



PGS HERITAGE

MAMATWAN MINE – CHANGES TO INFRASTRUCTURE LAYOUT AND ACTIVITIES, NEAR HOTAZEL, NORTHERN CAPE PROVINCE

Phase 1 – Heritage Impact Assessment

Issue Date: 14 February 2020
Revision No.: 3.0 **(30 September 2021)**
Project No.: 404HIA

PGS
HERITAGE



I, Wouter Fourie, declare that –



+27 (0) 86 675 8077



contact@pgsheritage.co.za



PO Box 32542, Totiusdal, 0134

Declaration of Independence

Offices in South Africa, Kingdom of Lesotho and Mozambique

Head Office:
906 Bergarend Streets
Waverley, Pretoria,
South Africa

Directors: HS Steyn, PD Birkholtz, W Fourie

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

Disclosure of Vested Interest


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

HERITAGE CONSULTANT: PGS Heritage (Pty) Ltd
CONTACT PERSON: Wouter Fourie
 Tel: +27 (0) 12 332 5305
 Email: wouter@pgsheritage.com

SIGNATURE:



ACKNOWLEDGEMENT OF RECEIPT

Report Title	<i>MAMHERITAGE IMPACT ASSESSMENT FOR THE MAMATWAN MINE – CHANGES TO INFRASTRUCTURE LAYOUT AND ACTIVITIES, NEAR HOTAZEL, NORTHERN CAPE PROVINCE</i>		
Control	Name	Signature	Designation
Author	Wouter Fourie		Heritage Specialist
Reviewed	Sharon Meyer		Environmental Assessment Practitioner/ SLR Consulting

CLIENT: SLR Consulting

CONTACT PERSON: Sharon Meyer
Tel: +27 011 467 0945
E-mail: smeyer@slrconsulting.com

SIGNATURE: _____

EXECUTIVE SUMMARY

South32 operates the opencast manganese Mamatwan Mine (MMT) (forms part of the legal entity Hotazel Manganese Mines (Pty) Ltd) located approximately 25km to the south of Hotazel in the John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality of the Northern Cape Province of South Africa.

PGS Heritage (Pty) Ltd (PGS) was appointed by SLR Consulting (South Africa) (Pty) Ltd (SLR) to undertake a Heritage Impact Assessment (HIA) in support of the environmental assessment process for the changes to infrastructure and activities at the Mamatwan Mine (MMT).

Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant. No heritage resources or features were identified during the fieldwork component of this HIA.

No heritage resources were identified as part of the project. It follows, that it is our considered opinion that the changes to the infrastructure and activities associated with the MMT will not have any impact on heritage resources. Any chance finds during the life of mine will be handled through the proposed chance finds procedures and management guidelines as provided in **section 6** of this report.

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	<i>Notice 648 of the Government Gazette 45421</i>	2
1.4.2	<i>NEMA – Appendix 6 requirements</i>	3
1.4.3	<i>The National Heritage resources Act</i>	4
2	SAHRA COMMENTS RECEIVED	5
3	TECHNICAL PROJECT DESCRIPTION	5
3.1	Layout/Activities that have Already Taken Place	6
3.1.1	<i>Expansion of the north-eastern and south-eastern WRDs</i>	6
3.1.2	<i>Change in WRD rehabilitation criteria</i>	6
3.1.3	<i>Expansion of the product stock yard</i>	6
3.1.4	<i>Establishment of potable and process water storage facilities</i>	6
3.1.5	<i>Expansion of an existing road</i>	7
3.2	Proposed Layout/Activities Changes	7
3.2.1	<i>Top-cut stockpile and mobile crushing and screening plant</i>	7
3.2.2	<i>Stormwater infrastructure</i>	7
3.2.3	<i>WRD height increase</i>	7
3.2.4	<i>Water supply pipeline from Middelplaats Mine</i>	8
3.2.5	<i>Upgrading the railway loadout station</i>	8
3.2.6	<i>Sale of waste rock as aggregate</i>	8
3.2.7	<i>Re-processing of material located in Adams pit</i>	9
3.2.8	<i>Optimization of water recovery</i>	9
4	METHODOLOGY	13
4.1	Site Significance	13
5	SENSITIVITY ASSESSMENT	15
5.1	Previous studies conducted for the study area	15
5.2	Archival findings	16
5.2.1	<i>South African Heritage Resources Information System (SAHRIS)</i>	17
5.3	Archaeological background	18
5.3.1	<i>Early Stone Age (400 000 – 3.3 million years Before Present/BP)</i>	18
5.3.2	<i>Middle Stone Age (30 000 – 300 000 BP)</i>	18
5.3.3	<i>Later Stone Age (30 000 BP – recent times)</i>	18
5.3.4	<i>Rock Art</i>	20
5.4	Aspects of the area’s history as revealed by the archival/desktop study	20

5.4.1	Settlement during the Later Stone Age	20
5.4.2	Early Black Settlement during the Late Iron Age and Historic Period	21
5.4.3	European Explorers and Visitors	22
5.4.4	The Journey of Lichtenstein (1805)	22
5.4.5	Andrew Smith's journey (1835)	23
5.4.6	British Protectorate	24
5.4.7	Situation at the beginning of the 19 th century	24
5.4.8	Lower Kuruman Native Reserve	24
5.4.9	The Langeberg Rebellion	25
5.4.10	Mining	27
5.5	Site survey	29
5.6	Sensitivity assessment outcome	30
6	PALAEONTOLOGY	32
7	IMPACT ASSESSMENT	32
8	PROPOSED MANAGEMENT MEASURES	32
8.1	Construction phase	32
8.2	Chance find procedure	32
8.3	Possible finds during construction	33
8.4	Timeframes in the event of a chance find	33
8.5	Heritage Management Plan for EMPr implementation	35
9	CONCLUSIONS AND RECOMMENDATIONS	36
10	REFERENCES	36

List of Figures

<i>Figure 1 – Human and Cultural Timeline in Africa (Morris, 2008)</i>	<i>xi</i>
<i>Figure 2 – Regional setting of study area</i>	<i>10</i>
<i>Figure 3 – proposed infrastructure changes</i>	<i>11</i>
<i>Figure 4 – Proposed rail loop</i>	<i>12</i>
<i>Figure 5 – “Tlharo of the Kalahari Desert” A sketch that appeared in Dr. Andrew Smith’s travel journal (Lye, 1975:171)</i>	<i>21</i>
<i>Figure 6 – “Tlhaping women cultivating gardens and singing” One of the sketches appearing in Dr. Andrew Smith’s journal (Lye, 1975:171)</i>	<i>22</i>
<i>Figure 7 - Map showing the original demarcation of the Lower Kuruman Native Reserve</i>	<i>25</i>
<i>Figure 8 - Photograph of Galeshewe (National Archives, TAB, 36277)</i>	<i>26</i>
<i>Figure 9 – “A view of the huge open-cast manganese ore mine of Samancor at Mamatwan...” The photograph was taken during August 1982 (National Archives, TAB, 16396)</i>	<i>28</i>
<i>Figure 10 – View of developed nature of parts of the site</i>	<i>29</i>
<i>Figure 11 – View of existing waste rock dumps</i>	<i>29</i>
<i>Figure 12 – Existing pumphouse at Middelpplaats shaft</i>	<i>29</i>

<i>Figure 13 – Existing water reservoir at Middelpplaats Shaft</i>	<i>29</i>
<i>Figure 14 – View of area where pipeline option 2 enters the adjacent Tshipi Mine area.....</i>	<i>30</i>
<i>Figure 15 – Mining infrastructure in the proposed rail loop area.....</i>	<i>30</i>
<i>Figure 16 – Project layout with tracklogs in red dashes.....</i>	<i>31</i>

List of Tables

<i>Table 1 – List of abbreviations used in this report.....</i>	<i>x</i>
<i>Table 2 - Reporting requirements for GN648.....</i>	<i>3</i>
<i>Table 3 - Reporting requirements as per NEMA Appendix 6 for specialist reports.....</i>	<i>3</i>
<i>Table 4 - Rating system for archaeological resources</i>	<i>13</i>
<i>Table 5 - Rating system for built environment resources.....</i>	<i>14</i>
<i>Table 6 - Lead times for permitting and mobilisation.....</i>	<i>33</i>

List of Appendices

<i>A</i>	<i>The Significance Rating Scales for the Proposed Prospecting Activities on Heritage Resources</i>
<i>B</i>	<i>Project team CV's</i>

TERMINOLOGY AND ABBREVIATIONS

Archaeological resources

This includes:

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

Cultural significance

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

Development

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

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

Early Stone Age

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

Fossil

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

Heritage

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

Heritage resources

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

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

Holocene

The most recent geological time period which commenced 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.

Table 1 – List of abbreviations used in this report

Abbreviations	Description
AIA	Archaeological Impact Assessment
AEL	Atmospheric Emissions Licence
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DENC	Northern Cape Department of Environment and Nature Conservation
DME	Department of Minerals and Energy
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr / EMP	Environmental Management program
ESA	Early Stone Age
GN	Government notice
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
IWUL	Integrated Water Use Licence
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
MMT	Mamatwan Mine
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PGS	PGS Heritage Pty Ltd
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SLR	SLR Consulting (South Africa) (Pty) Ltd

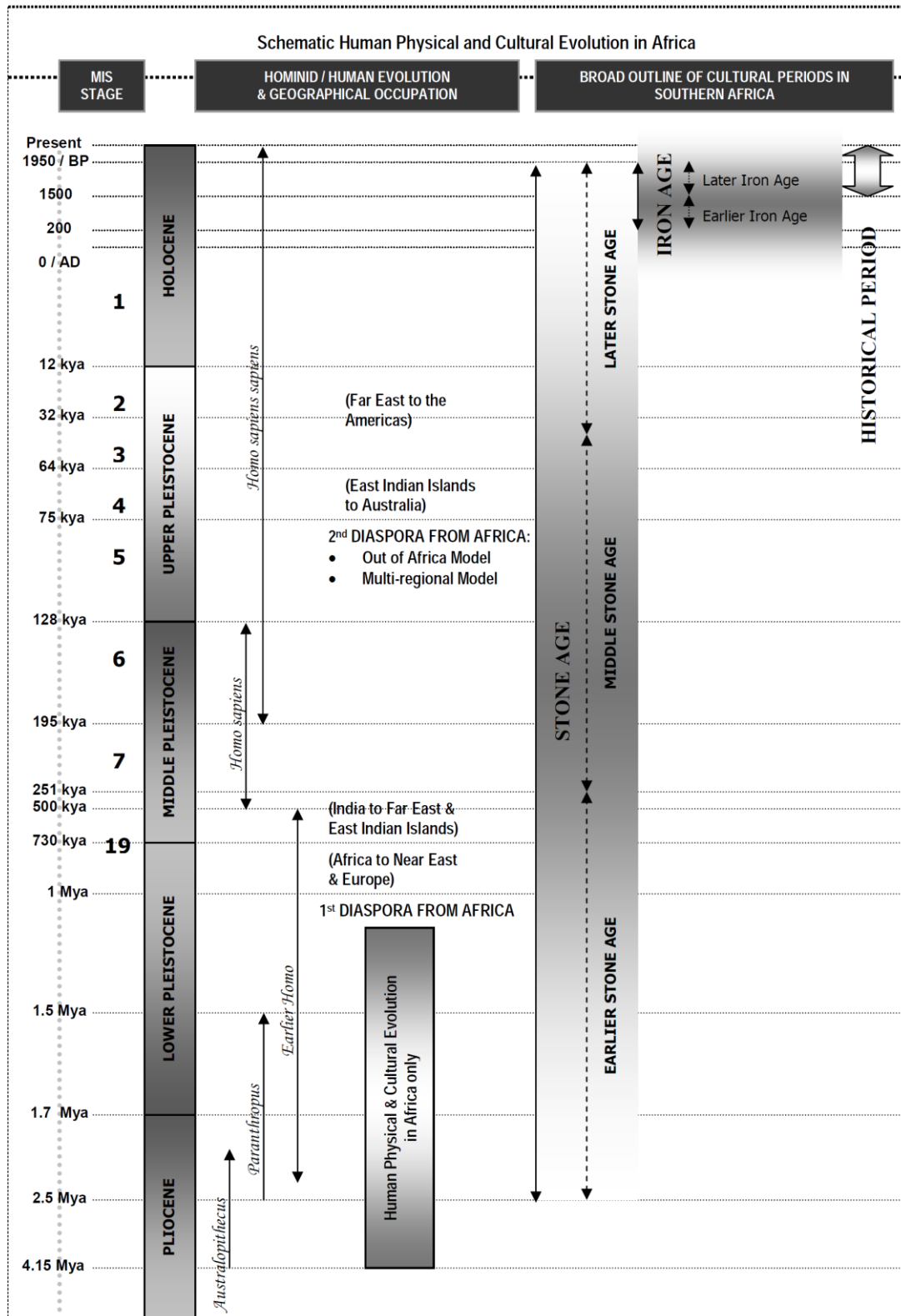


Figure 1 – Human and Cultural Timeline in Africa (Morris, 2008)

1 INTRODUCTION

South32 operates the opencast manganese MMT (forms part of the legal entity Hotazel Manganese Mines (Pty) Ltd) located approximately 25km to the south of Hotazel in the John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality of the Northern Cape Province of South Africa. MMT holds the following environmental permits and authorisations:

- A Mining right (Reference number: NC 252 MR) issued and approved by the former Department of Minerals and Energy (DME) (currently the Department of Mineral Resources (DMR)) in May 2006;
- An Environmental Management Programme (EMP) (Reference number: NC 6/2/2/118) issued and approved by the former DME (currently the DMR) in November 2005;
- An Atmospheric Emissions Licence (AEL) (Licence number: NC/AEL/JTG/MAM01/2012) issued by the Northern Cape Department of Environment and Nature Conservation (DENC) in March 2020;
- An Integrated Water Use Licence (IWUL) (License number: 10/D41K/KAGJ/1537) issued by the Department of Water and Sanitation (DWS) (currently the HSWS) in January 2012 and associated amendment issued in October 2017 and October 2020;
- An Environmental Authorisation (Reference number: NC/KGA/HOT3/07) for bulk fuel storage issued by former Department of Tourism, Environment and Conservation (currently DENC) in July 2007); and
- An Environmental Authorisation (Reference number: NC 30/5/1/2/3/2 (252) MR for the merging of the Mamatwan Sinterfontein Waste Rock Dump (WRD) with the Tshipi Eastern WRD from the DMRE in January 2020.

PGS was appointed by SLR to undertake a HIA in support of the environmental assessment process for the changes to infrastructure and activities at the MMT.

1.1 Scope of the Study

The aim of the study was to identify heritage resources that could potentially be affected by the proposed changes to infrastructure and activities at Mamatwan Mine and provide mitigation and management guidelines within the ambit of the National Heritage Resources Act (125 of 199) (NHRA).

1.2 Specialist Qualifications

This HIA Report was compiled by PGS.

The staff at PGS has a combined experience of nearly 40 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake

heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (APHP). A copy of my Curriculum Vitae is attached in Appendix B.

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

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

1.4 Legislative Context

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

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

1.4.1 Notice 648 of the Government Gazette 45421

Although minimum standard for archaeological (2007) and palaeontological (2012) assessments were published by SAHRA, GN.648 requires sensitivity verification for a site selected on the national web based environmental screening tool for which no specific assessment protocol related to any theme has been identified. The requirements for this GN is listed in **Table 2** and the applicable section in this report noted.

Table 2 - Reporting requirements for GN648

GN 648	Relevant section in report
2.2 (a) a desk top analysis, using satellite imagery;	section 5.6
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	section 5.6
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool;	section 5.6
2.3(b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity;	section 5.5

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. It is important to note, that where something is not applicable to this HIA, this has been indicated in the table below.

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

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
1.(1) (a) (i) Details of the specialist who prepared the report	Page 2 of Report – Contact details and company	-
(ii) The expertise of that person to compile a specialist report including a curriculum vita	Section 1.2 – refer to Appendix B	-
(b) A declaration that the person is independent in a form as may be specified by the competent authority	Page ii of the report	-
(c) An indication of the scope of, and the purpose for which, the report was prepared	Section 1.1	-
(cA) An indication of the quality and age of base data used for the specialist report	Section 4	-
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5.5	-
(d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 4	The vegetation density doe influence visibility – however the vegetation cover for the area was consistent the same during both site visits
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Section 4 and Appendix A	-
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and	Section 6	

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report	Comment where not applicable.
infrastructure, inclusive of a site plan identifying site alternatives;		
(g) An identification of any areas to be avoided, including buffers	Section 5.6	No buffers or areas of sensitivity identified
(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;		No buffers or areas of sensitivity identified
(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 5.5 and 7	
(k) Any mitigation measures for inclusion in the EMPr	Section 8	
(l) Any conditions for inclusion in the environmental authorisation		Not required
(m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation	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. A public consultation process was handled as part of the EIA and EMP process.
(p) A summary and copies if any comments that were received during any consultation process	Section 2	Final comments received from the SAHRA
(q) Any other information requested by the competent authority.		Not applicable.
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	NEMA Appendix 6 and GN648	

1.4.3 The National Heritage resources Act

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

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

2 SAHRA COMMENTS RECEIVED

The SAHRA provided comments. (1 September 2020) on the application on first draft of this report (2020) submitted to them. The final comments is listed below.

- 38(4)a – The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit has no objections to the rectification application;
- 38(4)b – The recommendations of the specialists are supported and must be adhered to. No further additional specific conditions are provided for the development;
- 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- 38(4)d – See section 51(1) of the NHRA;
- 38(4)e – The following conditions apply with regards to the appointment of specialists:
- If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;
- The Final 24G assessment and EMPr must be submitted to SAHRA for record purposes;
- The decision regarding the 24G Application must be communicated to SAHRA and uploaded to the SAHRIS Case application.

3 TECHNICAL PROJECT DESCRIPTION

The MMT is an operational mine and has been for the past 60 years. Key mine infrastructure includes an open pit, haul roads, run-of mine, crushing and screening facilities, beneficiation and sintering, various product stockpiles, topsoil stockpiles, waste rock dumps, a train load-out facility, a private railway siding, offices, workshops, change house, and access control facilities. It follows that mining has transformed the landscape within the MMT mining rights area as is illustrated in Figure 3. The location of the MMT is illustrated in Figure 2.

The decommissioned Middelplaats mine is located approximately 4km north east of the MMT as illustrated in Figure 3. The decommissioned Middelplaatas mine consists of a shaft area containing various older mining infrastructure including the headgear and water reservoir and pump house.

HMM has made application for an integrated environmental authorisation and amendment of their EMPr to cater for layout/activity changes that have already taken place at MMT, as well as proposed layout/activity changes. The layout and activity changes that HMM has implemented or are proposing at the MMT are discussed in more detail in the sections below.

3.1 Layout/Activities that have Already Taken Place

3.1.1 Expansion of the north-eastern and south-eastern WRDs

South32 is committed to undertake rehabilitation concurrent with mining operations as per the approved 2005 EMPr. As part of rehabilitation, the north-eastern WRD and the south-eastern WRD footprints were extended in order to enable a reduction in the steepness of the side wall slope.

3.1.2 Change in WRD rehabilitation criteria

The approved 2005 EMPr committed South32 to rehabilitate the WRDs to a 1:3 slopes. Significant erosion gulley's have developed along the side slopes of the rehabilitated Adams WRD. As part of rehabilitation trials, the north-eastern WRD was shaped to 1:5 slopes with 2 m high stormwater interception bench drains constructed at approximately 40 m intervals along the slopes. Significantly less erosion was associated with the change to the rehabilitation strategy and this approach will be implemented for all future WRD rehabilitation. It follows that as part of the proposed project it is proposed to change the rehabilitation criteria detailed in the EMPr.

3.1.3 Expansion of the product stock yard

The approved 2005 EMPr makes provision for a product stockyard. Within this approved stockyard area various materials such as coal, coke, ROM, DMS discard, sinter and product (varying in grades) can be stockpiled. As output has increased there has been a need for additional space to store larger volumes of material. The project stockyard area has been extended within the overall existing plant area.

3.1.4 Establishment of potable and process water storage facilities

MMT has added various potable and process water infrastructure at the existing plant area in order to improve operational efficiency and increase capacity. The various facilities include constructed tanks (164 to 5 000 m³) and portable tanks (5 to 10 m³). Potable and process water facilities are generally approved in the approved 2005 EMPr.

3.1.5 *Expansion of an existing road*

MMT has expanded a mine road running to the east of the open pit in order to improve operational capability and road safety.

3.2 Proposed Layout/Activities Changes

3.2.1 *Top-cut stockpile and mobile crushing and screening plant*

Top-cut material has historically been discarded onto a current WRD (Central WRD) because of its lower Manganese content. Following investigations done by South32, the viability of selling top cut material (also referred to as low grade product) was realised. It follows that additional storage space is required to stockpile the top-cut material. The top-cut material will need to be subjected to crushing and screening prior to being sent to the sinter plant. The proposal includes the establishment of a mobile crushing and screening plant adjacent to the stockpile area. After processing at the sinter plant, the low-grade product will be sold to local and/or international markets.

The top-cut stockpile and processing area would be up to 34 ha in extent and would be located to the east of the eastern WRD, extending to the property boundary adjacent to the R 380.

3.2.2 *Stormwater infrastructure*

In accordance with Government Notice (GN) 704, 4 June 1999 (GNR. 704 of June 1999), mines are required to design, construct, maintain and operate clean and dirty water systems. As part of the proposed project, investigation has been undertaken to determine the adequacy of the current stormwater management system. In this regard, additional stormwater management system infrastructure, such as a pollution control dam and/or evaporation channel to either transfer process water to the plant for re-use or evaporation is being investigated. The preliminary design findings indicate that a pollution control dam may be required and is likely to exceed 50 000 m³. Further to this, preliminary design findings indicate that a process water pipeline exceeding 1 000 m in length may be required. The preferred location of the pollution control dam and/or evaporation channel and the need for the pumping system and transfer pipeline as well as a preferred location are being investigated. Further information will be provided in the EIA phase.

3.2.3 *WRD height increase*

The approved 2005 EMPr specifies that the height of the WRDs is 50 m above natural ground level. MMT is proposing to increase this to 80 m in order to provide additional capacity for the disposal of waste rock. The definition of 'expansion' includes modifications or alterations which result in increases to the capacity of a facility. Increasing the height of the WRDs above what is provided for in the approved 2005 EMPr will provide for greater capacity. The height increase would not be applied to rehabilitated WRDs.

3.2.4 Water supply pipeline from Middelplaats Mine

MMT currently sources water from ingress in the open pit for use in the processing and beneficiation plants. This source of water is unreliable as water is not always available within the open pit and as such MMT has started to source water from the Sedibeng Vaal Gamagara Water Supply Scheme. The Vaal Gamagra Water Supply Scheme is known for challenges associated with water shortage and as such this is not deemed a sustainable long-term solution for MMT.

MMT is proposing to source water from the decommissioned Middelplaats Mine for back-up purposes in the event of process water shortages at the mine. The underground workings of the decommissioned Middelplaats mine are flooded and as such MMT is proposing on abstraction this water via two boreholes that still need to be drilled. A pipeline to transfer the water from the decommissioned Middelplaats Mine to the MMT will need to be established. It is anticipated that the pipeline will be an HDPE pipe with a diameter of 260 mm and will be located above ground.

3.2.5 Upgrading the railway loadout station

South32 has a Manganese Export Corridor Allocation on the Transnet Freight Rail (TFR) manganese line between Hotazel, in the Northern Cape, and Coega, in the Eastern Cape. The allocation is underutilised due to train loading inefficiencies at MMT. This results in TFR liability payments and increased road haulage costs. There is therefore a need to improve the loading rate of trains at the MMT. Additionally, the TFR has initiated a manganese expansion programme which will increase manganese export capacity by upgrading the rail network. TFR plans to increase capacity of the manganese rail line beyond the current 4-million tonnes per annum to 16 million tonnes per annum.

In order to meet the TFR's expanded capacity requirements, the loading rate of trains at the MMT needs to be increased. It currently takes MMT an average of 14 hours to load a train consisting of 104 wagons. South32 is therefore proposing on upgrading the existing load out station and conveyor to improve the loading capacity and time.

3.2.6 Sale of waste rock as aggregate

The approved 2005 EMPr makes provision for the storage of waste rock along the eastern and southern side of the open pit. WRDs established on site include the north-eastern, the central, the south-eastern, the south WRD's; the Adams rehabilitated WRDs and the Sinterfontein WRD. MMT is committed to partially backfilling the open pit with waste rock and concurrently rehabilitating WRD's that will remain on surface in perpetuity.

MMT is proposing on selling some of the waste rock that would have remained on surface in perpetuity as aggregate to third parties. Doing so could reduce the size of the WRD's remaining on surface at closure.

3.2.7 Re-processing of material located in Adams pit

Adams pit historically formed part of Assmang (Pty) Ltd (Assmang). The Adams pit was completely mined out by 1980. Adams pit contains numerous materials that are stockpiled in the pit. These include tailings, slimes, general waste, sinter de-dust, plant spillages and DMS grit.

MMT is proposing on re-processing the tailings, DMS grit, sinter de-dust and plant spillages currently stockpiled within Adams pit as part of rehabilitation of the pit. Market depending, it is anticipated that a maximum of 40 000 tons of material could be sold to third parties per month. The re-processing of the material stored in Adams pit would include:

- The use of an excavator to remove the material located in the Adams pit;
- The use of a new temporary mobile screen to remove unwanted material (general waste and sinter de-dust bags) and screen the material into different size fractions;
- The material would be transported by truck to dispatch using road or rail, for sale to third parties;
- Unwanted material (general waste and sinter de-dust bags) will be deposited at the designated MMT waste disposal site; and
- Waste rock will be used to backfill the open pit as part of rehabilitation.

3.2.8 Optimization of water recovery

As part of the ore washing within the OPP, slurry (sludge) material is generated. This material (known as slimes) is pumped to the eastern section of Adams pit. South32 has therefore initiated a process to investigate alternatives means to the management of slimes at the mine together with the intention to maximise water recovery within the plant area. This includes the establishment of a water treatment plant. Further information will be provided in the EIA phase.

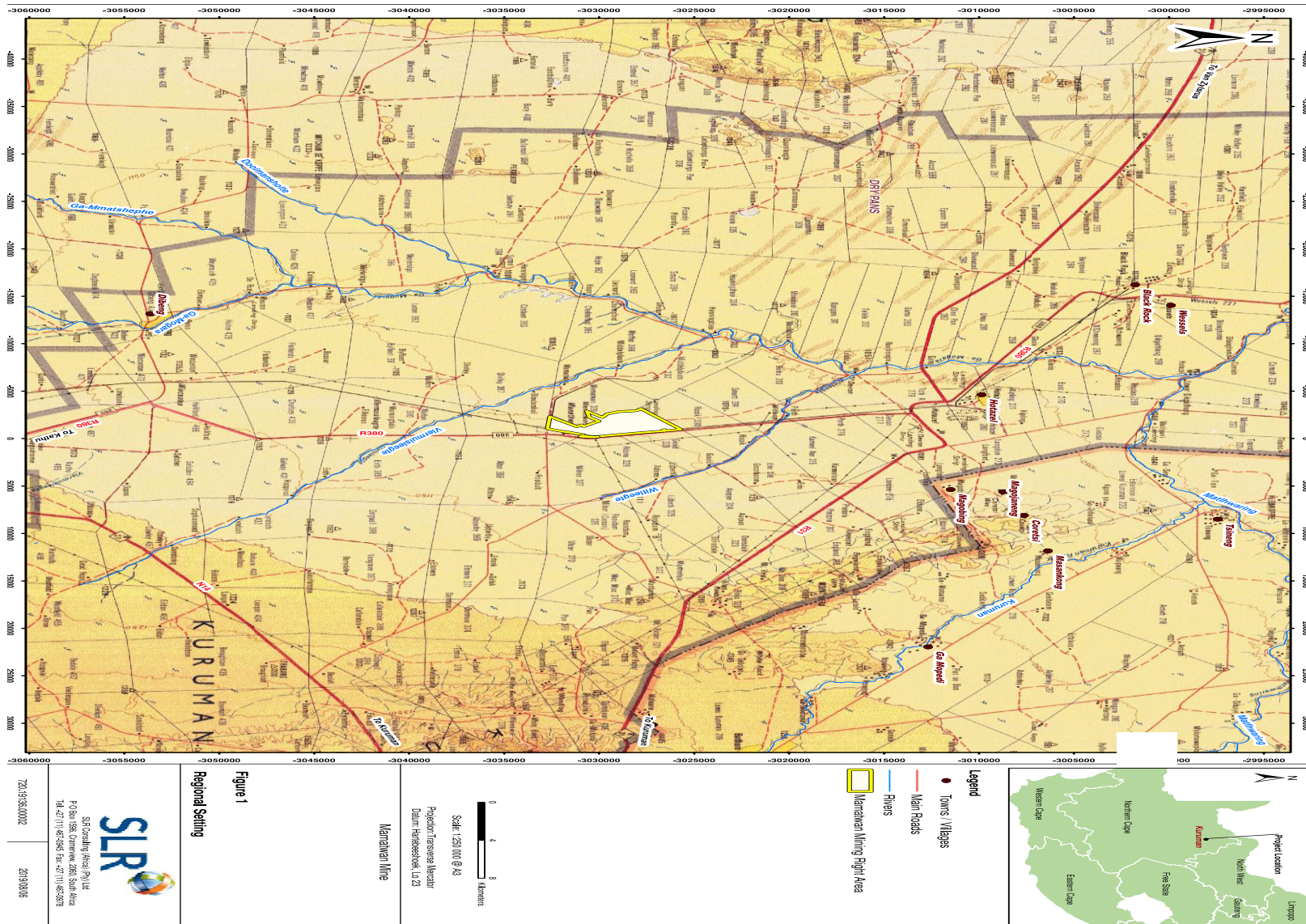


Figure 2 – Regional setting of study area

Mamatwan Mine new infrastructure
Proposed layout changes and upgrades

PGS Heritage (Pty) Ltd
Heritage Management
Unit

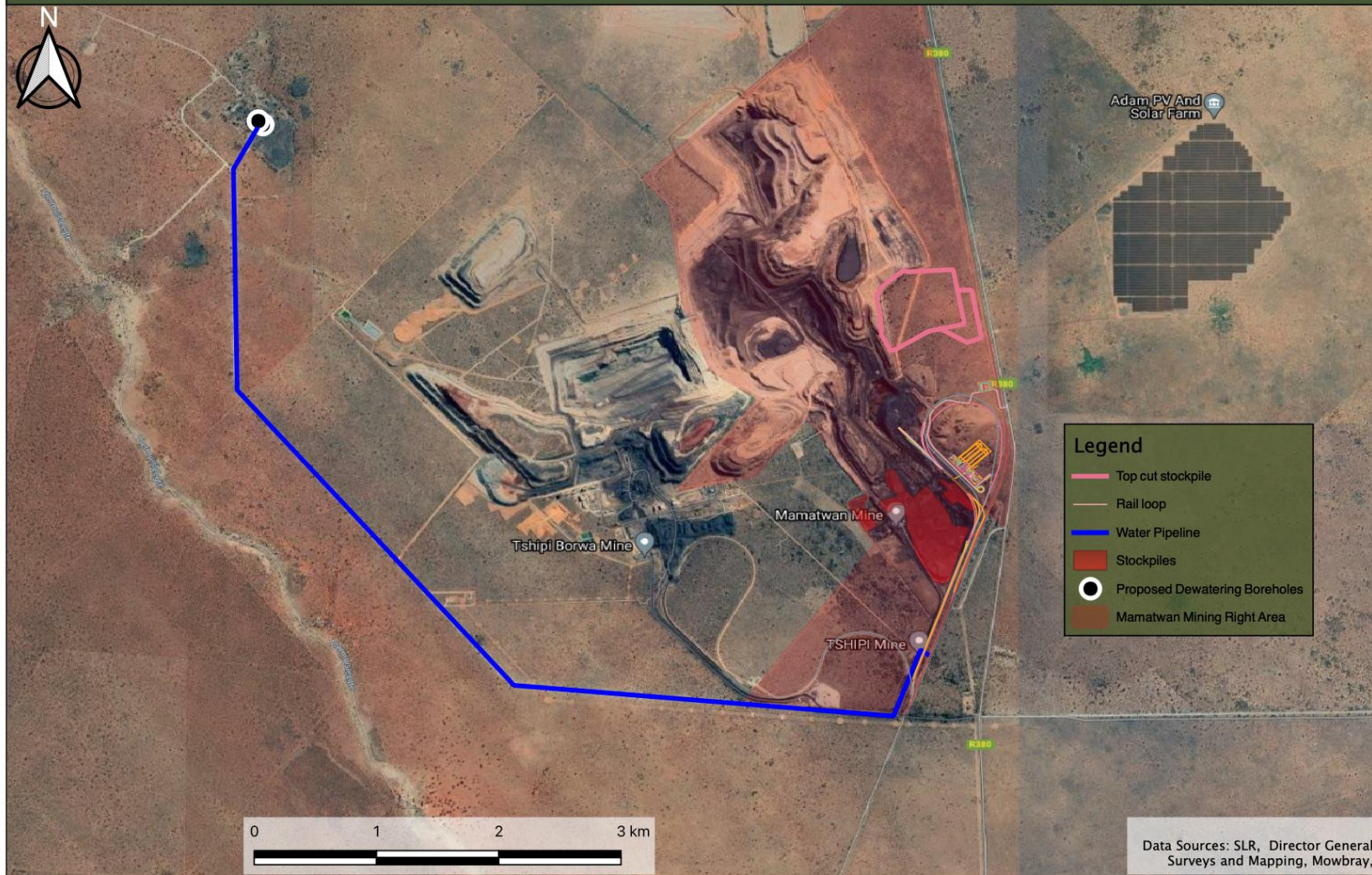


Figure 3 – proposed infrastructure changes

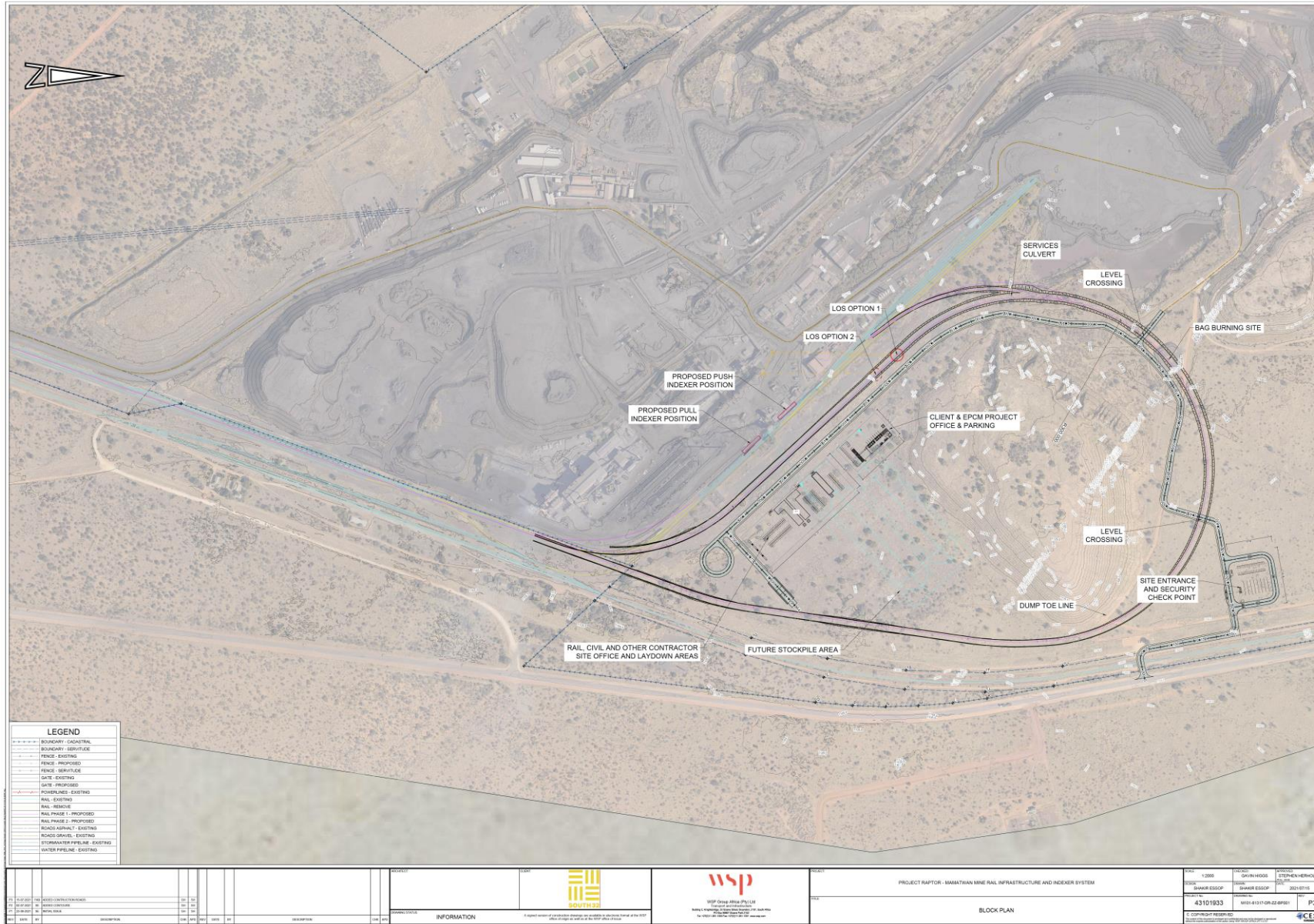


Figure 4 – Proposed rail loop

4 METHODOLOGY

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

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

Step II – Physical Survey: A physical survey was conducted by vehicle through the proposed project area by a qualified heritage specialist. The survey was conducted on 16 July and 14 October 2019, aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

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

4.1 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 (2016) is implemented in this report.

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

Table 4 - Rating system for archaeological resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Langebaanweg (West Coast Fossil Park), Cradle of Humankind	May be declared as a National Heritage Site managed by SAHRA. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Highest Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current examples: Blombos, Paternoster Midden.	May be declared as a Provincial Heritage Site managed by HWC. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Exceptionally High Significance

¹ According to Notice 648 of the Government Gazette 45421

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage 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 5 - Rating system for built environment resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance
II	Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status. Current examples: St George's Cathedral, Community House	May be declared as a Provincial Heritage Site managed by HWC.	Exceptionally High Significance
II	Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.	This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at local level.	High Significance

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

5 SENSITIVITY ASSESSMENT

5.1 Previous studies conducted for the study area

As part of the study, the review of available literature was undertaken in order to source base data. In this regard, various heritage and palaeontological studies within and surrounding the Mamatwan mine were reviewed. The review of this data provides a base case from 2005 to 2019.

The following studies were reviewed: .:

- Fourie, W. & van der Walt, J. 2005. Hotazel Manganese Mines: Wessels Mine on Section of the Farms Wessels 227, Dibiaghomo 226 and Dikgathlong 268 Mamatwan Mine on Section of the Farms Goid 329 and Mamatwan 331, Heritage Assessment. *Matakoma Heritage Consultants (Pty) Ltd.*
- Dreyer, C. 2009. First Phase Archaeological and Cultural Heritage Assessment of the Ntsimbintle Mining Activities at Mamatwane Near Hotazel, Kuruman District, Northern Cape

- Steyn, H.S. 2009. Heritage Impact Assessment: Ntsimbinthle Mining (Pty) Ltd on Portions 1, 2, 3, and 8 of the farm Mamatwan 331 and the farm Moab 700 in the Kgalagadi District Municipality of the Northern Cape Province.
- Butler, E. 2017 (Updated 2019). Palaeontological Desktop Assessment for the Establishment of a Diesel Farm and a Haul Road for the Tshipi Borwa Mine Near Hotazel, in the John Toalo Gaetsewe District Municipality in the Northern Cape Province
- Butler, E. 2017. Palaeontological Desktop Assessment for the proposed changes to operations at the UMK Mine Near Hotazel, in the John Toalo Gaetsewe District Municipality in the Northern Cape Province.
- Fourie, W. 2017. Heritage Impact Assessment for the proposed new infrastructure for United Manganese of Kalahari (Pty) Ltd (UMK), farms Botha 313, the remaining extent (RE) of the farm Smartt 314, and portion 1 and RE of the farm Rissik 330 located approximately 10 km south of the town of Hotazel in the John Toalo Gaetsewe District Municipality in the Northern Cape.
- Smeyatsky, I. 2018. Heritage Impact Assessment for the proposed waste rock dump project at the Tshipi Borwa Mine, near Hotazel, Northern Cape Province.
- Fourie, W. 2019. Recommendation for the exemption from heritage and Palaeontological impact studies: Environmental Authorisation (EA) and closure and rehabilitation optimisation project at the Tshipi Borwa Mine, near Hotazel, Northern Cape Province. Case ID: 13996
- Fourie, W and Bulter, E. 2019. Exemption Letter and reply. An 18m wide (on surface) boundary is located between the MMT and the Tshipi Borwa Mine. Tshipi and MMT have approval to mine the 18m wide boundary pillar. Additional capacity is required to store waste rock generated as part of mining the boundary pillar. To cater for the additional storage, it is proposed that the Mamatwan Sinterfontein and the Tshipi Eastern waste rock dumps are merged to fill the void between the two dumps. MMT is proposing on amending their approved EMP to cater for the merging of the waste rock dumps - Case id: 13652

All of these studies formed part of environmental assessment processes in support of various projects within and surrounding the Mamatwan Mine and were therefore subjected to review by the South African Heritage Resources Agency. The above listed studies were deemed acceptable by the SAHRA. It follows that the quality of data is deemed acceptable.

5.2 Archival findings

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

5.2.1 South African Heritage Resources Information System (SAHRIS)

A scan of SAHRIS has revealed the following studies conducted in and around the study area of this report:

- BECKER, E. 2013. Phase 1 Heritage Impact Assessment Hotazel to Kimberley and De Aar to Port of Ngqura. *Hatch*. – The report covered a very large area, however only uncovering a few historic structures and stone walling sites. Nothing within the vicinity of the study area itself.
- KRUGER, N. 2015. Archaeological Impact Assessment (AIA) for the Proposed East 132 Kv Double Circuit Power Line Connection for the East Solar Park to the Eskom Hotazel or UMTU Substances Development, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province. *Exigo3 Sustainability*. – A low-density, Middle Stone Age site was uncovered.
- PELSER, A. 2012. A report on a Heritage Impact Assessment (AIA) for the proposed photovoltaic solar power generation plant on the Farm Adams 328 near Hotazel in the Northern Cape. *Archaetnos CC*. – Historical structural remains and a single, Middle Stone Age tool was uncovered.
- VAN RYNEVELD, K. 2012. The Black Rock Powerline Project, Black Rock near Hotazel in the Northern Cape, South Africa. – Absence of any findings.
- PISTORIUS, J.C.C. 2008. A Phase I Heritage Impact Assessment (HIA) Study for a Proposed New Power Line for the United Manganese of Kalahari (UMK) Mine near Hotazel in the Northern Cape Province of South Africa. – Absence of any findings.
- FOURIE, W. & VAN DER WALT, J. 2005. Hotazel Manganese Mines: Wessels Mine on Section of the Farms Wessels 227, Dibiaghomo 226 and Dikgathlong 268 Mamatwan Mine on Section of the Farms Goold 329 and Mamatwan 331, Heritage Assessment. *Matakoma Heritage Consultants (Pty) Ltd*. – Absence of any findings
- DREYER, C. 2014. First Phase Archaeological & Heritage Assessment of the Proposed Vaal-Gamagara Water Pipeline project, Northern Cape: Hotazel Alternative Water Pipeline. – Absence of any findings.
- FOURIE, W. 2013. Lehating Heritage Impact Assessment Proposed Lehating Mining (Pty) Ltd underground manganese mine on Portions 1 of the Farm Lehating 714 and Portion 2 of the farm Wessels 227, approximately 20km northwest of Hotazel, Northern Cape Province. *PGS Heritage and Grave Relocation Consultants*. – An isolated occurrence of Later Stone Age implements.
- VAN SCHALKWYK, J. 2016. Cultural Heritage Impact Assessment Report for the Development of the Proposed Lehating 132Kv Power Line and Substation, North West of Hotazel, Northern Cape Province. – Several stone tool sites, historical structures and burial sites were uncovered.
- FOURIE, W. 2015. Mokala Re-alignment of the R380 and a Portion of the Ga-mogara River on a Portion of the Farm Kipling 271, Near Hotazel in the Northern Cape, *PGS heritage*

and Grave Relocation Consultants. – Three archaeological sites associated with the MSA were identified in the area.

- ROSSOUW, L. 2015. Phase 1 HIA of two proposed new power lines at Witloop and Vlermuislaagte, Hotazel, NC. *Palaeo Field Services*. – Some scattered Stone Age implements were uncovered.
- DE JONG, R. 2010. HIA Proposed Land Use Change to Provide for the Extension of the Town of Hotazel Phase III. *Cultmatrix CC*. – Nothing of notable heritage value was uncovered.

5.3 Archaeological background

Most archaeological material in the Northern Cape is found near water sources such as rivers, pans and springs, as well as on hills and in rock shelters. Sites usually comprise of open sites where the majority of evidence of human occupation is scatters of stone tools (Parsons 2003).

5.3.1 Early Stone Age (400 000 – 3.3 million years Before Present/BP)

An important archaeological site in the region is the Wonderwerk Cave, located approximately 100 km away. The Early Stone Age (ESA) levels at Wonderwerk Cave date to approximately 780 000 years old and are characterised by Acheulean stone tools such as prepared cores, bifacial cleavers and refined hand axes. A few pieces of haematite were also found in the uppermost MSA layers. Bedding material recovered indicates that the site was used as a home base by the end of the ESA. A few small irregular flakes and cores may belong to the older Oldowan era, but the dating of this material is uncertain (Beaumont & Vogel 2006).

5.3.2 Middle Stone Age (30 000 – 300 000 BP)

Middle Stone Age (MSA) artefacts belonging to the Fauresmith industry are also found in the region. The Fauresmith is characterised by prepared cores, long, narrow flake blades, convergent points and small, broad hand axes (Mitchell 2002). Also at Wonderwerk, layers with Fauresmith tools were dated to 276 00 – 510 000 BP. Associated with the MSA materials were several incised stone slabs, most with curved parallel lines. Pieces of haematite were also found. The cave was abandoned between 70 000 and 12 500 BP due to significantly drier conditions. During this time, much of the region was abandoned and settlement only occurred at a few sites near permanent water sources (Beaumont & Vogel 2006).

5.3.3 Later Stone Age (30 000 BP – recent times)

The earlier LSA industry of the region forms part of the Oakhurst industry (some have labelled this local variant the Kuruman), characterised by rare retouched artefacts, most of which are large scrapers that are oblong with retouch on the side. The predominant raw materials are banded

ironstone and dolomite. Very few adzes and blades are found, while backed artefacts and bone tools are absent. Ostrich eggshell beads and fragments are found (Humphreys & Thackeray 1983). At Wonderwerk, Oakhurst assemblages were dated to 8000 – 10 500 BP (Beaumont & Vogel 2006).

This was followed by the Wilton industry, characterised by the use of various raw materials including banded ironstone, chert, chalcedony, jasper and quartz. The main retouched tools are elongated scrapers with retouch on the end and backed artefacts such as segments and blades. Other retouched tools include adzes, unifacial points, borers and notched artefacts. At other sites, bifacial points and bifacial tanged and barbed arrowheads are found. At Wonderwerk, a few bone points have been found. Ostrich eggshell beads, pendants and decorated fragments, as well as stone rings were found (Humphreys & Thackeray 1983). Wilton layers at Wonderwerk have been dated to 2000 – 8000 BP. Associated with the LSA materials were 20 fine-line incised engraved stone slabs, most with schematic motifs. One example of a mammal depiction has been found. Pieces of haematite and specularite were also found in these layers (Beaumont & Vogel 2006).

Pottery made its appearance in the region by approximately 1400 BP and at Wonderwerk, Ceramic Later Stone Age layers have been dated to 900 – 2000 BP (Humphreys & Thackeray 1983; Beaumont & Vogel 2006). Two discrete, contemporary stone tool industries are associated with pottery remains in the Northern Cape: Swartkop and Doornfontein (Beaumont *et al.* 1995). Swartkop is a Wilton industry characterised by circular blades, a high proportion of backed blades, coarse undecorated pottery sherds that commonly contain grass temper, and a few iron items. It seems scrapers were favoured over blades on the Ghaap plateau (Humphreys & Thackeray 1983). These sites are usually found near water sources, such as pans and springs, or on the sides of low hills. Stone circles and ovals are sometimes also found and may represent the bases of dwellings. A late phase of this industry can be linked with the /Xam San who lived in the Karoo. Doornfontein is characterised by the predominance of coarse irregular flakes, frequent use of quartz as a raw material, and very little retouch. Many ceramics are found, which are amphora-like in shape with grit temper and decoration on the necks and rims. Later sites contain some large ostrich eggshell beads, iron objects, and coarser sherds with grass temper. These sites are found along the Orange River and nearby permanent water sources. This tradition is probably associated with Khoekhoen groups (Beaumont *et al.* 1995).

Two prehistoric specularite mines have been excavated near Postmasburg–Doornfontein (Beaumont & Boshier 1974) and Blinklipkop (Thackeray *et al.* 1983). These sites show that specularite mining started before 1200 BP. This substance was prized as a cosmetic by hunter-gatherers, Khoekhoen pastoralists and Iron Age peoples, making it an important trade item. At Blinklipkop, there is evidence of either trade with or occupation by Iron Age peoples by the seventeenth century. Historical sources indicate that Tlhaping Sotho-Tswana peoples occupied the mine in 1801 (Thackeray *et al.* 1983).

5.3.4 *Rock Art*

Rock engravings are principally found in the interior of South Africa and are plentiful in the Northern Cape. Engravings are found on rocky outcrops, river beds and boulders. They are made by pecking away the surface of the rock with another rock, incising it with a sharp stone or scraping it off with another stone. Unfortunately, there are no scientific methods for securely dating engravings and research into this is still at an experimental stage.

Most engravings were made by the San and were associated with their religious beliefs and rituals. San shamans went into trance to perform certain tasks such as controlling game, protecting the group and rainmaking. Certain animals were believed to hold supernatural power and thus many of the engraved animals can be seen as both sources and symbols of supernatural power. The places where engravings were made were also sources of supernatural power, especially in rainmaking rituals. Certain geometrics such as zigzags and dots are likely to have been associated with forms called entoptics seen whilst in trance (Dowson 1992).

Some engravings—particularly those featuring nonentoptic geometrics and aprons—were probably made by Khoekhoen people. Similar motifs are found in finger painted Khoekhoen rock art sites in certain regions of the Northern Cape, especially in the Vaal-Harts region to the east. Khoekhoen rock art is typified by finger paintings and roughly pecked engravings of geometrics that are located near water sources (Smith & Ouzman 2004). The rock paintings found in the Kuruman hills (Morris 1988) are probably of Khoekhoen authorship. Korana rock art—mostly painted—has also been identified in the Vaal-Harts region but may stretch into the Daniëlskuil region (Ouzman 2005). These depictions are characterised by finger painted and rough brush painted horses, human figures, geometrics, aprons, guns and finger dots. They are painted in shelters that are either hidden or not easily accessible. The complex issues of ethnicity and authorship of rock art (especially engravings) are still being researched.

5.4 Aspects of the area's history as revealed by the archival/desktop study

5.4.1 Settlement during the Later Stone Age

A number of Stone Age sites are known for the area surrounding Kuruman as well as along the Kuruman River (Humphreys & Thackeray, 1983; Beaumont & Morris, 1990; Parsons, 2003). Some of these sites contain rock engravings as well, such as Nchwaneng and Tsineng (Beaumont & Morris, 1990; Morris, 1988, 2002, 2003).

As the wider landscape became increasingly inhabited, the San were forced to move further west and northwest to remain in the vicinity of wild game (Snyman, 1992).

5.4.2 Early Black Settlement during the Late Iron Age and Historic Period

The Tlharo seems to have been the first Tswana group to enter the Kuruman area. They originated from the Hurutshe group further to the north-east, and after splitting from this group during the end of the 17th century, moved in a southern direction down the Molopo River. Their early settlements included Khuis, Madibeng, Heuningvlei, Langeberg and Tsineng (Snyman, 1992). As mentioned earlier, the town of Tsineng (Tsenin) is located in the general vicinity of the present study area.



Figure 5 - "Tlharo of the Kalahari Desert" A sketch that appeared in Dr. Andrew Smith's travel journal (Lye, 1975:171).

The second important Tswana group from the wider area is the Tlhaping. They originated from the Rolong group and during the mid-1700s moved southward along the Harts and Vaal Rivers to the vicinity of Campbell, from where they travelled westwards into the area falling between Tsantsabane and Majeng on the edge of the Kalahari Desert. The Tlhaping established a capital on a perennial river known as Nokaneng. Their ruler during this time was King Maswe. Although the exact locality of Nokaneng is not known, one possibility is that the present non-perennial river Ga-Mogara used to be the Nokaneng River. This possibility was supported by the missionary John Campbell, who in 1820 referred to the Ga-Mogara River as the Nokaneng (Campbell, 1922: Vol II:125; Snyman, 1992). Interestingly, Robert Moffat indicated Nokaneng to have been situated to the east of the Langeberg, but see also map accompanying Campbell (1922:Vol. II). This said, it is important to note that Breutz (1992) stresses the point that the actual capital Nokaneng was in fact located in the direct vicinity of Postmasburg.

During the reign of Molehabangwe, who had succeeded his father Maswe in 1775, a confederation was formed which consisted of a stratified society comprised of the Tlhaping, Rolong, Tlharo, Kgalagadi and San groups. While the Tlhaping was seen as the ruler class, the Kgalagadi and San were viewed as vassals (Snyman, 1992).

The Tlhaping conducted extensive trading activities with the Korana to the south and the Tswana to the north. During 1770 some of the Korana groups crossed the Orange River and came to the land of the Tlhaping. Although the initial contact was peaceful, conflict soon erupted. The better-armed Korana managed to force the Tlhaping out of the area in approximately 1790. This move was further augmented by the fact that the Nokaneng River had dried up. Campbell (1922: Vol. II:125) on his visit in 1820 also remarked that both the Nokaneng and Kuruman Rivers then had dried up, but that deep wells dug into the river beds supplied water. The Tlhaping first moved to Kathu and then to Ga-Mopedi on the Kuruman River. The Tlhaping eventually established themselves at Dithakong on the Moshaweng River (Snyman, 1992).

5.4.3 European Explorers and Visitors

Two of the more well-known early European explorers to these areas were Dr. Hinrich Lichtenstein in 1805 and Dr. Andrew Smith during 1835.



Figure 6 – “Tlhaping women cultivating gardens and singing” One of the sketches appearing in Dr. Andrew Smith’s journal (Lye, 1975:171).

5.4.4 The Journey of Lichtenstein (1805)

After crossing the Orange River in the vicinity of present-day Prieska, Lichtenstein’s party visited present-day Danielskuil, and by June 1805 they were at Blinkklip (Postmasburg), a well-known source for obtaining specular haematite. Archaeological investigations at Blinkklipkop (also known

as Nauga) established a date of AD 800 for the utilization of this particular rich source (Thackeray, et al 1983; Beaumont & Morris, 1990). From here they travelled further north and reached the Kuruman River where they met Tswana-speaking people. They followed the river downstream for three days, after which they followed a tributary to reach Lattakoe. From here they turned south and reached the Orange River on 11 July 1805.

While on their way to the Kuruman River (and to the south thereof), Lichtenstein and his fellow travellers visited a small settlement consisting of “...*about thirty flat spherical huts.*” Although the people who stayed here were herdsmen who looked after the cattle of richer people living on the Kuruman River, they indicated that San (Bushmen) were also present in the area.

Lichtenstein’s party subsequently travelled further north to visit the capital of King Muliawang located on a plain in the vicinity of the Kuruman River. He described the town as consisting of six hundred houses with 5 000 inhabitants. The individual dwellings were described as follows: “*The houses were all of a circular form, with the roof running up to a point; the roof rests on a circle of poles, which are united together below by thin walls of loam; above, for a little way below the roof, they are left open to admit light and air.*” (Lichtenstein, 1930:373). Lichtenstein also indicated that hedges were used as cattle enclosures.

5.4.5 Andrew Smith’s journey (1835)

Dr. Andrew Smith’s expedition into the interior of Southern Africa can be seen as one of the highlights of the era of exploration and travel into these regions of Africa. After some travelling, which included a visit to Mosjesj, Smith’s party crossed over the Vaal River and after reaching this river’s confluence with the Harts, followed it to Boetsap and subsequently reached Kuruman (Bergh, 1999).

Smith met Robert Moffat at Kuruman, and during this time made a journey all along the Kuruman River to Tsineng from where he travelled south to the Langeberg. Returning to Tsineng, Smith travelled north to Heuningvlei before returning back to Kuruman (Bergh, 1999).

For the aims of the present study, it is especially Smith’s journey from Tsineng to the Langeberg and back which is most interesting. The route followed by Smith seems to have been the Ga-Mogara River, and as such his route crossed over portions of the present study area.

In the vicinity of Tsineng Smith found a number of springs which the local people called Malichana. He observed a small group of Tswanas (Bituanas) as well as a Griqua family staying near the springs, and indicated that the Tswana group conducted agricultural activities in gardens laid out near the springs.

From Tsineng Smith's party travelled all along the bank of the Kuruman River, presumably to the confluence of the Ga-Mogara River. On this stretch of the journey Smith observed "...a number of almost naked natives in the distance carrying ostrich shells and something resembling leather sacks upon their shoulders..." (Lye, 1975:181). These people were on their way to a water hole, which had been excavated some seven meters deep. Anyone wishing to obtain water had to climb down the hole making use of footholds along the sides.

5.4.6 *British Protectorate*

On 23 March 1885 Britain declared a Protectorate over Bechuanaland and the Kalahari. On 30 September 1885 the Protectorate was divided into two parts. The area north of the Molopo River remained the Bechuanaland Protectorate and up to 1895 was administered from Vryburg, after which the capital was moved to Mafeking. The area south of the Molopo became the Crown Colony of British Bechuanaland with its capital at Vryburg (Tlou & Campbell, 1997). This area included the present study area as well as Kuruman.

In accordance to Act 31 of 1895 the area south of the Molopo River, namely British Bechuanaland, was included in the Cape Colony. This took place during November 1895 (Smit, 1966).

5.4.7 *Situation at the beginning of the 19th century*

When Reverend Robert Moffat first arrived in the Kuruman area in 1819 he found the Tlhaping settled at Maropin in the Kuruman Valley under their ruler Mothibi. They subsequently moved upstream to the vicinity of present-day Kuruman. During the same time Moffat found the BaTlharo established at Tsening.

In a document written by the Superintendent of Natives on 3 November 1921, it is indicated that before the farms to the west of the Lower Kuruman Native Reserve were surveyed and ceded to different white farmers, the black people of the area "...had the run of the whole country to the Moshewing River on the one side and the Gamagara River on the other..." and grazed their livestock and conducted agricultural activities over these vast tracts of land. In an associated petition document drawn up by the Tlharo people of Bathlaros, they indicated that their agricultural lands and cattle posts used to stretch in a westward direction all the way to the "Dibeng" River, which appears to be the present-day Ga-Mogara River (NTS, 7752, 22/335).

5.4.8 *Lower Kuruman Native Reserve*

On 4 May 1895 the Lower Kuruman Native Reserves well as a number of other so-called native reserves were established by virtue of Bechuanaland Proclamation No. 220 of 1895. These reserves were demarcated as part of a commission which investigated land claims and land settlement in British Bechuanaland. A subsequent report titled "*Report of the Commissioners*

appointed to determine land claims and to the effect of a land settlement in British Bechuanaland” and published in 1896, contained all the findings of the commission (Breutz, 1963).

At the time of its establishment, the Lower Kuruman Native Reserve had a population of 5425, and being 225 square miles in extent, had a population density of 26.5 acres per individual. With time, the population density increased. Livestock numbers also increased drastically. As a result of these pressures the size of the reserve was subsequently extended.

During negotiations and discussions on such an expansion of the reserve, it was indicated that a number of black people were residing outside the boundaries of the reserve. In a police report dated 22 January 1908 a list is provided of all the people, white and black, residing “...on the banks of the Kuruman River north of the surveyed farms in the Sishen Valley.” This document provides an indication of human habitation in the direct vicinity of the study area during the early 1900s. One interesting observation to be made from the document is that some of the persons who acted as borehole watchmen were black. For example, Hans Gaboerkwe had been living at Dibiachomo since 1899 and was tasked with keeping the well open (NTS, 7752, 22/335).

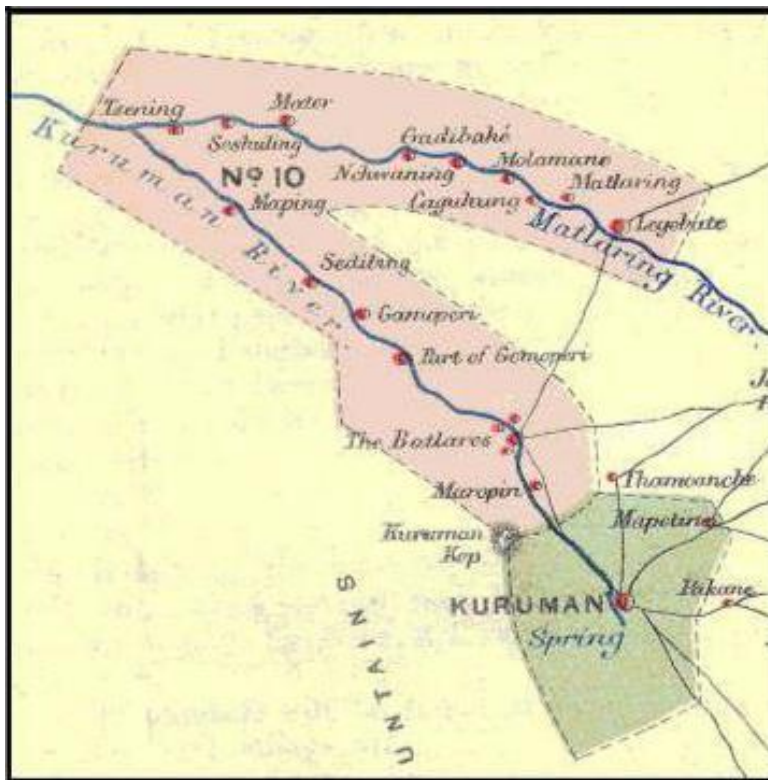


Figure 7 - Map showing the original demarcation of the Lower Kuruman Native Reserve

5.4.9 The Langeberg Rebellion

During 1897 conflict broke out between the authorities and a Thlaping leader from Taung, Galeshewe. The conflict arose after some of Galeshewe’s cattle that were infected by Rinderpest

had to be destroyed. After killing an officer, Galishewe fled to the Thlaro leader, Toto, of the Langeberg. Subsequently, a full-scale rebellion broke out that was eventually suppressed (Breutz, 1963).



Figure 8 - Photograph of Galeshewe (National Archives, TAB, 36277).

Although most of the activities associated with the rebellion took place away from the study area and surrounding region, it is evident from the historical records documenting the rebellion that some activities did take place in the vicinity. On 13 June 1897, for example, a battle took place between Inspector Berrangé's Cape Police and a large force under Galishewe at Tsineng (Dalgerty, 1898).

Another incident which took place in the area was the killing of J.P. and Edward Drotskie in the vicinity of Boeredraai (Snyman, 1992). It can be expected that the movement of military units must have taken place a number of times in the area as well. From the British records, for example, it is known that military patrols traversed the area between Kuruman and Tsineng, as well as along the Ga-Mogara river. Furthermore, on 20 June 1897 a large force of "rebel reinforcements" were observed between Upper and Lower Dikgathlong on their way to the Langeberg.

5.4.10 Mining

The study area and surrounding region is today well known for its manganese mines. The importance of manganese lies in the fact that it is used in the manufacture of carbon steel.

The history of modern manganese mining in the area can be traced back to Dr. A.W. Rogers who published a record of the geology of present-day Botswana and Griqualand West as part of the annual report of the Geological Commission of the Cape Colony in 1906. What is significant about his publication is that Rogers found that the well-known hill from the area known as Black Rock consisted largely of manganese, a mineral ore previously undiscovered in the Cape Colony.

The next important person to appear on the scene was Dr. L.G. Boardman. While employed by the Government Geological Survey as a geologist, Dr. Boardman investigated the manganese deposits at Black Rock during or directly after 1940. He was very excited by the extent of the manganese, and published his findings in a paper he wrote for the Geological Society of South Africa.

Even before the visit by Dr. Boardman, a prospector by the name of A.T. Fincham had felt that the area surrounding the Black Rock outcrop may also contain manganese. As a result he obtained options on a number of farms surrounding Black Rock. He approached the mining company S.A. Manganese with these farm options, but they felt that the Black Rock area was too isolated at the time. Fincham approached Ammosal as well, who took over his options on three farms and after a further assessment by geophysicist Oscar Weiss, decided to mine the Black Rock area during mid-1940.

During 1950 S.A. Manganese was again approached by Fincham regarding new options on farms surrounding Black Rock. Although the mining company was not interested Dr. Boardman, who had joined their ranks earlier, convinced the board to at least investigate the Black Rock area. Boardman subsequently surveyed a large tract of land, including the farms Wessels, Mamatwan, Dikgathlong and Dibiaghomo. He found very promising results over large sections of land, and a drilling rig soon arrived. The first borehole was drilled on Wessels, and after disappointing results it was moved to Dibiaghomo. Here, at a depth of 280 meters, ore containing a very high manganese percentage was reached. Other boreholes in the area found similar results and the freehold to a number of farms was obtained. When information about these discoveries leaked out and reached Ammosal, a tussle broke out between the two companies to obtain freeholds to as many farms in the mineral-rich area as possible.

Although mining operations started in earnest on Smartt, S.A. Manganese's attention was soon drawn to the farm Hotazel where very promising results were also found. A whole village was constructed on the farm, and the Hotazel mine was officially opened on 19 November 1959.

During the early 1960s S.A. Manganese Limited (Samangan) at the time had options on 18 farms, including the farms Mamatwan and Goid on the southern edge of the ore body. Although Mamatawan had been prospected only low-grade manganese ore could be found. However, the ratio between iron and manganese from Mamatwan was believed to be excellent. During this time Ammosal had started mining on the adjacent farms of Devon and Adams, and it was not long before the decision was made to commence mining operations on Mamatwan as well.

After a crushing and screening plant was erected at Mamatwan the mine began producing in November 1963. During the 1970s the mine reached a production output of more than one million tons a year (Samangan, 1977).



Figure 9 - “A view of the huge open-cast manganese ore mine of Samancor at Mamatwan...” The photograph was taken during August 1982 (National Archives, TAB, 16396).

Although the mining rights of the farm Wessels had been acquired by S.A. Manganese in 1952, and even though some prospecting work had taken place, it was not until 1965 that the farm was again investigated.

By January 1969 20 boreholes had been sunk on the farm Wessels, Dibiaghomo and Dikgathlong, which revealed three bands of manganese ore, of which the top and bottom bands were considered mineable.

The official opening of Wessels mine took place on 2 May 1973. By 1976 the mine was annually producing 750 000 tons of ore a year (Samangan, 1977).

5.5 Site survey

As part of the proposed project, field work was undertaken in order to verify information obtained as part of the review of available literature and to identify the presence of any heritage/cultural resource sites. The fieldwork was conducted by a heritage specialist from PGS Heritage on 16 July and 14 October 2019. The fieldwork activities were tracked by a GPS track (**Figure 16**). The various pipeline routes associated with the abstraction of water from Middelpplaats as well as undisturbed areas associated with proposed layout and activities changes (rail loop and topcut stockpile and crushing and screening area) formed part of the fieldwork. The images below provide an illustration of some of the infrastructure associated with the MMT and the decommissioned Middelpplaats Mine.

Infrastructure and activity changes that have already taken place are located within existing disturbed areas.



Figure 10 – View of developed nature of parts of the site



Figure 11 – View of existing waste rock dumps



Figure 12 – Existing pumphouse at Middelpplaats shaft



Figure 13 – Existing water reservoir at Middelpplaats Shaft



Figure 14 – View of area where pipeline option 2 enters the adjacent Tshipi Mine area



Figure 15 – Mining infrastructure in the proposed rail loop area

5.6 Sensitivity assessment outcome

Based on the background research and desktop assessment of previous studies done for the study area, only archaeological finds were considered to have a possibility of occurring in the largely disturbed study area. These archaeological finds would be protected through s35 of the NHRA.

The field work has however confirmed that no heritage resources as considered under s3 of the NHRA were found.

Figure 16 – Project layout with tracklogs in red dashes

6 PALAEOLOGY

Palaeontology is addressed in a separate report compiled by the appointed palaeontologist and is submitted separately to SAHRA.

7 IMPACT ASSESSMENT

With reference to Section 4.6, no heritage/cultural resources were identified within the proposed project areas. It follows that the assessment of the loss of heritage/cultural resources is not applicable to this HIA, however management actions are provided in Section 8 in the event of a chance find.

8 PROPOSED MANAGEMENT MEASURES

8.1 Construction phase

The project will encompass a range of activities during the construction phase, including vegetation clearance and the stockpiling of overburden.

It is possible that subsurface heritage resources will 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 infrastructure and construction of facilities results in significant disturbance, however foundation holes do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure, such as construction camps and laydown areas, is 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 is implemented.

8.2 Chance find procedure

In the event of a chance find, the following procedures need to be adhered to:

- A heritage practitioner should be appointed to develop a heritage induction program and conduct training for the ECO, as well as team leaders, in the identification of heritage resources and artefacts.
- An appropriately qualified archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during any project phase, the area should be demarcated, and activities be halted.
- The qualified 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 impact on the heritage resource.
- South32 must have a contingency plan so that operations/activities could move elsewhere temporarily away from the activity area while the material and data are recovered.
- Construction can commence as soon as the site has been cleared and signed off by the archaeologist.

8.3 Possible finds during construction

The study area occurs within a greater archaeological site as identified during the fieldwork and scoping phase. Clearing of vegetation can uncover the following:

- Stone artefact;
- Stone foundations;
- Ash middens associated with the farmsteads and homesteads that can contain bone, glass and clay ceramics, ash, metal objects such as spoons, forks, and knives; and
- Possible burials.

8.4 Timeframes in the event of a chance find

It must be kept in mind that mitigation and monitoring of heritage resources discovered in the event of a chance find will require permitting for collection or excavation of heritage resources and lead times must therefore be taken into consideration. **Table 6** gives guidelines for lead times on permitting.

Table 6 - Lead times for permitting and mobilisation

ACTION	RESPONSIBILITY	TIMEFRAME
Preparation for field monitoring and finalisation of contracts	The contractor and service provide	1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and SAHRA	1 month
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	3 months

ACTION	RESPONSIBILITY	TIMEFRAME
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and SAHRA	2 weeks
Relocation of burial ground or graves in the way of construction	Service provider – Archaeologist, SAHRA, local government and provincial government	6 months

8.5 Heritage Management Plan for EMPr implementation

NO.	MITIGATION MEASURES	PHASE	TIMEFRAME	RESPONSIBLE PARTY FOR IMPLEMENTATION	MONITORING PARTY (FREQUENCY)	TARGET	PERFORMANCE INDICATORS (MONITORING TOOL)	COST
Possible finds								
A	Implement chance find procedures in case where possible heritage finds area made	Construction Operation Decommissioning Closure	as and when required	South32 ECO Heritage Specialist	ECO (weekly)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34, 35, 36 and 38 of NHRA	ECO Monthly Checklist/Report	R10 000

9 CONCLUSIONS AND RECOMMENDATIONS

This report was developed to address the changes to infrastructure and activities associated with the MMT. No heritage resources or features were identified during the fieldwork component of this HIA.

It is our considered opinion that the changes to infrastructure and activities will not have any impact on heritage resources. Any chance finds during the remaining life of mine will be handled through the proposed chance finds procedures and management guidelines as provided in **section 6** of this report.

10 REFERENCES

- ARBOUSSET, T. & DAUMAS, F. 1968. *Narrative of an exploratory tour to the Cape of Good Hope*. Facsimile reprint. Cape Town: Struik.
- BANZAI ENVIRONMENTAL. 2017. Palaeontological Desktop Assessment for the Proposed Changes to Operations at the UMK Mine near Hotazel, in the Northern Cape Province.
- BANZAI ENVIRONMENTAL. 2019. Palaeontological Exemption Letter for regulatory updates from Mamatwan Mine near Hotazel, in the John Toala Gaetsewe District Municipality in the Northern Cape Province.
- BEAUMONT, P. & MORRIS, D. 1990. *Guide to archaeological sites in the northern Cape*.
- BECKER, E. 2013. Phase 1 heritage Impact Assessment Hotazel to Kimberley and De Aar to Port of Ngqura. *Hatch*.
- BERGH, J.S., 1999: *Geskiedenisatlas van Suid-Afrika: Die vier noordelike provinsies*. J.L. van Schaik Uitgewers, Pretoria.
- BREUTZ, P.L., 1963: *The Tribes of the Districts of Kuruman and Postmasburg*. Department of Bantu Administration and Development, Pretoria.
- BROOKS, A.S. 1984. San land-use patterns, past and present: implications for southern African prehistory. In Hall, M., Avery, G., Avery, D.M., Wilson, M.L. & Humphreys, A.J.B. (eds) *Frontiers: Southern African Archaeology Today*. Oxford: BAR International Series 207, pp 40-52.
- BURCHELL, W. 1967 [1822-24]. *Travels in the interior of southern Africa*. Vol 2. Cape Town: Struik.
- CAMPBELL, J. 1822. *Travels in South Africa*. Volume I and II. London: Francis Westley. Facsimile reprint 2004. Elibron Classics Series.
- DALGERTY, E.H., 1898: *Bechuanaland Rebellion 1897*. W.A. Richards & Sons, Cape Town.
- DE JONG, R. 2010. HIA Proposed Land Use Change to Provide for the Extension of the Town of Hotazel Phase III. *Cultmatrix CC*.
- DREYER, C. 2014. First Phase Archaeological & Heritage Assessment of the Proposed Vaal-Gamagara Water Pipeline project, Northern Cape: Hotazel Alternative Water Pipeline.
- FOURIE, W. & VAN DER WALT, J. 2005. Hotazel Manganese Mines: Wessels Mine on Section of the Farms Wessels 227, Dibiaghomo 226 and Dikgathlong 268 Mamatwan Mine on Section

- of the Farms Goid 329 and Mamatwan 331, Heritage Assessment. *Matakoma Heritage Consultants (Pty) Ltd.*
- FOURIE, W. 2013. Lehating Heritage Impact Assessment Proposed Lehating Mining (Pty) Ltd underground manganese mine on Portions 1 of the Farm Lehating 714 and Portion 2 of the farm Wessels 227, approximately 20km northwest of Hotazel, Northern Cape Province. *PGS Heritage and Grave Relocation Consultants.*
- FOURIE, W. 2015. Mokala Re-alignment of the R380 and a Portion of the Ga-mogara River on a Portion of the Farm kipling 271, Near Hotazel in the Northern Cape, *PGS heritage and Grave Relocation Consultants.*
- GROENEWALD, G., 2014. Palaeontological Impact Assessment for a Manganese mine. Kudumane Manganese Resources (Pty) Ltd.
- HUMPHREYS, A.J.B. & THACKERAY, A.I. 1983. *Ghaap and Gariap: Later Stone Age studies in the northern Cape.* South African Archaeological Society Monograph Series 2. Cape Town.
- KIBERD, PHILLIP. 2001. Bundu Farm. A Middle and Later Stone Age Pan Site, Northern Cape, South Africa. Preliminary results of fieldwork 1998- 2000. *Nyame Akuma*, No 55, June 2001 Kimberley: McGregor Museum.
- KLEIN, R.G. 1984. *Southern African Prehistory and Paleoenvironments.* A.A. Balkema.
- KRUGER, N. 2015. Archaeological Impact Assessment (AIA) for the Proposed East 132 Kv Double Circuit Power Line Connection for the East Solar Park to the Eskom Hotazel or UMTU Substances Development, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province. *Exigo3 Sustainability.*
- LICHTENSTEIN, H., 1815: *Travels in Southern Africa.* British and Foreign Public Library, London.
- LYE, W.F., 1975: *Andrew Smith's Journal of his expedition into the interior of South Africa / 1834-36.* A.A. Balkema, Cape Town.
- MACRAE, C. 1999. Life etched in stone. Fossils of South Africa. 305 pp. The Geological Society of South Africa, Johannesburg.
- MATAKOMA HERITAGE CONSULTANTS. 2006. Kalahari Manganese Mines, Heritage Assessment, on Umtu 281, Olive Pan 282, Gama 283
- MORRIS, D. 1988. Engraved in place and time: a review of variability in the rock art of the Northern Cape and Karoo. *South African Archaeological Bulletin* 43:109-121.
- MORRIS, D. 2002. Driekopseiland and 'the rain's magic power': history and landscape in a new interpretation of a Northern Cape rock engraving site. Unpublished Masters dissertation, University of the Western Cape, Cape Town.
- MORRIS, D. 2003. Rock art as source and resource: research and responsibility towards education, heritage and tourism. *South African Historical Journal* 49:193-206.
- MORRIS, D. 2008. Archaeological and Heritage Phase 1, Impact Assessment for proposed upgrading of Sishen Mine Diesel Depot Storage Capacity at Kathu, Northern Cape. Kimberley: McGregor Museum.
- PARSONS, I. 2003. Lithic expressions of Later Stone Age lifeways in the Northern Cape. *South African Archaeological Bulletin* 58:33-37.

- PELSER, A. 2012. A report on a Heritage Impact Assessment (AIA) for the proposed photo-voltaic solar power generation plant on the Farm Adams 328 near Hotazel in the Northern Cape. *Archaetnos CC*.
- PISTORIUS, J.C.C. 2008. A Phase I Heritage Impact Assessment (HIA) Study for a Proposed New Power Line for the United Manganese of Kalahari (UMK) Mine near Hotazel in the Northern Cape Province of South Africa.
- ROSSOUW, L. 2015. Phase 1 HIA of two proposed new power lines at Witloop and Vlermuislaagte, Hotazel, NC. *Palaeo Field Services*.
- SAMANGAN, 1977: *Kalahari Wealth: The story of manganese*. Purnell & Sons Pty. Ltd., Cape Town.
- SMIT, A.P., 1966: *Wateroog in die Dorsland: Ned. Geref. Kerk Kuruman 1916-1966*. Kerkraad van die Gemeente Kuruman, Kuruman.
- SNYMAN, P.H.R., 1992: *Kuruman 1800-1990*, PhD Thesis, University of South Africa.
- TANKARD, A.J., JACKSON, M.P.A., ERIKSSON, K.A., HOBDAV, D.K., HUNTER, D.R. & MINTER, W.E.L. 1982. Crustal evolution of southern Africa – 3.8 billion years of earth history, xv+ 523pp. Springer Verlag, New York.
- THACKERAY, A.I., THACKERAY, J.F. & BEAUMONT, P.B. 1983. Excavations at the Blinkklipkop specularite mine near Postmasburg, northern Cape. *South African Archaeological Bulletin* 38:17-25.
- TLOU, T. AND A. CAMPBELL, 1997: *History of Botswana*. Macmillan, Gaborone.
Unpublished MSc Thesis, UOFS.
- VAN DER MERWE, P.J., 1949: *Pioniers van die Dorsland*, Nasionale Pers, Kaapstad.
- VAN DER MERWE, S. J. 1997. Basin Analysis of the Kalahari Manganese Basin.
- VAN RYNEVELD, K. 2012. The Black Rock Powerline Project, Black Rock near Hotazel in the Northern Cape, South Africa.
- VAN SCHALKWYK, J. 2016. Cultural Heritage Impact Assessment Report for the Development of the Proposed Lehating 132Kv Power Line and Substation, North West of Hotazel, Northern Cape Province.

Archival Records

- MNW, 916, MM444/28
 MNW, 986, MM1661/29
 MNW, 377, MM1604/17
 NTS, 7752, 22/335

Appendix A

The Significance Rating Scales for the Proposed Activities on Heritage Resources

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE	Significance = consequence x probability	
Definition of CONSEQUENCE	Consequence is a function of intensity, spatial extent and duration	
Criteria for ranking of the INTENSITY of environmental impacts	VH	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	VL	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	VH	Very long, permanent, +20 years (Irreversible. Beyond closure)
Criteria for ranking the	VL	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours

EXTENT of impacts	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	Decision guideline
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Insignificant	Inconsequential, not requiring any consideration.

*VH = very high, H = high, M= medium, L= low and VL= very low and + denotes a positive impact.

PART B: DETERMINING CONSEQUENCE							
INTENSITY = VL							
DURATION	Very long	VH	Low	Low	Medium	Medium	High
	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High

VL	L	M	H	VH
----	---	---	---	----

A part of the site/ property	Whole site	Beyond the site, affecting neighbours	Extending far beyond site but localised	Regional/ National
EXTENT				

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Low	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VVH
CONSEQUENCE							

Appendix B
Project team CV's

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 – PGS Heritage (Pty) Ltd

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

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

2000-2004 - CEO– Matakoma Consultants

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

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

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