



PGS HERITAGE

PROPOSED MINE WASTE SOLUTIONS KAREERAND RETURN WATER PIPELINE PROJECT FOR HARMONY MINE BETWEEN KLERKSDORP AND POTCHEFSTROOM, CITY OF MATLOSANA AND JB MARKS LOCAL MUNICIPALITIES, WHICH FALL WITHIN THE DR KENNETH KAUNDA DISTRICT MUNICIPALITY IN THE NORTH-WEST PROVINCE, SOUTH AFRICA.

Heritage Impact Assessment

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Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page ii

REVISION HISTORY

Version	Issue Date	Description of Changes
001	29 May 2023	First draft
002	15 June 2023	Updating of formatting minor grammatical issues

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page iii

Declaration of Independence

- I, Jessica Angel, 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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Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page iv

ACKNOWLEDGEMENT OF RECEIPT

Report Title	<i>PROPOSED MINE WASTE SOLUTIONS KAREERAND RETURN WATER PIPELINE PROJECT FOR HARMONY MINE BETWEEN KLERKSDORP AND POTCHEFSTROOM, CITY OF MATLOSANA AND JB MARKS LOCAL MUNICIPALITIES, WHICH FALL WITHIN THE DR KENNETH KAUNDA DISTRICT MUNICIPALITY IN THE NORTH-WEST PROVINCE, SOUTH AFRICA.</i>		
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Reviewed	Wouter Fourie		Archaeologist/Heritage Specialist/ Project Manager – PGS Heritage
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CLIENT: Environmental Impact Management Services Consulting (Pty) Ltd

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SIGNATURE: _____

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page v

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

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
1.(1) (a) (i) Details of the specialist who prepared the report	Page iii of Report – Contact details and company
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to Appendix A
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page iii of the report
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1
(cA) An indication of the quality and age of base data used for the specialist report	Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 4, 5
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 3, 4
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 3
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	N/A
(g) An identification of any areas to be avoided, including buffers	N/A
(h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
(i) A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 5, 6
(k) Any mitigation measures for inclusion in the EMPr	Section 8
(l) Any conditions for inclusion in the environmental authorization	Section 8
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorization	Section 8
(n)(i) A reasoned opinion as to whether the proposed activity, activities or portions thereof should be authorised and	Section 9
(n)(iA) A reasoned opinion regarding the acceptability of the proposed activity or activities; and	
(n)(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 9
(o) A description of any consultation process that was undertaken during the course of carrying out the study	Not applicable
(p) A summary and copies if any comments that were received during any consultation process	Not applicable.
(q) Any other information requested by the competent authority.	Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	No protocols or minimum standards for HIAs or PIAs

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page vi

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services Consulting (Pty) Ltd (EIMS), on behalf of Harmony Gold Mining Company Limited (Harmony), to undertake a Heritage Impact Assessment (HIA), which forms part of the environmental process for the proposed Kareerand Return Water Pipeline, City of Matlosana and JB Marks Local Municipalities (LM), which fall within the Dr Kenneth Kaunda District Municipality (DM) in the North-West Province, South Africa.

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

Site Name and Location

The proposed development is located within the City of Matlosana and JB Marks Local Municipalities (LM), which fall within the Dr Kenneth Kaunda District Municipality (DM), between Klerksdorp and Potchefstroom, North West Province. The proposed return water pipeline will be installed alongside existing pipeline routes.

The estimated distance of the proposed pipeline is 11.1km (800mm). The proposed pipeline will be steel and flanged pipes installed on plinths above ground. Furthermore, the proposed pipelines will be installed within existing pipeline route from Kareerand Tailings Storage Facility (TSF) to Midway dam.

Fieldwork

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

Palaeontology

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas ranges from very high (red) on the western part of the proposed pipeline, to moderate (green) on the eastern part of the proposed pipeline (**Figure 21**). A desktop study is required and based on the outcome of the desktop study, a field assessment is likely (Almond and Pether 2008, SAHRIS website). A Palaeontological Desktop Assessment was commissioned as a stand-alone document for submission to SAHRA.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page vii

Impact Assessment

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

Mitigation measures

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

General

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page viii

TABLE OF CONTENT

1	INTRODUCTION	1
1.1	SCOPE OF THE STUDY	1
1.2	SPECIALIST QUALIFICATIONS	1
1.3	ASSUMPTIONS AND LIMITATIONS	2
1.4	LEGISLATIVE CONTEXT	2
1.4.1	NOTICE 648 OF THE GOVERNMENT GAZETTE 45421	2
1.4.2	NEMA – APPENDIX 6 REQUIREMENTS	4
1.4.3	THE NATIONAL HERITAGE RESOURCES ACT	4
2	SITE LOCATION AND DESCRIPTION	6
2.1	LOCALITY	6
2.2	PROJECT BACKGROUND	8
2.3	PROJECT DESCRIPTION	8
3	CURRENT STATUS QUO	9
3.1	SITE DESCRIPTION	9
3.2	SITE VEGETATION	11
4	ASSESSMENT METHODOLOGY	13
4.1	METHODOLOGY FOR ASSESSING HERITAGE SITE SIGNIFICANCE	13
4.1.1	SITE SIGNIFICANCE	13
5	HISTORICAL AND ARCHAEOLOGICAL OVERVIEW OF THE STUDY AREA	17
5.1	OVERVIEW OF THE STUDY AREA AND SURROUNDING LANDSCAPE	17
5.2	EXAMINATION OF ARCHIVAL AND HISTORICAL MAPS	26
5.2.1	SUD AFRICA, 1866	26
5.2.2	SECTION OF MAP, 1895/1896	27
5.2.3	KLERKSDORP, 1902	28
5.2.4	FIRST EDITION OF THE 2626DD STILFONTEIN TOPOGRAPHICAL MAP DATED TO 1944	29
5.2.5	KAREERAND PIPELINE (SEE FIGURE 19)	29
5.2.6	SECOND EDITION OF THE 2626DD STILFONTEIN TOPOGRAPHICAL MAP DATED TO 1996	31
5.3	PREVIOUS ARCHAEOLOGICAL AND HERITAGE RESEARCH FROM WITHIN THE STUDY AREA AND SURROUNDINGS	33
5.3.1	PREVIOUS ARCHAEOLOGICAL AND HERITAGE STUDIES FROM WITHIN THE STUDY AREA	35
5.4	PALAEONTOLOGY	36
5.5	FINDINGS OF THE HISTORICAL DESKTOP STUDY	37
5.5.1	HERITAGE SCREENING	37
5.5.2	HERITAGE SENSITIVITY	37
6	FIELDWORK FINDINGS	38
6.1	SENSITIVITY ASSESSMENT OUTCOME	38
7	IMPACT ASSESSMENT	40
7.1	DETERMINATION OF ENVIRONMENTAL RISK	40
7.2	IMPACT PRIORITISATION	42

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page ix

7.3	HERITAGE IMPACTS	44
8	MANAGEMENT RECOMMENDATIONS AND GUIDELINES	46
8.1	CONSTRUCTION PHASE	46
8.2	CHANCE FIND PROCEDURE	46
8.3	POSSIBLE FINDS DURING CONSTRUCTION PHASES	46
8.4	TIMEFRAMES	47
8.5	HERITAGE MANAGEMENT PLAN FOR EMPR IMPLEMENTATION	48
9	CONCLUSIONS	49
9.1	HERITAGE SITES	49
9.2	PALAEONTOLOGY	49
9.3	IMPACT ASSESSMENT	49
9.4	MITIGATION MEASURES	50
9.5	GENERAL	50
10	REFERENCES	51
10.1	PUBLISHED/UNPUBLISHED	51
10.2	UNPUBLISHED REFERENCES	52
10.3	NEWSPAPERS	53
10.4	ARCHIVAL REFERENCES	54
10.5	INTERNET	54
10.6	GOOGLE EARTH	54
10.7	HISTORICAL TOPOGRAPHICAL MAPS	54

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page x

List of Figures

<i>Figure 1 – Human and Cultural Timeline in Africa</i>	xv
<i>Figure 2 - Environmental screening tool's depiction of the archaeological and heritage sensitivity of the study area and surroundings.</i>	4
<i>Figure 3 - Locality map depicting the regional context of the study area.</i>	7
<i>Figure 4 – View of reclamation pump stations</i>	10
<i>Figure 5 – View of tall grasses.</i>	10
<i>Figure 6 – View of existing pipeline.</i>	10
<i>Figure 7 – View of existing pipeline.</i>	10
<i>Figure 8 – View of the Kareerand TSF RWD.</i>	11
<i>Figure 9 - Early photograph depicting Klerksdorp's Oudorp (National Archives, Photographs, 163420).</i> ...	18
<i>Figure 10 - The shop that Taylor and Leask established in Klerkdorp's Oudorp (Marx, 1987:15).</i>	19
<i>Figure 11 - Marthinus Gerhardus Jansen van Rensburg (Marx, 1987:17).</i>	19
<i>Figure 12 - 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>	22
<i>Figure 13 - 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>	23
<i>Figure 14 - Diamond miners at what is believed to be the Eastleigh Diggings (Marx, 1987).</i>	24
<i>Figure 15 - This aerial photograph of Khuma Township was taken in 1961, roughly one year after it was established (NGI, Aerial Photographs, 425_021_02738).</i>	25
<i>Figure 16 - Section of the 1866 Sud Africa map (blue polygon: approximate location of study area).</i>	27
<i>Figure 17 - Section of a map that appeared in the 1895/1896 publication by Charles Sydney. (red polygons highlight the names of the Hartebeestfontein, Buffelsfontein, Wildebeestpan and Stilfontein farms) Goldmann.</i>	28
<i>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).</i>	29
<i>Figure 19 - Section of the First Edition of the 2626DD Topographical Sheet, showing several heritage features. These comprise structures such as kraals, historical structures, ruins and historical Black Homesteads (yellow polygons) located within the vicinity of the proposed pipeline.</i>	30
<i>Figure 20 - Section of Second Edition of the 2626DD Topographical Map, showing several structures (yellow polygons) located adjacent to the proposed pipeline.</i>	32
<i>Figure 21 - Extract of the 1: 250 000 SAHRIS Palaeosensitivity Map (Council of Geosciences), overlain with the location of the study area.</i>	36
<i>Figure 22 – Key to the SAHRIS palaeontological map.</i>	37
<i>Figure 23 - Map depicting the track logs (blue lines) recorded during the current fieldwork.</i>	39

List of Tables

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page xi

<i>Table 1 - Reporting requirements for GN648.....</i>	<i>3</i>
<i>Table 2 - Rating system for archaeological resources.....</i>	<i>14</i>
<i>Table 3 - Rating system for built environment resources.....</i>	<i>14</i>
<i>Table 4 - Tangible heritage site in the study area.....</i>	<i>37</i>
<i>Table 5 - Landform type to heritage find matrix.....</i>	<i>38</i>
<i>Table 6 - Criteria for Determining Impact Consequence.....</i>	<i>40</i>
<i>Table 7 - Probability Scoring.....</i>	<i>41</i>
<i>Table 8 - Determination of Environmental Risk.....</i>	<i>41</i>
<i>Table 9 - Significance Classes.....</i>	<i>42</i>
<i>Table 10 - Criteria for Determining Prioritisation.....</i>	<i>42</i>
<i>Table 11 - Determination of Prioritisation Factor.....</i>	<i>43</i>
<i>Table 12 - Final Environmental Significance Rating.....</i>	<i>43</i>
<i>Table 13 - Impact rating for heritage resources.....</i>	<i>45</i>
<i>Table 14 - Lead times for permitting and mobilisation.....</i>	<i>47</i>
<i>Table 15 - Heritage Management Plan for EMPr implementation.....</i>	<i>48</i>

List of Appendices

A *Project team CV's*

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page xii

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page xiii

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.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page xiv

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page xv

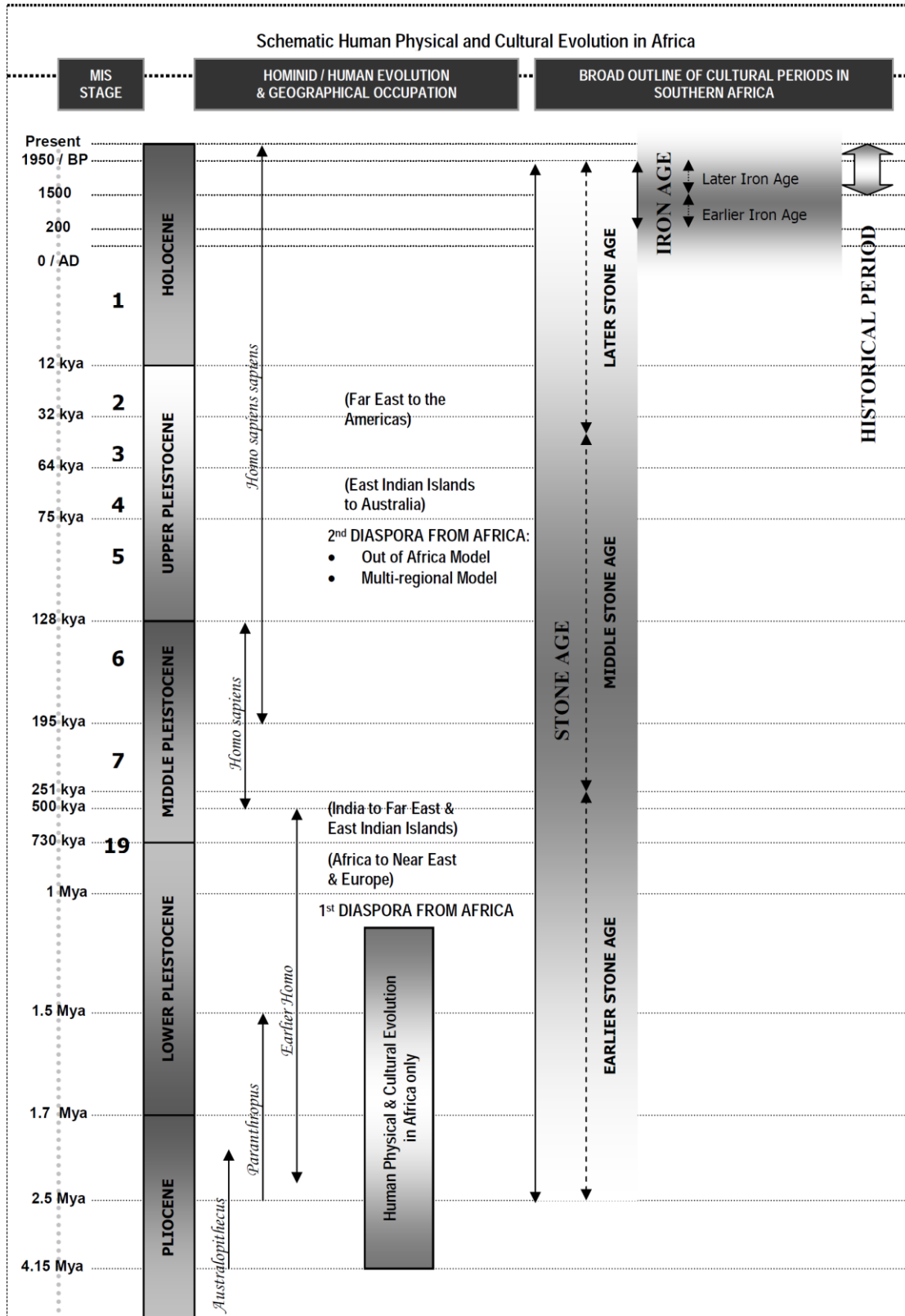


Figure 1 – Human and Cultural Timeline in Africa

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 1

1 INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) was appointed by Environmental Impact Management Services Consulting (Pty) Ltd (EIMS), on behalf of Harmony Gold Mining Company Limited (Harmony), to undertake a Heritage Impact Assessment (HIA), which forms part of the environmental process for the proposed Kareerand Pipelines Project (KPP) for Harmony Gold, located within the City of Matlosana and JB Marks Local Municipalities (LM), which fall within the Dr Kenneth Kaunda District Municipality (DM) in the North-West Province, between Klerksdorp and Potchefstroom, North West Province.

1.1 SCOPE OF THE STUDY

The study aims to identify possible heritage sites and finds that may occur in the proposed development of KPP. 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 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 Report was compiled by PGS Heritage (PGS).

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

Jessica Angel, the author of this report, is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA). She has 10 years of experience in the heritage assessment field and holds a Master's degree (MSc) in Archaeology from the University of the Witwatersrand.

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).

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 2

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 only represent some of 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. It should be noted that for the most part, the study area was accessible for the fieldwork survey. Fieldwork was also focussed on area that was not previously ploughed or disturbed by farming activity, thus focussing on areas with the highest potential to yield heritage resources.

Therefore, should any heritage features and/or objects be located or observed outside the identified heritage sensitive areas during the construction activities, a heritage specialist must be contacted immediately. Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

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

1.4 LEGISLATIVE CONTEXT

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

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

1.4.1 NOTICE 648 OF THE GOVERNMENT GAZETTE 45421

Although minimum standards for archaeological (2007) and palaeontological (2012) assessments were published by SAHRA, GN.648 requires sensitivity verification for a site selected on the national web based environmental screening tool for which no specific assessment protocol related to any theme has been identified.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 3

As such this report is aligned with the GN. as well as the report requirements as stipulated by SAHRA.

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 3	-
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web-based environmental screening tool;	Section 3	-
2.3(b) contains motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity;	Section 3	-

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 4

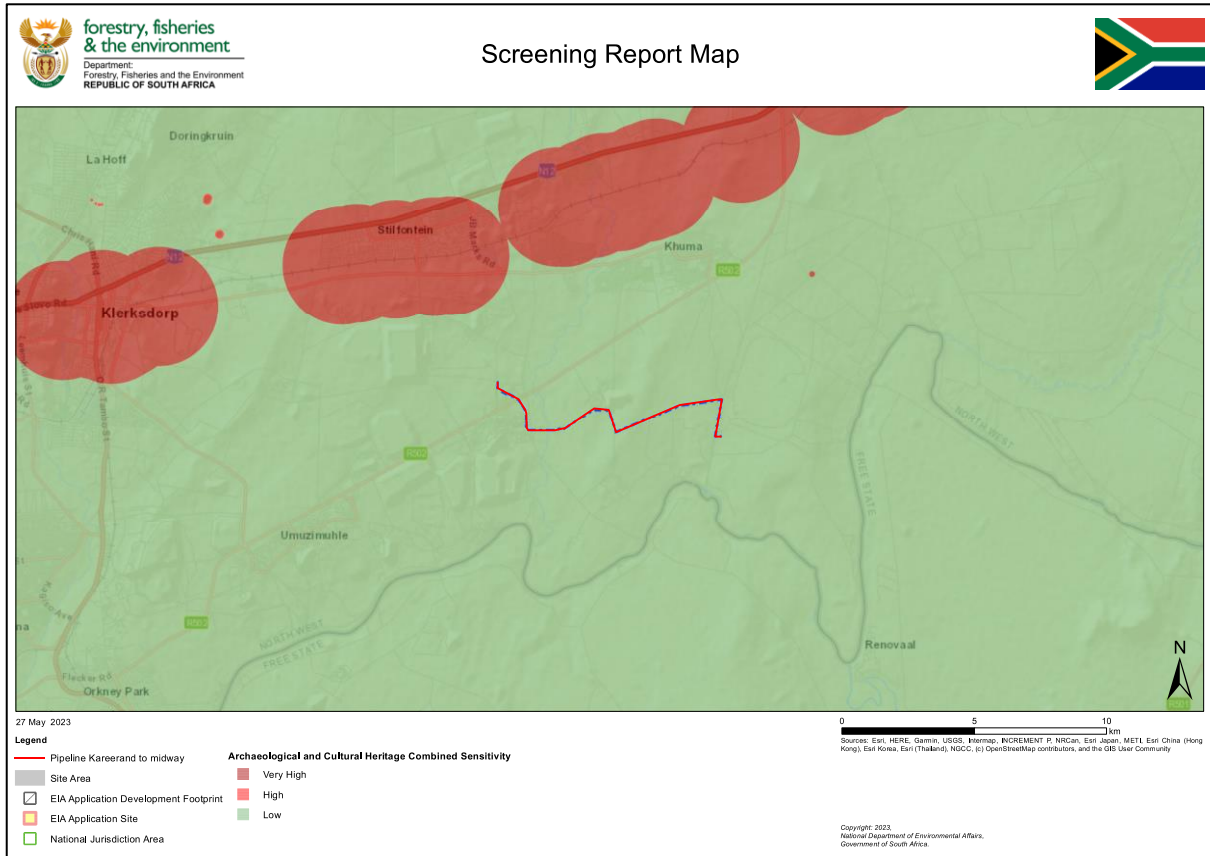


Figure 2 - Environmental screening tool's depiction of the archaeological and heritage sensitivity of the study area and surroundings.

1.4.2 NEMA – APPENDIX 6 REQUIREMENTS

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

1.4.3 THE NATIONAL HERITAGE RESOURCES ACT

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

Section 24(2) of the National Environmental Management Act of 1998 (Act No. 107 of 1998) (NEMA) requires environmental authorisation from the environmental authority for certain activities that have been identified and must undergo Environmental Impact Assessment (EIA). Similarly, Section 38 of the National Heritage Resources Act of 1999 (Act No. 25 of 1998) (NHRA) lists specific development activities that require notice to the heritage resources authority to determine if a heritage impact assessment (HIA) is necessary. Approval from the heritage authority is mandatory before proceeding with the development activities.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 5

To avoid redundancy and facilitate coordination between NEMA and NHRA requirements, Section 38(8) of the NHRA states that if the development activities listed in Section 38(1) require an EIA under NEMA, a separate HIA and approval from the heritage resources authority are unnecessary. However, the environmental authority must ensure that the heritage resources authority's requirements for HIA are fulfilled and that its comments and recommendations are considered before granting environmental authorisation.

Therefore, if a NEMA EIA is required for the development activities listed under Section 38 of the NHRA, separate HIA and EIA processes may not be followed, and different decisions may not be issued under NHRA and NEMA. The EIA process will be followed, and if the heritage resources authority requires HIA, it must be conducted as one of the EIA specialist studies.

The environmental authority must ensure that the heritage resources authority's requirements for the assessment are met. A separate heritage approval may not be issued, but the environmental authority must consider the heritage resources authority's comments and recommendations before granting or refusing environmental authorisation.

The NHRA is utilised as the basis for the identification, evaluation, and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources are 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.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 6

2 SITE LOCATION AND DESCRIPTION

2.1 LOCALITY

Coordinates for Study Area	Northernmost point: S -26.888470° E 26.800547°	Easternmost point: S -26.905085° E 26.876667°
	Southernmost point: S -26.905085° E 26.876667°	Westernmost point: S -26.888470° E 26.800547°
Location	The proposed development area is located south of the N12 between Klerksdorp and Potchefstroom, north of the Vaal River (Figure 3). The towns adjacent to the study area are Khuma, Buffelsfontein and Stilfontein. The proposed pipeline will be installed alongside existing pipeline routes.	
Property	Portions of the farms: <ul style="list-style-type: none"> ▪ Farm Hartbeesfontein 422 IP ▪ Farm Wildebeesfontein 422 IP ▪ Farm Buffelsfontein 443 IP ▪ Farm Kareerand 444 IP 	
Topographical Map	2626DD Stilfontein	
Extent	The estimated distance of the proposed pipeline is 1110 metres (~ 11,1 km).	

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

- Provincial roads (N12)
- Mining infrastructure
- Power lines
- Local roads (tar and informal)
- Existing pipelines

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 7

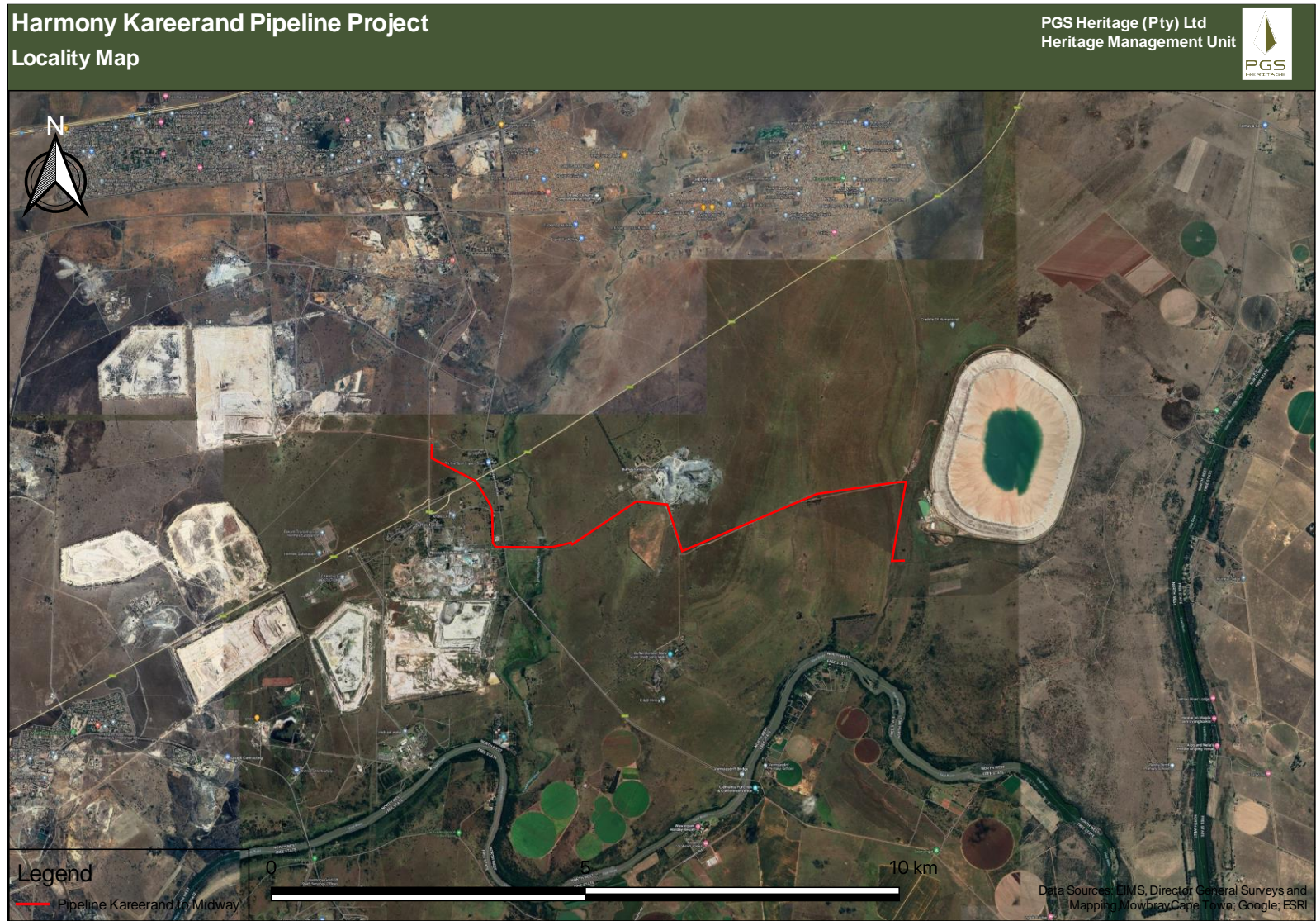


Figure 3 - Locality map depicting the regional context of the study area.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 8

2.2 PROJECT BACKGROUND

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

Mine Waste Solutions (MWS), also known as Chemwes (Pty) Ltd (Chemwes), as a subsidiary of Harmony Gold Mining Company has been in business since 1964 and conducts its operations over a large area of land to the east of Klerksdorp, within the area of jurisdiction of the City of Matlosana and JB Marks Local Municipalities (LM), which fall within the Dr Kenneth Kaunda District Municipality (DM) in the North-West Province.

MWS want to install an additional return water pipeline infrastructure to meet the planned Life of Mine (LOM) production rates and increase the volume of return water from Kareerand TSF to the reclamation pump stations. The current return water pipeline does not meet the requirements of the planned LOM and impacts on the long- term sustainability of the MWS operations.

The infrastructure planned is an additional 11.1km return water pipeline (800mm) from Kareerand TSF new return water dams to Midway Dam, as shown in Figure 1, along the existing slurry and return water pipelines.

2.3 PROJECT DESCRIPTION

MWS plans to construct an additional 800mm diameter return water pipeline along the existing pipeline route from Kareerand TSF to Midway Dam to increase pumping rate of return water from Kareerand TSF to the reclamation pump stations. MWS water use hierarchy gives priority to return (process) water. The water from Kareerand is the main source of water for the reclamation operations and the proposed pipeline will increase the volume of return water available for reclamation and processing at MWS plant, thereby reducing the need to import water from other approved sources.

The specifications of the proposed pipeline are:

- Transport material – Process water
- Type – 6mm Steel
- Construction – 10 bar rated flanged on plinths,
- Flow Rate – 4000 m3/h
- Length – ~ 11.1km
- Diameter – 800mm NB
- Land Ownership – Private and MWS owned land

Planned route – Parallel to the existing return water and slurry delivery pipelines between Midway and Kareerand TSF.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 9

3 CURRENT STATUS QUO

3.1 SITE DESCRIPTION

A site visit was conducted by an archaeologist and field assistant from PGS on the 22nd of May 2023. In terms of the archaeological visibility of the area, some areas with dense vegetation cover and/or surface disturbance impacted upon the survey.

The study area is located south of the N12 between Klerksdorp and Potchefstroom, north of the Vaal River. The towns adjacent to the study area are Buffelsfontein, Stilfontein and Khuma. In terms of the topography, the study area comprises relatively level portions of land. The current study area components are near existing pipeline routes, the Midway dam, the MWS processing plant, and the Kareerand TSF return water dams (RWD).

As mentioned previously, the study area falls within a landscape that contains multiple pipelines, thus the area can be described as largely disturbed. Parts of the surrounding landscape is used for informal cattle grazing. Other elements of disturbance identified within the study area include farm and provincial roads and other infrastructure associated with the existing pipelines. The likelihood of finding in-situ heritage resources is lessened due to this fact.

The study area is serviced by the R502 and N12 roads, graded roads, and farm tracks. Existing infrastructure includes mine infrastructure and power lines.

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 10



Figure 4 – View of reclamation pump stations at the most western end of the pipeline .



Figure 5 – View of tall grasses.



Figure 6 – View of existing pipeline.



Figure 7 – View of existing pipeline.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 11



Figure 8 – View of the Kareerand TSF RWD.

3.2 SITE VEGETATION

In terms of vegetation, the KPP area is characterised by the following vegetation types.

Parts of the study area is located within the Rand Highveld Grassland vegetation type (Mucina & Rutherford, 2006). This vegetation type is characterised by “...*highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species- rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera Themeda, Eragrostis, Heteropogon and Elionurus. High diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with Protea caffra subsp. caffra, P. welwitschii, Acacia caffra and Celtis africana, accompanied by a rich suite of shrubs among which the genus Rhus (especially R. magalismonata) is most prominent.*” (Mucina & Rutherford, 2006). In terms of geology, the Rocky Highland Grassland vegetation type is associated with Quartzite ridges of the Witwatersrand Supergroup and the Pretoria Group as well as the Selons River Formation of the Rooiberg Group (last two are of the Transvaal Supergroup) (www.sanbi.org).

The Vaal Reefs Dolomite Sinkhole Woodland vegetation type. This component of the study area is associated with a characteristic geomorphological feature of this vegetation type, namely a prominent Chert ridge. This vegetation type “...*occurs almost exclusively on the dolomites of the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup), where underground dissolution of the rock causes sinkholes.*” (www.sanbi.org; Mucina & Rutherford, 2006).

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 12

Several camelthorn trees (*Acacia erioloba*) were observed adjacent to the Midway-MWS Plant slurry Pipeline, with isolated smaller trees and shrubs found sporadically across the study area.

Alien trees (*Eucalyptus*) are mostly concentrated in the northern part of the study area and there is secondary grassland which is associated with areas of cultivation/grazing.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 13

4 ASSESSMENT METHODOLOGY

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

4.1 METHODOLOGY FOR ASSESSING HERITAGE SITE SIGNIFICANCE

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

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

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

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

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

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

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

4.1.1 SITE SIGNIFICANCE

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 14

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

Table 2 - Rating system for archaeological resources

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

Table 3 - Rating system for built environment resources

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 15

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 16

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

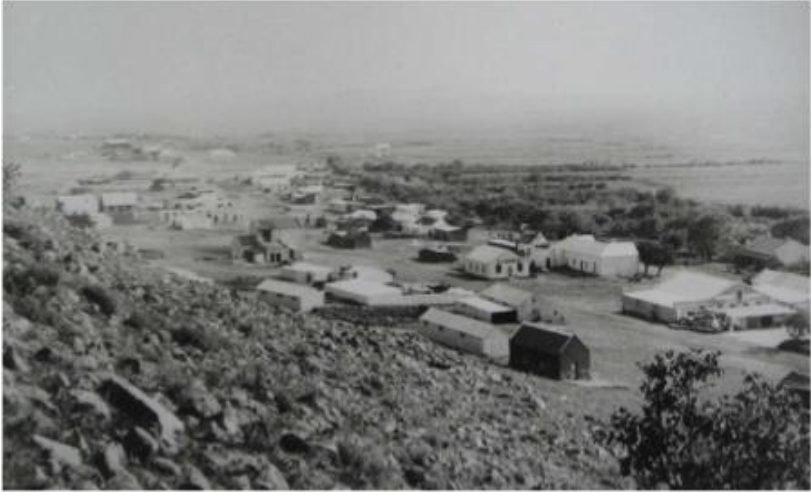
Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 17

5 HISTORICAL AND ARCHAEOLOGICAL OVERVIEW OF THE STUDY AREA



5.1 OVERVIEW OF THE STUDY AREA AND SURROUNDING LANDSCAPE

DATE	DESCRIPTION
2.5 million – 250 000 years ago	<p>The Earlier Stone Age is the first and oldest phase identified in 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>
1839	<p>The district of Potchefstroom was established in this year (Bergh, 1999). The study area fell within this district at the time.</p>

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 18

DATE	DESCRIPTION
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 9 - Early photograph depicting Klerksdorp's Oudorp (National Archives, Photographs, 163420).</i></p>
14 December 1853	<p>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.</p>
12 May 1859	<p>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.</p>
1865	<p>Messrs. James Taylor and Thomas Leask established the first business in Klerksdorp in this year. Tomas Leask became an important businessman in Klerksdorp.</p>

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 19

DATE	DESCRIPTION
	 <p><i>Figure 10 - The shop that Taylor and Leask established in Klerkdorp'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 11 - Marthinus Gerhardus Jansen van Rensburg (Marx, 1987:17).</i></p>
1887	<p>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).</p>

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 20

DATE	DESCRIPTION
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 on 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, Welverdiend, 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	<p>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.</p> <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</p>


Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 21

DATE	DESCRIPTION
	<p>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 Northampton's 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> <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>


Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 22

DATE	DESCRIPTION
	<div data-bbox="497 264 1315 855" data-label="Image"> </div> <div data-bbox="507 884 1378 1010" data-label="Caption"> <p><i>Figure 12 - 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> </div> <div data-bbox="494 1037 1390 1314" data-label="Text"> <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> </div> <div data-bbox="494 1341 1390 1774" data-label="Text"> <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 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> </div>


Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 23

DATE	DESCRIPTION
	 <p><i>Figure 13 - 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 Easleigh 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 number of decades, by 1937 its significance waned and the mining of gold became increasingly significant.</p>

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 24

DATE	DESCRIPTION
	 <p><i>Figure 14 - 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 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</p>

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 25

DATE	DESCRIPTION
	<p>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>  <p><i>Figure 15 - 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</p>

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 26

DATE	DESCRIPTION
	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.).

5.2 EXAMINATION OF ARCHIVAL AND HISTORICAL MAPS

The examination of historical data and cartographic resources represents a critical tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. 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, and 2006) were available for utilisation in the background study. These maps were assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The study area was overlain on the map sheets to identify structures or graves situated within or immediately adjacent to the study area that could possibly be older than 60 years and thus protected under Section 34 and 36 of the NHRA.

5.2.1 SUD AFRICA, 1866

(David Rumsey Historical Map Collection: reference cfP6163)

The map depicted in **Figure 16** below is titled “*Sud Africa*”. The full title is: “*Sud Africa. Bearbeitet von Adolf Graf. Terrain v. G. Dietrich. Gest. v. G. Haubold. Weimar: Geographisches Institut. (to accompany) Hand - Atlas Der Erde Und Des Himmels.*”. The map dates from 1866 and the author was Adolf Graf (Publisher: Geographisches Institut (*Weimer, Germany*)). The map was colour coded by Europeans and shows the routes followed by the principal explorers from 1831 to 1862. The red represents the route that the Boers would have taken.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 27



Figure 16 - Section of the 1866 Sud Africa map (blue polygon: approximate location of study area).

5.2.2 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.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 28

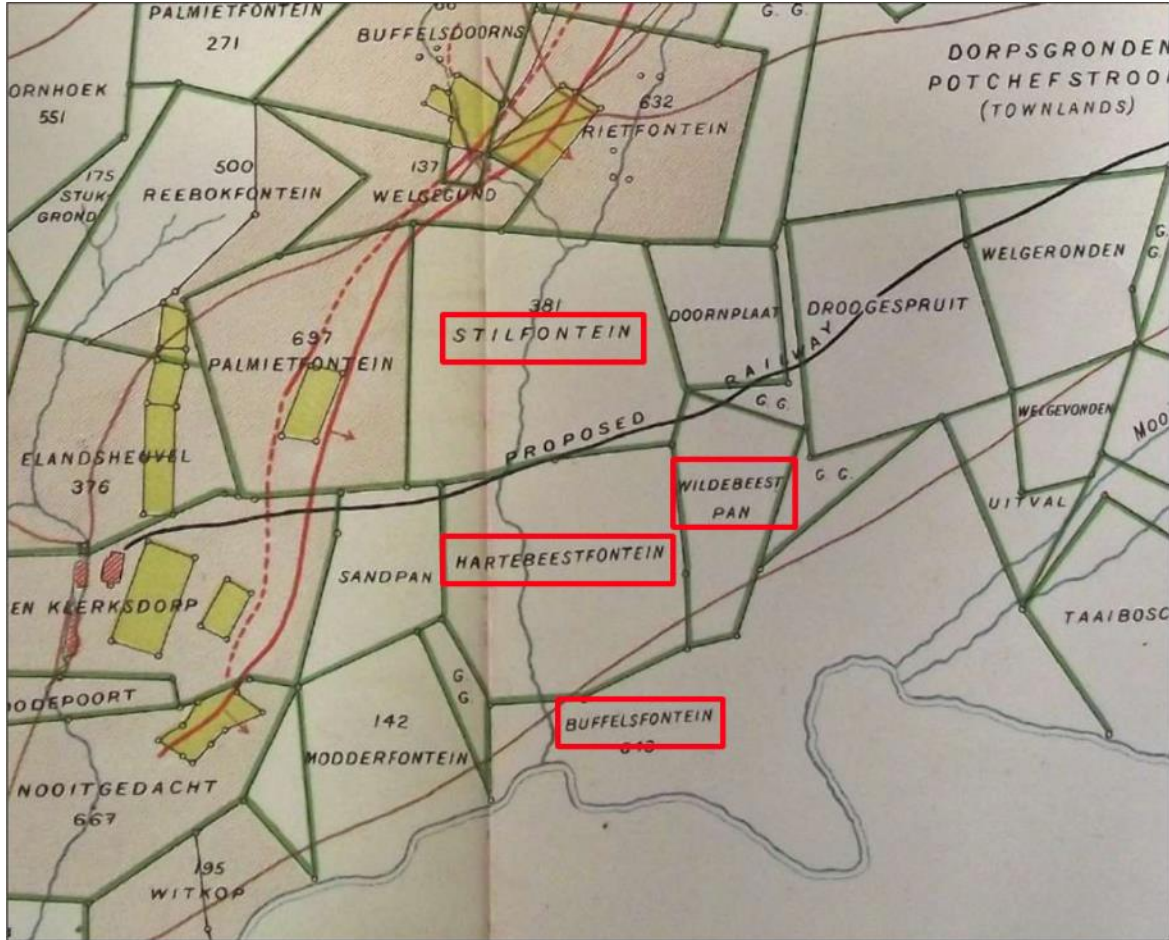


Figure 17 - Section of a map that appeared in the 1895/1896 publication by Charles Sydney. (red polygons highlight the names of the Hartebeestfontein, Buffelsfontein, Wildebeestpan and Stilfontein farms) Goldmann.

5.2.3 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.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 29

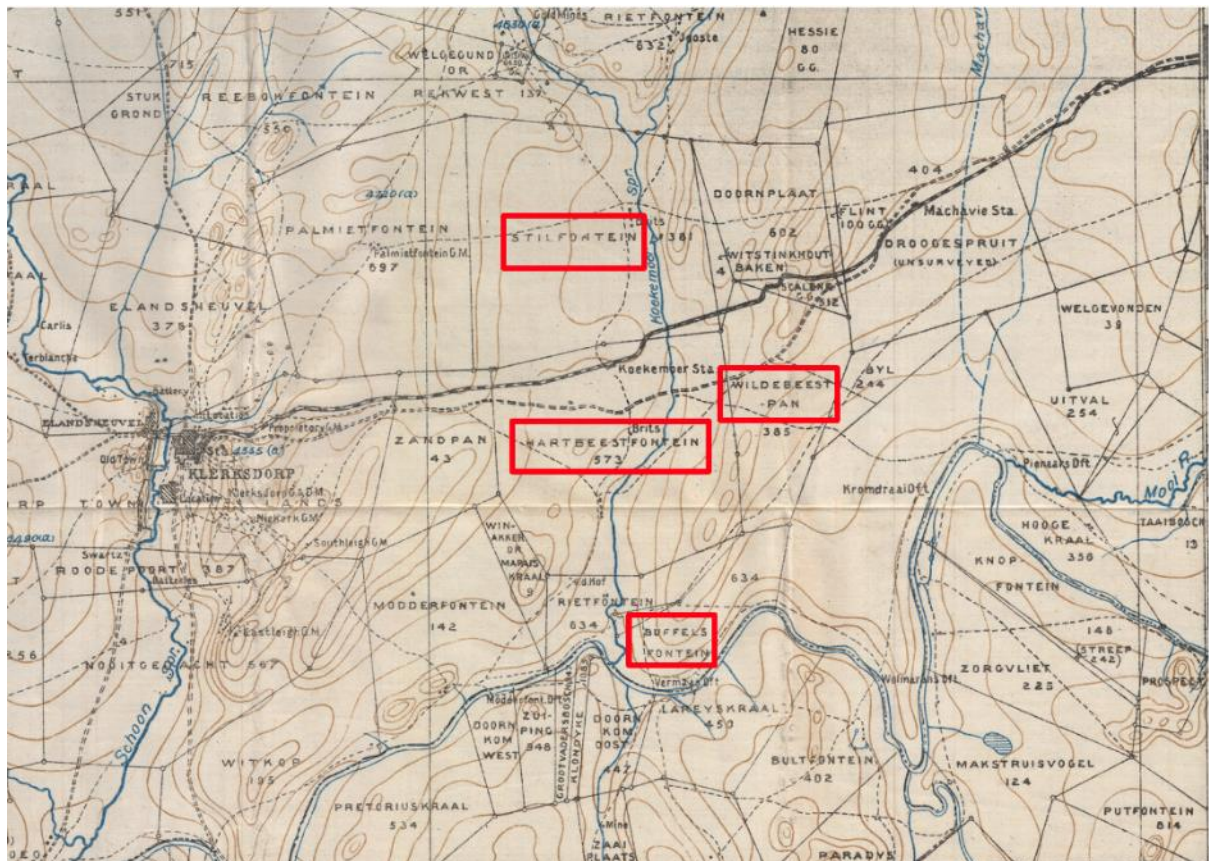


Figure 18 - Section of the 1902 Klerksdorp map highlighting the names of the Hartebeestfontein, Buffelsfontein, Wildebeestpan and Stilfontein farms (University of Cape Town Libraries, South Africa).

5.2.4 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. There are several historical structures (incl. Historical Black Homesteads and Farmsteads) adjacent to the proposed pipeline in the west of the study area. If these structures still exist today, they would be at least 77 years old. Overlays of the study area components over this map sheet are provided in **Figure 19**. Any observations that can be made from these map depictions, are individually discussed below.

5.2.5 KAREERAND PIPELINE (SEE Figure 19)

- Sections of the study area are depicted as agricultural areas and areas with trees and bushes.
- Several structures (incl. historic Black Homesteads) were depicted near the western most end of the proposed pipeline and one ruin near the eastern most end. **These structures were however not identified during the fieldwork.**

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 30

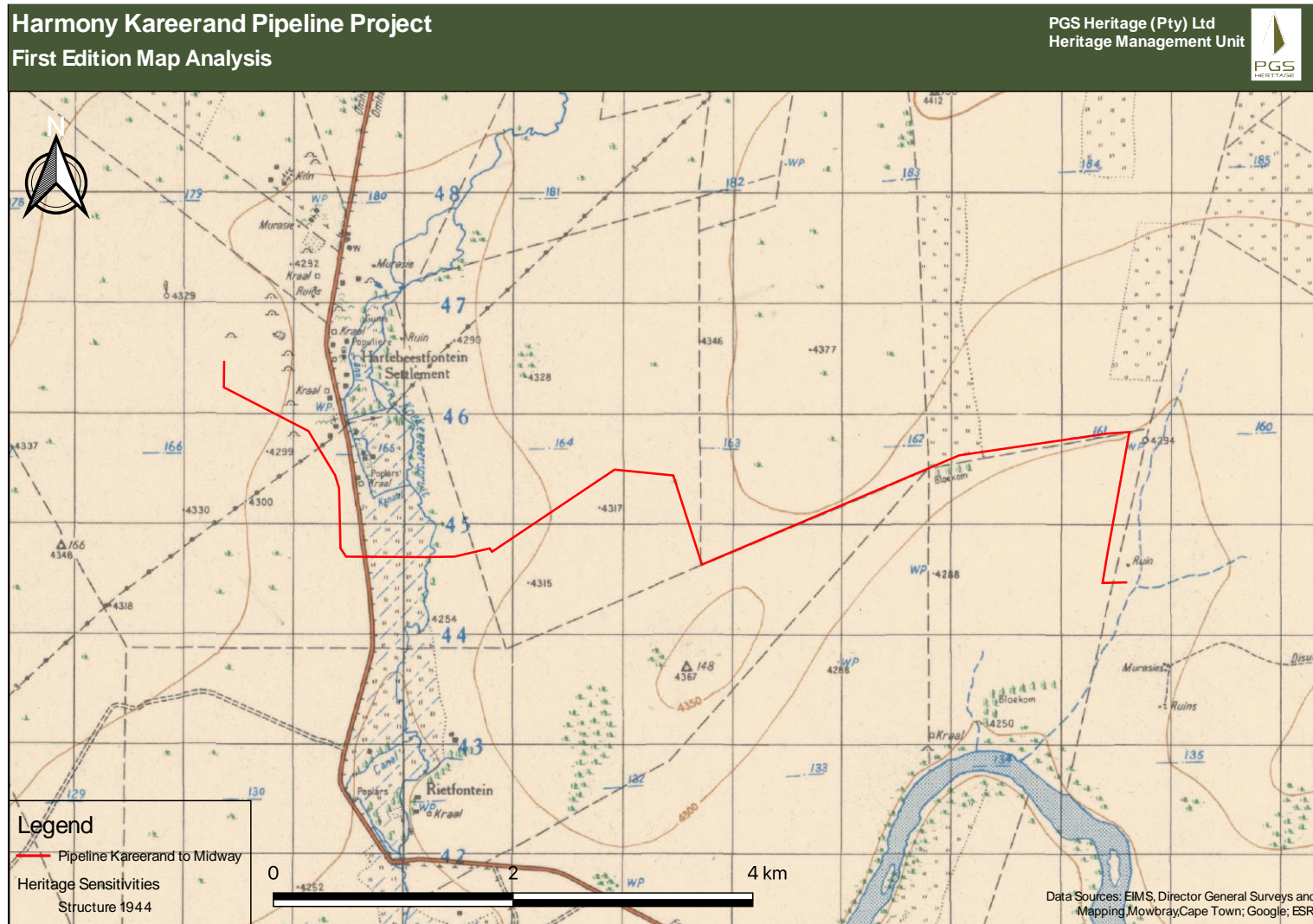


Figure 19 - Section of the First Edition of the 2626DD Topographical Sheet, showing several heritage features. These comprise structures such as kraals, historical structures, ruins and historical Black Homesteads (yellow polygons) located within the vicinity of the proposed pipeline.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 31

5.2.6 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 several structures within the vicinity of the study area. Overlays of the study area components over this map sheet are provided in **Figure 20**. All these identified sites are likely to be younger than 60 years old. Sections of the study area are depicted as agricultural areas and areas with trees and bushes.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 32

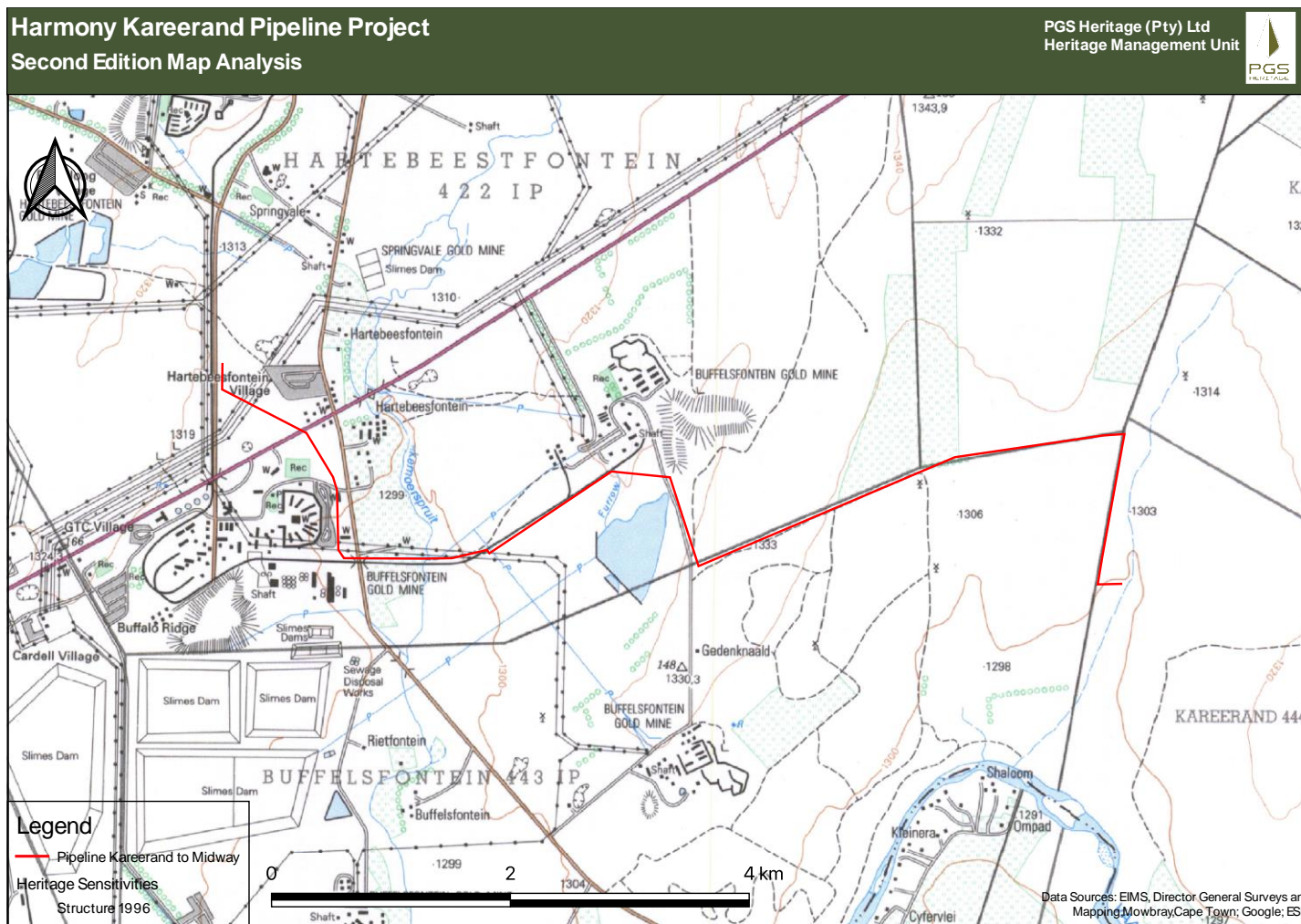


Figure 20 - Section of Second Edition of the 2626DD Topographical Map, showing several structures (yellow polygons) located adjacent to the proposed pipeline.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 33

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

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

- Dreyer, K. 2005. Archaeological and Historical Investigation of the Proposed Residential Developments on Subdivision 13 of the farm Pretoriuskraal 53, Viljoenskroon, Free State. **During this fieldwork, only the area around the house was surveyed on foot. The cleaned area around the house did not produce any archaeological or cultural remains. This 2005 study area was located roughly 10 km south-west of the current study area.**
- Pistorius, J.S.S. 2011. A Phase I Heritage Impact Assessment (HIA) Study for a Proposed Tailings Reclamation Project near the Mine Village of Stilfontein in the North West Province of South Africa. For Ground Water Consulting Services.

The study area for this project comprised two options for the proposed development, namely a property north-east of the town of Stilfontein as well as the general area where the Kareerand Tailings Storage Facility is currently located. **During the fieldwork, numerous cemeteries and historical structures (in the form of black homesteads) were identified.**

- Coetzee, F. 2012. Cultural Heritage Survey of the Proposed Kabi Vaalkop PV Solar Facility, near Orkney, Dr Kenneth Kaunda District, North West Province. For Savannah Environmental (Pty) Ltd.

The site for this 2012 study was situated 5km east of Orkney. The survey area consisted of three portions which are associated with three phases of the project. A fourth phase consisted of a substation and power line. The combined survey area was situated on the following farm portions: a portion of the farm Vaalkop 439 IP, Portion 7 of the farm Vaalkop 439 IP, a portion of Portion 3 of the farm Vaalkop 439 IP and a portion of Portion 200 of the farm Nooitgedacht 434 IP. **No archaeological sites or material and no graves were identified. Two demolished historical structures were identified but these were assessed to be less than 60 years old. The study area for this 2012 project was located roughly 8 km south-west of the current study area.**

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 34

- Birkholtz, P.D. 2014. Heritage Inventory of the Mines Waste Solutions (MWS) Areas located on certain portions of the farms Stilfontein 408 IP, Kromdraai 420 IP, Hartebeestfontein 422 IP, Modderfontein 440 IP, Buffelsfontein 443 IP and Kareerand 444 IP, to the east and south-east of Klerksdorp, North West Province. For AngloGold Ashanti Limited.

This heritage inventory was aimed at compiling a database of known heritage sites from within the Mine Waste Solutions (MWS) areas. As such, a field survey was undertaken of these areas. It must be noted that this field survey was not aimed at a walkthrough of the entire study area, but rather to visit known sites for inclusion in the heritage inventory. The significance of each site was established and general mitigation and conservation recommendations made. **During the fieldwork, a total of 34 heritage sites were identified. These included cemeteries, historic structures (such as farmsteads, farm buildings and farm worker homesteads), a mining accident monument as well as a Stone Age site. Due to the extent of the study area, these sites were identified over a reasonably extensive area which ranged from the surroundings of Stilfontein to the current study area.**

- Miller, S. 2015. Cultural Heritage Impact Assessment for Shafts #1 to #7, Orkney, Northwest Province, South Africa. For CAPM Gold.

The seven sites and shafts that were investigated by the specialist were procured by CAPM Gold from the Pamodzi Gold Company. It was the intent of the new owners to reinstate gold mining on the sites procured. As part of the environmental impact assessment it was therefore necessary to conduct a heritage impact assessment. **A total of seven sites were investigated, all of which were sites of mine shafts. Three of these sites contained traditional riveted steel headgear, which was dated to the end of the 1930's. The remaining four sites had modern concrete headgear which was dated to the period after c. 1960. The study area for this 2015 project is located roughly 5 km south-west of the current study area.**

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 35

5.3.1 PREVIOUS ARCHAEOLOGICAL AND HERITAGE STUDIES FROM WITHIN THE STUDY AREA

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**

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 36

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.

5.4 PALAEOLOGY

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas range from very high (red) on the western part of the proposed pipeline, to moderate (green) on the eastern part of the proposed pipeline (**Figure 21**). A desktop study is required and based on the outcome of the desktop study, a field assessment is likely (Almond and Pether 2008, SAHRIS website).

A Palaeontological Desktop Assessment was commissioned as a stand-alone document for submission to SAHRA.

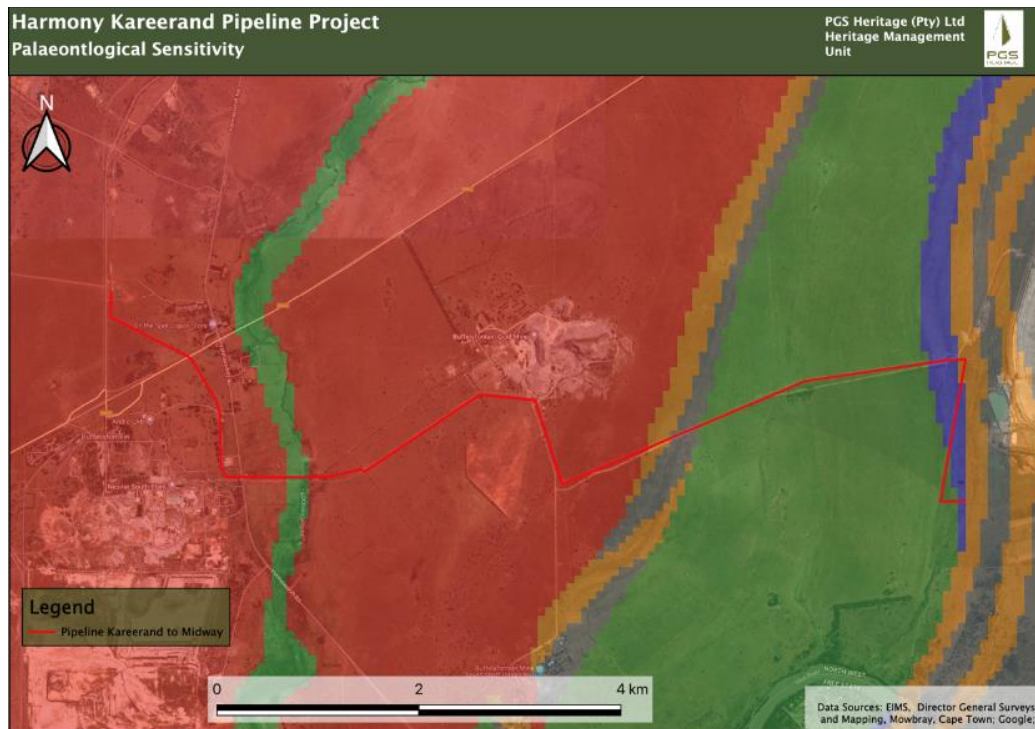


Figure 21 - Extract of the 1: 250 000 SAHRIS Palaeosensitivity Map (Council of Geosciences), overlain with the location of the study area.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 37

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

Figure 22 – Key to the SAHRIS palaeontological map.

5.5 FINDINGS OF THE HISTORICAL DESKTOP STUDY

5.5.1 HERITAGE SCREENING

A heritage screening report was compiled by the Department of Environmental Affairs National Web-based Environmental Screening Tool as required by Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended. According to the heritage screening report, the project area has a Low Heritage Sensitivity (**Figure 2**). The field work that was conducted in the study area demonstrates that there were no archaeological or historical sites of heritage significance that warrant conservation. This is most likely due to the level of disturbance 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.

5.5.2 HERITAGE SENSITIVITY

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

Table 4 - Tangible heritage site in the study area.

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

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 38

Table 5 - Landform type to heritage find matrix

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

6 FIELDWORK FINDINGS¹

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was conducted by an archaeologist (Jessica Angel) and field assistant (Xander Fourie) from PGS on 22 May 2023. The fieldwork team recorded track logs with their hand-held GPS devices. These track logs are depicted in blue in **Figure 23** and show the areas assessed by the archaeologists during the fieldwork.

No heritage resources were identified in the study area.

6.1 SENSITIVITY ASSESSMENT OUTCOME

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

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.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 39

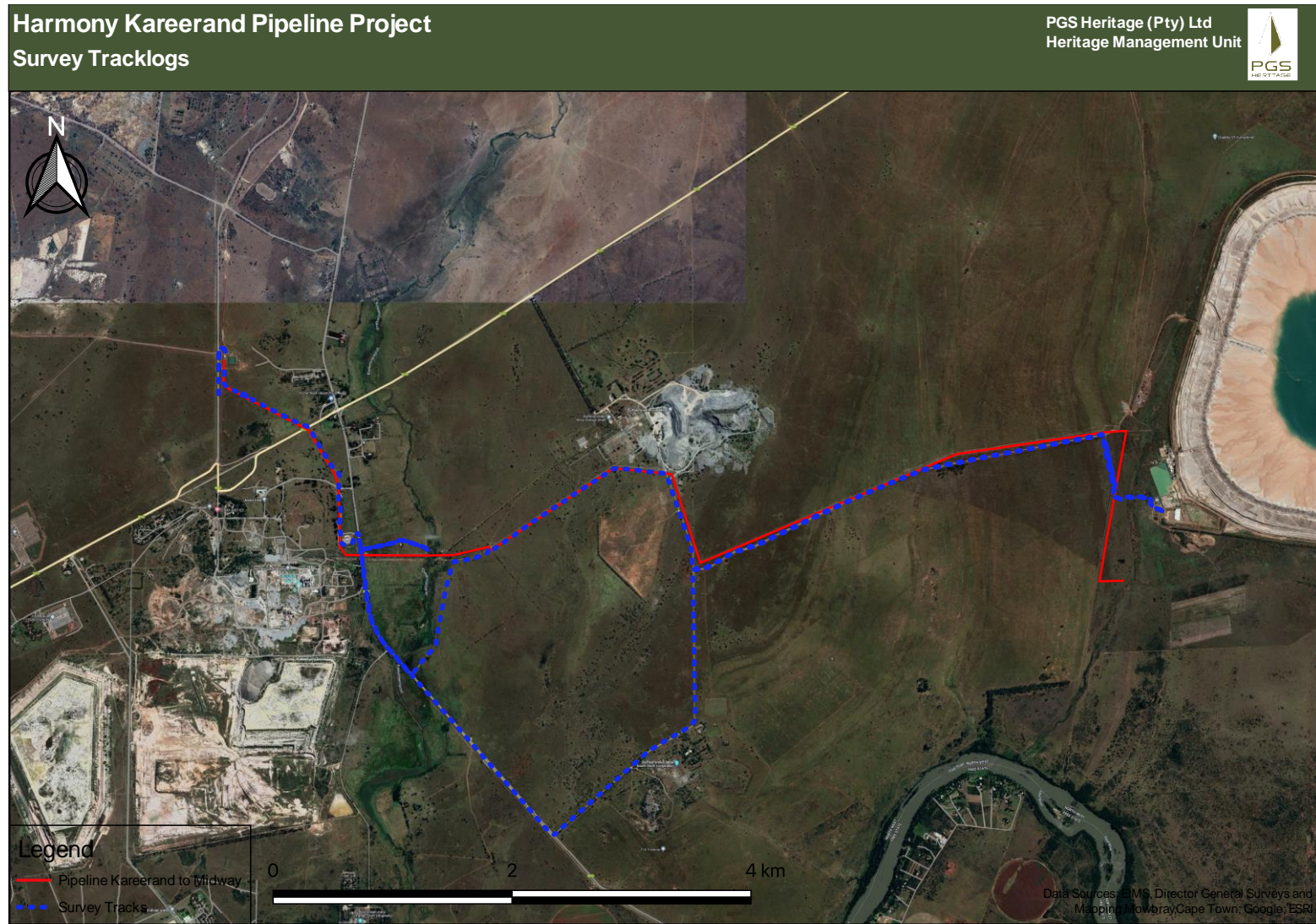


Figure 23 - Map depicting the track logs (blue lines) recorded during the current fieldwork.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 40

7 IMPACT ASSESSMENT

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts and the potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for the impacts identified.

7.1 DETERMINATION OF ENVIRONMENTAL RISK

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

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

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

4

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

Table 6 - Criteria for Determining Impact Consequence

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 41

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

Once the C has been determined, the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/ scored as per Table 7.

Table 7 - Probability Scoring

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

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

$$ER = C \times P$$

Table 8 - Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
	0	1	2	3	4	5
	Probability					

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in **Table 9**.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 42

Table 9 - Significance Classes

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

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

7.2 IMPACT PRIORITISATION

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

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

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

Table 10 - Criteria for Determining Prioritisation

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 43

	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).
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The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 11. The impact priority is therefore determined as follows:

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

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

Table 11 - Determination of Prioritisation Factor

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

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

Table 12 - Final Environmental Significance Rating

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 44

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

7.3 HERITAGE IMPACTS

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

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 45

Table 13 - Impact rating for heritage resources

IMPACT DESCRIPTION		Pre-Mitigation							Post Mitigation								Priority Factor Criteria			
Identifier	Impact	Nature	Extent	Duration	Magnitude	Reversibilit	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibilit	Probability	Post-mitigation ER	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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 46

8 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

8.1 CONSTRUCTION PHASE

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

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

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

8.2 CHANCE FIND PROCEDURE

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

8.3 POSSIBLE FINDS DURING CONSTRUCTION PHASES

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

- Unmarked graves.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 47

8.4 TIMEFRAMES

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

Table 14 - Lead times for permitting and mobilisation

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 48

8.5 HERITAGE MANAGEMENT PLAN FOR EMPR IMPLEMENTATION

Table 15 - Heritage Management Plan for EMPr implementation

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 49

9 CONCLUSIONS

PGS was appointed by EIMS, on behalf of Harmony, to undertake an HIA, which forms part of the environmental process for the proposed Kareerand Return Water Pipeline, City of Matlosana and JB Marks Local Municipalities (LM), which fall within the Dr Kenneth Kaunda District Municipality (DM) in the North-West Province, South Africa.

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

The HIA has shown that the study area has no heritage resources situated within the proposed development boundaries.

9.1 HERITAGE SITES

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. The fieldwork was conducted by an archaeologist (Jessica Angel) and field assistant (Xander Fourie) from PGS on 22 May 2023. It is important to note that sections of the study area are in areas which are more densely overgrown and/or disturbed, which limited visibility in those areas of the study area.

During the field work, no archaeological sites or burial grounds and graves were identified.

9.2 PALAEOLOGY

According to the Palaeosensitivity Map available on the South African Heritage Resources Information System database (SAHRIS), the Palaeontological Sensitivity of the proposed development areas range from very high (red) on the western part of the proposed pipeline, to moderate (green) on the eastern part of the proposed pipeline (**Figure 21**). A desktop study is required and based on the outcome of the desktop study, a field assessment is likely (Almond and Pether 2008, SAHRIS website).

A Palaeontological Desktop Assessment was commissioned as a stand-alone document for submission to SAHRA.

9.3 IMPACT ASSESSMENT

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 50

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

9.4 MITIGATION MEASURES

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

9.5 GENERAL

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 51

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Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 52

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Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 53

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Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 54

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10.5 INTERNET

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www.nwpg.gov.za

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10.6 GOOGLE EARTH

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

10.7 HISTORICAL TOPOGRAPHICAL MAPS

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 55

APPENDIX A
PGS TEAM CVS

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 56

PROFESSIONAL CURRICULUM VITAE FOR JESSICA ANGEL
Professional Archaeologist for PGS Heritage

Personal Details

- **Name:** Jessica
- **Surname:** Angel
- **Date of Birth:** 25-12-1983
- **Citizenship:** South African
- **Gender:** Female
- **Marital Status:** Single
- **Languages Spoken:** English and Afrikaans
- **Drivers Licence** Code B – competent 4x4 driver
- **First Aid** (Level 1)
- **Snake Handling and snake bite first aid** (March 2019. African Snakebite Institute – Johan Marias)

Education History

- **2002:** Matriculated from Northcliff High School with the following subjects: English, Afrikaans, Mathematics, Science, Biology and Art.
- **2005:** Completed BA at University of the Witwatersrand with Geography and Archaeology Majors.
- **2006:** Completed BSc Hons (Geography) at the University of the Witwatersrand with the following subjects: Environmental Management, Advanced Geographic Information Systems (GIS), Paleogeomorphology and Globalisation and Agro Food Restructuring.
- **2009 – 2013:** M.Sc Archaeology and Geography, with thesis title: *Mpumalanga Late Iron Age: Incorporating Geographic Information Systems (GIS) and Archaeological Data to Better Understand Spatial and Temporal Distribution of Past Societies.* (Graduated March 2014).

Employment History

- **2015 – current:** Senior Archaeologist – PGS Heritage
- **2012-2013:** Basic internship at PGS. Duties include gaining familiarity with gathering relevant background data, field surveys, exhumations and report writing.
- **2013:** Heritage work at NGT. Background research, report writing and ground surveys.
- **2011:** Research Assistant: GIS work for Prof Karim Sadr. Duties include: Google Earth survey work and digitising. (Sadr, K & Rodier, X. 2012. Google Earth, GIS and stone-walled structures in southern Gauteng, South Africa. *Journal of Archaeological Science* xxx: 1-9)

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 57

Experience in the field of archaeology:

2012:

- First Phase Heritage Assessment. Belfast, Mpumalanga
- First Phase Heritage Assessment. Delareyville, Stone Age survey
- Heritage Assessment. Belfast Mpumalanga, Ndebele initiation site.

2013:

- Second Phase Impact Assessment. Pretoria East, Gauteng. Documentation and mapping the layout of an Iron Age site.
- Final Phase Impact Assessment. Grave Exhumation. Chlorkop, Gauteng
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- First Phase Heritage Assessment. Port Nolloth, Namaqualand. Powerline.

2015

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2016

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Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 58

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- Heritage Impact Assessment. Proposed development of four Leeuwbosch Wind Farms for the Associated Grid Connection near Loeriesfontein, Northern Cape Province. (SAHRIS CaseID:12081, 12082, 12078, 12077)
- Heritage Fatal Flaw Assessment, for the inclusion in the Environmental Screening Investigation for the Proposed Arnot New Ash Disposal Facility, Mpumalanga.
- Heritage Walk Down and Management Plan. Upgrading of the 66KV Network to a 132KV Network in the Hotazel, Kuruman and Kathu Area, Northern Cape Province. Post Authorisation Walkdown from Mothibistad Substation to Sekgame Switching Station. (SAHRIS CaseID:11967)
- Heritage Screening of Portion 9 of the Farm Grootfontein 394 JR, Tswane, Gauteng.
- Second Phase Heritage Mitigation. Mitigation work required with respect to the heritage find PGS06 on the remainder of the farm number 469, Hay District (Registration division), Tsantsabane Local Municipality, Northern Cape Province, in respect to the ACWA Power Solar reserve, Redstone Solar Thermal Power Plant. (SAHRIS CaseID:10081)
- Second Phase Heritage Mitigation. Clanwilliam Dam Project. Continued from 2015

2017

- Heritage Impact Assessment for the Proposed Lanseria Outfall Sewer, Johannesburg. (SAHRIS CaseID:11397)

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 59

- Heritage Study. Proposed opencast Mining on the Farm Kwaggafontein 8 IT, near Carolina, Mpumalanga Province. (SAHRIS CaseID:11952)
- Heritage Impact Assessment for the Proposed K60 Road Development, Rabie Ridge Gauteng.
- Heritage Impact Assessment. Kimberly Ekapa Mining Joint Venture 2.8 Slimes Pipeline Project, Kimberly, Northern Cape Province.
- Heritage Screening and Site Assessment. MTK 39/2015/16 Mintek Derelict and Ownerless Mines Rehabilitation Programme 2016-2019. Msauli Mine, Steelpoort Mine, Penge Mine, Langerdraai Mine and Uitkuik Mine.
- Heritage Impact Assessment. Proposed Phalandwa Extension Mine, Delmas, Mpumalanga.
- Site Assessment and Heritage Screening. Wadeville Extension 51. Township establishment and associated infrastructure development on Portion 273 and the remaining extent of Portion 267 on the Farm Klippoortjie 110 – IR. Ekurhuleni, Gauteng.
- Site assessment and Heritage Scoping. Proposed eMakhazeni Project near Belfast, Mpumalanga. (SAHRIS CaseID:12316)
- Heritage Impact Assessment. Proposed extension of the mining operations at the existing Ilima Colliery (Old Pembani Colliery), Near Carolina, Mpumalanga. (SAHRIS CaseID:12793)
- Heritage Impact Assessment. Proposed Mlonzi Golf Estate and Hotel, near Lusikisiki, Eastern Cape.
- Second Phase Heritage Mitigation. Clanwilliam Dam Project. Continued from 2015

2018

- Heritage Impact Assessment. Proposed Extension of the Mining Operations at the Existing Manungu Colliery, near Delmas, Mpumalanga.
- Heritage Impact Assessment. Proposed Mashishing Housing Development, Lydenburg, Mpumalanga. (SAHRIS CaseID:12999)
- Heritage Impact Assessment. Phase 1B1 Thornhill Housing Development, Port Alfred, Eastern Cape Province.
- Heritage Impact Assessment. Target to Freddie's Pipeline, Allanridge, Freestate.
- Heritage Impact Assessment. Proposed Leslie Coal Mine near Leandra, Mpumalanga. (SAHRIS CaseID:12399)

2020

- Coega Zone 10, Coega IDZ, Eastern Cape Province. Colonial Period Phase 2 Mitigation Archaeological Excavation

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 60

2018 to 2023

- Presently employed on the Polihali Dam Project in Lesotho as Collections Manager (5 year contract).

The Polihali Dam Project is a 2nd Phase CRM operation in mitigation of total inundation of a range of cultural sites, including extant, historical and Stone Age sites. Nine (9) APC and thirty one (31) LSA sites are earmarked for detailed survey and excavation.

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 61

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

Document	Project	Revision	Date	Page Number
699HIA-001	Kareerand Pipeline Project	2.0	29/05/2023	Page 62

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

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

2000-2004 - CEO– Matakoma Consultants

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

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

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