



PGS
HERITAGE

The proposed development of a the Mispah 1 TSF Reclamation Pipelines Project

Heritage Impact Assessment

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REVISION HISTORY

Version	Issue Date	Description of Changes
01	13 December 2022	First draft
02	09 February 2023	

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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

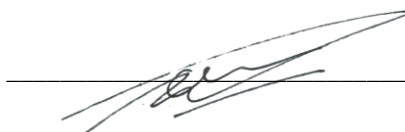
- I do not have and will not have any vested interest (either business, financial, personal, or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

HERITAGE CONSULTANT:

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ACKNOWLEDGEMENT OF RECEIPT

Report Title	The proposed development of the Mispah 1 TSF Reclamation pipelines Project		
Control	Name	Signature	Designation
Reviewer	W Fourie		PGS Heritage -Project Manager/Archaeologist
Reviewed	J v Mayer		Client

CLIENT: Environmental Impact Management Services (Pty) Ltd

CONTACT PERSON: John von Mayer
Email: john@eims.co.za

SIGNATURE: _____

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

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
1.(1) (a) (i) Details of the specialist who prepared the report	Page ii 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 C
(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, 4 and 5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
(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 and Appendix A
(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 5 and 6
(g) An identification of any areas to be avoided, including buffers	Section 6
(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 6
(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 and 9
(k) Any mitigation measures for inclusion in the EMPr	Section 8
(l) Any conditions for inclusion in the environmental authorization	Section 8
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorization	Section 8
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 9
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 8, 9
(o) A description of any consultation process that was undertaken during the course of carrying out the study	
(p) A summary and copies if any comments that were received during any consultation process	Not applicable. To date no comments regarding heritage resources that require input from a specialist have been raised.
(q) Any other information requested by the competent authority.	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	No protocols or minimum standards for HIAs or PIAs

EXECUTIVE SUMMARY

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EIMS appointed PGS) to undertake a Heritage Assessment that forms part of the BA for the proposed Mispah 1 TSF Reclamation pipelines project.

A selective survey of the study area was conducted on 5 December 2022. The fieldwork component consisted of a walkdown of the proposed development areas and aimed at identifying heritage resources within the impact areas. The focus was placed on the undisturbed areas within the larger assessment area. Heritage resources are unique and non-renewable, and as such, any impact on such resources must be seen as significant.

Heritage Resources Identified

During the fieldwork, no heritage resources were identified.

Anticipated Impacts on Heritage Resources

The potential to find unidentified heritage resources during construction does exist. However, the impact is rated as Low.

Mitigation measures

The calculated impact as summarised in **Section 7** of this report, confirms that the impact of the pipeline project will be reduced with the mitigation measures. This finding in addition to implementing a chance finds procedure as part of the EMP, will mitigate possible impacts on unidentified heritage resources.

General

If heritage resources are discovered during site clearance, construction activities must stop in the vicinity, and a qualified archaeologist must be appointed to evaluate and recommend mitigation measures.

It is the author's opinion that the proposed development's overall impact on heritage resources is **Low**. With the implementation of recommended mitigation measures, the overall impact on heritage resources will be reduced to acceptable levels during the project activities.

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TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

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

Cultural significance

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

Development

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

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

Early Stone Age

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

Fossil

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

Heritage

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

Heritage resources

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

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

Holocene

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

Late Stone Age

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

Late Iron Age (Early Farming Communities)

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

Middle Stone Age

The archaeology of the Stone Age between 30 000-300 000 years ago, associated with early modern humans.

Palaeontology

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

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Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DFFE	Department of Forestry, Fisheries and the Environment
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
EnviroServ	EnviroServ Waste Management (Pty) Ltd
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA-G	Gauteng Provincial Heritage Resources Authority
PHS	Provincial Heritage Site
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SLR	SLR Consulting (Pty) Ltd

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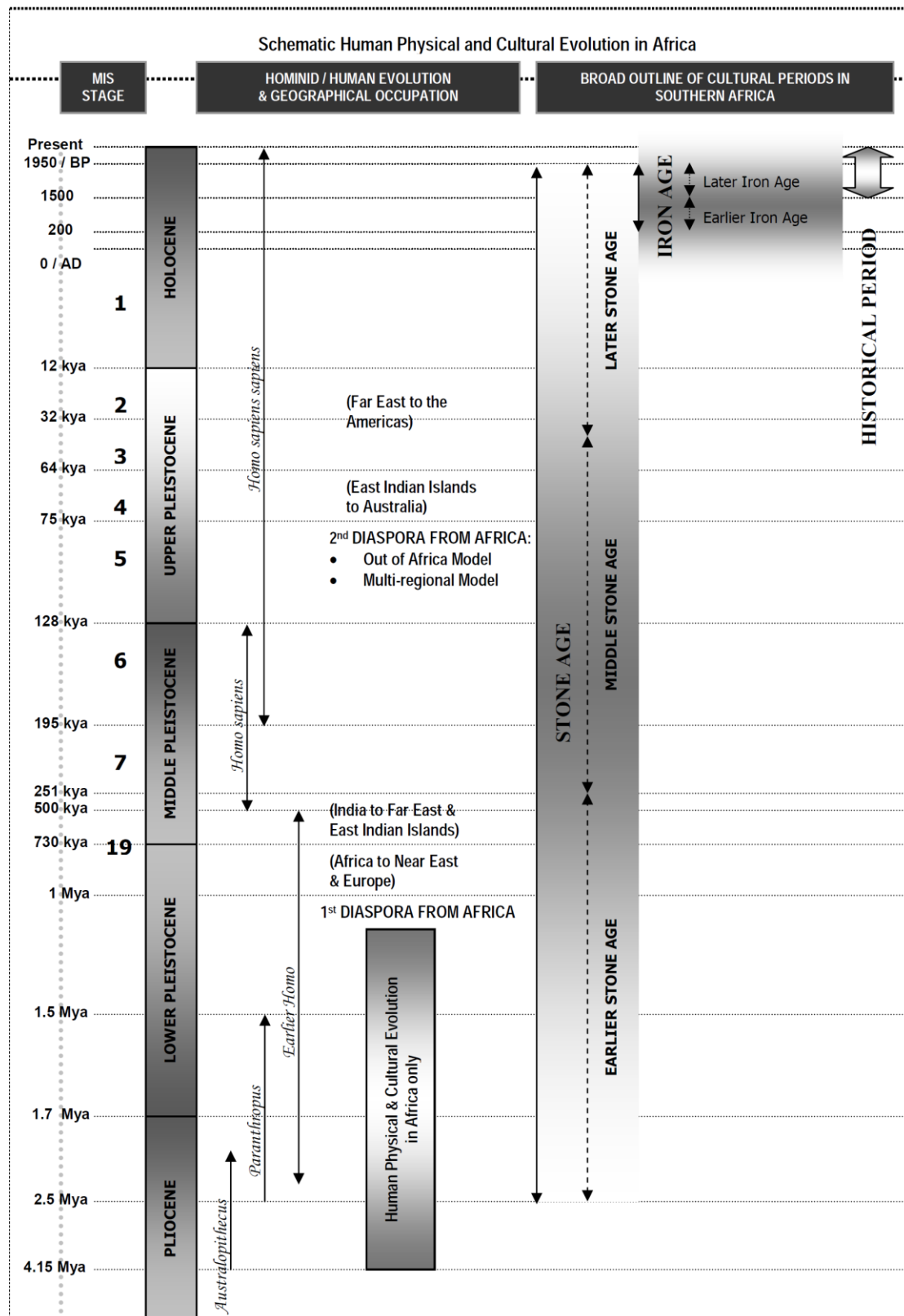


Figure 1 – Human and Cultural Timeline in Africa

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1 INTRODUCTION

Environmental Impact Management Services (Pty) Ltd (EIMS) appointed PGS Heritage (Pty) Ltd (PGS) to undertake a Heritage Assessment that forms part of the Basic Environmental Assessment (BA) for the proposed Mispah 1 TSF Reclamation pipelines project.

1.1 SCOPE OF THE STUDY

The study aims to identify heritage sites and finds that may occur in the proposed project area. The assessment then aims to assist the developer in responsibly managing the discovered heritage resources, to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 SPECIALIST QUALIFICATIONS

This assessment was compiled by PGS Heritage (PGS).

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

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

1.3 ASSUMPTIONS AND LIMITATIONS

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and existing vegetation cover. Fieldwork was also focussed on areas that were not previously disturbed, thus focussing on areas with the highest potential to yield heritage resources.

Therefore, should any heritage features and/or objects be located or observed outside the identified heritage sensitive areas during the construction activities, a heritage specialist must be contacted immediately. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and

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cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

1.4 LEGISLATIVE CONTEXT

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

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

1.4.1 NOTICE 648 OF THE GOVERNMENT GAZETTE 45421

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

Table 1 - Reporting requirements for GN648

GN 648	Relevant section in report	Where not applicable in this report
2.2 (a) a desktop analysis, using satellite imagery;	Section 5	
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web-based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	Section 4	-
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 4	-
2.3(b) contains motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity;	Section 4 provides a description of the current use and confirms/doesn't confirm the status in the screening report.	-

An assessment of the Environmental Screening tool provides low sensitivity ratings for archaeological and heritage resources (**Figure 2**).

The fieldwork has confirmed this rating.

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Archaeological and Cultural Heritage Theme

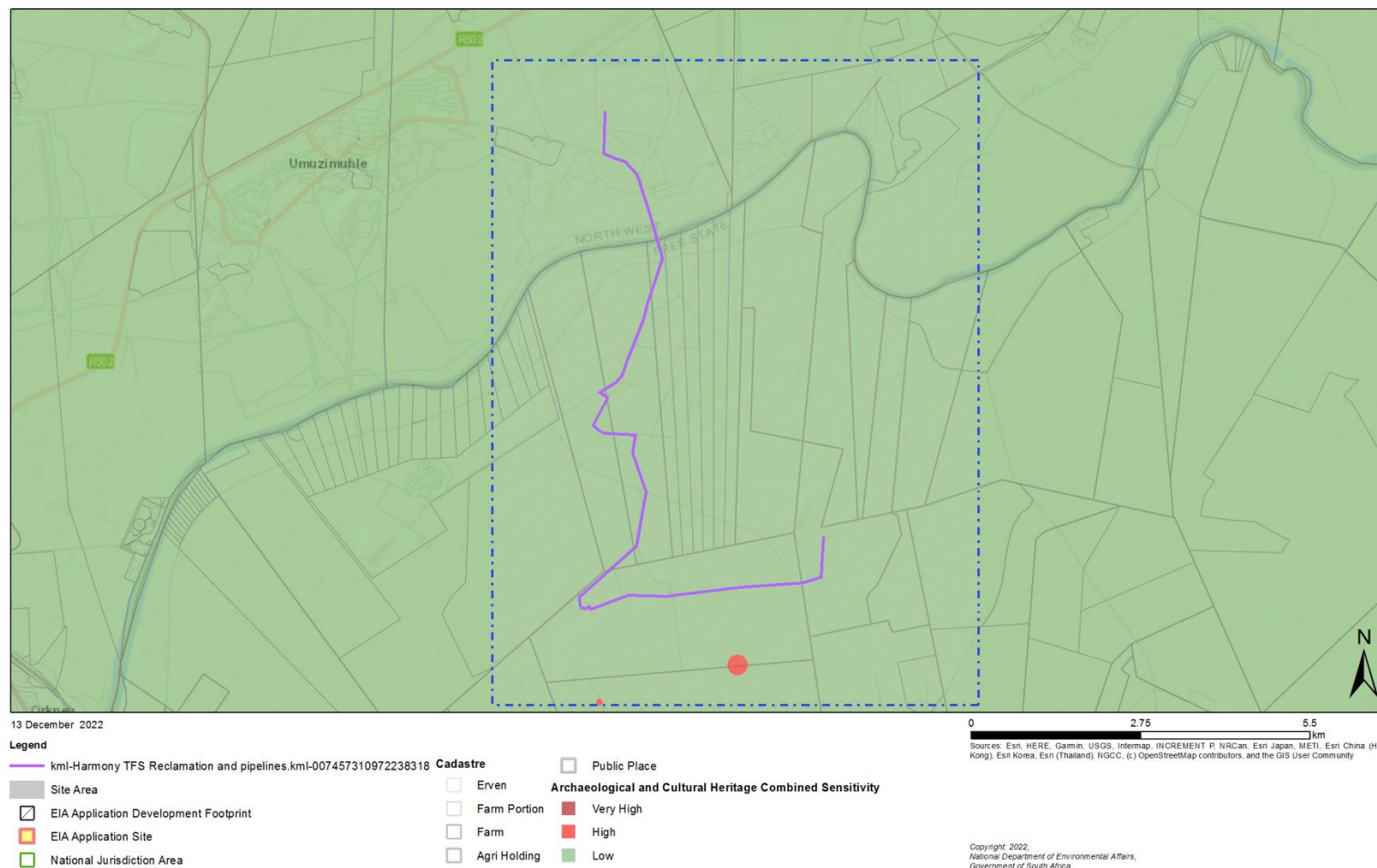


Figure 2 – Archaeology and Heritage screening map for the proposed pipeline in blue (Source: DFFE).

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1.4.2 NEMA – APPENDIX 6 REQUIREMENTS

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

1.4.3 THE NATIONAL HERITAGE RESOURCES ACT

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

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

2 TECHNICAL DETAILS OF THE PROJECT

2.1 LOCALITY

The project and pipeline alignments are situated 10 kilometers east of the town of Orkney in the North West Province. The infrastructure planned is a new 600mm slurry- and 500mm low-pressure process water pipelines of almost 9km from the East Pump Station to the Mispah 1 TSF Reclamation Pump Station, as shown in **Figure 3**. Both the slurry and process water pipeline to cross the Vaal River at Nologwa Bridge.

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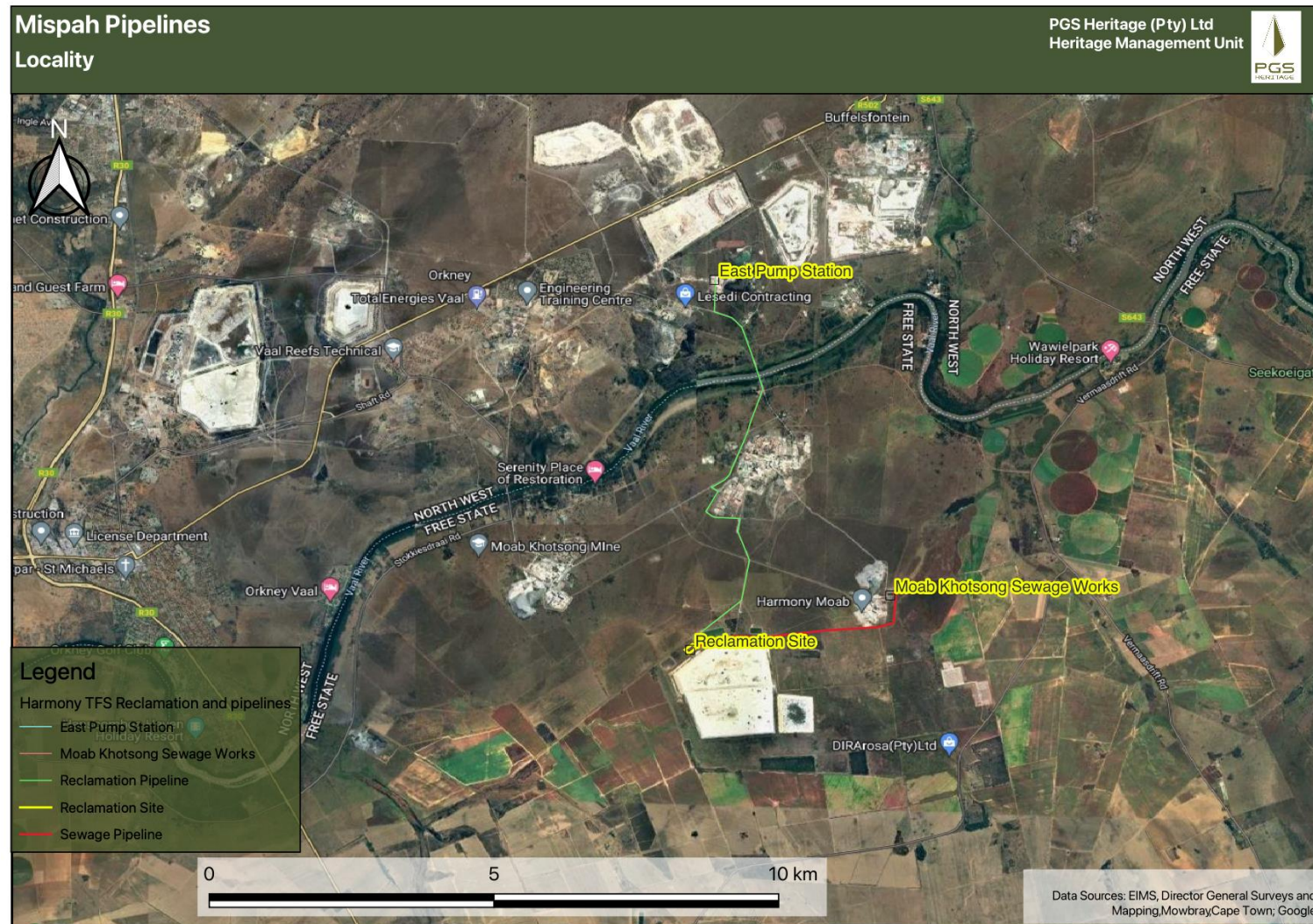


Figure 3 – Location of the proposed development area.

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2.2 TECHNICAL PROJECT DESCRIPTION

The following information has been supplied by EIMS.

The infrastructure planned is a new 600mm slurry- and 500mm low-pressure process water pipelines of almost 9km from the East Pump Station to the Mispah 1 TSF Reclamation Pump Station, as shown in **Figure 4**. Both the slurry and process water pipeline to cross the Vaal River at Noligwa Bridge.

The slurry pipeline will be a flanged 600mm NB steel pipeline with a concrete mortar or HDPE lining and flow rate of 472 l/s. The section across the Vaal River will be a continuous welded pipe with HDPE liner. While the low-pressure process water pipeline will be a flanged 500mm NB steel pipeline and flow rate of 337 l/s. Both pipes will be installed on surface on prefabricated concrete plinths.

A new slurry reclamation pump station will be constructed west of the Mispah 1 TSF as shown in **Figure 4**. The area cleared for the pump station will be ~ 4ha and consist of a series of slurry and high-pressure water pumps and associated infrastructure. The liquefied slurry from the TSF gravitate to the pump station where it is pumped to MWS processing plant, in Stilfontein, via the East pump station. From the East pump station, the slurry is pumped through the existing pipelines to MWS processing plant to extract gold before the tailings is disposed at Kareerand TSF. The pipelines will predominately follow existing pipeline corridors and vegetation clearance will be minimum.

A 100mm NB potable waterline and 150mm NB sewage line will also be installed to the reclamation pump station. The sewage from the change house and ablution will be pumped to the Moab Khotsonq sewage work's as shown in **Figure 4**. The sewage pipeline will be flanged steel pipeline and installed above-ground on pre-cast concrete plinths and a 3.5m wide access road, adjacent to the pipelines, will be cleared/graded to provide access for construction, maintenance and inspections.

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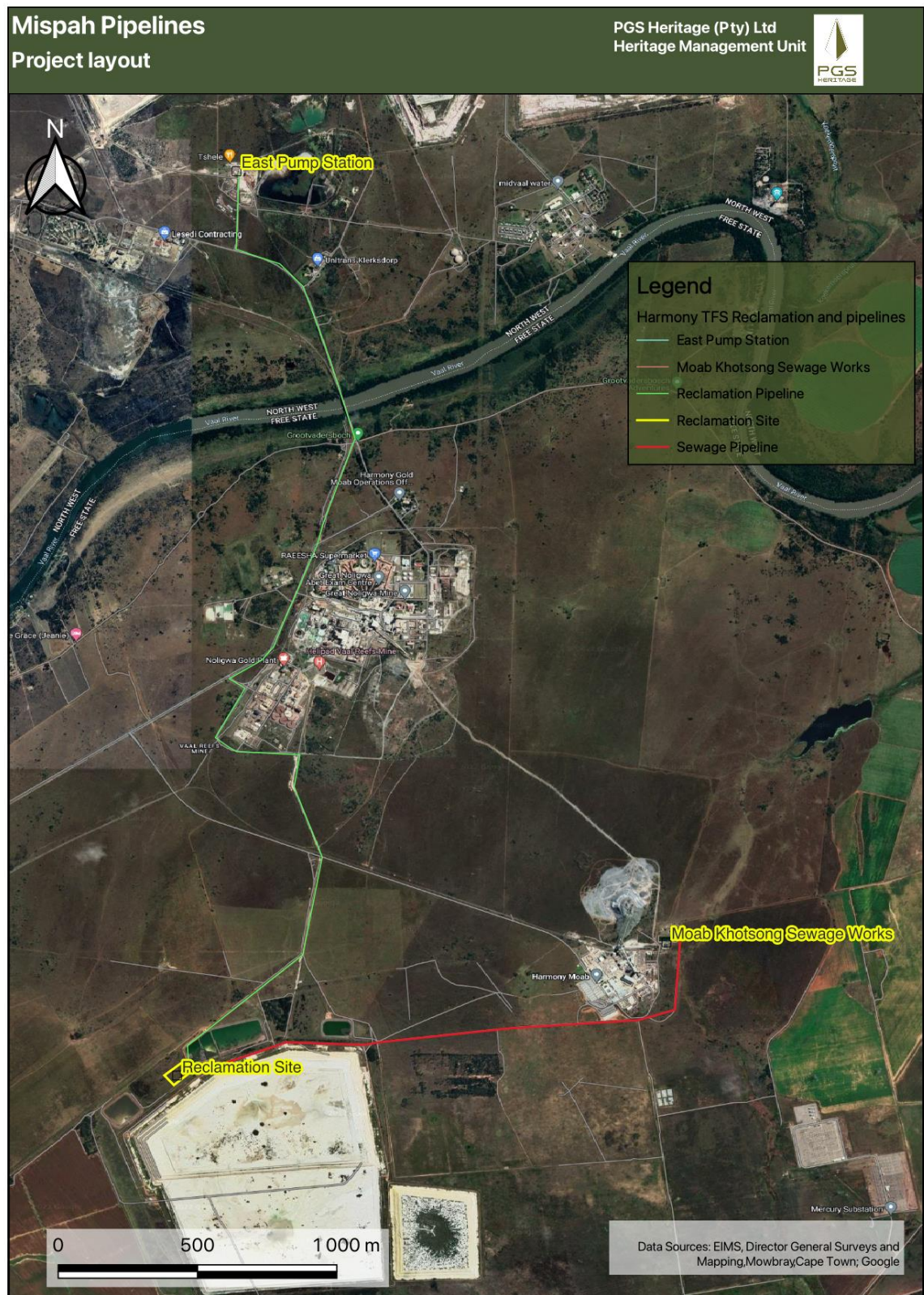


Figure 4 - Project layout

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3 ASSESSMENT METHODOLOGY

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

3.1 METHODOLOGY FOR ASSESSING HERITAGE SITE SIGNIFICANCE

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

Step I – Desktop Study: A detailed archaeological and historical overview of the study area and surroundings was undertaken. This work was augmented by assessing reports and data on the SAHRIS. Additionally, an assessment was made of the available historic topographic maps. All these desktop study components were undertaken to support the fieldwork.

Step II – Physical Survey: A physical survey was conducted by a combination of vehicle and pedestrian access through the proposed project area by a qualified archaeologist and field assistant (5 December 2022), aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

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

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

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

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

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3.1.1 SITE SIGNIFICANCE

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

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

Table 2 - Rating system for archaeological resources

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

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Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
	retained as part of the National Estate.	the consultant and approved by the authority.	

Table 3 - Rating system for built environment resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status. Current examples: St George's Cathedral, Community House	May be declared as a Provincial Heritage Site managed by Provincial Heritage Authority.	Exceptionally High Significance
II	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at local level.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement or community.	Like Grade IIIA buildings and sites, such buildings and sites may be representative, being excellent examples of their kind, or may be rare, but less so than Grade IIIA examples. They would receive less stringent protection than Grade IIIA buildings and sites at local level.	Medium Significance
IIIC	Such a resource is of contributing significance to the environs These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.	This grading is applied to buildings and/or sites whose significance is contextual, i.e., in large part due to its contribution to the character or significance of the environs.	Low Significance

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Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
		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.	
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

3.2 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The methodology used to determine the environmental impact significance was provided by EIMS and is explained in **Appendix A**.

4 CURRENT STATUS QUO

The site consists of three components the reclamation site and two pipelines one heading in a northerly direction to the East Pump Station from the reclamation site and the other east to the Moab Khotsong Sewage Works.

The reclamation site is in a relatively flat area, with the northern edge located on a manmade raised area. The ground cover is dense, with almost zero visibility (**Figure 5**). The pipeline leading east to the Moab Khotsong Sewage Works runs along a canal and dirt road before leading into a field (**Figure 6**). The ground cover is relatively clear before the field; however, the area is highly disturbed. The vegetation in the field is relatively grassy though there is on average about 50% visibility. The pipeline heading to the East Pump Station runs parallel along an existing pipeline until it reaches the Vaal Reef Mine where it deviates east and then north again along the western edge of the Vaal Reefs Mine boundary fence to run parallel to another existing pipeline leading over the Vaal River to the East Pump Station. The ground visibility is relatively low with dumping occurring at the southern end of Vaal Reefs Mine, especially along the eastern side of the pipeline.

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Figure 5 - Eastern view of the reclamation site.



Figure 6 - Eastern view of Moab Khotsong Sewage Works pipeline



Figure 7 - Eastern view of Dam pump house.



Figure 8 - Dumping occurring along the East Pump Station pipeline.

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Figure 9 - Southern view of the East Pump Station Pipeline location.

5 BACKGROUND RESEARCH

The previous section provided a topographical description of the proposed development area. This section seeks to describe the historical origins of the receiving environment.

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore, an internet literature search was conducted, and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

5.1 HISTORICAL OVERVIEW OF THE STUDY AREA AND SURROUNDING LANDSCAPE


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

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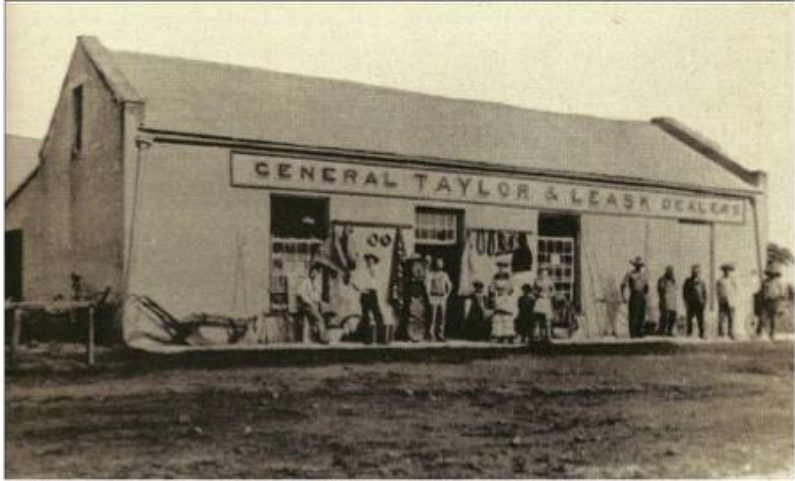

5.2 OVERVIEW OF THE STUDY AREA AND SURROUNDING LANDSCAPE

DATE	DESCRIPTION
2.5 million – 250 000 years ago	<p>The Earlier Stone Age is the first and oldest phase identified in 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 stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago.</p> <p><i>No ESA sites are known from the vicinity of the study area</i></p>
250 000 to 40 000 years ago	<p>The Middle Stone Age is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique.</p> <p><i>No MSA sites are known from the vicinity of the study area</i></p>
40 000 years ago to the historic past	<p>The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths. A well-known feature of the Later Stone Age is rock art in the form of rock paintings and engravings.</p> <p><i>No LSA sites are known from the vicinity of the study area</i></p>
AD 1500 – AD 1700	<p>The Olifantspoort facies of the Moloko Branch of the Urewe Ceramic Tradition is the first Iron Age facies to be identified within the surroundings of the study area. The key features of the decoration used on the ceramics from this facies include multiple bands of fine stamping or narrow incision separated by colour (Huffman, 2007).</p>
AD 1700 – AD 1840	<p>The Thabeng facies of the Moloko Branch of the Urewe Tradition is the next Iron Age period to be identified within the surroundings of the study area. The decoration on the ceramics associated with this facies is characterised by incised triangles, coloured chevrons and arcades (Huffman, 2007).</p>
AD 1700 – AD 1840	<p>The Buispoort facies of the Moloko branch of the Urewe Ceramic Tradition is the next phase to be identified within the study area's surroundings. The key features on the decorated ceramics include rim notching, broadly incised chevrons and white bands, all with red ochre (Huffman, 2007).</p>
1823 – 1827	<p>During the Difaqane the Khumalo Ndebele (or Matabele) of Mzilikazi established themselves along the banks of the Vaal River (Bergh, 1999). In c. 1827 the Matabele moved further north and settled along the Magaliesberg Mountain and five years later in 1832 settled along the Marico River.</p>
1836 – 1840	<p>The first Voortrekkers started crossing over the Vaal River (Bergh, 1999) and in terms of the direct surroundings of the study area established themselves along the banks of the Schoonspruit during this time. One of the first Voortrekkers to arrive in the area was C.M. du Plooy. Shortly thereafter a group consisting of twelve families under the leadership of H.J. van der Merwe also established themselves in the general vicinity (Du Plessis, 1952). The land next to Schoonspruit was later to become the farm Elandsheuwel (today known as Oudorp). They established a town which they called "Clercqsdorp" after the first magistrate north of the Vaal River, Jacob De Clercq.</p>

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1839	The district of Potchefstroom was established in this year (Bergh, 1999). The study area fell within this district at the time.
16 December 1841	<p>The farm Hartebeestfontein (known at the time as Stinkhoutboom) was inspected by G.J. Kruger on this day (RAK, 2875). Kruger was to become the Commandant-General of the Zuid-Afrikaansche Republiek during the 1850s and must have held an official position during this time. The farm was inspected for Christiaan Theunissen but this was opposed by Marthinus Wessel Koekemoer.</p> <p>On the same day the farm Buffelsfontein was also inspected by G.J. Kruger (RAK, 2876).</p>
1850	<p>Although the exact date for the establishment of the town of Klerksdorp is not known, the first depiction of a town on the banks of the Schoonspruit was on an archival map dated to 1850.</p>  <p><i>Figure 10 - Early photograph depicting Klerksdorp's Oudorp (National Archives, Photographs, 163420).</i></p>
14 December 1853	The farm Hartebeestfontein was officially transferred to Marthinus Wessel Koekemoer (RAK, 2875). Koekemoer owned the farm for nearly 20 years until 21 July 1871. Local place names such as Koekemoer Station and the Koekemoer Spruit were named after him.
12 May 1859	The farm Buffelsfontein was transferred to Johannes Petrus Pretorius (RAK, 2876). Pretorius was a Voortrekker who was born on 25 December 1782 on his farm in Tulbagh in what is today known as the Western Cape. He died on 8 June 1861 at his farm Buffelsfontein (Visagie, 2000). A portion of the farm was transferred from Pretorius to Petrus Johannes Vermaas and William John Dunn with the remaining portion transferred to Gerhardus Dirk Pretorius after the death of Johannes Petrus Pretorius. Vermaas owned his portion of the farm until 1875 (RAK, 2876). It is evident that the Vermaas Drift over the Vaal River situated adjacent to the farm Buffelsfontein was named after Petrus Johannes Vermaas.
1865	Messrs. James Taylor and Thomas Leask established the first business in Klerksdorp in this year. Tomas Leask became an important businessman in Klerksdorp.

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	 <p><i>Figure 11 - The shop that Taylor and Leask established in Klerksdorp's Oudorp (Marx, 1987:15).</i></p>
November 1885	<p>During this time Martinus Gerhardus Jansen van Vuuren of the farm Ysterspruit wrote a letter to President S.J.P. Kruger indicating that he had discovered gold on his farm. He also submitted samples of what he had discovered with the letter for analysis. The government of the Zuid-Afrikaansche Republiek wrote back to state that the samples that he submitted were rich in gold and silver (Marx, 1987). This discovery at Ysterspruit can therefore be seen as the first discovery of gold in the neighbourhood of Klerksdorp. The farm Ysterspruit is located approximately 35km south- west of the study area.</p>  <p><i>Figure 12 - Marthinus Gerhardus Jansen van Rensburg (Marx, 1987:17).</i></p>

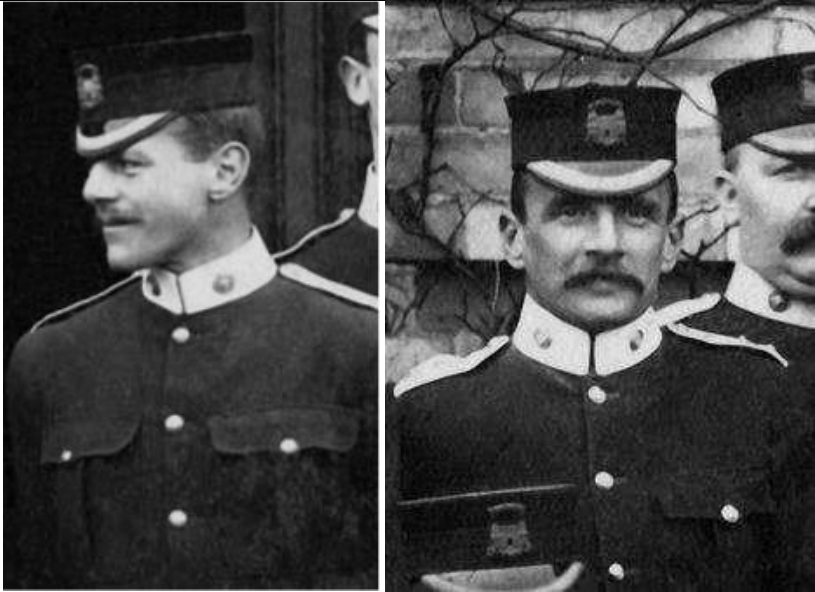
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1887	The second important discovery of gold in the Klerksdorp area, and the discovery that is more commonly known, is the gold discovered by A.P. Roos on a low hill known as Town or Railway Hill (Guest, 1938).
1887 – 1888	During this time Thomas Leask was prospecting for gold on the farms Roodepoort (also known as Strathmore) and Nooitgedacht. He found the results so promising that he ordered a five stamp mill from England and erected it on the banks of the Schoonspruit, not far from the homestead on Strathmore. During these early years this mill was used by various mining companies from the surrounding area, with the ore transported by ox wagon to the mill site (Guest, 1938).
1889	<p>This year saw a flurry of gold mining companies being established. These include a number of mines on the farm Nooitgedacht such as the Ariston, Nooitgedacht and Wilkinson Mines (Guest, 1938).</p> <p>The Buffelsdoorn Estate and Gold Mining Company was also established in 1889. At the time the mining company controlled portions of the farms Buffelsdoorn, Rietfontein, Request, Eleazar, Rietkuil East, Palmietfontein and also a portion of the farm Stilfontein. Furthermore, the company also owned coal rights on the farm Hartebeestfontein which it had acquired from the Klerksdorp Coal Syndicate. This latter coal mine was located near the Koekemoer Station and was known as the Buffelsdoorn Collieries (Guest, 1938).</p>
1895	Jack Scott, who with his father Charles, had undertaken prospecting and mining operations on their farm Strathmore (Roodepoort), obtained an option on the farm Stilfontein in 1895 (Erasmus, 2004).
1896	From the information provided above it is evident that the present study area did not focus strongly in the early development of mining in the vicinity of Klerksdorp. A map that was published in Charles Sydney Goldmann's South African Mines: Their Position, Results and Developments (1895/1896) supports this and indicates that none of the farms forming part of the present study area were part of the Klerksdorp (Schoonspruit) Goldfields (Figure 17).
1897	<p>The Nederlandsche Zuid-Afrikaansche Spoorweg Maatschappij (NZASM) completed the so-called South-Western Line in 1897 thereby linking the Witwatersrand with Klerksdorp. The line was opened to traffic in August 1897 and comprised the following stations: Randfontein, Bank, Wilverdiend, Frederikstad, Potchefstroom, Machavie, Koekemoer and Klerksdorp (De Jong et.al., 1988). The railway line is still located a short distance north of the study area with Koekemoer Station the closest of the stations along this line to the present study area. Koekemoer Station is located 5.2km north-west of the study area.</p> <p>Drilling operations by Jack Scott on the farm Stilfontein dissected the Strathmore Reef which his father had identified in 1888 (Erasmus, 2004).</p>
1899 – 1902	During the South African War (1899-1902) a number of battles and skirmishes were fought in the wider area, though none inside the present development area. Examples of battles from the surrounding landscape include a Boer attack on Klerksdorp on 29 January 1901 that was repulsed by the Northamptonshire regiment (Gurney and Jervois, 1935). Klerksdorp is located roughly 19.3km west of the study area. However, a number of events associated with the Boer War took place in closer proximity to the study area.

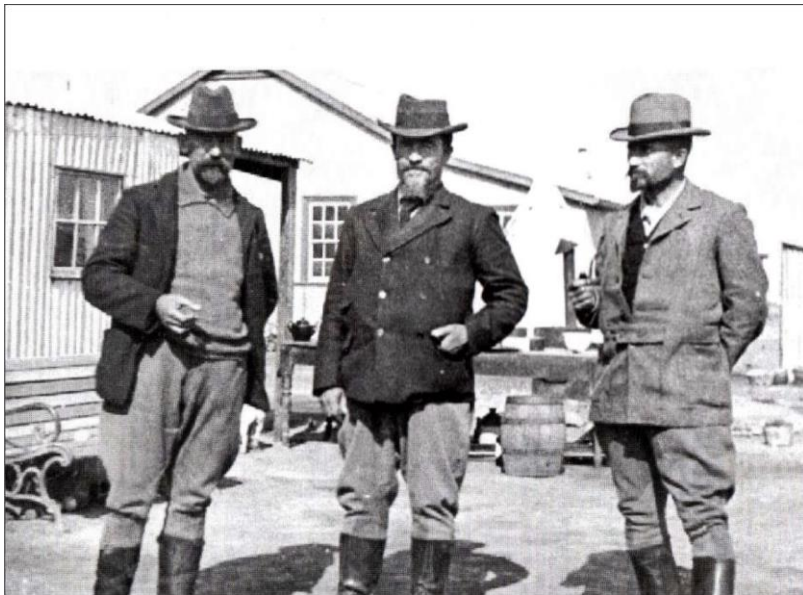
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	<p>At the onset of hostilities town of Klerksdorp was naturally in Boer hands. On 8 June 1900 it was occupied by Captain Lambart and a small British force. Less than two months later, on 25 July 1900, the town was retaken by a Boer Commando under General Liebenberg. On 16 November 1900 Klerksdorp was occupied again by the British, and in this instance by a force under the command of General Douglas. For the remainder of the war the town would remain in British hands (Marx, 1987).</p> <p>The significance of the Vaal River as a natural barrier for the movement of troops resulted in the drifts along the river becoming of strategic importance. The side which could control the drifts could naturally also control the movement of their enemies. This was especially true for the British Army who wanted to control the mobility of the Boer Commandos. Three drifts are known to have existed in the general vicinity of the study area, including Vermaas Drift (located immediately south-east of the overall study area boundary and adjacent to the farm Buffelsfontein), Wolmaran's Drift (located 4.5km south of the present study area on the farm Kromdraai) and Kromdraai Drift (located roughly 300m from the study area).</p> <p>It is known that on 2 August 1900 Colonel Younghusband with the 3rd Battalion Imperial Yeomanry and a section of the Northamptons were ordered to Vermaas Drift. This force stayed at the drift until 6 August 1900 when they were ordered to join the main body further to the east (Amery, 1909). Other references to these drifts during the war years include a report in the Sydney Morning Herald of 15 December 1900 that Privates F.W. Mohr and A. Moran of the New South Wales Regiment of the Imperial Bushmen went missing after a skirmish at Wolmaran's Drift on (or before) 14 December 1900. Both individuals later returned to their unit (The Advertiser, 19 December 1900).</p> <p>Between December 1900 and March 1901, the 58th Northamptonshire Regiment was placed in defensive positions around Klerksdorp. While its headquarters comprising A and G Companies under the command of Colonel H.C. Denny were at Klerksdorp, D and E Companies under the command of Captains Skinner and Ripley were placed at Coal Mine Bridge (at present-day Orkney) with F and H Companies under the command of Major Fawcett positioned at Koekemoer Station, B Company commanded by Captain A.A. Lloyd at Wolmaran's Drift and C Company under the command of Captain C.S. Pritchard at Vermaas Drift (Gurney and Jervois, 1935).</p>


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	 <p><i>Figure 13 - Captain Arthur Athelwold Lloyd (left) and Major Charles Steward Pritchard (right) were the respective commanding officers at Wolmaran's Drift and Vermaas Drift between December 1900 and March 1901 (Northampton Museum Service).</i></p> <p>Further evidence for the presence of British forces within the surroundings of the study area during the war was found in archival documents relating to compensation claims submitted after the war. In a claim submitted by the New Ariston Gold Mines (National Archives, CJC, 35, 656) it is indicated that a column under General Elliot and Colonel Byng had been encamped on the farm Nooitgedacht in the vicinity of the New Ariston Gold Mine for some time during the war. According to another document there also were a number of blockhouses manned by British troops in the area during the war (CJC, 128, 2493). Furthermore, according to the compensation claim submitted by Izak Johannes Koekemoer (National Archives, CJC, 994, 925), the Koekemoer farmstead on the farm Hartebeestfontein was destroyed by members of C Squadron Imperial Light Horse under the command of Captain Nommand on or about 30 November 1900. Apart from the farmhouse that was destroyed, a number of livestock and other farm animals were also taken away or destroyed. At the time this unit under Captain Nommand was holding Koekemoer Station.</p> <p>From a collection of photographs that was put up for sale on the internet (www.antiquarianauctions.com), it is evident that a blockhouse was located at Koekemoer Station during the war. A black concentration camp was also located near Koekemoer Station (see for example Warwick, 1983). It is not presently known exactly where this camp was located, but in all likelihood it would have been situated in close proximity to the station itself. It is possible that the intensive mining and related development which have taken place in the vicinity of Koekemoer Station would have destroyed the camp.</p> <p>On 9 and 10 April 1902 representatives of the Transvaal Republic (Z.A.R.) and the Republic of the Orange Free State met on the banks of</p>

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	<p>the Schoonspruit at Klerksdorp. The Transvaal delegation comprising Vice-President Schalk Burger, State Secretary F.W. Reitz, Commandant-General Louis Botha, General Koos de la Rey, General L.J. Meyer and General J.C. Krogh were accommodated in the Nieuwe Dorp. The Free State delegation comprising President Steyn, Commandant-General Christiaan de Wet, State Secretary J.W.C. Brebner, General J.B.M. Hertzog and General C.H. Olivier was accommodated in the Oude Dorp. The meeting was conducted with the knowledge of the British High Command. The aim of the meeting was for the representatives of the two Boer Republics to discuss the status of the war and to establish whether peace should be negotiated with the British (Raath, 2007). The meeting was the first step toward the final peace settlement on 31 May 1902 at Vereeniging.</p>  <p><i>Figure 14 - This photograph was taken during the peace negotiations at Vereeniging and show three members of the Free State delegation at the Klerksdorp meeting of April 1902 namely (from left to right) State Secretary J.W.C. Brebner, Commandant-General C.R. de Wet and General J.B.M. Hertzog (Van Schoor, 2007).</i></p>
21 December 1914	<p>During the early years of mining in the area the mining of alluvial diamonds was just as important as early gold mining activities and became even more so during the second decade of the twentieth century. On 17 November 1911, for example, the part of Goedgenoeg farm located between Dean Station and Vaalsig was proclaimed alluvial diggings. The Goedgenoeg diggings resulted in the extraction of a total of 94, 75 carats of diamonds to the value of just over £355 during 1914. On 21 December 1914 the so-called Eastleigh diggings were proclaimed. Although the reference Orkney Diary (1990) indicates that these diggings were located west of the Schoonspruit, on a government owned portion of the farm Goedgenoeg, Marx (1987) in turn states that the Eastleigh diggings were located on both sides of the Klerksdorp-Orkney road, on land formerly owned by Eastleigh Mines. Initially only 332 claim licences were issued in terms of the Eastleigh diggings, but with the proclamation of the north-eastern section of Goedgenoeg, approximately 1 000 alluvial diamond miners were active in the area. Although these alluvial mining activities continued in earnest for the next</p>


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	<p>number of decades, by 1937 its significance waned and the mining of gold became increasingly significant.</p>  <p><i>Figure 15 - Diamond miners at what is believed to be the Eastleigh Diggings (Marx, 1987).</i></p>
1930s	<p>During the 1930s a person by the name of Alexander Bisset Lucas put together a parcel of mineral right options known as Lucas Block. This parcel of mineral right options would become very significant in the later mining history of the landscape within which the study area is located (Antrobus, 1986), with mines such as Stilfontein, Buffelsfontein and Hartebeestfontein established on this block. Interestingly, Lucas had acquired a portion of the farm Buffelsfontein in 1917 from one Mark Donaldson (RAK, 2876) and named it Shenfield after the farm near Grahamstown where he grew up. The portion of the farm Buffelsfontein which Lucas had obtained was located directly north of the Vaal River on the section of the farm situated to the west of Vermaas Drift and outside of the present study area.</p>
1935	<p>The Klerksdorp District was established, and the study area now fell within this district (Bergh, 1999). At the time the eastern section of the present study area still fell within the Potchefstroom District.</p>
18 March 1940	<p>The town of Orkney was officially proclaimed on 18 March 1940 by the Administrator of the Transvaal, Mr. J.J. Pienaar. This proclamation was subsequently also published in the Government Gazette.</p>
c. 1945	<p>During the latter stages of the Second World War (1939 – 1945) the American and British scientists working on the production of nuclear weapons as part of the Manhattan Project realised that although they were able to obtain enough uranium for their immediate uses from places such as the Belgian Congo and Canada, more uranium would be required from other places as well (Groves, 1962). One of the scientists on the Manhattan Project was Professor G.W. Bain of the Amherst College, Massachusetts (Jones, 1995). During this time Professor Bain remembered that he had ore samples from the Witwatersrand in his private collection which he had collected during a visit to South Africa in 1941. He conducted tests on these samples and to his excitement realised that they emitted beta rays which in turn meant that the Witwatersrand gold mines could become another source for uranium (Jones, 1995) (Groves, 1962). This was the start of the uranium industry</p>

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	<p>of South Africa and by 1959 the country had become a major world producer in uranium (Bhushan & Katyal, 2002).</p> <p>A number of gold mines in the Klerksdorp that were established during the 1950s such as Buffelsfontein and Hartebeestfontein were significantly associated with the production and export of uranium.</p>
1949	<p>The Stilfontein Gold Mining Company was registered and a town of the same name was also laid out (Erasmus, 2004). The mine was established and owned by the Strathmore Group of Jack Scott and was established on sections of the Lucas Block of mineral right options.</p> <p>According to an article which appeared in the Mining Mirror of June 2013, the first two shafts at the mine were named after Jack Scott's twin son and daughter, Charles and Margaret. The sinking of these shafts commenced in April and May 1949 respectively. Interestingly, the Margaret Shaft holds the record for the first ever concrete headgear to be built in South Africa (South African Mining and Engineering Journal, 1982) (Mining Mirror, June 2013).</p>
1952	<p>Production at the Stilfontein Gold Mining Company commenced during this year (Erasmus, 2004).</p> <p>During the same year the Buffelsfontein Gold Mining Company was established by the Strathmore group on sections of the Lucas Block (The Mining Magazine, 1952). The mine had a number of vertical shafts, including Pioneer Shaft, Eastern Shaft, Southern Shaft and Orangia Shaft. From the available cartographical and aerial photograph evidence, it is clear that the mine's first shaft was the Pioneer Shaft (c. 1952) followed by the Eastern Shaft (before 1961). The Southern Shaft was established between 1961 and 1967 whereas the Orangia Shaft was built after 1967.</p>
1953	<p>The Hartebeestfontein Gold Mine was established in 1953 (Golosinski & Yuguang, 1996) and was owned by Anglovaal (Marx, 1987). This is confirmed by Hocking (1987) who indicates that Anglovaal commenced shaftsinking at Hartebeestfontein during 1953.</p>
1954	<p>In 1954 a merger took place between Jack Scott's Strathmore Consolidated Investment Company and the General Mining and Finance Corporation which meant that the latter company now controlled the Buffelsfontein and Stilfontein mines (Standard Encyclopaedia of Southern Africa, 1972).</p>
1960	<p>The township of Khuma was established in 1960, and its name is derived from the Setswana word 'Khumo' which means 'Wealth' (www.nwpg.gov.za).</p>

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DATE	DESCRIPTION
	 <p><i>Figure 16 - This aerial photograph of Khuma Township was taken in 1961, roughly one year after it was established (NGI, Aerial Photographs, 425_021_02738).</i></p>
28 February 1986	<p>According to a document titled 'Catalogue of Heritage Sites' by the Matlosana Municipality (n.d.), Khuma is associated with a significant struggle history. A memorial in Khuma commemorates the life and sacrifice of MK Cadre Mfana Majova who operated in Angola and South Africa and was killed during a mission in South Africa. Furthermore, a number of landmarks in the township are also associated with the struggle history of its people. The municipal cemetery at Khuma also holds the graves of four individuals who were killed by the police on 28 February 1986 (Matlosana Municipality, n.d.).</p>

5.3 ARCHIVAL AND HISTORICAL MAPS

The examination of historical data and cartographic resources represents a critical tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Relevant topographic maps and satellite imagery were studied to identify structures, possible burial grounds or archaeological sites present in the footprint area.

Historical topographic maps (1:50 000) for various years (1944, 1996, 2006) were available for utilisation in the background study. These maps were assessed to observe the area's development and the location of possible historical structures and burial grounds. The study area was overlain on the map sheets to identify structures or graves situated within or immediately adjacent to the study area that could be older than 60 years and thus protected under Section 34 and 36 of the NHRA.

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5.3.1 SECTION OF MAP, 1895/1896

(Publication by Charles Sydney Goldmann)

The map provides one with an understanding of the development of gold mines in the general surroundings of the study area (**Figure 17**). The shaded areas formed part of the Klerksdorp Goldfields, whereas the yellow areas were registered mynpachts. From this it is evident that the present study did not form part of the early mining development in the vicinity of Klerksdorp at the time.

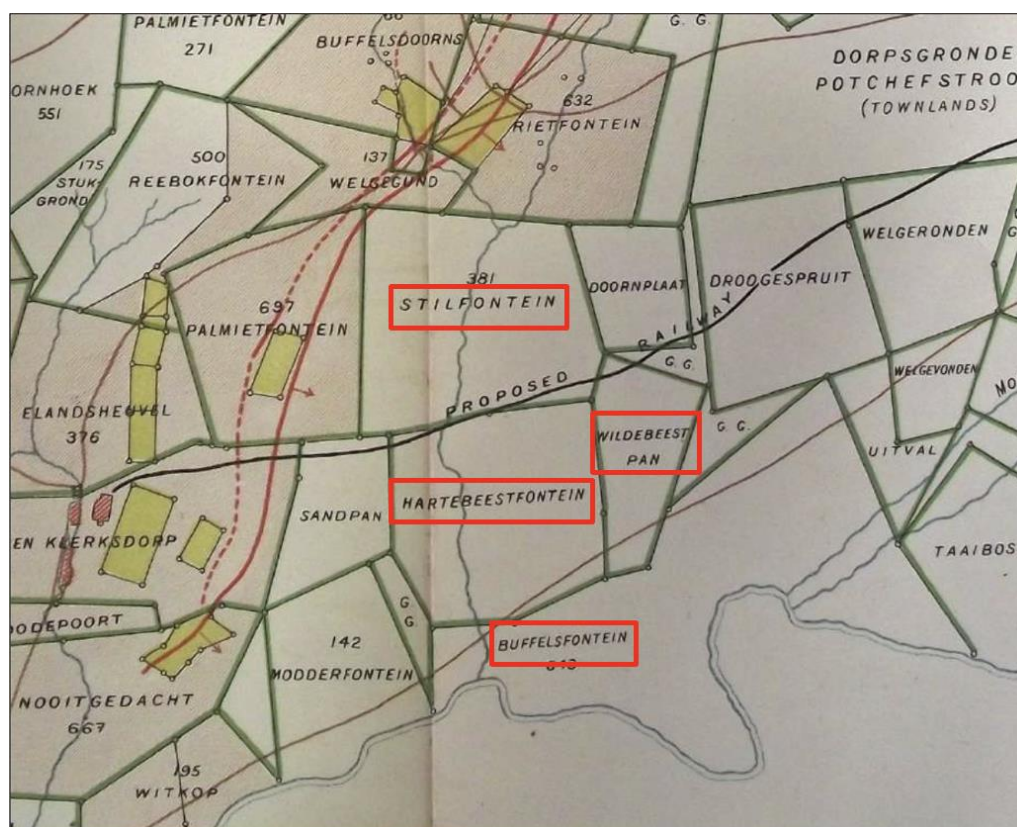


Figure 17 - Section of a map that appeared in the 1895/1896 publication by Charles Sydney Goldmann. (red polygons highlight the names of the Hartebeestfontein, Buffelsfontein, Wildebeestpan and Stilfontein farms)

5.3.2 KLERKSDORP, 1902

(University of Cape Town Libraries, South Africa)

The map depicted in **Figure 18** below is titled “Klerksdorp”. It was created by Jackson, H. M. (Hugh Milbourne) and the contributors were the Great Britain Army Field Intelligence Dept and the Transvaal (Colony) Surveyor-General's Office. The map dates from 1902.

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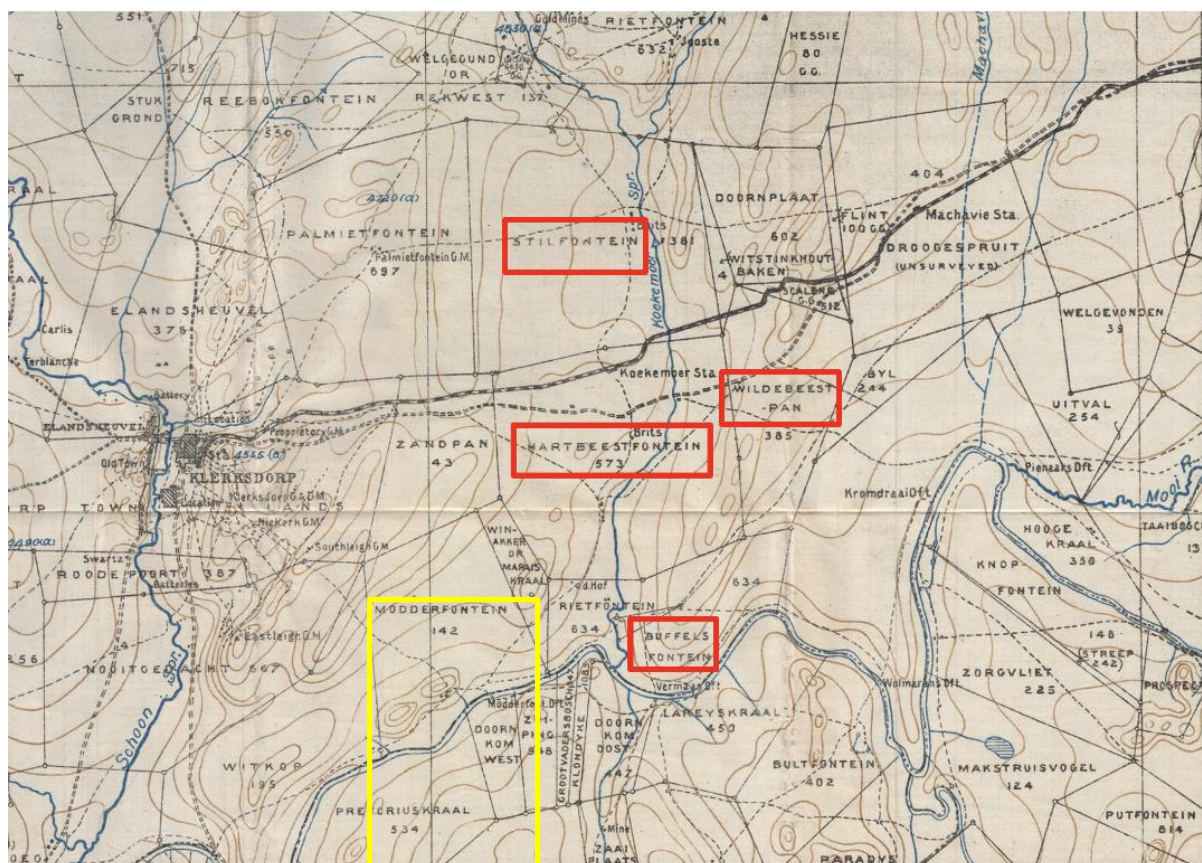


Figure 18 - Section of the 1902 Klerksdorp map highlighting the names of the Hartebeestfontein, Buffelsfontein, Wildebeestpan and Stilfontein farms (University of Cape Town Libraries, South Africa). (Yellow block indicating study area)

5.3.3 FIRST EDITION OF THE 2626DD STILFONTEIN TOPOGRAPHICAL MAP DATED TO 1944

The 2626DD map sheet was surveyed and drawn by 45 Survey Coy., S.A.E.C, 1944. This map sheet shows several structures within the vicinity of the study area. No structures are visible along the alignments of the pipeline route (**Figure 19**). Any observations that can be made from these map depictions, are individually discussed below.

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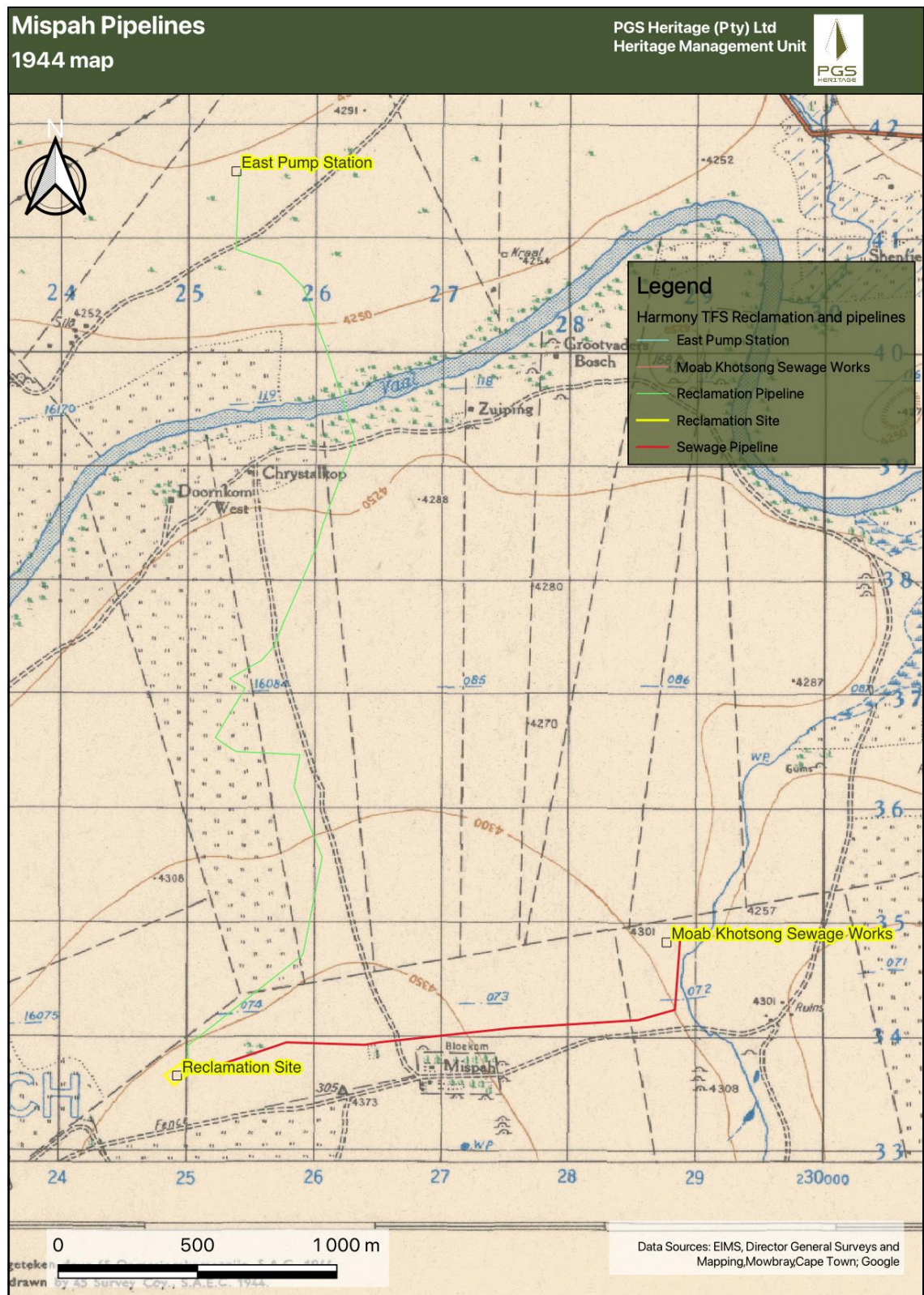


Figure 19 - Section of First Edition of the 2626DD Topographical Map

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5.3.4 SECOND EDITION OF THE 2626DD STILFONTEIN TOPOGRAPHICAL MAP DATED TO 1996

The 2626DD map sheet was published by the Chief Directorate. This map sheet shows various structures and mining infrastructure within the study area. Overlays of the study area components over this map sheet are provided in **Figure 20**.

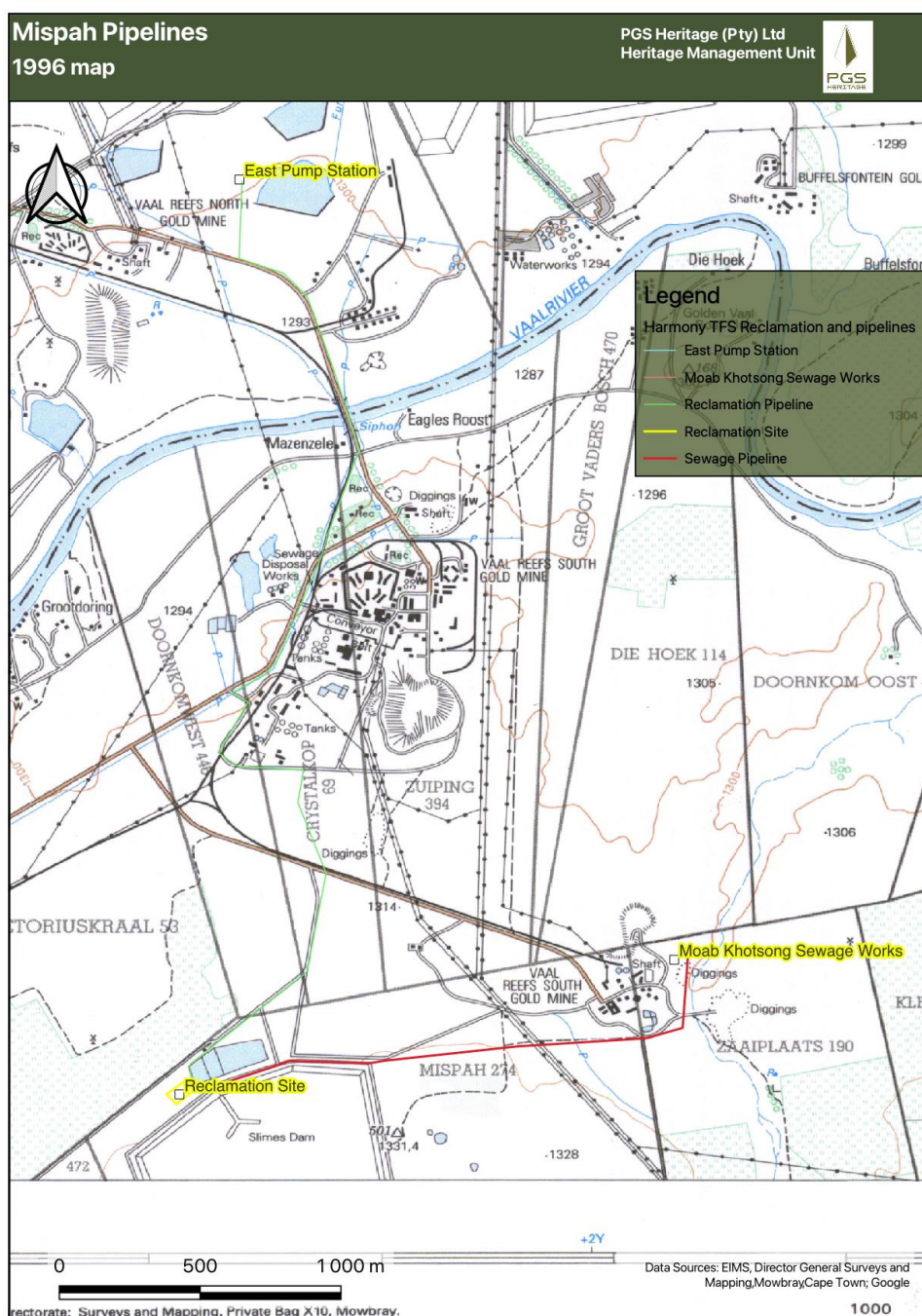


Figure 20 - Section of Second Edition of the 2626DD Topographical Map, showing several structures (yellow polygons) located adjacent to the proposed Kareerand RW pipeline.

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5.4 PREVIOUS HERITAGE IMPACT ASSESSMENT REPORTS FROM THE STUDY AREA AND SURROUNDINGS

Several previous archaeological and heritage surveys were undertaken within the immediate vicinity of the study area.

- Van der Walt, J. 2016. Archaeological Impact Assessment for the Proposed Buffels Solar 1 Solar Energy Facility, North West province. For Savannah Environmental (Pty) Ltd.

The proposed Buffels Solar 1 project area was located on Portion 1 of the farm Hartebeestfontein 422 IP, close to Orkney and Stilfontein, North West province. **No graves or burial grounds or sites of archaeological significance or structures of historical significance were recorded in the study area, except for some demolished mining architecture. The study area for this 2016 project was located almost immediately adjacent to the current study area close to the western end of the proposed Kareerand RW pipeline.**

- Van der Walt, J. 2016. Archaeological Impact Assessment for the Proposed Buffels Solar 2 Solar Energy Facility, North West province. For Savannah Environmental (Pty) Ltd.

The proposed Buffels Solar 2 project area was located on Portion 57 of the farm Hartebeestfontein 422 IP, close to Orkney and Stilfontein, North West province. **No graves or burial grounds or sites of archaeological significance or structures of historical significance were recorded in the study area, except for some demolished mining architecture. The study area for this 2016 project was located almost immediately adjacent to the current study area close to the western end of the proposed Kareerand RW pipeline.**

- Birkholtz, P.D. 2020. Heritage Impact Assessment for the Proposed Kareerand TSF Expansion Project, located on certain portions of the farms Kromdraai 420 IP, Hartebeestfontein 422 IP, Wildebeestpan 442 IP, Buffelsfontein 443 IP, Umfula 575 IP And Megadam 574 IP, east and south-east of Klerksdorp, City of Matlosana and Potchefstroom Local Municipalities, North West Province. For GCS Water & Environmental Consultants.

Between 2017 and 2018, fieldwork was undertaken by experienced fieldwork teams comprising one heritage specialist/archaeologist and one fieldwork assistant. A total of four fieldwork trips were undertaken by experienced fieldwork teams between 2017 and 2018. During all these fieldwork trips these teams comprised one heritage specialist/archaeologist and one fieldwork assistant. **The fieldwork resulted in the**

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identification of 48 archaeological and heritage sites. These identified sites comprise the following: six cemeteries, eight possible graves, one Historic Black Homestead containing confirmed graves, twenty Historic Black Homesteads, three Recent Structures, two Historic Farmsteads, seven Stone Age sites (incl. MSA and LSA artefacts) and one old lane of trees.

5.5 HERITAGE SCREENING

A Heritage Screening Report was compiled using the DFFE National Web-based Environmental Screening Tool as required by Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended. According to the Heritage screening report, the directly affected area has a **low** sensitivity rating (**Figure 2**). The field work in the study area demonstrates that only one burial ground of heritage significance, located adjacent to the study area, warrants conservation. This is most likely due to the level of disturbance and dense vegetation in the study area. Therefore, in the case of this study area, the DFFE screening tool sensitivity map is only partly supported based on the findings of this fieldwork

5.5.1 HERITAGE SENSITIVITY

The sensitivity maps were produced by overlying:

- Satellite Imagery;
- Current Topographical Maps;
- First edition Topographical Maps dating from the 1940's.

This enabled the identification of possible heritage sensitive areas around the proposed development area that included:

- Cluster of dwellings (farmsteads),
- Homesteads ("huts") and
- Structures/Buildings.

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 4**.

Table 4 - Tangible heritage site in the study area.

Name	Description	Legislative protection
Archaeology	Older than 100 years	NHRA Sections 3 and 35

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Structures	Possibly older than 60 years	NHRA Sections 3 and 34
Burial grounds	Graves	NHRA Sections 3 and 36 and MP Graves Act

5.5.2 POSSIBLE HERITAGE FINDS

The evaluation of satellite imagery and the analysis of the studies previously undertaken in the area has indicated that certain areas may be sensitive from a heritage perspective. This combined analysis of satellite imagery and previous heritage studies has assisted in the development of the following landform type to heritage find matrix (**Table 5**)

Table 5 - Landform type to heritage find matrix

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

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6 FIELDWORK FINDINGS¹

A field survey of the proposed alignment was done on 5 December 2022 by an archaeologist (Nicholas Fletcher) and a field assistant (Xander Fourie) from PGS. During the survey the extent of the pipeline alignment was assessed by foot and vehicle. **Figure 21** provides a view of the alignment with the tracklogs for the fieldwork.

Large tracts of the alignment follow existing roads and pipeline alignment associated with the mining industry. During the fieldwork no heritage resources were identified.

¹ Site in this context refers to a place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

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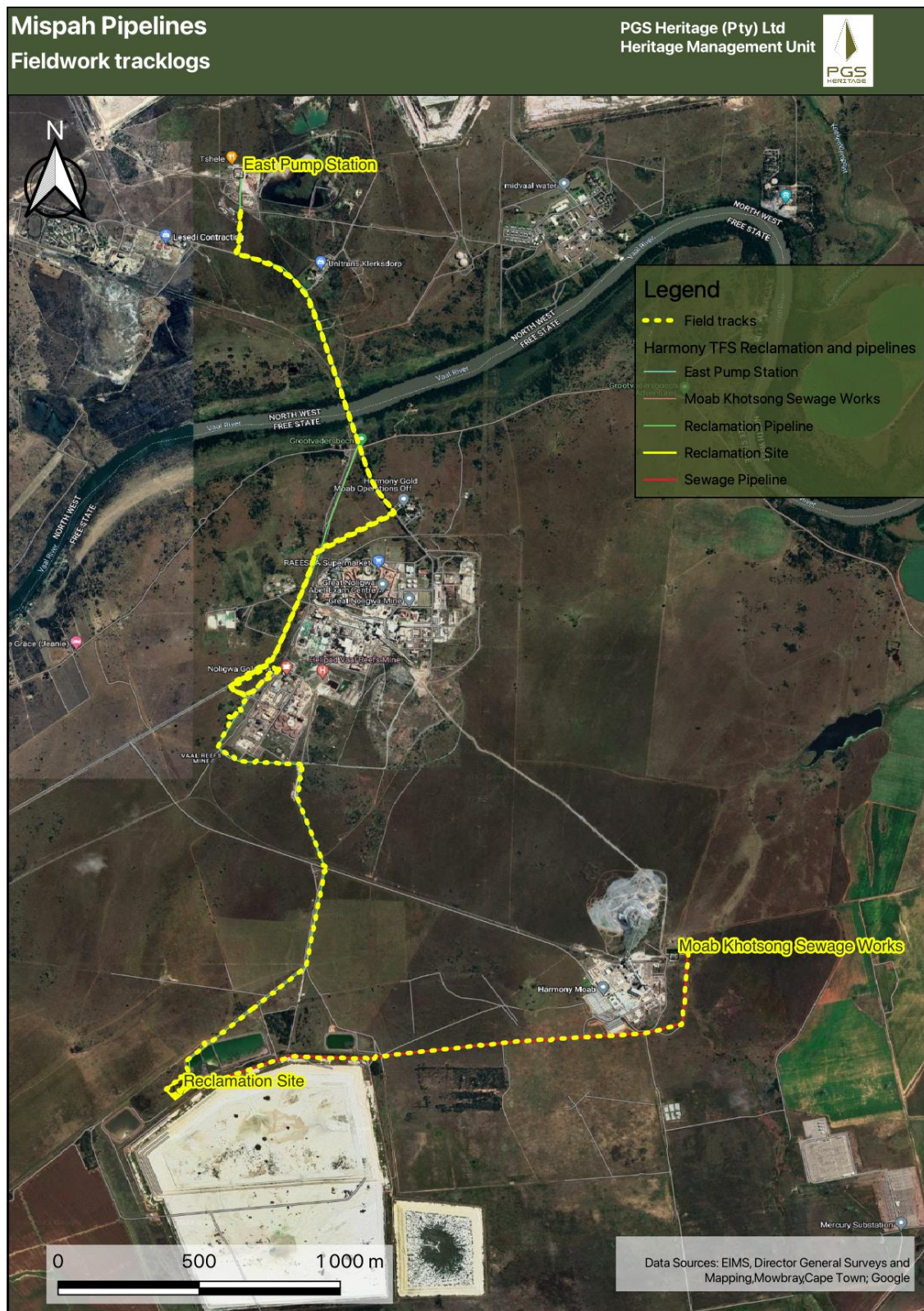


Figure 21 - Fieldwork tracklogs (track in yellow, study area in red and purple).

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7 IMPACT ASSESSMENT

The impact assessment rating is based on the rating scale as contained in **Appendix A**.

No heritage resources were identified during the fieldwork.

The potential to find unidentified heritage resources during construction do exist. However the impact is rated as Low.

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Table 6 - Impact rating table

IMPACT DESCRIPTION				Pre-Mitigation							Post Mitigation								Priority Factor Criteria			
Identifier	Impact	Alternative	Phase	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	Heritage Features	Alternative 1	Construction	-1	1	5	3	5	2	-7	-1	1	5	1	5	1	-3	High	1	2	1,13	-3,375

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8 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

The following section must be read in conjunction with **Table 8** of this report.

8.1 CONSTRUCTION AND OPERATIONAL PHASES

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

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

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

8.2 CHANCE FINDS PROCEDURE

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

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8.3 POSSIBLE FINDS DURING CONSTRUCTION

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

- Historical structures and foundations
- Unmarked burial grounds and graves

8.4 TIMEFRAMES

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead times must be worked into the construction time frames. **Table 7** gives guidelines for lead times on permitting.

Table 7 - 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 the development	Service provider – Archaeologist, SAHRA, local government and provincial government	6 months

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8.5 HERITAGE MANAGEMENT PLAN FOR EMPR IMPLEMENTATION

Table 8 - Heritage Management Plan for EMPr implementation

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

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9 CONCLUSIONS AND RECOMMENDATIONS

EIMS appointed PGS) to undertake a Heritage Assessment that forms part of the BA for the proposed Mispah 1 TSF Reclamation pipelines project.

A selective survey of the study area was conducted on 5 December 2022. The fieldwork component consisted of a walkdown of the proposed development areas and aimed at identifying heritage resources falling within the impact areas. The focus was placed on the undisturbed areas within the larger assessment area. Heritage resources are unique and non-renewable, and as such any impact on such resources must be seen as significant.

9.1 HERITAGE RESOURCES IDENTIFIED

During the fieldwork, no heritage resources were identified.

9.2 ANTICIPATED IMPACTS ON HERITAGE RESOURCES

The potential to find unidentified heritage resources during construction do exist. However, the impact is rated as Low.

9.3 MITIGATION MEASURES

The calculated impact as summarised in **Section 7** of this report confirms the impact of the pipeline project will be reduced with the implementation of the mitigation measures. This finding in addition to the implementation of a chance finds procedure, as part of the EMPr, will mitigate possible impacts on unidentified heritage resources.

9.4 GENERAL

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

It is the author's considered opinion that the overall impact of the proposed development on heritage resources is **Low**. With the implementation of recommended mitigation measures the overall impact on heritage resources will be reduced to acceptable levels during the activities of the project.

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10.6 GOOGLE EARTH

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

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APPENDIX A
ENVIRONMENTAL IMPACT METHODOLOGY

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TITLE:	ENVIRONMENTAL IMPACT ASSESSMENT RATING PROCEDURE	DOC No:	PRO 106	REV:	00	Page 2 of 7
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1. Purpose

The purpose of this procedure is to guide the undertaking of an impact and risk assessment process, as required under the regulations promulgated under the National Environmental Management Act (Act 107 of 1998 - NEMA).

2. Scope

This procedure provides the methodology to be applied to environmental impacts and risks identified during the Environmental Impact Assessment Process. The methodology ensures that consistent impact assessment rating is carried out that is legally compliant and aligned with EIMS's objective of providing a quality service.

3. References

GNR. 982 National Environmental Management Act (Act No. 107 of 1998): Environmental Impact Assessment Regulations, 2014 – hereafter referred to as the Regulations.

4. Additional Guidelines and References

Guidelines and Reference Docs (not exhaustive – please verify with the applicable competent authority).

Compulsory Compliance: GNR. 982 National Environmental Management Act (Act No. 107 of 1998 - NEMA): Environmental Impact Assessment Regulations, 2014.	National
Companion Guideline for Implementation: Environmental Management Assessment Regulations, 2010 - GN 805/2012 (NEMA)	National
DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5, Department of Environmental Affairs and Tourism (DEAT), Pretoria	National

5. Definitions and Abbreviations

Refer to Chapter 1 of the Regulations.

6. Procedure

The impact significance rating methodology, as presented herein and utilised for all EIMS Impact Assessment Projects, 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. The ER is determined for the pre- and post-mitigation scenario. 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.

a. Determination of Environmental Risk

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER). The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and Reversibility (R) applicable to the specific impact.

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

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

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

Table 1: Criteria for Determining Impact Consequence

Aspect	Score	Definition
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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 (15-65 years, the impact will cease after the operational life span of the project)
	5	Permanent (>65 years, no mitigation measure of natural process will reduce the impact after construction)
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected)
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way, moderate improvement for +ve impacts)
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease, high improvement for +ve impacts)
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease, substantial improvement for +ve impacts)
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible impact.

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

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Table 2: Probability Scoring

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

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

$$ER = C \times P$$

Table 3: Determination of Environmental Risk

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

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

Table 4: Environmental Risk Scores

ER Score	Description
<9	Low (i.e. where this impact is unlikely to be a significant environmental risk/ reward).
≥9 ≤17	Medium (i.e. where the impact could have a significant environmental risk/ reward),
>17	High (i.e. where the impact will have a significant environmental risk/ reward).

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.

b. 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

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decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 5: Criteria for Determining Prioritisation

Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/ definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable Loss of Resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

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

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

The result is a priority score which ranges from 2 to 6 and a consequent PF ranging from 1 to 1.5 (Refer to Table 6).

Table 6: Determination of Prioritisation Factor

Priority	Prioritisation Factor
2	1
3	1.125
4	1.25
5	1.375
6	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 factor of 0.5, if all the priority attributes are high (i.e. if an impact comes out with a high 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 to upscale the impact to a high significance).

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Table 7: Final Environmental Significance Rating

Significance Rating	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).
≥9, ≤17	Medium positive (i.e. where the impact could influence the decision to develop in the area).
>17	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.

7. Responsibilities

It is the responsibility of each EIMS employee and each external Specialist appointed by EIMS to ensure that this procedure is carried out as described. All the personnel within the organization have the responsibility to report any deviations/changes from the procedures to management. This is to ensure that the necessary changes are documented after approval.

It is the responsibility of the senior/ junior consultant (as applicable) assigned with the task of report compilation to ensure that this methodology/ procedure is strictly applied. It is the responsibility of the assigned Senior Consultant or Quality Reviewer to review and verify that the procedure has been complied with, and such documented at the specified quality check intervals.

8. Records

RECORD	STORAGE LOCATION	STORAGE SYSTEM	RESPONSIBLE PERSON	RETENTION PERIOD
Significance Rating Input Spreadsheet	Project File - /Server/assignments/ Job#/Records	Electronic- Scanned PDF	Project Manager	10 Years

9. Record of Changes, Revisions and Cancellations

RECORD OF CHANGES, REVISIONS AND CANCELLATIONS		
DATE	NATURE / DETAIL OF CHANGE	REV No.

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APPENDIX C
PGS TEAM CVS

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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

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

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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, Mauritius, Malawi, Zambia, Mozambique, and the Democratic Republic of the Congo