



PGS HERITAGE

**PROPOSED KUSASALETHU RETURN WATER AND BACKFILL
PIPELINES, IN THE MERAFAONG LOCAL MUNICIPALITY, GAUTENG
PROVINCE, SOUTH AFRICA.**

Heritage Impact Assessment

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REVISION HISTORY

Version	Issue Date	Description of Changes
001	11 April 2023	First draft

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Declaration of Independence

- I, Nikki Mann, 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;

HERITAGE CONSULTANT:

PGS Heritage (Pty) Ltd

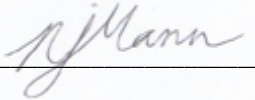
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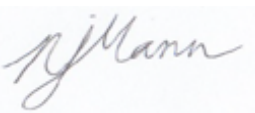

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ACKNOWLEDGEMENT OF RECEIPT

Report Title	<i>PROPOSED KUSASALETHU RETURN WATER AND BACKFILL PIPELINES, IN THE MERA FONG LOCAL MUNICIPALITY, GAUTENG PROVINCE, SOUTH AFRICA.</i>		
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Author	Nikki Mann		Archaeologist – PGS Heritage
Reviewed	Wouter Fourie		Archaeologist/Heritage Specialist/ Project Manager – PGS Heritage
Reviewed			Client

CLIENT: Environmental Impact Management Services Consulting (Pty) Ltd

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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 iii of Report – Contact details and company
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to Appendix A
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page iii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
(cA) An indication of the quality and age of base data used for the specialist report	Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 4, 5
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3, 4
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3
(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;	N/A
(g) An identification of any areas to be avoided, including buffers	N/A
(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;	N/A
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(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 5, 6
(k) Any mitigation measures for inclusion in the EMPr	Section 8
(l) Any conditions for inclusion in the environmental authorization	Section 8
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorization	Section 8
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 9
(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 9
(o) A description of any consultation process that was undertaken during the course of carrying out the study	
(p) A summary and copies if any comments that were received during any consultation process	Not applicable.
(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

EXECUTIVE SUMMARY

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PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services Consulting (Pty) Ltd (EIMS), on behalf of Harmony Gold Mining Company Limited (Harmony), to undertake a Heritage Impact Assessment (HIA), which forms part of the environmental process for the proposed Kusasaletu Return Water and Backfill Pipelines, in the Merafong Local Municipality, Gauteng Province, South Africa.

This HIA aims to evaluate the possible impacts on heritage resources present within the proposed development footprint of the Pipeline Project for Harmony. Immediate and direct impacts on archaeological and palaeontological resources were addressed through the HIA.

Site Name and Location

The proposed development is located within the Merafong Local Municipality, West Rand District Municipality, approximately 3km from Carletonville, Gauteng Province.

The estimated distance of the three proposed pipelines is 7 750 metres (~ 7.75 km). All proposed pipelines will be steel and flanged pipes installed on prefabricated concrete plinths above ground. Furthermore, the proposed pipelines will be installed within existing pipeline corridors and road reserves, as well as within historically impacted (i.e., disturbed) areas.

Fieldwork

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was undertaken by way of a combination of vehicle and pedestrian access through the proposed project area. The fieldwork was conducted by one archaeologist (Nikki Mann) and one field assistant (Xander Fourie) from PGS on 22 March 2023. Throughout the fieldwork, hand-held GPS devices were used to record tracklogs showing the routes followed by the fieldwork team. It is important to note that although as intensive a fieldwork coverage as possible was undertaken, sections of the study area are in areas which are more densely overgrown and/or disturbed, which limited visibility in those areas of the study area. **No archaeological sites, burial grounds, or graves were identified during the field work.**

Palaeontology

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas are mostly rated as high (orange) (**Figure 24**). A desktop study is required and based on the outcome of the desktop study, a field assessment may be necessary (Almond and Pether 2008, SAHRIS website).

Impact Assessment

No evidence for any archaeological or heritage sites could be identified within the environs of the study area. As a result, no impact is expected from the proposed development on heritage.

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Mitigation measures

With no impact expected on heritage, no further mitigation is required. Refer to **Section 8** of this report.

General

It is the considered opinion of the authors of this report that the overall impact of the proposed development on heritage resources will be Low. Provided that the general recommendations and mitigation measures outlined in this report are implemented, the impact would be acceptably Low or could be totally mitigated to the degree that the project could be approved from a heritage perspective. The management and mitigation measures as described in section 8 of this report have been developed to minimise the project impact on heritage resources.

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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

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

Heritage

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

Heritage resources

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

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

Holocene

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

Late Stone Age

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

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

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

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Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIMS	Environmental Impact Management Services (Pty) Ltd
EMPr	Environmental Management Programme
ESA	Earlier Stone Age
GPS	Global Positioning System
Harmony	Harmony Gold Mining Company Limited
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LCTs	Large Cutting Tools
LSA	Late Stone Age
LIA	Late Iron Age
MPRDA	Mineral and Petroleum Resources Development Act 28 of 2002
MSA	Middle Stone Age
MIA	Middle Iron Age
MWS	Mine Waste Solutions
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No 25 of 1999)
PGS	PGS Heritage (Pty) Ltd
PHRA	Provincial Heritage Resources Authority
PIA	Palaeontological Impact Assessment
PSSA	Palaeontological Society of South Africa
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
TSF	Tailings Storage Facility

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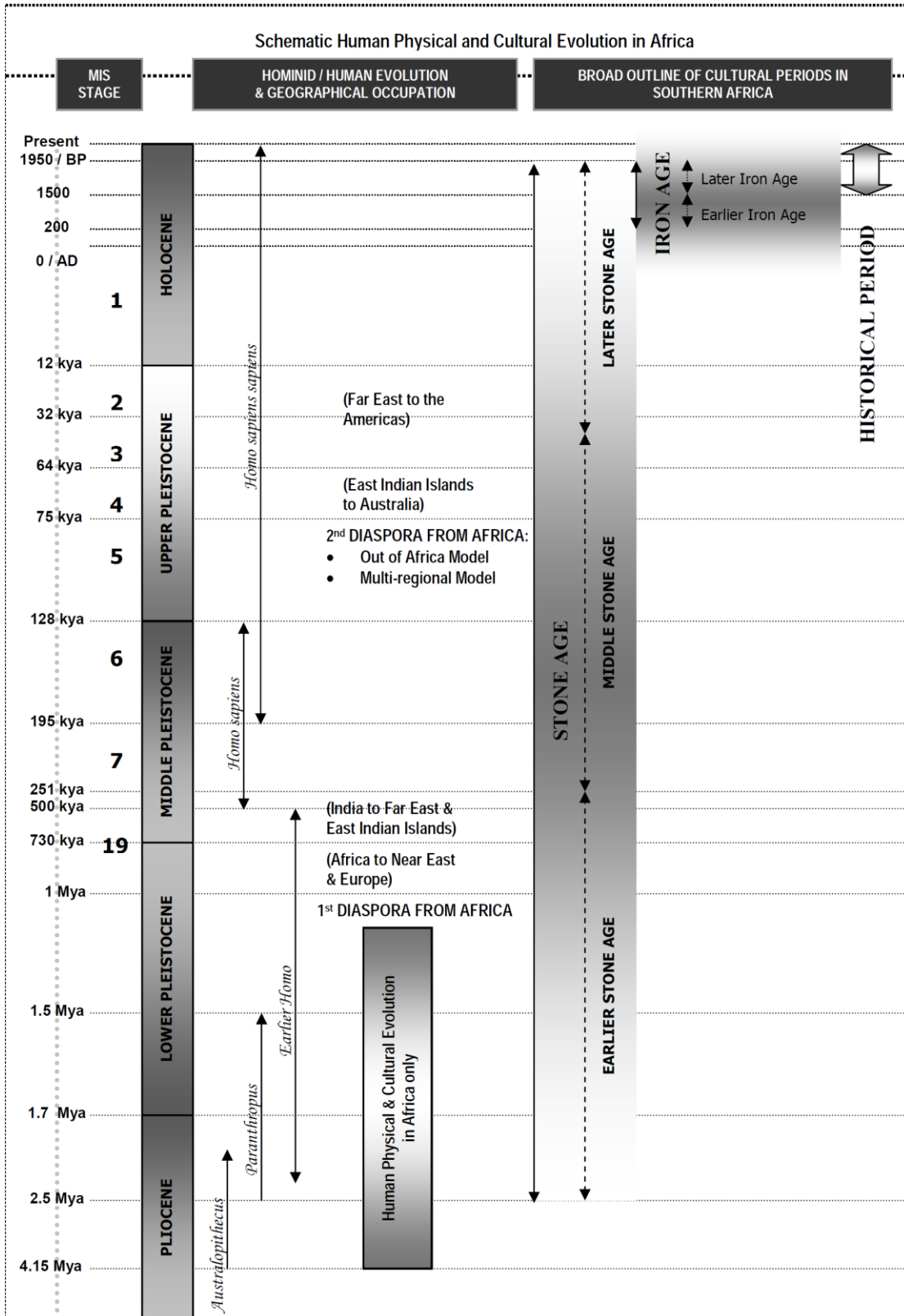


Figure 1 – Human and Cultural Timeline in Africa

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1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services Consulting (Pty) Ltd (EIMS), on behalf of Harmony Gold Mining Company Limited (Harmony), to undertake a Heritage Impact Assessment (HIA), which forms part of the environmental process for the proposed Kusasaletu Return Water and Backfill Pipelines, in the Merafong Local Municipality, West Rand District Municipality, approximately 3km from Carletonville, Gauteng Province.

1.1 SCOPE OF THE STUDY

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

1.2 SPECIALIST QUALIFICATIONS

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

The staff at PGS has a combined experience of nearly 90 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

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

Nikki Mann, the author of this report, is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA). She has 4 years of experience in the heritage assessment field and holds a Master's degree (MSc) in Archaeology from the University of Cape Town.

1.3 ASSUMPTIONS AND LIMITATIONS

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the

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subterranean nature of some archaeological sites and existing vegetation cover. It should be noted that for the most part, the study area was accessible for the fieldwork survey. Fieldwork was also focussed on area that was not previously ploughed or disturbed by farming activity, thus focussing on areas with the highest potential to yield heritage resources. It should be noted that there were a few sections of study area that could not be surveyed due to dense vegetation cover.

Therefore, should any heritage features and/or objects be located or observed outside the identified heritage sensitive areas during the construction 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. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

The study area boundaries and development footprints depicted in this report were provided by the client. As a result, these were the areas assessed during the fieldwork. Should any additional development footprints located outside of these study area boundaries be required, such additional areas will have to be assessed in the field by an experienced archaeologist/heritage specialist long before construction starts.

1.4 LEGISLATIVE CONTEXT

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

- Notice 648 of the Government Gazette 45421- general requirements for undertaking an initial site sensitivity verification where no specific assessment protocol has been identified
- National Environmental Management Act (NEMA), Act 107 of 1998 – Appendix 6
- National Heritage Resources Act (NHRA), Act 25 of 1999

1.4.1 NOTICE 648 OF THE GOVERNMENT GAZETTE 45421

Although minimum standards for archaeological (2007) and palaeontological (2012) assessments were published by SAHRA, GN.648 requires sensitivity verification for a site selected on the national web based environmental screening tool for which no specific assessment protocol related to any theme has been identified. The requirements for this Government Notice (GN) are listed in **Table 1** and the applicable section in this report noted.

Table 1 - Reporting requirements for GN648

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GN 648	Relevant section in report	Where not applicable in this report
2.2 (a) a desktop analysis, using satellite imagery;	Section 5	
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web-based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	Section 3	-
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web-based environmental screening tool;	Section 3	-
2.3(b) contains motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity;	Section 3	-

An assessment of the Environmental Screening tool provides the following sensitivity rating for archaeological and heritage resources that fall within the proposed area as Low (**Figure 2**), while palaeontological resources are rated as High (**Figure 3**).

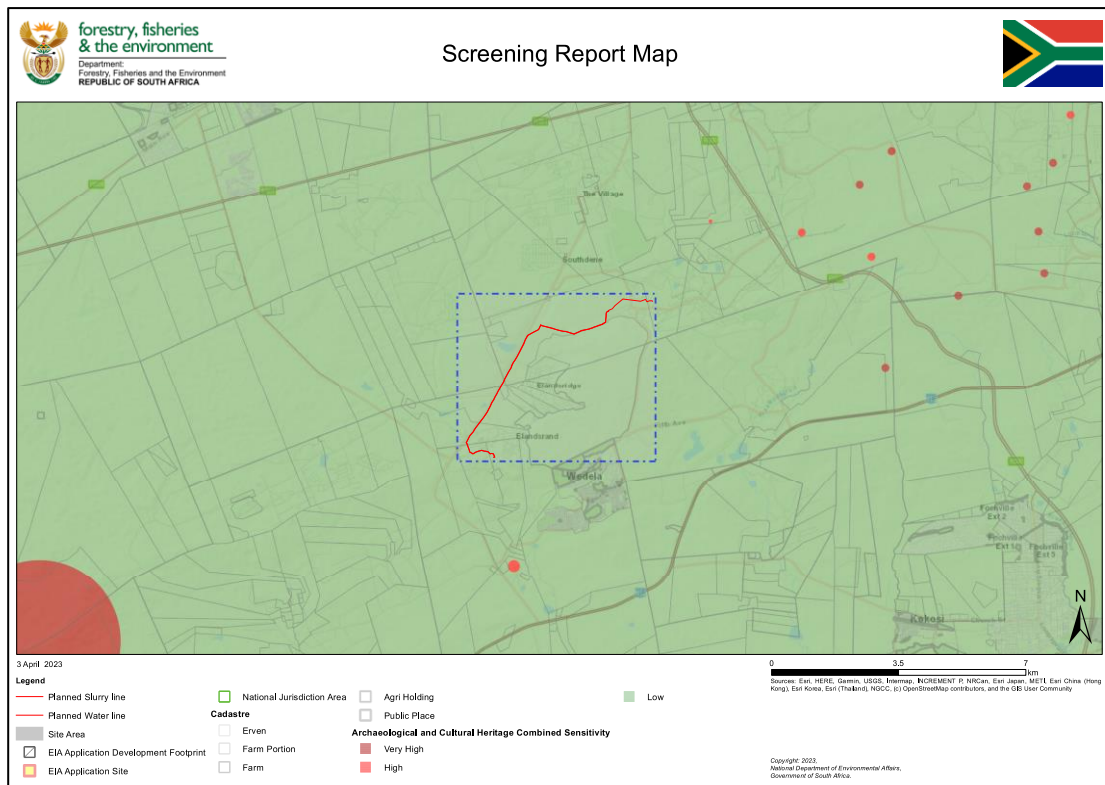


Figure 2 - Environmental screening tool's depiction of the archaeological and heritage sensitivity of the study area and surroundings.

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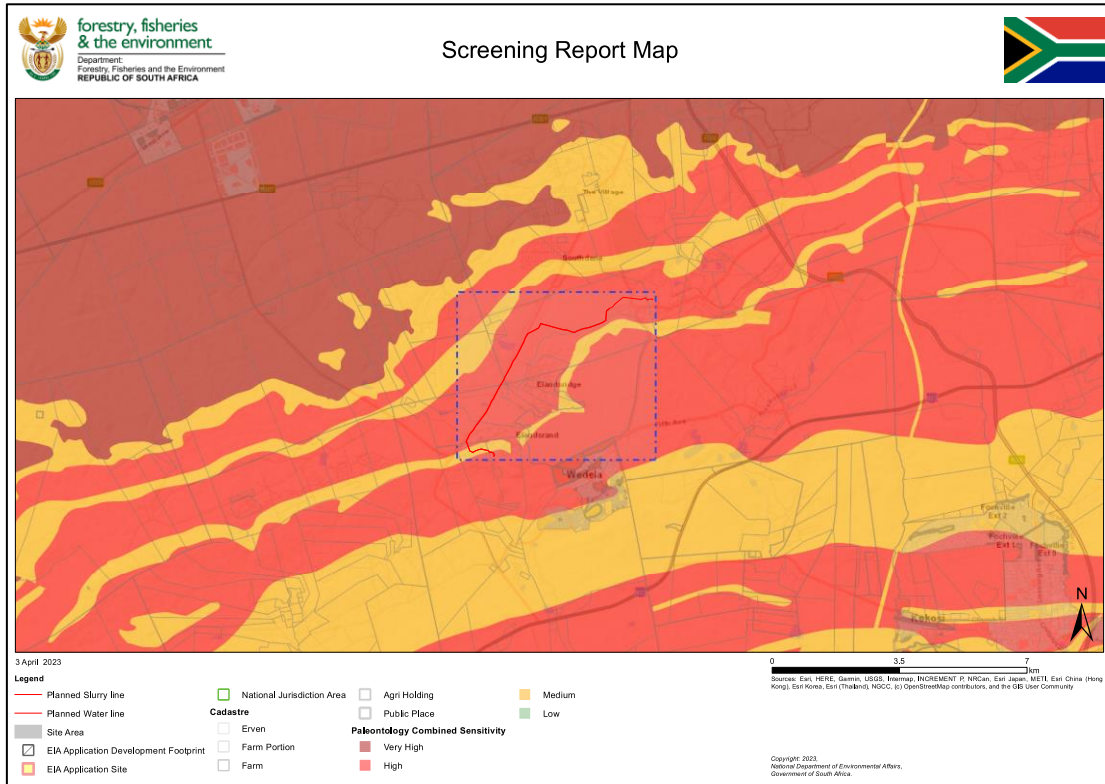


Figure 3 - Environmental screening tool's depiction of the palaeontological sensitivity of the study area and surroundings.

1.4.2 NEMA – APPENDIX 6 REQUIREMENTS

The HIA report has been compiled considering the NEMA Appendix 6 requirements for specialist reports as indicated in the table below. For ease of reference, the table below provides cross-references to the report sections where these requirements have been addressed.

1.4.3 THE NATIONAL HERITAGE RESOURCES ACT

- National Heritage Resources Act (NHRA) Act 25 of 1999
 - Protection of Heritage Resources – Sections 34 to 36; and
 - Heritage Resources Management – Section 38

The NHRA is utilized as the basis for the identification, evaluation, and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of NHRA. This study falls under s38(8) and requires comment from the relevant heritage resources authority.

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2 SITE LOCATION AND DESCRIPTION

2.1 LOCALITY

Coordinates for Study Area	Northernmost point: S -26.421366 E 27.392107	Easternmost point: S -26.422006 E 27.399391
	Southernmost point: S -26.456557 E 27.360015	Westernmost point: S -26.453322 E 27.353272
Location	<p>The proposed development is located within the Merafong Local Municipality, West Rand District Municipality, approximately 3km from Carletonville, Gauteng Province (Figure 4).</p> <p>The proposed pipelines will be installed within existing pipeline corridors and road reserves, as well as within historically impacted (i.e., disturbed) areas.</p>	
Property	<p>Portions of the farms:</p> <ul style="list-style-type: none"> ▪ Farm Blyvooruitzicht 116-IQ ▪ Farm Doornfontein 118 IQ ▪ Farm Buffelsdoorn 143 IQ 	
Topographical Map	2627AD Carletonville	
Extent	The estimated distance of the three proposed pipelines is 7 750 metres (~ 7.75 km).	

The following infrastructure is encountered in the region of the areas surveyed:

- National road (N12)
- Provincial roads (R501, R500)
- Mining infrastructure (incl. existing pipelines)
- Power lines
- Local roads (tar and informal)

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Figure 4 - Locality map depicting the regional context of the study area.

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2.2 PROJECT BACKGROUND

- Kusasaletu is a mature, deep-level mine 90km west of Johannesburg, near the Gauteng-North West provincial border in the West Rand Region. The current life of mine is estimated at three years that extends past the Kusasaletu Gold Plant's life of mine that currently supplies backfill to the mine for support to the underground mining structures.
- Kusasaletu Gold Plant going into care and maintenance necessitated the need to find an alternative source of backfill material for the mine for the remaining life of mine. Harmony's Savuka Gold Plant (SGP) was identified as possible source as it deposits its tailings on the Savuka TSF Complex not far from Kusasaletu mine.
- SGP has been identified as the feasible source of backfill for the Kusasaletu Mine and backfill will be pumped from the SGP to Kusasaletu Plant via two (2) backfill pipelines (1 x duty and 1 x standby) on an intermitted basis.
- Once the batch of backfill is pumped, the pipeline will be flushed with water, this water will be captured at Kusasaletu Plant and return to SGP via a single (1) return water pipeline.

2.3 PROJECT DESCRIPTION

The applicant is planning to construct the following:

- Two (2) new backfill pipelines (1 x duty and 1 x standby). The estimated daily volume of backfill that will be pumped to Kusasaletu Plant will be $\pm 1\ 100$ tons. The backfill pipelines will have an inside diameter (ID) of 200 mm and flow rate of between 36 l/s and 40 l/s.
- One (1) new return water The return water pipeline will also have an ID of 200 mm and flow rate of between 15 l/s and 20 l/s and daily volume of water pumped to SGP is estimated at 186 000 litres.
- The estimated distance of the three pipelines is 7 750 metres (7.75km), and all will be steel and flanged pipes installed on prefabricated concrete plinths above ground.
- The proposed pipelines will be installed within existing pipeline corridors and road reserves as well as historically impacted areas.

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3 CURRENT STATUS QUO

3.1 SITE DESCRIPTION

A site visit was conducted by one archaeologist (Nikki Mann) and one field assistant (Xander Fourie) from PGS on 22 March 2023. As mentioned previously, the study area falls within a landscape that contains pipelines, thus the area can be described as largely disturbed. Parts of the surrounding landscape is used for informal cattle grazing. Other elements of disturbance identified within the study area include farm and provincial roads and other infrastructure associated with the existing pipelines and other mining activities. The likelihood of finding in-situ heritage resources is lessened due to this fact.

The proposed development area is located approximately 3km south of Carletonville, in the Merafong City Local Municipality and the West Rand District Municipality, within the Gauteng Province.

The proposed development areas are within generally flat and open landscapes. Overall, the archaeological ground visibility of the project footprint area could have been due to dense vegetation cover.

In terms of the geology, the study area comprises: Timeball Hill and Rooihogte Formations (Mudrock, quartzite (ferruginous in places), wacke, chert breccia, minor diamictite, conglomerate, shale, magnetic ironstone) and Diabase (Magnesium-rich tholeiite, melanorite) (Council of Geoscience, 2022).

The study area is serviced by the N12, R501 and R500, provincial gravel roads and farm roads. Existing infrastructure includes mine infrastructure, electricity transmission lines, telephone lines, fences and other recent structures.

The general site descriptions and photographs of the proposed development areas are provided as follows:

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Figure 5 – View of existing pipeline infrastructure within a wetland setting.



Figure 6 – View of tall grasses.



Figure 7 – View of general dense vegetation.

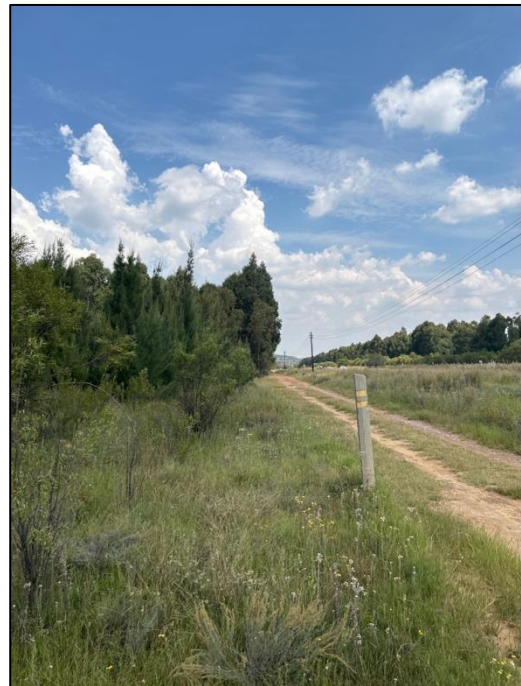


Figure 8 – View of flat landscape.

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Figure 9 – View of grazing land.

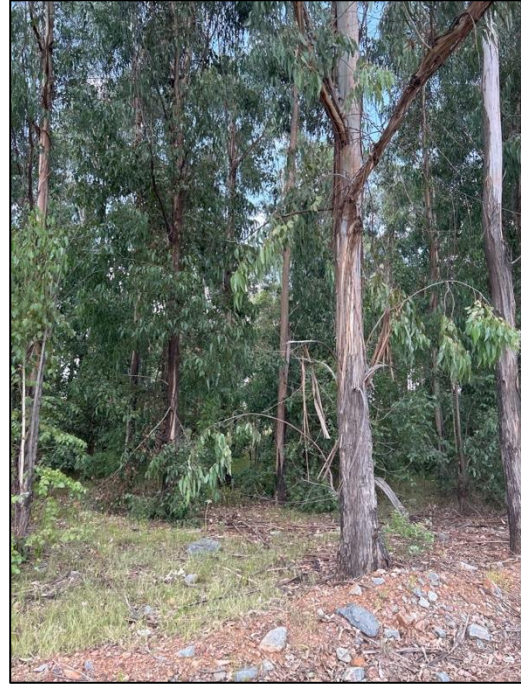


Figure 10 – View of Eucalyptus trees.



Figure 11 - View of the TSF in the north-eastern part of the study area.



Figure 12 – Existing danger signage.

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Figure 13 – View of the existing pipeline in the northern part of the study area.



Figure 14 – View of a public notification poster.



Figure 15 – View of the grassland in the southern part of the study area (looking towards the Harmony Gold Mine).

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3.2 SITE VEGETATION

In terms of vegetation, the study area is located within the **Gauteng Shale Mountain Bushveld**:

The Gauteng Shale Mountain Bushveld vegetation type is described as, “*low, broken ridges varying in steepness and with high surface rock cover. Vegetation is a short (3–6 m tall), semi-open thicket dominated by a variety of woody species including Acacia caffra, Rhus leptodictya, R. magalismontana, Cussonia spicata, Ehretia rigida, Maytenus heterophylla, Euclea crispa, Zanthoxylum capense, Dombeya rotundifolia, Protea caffra, Celtis africana, Ziziphus mucronata, Vangueria infausta, Canthium gilfillanii, Englerophytum magalismontanum, Combretum molle, Ancylobotrys capensis, Olea europaea subsp. africana and Grewia occidentalis. The understorey is dominated by a variety of grasses. Some of the ridges form plateaus above the northern slopes that carry scrubby grassland with high surface rock cover*” (www.sanbi.org).

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4 ASSESSMENT METHODOLOGY

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

4.1 METHODOLOGY FOR ASSESSING HERITAGE SITE SIGNIFICANCE

PGS compiled this HIA report for the proposed pipeline project. The applicable maps, tables and figures are included, as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (No. 107 of 1998). The HIA process consists of three steps:

Step I – Literature Review and initial site analysis: The background information to the field survey relies greatly on the Heritage Background Research which was undertaken through archival research and evaluation of satellite imagery and topographical maps of the study area.

Step II – Physical Survey: A physical survey was conducted by a combination of vehicle and pedestrian access through the proposed project area by one qualified heritage specialist and one field assistant (22 March 2023), aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

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

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

- Site integrity (i.e., primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter)
 - Low - <10/50m²
 - Medium - 10-50/50m²
 - High - >50/50m²
- Uniqueness; and
- Potential to answer present research questions.

Impacts on these sites by the development will be evaluated as follows:

4.1.1 SITE SIGNIFICANCE

Site significance classification standards use is based on the heritage classification of s3 in the NHRA and developed for implementation keeping in mind the grading system approved by SAHRA for archaeological impact assessments. The update classification and rating system as developed by Heritage Western Cape (2021) is implemented in this report

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Site significance classification standards prescribed by the Heritage Western Cape Guideline (2016), were used for the purpose of this report (**Table 2** and **Table 3**).

Table 2 - Rating system for archaeological resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Langebaanweg (West Coast Fossil Park), Cradle of Humankind	May be declared as a National Heritage Site managed by SAHRA. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Highest Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current examples: Blombos, Paternoster Midden.	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Exceptionally High Significance
III	Heritage resources that contribute to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay	Resource must be retained. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree.	Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	Medium Significance
IIIC	Such a resource is of contributing significance.	Resource must be satisfactorily studied before impact. If the recording already done (such as in an HIA or permit application) is not sufficient, further recording or even mitigation may be required.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant or the consultant and approved by the authority.	No research potential or other cultural significance

Table 3 - Rating system for built environment resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance

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Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status. Current examples: St George's Cathedral, Community House	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority.	Exceptionally High Significance
II	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at local level.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement or community.	Like Grade IIIA buildings and sites, such buildings and sites may be representative, being excellent examples of their kind, or may be rare, but less so than Grade IIIA examples. They would receive less stringent protection than Grade IIIA buildings and sites at local level.	Medium Significance
IIIC	Such a resource is of contributing significance to the environs These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.	This grading is applied to buildings and/or sites whose significance is contextual, i.e., in large part due to its contribution to the character or significance of the environs. These buildings and sites should, as a consequence, only be regulated if the significance of the environs is sufficient to warrant protective measures, regardless of whether the site falls within a Conservation or Heritage Area. Internal alterations should not necessarily be regulated.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant and approved by the authority. Section 34 can even be lifted by	No research potential or other cultural significance

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Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
		HWC for structures in this category if they are older than 60 years.	

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5 HISTORICAL AND ARCHAEOLOGICAL OVERVIEW OF THE STUDY AREA

5.1 Overview of the study area and surrounding landscape

DATE	DESCRIPTION
2.5 million – 250 000 years ago	<p>The Earlier Stone Age is the first and oldest phase identified in Southern Africa's archaeological history and comprises two technological phases. The earliest of these technological phases is known as Oldowan, which is associated with crude flakes and hammer stones and dates to approximately 2 million years ago. The second technological phase in the Earlier Stone Age of Southern Africa is known as the Acheulian and comprises more refined and better-made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian phase dates to approximately 1.5 million years ago.</p> <p>One such site is the Sterkfontein Caves, located approximately 56km north-east of the study area. The Sterkfontein caves have also provided a wealth of knowledge on our previous Australopithecus and hominid ancestors through discoveries such as Mrs Ples and Little Foot (www.Maropeng.co.za).</p>
250 000 to 40 000 years ago	<p>The Middle Stone Age (MSA) dates to between 250 000 to 40 000 years BP. MSA dates of around 250 000 BP originate from sites such as Leopards Kopje in Zambia, while the late Pleistocene (125 000 BP) yields several important dated sites associated with modern humans (Deacon & Deacon, 1999). The MSA is characterised by flake and blade industries, the first use of grindstones, wood and bone artefacts, personal ornaments, the use of red ochre, circular hearths and a hunting and gathering lifestyle.</p>
40 000 years ago, to the historic past	<p>The Later Stone Age is the third phase identified in South Africa's archaeological history. It is associated with an abundance of very small stone artefacts known as microliths. In Southern Africa, the Later Stone Age is characterised by the appearance of rock art in the form of paintings and engravings.</p> <p>The Magaliesberg Mountains, located approximately 50km north-east of the study area, is well known for its Stone Age history, and especially so the Later Stone Age (Carruthers, 2000). Several researchers have undertaken excavations of these sites, including Professor Revil Mason, Mr Robbie Steel and Dr Lyn Wadley. The Later Stone Age sites from this area include open sites such as Xanadu as well as rock shelter and cave sites such as Kruger Cave and Jubilee Shelter (Bergh, 1999). Additionally, Later Stone Age lithics were identified in the general surroundings of the study area during an archaeological survey undertaken by Van der Walt (2009).</p>
The Study Area and Surroundings during the Iron Age – Early Farming Communities	
<p>The arrival of early farming communities (EFC) during the first millennium, heralded the start of the Iron Age in South Africa. The Iron Age is that period in South Africa's archaeological history associated with pre-colonial farming communities who practised cultivation and pastoralist farming activities, metal working, cultural customs such as lobola and whose settlement layouts show the</p>	

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	tangible representation of the significance of cattle (known as the Central Cattle Pattern) (Huffman, 2007).
AD 150 – AD 750	Early Iron Age ceramic facies can be identified within the vicinity of the study area. Firstly, the Bambata ceramic facies were identified at the site known as Jubilee Shelter in the Magaliesberg, which dates to between AD150 - AD750 and is associated with the Kalundu tradition though no settlements were ever found relating to this facies within the region (Wadley 1996). Secondly, the Mzonjani ceramic facies associated with the Urewe tradition can be found at the site known as Broederstroom, which is a settlement located in the Magalies Valley, which dates to between AD450 – AD750 and is situated approximately 47km north northeast of the study area (Huffman 2007, Manson 1981, Wadley 1996).
AD 1000 – AD 1300	The Middle Iron Age in the surrounding area is represented by the Eiland ceramic facies, dating to between AD 1000 – AD 1300, and is associated with the Kalundu tradition (Evers 1988, Huffman 2007). Eiland ceramics can also be found in the settlements of communities in the Limpopo valley that produce Mapungubwe facies ceramics. This hints at regional trade occurring across the Soutpansberg mountain range at sites like Mapungubwe and Mutamba (Antonites 2012, Calabrese 2007: 24). Hall (1981) has also identified the Eiland facies at Rooikrans in the Boschoffsberg valley and Rhenosterkloof 3 in the Sand River Valley. While a variation of the Eiland facies can also be found in southeastern Botswana and is known as the Broadhurst facies (Denbow 1981, Biemond 2017).
AD 1550 – AD 1580	The Ndebele, an offshoot of the main Nguni-speaking peoples, began migrating to the Transvaal region. The main group of Transvaal Ndebele traces its ancestry to King Mhlanga, who settled at Emhlangeni or Mohlakeng in Sotho, which is now a suburb of Randfontein (van de Walt 2015). After the passing of Mhlanga, Musi Mhlanga's son assumed the position of King amongst the amaNdebele and soon after moved the amaNdebele northeast to what is today known as Pretoria (www.Britanica.com).
1600 – 1750	<p>The origins of the Bakwena ba Mogôpa can be traced back to a place named Rathatheng, near the junction of the Marico and Crocodile (Odi or Oori) Rivers, where the Bakwena ba Mogôpa were known to have settled as early as AD 1600.</p> <p>During the mid-seventeenth century, the Bakwena ba Mogôpa moved from Rathateng to Lokwadi (Zandrivierspoort) near the foot of the Phalane Mountains.</p> <p>During the first half of the eighteenth century, the Bakwena ba Mogôpa moved to the Mabjanamatswane Hills, north-east of modern-day Brits. The sphere of influence of the Bakwena ba Mogôpa during this time stretched from the Crocodile River in the west to the Apies River in the east and from the Pienaars River in the north to the Hennops River in the south (Breutz, 1953) (Mogapi, 1996).</p>

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1700	<p>The Bapo ba Mogale, an early Nguni migrant group, resided along the banks of the Crocodile (Odi or Oori) river during this time (Breutz, 1953).</p> <p>Their settlements along the banks of this river would likely have been in the general surroundings of the present study area, albeit more likely along the western bank of the river than the eastern bank.</p> <p>Within a few years, the Bapo ba Mogale moved in a western direction to the area known as Makolokwe (either the present-day farm Wolwekraal or the present-day farm Kareepoort) (Breutz, 1953).</p>
1750 – Early 1800s	<p>During the middle of the eighteenth century, the Bakwena ba Mogôpa moved from the Mabjanamatswane Hills in an eastern direction to settle at Mangwatladi (or Lengwatladi) east of the Apies River.</p> <p>They stayed here for several years, moving back to the Mabjanamatswane Hills. Bakwena ba Mogôpa later settled in this same area at Mamogaleskraal (Gwate) at the foot of a hill named Thaba ya Morena (Breutz, 1953) (Mogapi, 1996).</p>
AD 1817 – 1823	<p>A Pedi force under Maleleku invaded the areas surrounding the Magaliesberg Mountains. After an unsuccessful attack against the Bakwena ba Mogôpa near the Apies River, the Pedi attacked the Bapo Mogale in the vicinity of Wolhuterskop. Although they were defeated as well, the Pedi managed to retire from the battle with many captured cattle as well as women and children who were enslaved during the battle.</p> <p>The heir to the Bapo throne, Mohale Mohale, was a child at the time, and although he was also almost captured in the battle, he was hidden in a kloof and managed to escape discovery. The name of the Magaliesberg Mountains is derived from Mohale Mohale's name (Breutz, 1953) (Carruthers, 2000).</p>
AD 1827 – 1832	<p>The Khumalo Ndebele (Matabele) of Mzilikazi moved north from their settlements along the Vaal River into the surroundings of the study area and started attacking the communities residing here (Bergh, 1999). They crossed over the Magaliesberg Mountains at present-day Commandonek, and according to Carruthers (2000), first attacked the Bakwena ba Mogôpa settlement located near present-day Zilkaatsnek. Although the Kwena defended themselves against the Matabele onslaught over the course of three separate battles, they were defeated in the end. Their surrender to Mzilikazi came at a very high cost, with their chief More and his son Segwati both executed and all the Kwena cattle confiscated. Additionally, the Kwena men were forced to join the ranks of the Matabele army, and those who refused were "...impaled on stakes or had their ears and eyes removed." (Carruthers, 2000:240).</p> <p>Mzilikazi then attacked the Bopo at Wolhuterskop and dispersed them (Breutz, 1953).</p>

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	<p>After the defeat of these and other groups living along the Magaliesberg Mountains, Mzilikazi and his Khumalo Ndebele settled themselves along the northern foothills of the mountains between 1827 and 1832. He had three royal residences built along the mountain range, their localities providing an estimate of the area controlled and settled by the Matabele during these five years. The three Matabele royal residences were built at Kungwini (at the foot of the Wonderboom Mountain), Hlahlandlela (near present-day Rustenburg) and Dinaneni (near present-day Zilkaatsnek).</p>
The Study Area and Surroundings during the Historical Period	
<p>The Historical Period within the study area and surroundings commenced with the arrival of newcomers to this area. The first arrivals would almost certainly have been travellers, traders, missionaries, hunters, and fortune seekers. However, with time, this initial trickle was replaced by a mass flood of white immigrants during the 1830s, when a mass migration of roughly 2 540 Afrikaner families (comprising approximately 12 000 individuals) from the frontier zone of the Cape Colony to the interior of Southern Africa took place. The people who took part in this Great Trek were later to be known as Voortrekkers (Visagie, 2011).</p> <p>As the Historical Period carried on, the general surroundings of the study area underwent significant changes and development during the twentieth century, including extensive development in the form of gold and uranium mining, railway and transportation development as well as the establishment of nearby towns such as Krugersdorp.</p>	
1836	The first Voortrekker parties started crossing over the Vaal River (Bergh, 1999).
AD1840s – 1850s	<p>Increasing numbers of Voortrekkers started establishing themselves permanently in the general vicinity of the study area during this time (De Beer, 1975). During this period, the first contact between these new arrivals and the black people residing in this wider area took place. According to Bergh (2005), regarding the Rustenburg District located 80km northwest of the study area, these early contacts resulted in the setting aside of land by the Voortrekker leadership for some of the black groups, such as the Bafokeng. Mbenga (1997) also indicates that the relationship between the Voortrekkers and the Bakgatla was initially similarly amicable.</p> <p>However, within a short period, the relationship between the Voortrekkers and the black groups living in these areas became increasingly strained. For example, Bergh (2005) states that the Bafokeng were eventually dispossessed of their farms. The system of unpaid labour enforced by the Voortrekkers on the local black groups would certainly have deteriorated the relationship further. See, for example, Morton (1992).</p> <p>The permanent settlement of white farmers in the area resulted in the proclamation of individual farms and the establishment of permanent farmsteads.</p>
AD1899 – AD1902	On 11 October 1899, war broke out between Britain and the two Boer republics of the Orange Free State and Transvaal (Zuid-Afrikaansche

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	<p>Republiek). The Magaliesberg Mountains had strategic significance to both sides because of its closeness to Pretoria (and Krugersdorp) as well as the fact that the main access routes between Pretoria and the western part of the old Zuid-Afrikaansche Republiek (including the town of Rustenburg) passed through its valleys. As a result, several skirmishes and battles took place in the wider surroundings</p> <p>As part of the so-called 'scorched earth' policy initiated by Lord Kitchener, many Boer farmhouses were destroyed. This would certainly also have been true for the surroundings of the study area as well. Another aspect characteristic of the 'scorched earth' policy was the system of concentration camps (also referred to as refugee camps) in which Boer and Black women and children were held. The closest of any of these camps to the present study area was the one at Krugersdorp, which existed from 1901 to March 1902. (www.angloboerwar.com).</p> <p>Many of the mines on the rand closed, and their staff returned home. Then in November 1901, Pope Yeatman, the general manager of the Randfontein Estates Gold Mining Company, returned to South Africa to oversee the reopening of the mines and the installation of the new machinery which had come from Europe and the United States. (Randfontein Gold Mining Company Limited 1989). The Anglo-Boer War ended with the signing of the Peace Treaty of Vereeniging in May 1902. (www.angloboerwar.com).</p>
AD 1902	<p>The South African War took place during this time. No evidence for specific battles or skirmishes from within the study area was found during the desktop study, although there is evidence that troops of both the British and the Boer forces were present throughout the general region, including the Carletonville/Westonaria area (van der Bergh, 2009) and the Krugersdorp/Randfontein area.</p> <p>However, evidence was found for a skirmish that took place on a koppie to the south of Carletonville/Westonaria. This incident was an ambush planned for the morning of 5 September 1900 by Commandant Danie Theron and his scouts and General Liebenberg, and members of the Potchefstroom Commando. A large British convoy comprising 1,000 men was expected to move from Johannesburg to Potchefstroom. However, the planned attack was derailed due to the unexplained absence of Genl. Liebenberg. Theron was apparently surprised by a British scouting force on a nearby hill. Nevertheless, he killed three British soldiers on the hill before firing on the British column, apparently as a bluff. The British forces started shelling the hill's summit with howitzers, and Theron was struck by shrapnel and killed. (Malan, 1939; Breytenbach, 1950). The British forces subsequently buried Theron on the border between the farms Buffelsdoorn and Elandsfontein with the three British soldiers who he had killed. Subsequently (In September 1900), Theron's body was exhumed by his men and buried in the Pienaar family cemetery on the farm Elandsfontein. After the war (on 10 March 1903 his men exhumed his body again and</p>

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DATE	DESCRIPTION
	<p>buried him next to the grave of his fiancé Hannie Neethling at Eikenhof, south of Johannesburg (Malan, 1939; Breytenbach, 1950).</p> <p>In 1950 the Danie Theron Monument was unveiled on the ridge summit where he died. The monument was built with funds collected by the Voortrekker organisation (http://www.afrikanergeskiedenis.co.za/presidente/monumente-en-erfenisterreine/danie-theron-monument-gatsrand/).</p>
AD 1903 – 1905	The Krugersdorp Municipality was established in 1903, of which Randfontein was included and remained so until 1929, when it became an independent Authority. In 1905 the first school was erected in Randfontein by the Transvaal administration, and the first two churches, one by the Anglican community and the other by the Methodists. (Randfontein Gold Mining Company Limited 1989)
AD 1906 – 1910	The railway line between Pretoria North and Rustenburg was constructed during this time (Bergh, 1999).
AD 1914 – 1939	In 1914, the first world war broke out, leading to the mobilization of south African forces to invade German West Africa. Hostilities ceased in 1918, with approximately 700 soldiers from Randfontein seeing active service. Twenty-five years later, in 1939, the second world war broke out. This led to cutting ties with Germany and mobilising a voluntary brigade by Jan Smuts from regiments such as the Transvaal Scottish, of which many men resided in Randfontein. (Randfontein Gold Mining Company Limited 1989).
AD1950 – 1967	In 1950 Dr Nico Diederichs was elected as Randfontein's town representative in parliament. Later becoming state president. During this period, tests were carried out in Randfontein, showing that the bird reef contained uranium. This led to Randfontein Estates applying for a permit to become a uranium producer, which was granted in 1952. Randfontein Estates' workforce had diminished significantly from 27 000 men in 1935 to 1600 men in 1967, with only one headgear in operation. Randfontein 247 IQ was subdivided and later included in the expansion of the West Porges Township in 1967 (Randfontein Gold Mining Company Limited 1989).
AD 1948 - 1959	<p>Carletonville was named after Mr Guy Carleton Jones, an engineer from the Gold Fields Ltd mining company, who played a prominent role in discovering the West Wits gold field, which Carletonville forms a part of. Carletonville was laid out by West Witwatersrand Areas gold mining company on the farm Twyfelvlakte.</p> <p>Most of the mines were developed after the Second World War.</p> <p>The town was proclaimed in 1948 and became a municipality on July 1, 1959 (Bulpin 1986: 721).</p>

5.2 EXAMINATION OF ARCHIVAL AND HISTORICAL MAPS

The examination of historical data and cartographic resources represents a critical tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area.

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Relevant topographic maps and satellite imagery were studied to identify structures, possible burial grounds or archaeological sites present in the footprint area.

Historical topographic maps (1:50 000) for various years (1958, 1976, 1991, 2006) were available for utilisation in the background study. These maps were assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The study area was overlain on the map sheets to identify structures or graves situated within or immediately adjacent to the study area that could possibly be older than 60 years and thus protected under Section 34 and 36 of the NHRA.

5.2.1 KRUGERSDORP IMPERIAL MAP, 1900 – 1919

(University of Cape Town Libraries, South Africa)

The map depicted in **Figure 16** below is titled “Krugersdorp”. John Wood compiled it for the Field Intelligence Department. The map dates from 1900 and depicts three farms that form part of the current Project Site (Blijvooruitzicht, Doornfontein and Buffelsdoorns).

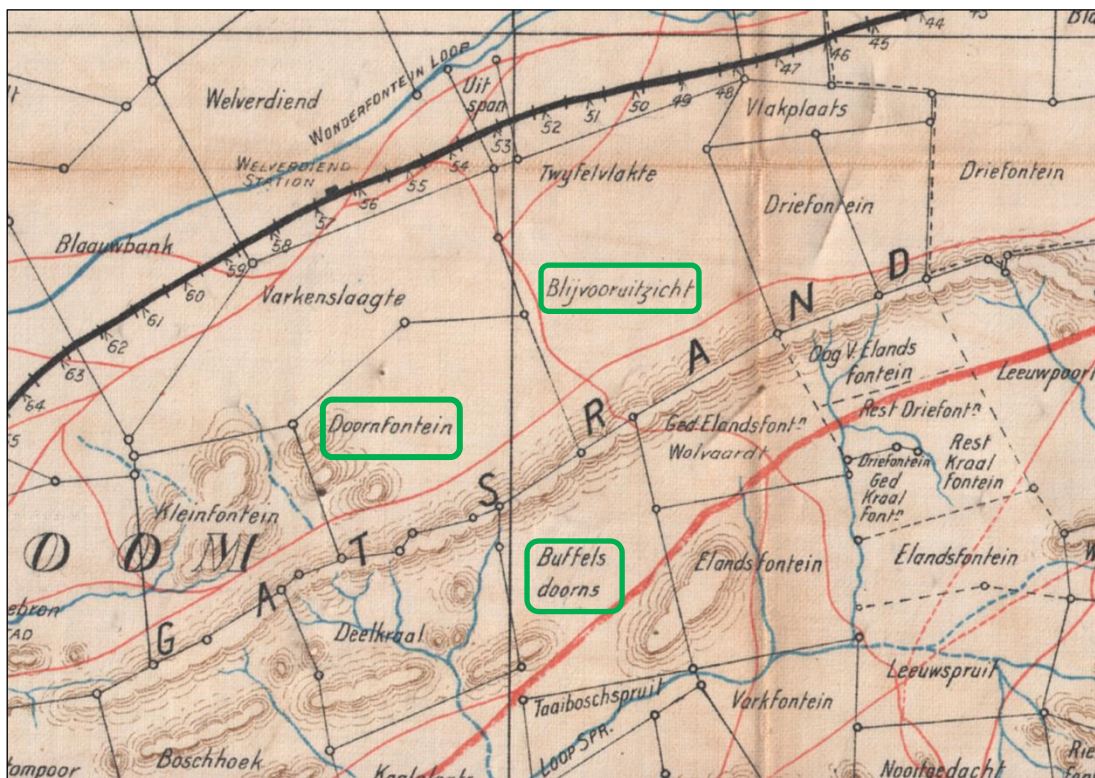


Figure 16 - Section of the 1900 Krugersdorp map highlighting the names of the farms (Blijvooruitzicht, Doornfontein and Buffelsdoorns) where the Project Site is located (green polygons) (University of Cape Town Libraries, South Africa).

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5.2.2 THE FIRST EDITION OF THE 2627AD CARLETONVILLE TOPOGRAPHICAL MAP DATED 1958

The 2627AD Carletonville map sheet was compiled from aerial photography undertaken in 1948, surveyed in 1958 and drawn in 1959 by the Trigonometrical Survey Office.

The 2627AD map was utilised to create an image overlay of the proposed Project Site (**Figure 17**). This map sheet shows a few heritage features within the proposed Project Site. If these heritage sites still exist today, they would be at least 65 years old.

Overlays of the Project Site over this map sheet are provided in the image below. The following observations can be made from this overlay:

- Historical Homesteads
- Secondary roads;
- Footpaths;
- Hedges and Agricultural Fields.

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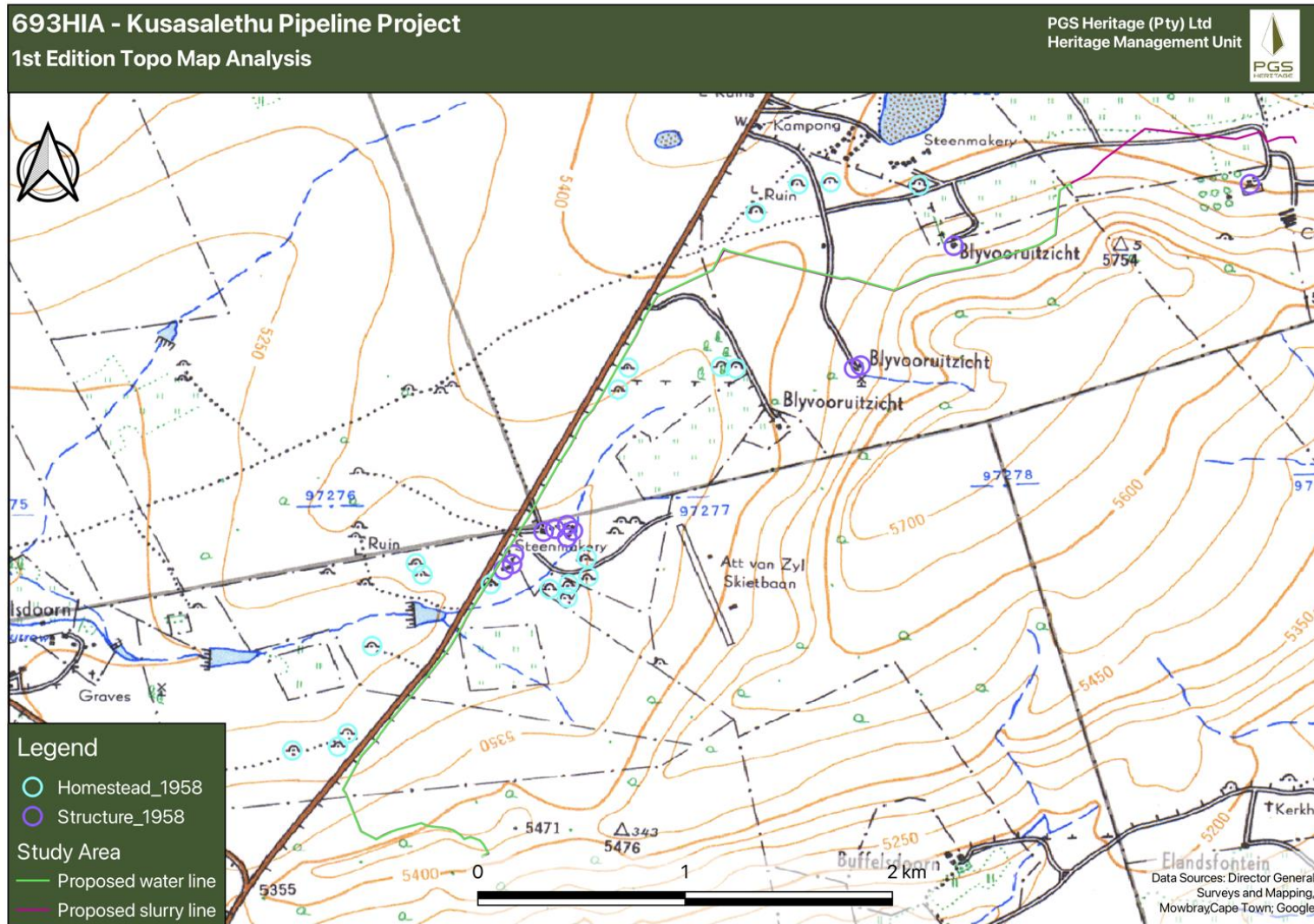


Figure 17 - Section of First Edition of the 2627AD Topographical Map, showing several heritage features. These comprise structures (purple polygon), and historical Black Homesteads (cyan polygons) located adjacent to the proposed development.

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5.2.3 THE SECOND EDITION OF THE 2627AD CARLETONVILLE TOPOGRAPHICAL MAP DATED 1976

The 2627AD Carletonville map sheet was utilised to create an image overlay of the proposed Project Site (**Figure 17**). This map sheet shows a few heritage features within the proposed Project Site. If these heritage sites still exist today, they would be at least 47 years old.

Overlays of the Project Site over this map sheet are provided in the image below. The following observations can be made from this overlay:

- Structures
- Secondary roads;
- Footpaths;
- Powerlines;
- Telephone Lines;
- Hedges and Agricultural Fields.

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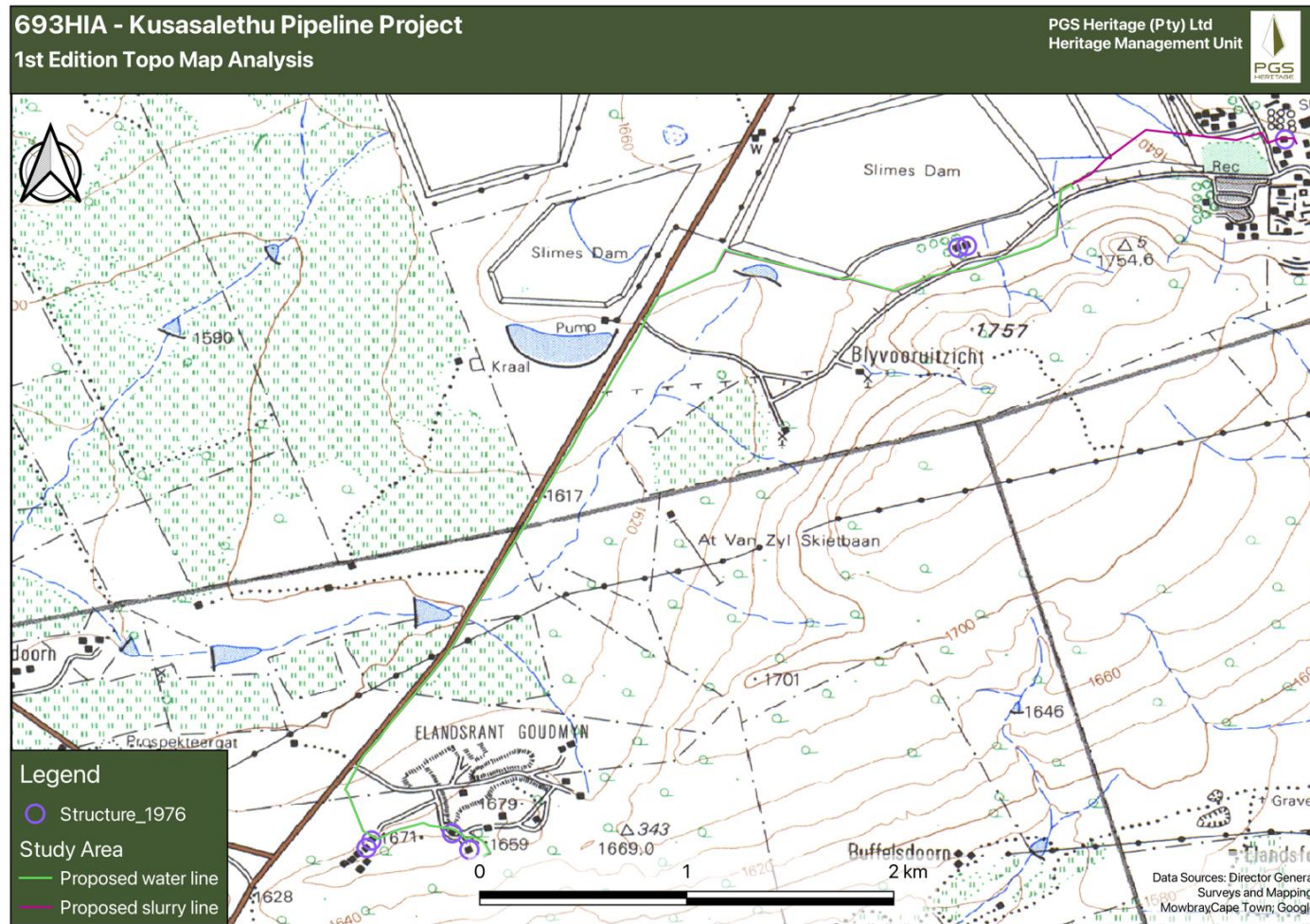


Figure 18 - Section of Second Edition of the 2627AD Topographical Map, showing several heritage features. These comprise structures (purple polygon) located adjacent to the proposed development.

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5.3 HISTORICAL AERIAL PHOTOGRAPHY OF THE STUDY AREA AND SURROUNDING AREA¹

In addition to the historical topographic maps, there were also several historical aerial photographs (1938, 1948, 1961, 1968, 1974, 1987, 1996) available for utilisation in the background study. These photographs were assessed to observe the development of the area. The study area was overlain on the aerial photographs to assess the level of land disturbance through time (**Figure 19 - Figure 23**).



Figure 19 - Aerial photography from 31/12/1938 showing the approximate location of D92 (7th Avenue) road. The imagery demonstrates the level of disturbance from agriculture within the region which includes the southern end of the study area.

¹ NGI, Aerial Photographs.

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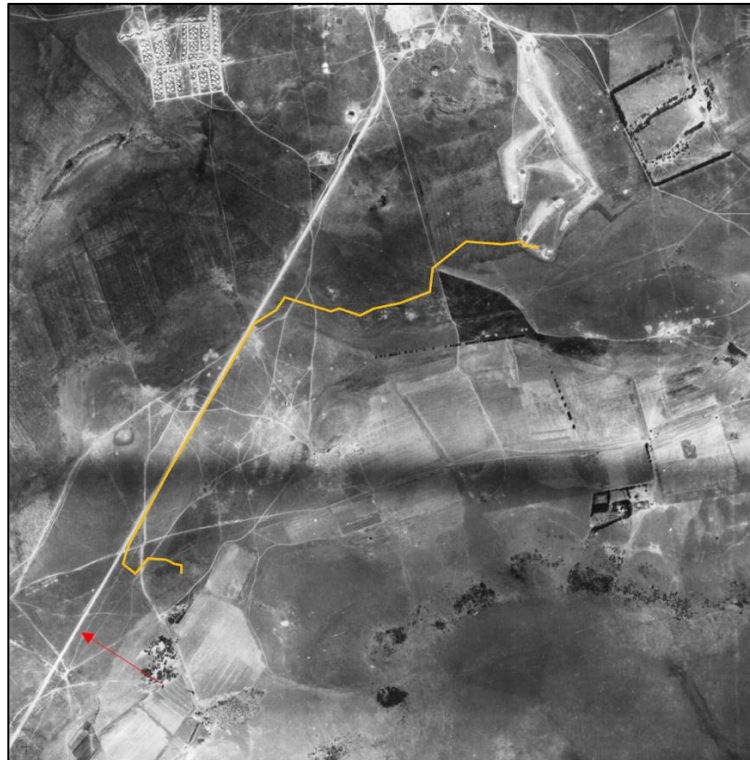


Figure 20 - Aerial photography from 31/08/1948 showing the approximate location of the study area (yellow line) and the D92 (7th Avenue) road (red arrow).

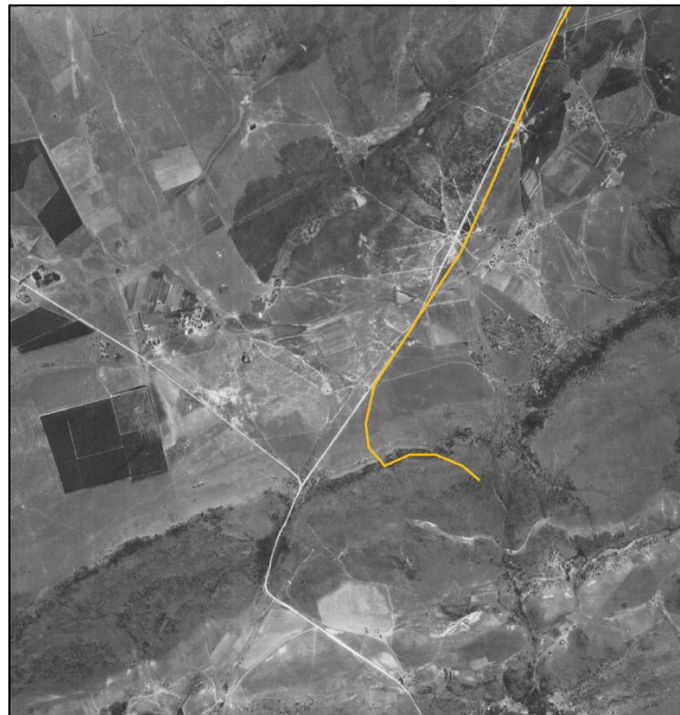


Figure 21 - Aerial photography from 08/08/1961 showing the approximate location of the study area (yellow line).

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Figure 22 - Aerial photography from 26/11/1974 showing the approximate location of the study area (yellow line).

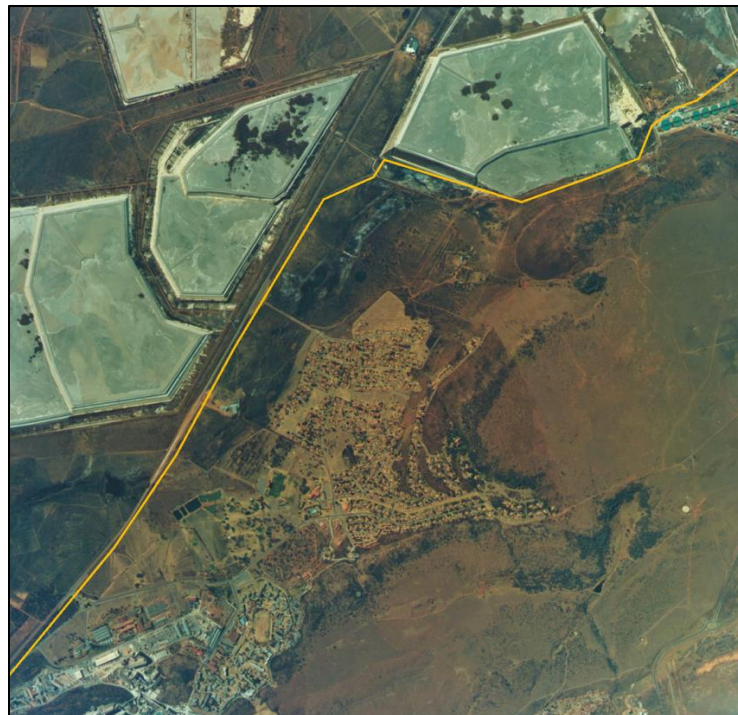


Figure 23 - Aerial photography from 31/08/1996 showing the approximate location of the study area (yellow line).

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5.4 PREVIOUS ARCHAEOLOGICAL AND HERITAGE RESEARCH FROM WITHIN THE STUDY AREA AND SURROUNDINGS

A search of the South African Heritage Resources Information System (SAHRIS) database revealed that several previous archaeological and heritage impact assessments had been undertaken within the surroundings of the study area. In each case, the results of each study are shown in bold. These previous studies are listed below in ascending chronological order:

- Hardwick, S. 2018. Environmental Impact Assessment for the Blyvoor Gold Mining Project near Carletonville, Gauteng Province. Notification of Intent to Develop. **No heritage resources were identified during the heritage survey.**
- Pelser, A. J. 2018. Report on a Phase 1 Archaeological Impact Assessment for the Proposed Development of 2 New Kilns as Part of Corobrik Driefontein's Expansion on Portions 23 & 27 (Portions of Portion 22) of the Farm Driefontein 355 IQ, near Carletonville, Gauteng. **No heritage resources were identified during the heritage survey.**
- Pistorius, J. C. C. 2019. A Phase I Heritage Impact Assessment Study for AngloGold Ashanti (Pty) Limited's Proposed Surface Pipeline and Associated Infrastructure near Carletonville in the Gauteng Province. **No heritage resources were identified during the heritage survey.**
- Smeyatsky, I and Kitto, J. 2019. Westrand Strengthening Project, Spanning Randfontein, Krugersdorp & Westonaria, Westrand District Municipality, Gauteng Province. **The fieldwork resulted in the identification of twenty-three (23) archaeological and heritage sites. These identified sites comprise the following: the sites identified were 12 burial grounds and graves (of which four (4) are municipal cemeteries) and eleven (11) historical structures or dwellings.**
- Fourie, W. 2021. The Proposed Eskom Azaadville 4km 400KV Deviation Power Line, Eskom Westrand Strengthening Phase I, Mogale City and Randwest City Local Municipality, Gauteng Province. **No heritage resources were identified during the heritage survey.**

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5.5 Palaeontology

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas are mostly rated as high (orange) (**Figure 24**). A desktop study is required and based on the outcome of the desktop study, a field assessment is likely (Almond and Pether 2008, SAHRIS website).

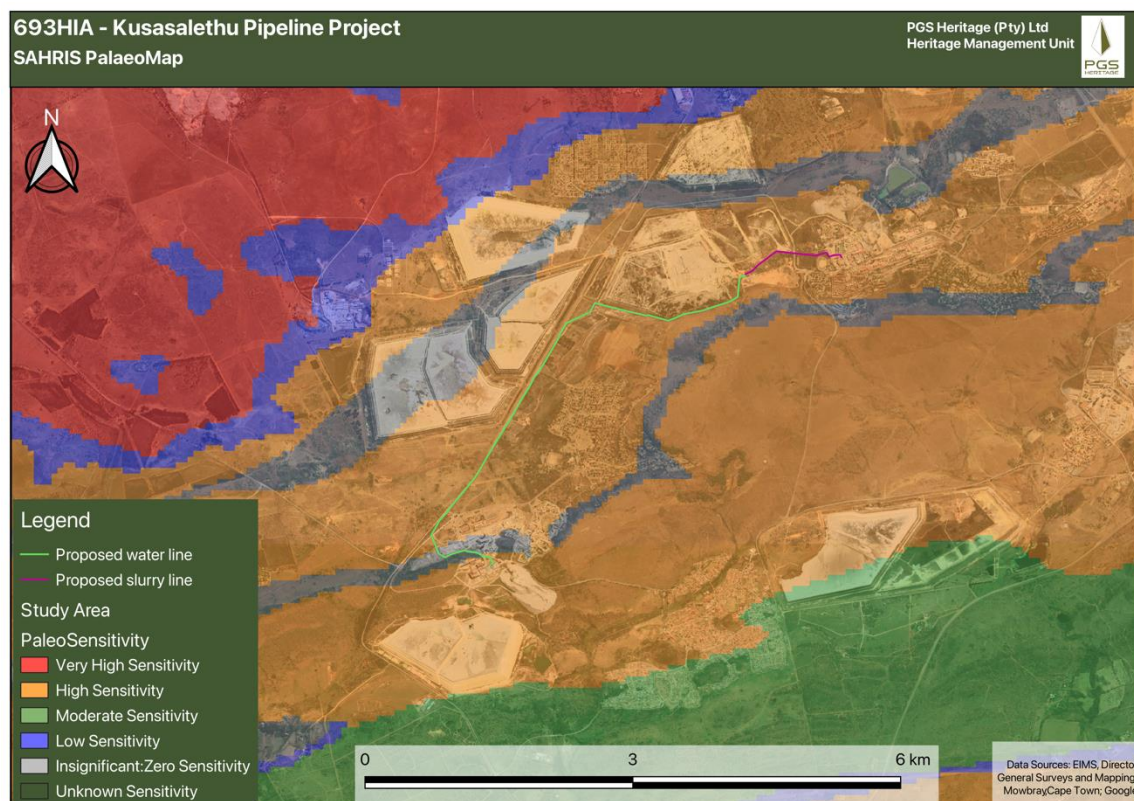


Figure 24 - Extract of the 1: 250 000 SAHRIS Palaeosensitivity Map (Council of Geosciences), overlain with the location of the study area.

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 25 – Key to the SAHRIS palaeontological map.

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5.6 FINDINGS OF THE HISTORICAL DESKTOP STUDY

5.6.1 HERITAGE SCREENING

A heritage screening report was compiled by the Department of Environmental Affairs National Web-based Environmental Screening Tool as required by Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended. According to the heritage screening report, the project area has a Low Heritage Sensitivity (**Figure 2**). The field work that was conducted in the study area demonstrates that there were no archaeological or historical sites of heritage significance that warrant conservation. Therefore, in the case of this study area, the DFFE screening tool sensitivity map is supported based on the findings of this fieldwork.

5.6.2 HERITAGE SENSITIVITY

Analysis of maps and satellite imagery enabled the identification of possible heritage sensitive areas. By superimposition and analysis, it was possible to rate these structures according to age and thus their level of protection under NHRA. **Table 4** lists the possible tangible heritage sites identified in the vicinity of the study area and the relevant legislative protection.

Table 4 - Tangible heritage site in the study area.

Name	Description	Legislative protection
Archaeology	Older than 100 years	NHRA Sections 3 and 35
Structures	Possibly older than 60 years	NHRA Sections 3 and 34
Burial grounds	Graves	NHRA Sections 3 and 36 and MP Graves Act

Additionally, evaluation of satellite imagery has indicated the following areas that may be sensitive from a heritage perspective. The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix (**Table 5**).

Table 5 - Landform type to heritage find matrix

LANDFORM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters, LIA settlements
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Water holes/pans/rivers	MSA and LSA sites, LIA settlements
Farmsteads	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements

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6 FIELDWORK FINDINGS²

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was conducted by an archaeologist (Nikki Mann) and field assistant (Xander Fourie) from PGS on 22 March 2023. The fieldwork team recorded track logs with their hand-held GPS devices. These track logs are depicted in blue in **Figure 26** and show the areas assessed by the archaeologists during the fieldwork. The field team did not survey the sections of the proposed pipelines which are planned to run alongside the current Savuka slurry pipeline, as these areas are already disturbed.

No heritage resources were identified in the study area.

6.1 SENSITIVITY ASSESSMENT OUTCOME

From the desktop assessment some possibly sensitive heritage areas were identified adjacent to the study area. However, no heritage sites were identified during the survey of the project area as the majority of the study area was already disturbed.

² Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

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Figure 26 - Map depicting the track logs (blue lines) recorded during the current fieldwork.

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7 IMPACT ASSESSMENT

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). 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 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). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for the impacts identified.

7.1 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. The 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:

$$C = (E+D+M+R) \times N$$

4

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 6** below.

Table 6 - 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),

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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 7.

Table 7 - 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:

$$ER = C \times P$$

Table 8 - 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
	0	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 9**.

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Table 9 - 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.

7.2 IMPACT PRIORITISATION

Further to the assessment criteria presented in the section above, it is necessary to assess each potentially significant impact in terms of:

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

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 10 - Criteria for Determining Prioritisation

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.

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	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).
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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:

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

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to **Table 11**).

Table 11 - Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
2	Low	1
3	Medium	1.125
4	Medium	1.25
5	Medium	1.375
6	High	1.5

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 an attempt 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 and significant potential for irreplaceable loss of resources, then the net result would be too upscale the impact to a high significance).

Table 12 - Final Environmental Significance Rating

Environmental Significance Rating	
Value	Description
< -17	High negative (i.e., where the impact must have an influence on the decision process to develop in the area).
≥ -17 ≤ -9	Medium negative (i.e., where the impact could influence the decision to develop in the area).
> -9, <0	Low negative (i.e., where this impact would not have a direct influence on the decision to develop in the area).
0	No impact
<0, <9	Low positive (i.e., where this impact would not have a direct influence on the decision to develop in the area).
≥ 19 ≤ 17	Medium positive (i.e., where the impact could influence the decision to develop in the area).
≥ 217	High positive (i.e., where the impact must have an influence on the decision process to develop in the area).

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

7.3 HERITAGE IMPACTS

No heritage resources were identified. As a result, no impact is expected from the proposed development on heritage.

Table 13 indicates the rating of the possible impacts and the overall impact inclusive of cumulative impact is low. The possibility of chance finds of unidentified heritage resources, can be mitigated through the proposed management measures contained in the next section of this report.

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Table 13 - Impact rating for heritage resources

IMPACT DESCRIPTION		Pre-Mitigation							Post Mitigation								Priority Factor Criteria			
Identifier	Impact	Nature	Extent	Duration	Magnitude	Reversibilit	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibilit	Probability	Post-mitigation ER	Confid ence	Cumulative Impact	Irreplaceabl e loss	Priority Factor	Final score
10.1.1	Impact on heritage resources	-1	1	2	1	3	2	-3.5	-1	1	2	1	2	1	-1.5	High	1	1	1.00	-1.5

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8 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

8.1 CONSTRUCTION PHASE

The project will encompass a range of activities during the Construction Phase, including disturbance to the soil surface and small-scale infrastructure development associated with the project.

It is always possible that cultural material may be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction and as such must be minimised. Development surrounding mining and construction results in significant disturbance; however, any excavation work offers a window into the past, and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project, and these must be catered for. Temporary infrastructure developments, such as construction camps and laydown areas, are often changed or added to the project as required. In general, these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the Construction Phase, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented.

8.2 CHANCE FIND PROCEDURE

- An appropriately qualified heritage practitioner / archaeologist must be identified to be called upon if any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities halted.
- The qualified heritage practitioner / archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.
- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner / archaeologist.

8.3 POSSIBLE FINDS DURING CONSTRUCTION PHASES

The study area occurs within a greater historical and archaeological context as identified during the desktop and fieldwork phase. Soil clearance may uncover the following:

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- Unmarked graves.

8.4 TIMEFRAMES

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead times must be worked into the construction time frames. The table below gives guidelines for lead times on permitting.

Table 14 - Lead times for permitting and mobilisation

Action	Responsibility	Timeframe
Preparation for field monitoring and finalisation of contracts	The contractor and service provider	1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and SAHRA	3 months
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	3 months
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and SAHRA	2 weeks
Relocation of burial grounds or graves in the way of construction	Service provider – Archaeologist, SAHRA, local government and provincial government.	6 months

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8.5 HERITAGE MANAGEMENT PLAN FOR EMPR IMPLEMENTATION

Table 15 - Heritage Management Plan for EMPr implementation

Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for implementation	Monitoring Party (frequency)	Target	Performance indicators (Monitoring tool)
General project area	Implement a chance find procedures in case where possible heritage finds are uncovered.	Construction	During construction	Applicant ECO Heritage Specialist	ECO (monthly / as or when required)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34-36 and 38 of NHRA	ECO Monthly Checklist/Report

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9 CONCLUSIONS

PGS was appointed by EIMS to undertake a HIA, which forms part of the environmental process for the proposed Kusasaletu Return Water and Backfill Pipelines, in the Merafong Local Municipality, West Rand District Municipality, approximately 3km from Carletonville, Gauteng Province.

This HIA aims to evaluate the possible impacts on heritage resources present within the proposed development footprint. The HIA has shown that the study area has no heritage resources situated within the proposed development boundaries.

9.1 HERITAGE SITES

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was conducted by an archaeologist (Nikki Mann) and field assistant (Xander Fourie) from PGS on 22 March 2023. It is important to note that sections of the study area are in areas which are more densely overgrown and/or disturbed, which limited visibility in those areas of the study area. **During the field work, no archaeological sites or burial grounds and graves were identified.**

9.2 PALAEOLOGY

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas are mostly rated high (orange). A desktop study is required and based on the outcome of the desktop study, a field assessment is likely (Almond and Pether 2008, SAHRIS website).

9.3 IMPACT ASSESSMENT

No evidence for any archaeological or heritage sites could be identified within the environs of the study area. As a result, no impact is expected from the proposed development on heritage.

9.4 MITIGATION MEASURES

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With no impact expected on heritage, no further mitigation is required. Refer to **Section 8** of this report.

9.5 GENERAL

It is the considered opinion of the authors of this report that the overall impact of the proposed development on heritage resources will be Low. Provided that the general recommendations and mitigation measures outlined in this report are implemented, the impact would be acceptably Low or could be totally mitigated to the degree that the project could be approved from a heritage perspective.

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10.3 INTERNET

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10.4 **GOOGLE EARTH**

All the aerial depictions and overlays used in this report are from Google Earth or QGIS.

10.5 **HISTORICAL TOPOGRAPHICAL MAPS**

All the historic topographical maps used in this report were obtained from the Directorate: National Geospatial Information of the Department of Rural Development and Land Reform in Cape Town.

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APPENDIX A
PGS TEAM CVS

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PROFESSIONAL CURRICULUM VITAE FOR NIKKI MANN

Professional Archaeologist for PGS Heritage

Name: Nikki Mann
Profession: Archaeologist
Date of birth: 1992-10-13
Parent Firm: PGS Heritage (Pty) Ltd
Position at Firm: Archaeologist
Years with firm: 2
Years of experience: 7
Nationality: South African
HDI Status: White

EDUCATION:

Name of University or Institution : University of Cape Town
Degree obtained : BSc
Major subjects : Archaeology, Environmental and
 Geographical Sciences
Year : 2013

Name of University or Institution : University of Cape Town
Degree obtained : BSc [Hons]
Major subjects : Archaeology
Year : 2014

Name of University or Institution : University of Cape Town
Certificate obtained : MSc – Archaeology (phytolith analysis)
Year : 2017

Professional Qualifications:

Professional Archaeologist - Association of Southern African Professional Archaeologists -
 Professional Member – No 472

Languages:

English
 French

KEY QUALIFICATIONS

- 3 years of work in the heritage consulting field;

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- 7 years working experience in archaeological excavations;
- Proven experience in report writing and report deliverables;

HERITAGE IMPACT ASSESSMENTS

South African

2021- Current – Archaeologist – PGS Heritage (Pty) Ltd

HMPs for the Khangela and Umsinde WEFs and associated grid infrastructure, near Murraysburg, Western Cape. Nala Environmental. **Position:** Heritage Specialist.

Proposed new 132kV grid connection for the authorised Emoyeni WEF, near Murraysburg, Western Cape. Nala Environmental. **Position:** Heritage Specialist.

Proposed Apollo PV Plant, near Atlantis, Western Cape – Desktop study. TerraManzi. **Position:** Heritage Specialist.

Proposed Eskom Witkop-Pietersburg 132kV Powerline, Limpopo. Polokwane. Acer. **Position:** Heritage Specialist.

Proposed deviations to Eskom Nhlavuko-Tshebela 132kV Powerlines, Limpopo. Polokwane. Acer. **Position:** Heritage Specialist.

Proposed Tetra4 Cluster 2 gas production project, near Welkom. EIMS. **Position:** Heritage Specialist.

Kathu Tyre Management Plant HIA. Kathu. EXM. **Position:** Heritage Specialist.

Kathu Borrow Pit Screening. Kathu. EXM. **Position:** Heritage Specialist.

Kolomela Mine Expansion. Postmasburg. EXM. **Position:** Heritage Specialist.

Kudumane HIA update. Hotazel. SRK. **Position:** Heritage Specialist.

Victoria West Pipeline project. Victoria West. iXEng. **Position:** Heritage Specialist.

10MW Chelsea Solar PV. Gqeberha, Eastern Cape. SLR. **Position:** Heritage Specialist.

Koup 1 and Koup 2 WEF. Beaufort West, Western Cape. SiVEST. **Position:** Heritage Specialist.

Victoria West Pipelines. Victoria West, Northern Cape. iXEng. – **Position:** Heritage Specialist.

East Orchards Poultry Farm Project. Delmas, Mpumalanga. EcoSphere. – **Position:** Heritage Specialist.

Gunstfontein WEF and OHL. Sutherland, Northern Cape. Savannah– **Position:** Heritage Specialist.

Overhead power line for Oya PV Facility. Sutherland, Northern Cape. SiVEST– **Position:** Heritage Specialist.

Infrastructure for Kudusberg WEF. Sutherland, Northern Cape. SiVEST– **Position:** Heritage Specialist.

Proposed SKA fibre optic cable, between Beaufort West and Carnarvon, Northern and Western Cape. **Position:** Heritage Specialist.

Proposed SANSA Space Operations. Matjiesfontein, Western Cape. **Position:** Heritage Specialist.

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Pienaarspoort WEF 1 and 2. North-west of Matjiesfontein, Western Cape. Savannah- **Position:** Heritage Specialist.

Swellendam WEF. Swellendam, Western Cape. – **Position:** Heritage Specialist.

Matjiesfontein Road Extension Project. Matjiesfontein, Western Cape. **Position:** Heritage Specialist.

MITIGATION WORK

2020 – Coega Zone 10, Coega IDZ, Eastern Cape Province. Colonial Period Phase 2 Mitigation Archaeological Excavation. **Archaeologist.**

2019 – 2020 - **Lesotho Highland Development Authority – Polihali Dam Project - Heritage Management Plan development and Implementation.** Mokhotlong, Kingdom of Lesotho. **Archaeologist.**

2018- Proposed development of boreholes and associated pipelines for the Langebaan Aquifer within the Hopefield Private Nature Reserve, Hopefield, Western Cape. **Archaeologist.**

POSITIONS HELD

2021 – current: Archaeologist - PGS (Pty) Ltd

2019 – 2020: Archaeologist - PGS (Pty) Ltd Lesotho

2018 – 2020: Contract Archaeologist – CTS Heritage

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