be present in the banded iron units of the Mooidraai Formation. From borehole log information it appears that the structures are poorly developed and are representative of micro-stromatolites if compared to the well-developed stromatolites in the dolomites of the Transvaal Supergroup.

Recommendation:

The developer and the ECO must be made aware of the possible presence of “Stromatolites” in the pre-Kalahari Formations and if recorded in future drilling operations, a palaeontologist must be informed and appropriate actions taken in the event of future mining of the stratigraphic units.

7 REFERENCES

- Johnson MR , Anhaeusser CR and Thomas RJ (Eds) (2006).** The Geology of South Africa. GSSA, Council for Geoscience, Pretoria.
- Van der Merwe SJ. (1997).** Basin Analysis of the Kalahari Manganese Basin. Unpublished MSc Thesis, UOFS.

8 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

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

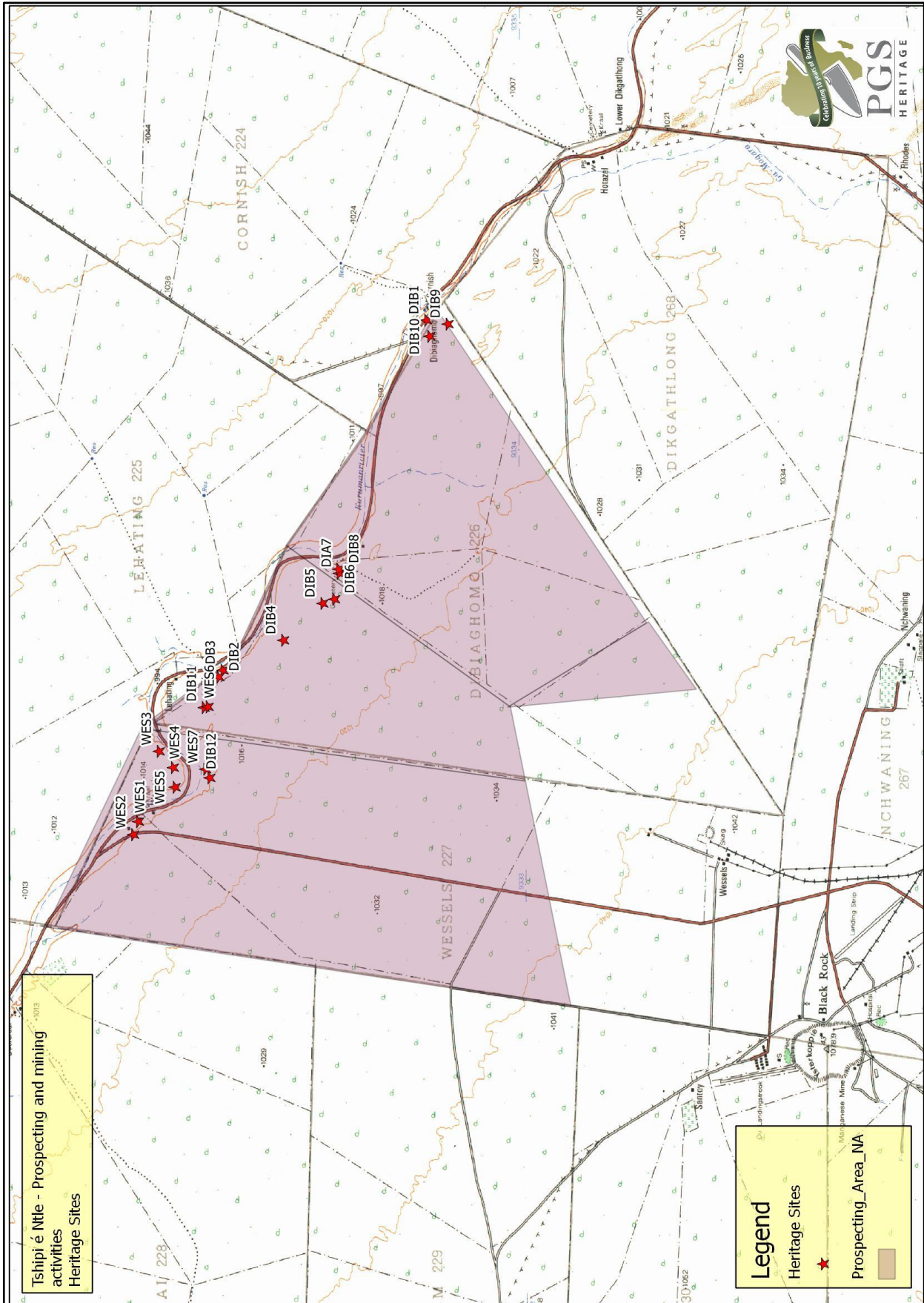
9 DECLARATION OF INDEPENDENCE

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



Dr Gideon Groenewald
Geologist

Appendix B
HERITAGE MAP



LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

3.1 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 heritage legislation, permits are required to damage, destroy, alter, or disturb them. People who already possess such material are required to register it. The management of heritage resources is 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 an interest in the graves: they must be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle should 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.

3.2 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 National Health Act (Act 61 Of 2003) 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 National Health Act (Act 61 Of 2003) 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 compiled by PGS Heritage (PGS) for Tshipi é Ntle Manganese Mining – prospecting activities have assessed the significance of the heritage resources found on site by utilising the classification standards as prescribed by SAHRA .

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

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
 - Density of scatter (dispersed scatter)
 - Low - <10/50m²
 - Medium - 10-50/50m²
 - High - >50/50m²
- **uniqueness** and
- **potential** to answer present research questions.

Table 2: 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

THE SIGNIFICANCE RATING SCALES FOR THE PROPOSED PROSPECTING ACTIVITIES ON HERITAGE RESOURCES

IMPACT ASSESSMENT METHODOLOGY

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

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

PART A: DEFINITION AND CRITERIA *		
Definition of SIGNIFICANCE	Significance = consequence x probability	
Definition of CONSEQUENCE	Consequence is a function of severity, spatial extent and duration	
Criteria for ranking of the SEVERITY of environmental impacts	H	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	L	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	L	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE

SEVERITY = L

DURATION	Long term	H	Medium	Medium	Medium
	Medium term	M	Low	Low	Medium
	Short term	L	Low	Low	Medium

SEVERITY = M

DURATION	Long term	H	Medium	High	High
	Medium term	M	Medium	Medium	High
	Short term	L	Low	Medium	Medium

SEVERITY = H

DURATION	Long term	H	High	High	High
	Medium term	M	Medium	Medium	High
	Short term	L	Medium	Medium	High
			L	M	H
			Localised - Within site boundary - Site	Fairly widespread - Beyond site boundary - Local	Widespread - Far beyond site boundary - Regional/ national
SPATIAL SCALE					

PART C: DETERMINING SIGNIFICANCE

PROBABILITY (of exposure to impacts)	Definite/ Continuous	H	Medium	Medium	High
	Possible/ frequent	M	Medium	Medium	High
	Unlikely/ seldom	L	Low	Low	Medium
			L	M	H
CONSEQUENCE					

PART D: INTERPRETATION OF SIGNIFICANCE

Significance	Decision guideline
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

*H = high, M= medium and L= low and + denotes a positive impact.