JAAGERS PLAAT PROSPECTING RIGHT APPLICATION FOR BLACK MOUNTAIN MINING

Heritage Impact Assessment

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Declaration of Independence

- I, Jennifer Kitto, declare that –
- General declaration:
- I act as the independent heritage practitioner in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting heritage impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

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

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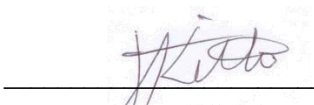
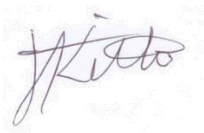
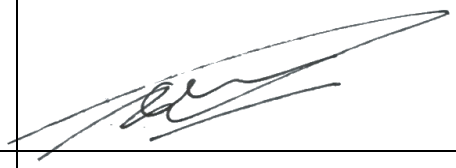
SIGNATURE: 

ACKNOWLEDGEMENT OF RECEIPT

Report Title	*Heritage Impact Report for the Jaagers Plaat Prospecting Right for Black Mountain Mining*		
Control	**Name**	**Signature**	**Designation**
Author	**J Kitto**		**PGS Heritage Specialist/ Principal Investigator**
Reviewed	**W Fourie**		**PGS Heritage Specialist**
Reviewed			**EIMS**

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SIGNATURE: _____

The Heritage Impact Assessment Report has been compiled considering the National Environmental Management Act (Act No. 107 of 1998) (NEMA): Appendix 6 of the Environmental Impact Assessment (EIA) Regulations of 2014 (as amended, 2017) requirements for specialist reports as indicated in the table below.

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Relevant section in report**
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii of Report – Contact details and company
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1. – refer to Appendix A
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 3
(cA) An indication of the quality and age of base data used for the specialist report	
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Appendix B
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 7
(g) An identification of any areas to be avoided, including buffers	Section 7
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 13
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 12
(k) Any mitigation measures for inclusion in the EMPr	Section 11
(l) Any conditions for inclusion in the environmental authorisation	Section 11
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 11
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 6
(o) A description of any consultation process that was undertaken during the course of carrying out the study	A public participation process was handled as part of the EAP process and is not elaborated on here.
(p) A summary and copies if any comments that were received during any consultation process	Not applicable. To date no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	Not applicable.

(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	No protocols or minimum standards for HIAs or PIAs promulgated through a governmental notice.

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS), to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Assessment Report (BAR) for a proposed prospecting work programme submitted for a prospecting right application without bulk sampling for five different areas located in the Namaqualand District, Northern Cape Province. This report focusses on Area 2 – Jaagers Plaats, which is located on various farm portions situated between 100 to 130 kilometers South East of the town of Aggeneys and 175 kilometers East South East of the town of Springbok, Namaqualand District, Northern Cape Province.

The project will follow a phased approach starting with non-invasive prospecting techniques and depending on the outcomes may then move to the implementation of invasive techniques such as drilling.

The desktop heritage impact assessment identified various potential heritage resources within the study area, including burial grounds and graves, historical structures, palaeontological resources and archaeological resources that could be impacted during invasive prospecting activities.

Burial grounds and graves

No burial grounds or graves are depicted on the historical topographic maps for the study area. However, it is possible that unknown burial grounds and graves are present. Burial grounds and graves have high heritage significance and are given a Grade IIIA significance rating in accordance with the system described in Section 9.1 of this document.

The impact of the proposed activities on burial grounds and graves is rated as LOW negative significance before mitigation, but with the implementation of the required mitigation measures the post-mitigation impact would be LOW negative.

Historical Structures

The impact of the proposed prospecting activities on potential historical structures is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

Any identified historical structures should be avoided with a buffer of 30m to avoid damage during the prospecting activities.

Palaeontology

Banzai Environmental was appointed to do a Palaeontological Desktop Assessment and found that:
The proposed prospecting application area is mainly underlain by the Kalahari and Prins Albert Formations with isolated outcrops of Karoo Dolerite and Whitehill Formation.

According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Kalahari Group is low, the igneous rocks of the Bushmanland and Karoo Dolerite is insignificant or zero while the Ecca sediments of the Karoo Supergroup have a high Paleontological Sensitivity. According to the Impact Tables, the Application area of Jaagers Plaat have a Medium Sensitivity.

In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent. The impact of the proposed activities on palaeontological resources is rated as MODRATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

In the event that fossil remains are discovered during any phase of the proposed prospecting activities, the Chance Find Protocol must be implemented by the ECO in charge of these developments.

Archaeology

Previous studies conducted in the surroundings of the study area have identified a number of archaeological sites. These include Stone Age (ESA, MSA and LSA) sites including find spots, surface scatters and rock art sites.

The impact of the proposed project on potential archaeological resources is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

When physical prospecting is planned an archaeologist must first visit and assess the areas of impact and make recommendations on any finds made.

In the event that archaeological artefacts are discovered during any phase of the proposed prospecting activities, the Chance Find Protocol must be implemented by the ECO in charge of these developments.

General

It is our considered opinion that the overall impact of the development, on the potential heritage resources identified during this report, is seen as acceptably low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised.

In the event that heritage resources are discovered during site clearance, construction activities must stop, and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

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TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

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

Early Stone Age

The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

Fossil

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

Heritage

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

Heritage resources

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

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

Holocene

The most recent geological time period which commenced 20 000 years ago.

Late Stone Age

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

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

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

Palaeontology

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

Abbreviations	Description

AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
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
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

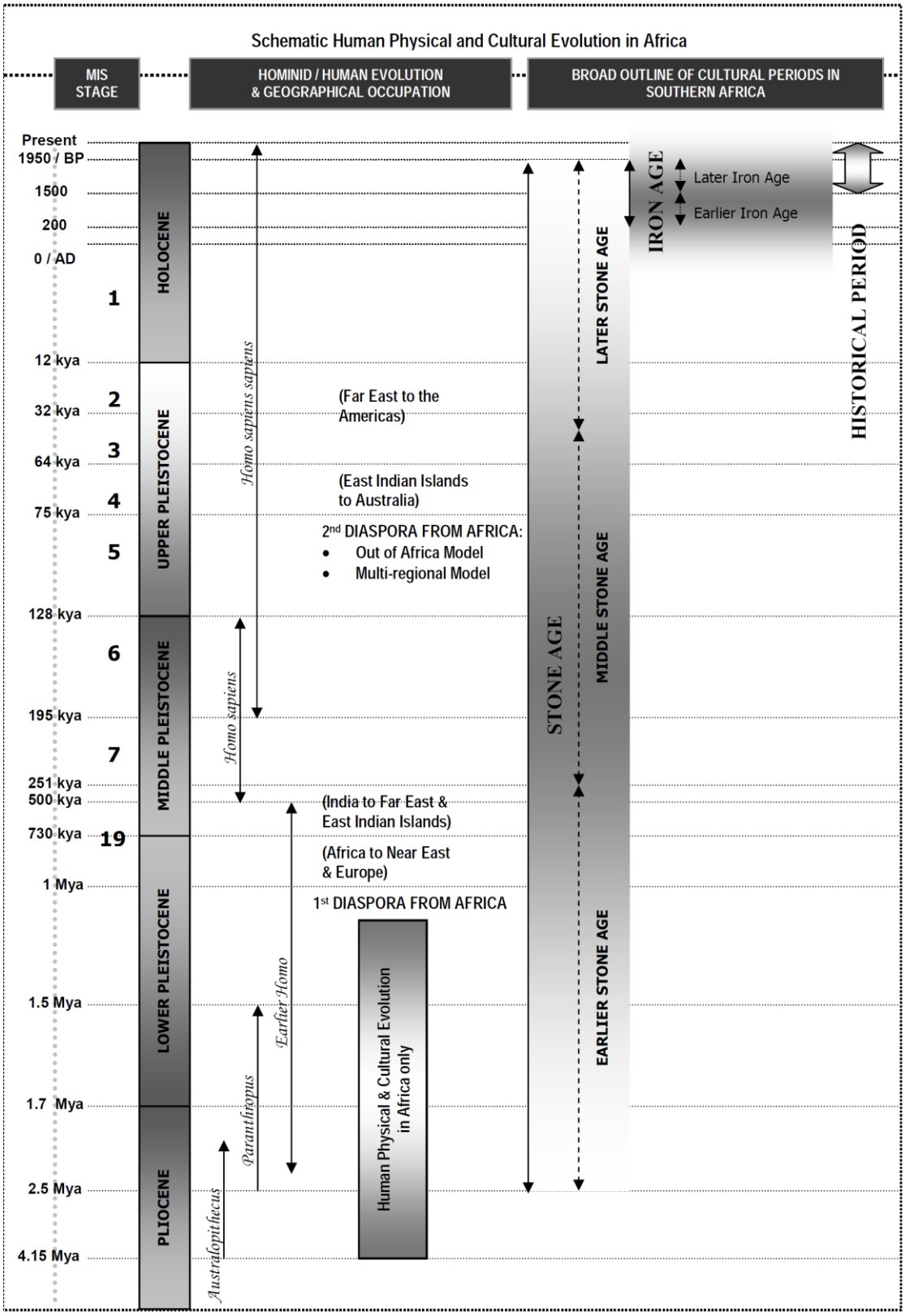

Figure 1: Human and Cultural Time line in Africa (Morris, 2008)

1 SUMMARY OF SPECIALIST EXPERTISE

This HIA was compiled by PGS.

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

Jennifer Kitto, author of this report and Heritage Specialist, has 18 years' experience in the heritage sector, a large part of which involved working for a government department responsible for administering the National Heritage Resources Act, No 25 of 1999. She is therefore well-versed in the legislative requirements of heritage management. She holds a BA in Archaeology and Social Anthropology and a BA (Hons) in Social Anthropology.

Wouter Fourie, the Project Coordinator and author, 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).

2 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS), to undertake a Heritage Impact Assessment (HIA) that forms part of the Basic Assessment Report (BAR) for a proposed prospecting work programme submitted for a prospecting right application without bulk sampling for five different areas located in the Namaqualand District, Northern Cape Province. This report focusses on Area 2 Jaagers Plaat, which is located on various farm portions situated between 100 to 130 kilometers South East of the town of Aggeneys and 175 kilometers East South East of the town of Springbok, Namaqualand District, Northern Cape Province.

3 SCOPE OF WORK AND TERMS OF REFERENCE

3.1 Overview of the Scope of Work

PGS Heritage was appointed by EIMS to undertake a desktop Heritage Impact Assessment (HIA). The aims of the study are to identify potential heritage sites and finds that occur in the proposed prospecting right area as well as to assess the impact of the proposed activity on these identified heritage sites. The Heritage Impact Assessment aims to inform the Basic assessment Report (BAR) in the development of a comprehensive Prospecting Work Programme (PWP) to assist the

client/landowner in managing the identified heritage resources in a responsible manner, in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

The scope of work for the Heritage Impact Assessment Phase of the project can be itemised as follows:

1. The desktop studies will be undertaken as part of a basic assessment report (BAR) in support of five prospecting right applications located near the town of Aggeneys in the Northern Cape.
2. The purpose of the above-mentioned studies are two-fold namely:
    a. To develop heritage features and heritage sensitivity maps for each of the prospecting right applications; and
    b. Undertake heritage impact assessments and develop management plans at a desktop level for each of the five prospecting right applications.

This report documents the desktop heritage study for Area 2 – Jaagers Plaat.

3.2 Definition of Study Area for Scope of Work

PGS Heritage was appointed by EIMS to undertake a desktop Heritage Impact Assessment (HIA) for a proposed prospecting work programme submitted for a prospecting right application without bulk sampling for various farm portions situated100 to 130 kilometers South East of the town of Aggeneys and 175 kilometers East South East of the town of Springbok, Namaqualand District, Northern Cape Province. A detailed desktop study was undertaken.

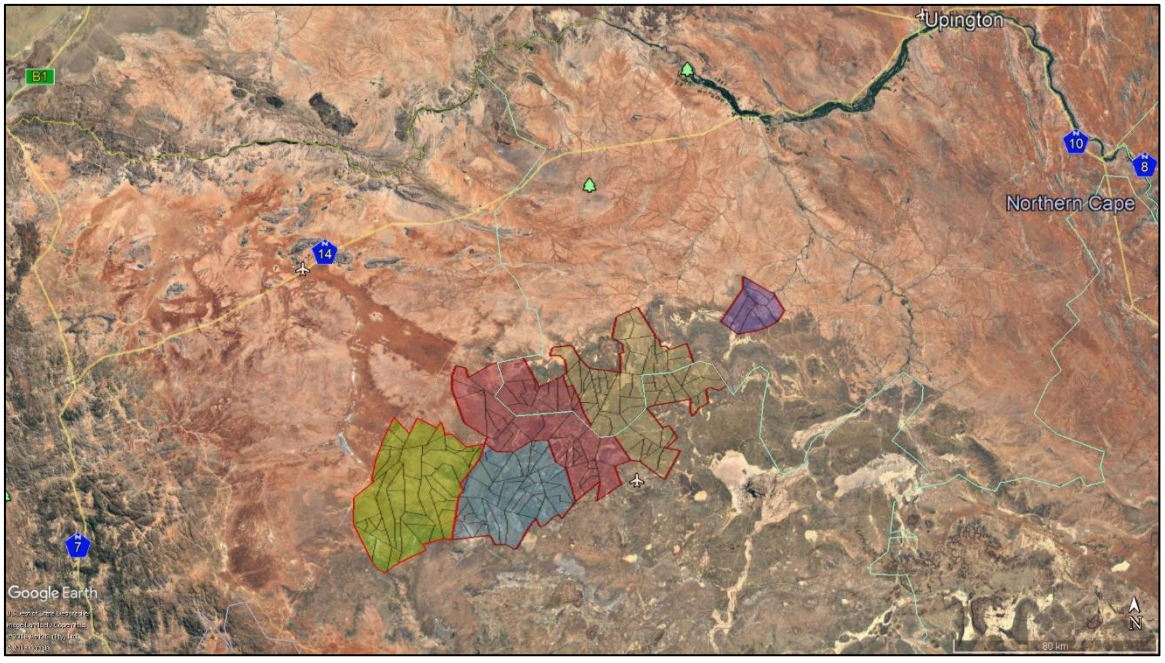

Figure 2: The study area within its regional context (blue shaded polygon)

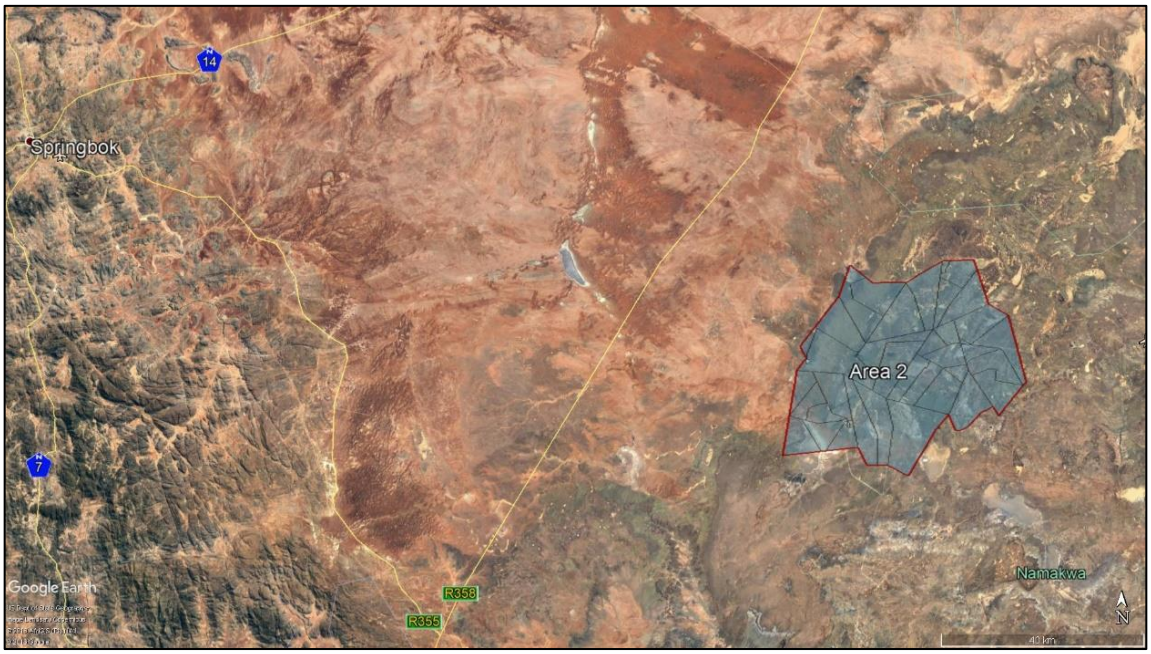

Figure 3: The study area within its local context (blue shaded polygon)

DEFINITION AND DESCRIPTION OF STUDY AREA		
Coordinates	Northernmost 29° 52.594'S; 19° 47.111'E Southernmost 30° 15.167'S; 19° 39.393'E Central point 30° 3.754'S; 19° 38.511'E	Easternmost 30° 5.266'S; 19° 53.561'E Westernmost 30° 4.236'S; 19° 25.817'E
Property	The farm portions: Farm Weltevreden 146 Portions 0 RE, 2 and 3; Farm Klein Brand Pens 147 Portions 0 RE, 1 RE and 4; Farm Lemoendoorn 148 Portions 0 RE and 1; Farm Blouputs 149 Portion 0; Farm Groot Brand Pens 150 Portion 1 RE; Farm Granaat Bosch Kolk 151 Portions 0 RE and 1; Farm Abrahams Kop 152 Portions 1, 2 and 4; Farm Nutiep 153 Portions 1 and 2; Farm Jaagers Plaat 154 Portions 0 RE and 1; Farm Groot Zevenfontein East 155 Portions 1 and 2; Farm Abiquas Kolk Oost 156 Portions 3 RE and 4; Farm Dik Pens 182 Portions 0 RE, 2 RE, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12; Farm Water Kuil 185 Portions 0 RE and 1; Farm Dwaggas West 186 Portion 0; Farm Dwaggas Oost 190 Portion 1; Farm Hyes 191 Portion 1 and Farm Blouvlei 1155 Portion 0; all located in the Namaqualand District, Northern Cape Province .	
Location	The study area (Area 2 – Jaagers Plaats) is located approximately 100 to 130 kilometers South East of the town of Aggeneys and 175 kilometers East South East of the town of Springbok, Namaqualand District, Northern Cape Province	
Extent	The extent of the study area is approximately 129 407 Ha (one hundred and twenty thousand four hundred and seven hectares)).	
Land Description	The Prospecting application area is located close to the Aggeneys - Gamsberg base metal mines. The proposed properties are situated mainly south of the R358 tar road from Pofadder to	

	Nuwerus. Several farm roads and servitude gravel roads cross these properties. Existing power lines are also situated across these properties. The proposed properties are expected to be generally flat, with a few drainage lines, quartzite ridges and outcrops, as well as a few pans across some parts of these properties. The areas proposed for the prospecting project are expected to have red Kalahari Aeolian sands of various thickness on top of a general calcrete layer. The vegetation of the general area and the proposed site is expected to be typical of the Upper Karoo, consisting mainly of Karoo scrub and grass and the occasional Karoo Acacia which forms part of the vegetation in the Nama-Karoo biome (Mucina & Rutherford 2006). The properties are expected to be previously largely undisturbed and presently mainly used for grazing of sheep and cattle. Existing farm infrastructure such as windmills, boreholes, fencing and livestock pens is expected to be sparsely dotted across the properties. Only a few tracks or roads cross these properties.

4 LEGISLATIVE AND POLICY FRAMEWORK

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

i. National Environmental Management Act (NEMA), Act 107 of 1998
ii. National Heritage Resources Act (NHRA), Act 25 of 1999
iii. Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002
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. GNR 982 of 2014, as amended 2017 (Government Gazette 38282) promulgated under the (NEMA):
    a. Basic Assessment Report (BAR) – Regulations 19 and 23
    b. Environmental Scoping Report (ESR) – Regulation 21
    c. Environmental Impacts Report (EIR) – Regulation 23
    d. Environmental Management Programme (EMPr) – Regulations 19 and 23
ii. NHRA:
    a. Protection of Heritage Resources – Sections 34 to 36; and
    b. Heritage Resources Management – Section 38
iii. MPRDA Regulations of 2014:
    a. Environmental reports to be compiled for application of mining right – Regulation 48
    b. Contents of scoping report– Regulation 49
    c. Contents of environmental impact assessment report – Regulation 50

d. Environmental management programme – Regulations 51
e. Environmental management plan – Regulation 52

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

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

5 RECEIVING ENVIRONMENT;

The proposed Jaagers Plaats Prospecting Project will be situated on Parts of the Farms Weltevreden 146; Klein Brand Pens 147, Lemoendoorn 148, Blouputs 149, Groot Brand Pens 150; Granaat Bosch Kolk 151, Abrahams Kop 152; Nutiep 153 Jaagers Plaat 154, Groot Zevenfontein East 155, Abiquas Kolk Oost 156, Dik Pens 182, Water Kuil 185, Dwaggas West 186; Dwaggas Oost 190, Hyes 191 and Blouvlei 1155. The proposed properties are located approximately 100 to 130 kilometers South East of the town of Aggeneys and 175 kilometers East South East of the town of Springbok, Namaqualand District, Northern Cape Province.

The proposed properties are situated mainly south of the R358 tar road from Pofadder to Nuwerus. Several farm roads and servitude gravel roads cross these properties. Existing power lines are also situated across these properties.

5.1 Heritage Desktop Study

The high-level archival research focused on available information sources that were used to compile a general background history of the study area and surrounds.

5.1.1 Archival/historical maps

First edition historical topographic maps dating between 1970 and 1973 were available for utilisation in the background study. The maps were utilised to identify structures or graves that could possibly be older than 60 years and thus protected under Section 34 and 36 of the NHRA. Many of the structures identified are farmsteads or homesteads.

Since the area is extremely large, several topographical sheets had to be examined:

- 2919CD-1973
- 2919DC-1973
- 2919DD-1973
- 3019AB-1972
- 3019BA-1972
- 3019BB-1972

In total, 30 potential heritage features were identified in the location of the study area as depicted on the topographical maps (**Figure 4** and **Figure 5**). The majority are depicted as several single structures and groups of structures (yellow icons). Since the first edition of the topographic maps for the area date to between 1972-73, the potential heritage features are likely to be 47/48 years or older. The identification of the features will have to be confirmed during the field work phase.

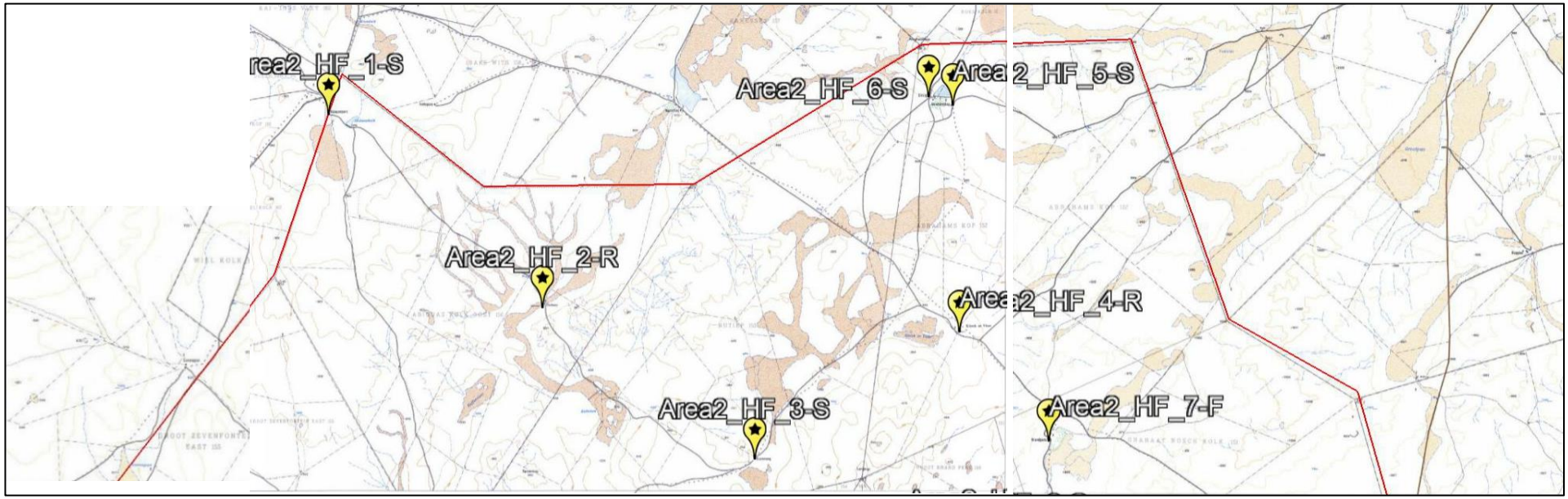

Figure 4: Enlarged section of the first edition of the topographical map sheets covering the northern section of Area 2 – Jaagers Plaats. showing the possible heritage features as yellow icons (structures).

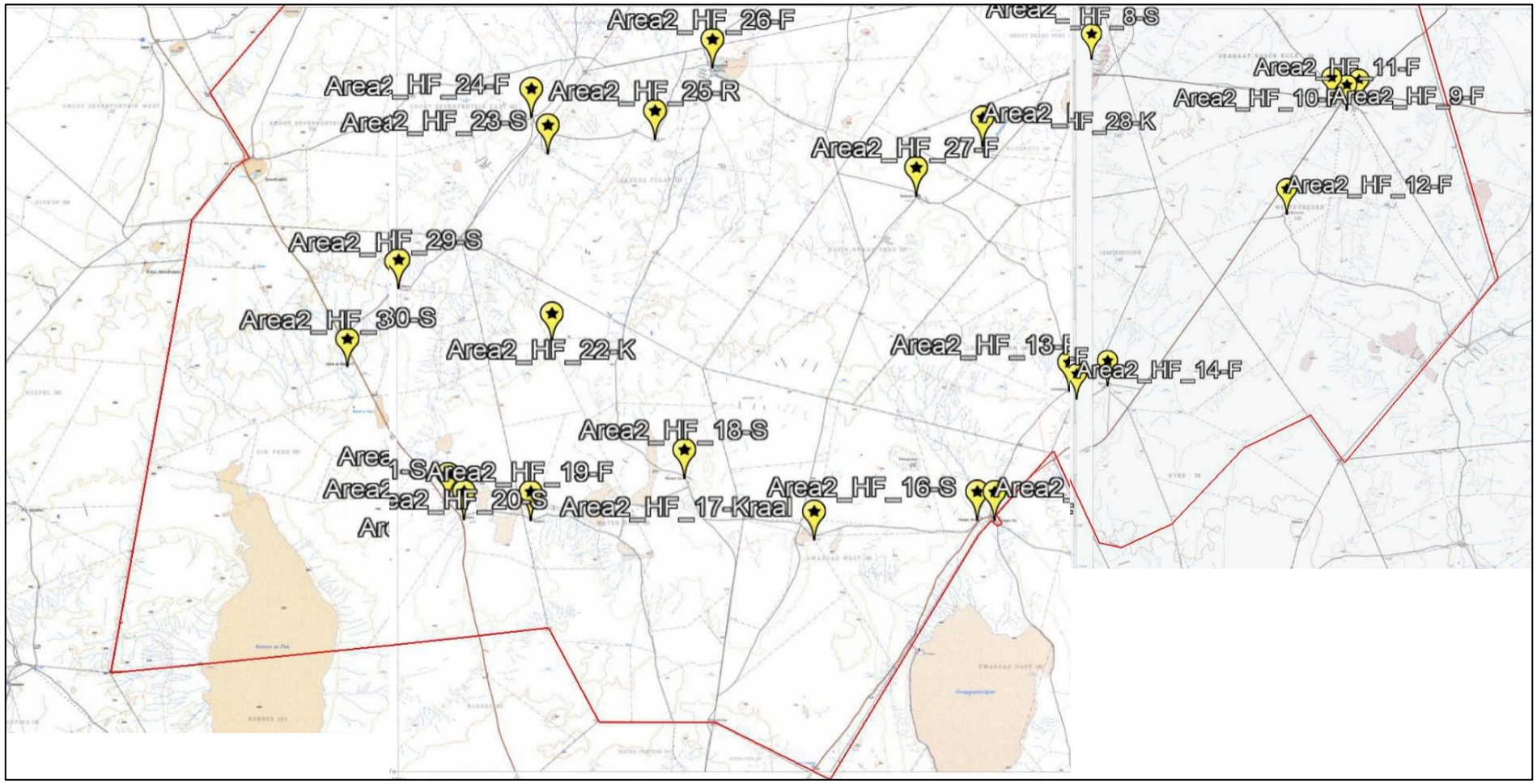

Figure 5: Enlarged section of the first edition of the topographical map sheets covering the southern section of Area 2 – Jaagers Plaats. showing the possible heritage features (structures) as yellow icons.

5.1.2 Historical and Archaeological Overview of the Study Area and Surrounding Landscape

A review of the archaeological context of the Northern Cape (van der Ryst 2015)

The Northern Cape is an arid region with limited surface water so that archaeological remains are often found near water (Mitchell 2002) and sources of lithics that have been used to produce stone tools. Palaeo- and current river systems, springs and pans and dominant geographical landscape features such as hills or shelters are important locales within any landscape.

The region abounds with the remains of prehistoric hunting and gathering groups. Numerous archaeological sites have been recorded, researched and published through archaeological impact and heritage assessments. Stone tools mostly mark areas of prehistoric occupations and these suggest a widespread presence for tool-producing Plio-Pleistocene hominins in southern Africa (Barham and Mitchell 2008). This important part of the prehistory of southern Africa, known as the Stone Age, is chronologically divided into the Earlier, Middle and Later Stone Ages (ESA, MSA and LSA). The ESA is characterized by the use of large stone cutting tools (LCT's) (McNabb et al. 2004), in particular hand axes, but also cleavers and tool types such as scrapers. Following on the ESA, the MSA typologies represent greater specialization in the production of stone tools, in particular flake, blade and scraper tools and also in a more extended range of specialized, formal tools. Regional lithic style, evidence for symbolic signalling, polished bone tools, portable art and decorative items are apparent during the MSA. ESA and MSA lithics occur widespread around water sources and previously favourable land settings that are now buried. During the LSA small (microlithic) tools, bone tools and weapon armatures and a range of decorative items as well as rock art were produced. Ceramics were used and/or manufactured by hunters and Khoekhoe herders towards the terminal phases of the LSA over a period of around 2000 year. The more recent occupations of LSA groups are abundant as surface finds and in sealed deposits in shelters (Beaumont et al. 1995).

Differences in stone artefact assemblages have been used in attempts to discern between late-Holocene hunter-gatherer and herder sites (Parsons (2003, 2004, 2007, 2008); Lombard and Parsons 2008) but this distinction is not generally accepted. Hunter-gatherer assemblages termed Swartkop may contain grass-tempered ceramics (Beaumont and Vogel 1989). Sites with engravings, are often situated close to water sources. The Doornfontein herder sites contain ceramics that occasionally have lugs and/or spouts. Differences in the geographical spread indicate a preference for pastoral Doornfontein sites along rivers while Swartkop sites are usually found further from the river (Fauvelle-Aymar 2004). Substantial herder encampments were located along the Orange River floodplain. Hendrik Jacob Wikar during his travels in 1778 recorded the names of the various herder groups who had settlements on both sides of the river (Mossop 1935).

Rock Art

The rock art of the Northern Cape comprises paintings and, importantly, diverse categories of engravings (Morris 2012). More details on these sites in the Namaqualand region are provided below.

Namaqualand General (Hoffman and Rohde 2007)

Hoffman and Rohde's article on the historical impact of changing land use practices in Namaqualand (2007) cites evidence in both the archaeological (Webley, 2007) and historical (Penn, 1995a) record that suggests that immediately prior to colonial contact in the 17th century, human populations in Namaqualand (south of the Orange River), whether hunter-gatherer or pastoralist in their lifestyles, ranged widely within and beyond the area of study, probably never exceeding a few thousand individuals at any one time. Simon van der Stel's expedition, to the vicinity of present day Springbok in 1685, encountered eight or nine relatively small groups of Namaqua pastoralists on the western slopes of the central Kamiesberg and scattered groups of Bushmen hunter-gatherers along the way). The region was only settled by European farmers in about 1750 when the first loan farms were established (Penn, 1995a, b).

David Morris, in various HIA reports on the general area (2010, 2011, 2013) confirms that although little archaeological research has been conducted in the general area around Pofadder and Aggeneys, information on archaeological sites in the region is obtained from several impact assessment studies that have been undertaken in recent years. These form the basis of his background review. According to Morris, Late Holocene Later Stone Age (LSA) sites are the predominant archaeological trace noted in the Aggeneys-Pofadder region (Morris 2010). Morris also references Beaumont et al. (1995) who have shown, with reference to the LSA, that "virtually all the Bushmanland sites so far located appear to be ephemeral occupations by small groups in the hinterland on both sides of the [Orange] river" (1995:263). This was in sharp contrast to the substantial herder encampments along the Orange River floodplain itself (Morris & Beaumont 1990). Orton and Webley (2012, 2013) also note that away from the river, LSA material, mainly quartz flakes, appears to be focused around the base of granite hills or around pans (Orton & Webley 2012). Beaumont et al. (1995) agree and add that red dunes and the margins of seasonal pans also served as foci for LSA occupation.

Grinding grooves have been found on rock outcrops in the Aggeneys/Gamsberg area (Morris 2011) and rock paintings are known from a boulder site alongside the Aggeneys/Black Mountain aggregate quarry (Morris 2011). More recently, important engraved cupule sites have been identified at two sites on Black Mountain Mining property, Aggeneys and at the foot of the Swartberg on Zuurwater 62 (Morris 2013).

Beaumont et al. (1995:240-1) note a widespread low-density stone artefact scatter of Pleistocene age across areas of Bushmanland to the south where raw materials, mainly quartzite cobbles, were derived from the Dwyka till. Beaumont et al. have shown that "substantial MSA sites are uncommon in Bushmanland" (1995:241): and those that have been documented thus far have generally yielded

only small samples (Smith 1995). No substantial sites have been found previously in the survey area. Only very sparse localized scatters of stone tools have been seen in places, with limited traces in the hills (e.g. an MSA site at the top of Gamsberg) or at the bases of hills. ESA including a Victoria West core on quartzite has been noted within the Gamsberg basin (Morris 2010).

Second South African War (Anglo-Boer War)

Erasmus (2004) notes that Okiep was besieged by Boer forces under the command of General Jan Smuts from 8 April to 3 May 1902. This was Smut's last engagement of the South African War. The siege finally ended when the British forces granted Smuts safe passage from Okiep to the peace negotiations in Vereeniging. These negotiations resulted in the termination of the War in May 1902.

Webley (2016) notes that the railway line which transported copper from Okiep to Port Nolloth at the coast, became the focus of intensive military activity during the Second South African War. This is because the railway line also provided a line of communication with the coast. There were at least thirteen blockhouses around the perimeter of Okiep. One of the most significant events of the war in the Northern Cape was the attempt by the Boers, under Maritz, to shunt an engine, loaded with dynamite, into the town of Okiep with the intention of destroying the town centre. The plan was not successful as the train derailed before reaching its destination.

Towns

Aggeneys

The derivation and meaning of the name "aggeneys" is relatively obscure. The word itself is of Khoe origin, however the name has been rendered variously as, "mountainous place", "place of slaughter", "place of blood", "place of water" (Erasmus 2014). According to Raper (2004), 'Aggeneys means place of the red clay', as apparently the Catholic priest at the Pella Mission Station recorded in his memoirs that the Khoikhoi used to smear red clay on their lips to prevent sunburn.

In approximately 1872, the first references are made to a farm at Aggeneys. It had become important with the arrival of the "Trekboere" as the first watering point reached after the Kweekfontein in the Springbok area. A certain Mr Hayes, a Catholic, and his family farmed cattle at Aggeneys. (http://www.aggeneys.com/history). Mr Hayes left the Aggeneys farm in 1900 and moved to Pella where he died in 1905 at the age of 85. The farm was taken over by the Harridge or Herridge family. Edward Herridge was a former British soldier. They left the farm after the Boer War for Klein Pella.

The Burger family, who were trekboere, probably from the Williston area, passed through the region immediately prior to the Boer War and while near Aggeneys, some 720 of their cattle were seized by the British troops, at the time camped at Aggeneys. After the war in 1904, the Burger family returned to Aggeneys and made applications to hire the State ground, at a nominal yearly rental.

Two brothers, Barend and Willem were granted Aggeneys East and West respectively, the other brothers (there were six brothers and five sisters in all) hired grazing from these two brothers.

In 1908 right of property was granted to Barend and Willem. Barend died in 1941 and Wikkie, his youngest son, inherited the farm. The adjacent portions of Zuurwater and Koeris, purchased by Barend, were left to his sister and another brother and Wikkie bought these out later. It was from Wikkie Burger that the farms were purchased (http://www.aggeneys.com/history). Aggeneys is located approximately 75 to 120 kilometers North West of the study area.

Springbok

Springbok, known as the "capital" of Namaqualand, owes its existence to the opening of the first copper mines in this area in the 1850s. The copper deposits were first discovered in the early 1840s by a German prospector named Albert von Schlicht. In 1850, Phillips and King of Cape Town bought a portion of the farm Melkboschkuil from the Cloete brothers for £750 and opened the first commercial mining operation in South Africa in 1852. The village of Springbokfontein was laid out in 1862 and the name was subsequently shortened to Springbok. In the late 1860s and early 1870s the town almost died when richer deposits were discovered at Okiep 10km north of Springbok and the later at Nababeep and Carolusberg. This resulted in mining activities ceasing in the town itself. However, the water from the town's strong spring continued to ensure Springbok's development into the main commercial and administrative centre for the new mining operations and their associated villages (Erasmus 2014). A more recent development is the consideration of the Namaqualand Copper Mining landscape as a World Heritage Site by UNESCO. Besides Springbok's original "Blue Mine", an original prospecting shaft sunk by Simon van der Stel's exploration party at Carolusberg in 1685, is included in the proposed heritage site (Erasmus 2014). Springbok is located roughly 175 kilometers West North West of the study area.

Prospecting History

The first known investigation of the mineral potential of the area was in 1928 when a German, Mr Horneman, who appears to have been some sort of local official, asked permission from Barend Burger to prospect in the area. The following year he hired a qualified blaster, Abraham Maas, to sink a shaft on the Swartberg. However, his interpretation of the geology was incorrect and the shaft was sunk in the poorly mineralised area of the ore body and was stopped after 20m, with little mineralisation. Some samples were taken and it is reported that the O'Kiep Copper Company made an offer to Horneman but this was refused (http://www.aggeneys.com/history; http://www.vedanta-zincinternational.com/operations/black-mountain/about-us/history-milestones/).

Several times between then and the late 1960's a number of companies and individuals looked at the area or at samples and for varying reasons turned it down. Some of them came tantalisingly close to signing options but it never materialised. This period culminated when a Geologist, Ben Brock, representing Phelps Dodge, decided to recommend the prospect at Swartberg (Black

Mountain) to his principals. In 1971 the first borehole was sited and drilling commenced. Exploration continued and then spread to Broken Hill and the Aggeneys Mountain (Big Syncline) during the next two years. The most promising of the three was at Noeniespoort and an audit was conducted in 1974 to procure bulk samples for metallurgical testing. In 1976 Phelps Dodge Corporation commissioned a feasibility study for an underground mine. In October 1977, after a decision to seek a partner for the venture, Phelps Dodge came to an agreement with Gold Fields of South Africa Limited (GFSA) and its associates, who subscribed for a 51% interest in the Black Mountain Mineral Development Company (Proprietary) Limited (http://www.aggeneys.com/history; http://www.vedanta-zincinternational.com/operations/black-mountain/about-us/history-milestones/).

The mine came on stream at the end of 1979 and has to date produced some 5,5 million tons of ore. The ore is treated in a metallurgical plant on the site. The concentrate produced is road hauled to Loop 10 on the Sishen-Saldanha railway line – some 170 km, if for export to Saldanha (http://www.aggeneys.com/history).

The remoteness of the site required major infrastructure and development and the new village and amenities were introduced over the next few years including the pump station and pipeline from the Orange River near Pella. The town of Aggeneys was established in 1976 (http://www.aggeneys.com/history).

In the late nineties, GFSA decided to sell off its base metal assets, including Black Mountain. After conducting a due-diligence study, Anglo-American Corporation purchased Black Mountain and the nearby, as yet undeveloped Gamsberg zinc deposit. Low-key exploration through the 1990s, aimed mainly at finding extensions to the Broken Hill orebody, yielded little encouragement but the geologists were still optimistic. With the change in ownership almost certainly signalling an end to the drilling program, the Chief Geologist requested funds for one final hole to test an area further out from the previously drilled holes. This proved a turning point in the history of Black Mountain Mining, as high-grade mineralization was intersected at a depth of just over 1 000m. Funds were immediately made available for an expanded drilling programme (http://www.vedanta-zincinternational.com/operations/black-mountain/about-us/history-milestones/).

On 10 May 2010, Anglo American announced the sale of its global Zinc portfolio to the Vedanta Groups. The $364 million sale of the Black Mountain Mining zinc interests was completed on February 5, 2011. Since acquisition the life of the existing BMM operations has been extended by a further 2.5 years. In addition, following completion of the feasibility study in September 2015, phase 1 of the Gamsberg Project was approved in November 2014. On 27 July 2015 BMM marked the ground breaking ceremony at the Gamberg Project site. Pre-start activities continue – to date they have excavated over 6Mt of waste (http://www.vedanta-zincinternational.com/operations/black-mountain/about-us/history-milestones/).

5.2 Palaeontology

The Jaagers Plaat Prospecting Right Applications area is mainly underlain by the Kalahari and Prins Albert Formations with isolated outcrops of Karoo Dolerite, Whitehill Formation. (***Figure 6***).

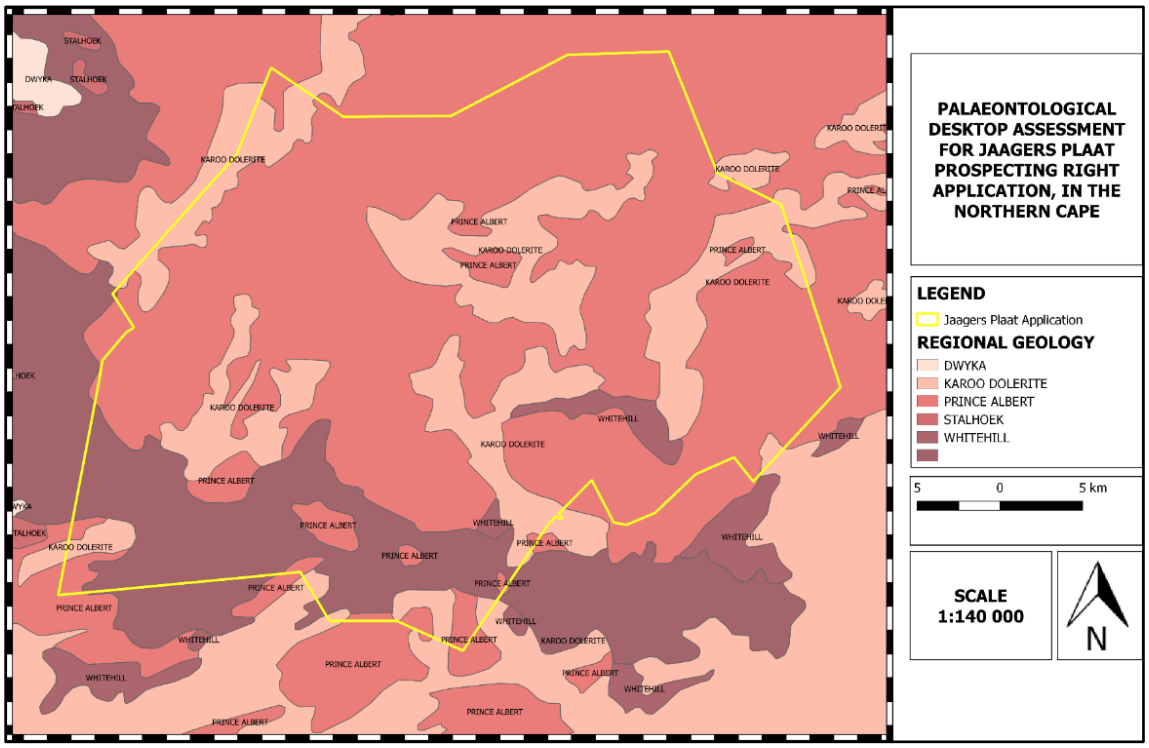

Figure 6: Approximate location and surface geology of the proposed Jaagers Plaat prospecting area in the Northern Cape[1]. Map drawn by QGIS Desktop 2.18.28

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the Kalahari Group is rated as Low, the igneous rocks of the Bushmanland and Karoo Dolerite is rated as Insignificant or zero, while the Ecca sediments of the Karoo Supergroup have a High Paleontological Sensitivity. **(Figure 7).**

[1] Note: the unlabeled brown colour in the legend is allocated to the geological formations broadly assigned to the younger strata of the Kalahari Group deposits of the central interior and the uppermost, superficial deposits that form the surface of the plains and are of Quaternary to Recent date.

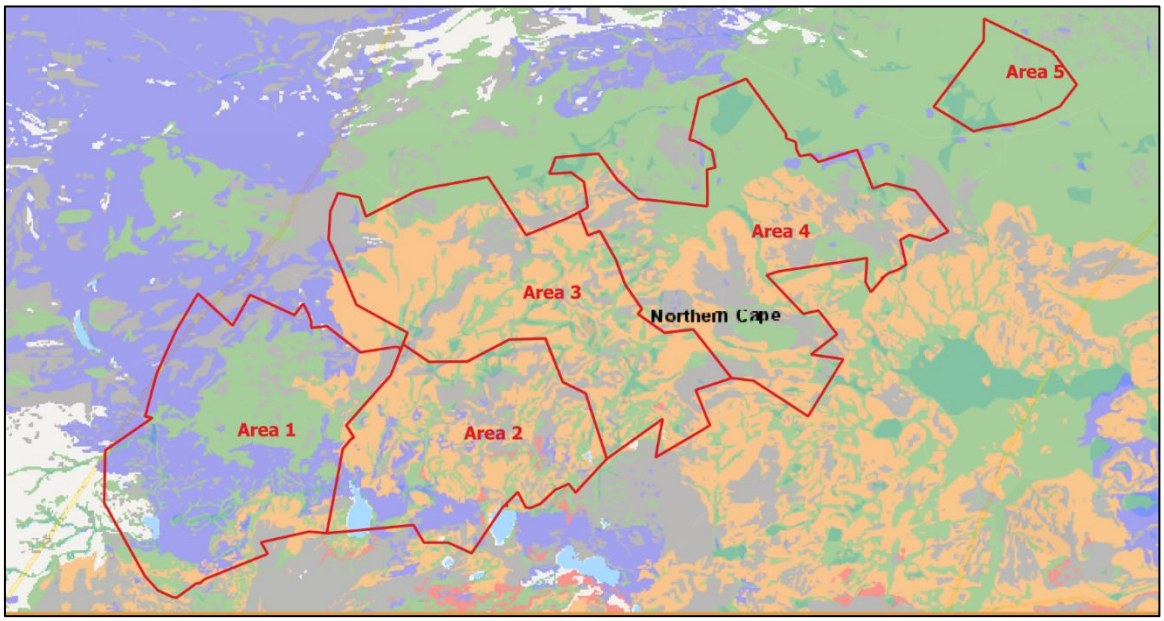

Figure 7: Extract of the 1: 250 000 SAHRIS Palaeosensitivity Map (Council of Geosciences). Approximate location of the proposed five prospecting application areas is indicated in red. Area 2 = Jaagers Plaat Prospecting Application area.

If fossil remains are discovered during any phase of the proposed prospecting activities, either on the surface or exposed by additional excavations a Chance Find Protocol (which must be included in the Prospecting Work Program) must be implemented by the ECO in charge of the activities. These discoveries must be secured preferably in situ and the ECO must alert SAHRA so that appropriate mitigation (documented and collection) can be undertaken. The specialist would need a collection permit from SAHRA. Fossil material must be curated in an approved collection (museum or university) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

6 CONSIDERATION OF RELATED/SIGNIFICANT ASPECT MANAGEMENT PLANS IN THE AREA;

6.1.1 Previous Heritage Studies in area

A search on the South African Heritage Resources Information System (SAHRIS) has identified Heritage Impact Assessments conducted in and around the study area:

> **Gaigher, S. 2012. Heritage Impact Assessment Report: Proposed Establishment of Several Electricity Distribution Lines within the Northern Cape Province.** The study area covered a large area from Kathu to Kenhardt. .Artefacts associated with the Stone Age as well as historic age were identified in some of the areas investigated. Only a few scattered Late Stone Age artefacts and two possible burial cairns were identified within the overall route corridor area.

Pelser, A. 2012. A Report On A Heritage Impact Assessment (HIA) For A Proposed Photo-Voltaic Solar Power Generation Planton Klein Zwart Bast 188, Kenhardt District, Northern Cape. Escience Associates (PTY) LTD. Eleven Stone Age sites were recorded. Subsequent mitigation of some of sites revealed that the whole area characterized by the dwyka tillite rocks can in fact be seen as a single Stone Age site or landscape.

Fourie, W. 2016. Heritage Scoping Report - Hartebeesleegte Wind Energy Facility (WEF). For SiVest. The study area for this project was located 75km north of Loeriesfontein in the Northern Cape Province. Only one heritage resource was identified, an Historical Farmstead.

Fourie, W. 2017. Heritage Impact Report - Itemba Wind Energy Facility (WEF). For SiVest. The study area for the project was located approximately 62km north of Loeriesfontein in the Northern Cape Province. An historic farmstead and two Late Stone Age stone artefact scatters were identified.

Fourie, W. 2017. Heritage Impact Report - !Xhaboom Wind Energy Facility (WEF). **For SiVest.** The study area for the project was located approximately 62km north of Loeriesfontein in the Northern Cape Province. Three Late Stone Age stone artefact scatters were identified.

Webley L & Halkett, D. 2012. Heritage Impact Assessment: Proposed Kenhardt Photo-Voltaic Solar Power Plant On Remainder Of The Farm Klein Zwart Bast 188, Northern Cape Province. The study area was located to the north of the Kenhardt – Bossiekom District Road, some 40km west of Kenhardt. Stone artefact scatters from the Early Stone Age (ESA) and Middle Stone Age (MSA) were identified, as well as a few possible grave cairns.

7 SPATIAL SENSITIVITY MAPPING;

The desktop-based screening assessment conducted by PGS of the proposed Jaagers Plaats Prospecting Application area, identified several heritage features depicted on the historic topographic maps, as well as further possible heritage features visible on the satellite imagery of the study area. These features are discussed below.

7.1 Heritage Sensitivities identified during Desktop Studies

Examination of various sources (historical topographical maps, satellite imagery and information from previous HIA reports covering the surrounding area, provided information on possible heritage resources existing in the study area. This information has been combined to produce a heritage sensitivity map for the project (**Figure 8**).

By superimposition and analysis, it was possible to rate these structure/areas according to age and thus their level of protection under the NHRA. Note that these structures refer to possible tangible heritage sites as listed in **Table 1**.

Objects depicted include structures representing homesteads, farmsteads, kraals and possible graves. Observation of the previous heritage reports has shown that Stone Age artefact scatters are in quite common abundance in the surrounding areas. This factor needs to be held in consideration regarding any of the alternatives.

Heritage sensitivities

The evaluation of the possible heritage resource types and their heritage significance together with mitigation requirements, was linked to types of landscape. This enabled the development of a heritage sensitivity map. These landforms do not indicate no-go areas, but the possibility of finding heritage significant sites that could require mitigation work.

Land forms include drainage areas, dunes, river terraces, ridges and mountain areas, and pans and are in most cases associated with Stone Age finds and settlements.

Possible finds

Evaluation of satellite imagery has indicated areas that may be sensitive from a heritage perspective. The analysis of the studies conducted in the area assisted in the development of the landform type to heritage find matrix in **Table 1**.

7.2 Archaeological and heritage potential

The information from previous heritage studies undertaken in the greater area of the Aggeneys region in addition to the topographic map information, shows that the following types of heritage resources are possible within the Jaagers Plaats Application Area.

7.2.1 Archaeological resources

Most of the previous studies conducted in the general area identified artefacts associated with the Stone Age. The occurrences ranged from single artefact find spots to low or medium density artefact scatters (Gaigher 2012; Pelser 2012, Fourie 2017; Webley & Halkett 2012).

7.2.2 Historical structures and graves or burial grounds

Several previous heritage studies undertaken in the area did identify a few isolated historical structures or farmsteads and graves or burial grounds that date to the historical period (Fourie 2016; Fourie 2017; Webley L & Halkett, D. 2012). This is in addition to the structures depicted on the historic topographic map sheets dating to 1972 and 1973.

Table 1 - Tangible heritage site in the study area

Name	Description	Legislative protection
Architectural Structures	Possibly older than 60 years	NHRA Sect 3 and 34
Burial grounds	Graves	NHRA Sect 3 and 36 and MP Graves Act
Archaeological finds	Such as stone age sites	NHRA Sect 35

7.3 Identification of Areas of Potential Heritage Sensitivity (excluding palaeontology)

All the relevant sources of heritage information used in this study have been summarised in a heritage sensitivity map. This map provides a zoned depiction of the study area wherein areas of heritage sensitivity are indicated (See **Figure 8**).

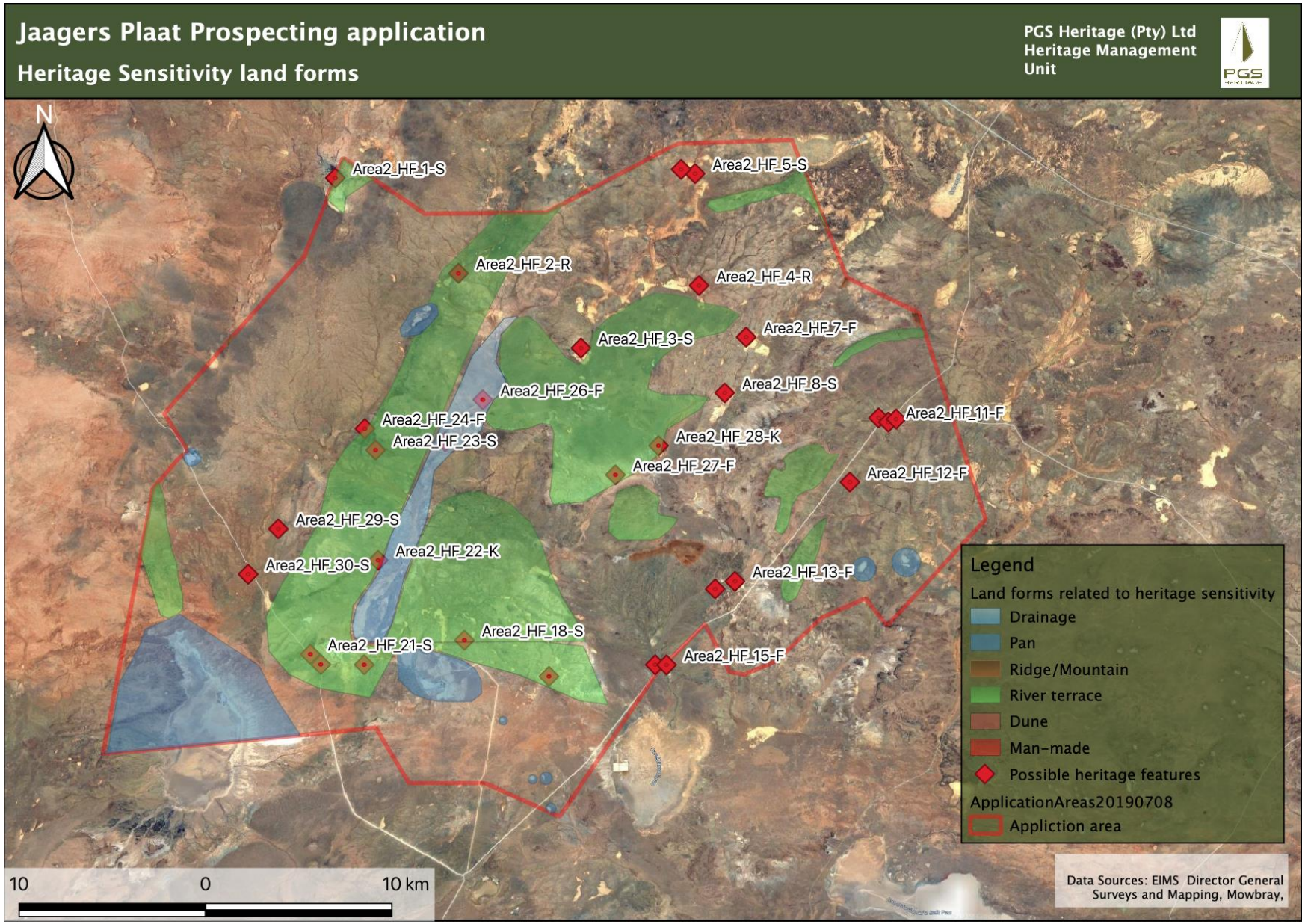

Figure 8: Heritage sensitivity map. Identified structures with a 100m buffer are depicted.

7.3.1 Palaeontology

A desktop study of the palaeontology of the study area was commissioned from Banzai Environmental. This study identified the Jaagers Plaat application area as underlain by geological formations rated as having varied palaeontological sensitivity, from Insignificant, through Low, to Moderate with some areas of High and Very High sensitivity.

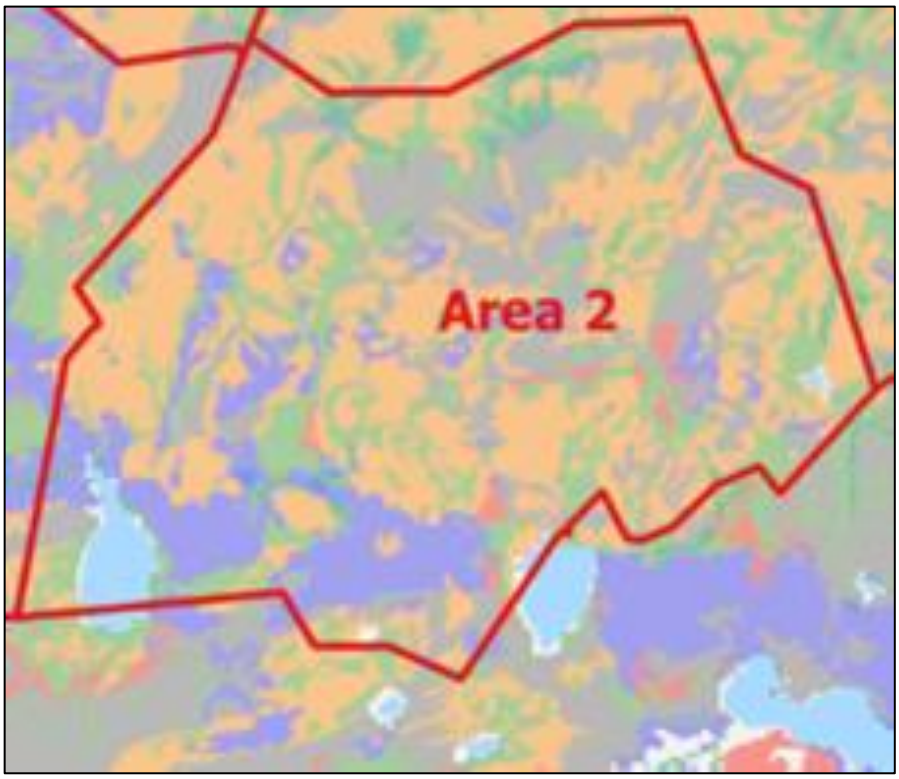

Figure 9: The SAHRIS Palaeosensitivity map indicates that the Jaagers Plaat application area is underlain by geological formations rated as having varying palaeontological sensitivity, from white/grey (Insignificant), to Blue (Low), to Green (Moderate), to Yellow (High) and some Red (Very High).

As the proposed activities are prospecting activities with no bulk sampling, at this stage a protocol for finds is required. This will apply to the whole study area.

8 TECHNICAL DETAILS OF THE PROJECT

8.1 Technical Project Description

The applicant, Black Mountain Mining (Pty) Ltd, is applying for a prospecting right in order to ascertain if economically viable mineral deposits exist within the application area for the following: ferrous & base metals (Zinc Ore, Lead Ore, Copper Ore, Iron Ore & Manganese Ore) and all associated metals and minerals, precious metals (Gold Ore, Silver Ore) and all associated metals and minerals. Both non-invasive and invasive prospecting techniques will be utilized. The target

geological formation is the Bushmanland Group. The application will follow a phased approach, and project is divided into several sequential phases. The different phases and timeframes of the prospecting envisaged are, by their nature, dependent on the results obtained during the preceding phases of prospecting. The project will include the use of Non-Invasive and Invasive prospecting techniques.

- Non-Invasive Prospecting Techniques: The project will include the following non-invasive activities:
    - Desktop Study/Literature review
    - Geological Field Mapping
    - Semi-Ground Geophysical Mapping
    - Compilation, Interpretation and Modelling of Data
    - Detailed Ground Geophysical Survey on individual positively mineralized targets to define possible extent
    - Analytical Desktop Pre-Feasibility Study
- Invasive Prospecting Techniques: Invasive techniques that will be utilized during prospecting include the following:
    - Exploration Boreholes
    - Boreholes to confirm continuity of mineralization & potential deposit size
    - Resource Definition Drilling

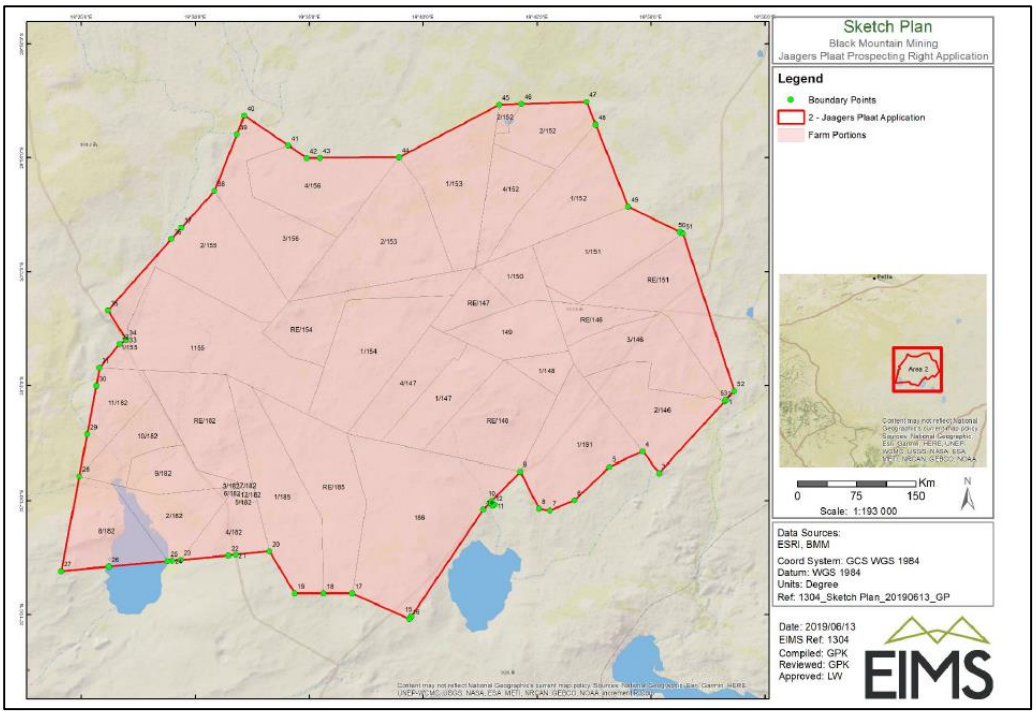

Figure 10: Plan showing the overall study area boundaries for the Jaagers Plaat application area (from EIMS)

9 ASSESSMENT METHODOLOGY

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

9.1 Methodology for Assessing Heritage Site significance

This HIA report was compiled by PGS for the proposed Jaagers Plaat Prospecting Right application. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the NEMA (no 107 of 1998). The HIA process consisted of two steps:

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

Step II – The final step involved the initial assessment of potential heritage resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations

Impacts on the potential heritage resources by the development will be evaluated in terms of the EIMS impact assessment methodology. The heritage significance assessment can only be undertaken at the level of a field-based study.

9.2 Methodology for Impact Assessment

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

9.2.1 Determination of Environmental Risk

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

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

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

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

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 2.

Table 2: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 3.

Table 3: Probability Scoring

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

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

ER= C x P

Table 4: Determination of Environmental Risk

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

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 5.

Table 5: Significance Classes

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

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

9.2.2 Impact Prioritisation:

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

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

In addition, it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.
In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 6: Criteria for Determining Prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 11. The impact priority is therefore determined as follows:

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to **Table 7**).

Table 7: Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

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

Table 8: Final Environmental Significance Rating

Environmental Significance Rating	
Value	**Description**
< 10	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥10 <20	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 20	High (i.e. where the impact must have an influence on the decision process to develop in the area).

10 ASSESSMENT OF POTENTIAL HERITAGE IMPACTS UTILISING THE EIMS IMPACT ASSESSMENT METHODOLOGY

10.1 Impact assessment

The identified heritage resources are allocated a sensitivity buffer based on the recognised management buffers accepted by SAHRA in the past few years. No regulations in the NHRA provide guidelines on buffer zones. In the case of heritage sensitivity, a buffer of 30 – 50 meters is proposed based on the type of heritage resource. In the case of burial grounds and graves (BGG) a buffer of 50 meters is generally proposed and 30 meters for a heritage structure such as ruins and other built structure.

10.1.1 Impact assessment tables

Implementing the impact assessment methodology as supplied by EIMS the following tables provide a quantitative assessment of the impacts of the proposed prospecting activities on the Jaagers Plaat Prospecting Application area.

Table 9: Projected impact on burial grounds and graves

Impact Name	**Impact on burial grounds and graves**				
Alternative	**0**				
Phase	**Planning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	2

Extent of Impact	1	1	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	2	1
Environmental Risk (Pre-mitigation)					-6,00
Mitigation Measures					
No evidence of graves was obtained from the desktop study. However, However, it is possible that unknown burial grounds and graves are present.					
Environmental Risk (Post-mitigation)					-3,25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					3
The impact may result in the irreplaceable loss of resources of high value (services and/or functions).					
Prioritisation Factor					1,33
Final Significance					-4,33

The impact of the proposed activities on burial grounds and graves is rated as LOW negative significance before mitigation, but with the implementation of the required mitigation measures the post-mitigation impact would be LOW negative.

Table 10: Projected impact on structures older than 60 years

Impact Name	**Impact on structures older than 60 years**				
Alternative	**0**				
Phase	**Planning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	1	1	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	2	1
Environmental Risk (Pre-mitigation)					-7,00
Mitigation Measures					
Any structures that could be 60 years or older should be avoided with a buffer zone of at least 30m to prevent any damage or destruction as required by s34 of the NHRA					
Environmental Risk (Post-mitigation)					-3,25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1,17
Final Significance					-3,79

The impact of the proposed prospecting activities on potential historical structures is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

Table 11: Projected impact on palaeontological resources

Impact Name	**Impact on palaeontological resources**				
Alternative	**Alternative 1**				
Phase	**Planning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	2
Extent of Impact	1	1	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	4	1
Environmental Risk (Pre-mitigation)					-15,00
Mitigation Measures					
If fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the ECO in charge of these developments. These discoveries ought to be secured (preferably in situ) and the ECO ought to alert SAHRA so that appropriate mitigation (e.g. documented and collection) can be undertaken by a professional palaeontologist.					

Environmental Risk (Post-mitigation)	-3,25
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikley that the impact will result in spatial and temporal cummulative change.	
Degree of potential irreplaceable loss of resources	3
The impact may result in the irreplacable loss of resources of high value (services and/or functions).	
Prioritisation Factor	1,33
Final Significance	-4,33

The impact of the proposed activities on palaeontological resources is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

Table 12: Projected impact on archaeological resources

Impact Name	**Impact on archaeological resources**				
Alternative	**0**				
Phase	**Planning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	1	1	Reversibility of Impact	5	5
Duration of Impact	5	5	Probability	2	1
Environmental Risk (Pre-mitigation)					-7,00
Mitigation Measures					
If stone artefacts are discovered during any phase of the proposed prospecting activities, either on the surface or exposed by additional excavations the Chance Find Protocol (which must be included in the Prospecting Work Program) must be implemented by the ECO in charge of the activities. As required by s35 of NHRA.					
Environmental Risk (Post-mitigation)					-3,25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					2
The impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.					
Prioritisation Factor					1,17
Final Significance					-3,79

The impact of the proposed project on potential archaeological resources is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

11 HERITAGE MANAGEMENT PLAN

NO.	MITIGATION MEASURES	PHASE	TIMEFRAME	RESPONSIBLE PARTY FOR IMPLEMENTATION	MONITORING PARTY (FREQUENCY)	TARGET	PERFORMANCE INDICATORS (MONITORING TOOL)
Potential Heritage Resources to be implemented during invasive prospecting activities							
Burial Grounds and graves	Demarcate sites with a 50-meter buffer and avoid them.	Planning/ Prospecting	Planning/ Prospecting	Applicant ECO	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA	ECO Monthly Checklist/Report
Historical structures	• The sites should be avoided with at least a 30 m buffer if activities should occur near them. • If any other heritage resources are identified SAHRA should be contacted and a qualified archaeologist appointed to evaluate the structures and make appropriate recommendation on mitigation	Planning/ Prospecting	Planning/ Prospecting	Applicant ECO	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34 and 38 of NHRA	ECO Monthly Checklist/Report
Palaeontology	• The EAP and ECO must be notified that the whole study area has a High Palaeontological Sensitivity. A "Chance Find Protocol" must be implemented during the proposed prospecting activities and incorporated in the PWP of this project.	Planning/ Prospecting	Planning/ Prospecting	Applicant ECO Palaeontologist	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35 and 38 of NHRA	ECO Monthly Checklist/Report
Archaeology	• When physical prospecting is planned an archaeologist must first visit and assess the areas of impact and make recommendations on any finds made. • A "Chance Find Protocol" must be implemented during the	Planning/ Prospecting	Planning/ Prospecting	Applicant ECO Archaeologist	Applicant ECO	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35 and 38 of NHRA	ECO Monthly Checklist/Report

NO.	MITIGATION MEASURES	PHASE	TIMEFRAME	RESPONSIBLE PARTY FOR IMPLEMENTATION	MONITORING PARTY (FREQUENCY)	TARGET	PERFORMANCE INDICATORS (MONITORING TOOL)
	proposed prospecting activities and incorporated in the PWP of this project.						

12 CONCLUSIONS AND RECOMMENDATIONS

The desktop heritage impact assessment identified various potential heritage resources within the study area, including burial grounds and graves, historical structures, palaeontological resources and archaeological resources that could be impacted during invasive prospecting activities.

12.1 Burial grounds and graves

No burial grounds or graves are depicted on the historical topographic maps for the study area. However, it is possible that unknown burial grounds and graves are present. Burial grounds and graves have high heritage significance and are given a Grade IIIA significance rating in accordance with the system described in Section 9.1 of this document.

The impact of the proposed activities on burial grounds and graves is rated as LOW negative significance before mitigation, but with the implementation of the required mitigation measures the post-mitigation impact would be LOW negative.

12.2 Historical Structures

The impact of the proposed prospecting activities on potential historical structures is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

Any identified historical structures should be avoided with a buffer of 30m to avoid damage during the prospecting activities.

12.3 Palaeontology

Banzai Environmental was appointed to do a Palaeontological Desktop Assessment and found that:
The proposed prospecting application area is mainly underlain by the Kalahari and Prins Albert Formations with isolated outcrops of Karoo Dolerite and Whitehill Formation.

According to the PalaeoMap of South African Heritage Resources Information System the Palaeontological Sensitivity of the Kalahari Group is low, the igneous rocks of the Bushmanland and Karoo Dolerite is insignificant or zero while the Ecca sediments of the Karoo Supergroup have a high Paleontological Sensitivity. According to the Impact Tables, the Application area of Jaagers Plaat have a Medium Sensitivity.

In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent. The impact of the proposed activities on palaeontological resources is rated as MODRATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

In the event that fossil remains are discovered during any phase of the proposed prospecting activities, the Chance Find Protocol must be implemented by the ECO in charge of these developments.

12.4 Archaeology

Previous studies conducted in the surroundings of the study area have identified a number of archaeological sites. These include Stone Age (ESA, MSA and LSA) sites including find spots, surface scatters and rock art sites.

The impact of the proposed project on potential archaeological resources is rated as MODERATE negative significance before mitigation and with the implementation of the mitigation measures the impact significance is reduced to LOW negative.

When physical prospecting is planned an archaeologist must first visit and assess the areas of impact and make recommendations on any finds made.

In the event that archaeological artefacts are discovered during any phase of the proposed prospecting activities, the Chance Find Protocol must be implemented by the ECO in charge of these developments.

12.5 General

It is our considered opinion that the overall impact of the development, on the potential heritage resources identified during this report, is seen as acceptably low after the recommendations have been implemented and therefore, impacts can be mitigated to acceptable levels allowing for the development to be authorised.

In the event that heritage resources are discovered during site clearance, construction activities must stop and a qualified archaeologist must be appointed to evaluate and make recommendations on mitigation measures.

13 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

- This Heritage report is only applicable to the proposed Jaagers Plaat Prospecting Apoplication area as depicted in **Figure 2** and **Figure 3** above;
- This report only provides a high-level desktop / strategic screening of potential heritage risk areas;
- The recommendations and conclusions regarding the assessment of the potential impacts will require confirmation by a detailed field-based survey, which is still to be undertaken as part of the HIA/EIA process.
- Specifically, it should be noted that some of the heritage sites noted that are depicted on the historical topographic maps may no longer exist due to past disturbance and that there may be grave and burial ground sites that are not depicted on the historic maps which will be identified only by the subsequent field study.
- Therefore, should any heritage features and/or objects be located or observed outside the identified heritage sensitive areas during the prospecting activities, a heritage specialist must be contacted immediately.
- Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.

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ANNEXURE A – CV

WOUTER FOURIE

Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

Summary of Experience

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

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave "rescue" excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
- Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
- Involvement with various Heritage Impact Assessments, outside South Africa, including -
- Archaeological Studies in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation project in DRC

Key Qualifications

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

Principal Investigator - Grave Relocations

Field Director – Iron Age

Field Supervisor – Colonial Period and Stone Age

Accredited with Amafa KZN

Key Work Experience

2003- current - Director – Professional Grave Solutions (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mozambique and the Democratic Republic of the Congo

PROFESSIONAL CURRICULUM: JENNIFER KITTO

Name:	Jennifer Kitto
Profession:	Heritage Specialist
Date of Birth:	1966-09-11
Parent Firm:	PGS Heritage (Pty) Ltd
Position in Firm:	Heritage Consultant
Years with Firm:	8 Years
Years experience:	20
Nationality:	South African
HDI Status:	White Female

EDUCATION:

Name of University or Institution:	Dorset Institute for Higher Education (now Bournemouth University), Poole, United Kingdom
Degree obtained:	**:**Higher National Diploma: Practical Archaeology
Year	**:**1989

Name of University or Institution	**:** University of the Witwatersrand
Degree obtained	**:** BA
Major subjects	**:**Archaeology and Social Anthropology
Year	**:**1993

Name of University or Institution	**:**University of the Witwatersrand
Degree obtained	**:** BA [Hons]
Major subjects	**:**Social Anthropology
Year	**:** 1994

Professional Qualifications:

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

Languages:

English First Language

Afrikaans - Speaking (Fair) Reading (Fair), Writing (Fair**)**

KEY QUALIFICATIONS

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

SUMMARY OF EXPERIENCE

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

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
- Heritage Audits and subsequent Compilation of Heritage Management Policy for various projects

HERITAGE ASSESSMENT PROJECTS

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

- Heritage Screening Reports for Various Road Routes: Bronkhorstspruit, Carletonville and Randfontein and Eikenhof-Vaal Dam regions, Gauteng Department of Roads and Transport, Gauteng Province
- Heritage Audit and Management Policy, Sibanye Gold, Beatrix Mining area, Lejweleputswa District Municipality, Free State Province
- Heritage Audit and Management Policy, Sibanye Gold, Kloof and Driefontein Mining areas, West Rand District Municipality, Gauteng Province
- HIA Report, Dolos-Giraffe Substation, Hopefield-Bultfontein, Free State Province
- HIA Report and Phase 2 Mitigation Report, AEL Mining Services, Decontamination of AEL Detonator Campus, Modderfontein Factory, Modderfontein, City of Johannesburg Metropolitan Municipality, Gauteng
- HIA Report, Old Rand Leases Hostel redevelopment, Fleurhof Ext 10, Roodepoort, City of Johannesburg Metropolitan Municipality, Gauteng
- HIA Report, Watershed Substation, North-West Province
- HIA Report, Solid Waste Landfill Facility, Rhodes Village, Eastern Cape
- HIA Report, Solid Waste Landfill Facility, Rossouw, Eastern Cape
- Phase 2 Mitigation Report, Cass Farmstead, Optimum Colliery, Mpumalanga
- HIA Report, Kusile Ash Disposal Facility, Witbank, Mpumalanga
- Report on Rand Steam Laundries Background History, City of Johannesburg Metropolitan Municipality, Gauteng
- New Cemetery, Barkly East, Senqu Municipality, Eastern Cape (desktop/archival research for HIA report)
- Lady Slipper Country Estates, Nelson Mandela Metro Municipality, Eastern Cape (desktop/archival research for HIA report)

- Exxaro Resources Paardeplaats Project, Belfast, Mpumalanga (field survey and archival research for HIA report)
- Copperleaf Mixed Use Development, Farm Knoppieslaagte 385/Knopjeslaagte 140, Centurion, Gauteng (field survey and archival research for HIA report)
- Isundu-Mbewu Transmission Line Project, Pietermaritzburg, Kwazulu Natal (Initial Heritage Scan (survey) for Corridor 3 Alternative 1)

GRAVE RELOCATION PROJECTS

Below, a selection of grave relocation projects involvement:

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

EMPLOYMENT SUMMARY:

Positions Held

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

METHODOLOGY FOR IMPACT ASSESSMENT

Method of Assessing Impacts:

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

Determination of Environmental Risk

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

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

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

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

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in .Table 1.

Table 13: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),

Aspect	Score	Definition
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per ***Table 2.***.

Table 2: Probability Scoring

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

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

ER= C x P

Table 3: Determination of Environmental Risk

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

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 4.

Table 4: Significance Classes

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

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

Impact Prioritisation:

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

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

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

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

Table 5: Criteria for Determining Prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.

Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

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

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to **Table 6**).

Table 6: Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

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

Table 7: Final Environmental Significance Rating

Environmental Significance Rating	
Value	**Description**
< 10	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
≥10 <20	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 20	High (i.e. where the impact must have an influence on the decision process to develop in the area).