



PGS HERITAGE

THE PROPOSED HARMONY FSS6 RECLAMATION PIPELINE, WELKOM, FREE STATE PROVINCE

Heritage Impact Assessment

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Declaration of Independence

I, Wouter Fourie, declare that –

General declaration:

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

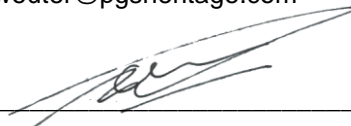
Disclosure of Vested Interest

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



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EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake a Heritage Impact Assessment (HIA) which will serve to inform the Environmental Impact Assessment Report (EIA) and Environmental Management Programme (EMPr) for the proposed Harmony FSS6 reclamation pipeline, Welkom in the Free State Province.

Heritage resources are unique and non-renewable and as such, any impact on such resources must be seen as significant. The HIA has shown that the study area and surrounding area has some heritage resources situated further away from the study area. Through data analysis and a site investigation, the following issues were identified from a heritage perspective.

Heritage Resources

A field survey of the study area was undertaken on foot by two archaeologists (Michelle Sachse and Nicholas Fletcher) on 5 October 2021. No archaeological sites or burial grounds and graves were identified during the fieldwork.

Impact Assessment

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

Recommendations

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

General

It is the author's considered opinion that the overall impact on heritage resources is Low. Provided that the recommended mitigation measures 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; and
- 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 3 300 000 years ago.

Fossil

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

Heritage

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

Heritage resources

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

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

Holocene

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

Late Stone Age

The archaeology of the last 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 Iron Age

The archaeology of the period between 900-1300AD, associated with the development of the Zimbabwe culture, defined by class distinction and sacred leadership.

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.

Table 1 – List of abbreviations used in this report

Abbreviations	Description
AIA	Archaeological Impact Assessment
APHP	Association of Professional Heritage Practitioners
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EIMS	environmental Impact Management Services (Pty) Ltd
EIAs practitioner	Environmental Impact Assessment Practitioner
ESA	Earlier Stone Age
FSS	Free State South
GN	Government Notice
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
IAIASA	International Association for Impact Assessment South Africa
LIA	Late Iron Age
LSA	Late Stone Age
MIA	Middle Iron Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No 25 of 1999)
NCW	Not Conservation Worthy
PGS	PGS Heritage (Pty) Ltd
PHRA	Provincial Heritage Resources Authority
PIA	Palaeontological Impact Assessment
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
TSF	Tailings Storage Facility

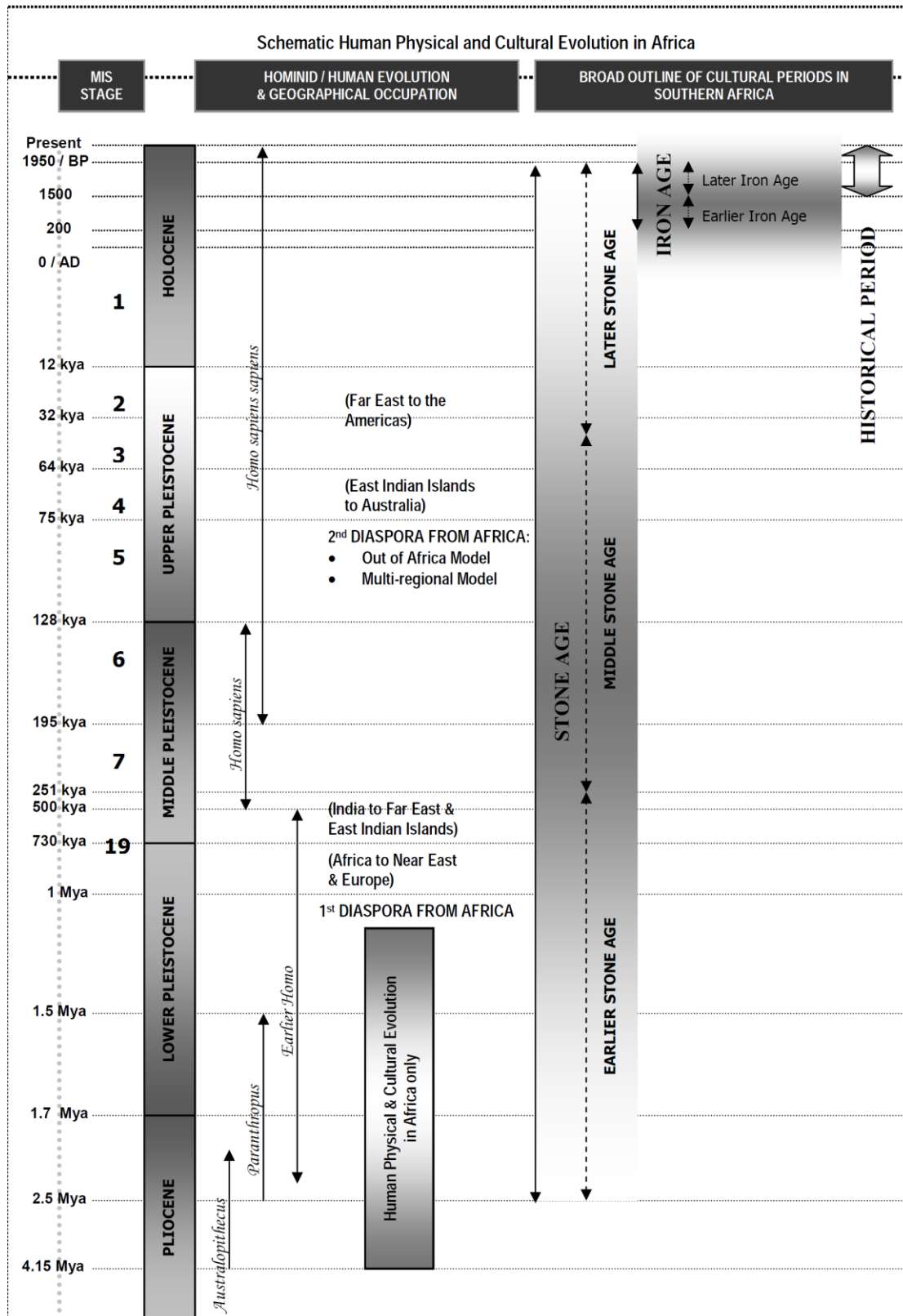


Figure 1 – Human and Cultural Timeline in Africa

1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services (Pty) Ltd (EIMS) to undertake a Heritage Impact Assessment (HIA) which will serve to inform the Environmental Impact Assessment Report (EIA) and Environmental Management Programme (EMPr) for the proposed Harmony Free State South (FSS) 6 Tailings Storage Facility (TSF) reclamation pipeline, Welkom in the Free State Province.

1.1 SCOPE OF THE STUDY

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The HIA aims to inform the EIA in the development of a comprehensive EMPr to assist the project applicant in responsibly managing the identified heritage resources in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act (Act 25 of 1999) (NHRA).

1.2 SPECIALIST QUALIFICATIONS

This HIA was compiled by PGS.

The staff at PGS have 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 and author of this report, 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).

Michelle Sachse, the co-author of this report, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist. She holds a MA in Archaeology and a BA (Hons) in Archaeology

Nicholas Fletcher is a field archaeologist. He holds a BA (Hons) in Archaeology.

1.3 ASSUMPTIONS AND LIMITATIONS

Not detracting in any way from the comprehensiveness of the research undertaken, it is necessary to realise that the heritage resources located during the desktop research and fieldwork do not necessarily represent all the possible heritage resources present within the area.

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.

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:

1.4.1 STATUTORY FRAMEWORK: THE NATIONAL HERITAGE RESOURCES (ACT 25 OF 1999)

The NHRA has applicability, as the study forms part of an overall HIA in terms of the provisions of Section 34, 35, 36 and 38 of the NHRA and forms part of a heritage scoping study that serves to identify key heritage resources, informants, and issues relating to the palaeontological, archaeological, built environment and cultural landscape, as well as the need to address such issues during the impact assessment phase of the HIA process.

1.4.1.1 SECTION 35 – ARCHAEOLOGY, PALAEOLOGY AND METEORITES

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the NHRA, PIAs and AIAs are required by law in the case of developments in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is known to have occurred during prehistory and the historic period.

1.4.1.2 SECTION 36 – BURIAL GROUNDS & GRAVES

A section 36 permit application is made to the SAHRA or the competent provincial heritage authority which protects burial grounds and graves that are older than 60 years and must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit. SAHRA must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A permit is required under the following conditions:

Permitting requirements for burial grounds and graves older than 60 years to Heritage Western Cape (prehistoric) and historic burials to the South African Heritage Resources Agency:

- a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of the conflict, or any burial ground or part thereof which contains such graves.
- b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.
- d) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant.

1.4.1.3 SECTION 38 HIA AS A SPECIALIST STUDY WITHIN THE EIA IN TERMS OF SECTION 38(8)

A NHRA Section 38 (Heritage Impact Assessments) application to MPPHRA is required when the proposed development triggers one or more of the following activities:

Permitting requirements for demolition of built environment features:

- a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- b) the construction of a bridge or similar structure exceeding 50 m in length;
- c) any development or other activity which will change the character of a site,
 - i. exceeding 5 000 m² in extent; or
 - ii. involving three or more existing erven or subdivisions thereof; or
 - iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resource authority;
- d) the re-zoning of a site exceeding 10 000 m² in extent; or
- e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority

In this instance, the heritage assessment for the property is to be undertaken as a component of the BA for the project. Provision is made for this in terms of Section 38(8) of the NHRA, which states that:

An HIA report is required to identify, and assess archaeological resources as defined by the Act, assess the impact of the proposal on the said archaeological resources, review alternatives and recommend mitigation (see methodology above).

Section 38 (3) Impact Assessments are required, in terms of the statutory framework to conform to basic requirements as laid out in Section 38(3) of the NHRA. These are:

- The identification and mapping of heritage resources in the area affected
- The assessment of the significance of such resources

- The assessment of the impact of the development on the heritage resources
- An evaluation of the impact on the heritage resources relative to sustainable socio/economic benefits
- Consideration of alternatives if heritage resources are adversely impacted by the proposed development
- Consideration of alternatives
- Plans for mitigation in the future

1.4.2 NOTICE 648 OF THE GOVERNMENT GAZETTE 45421

Although minimum standard for archaeological (2007) and palaeontological (2012) assessments were published by SAHRA (2016), Government Notice (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 GN are listed in **Table 3** and the applicable section in this report noted.

Table 2 - Reporting requirements for GN648.

GN 648	Relevant section in report	Where not applicable in this report
2.2 (a) a desk top analysis, using satellite imagery;	section 4	
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 5	-
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 5	-
2.3(b) contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity;	Section 5 provides a description of the current use and confirms the status in the screening report	

An assessment of the Environmental Screening tool provides that there are currently no known archaeological and heritage resources (**Figure 2**) and palaeontological sensitivity (**Figure 3**) the project area is medium.

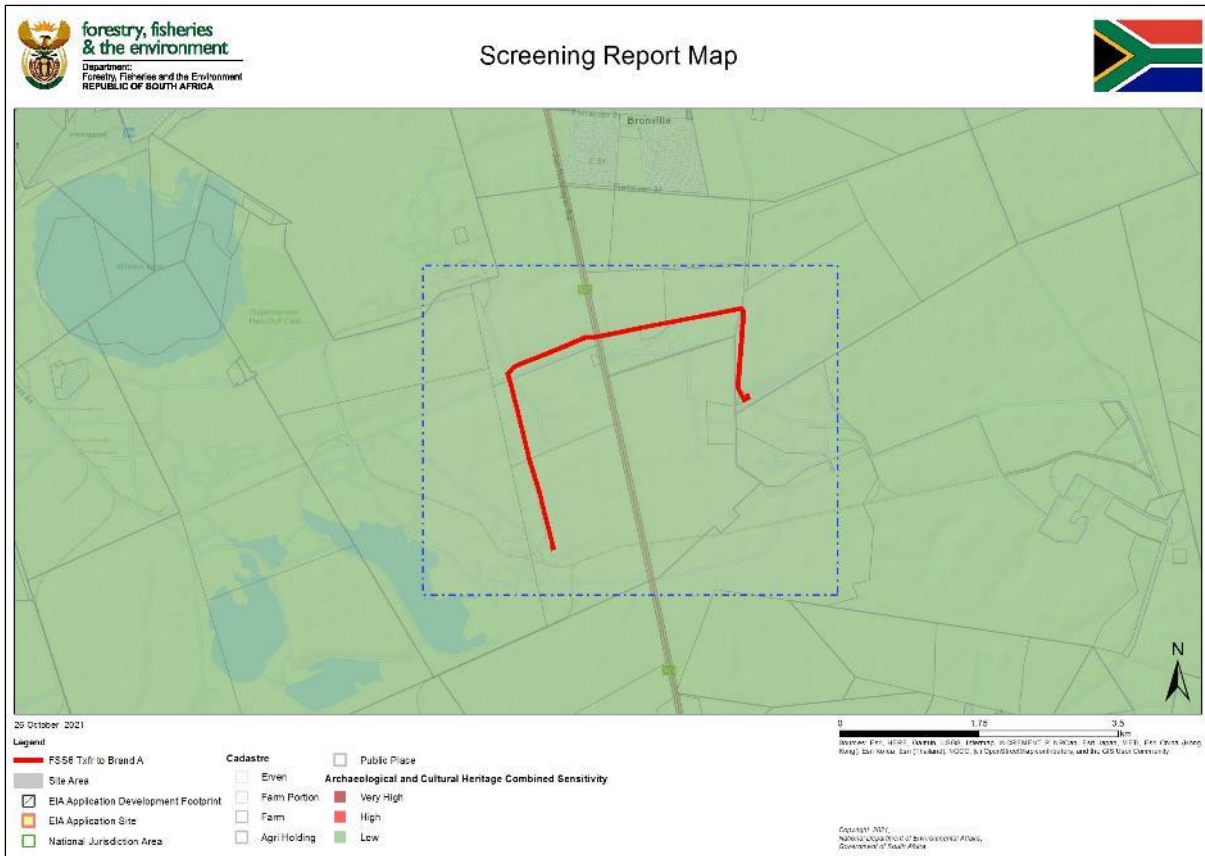


Figure 2 - Environmental screening tool - archaeological and heritage sensitivity.

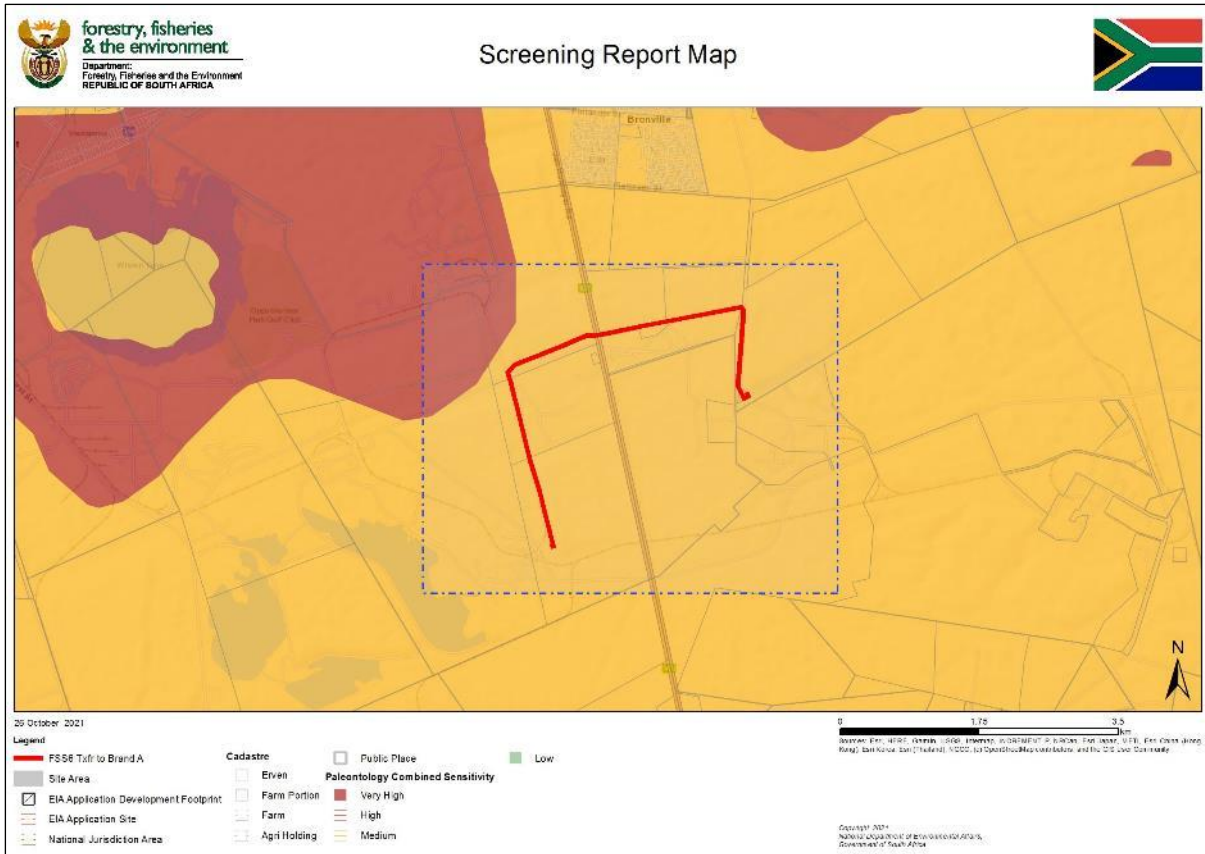


Figure 3 - Environmental screening tool – palaeontological sensitivity.

1.4.3 NEMA – APPENDIX 6 REQUIREMENTS

The HIA report has been compiled considering the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) 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. It is important to note, that where something is not applicable to this HIA, this has been indicated in the table below.

Table 3 - Reporting requirements as per NEMA, as amended, Appendix 6 for specialist reports

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
1.(1) (a) (i) Details of the specialist who prepared the report	Page 2 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 ii 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 6	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3	-
(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;	Section 6 and 7	-
(g) An identification of any areas to be avoided, including buffers	Section 6 and 7	-
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 7	
(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 8	
(k) Any mitigation measures for inclusion in the EMPr	Section 9.4	
(l) Any conditions for inclusion in the environmental authorisation		Non required
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 9.4	
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 10	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
(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 10	-
(o) A description of any consultation process that was undertaken during the course of carrying out the study		Not applicable. A public consultation process was handled as part of the BA and EMPr process.
(p) A summary and copies if any comments that were received during any consultation process		Not applicable. To date no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.		Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	NEMA Appendix 6 and GN648 HWC guidelines on HIAs, PIAs and AIAs	

2 SITE LOCATION AND DESCRIPTION

2.1 PROJECT DESCRIPTION (PROVIDED BY EIMS)

Harmony Gold Mining Company Limited (hereafter referred to as the applicant) is planning to reclaim the Free State South (FSS) 6 TSF through the Tswelopele Beneficiation Operations (TBO) Saaiplaas Plant. Final residue from Saaiplaas Plant tailings will be deposited on the St. Helena 123 TSF (**Figure 4**).

The applicant plans to construct a new reclamation pump station at FSS 6 TSF and slurry transfer line from FSS6 TSF to the existing Brand A TSF Reclamation Pump Station to transport reclaimed slurry.

The reclamation pump station will be constructed adjacent to the footprint of FSS6 TSF and consist of offices, pumping and electrical infrastructure.

The technical specification of the proposed slurry pipeline is:

- Transport material – Slurry / Tailings
- Type – Steel (SABS 719 Grade B, with 10mm Cement Mortar Lining (CML))
- Construction – Flanged on plinths
- Flow Rate – 196 l/s
- Length – ± 6 500m
- Diameter – 0.45 m NB
- Property Owner – Private
- Planned route – On historic pipeline route to Brand A and return water pipes from Dam 23 on existing servitudes.

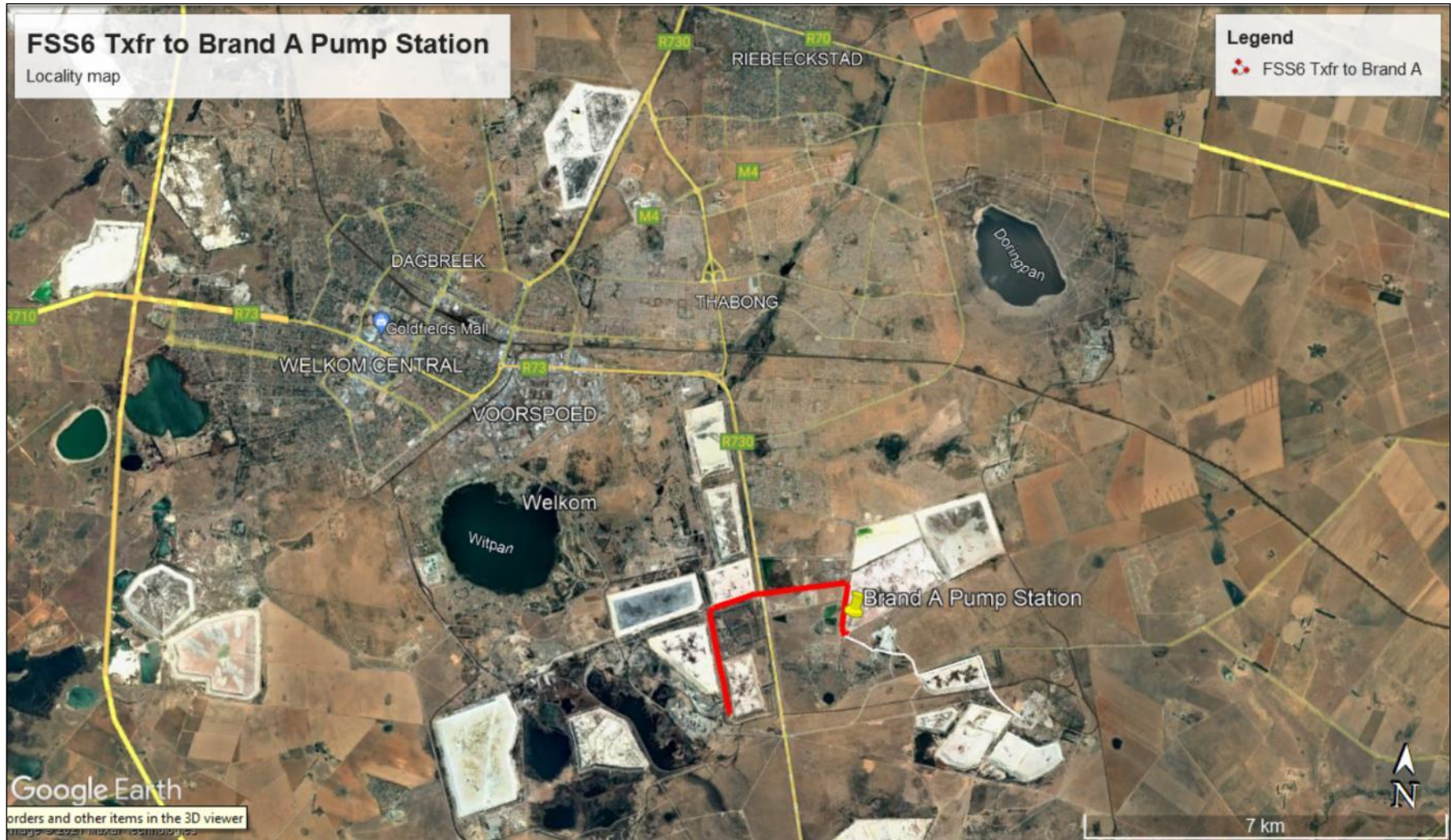


Figure 4 - Locality map showing the proposed alignment in proximity to Welkom

3 METHODOLOGY

The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the NEMA (no 107 of 1998). The HIA process consisted of three steps:

Step I – Literature Review and sensitivity analysis¹: The background information to the field survey relies greatly on previous studies completed for the project to determine known sensitivities, as well as the heritage background research completed for this report.

Step II – Physical Survey: A physical survey was conducted by foot through the proposed project area by a qualified heritage specialist. The survey was conducted on 25 March 2021, aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

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

3.1 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. An update classification and rating system as developed by Heritage Western Cape (2016) is implemented in this report.

Site significance classification standards prescribed by the Heritage Western Cape Guideline (2016) based on SAHRA guidelines, were used for the purpose of this report (**Table 4** and **Table 5**).

Table 4 - 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 HWC. 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.		

¹ According to Notice 648 of the Government Gazette 45421

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
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 5 - 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
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 HWC.	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

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
IIC	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 HWC for structures in this category if they are older than 60 years.	No research potential or other cultural significance

4 CURRENT STATUS QUO

4.1 SITE DESCRIPTION

4.1.1 GENERAL SITE

The proposed FSS6 reclamation pipeline is located some 6 kilometres to the south of Welkom. It starts at the FSS6 LP Gooseneck up until it reaches the Brand A Pump Station. It runs north between two waste rock dumps which are located 1 kilometre west from the R730, then it turns east from where it runs across the R730 and along another waste rock dump and a large refuse dump in the north, then it turns south and runs up until it reaches the Brand A Pump Station. It follows the existing pipeline servitude that connects the TSF with the Harmony Brand A Pump Station. The existing servitude runs through grassland that is largely transformed by mining infrastructure. Also, the Willow Valley Poultry Farm is located 30 metres east from the R730 where the proposed pipeline crosses the road. **(Figure 5 -Figure 13)**.

Existing surrounding land uses associated with the project area include a combination of:

- mining related infrastructure and developments,
- powerlines,
- refuse dump and
- dirt roads.



Figure 5 – Start of the proposed alignment in the eastern section close to the FSS6 LP Gooseneck



Figure 6 – Service Road used that runs along the proposed alignment, located east of the R730



Figure 7 – General view of the waste rock dump on the east of the service road



Figure 8 – General view of the waste rock dump on the west of the service road



Figure 9 – View of the proposed alignment crossing the R730 main road



Figure 10 – Alignment along the service road with the large refuse dump located to the north



Figure 11 – End of proposed pipeline



Figure 12 - View of the Brand A Pump Station



Figure 13 - Willow Valley Poultry Farm located to the right

5 HISTORICAL OVERVIEW OF THE STUDY AREA

5.1 GENERAL REGIONAL BACKGROUND

The Free State has a rich archaeological and historical history going back millions of years and includes significant aspects such as Later Stone Age rock art, Battlefields and Iron Age stonewalled enclosures. The general surroundings of the study area became a melting pot of contact and conflict as it represents one of many frontiers where San hunter-gatherers, Nguni and Sotho-Tswana agro-pastoralists, Dutch Voortrekkers and British Colonists all came together. The ravages of war also swept across these plains, and in particular the South African War (1899-1902) as well as the Boer Rebellion (1914-1915).

The archaeological history of the area can broadly be divided into a Stone Age, Iron Age and Historic Period. Both the Stone and Iron Ages form part of what is referred to as the Pre-Colonial Period (Prehistoric Period) whereas the Historic Period is referred to as the Colonial Period (Historic Period) (refer **Table 6**).

In the table below a detailed archaeological and historical overview of the study area and surrounding landscape is presented in a chronological manner. This overview is based on intensive archival and literature research and whenever possible, the relative distances between the study area and mentioned sites, features and events are provided.

It must be noted that such an overview, which is based on available literature and archival research, would necessarily reflect a bias toward a traditional white history of the region as this would have been the focus of publications and archival documents during the last 150 years.

Table 6: Archaeological and Historical Overview of the Study Area and Surrounding Landscape

DATE	DESCRIPTION
The Study Area during the Stone Age	
Very little is known about the Stone Age archaeology of the study area and its immediate surroundings. In the wider surroundings, probably the most significant Stone Age is at Florisbad, located roughly 78 km south-west of the present study area. Closer to the study area, a number of Middle and Later Stone Age material in associated with mammal fossil remains have been identified in erosion gulleys along the Sand, Doring and Vet Rivers between Virginia and Theunissen (De Ruiter <i>et. al.</i> 2011). See also Rossouw (n.d.).	
2.5 million to 250 000 years ago	The Earlier Stone Age (ESA) is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made

DATE	DESCRIPTION
	<p>stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago.</p> <p>No information regarding ESA sites from the study area and surroundings was found.</p>
<p>>250 000 to 40 000 years ago</p>	<p>The Middle Stone Age (MSA) is associated with flakes, points and blades manufactured by means of the prepared core technique. This phase is furthermore associated with modern humans and complex cognition (Wadley, 2013).</p> <p>During research fieldwork by the National Museum in Bloemfontein, ten sites were recorded where Middle Stone Age and/or Later Stone Age lithics were identified in association with mammal fossil remains from erosion gulleys along the Sand, Vet and Doring Rivers (De Ruiter <i>et. al.</i> 2011). While almost all of these sites are located within a distance of 20 km of the present study area, one site is located immediately adjacent to the study area. This site is named Kalkoenkrans 225 and is located no more than 500 m north-east of the study area.</p> <p>During the fieldwork undertaken during the Heritage Scoping, a Middle Stone Age site was identified within the study area on the northern bank of the Sand River (see Site 33 below).</p>



Figure 14 – Photograph of the archaeological field survey as published in De Ruiter *et. al.* (2011).

<p>40 000 years ago to c. 1800s</p>	<p>The Later Stone Age (LSA) is the third archaeological phase identified and is characterised by an abundance of very small stone tools known as microliths as well many rock art sites across the country. This period is associated with hunter-gatherers (San) as well as early pastoralists (Khoekhoe) and lasted up until - and in many cases a considerable number of years after – the arrival of Iron Age and European communities.</p>
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DATE	DESCRIPTION
	<p>Apart from the occurrence of Later Stone Age lithics along the Sand, Vet and Doring Rivers (see above), no other Later Stone Age sites are known from the surroundings of the study area. Similarly, no known rock art sites are known from the study area or its wider surroundings.</p>
<p>The Study Area during the Iron Age</p>	
<p>The arrival of early farming communities during the first millennium, heralded in the start of the Iron Age for South Africa. The Iron Age is that period in South Africa’s archaeological history associated with pre-colonial farming communities associated with agricultural and pastoralist farming activities, metal working, cultural customs such as lobola as well as the tangible representation of the significance of cattle imprinted on their settlement layouts (known as the Central Cattle Pattern) (Huffman, 2007).</p> <p>According to the distribution map for Iron Age settlements on the Southern Highveld as published in Maggs (1976), the study area is located to the west of the known distribution of such Late Iron Age sites. It is therefore unlikely for any Late Iron Age sites to be located within the study area or its immediate surroundings. This surmise is largely supported by the distribution maps as published by Huffman (2007), albeit these latter distribution maps (which are based on known archaeological information) indicate that the study area is located very close to the periphery of two Iron Age facies. For the sake of completeness, these two Iron Age facies, known as Thabeng and Makgwareng, will be presented here.</p>	
<p>AD 1700 – AD 1840</p>	<p>The Thabeng facies of the Moloko Branch of the Urewe Tradition is one of the facies identified within the study area. The decoration on the ceramics associated with this facies is characterised by incised triangles, coloured chevrons and arcades. The Tlhaping at Dithakong, Rolong at Platberg and the Kubung from the Free State form a Southwestern Sotho-Tswana cluster that is associated with this Thabeng facies pottery and Type Z settlement layouts (Huffman, 2007).</p> <p>The Type Z settlements are one of the Late Iron Age stonewalled settlement types identified by Tim Maggs during his extensive archaeological research project on the Iron Age of the southern Highveld, which includes the present study area (Maggs, 1976). These sites are characterised by large primary enclosures enclosed by a ‘discontinuous ring’ of characteristic bilobial dwellings. Each of these bilobial dwellings comprises a hut at its front with a semicircular courtyard at the back. With the area in front of the hut enclosed by a low stone wall and the courtyard at the back similarly enclosed by a smaller enclosure, the layout plan of these huts comprise two lobes, one larger than the other. The huts are defined by a ring of upright stones and are usually paved with flat stones. Unlike Type V settlements (see below), corbelled huts are rarely associated with these Type Z settlements, and appear to be the result of contact with the Type V settlements located to the east.</p> <p>While a number of Type Z sites are located within the study area, one of the more prominent ones is OXF1, located roughly 34.7 km east-by-northeast of the present study area and a short distance north-west of the town of Ventersburg. This site was excavated by Tim Maggs during the 1970s as part of his overall research project alluded to above (Maggs, 1976).</p>

DATE	DESCRIPTION
	<p>In his conclusions on the history of his entire study area, Maggs (1976:317) states that “...the conclusion seems inescapable that the Kubung were the builders of Type Z. This conclusion could be put forward on the typological evidence alone, for the Kubung are the only known off-shoot of the Rolong to have settled in our area, and the Type Z industry was clearly the work of a group related to the Rolong.”</p>

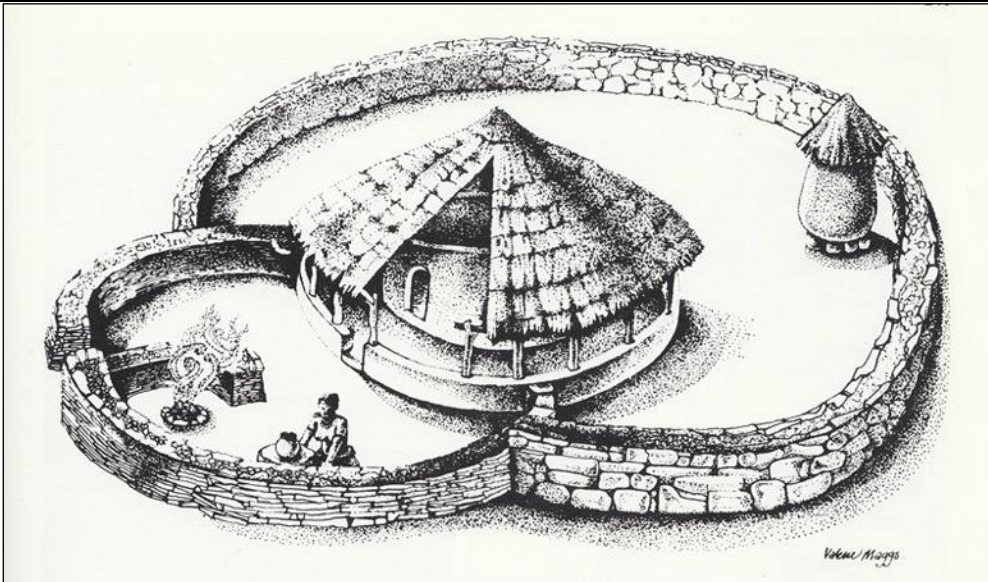


Figure 15 – Artist’s impression of a bilobial dwelling at site OXF 1. These bilobial dwellings represent a characteristic element of Type Z settlements (Maggs, 1976:241).

<p>AD 1700 – AD 1820</p>	<p>The Makgwareng facies of the Blackburn Branch of the Urewe Ceramic Tradition represents the next known Iron Age period within the surroundings of the study area. The decoration on the ceramics from this facies is characterised by finely stamped triangles, rim notching and appliqué (Huffman, 2007).</p> <p>This facies developed from Ntsuanatsatsi south of the Vaal River and can be associated with the Type V stone walling settlement type (Huffman, 2007), the name of which is derived from Vegkop (Maggs, 1976). Van Riet Lowe (1927) was one of the first to record these structures. Dreyer (1990) also conducted excavations on Type V Late Iron Age stonewalled settlements located a short distance south-west of Winburg.</p> <p>The Type V settlements comprise a core of cattle enclosures surrounded by beehive huts. Corbelled stone huts are associated with this walling type, and can be seen as characteristic. They are low stone huts located at the edge of the cattle enclosures and were where the boys herding the cattle often lived (Huffman 2007). As suggested by Huffman (2007), the corbelled huts were in fact beehive huts made of stone rather than grass and reeds. Furthermore, the presence of beehive huts at these sites necessarily indicates a Nguni association or origin with these settlements.</p>
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DATE	DESCRIPTION
	<p>Based in information presently available, the best known site of this type found within the surroundings of the study area, comprises a so-called “Early Sotho Settlement, Waterval, Sandrivierhoogte” that was originally declared a National Monument and which is now registered as a Provincial Heritage Site. The site is located 27.3 km east of the present study area. The site was proclaimed a national monument by virtue of a notice in the Government Gazette on 17 December 1982. In the declaration, the site is described as a ‘Leghoya Village’ comprising corbelled huts and stonewalls. The site has since been declared a Provincial Heritage Site in terms of the National Heritage Resources Act (www.sahra.org.za).</p>



Figure 16 – Corbelled stone huts associated with a Type V settlement (Huffman, 2007:39).

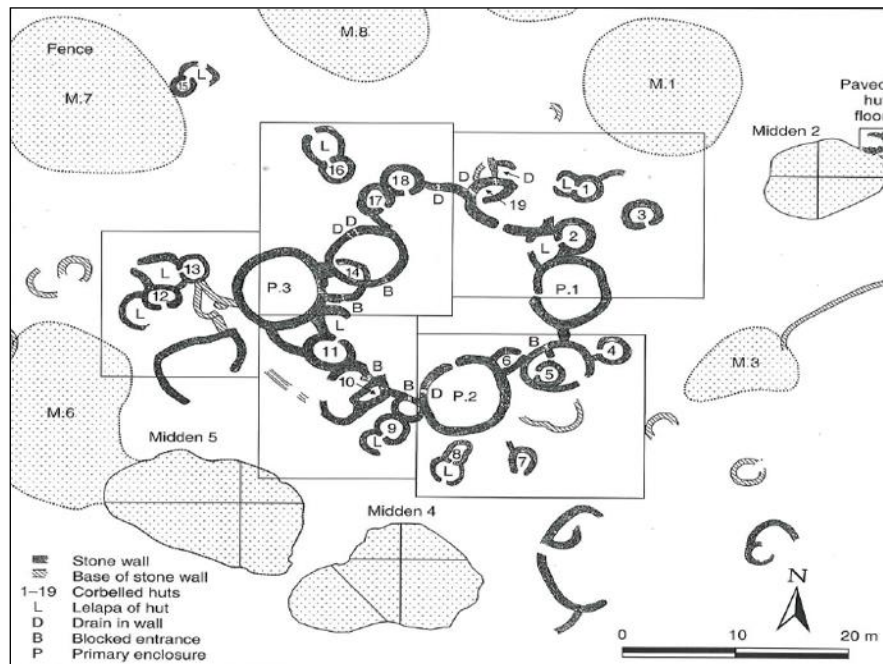



Figure 17 – Layout of a Type V Settlement (Huffman, 2007:38).

DATE	DESCRIPTION
1820s	<p>Across the Southern Highveld, this period was characterised by warfare and unrest. Known as the Mfecane, these years of upheaval originated primarily in the migration of three Nguni groups from present day Kwazulu-Natal into the present-day Free State as a result of the conquests of the Zulu under King Shaka. The three Nguni groups were the Hlubi of Mpangazitha, the Ngwane of Matiwane and the Khumalo Ndebele (Matabele) of Mzilikazi.</p> <p>In c. 1821, the Hlubi migrated across the Drakensberg Mountains in a westerly direction (Maggs, 1976) and attacked the Tlokwa of MaNthatisi along the banks of the Wilge River. This river has its source near Harrismith and flows into the Vaal River where the Vaal Dam is located today. While it is not exactly certain where MaNthatisi's settlements would have been located (in all likelihood further south), the Tlokwa fled westward as a result of the Hlubi attack and in turn attacked other groups in its path. This started a period of unrest and warfare, which rippled across the Highveld on both sides of the Vaal River (Legassick, 2010) (Lye and Murray, 1980).</p> <p>The Ngwane followed closely on the Hlubi and further augmented the unrest and warfare along the southern Highveld (Legassick, 2010).</p> <p>Although the effects of the migrations of the Hlubi and Ngwane would certainly have had a profound impact on the northern Free State, this was also the case in terms of the Khumalo Ndebele who would have played a significant role in the surroundings of the study area during this time.</p> <p>The Khumalo Ndebele (also known as the Matabele) were also forced to leave Kwazulu-Natal and between 1823 and 1827 settled along the central Vaal River (Bergh, 1999). Mzilikazi attacked a number of Sotho-Tswana groups and settlements and incorporated them into his kingdom. As a result, his activities would have had a definite impact on the northern Free State at the time.</p>



Figure 18 - King Mzilikazi of the Matabele. This illustration was made by Captain Cornwallis Harris in c. 1838 (www.sahistory.org.za).

DATE	DESCRIPTION
The Early Colonial Period	
<p>The early Colonial Period within the study area and surroundings was characterised by the arrival of newcomers to the Transoraniga. The first arrivals were the Griqua followed by white Trekboers, who for the most part practiced a nomadic pastoralist way of life and were small in number. During the 1830s 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>	
1804	<p>The Griqua were of European and Khoikhoi descent, and although they had been present on the Orange River for some time, they only established themselves permanently north of the river in 1804 when they settled near present-day Danielskuil (Reader's Digest, 1994).</p>
Early 1800s	<p>During the early 1800s, frequent droughts forced white farmers from the Cape Colony to move with their livestock across the Orange River to look for better grazing. Initially, these Trekboers first obtained permission from the Cape authorities before departing across the frontier, however with time, increasing numbers of Trekboers moved across this river into the Transorangia (as it became known) without any prior permission (Schoeman, 1980).</p>
Early 1836	<p>The first Voortrekker party of some 70 wagons crossed over the Orange River during early 1836. More groups followed and in terms of the surroundings of the study area, established themselves along the Vet River (Schoeman, 1980). Meintjies (1973) mentions that a Voortrekker party under Hendrik Potgieter arrived along the Vet River during this time. The grazing around the Vet River was not enough for all the livestock and animals of the Voortrekkers, so they split into smaller groups with one group establishing itself in May 1836 at Blaauwdrift, on the Zand River. This farm is located within the study area. Apart from this historic event, the closest known tangible evidence for the Voortrekkers to the study area was a fort which they built on the northern bank of the Zand River on the farm Du Preez Leger. The farm Du Preez Leger is located 1.7 km east of the present study area.</p>
1837 - 1843	<p>In 1841 the town of Winburg was established on the banks of the Vet river. After the annexation of Natal by the British in 1843 and the subsequent dissolution of the Voortrekker Republic of Natalia, Winburg became the capital of the Voortrekkers in what is today known as the Free State (Erasmus, 2004). Winburg is located 34 km south-east of the study area.</p> <p>On 10 October 1968, an extensive Voortrekker Monument was opened near Winburg (www.artefacts.co.za).</p>

DATE	DESCRIPTION
	 <p data-bbox="180 712 1385 792">Figure 19 – Depiction of an ox wagon crossing a river during the Great Trek (Reader’s Digest, 1994:116).</p>
The Mid to Late Nineteenth Century	
<p data-bbox="180 1077 304 1149">3 February 1848</p>	<p data-bbox="347 882 1385 954">The Orange River Sovereignty was proclaimed over the Transorangia by Great Britain and had its capital at the newly established town of Bloemfontein (www.wikipedia.org).</p> <p data-bbox="347 976 1385 1099">The sovereignty came about after one-sided agreements that favoured the British Government had been reached between Great Britain on the one hand and King Moshesh of the Basotho and Adam Kok III of the Griqua on the other.</p> <p data-bbox="347 1122 1385 1346">Those Voortrekkers present in the Transorangia were completely by-passed by these agreements, which led to serious dismay and disappointment amongst them. In terms of the surroundings of the study area, the response of the Voortrekkers was to force the British magistrate at Winburg, one Thomas Biddulph, out of town and proclaim the Republic of Winburg (Reader’s Digest, 1994).</p>
<p data-bbox="180 1615 304 1686">16 January 1852</p>	<p data-bbox="347 1368 1385 1541">On 16 January 1852 the Sand River Convention was signed between the British Government and the Transvaal Boers. The British Government was represented by British Assistant Commissioners W.S. Hogge and C.M. Owen, whereas the Transvaal Boers were under the leadership of the Voortrekker hero of Blood/Ncome River, General Andries Pretorius.</p> <p data-bbox="347 1563 1385 1787">This convention formally recognised the existence and independence of the Boer Republic north of the Vaal River by the British Government. As a result, this agreement allowed for the creation of a Boer Republic, namely the <i>Zuid-Afrikaansche Republiek</i> (South African Republic) (Oberholster, 1972). The <i>Zuid-Afrikaansche Republiek</i> remained in existence until the end of the South African War in 1902.</p> <p data-bbox="347 1809 1385 1928">The site where the signing of the convention took place, was declared a monument and for many years was marked by a stone cairn and plaque (Oberholster, 1972). The present condition of the monument is not known.</p>

DATE	DESCRIPTION
	The site is located near the bridge where the N1 highway passes over the Sand River, and is located approximately 29 km east of the present study area.
23 February 1854	<p>The Orange River Convention was signed by representatives of Great Britain and the Boers, and resulted in the proclamation of the Boer Republic of the Orange Free State. The convention was signed at Bloemfontein (www.wikipedia.org).</p> <p>As with the proclamation of the Sovereignty, the Orange River Convention was again one-sided and did not obtain the blessing or inputs of all the major role-players in the Free State. While the Voortrekkers were excluded in 1848, the signing of the Orange River Convention in 1854 did the same to the Basotho and Griqua.</p> <p>For the next 48 years, the study area fell within the boundaries of the Boer Republic of the Orange Free State.</p> <p>Incidentally, the Orange River Convention is sometimes referred to as the Bloemfontein Convention.</p>
1872	<p>The town of Ventersburg was laid out on the farm Kromfontein in 1872. Kromfontein had originally belonged to one of the early Voortrekker leaders, namely Field-Cornet P.A. Venter. After his death in 1857, his son B.G. Venter allowed church services to be held in his father's homestead. The second Gereformeerde (Dopper) church north of the Orange River was also established at Kromfontein in 1859.</p> <p>The use of the farm for church services led to the establishment of a town. The new town was named after Field-Cornet P.A. Venter, and formal proclamation for Ventersburg took place in 1876 (Erasmus, 2004).</p> <p>Ventersburg is located 37.23 km east of the present study boundaries.</p>
1890	<p>Erasmus (2004) states that two American engineers were responsible for the original survey of sections of the proposed railway line between Bloemfontein and Johannesburg. On the farm Merriespruit they chiselled the name 'Virginia' on a boulder, presumably in honour of the American State of Virginia. When the railway line was built a few years later, the nearby railway siding was named Virginia and some years later, in 1954, the town of Virginia was also established.</p> <p>The Virginia railway siding is located 13.5 km east of the present study area. The exact position of the chiselled boulder, if it still exists today, is not presently known.</p>
Early 1890s	The railway line between Bloemfontein and Johannesburg was built during the early 1890s, and eventually reached Johannesburg during September 1891 and Pretoria in January 1892 (Schoeman, 1980). In terms of the study area, this railway line passed to its east and in this area was built from Smaldeel (present day Theunissen) to Theron, Welgelegen and Virginia.

DATE	DESCRIPTION
9 November 1892 – 1899	<p>The Driekopjes Diamond Mining Company was registered. One of the founding directors of the company was the man who would become synonymous with South African diamond mining and diamonds, Sir Thomas Major Cullinan.</p> <p>The “Driekopjes” in the name of the company referred to a farm of that name north-west of Kroonstad, where diamond mining was taking place. In June 1894 the Driekopjes Diamond Mining Company also acquired an interest in the farm Welgegund from the Van Rensburg Diamond Mining Syndicate. The farm Welgegund was located within the study area, and is presently known as the farm Driekoppies 422. No information could be found on this syndicate. However, the fact that the Driekopjes Company acquired an interest from the Van Rensburg syndicate, suggests that diamond prospecting and possibly mining activities had taken place within the study area before this transfer took place.</p> <p>A large number of diamonds were subsequently recovered from Welgegund. However, all mining activities came to a halt with the South African War (1899 – 1902) (Helme, 1974).</p>
Mid 1890s	<p>During the mid 1890s two men arrived on the farm Aandenk to undertake prospecting work. Alexander Edward King Donaldson was a prospector and his associate Herbert Hinds an engineer. They excavated an 18-meter-deep shaft and took samples from their excavations for further testing and analysis. On their return journey to England, both men died when their ship, the Drummond Castle, wrecked at Ushant off France, and with it the samples they had brought from the Free State (www.sahra.org.za) (Felstar Publishers, 1968).</p> <p>The activities of these two men laid the foundation for the discovery and development of the Free State Goldfields. The farm Aandenk is located immediately south of Allanridge today, some 35 km north by north-west of the present study area.</p>
1899	<p>The town of Odendaalsrust was officially established in 1899 when the Dutch Reformed Church chose the farm Kalkkuil for its new parish. The town was proclaimed a municipality in 1912. At the time, it only had about 40 houses, three shops and a hotel (Mayhew, 1982).</p>
The South African War (1899 – 1902)	
<p>The South African War was fought between the Boer Republics of the Transvaal and Free State on the one side and Great Britain on the other, but is referred to as the South African War as the victims and participants of the war were not excluded to Britain or Boer alone.</p> <p>As will be discussed in more detail below, the march of Lord Roberts from Bloemfontein to Pretoria in May and June 1900 was especially significant in terms of the study area. In particular, the so-called Battle of Zand River (7 – 10 May 1900) was fought very close to the study area, with at least the movement of troops during the battle taking place across the study area.</p>	
13 March 1900 – 6 May 1900	<p>Bloemfontein, the capital of the Boer Republic of the Orange Free, was occupied by the British Army under Lord Roberts on 13 March 1900. The Boer Republic of the Orange Free State was renamed the Orange River Colony.</p>

DATE	DESCRIPTION
	<p>With the Republican forces of the Transvaal and Free State retreating northwards from Bloemfontein, Lord Roberts's eyes drifted further north, where the greatest prize of the war lay waiting, Pretoria. Lord Roberts and his staff strongly believed that once the capital of the <i>Zuid-Afrikaansche Republiek</i> fell, the war would be over.</p> <p>However, the success of the British Army required all focus on the immediate front, as the land between Bloemfontein and Pretoria was bisected by a myriad of rivers, dongas and hills, all strategically significant obstacles from where the Boer forces could implement a solid defence. The Boer forces standing between Lord Roberts and Transvaal capital were estimated by British Intelligence to comprise two main groups namely a force of between 5 000 to 6 000 burghers with 18 guns under General Louis Botha and a similarly large force in the surroundings of Kroonstad (Maurice & Grant, 1906).</p> <p>After departing from Bloemfontein, Lord Roberts's force was involved in a couple of successful actions on their way to Pretoria, including Brandfort (3 May 1900) and Vet River (4 - 6 May 1900). With the successful conclusion of the battle of Vet River, Lord Roberts and almost his entire army crossed over the river successfully, and by the evening of 6 May 1900 bivouacked at the small railway siding known as Smaldeel. The town of Theunissen is located here today and is roughly 12 km south of the present study area (Maurice & Grant, 1906).</p> <p>A short distance to the north lay the next, and far more daunting, obstacle on Lord Roberts's march to Pretoria, the Zand (or Sand) River. It was here, at this river, that General Louis Botha, the commanders-in chief of the Transvaal republican forces, was determined to halt Lord Roberts's march on Pretoria.</p>



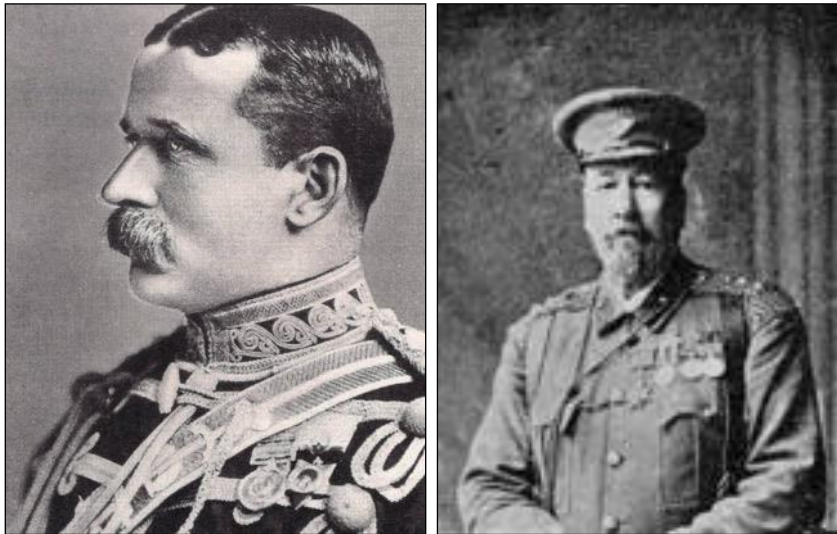
Figure 20 – Lord Frederick Sleigh Roberts (left) and General Louis Botha (right). These two officers commanded the opposing forces at the Battle of Zand River (Changuion, 2001:77 & 117).

DATE	DESCRIPTION
7 – 10 May 1900	<p>On 7 May 1900 a reconnaissance of the Zand River by General Edward Hutton indicated that the northern bank of the river was held by a force of roughly 6 000 Boers supported by two heavy and eight light pieces of artillery. These estimates provided by General Hutton allowed Lord Roberts to draw up a battle plan (Maurice & Grant, 1906).</p> <p>On the 9th of May 1900, Lord Roberts moved his army forward and established his headquarters at the Welgelegen Station, roughly 6 km east of the study area. The movement of the British Army under Lord Roberts from a position a short distance south of the study area at Smaldeel to a position a short distance east of it, suggests that the main component of Lord Roberts's force followed the railway line and, in this way, skirted around the study area. However, in view of the closeness of this railway line to the present study area, sections of his force would almost certainly have crossed over the study area as well.</p> <p>Lord Roberts's battle plan focussed on securing significant drifts that provides safe crossing of his infantry over the Zand River, and especially so Junction Drift (23.5 km east of the study area), Merriespruit (16.6 km east of the study area), Du Preez Leger Drift (located within the study area where the bridge on the road between Theunissen and Welkom crosses the river) and De Klerks Kraal Drift (940 m west of the present study area). For the purposes of this discussion, the events associated with the latter two of these drifts will be discussed in more detail below.</p> <p>On the morning of 9 May 1900, Lieutenant-Colonel Thomas William Porter with the 1s Cavalry Brigade departed from Smaldeel to reconnoitre the two drifts at Du Preez Leger and De Klerks Kraal. They were assisted in this task by Major-General J.B.B. Dickson with the 4th Cavalry Brigade. Meanwhile, at 11 am, Major-General John French with his advance guard reached Kalkoenkrans, a section of which farm is located within the present study area. At Kalkoenkrans, French received word from the reconnaissance units on the river that the Du Preez Leger Drift was not held by the enemy. Seizing the opportunity to outflank the Boer positions, French immediately ordered a squadron of the Scots Greys forward to take possession of the drift, and ordered the remainder of the 1st Cavalry Brigade to follow and assist in this task. The 4th Cavalry Brigade was left at Kalkoenkrans in support. By 15h30 that afternoon the Du Preez Leger Drift was occupied by the British force, with the De Klerks Kraal Drift was taken shortly thereafter. Incidentally, the other significant drifts on the river had also been taken with similar ease.</p> <p>On the morning of 10 May 1900, Lord Roberts's army advanced on the river. On its left flank (and the side closest to the study area) General French with the 1st Cavalry Brigade, the 4th Cavalry Brigade as well as Hutton's Mounted Infantry, crossed over the Du Preez Leger Drift from where they moved in a north-eastern direction.</p> <p>On the left centre of the front, the 3rd Cavalry Brigade and Henry's Mounted Infantry crossed over the drift at the railway line in proximity to present-day Virginia, some 16.6 km to the east of the study area. The northern bank was occupied by 8 am that same morning.</p>

DATE	DESCRIPTION
	<p>The crossing of the drifts further to the east was achieved with more difficulty, but the northern banks were also occupied a mere half an hour after the crossing over the Merriespruit Drift near the railway line.</p> <p>This meant that Lord Roberts's front comprising cavalry and mounted infantry units had successfully crossed over the Zand River early on the morning of 10 May 1900, without meeting any significant resistance. However, the fortunes of war were about to change for Lord Roberts. A patrol sent out by General French ran into a large Boer force of between 2 000 and 3 000 burghers moving down onto the centre of Lord Roberts's front at the Virginia Station. French ordered an attack by one squadron each from the 6th Inniskilling Dragoons, Scots Greys and Australian Horse and two troops from the 6th Dragoon Guards (Carabiniers). Their attack was focussed on the centre of the advancing Boer force on a ridge located on the farm Vredes Verdrag. This farm is situated some 21.3 km north-east of the present study area and as a result this part of the battle will not be discussed in any detail. Suffice to say that the battle raged for some time and the outcome was not at all clear until 14h00 that afternoon when the Boers abandoned the field of battle, allowing the British to occupy the ridge and proceed forward (Maurice & Grant, 1906).</p> <p>Further battles and actions took place to the east, near Junction Drift. However, by the afternoon of 10 May 1900, all the drifts had been successfully cleared and occupied to allow for the crossing of the Zand River by Lord Roberts's infantry (Maurice & Grant, 1906).</p>



Figure 21 – Lord Roberts's infantry crossing the Zand River at the conclusion of the Battle of Zand River. This photograph was in all likelihood taken during the afternoon of 10 May 1900, after all the significant drifts across the river had been cleared by the cavalry and other units. The crossing and surrounding landscape are monitored by an observation balloon (see top right). It is not possible to

DATE	DESCRIPTION
	<p>identify the exact drift where this crossing took place, although the remnants of a bridge foundation structure can be seen in the riverbed (Raath, 2007:351).</p>
	
	<p>Figure 22 – Two of the British officers at the Battle of the Zand River who were closely associated with the events within the study area, namely the occupation of the Du Preez Leger Drift on 9 May 1900 as well as the crossing of the drift on the morning of 10 May 1900. General John French (left) (Changuion, 2001:77) and Colonel Thomas William Porter (www.nzetc.victoria.ac.nz).</p>
	<p>After the fall of Pretoria on 5 June 1900 and the subsequent battles of Diamond Hill (11-12 June 1900) and Bergendal (21-27 August 1900), the Boer generals decided that the only way to proceed with the war would be the implementation of a completely different strategy, a strategy based on mobility by using smaller commandos to attack and harass the British on all fronts in what was to become known as guerrilla warfare. This style of warfare had significant successes and extended the war for nearly another two years. However, these successes also came with significant losses as the war increasingly dragged the civilian population of the Boer Republics into the carnage of war.</p> <p>No skirmishes or battles associated with the guerrilla war are known from within the study area or its immediate surroundings. This said, the study area and surroundings, as with almost the entire South Africa, experienced the effects of guerrilla warfare.</p> <p>In retaliation to the new form of warfare, the British High Command devised a strategy of building extensive blockhouse lines across the country as a way of hindering the mobility of the Boer commandoes. By December 1900, points along the railway line north of Bloemfontein had been fortified with hastily constructed trenches shaded by roofs and defended by razor wire. The closest of these defensive works to the present study area was at Virginia, 13.5 km to the east. Shortly thereafter, a number of key positions along the railway line north of Bloemfontein</p>

DATE	DESCRIPTION
	<p>were significantly strengthened with the construction of multi-storey blockhouses. At Virginia, for example, a double storey stone blockhouse as well as one corrugated iron blockhouse were built (Hattingh & Wessels, 1997).</p> <p>Lord Kitchener, in particular, also implemented a strategy that was to become known as scorched earth whereby the Boer farms were burnt to the ground and the civilian population (both white and black) remaining on these farms forced into concentration camps. No details regarding the destruction of farms from within the study area are presently known. However, the destruction of farms during the guerrilla phase of the war would certainly have taken place within the study area as well.</p> <p>While no concentration camps existed within the study area, a surprising large number of such camps were located in the surroundings of the study area. Black concentration camps were located at Smaldeel, Virginia, Welgelegen and Winburg (Warwick, 1983). Of these, Welgelegen is the closest at a distance of 6 km east of the present study area. The closest white concentration camp to the study area was at Winburg, roughly 34 km south-east of the study area (www.angloboerwar.com).</p> <p>Untold hardship ensued in these concentration camps, and many women and children died as a result of exposure, inadequate nutrition and poor medical facilities. These camps resulted in the deaths of 27 926 white and 14 154 black people (www.sahistory.org.za).</p>
The Early Twentieth Century (1902 – 1913)	
The Boer Rebellion (1914 – 1918)	
<p>At the end of the South African War (1899 – 1902), the Transvaal and Orange Free State republics lost their independence to the British Empire. In 1910, the Union of South Africa was established consisting of the Cape Colony, Natal, the Transvaal Colony and the Orange River Colony. General Louis Botha was appointed the Union's first prime minister and believed that South Africa's future would be best served as part of the British Commonwealth. In 1914, the South African government under General Louis Botha decided to assist Great Britain in its war with Germany. A number of Boer leaders were not happy about this turn of events, and when General Koos de la Rey was killed at a roadblock in Johannesburg, emotions reached a boiling point and rebellion broke out across the former Boer republics. This rebellion saw more than 11 000 Boer men under the leadership of some of the former Boer War generals such as De Wet, Maritz, Kemp and Beyers rebelling against the South African government and its armed forces under the leadership of former Boer War generals Louis Botha and Jan Smuts.</p>	
<p>16 November 1914</p>	<p>In terms of the study area, the most notable event relating to the Boer Rebellion was the battle that occurred between the commando of General De Wet and the Government forces under the command of Colonel Enslin at the Virginia railway station on 16 November 1914. This battle followed on the defeat of De Wet's rebels at Mushroom Valley, south-east of Winburg, at the hands of General Louis Botha. De Wet and 2 000 rebels managed to escape from Mushroom</p>

DATE	DESCRIPTION
	<p>Valley and followed the railway line north-eastwards towards the Virginia Station on the Zand River. De Wet wanted to cross over the railway line, and as a result, a fight ensued with Colonel Enslin's forces stationed at Virginia Station. General De Wet suffered a number of casualties and 50 of his men were also taken prisoner. After the battle, De Wet and his men followed the Zand River in a western direction and crossed over the river into the Transvaal Colony in proximity to Hoopstad (Union of South Africa, 1916).</p> <p>The Virginia Station is located 13.5 km east of the study area, and as a result the battle would have taken place outside the study area boundaries. However, the movement of De Wet and his commando after the battle would have taken them through the present study area.</p>



Figure 23 –The hardships experienced by General C.R. de Wet during the rebellion can be seen on these photographs. The one on the left shows De Wet shortly after the South African War (Van Schoor, 2007) with the image on the right depicting the general in the Bloemfontein prison after his capture late in 1914 (Raath & Langner, 2014:119).

The Remainder of the Twentieth Century (1915 – Present Day)	
1929 - 1933	<p>Nearly 25 years after finding the first indications of gold on the farm Aandenk, Archibald Megson finally managed to raise the interests of possible investors in Johannesburg. In 1929, during a chance encounter with Joseph Freedman, Megson found a more welcoming response. Freedman introduced the prospector to Johannesburg attorney, Emmanuel Jacobson, and his friend Allan Roberts, a dental technician. Despite being interested in what the prospector had to say, it took almost four years before Jacobson, Roberts and Megson travelled to the Free State (Shorten, 1970).</p> <p>Allan Roberts, who was an amateur prospector, was able to trace a conglomerate outcrop all along the farm Aandenk, and incorrectly identified it as part of the Upper Witwatersrand series. The two friends returned to Johannesburg and formed a syndicate comprising themselves, F.L.</p>

DATE	DESCRIPTION
	<p>Marx, Dr. E.B. Woolf, Samuel Potter and Joseph Freedman. Freedman represented the interests of the old prospector Archibald Megson in the syndicate (Shorten, 1970).</p> <p>The syndicate acquired prospecting options on 31 farms in the area and the company Wit. Extensions Limited was established by the syndicate. On 23 October 1933, drilling commenced at a point roughly 80 m from Megson's trench on the same farm Aandenk. However, by February 1935 the drilling work had to be halted due to a lack of funds without any evidence for gold-bearing reefs identified. Many years later, it was estimated that if the two friends had only managed to deepen the hole by another 400 feet, they would have become very rich men and the discoverers of the Free State goldfields. Sadly, this was not to be their fate. Allan Roberts died in such poverty in 1939 and his friends had to pay for his funeral whereas Emmanuel Jacobson had to sell all his assets to survive (Shorten, 1970). Today, the town of Allanridge (named after Allan Roberts) and a monument to the west of the road between Welkom and Bothaville are all that is left of the dreams and expectations of these two mining pioneers.</p>

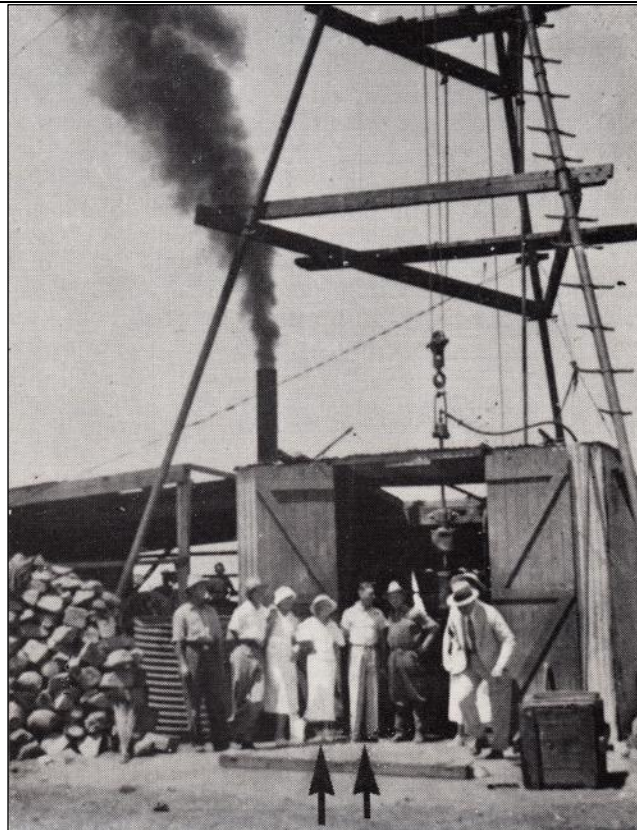


Figure 24 – The first gold prospecting borehole in the Free State was sunk on the farm Aandenk between October 1933 and February 1935. The arrows indicate the positions of Allan Roberts and his wife (Felstar Publications, 1968:11).


1935	After the failure of Wit. Extensions Limited, an agreement was reached with the Anglo-French Exploration Company to continue prospecting work at Aandenk. However, instead of continuing
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DATE	DESCRIPTION
	<p>deeper on the same borehole, the Anglo-French Exploration Company decided to rather deflect the borehole and no results were achieved. It was later estimated that if either one of these companies had deepened the borehole by only another 400 feet, payable gold would have been discovered (Shorten, 1970).</p> <p>The agreement between Wit. Extensions Limited and Anglo-French Exploration Company came to an end and the famous geologist Dr. Hans Merensky acquired an interest in Wit. Extensions Limited. He subsequently carried out extensive prospecting work including the drilling of further boreholes. However, even these more extensive attempts by Merensky to find the Free State goldfields also failed (Shorten, 1970). Machens (2009) indicates that when news broke that the famous discoverer of inter alia South Africa’s platinum reserves owned options in a company working on the Free State goldfields, the interest from investors and mining companies to this part of the Free State was further awakened.</p>



Figure 25 –The famous geologist Dr. Hans Merensky, who had his role to play in the discovery of the Free State goldfields (Machens, 2009).

<p>1 February 1937 – April 1939</p>	<p>After failing to discover any payable gold, Merensky sold his shares in Wit. Extensions to the Anglo American Corporation, who on 1 February 1937 established the West Rand Investment Trust. The trust also carried out an extensive drilling operation. The activities and interest of the Anglo American Corporation in this part of the Free State attracted the interest of other mining</p>
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DATE	DESCRIPTION
	houses and investment companies, and prospecting options were taken out on a large number of farms from this area (Shorten, 1970).
	<p>Despite all this interest, the first payable gold in the Free state was only identified in March 1939 during drilling operations by the African and European Investment Company on the farm Uitsig at a depth of 2 701 feet (Felstar Publishers, 1968). One month later, during April 1939, another discovery of payable gold was made on the farm St. Helena at a depth of 1 143 feet (Shorten, 1970).</p> <p>The discoveries of payable gold at Uitsig and St. Helena created significant excitement amongst mining companies and investors, and increasing numbers of prospecting options and eventually mines were acquired and developed. The Free State gold rush had begun.</p> <p>The farm Uitsig is located 10.3 km north by north-east of the present study area with the farm St. Helena roughly 2.9 km to the north.</p>
1941	The first gold mining lease in the Free State was granted by the government of the Union of South Africa for the farm St. Helena in 1941, and the St. Helena Gold Mining Company was established to mine and develop the property (Felstar Publishers, 1968). A number of other gold mining companies were also established in a relatively short spate of time, including the Welkom Gold Mining Company, President Steyn Gold Mining Company and the President Brand Gold Mining Company.
	 <p><i>Figure 26 –The first mine shaft ever sunk along the Free State goldfields, namely the No. 3 Incline Shaft at the St. Helena Gold Mine (Felstar Publishers, 1968:151).</i></p>
16 April 1946	The borehole of the Blinkpoort Gold Syndicate Limited on the boundary of the farms Geduld and Friedenheim, reached payable gold in 1946. On 16 April 1946 it was announced that the gold-bearing material retrieved at a depth of 3 922 feet from this borehole assayed at an impressive 1 252 dwts per ton which was unique in the history of gold prospecting and mining in South Africa, with averages usually in the region of 250 dwts per ton. This discovery led to further interest in the Free State goldfields (Felstar Publishers, 1968).
11 July 1946 –	On 11 July 1946 an application was made by the land company of Sir Ernest Oppenheimer's Anglo American Corporation, namely the South African Township and Mining and Finance Corporation,

DATE	DESCRIPTION
15 April 1947	<p>for the establishment of a new town called Welkom. After some legal and procedural processes and debate between the township applicants and its opponents (including the Odendaalsrus Town Council), the application for the establishment of the town of Welkom was approved on 15 April 1947 (Felstar Publishers, 1968).</p> <p>William Backhouse designed the town as a garden city with a commercial centre built around a town square and traffic circles rather than stop streets or traffic lights. More than a million trees were also planted (Erasmus 2014).</p>



Figure 27 –This photograph of Welkom was taken during the 1960s, roughly ten years after its establishment (Felstar Publications, 1968:171).

1953	<p>After gold was discovered in the area, Odendaalsrus became a prominent town in the Free State. A railway line was built from Allanridge to Odendaalsrus in 1953 and served the two Freddie’s mines (Nienaber et al. 1982).</p>
1954	<p>Three of the six mines surrounding Welkom had reached production stage by 1954. These were the Welkom, Western Holdings and St. Helena Mines.</p> <p>During the same year, the town of Virginia was laid out on the banks of the Zand River. As indicated elsewhere, the name of this town was derived from the nearby railway station, which in turn was named this after two American engineers working on the line in 1890 had carved the name “Virginia” on a boulder from a nearby hill (Erasmus 2014).</p>

DATE	DESCRIPTION
	Virginia is located 12 km east of the present study area.
1981 - 1987	<p>Beisa Shaft (now the Beatrix West Section) was commissioned in 1981 to exploit uranium. The sinking of Beatrix 1 and 2 Shafts (now the Beatrix South Section) were also started at the time (www.sibanyegold.co.za).</p> <p>In 1984, the Beisa Uranium Mine was closed due to the low price of uranium at the time. In 1985 the Beatrix 1 and 2 Shafts were commissioned, and exploration work commenced in proximity to the Beisa Mine on the farm Kalkoenkrans (www.sibanyegold.co.za).</p> <p>The sinking of two sub-vertical shafts and a ventilation shaft commenced at the Beisa Mine in 1987. During the same year this mine was renamed the Oryx Mine (www.sibanyegold.co.za).</p> <p>The Beisa (Oryx) Mine is located within the study area on the farm Palmietkuil.</p>

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

Topographic maps (1:50 000) for various years (1947, 1968 and 1975) were assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The maps were also used to assess the possible age of structures located, to determine whether they could be considered as heritage sites. Map overlays were created showing the possible heritage sites identified within the areas of concern, as can be seen below.

The relevant topographical maps include:

- First Edition Topographic map 282BB Virginia, surveyed in 1945 and drawn in 1945 by the Trigonometrical Survey Office. **(Figure 28)**
- Second Edition Topographic map 282BB Virginia, surveyed in 1954 and drawn in 1957 by the Trigonometrical Survey Office. **(Figure 29)**
- Third Edition Topographic map 282BB Virginia, redrawn in 1975 by the Trigonometrical Survey Office. **(Figure 30)**

Relevant to the study is the point SP001 indicated on the maps. This is an existing burial ground identified during the study. The 1954 map show a concentration of huts just west of this point that is most probably associated with these graves. The 1975 maps show no indication that the huts/houses are still present.

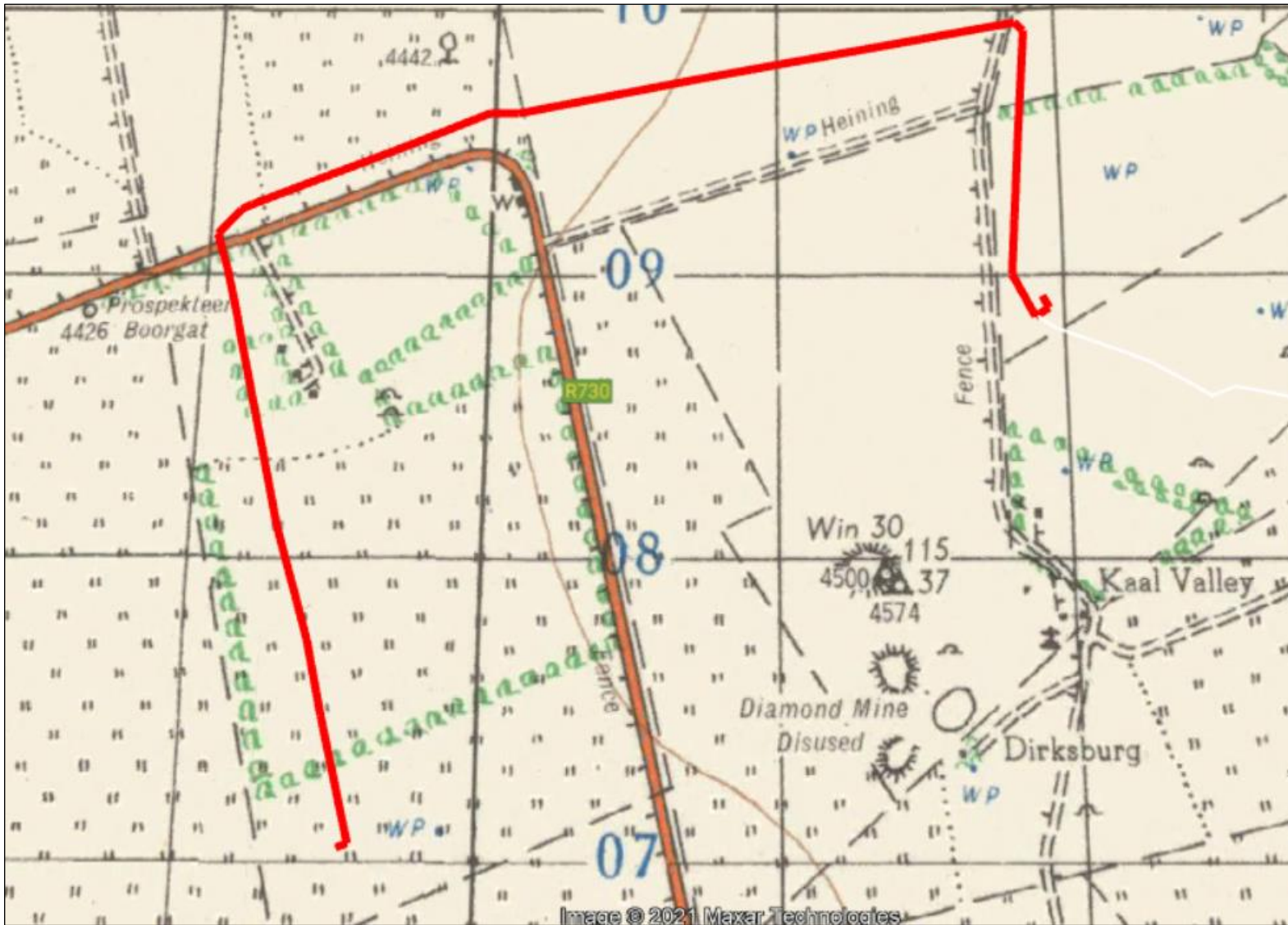


Figure 28 - First Edition Topographic map 2826BB, surveyed in 1945 showing the proposed alignment in red.

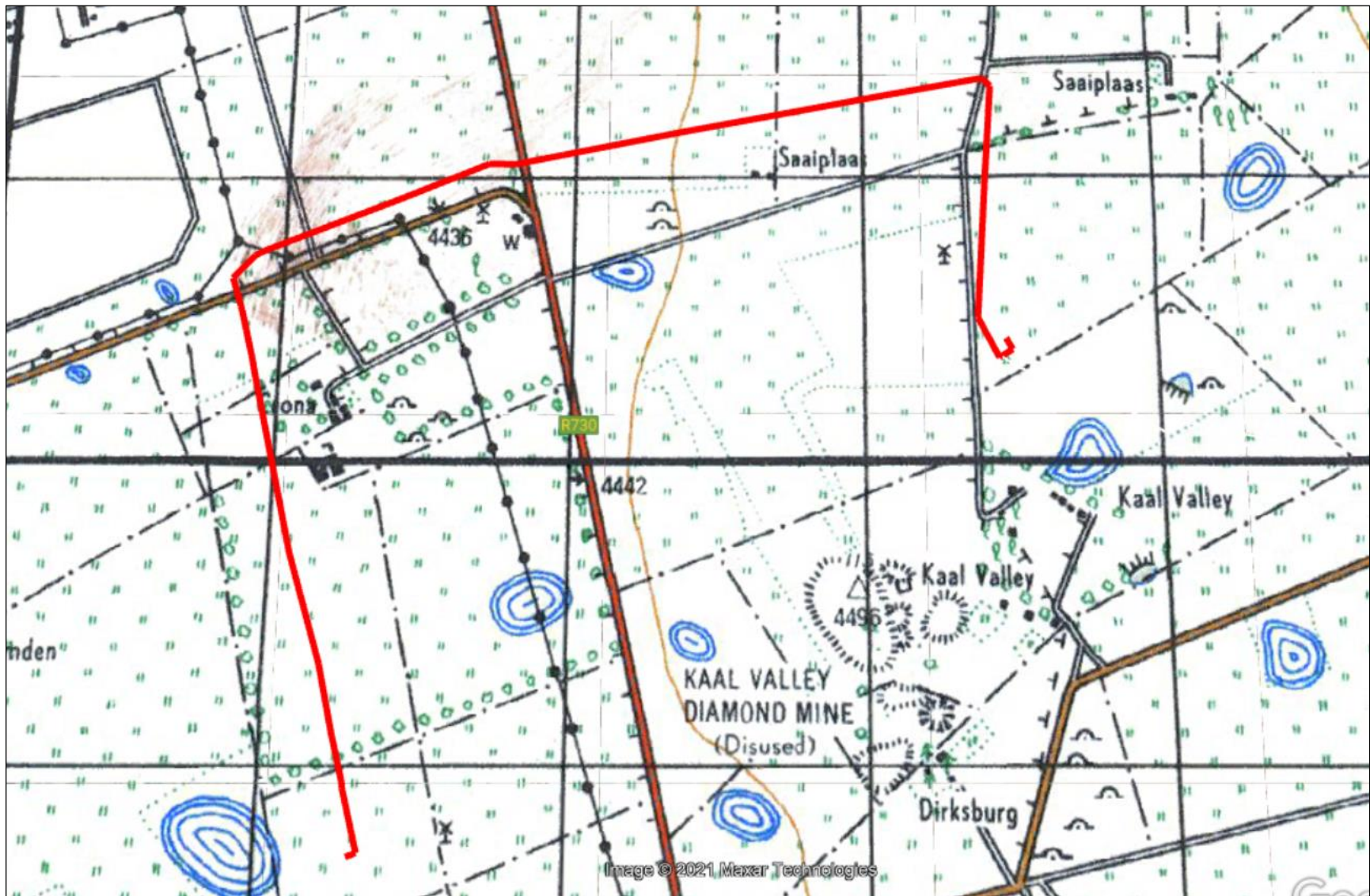


Figure 29 - Second Edition Topographic map 2826BB, published by the Chief Director of Surveys and Mapping in 1954 showing the proposed alignment in red

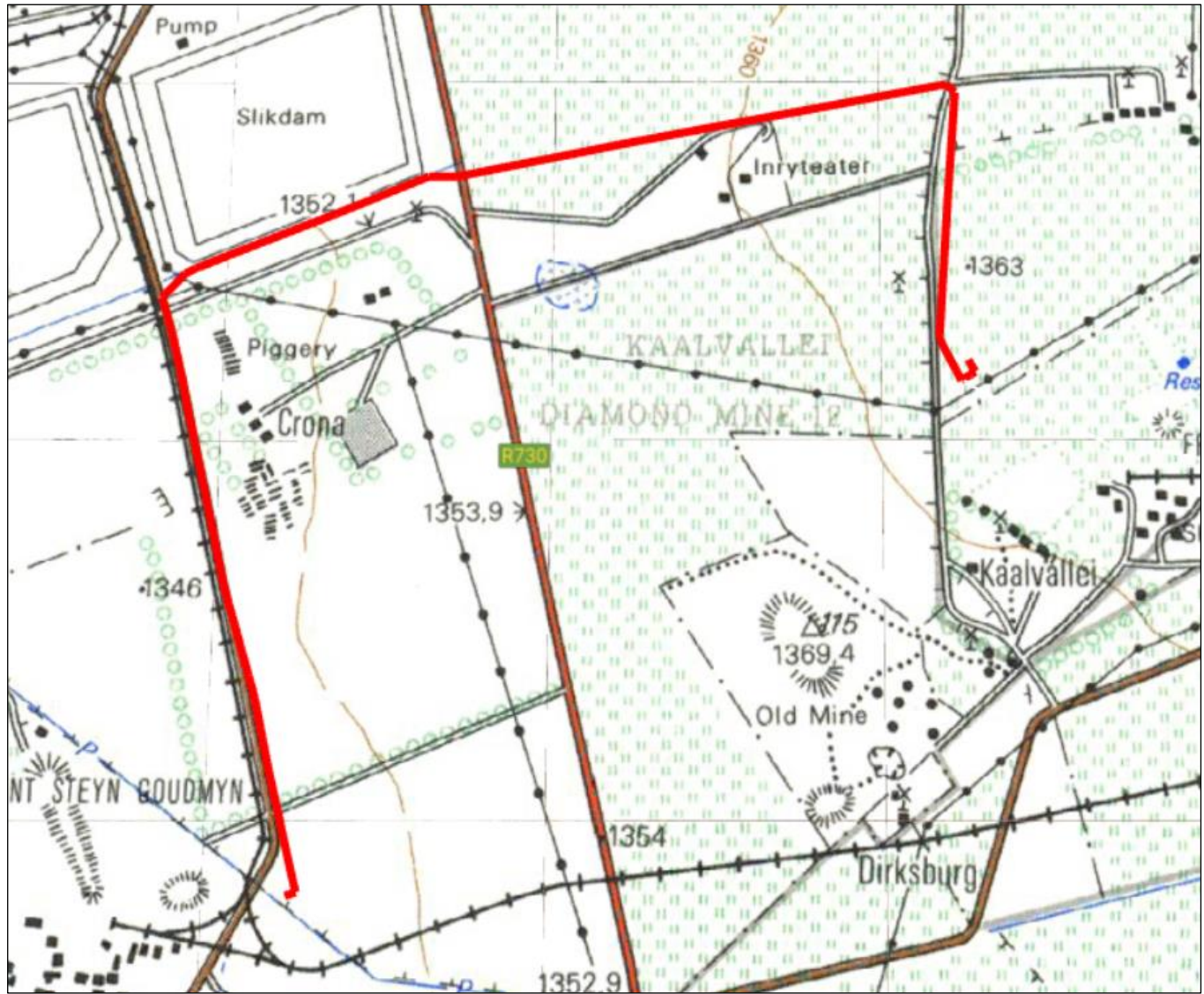


Figure 30 – Third Edition Topographic map 2826BB, published by the Chief Director of Surveys and Mapping in 1975, showing the proposed alignment in red

5.3 FINDINGS OF THE HISTORICAL DESKTOP STUDY

5.3.1 HERITAGE SENSITIVITY

The sensitivity maps were produced by overlying:

- Satellite Imagery;
- Current Topographical Maps; and
- Topographical Maps dating from 1945 to 1975.

By superimposition and analysis, it was possible to rate these structure/areas according to age and thus their level of protection under the NHRA. Note that these structures refer to possible tangible heritage sites as listed in **Table 7**.

Table 7 - Tangible heritage sites in the study area

Name	Description	Legislative protection
Archaeology - Iron Age Sites	Older than 100 years	NHRA Sect 3 and 35
Architectural Structures	Possibly older than 60 years	NHRA Sect 3 and 34
Graves and Burial Grounds	60 years or older	NHRA Sect 3 and 36

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 in **Table 8**.

Table 8 - 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
Watering holes/pans/rivers	ESA, MSA and LSA sites, LIA settlements
Farmsteads and settlements	Historical archaeological material
Ridges and drainage lines	LSA sites, LIA settlements

6 FIELDWORK AND FINDINGS

A controlled surface survey was conducted on foot and by a vehicle by two archaeologists (Michelle Sachse and Nicholas Fletcher) from PGS. The fieldwork was conducted on 5 October 2021. During the fieldwork, hand-held GPS devices were used to record tracklogs. These recorded track logs show the routes followed by the fieldwork team on site. The tracklogs (in yellow) for the survey are indicated in **Figure 31**.

During the survey, no heritage sites were identified. This includes historical structures and burial ground and graves.



Figure 31 - Fieldwork tracklogs (yellow).

7 PALAEOLOGY

According to the PalaeoMap of SAHRIS the Palaeontological Sensitivity of the area is moderate sensitive. A desktop study is required (for the areas marked in green) (**Figure 32**).



Figure 32 – Palaeontological Heritage Sensitivity map. As can be viewed, most of the area is moderate sensitive (Retrieved from SAHRIS).

Table 9 - SAHRIS palaeosensitivity ratings table.

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 paleontological studies are required however a protocol for finds is required
Grey	Insignificant/Zero	No paleontological studies are required
White/Clear	Unknown	These areas will require a minimum of a desktop study.

8 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.

8.1 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:

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

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 10** below.

Table 10 - Criteria for Determining Impact Consequence

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

Aspect	Score	Definition
	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 11**

Table 11 - 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 12 - 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 13**.

Table 13 - 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.

8.2 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 14 - 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.
	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.

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

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

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

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to **Table 15**).

Table 15 - 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 16 - 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).

$\geq 19 \leq 17$	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).

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.

8.3 HERITAGE IMPACTS

No heritage resources were identified.

Despite an intensive walkthrough of the footprint area, no evidence for any archaeological or heritage sites could be identified. As a result, no impact is expected from the proposed development on heritage.

Table 17 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 so this report.

Table 17 - Impact rating for heritage resources

IMPACT DESCRIPTION		Pre-Mitigation								Post Mitigation								Priority Factor Criteria			
Identifier	Impact	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative Impact	Irreplaceable 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	
10.1.2	Impact on palaeontology	-1	1	4	2	2	2	-4.5	-1	1	4	2	1	1	-2	High	1	1	1.00	-2	

8.4 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

8.4.1 CONSTRUCTION PHASE

The project will encompass minimal removal of vegetation as the pipeline will be installed above ground on precast concrete plinths.

It is possible that cultural material will be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction and as such must be minimised.

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.

8.4.2 CHANCE FIND PROCEDURE

- An appropriately qualified heritage practitioner/archaeologist must be identified to be called upon in the event that 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 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.

8.4.3 POSSIBLE FINDS DURING CONSTRUCTION

The study area occurs within a greater historical and the archaeological site as identified during the desktop and fieldwork phase. Soil clearance for infrastructure as well as the proposed reclamation activities could uncover the following:

- High-density concentrations of a stone artefact
- unmarked graves

8.5 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. **Table 18** gives guidelines for lead times on permitting.

Table 18 – 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

8.6 HERITAGE MANAGEMENT PLAN FOR EMPR IMPLEMENTATION

Table 19 – 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 chance find procedures in case where possible heritage finds are uncovered.	Construction and operation	During construction and operation	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

9 CONCLUSIONS

PGS was appointed by EIMS to undertake a HIA which will serve to inform the EIA and EMPr for the proposed FSS 6 TSF reclamation pipeline located in Welkom in the Free State Province.

Heritage resources are unique and non-renewable and as such, any impact on such resources must be seen as significant. The HIA has shown that the study area and surrounding area has some heritage resources situated further away from the study area. Through data analysis and a site investigation, the following issues were identified from a heritage perspective.

9.1 HERITAGE SITES

A field survey of the study area was undertaken on foot by two archaeologists (Michelle Sachse and Nicholas Fletcher) on 5 October 2021. No archaeological sites or burial grounds and graves were identified during the fieldwork.

9.2 IMPACT ASSESSMENT

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

9.3 RECOMMENDATIONS

With no impact expected on heritage, no further mitigation is required. Refer Chapter 7 of this report.

9.4 GENERAL

It is the author's considered opinion that the overall impact on heritage resources is Low. Provided that the recommended mitigation measures 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 7 of this report have been developed to minimise the project impact on heritage resources.

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10.2 HISTORIC TOPOGRAPHIC MAPS

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

10.3 GOOGLE EARTH

All the aerial depictions used in this report are from Google Earth.

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WOUTER FOURIE

Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

Summary of Experience

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

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

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

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

Key Qualifications

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

BA - Archaeology, Geography and Anthropology - 1996

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

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

CRM Accreditation (ASAPA) -

- Principal Investigator - Grave Relocations
- Field Director – Iron Age
- Field Supervisor – Colonial Period and Stone Age
- Accredited with Amafa KZN

Key Work Experience

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

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

Harmony FSS6 Reclamation pipeline: HIA Report

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

2000-2004 - CEO– Matakoma Consultants

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

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

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

MICHELLE SACHSE
Professional Archaeologist

Summary of Experience

Involvement in various grave relocation projects in the various provinces of South Africa.

Expertise in Heritage Impact Assessment Surveys, Historical and Archival Research, Archaeology, Fieldwork including *inter alia* -

Involvement with various Heritage Impact Assessments,

- Heritage Impact Assessments within Gauteng, Limpopo, Mpumalanga, North-West and the Northern Cape Province.
- Archaeological Walkdowns for various projects.
- Desktop, archival and heritage screening for projects.

Key Qualifications

2016 - 2019	MA in Archaeology University of Pretoria, Pretoria
2015	BA Honours in Archaeology University of Pretoria, South Africa
2012 - 2014	BA (General) University of Pretoria, South Africa Major subjects: Archaeology and History

Key Work Experience

- 2020 – to date: Archaeologist - PGS Heritage
- 2018 – 2019: Assistant Manager at the Archaeology Laboratory on South Campus at University of Pretoria