

PROSPECTING ACTIVITIES: XHARIEP PLANT AND MINING (PTY) LTD. FARM 703 – PORTIONS 18,19, 115 AND THE REMAINING EXTENT OF PORTION 27.

Desktop Heritage Impact Assessment (HIA) Report

August 2020

CREDIT SHEET

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Disclaimer; Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. G&A Heritage and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

Statement of Independence

As the duly appointed representative of G&A Heritage, I Stephan Gaigher, hereby confirm my independence as a specialist and declare that neither I nor G&A Heritage have any interests, be it business or otherwise, in any proposed activity, application or appeal in respect of which the Environmental Consultant was appointed as Environmental Assessment Practitioner, other than fair remuneration for work performed on this project.

SIGNED BY: STEPHAN GAIGHER



MANAGEMENT SUMMARY

Project Name and Location

Prospecting activities: Xhariep Plant and Mining (Pty) Ltd.: Farm 703 Portions – 18, 19, 115 and the Remaining Extent of Portion 27. Located approximately 50km north-west of Hotazel within the Ga-Segonyana Local Municipality, in the John Taolo Gaetsewe District of the Northern Cape Province.

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Date of Report

28 August 2020

MANAGEMENT SUMMARY

The purpose of the management summary is to distil the information contained in the report into a format that can be used to give specific results quickly and facilitate management decisions. It is not the purpose of the management summary to repeat in shortened format all the information contained in the report, but rather to give a statement of results for decision making purposes.

This study focuses on the prospecting activities for Iron Ore and Manganese Ore, on the Farm 703 – Portions 18, 19, 115 and the Remaining Extent of Portion 27 approximately 50km north-west of Hotazel in the Kuruman Magisterial District of the Northern Cape Province. The farm application falls within the Ga-Segonyana Local Municipality, which falls under the management of the John Taolo Gaetsewe District Municipality.

Access to the site can be obtained from the R380 between Hotazel and the Botswana border. The application area is 14788.0333 Ha. in extent.

This study encompasses the heritage impact investigation. A preliminary layout has been supplied to lead this phase of this study.

Scope of Work

A Desktop Heritage Impact Assessment, including Archaeological, Cultural heritage, Built Heritage and Desktop Palaeontological Assessment to determine the potential of impacts on heritage resources within the study area.

The following are the required to perform the assessment:

- A desk-top investigation of the area;
- Identify possible archaeological, cultural, historic, built and palaeontological sites within the proposed development area through analysis of known information;
- Evaluate the potential of impacts occurring due to construction and operation of the proposed development on archaeological, cultural, historical resources; built and palaeontological resources; and
- Recommend mitigation measures in terms of detailed studies to determine and ameliorate any negative impacts on areas of archaeological, cultural, historical, built and palaeontological importance.

The purpose of this study is to determine the possible occurrence of sites with cultural heritage significance within the study area. The study is based on archival and document combined with terrain evaluation. No fieldwork was performed.

Findings and Recommendations

The area was investigated through archival studies. The site was found to be devoid of any documented heritage sites with significance.

It is recommended that obscured, subterranean sites be managed, if they are encountered. Due to the low impact proposed for the prospecting activities a survey of the whole area is not recommended at this stage, however this would be required if a mining rights application is lodged.

A stand-alone Desktop Palaeontological Impact Assessment will be submitted in conjunction with this report.

Fatal Flaws

No fatal flaws were identified.

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ABBREVIATIONS

Abbreviation	Meaning
BP	Before Present
c.	circa
BCE	Before the Common Era
Bp	Before Present
CE	Common Era
EIA	Early Iron Age
EMP	Environmental Management Plan
ESA	Early Stone Age
ESMS	Environmental and Social Management System
ESSS	Environmental and Social Safeguard Standards
Fm	Femtometre (10^{-15} m)
GPS	Geographic Positioning System
HIA	Heritage Impact Assessment
ICP	Informed Consultation and Participation
LIA	Late Iron Age
LSA	Late Stone Age
MSA	Middle Stone Age
MYA	Million Years Ago
NHRA	National Heritage Resources Agency
PIA	Palaeontological Impact Assessment
PS	Performance Standard
SAHRA	South African Heritage Resource Agency
SAHRIS	South African Heritage Information System
SAPS	South African Police Service
S&EIR	Scoping and Environmental Impact Reporting
Um	Micrometre (10^{-6} m)
WGS 84	World Geodetic System for 1984

GLOSSARY OF TERMS

'Archaeological' means:

- a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- b) Rock art, being a 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 is older than 100 years including any area within 10 m of such representation; and
- c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

'Circa' is used in front of a particular year to indicate an approximate date.

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

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

A **'place'** is defined as:

- a) A site, area or region;
- b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
- c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'Structures' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

1. General

1.1 Project Description

G&A Heritage was appointed by M&S Consulting to undertake a Desktop Heritage Impact Assessment (HIA) and Desktop Palaeontological Impact Assessment (PIA) for the prospecting activities on the Farm 703 – Portions 18, 19, 115 and the Remaining Extent of Portion 27, approximately 50km north-west of Hotazel in the Kuruman Magisterial District of the Northern Cape Province. The farm application falls within the Ga-Segonyana Local Municipality, which falls under the management of the John Taolo Gaetsewe District Municipality.

Prospecting activities for Iron Ore and Manganese Ore are to take place in the form of percussion drilling. The only other alternative land use for the area is livestock farming however the applicant's main economic activity is prospecting / mining and for this reason does not favour any other alternative land use.

1.2 Location of the Overall Activity



Figure 1. Locality Map (study area in relation to Hotazel)

1.2.1 The registered description of the land to which the proposed prospecting activities relates

Property Description	District	Title Deed	Extent (Ha.)
Portion 18 of the Farm 703	Kuruman	T957/2010	1 682.7656 Ha.
Portion 19 of the Farm 703	Kuruman	T3338/2006	5 744.4175 Ha.

Portion 115 of the Farm 703	Kuruman	T640/2015	6 054.2846 Ha.
Remaining Extent of Portion 27 of the Farm 703	Kuruman	T1861/1976	1 306.5656 Ha.

1.2.2 Alternatives considered

Xhariep has considered the following alternatives:

- The Geological formation that supports the possibility that the minerals applied for could be found within the area.
- The availability of farms within the area that is not already occupied by existing prospecting or mining rights.
- The availability of infrastructure, such as a road network, in the immediate surrounding area, which could be utilized to allow easy access to the site.

1.3 Description of the scope of the proposed overall activity

1.3.1 Listed and specified activities:

The final site layout can only be determined during active prospecting as set out below:

- The first phase of the proposed prospecting activities entails a reconnaissance visit.
- The second phase of the proposed prospecting activities entails the review of historical activities and data, a desktop study as well as geological mapping by a Geologist. The exact locality of the proposed first phase percussion boreholes can only be determined at this phase.
- The exact locality of the proposed second phase percussion boreholes can only be determined after the first phase drilling has been completed and the samples analysed.
- The exact locality of the proposed third phase percussion boreholes can only be determined after the second phase drilling has been completed and the samples analysed.

No offices or storerooms will be established at the site as Xhariep Plant and Mining (Pty) Ltd. (hereinafter referred to as “Xhariep”) shall make use of facilities in the town of Hotazel.

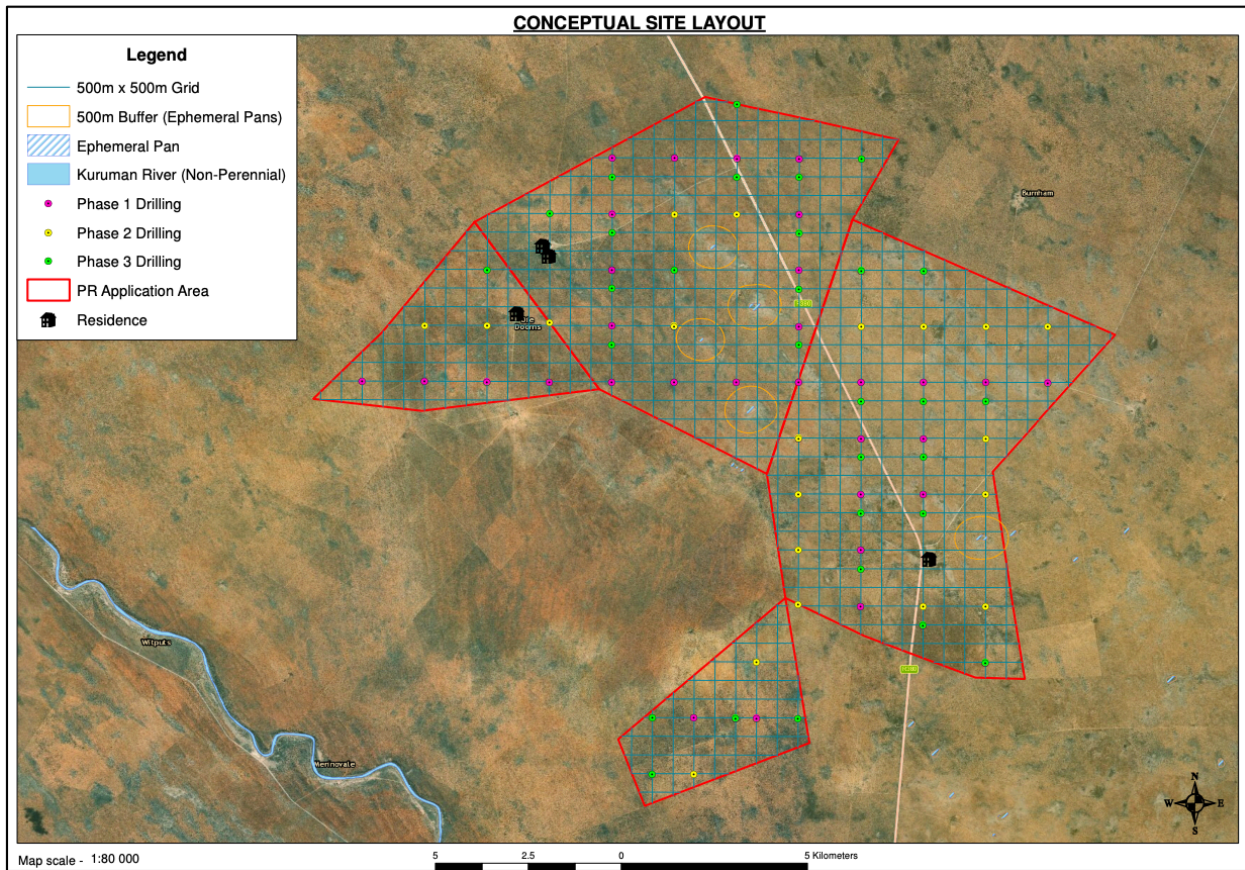


Figure 2. Conceptual Site Layout

Name of activity		Aerial extent of the activity	Listed activity (mark with an X where applicable or affected)	Applicable Listing Notice
1.	Percussion boreholes (80 boreholes with a 10m x 10m surface disturbance around each hole)	8 000 m ² 0.8 Ha.	X	GNR327 – Activity 20 GNR327 – Activity 27
2.	Access tracks: - 500m long and 3m wide access tracks will be created (anticipated). - Existing roads will be used as far as possible.	1 500 m ² 0.15 Ha	X	GNR327 – Activity 20 GNR327 – Activity 27
3.	Chemical toilets	6 m ² each		
Full description of listed activities applied for:				
Full description of listed activities:				
<ul style="list-style-type: none"> - GNR 327 – Activity 20: Any activity including the operation of that activity which requires a prospecting right in terms of Section 16 of the Mineral and Petroleum Resources Act, 2002 (Act No. 28 of 2002), including <ul style="list-style-type: none"> a) Associated infrastructure, structures and earthworks, directly related to prospecting of a mineral resource or including activities for which an exemption has been issued in terms of Section 106 of the Mineral and Petroleum Resources Act, 2002 (Act No. 28 of 2002); b) The primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing 				

- of a mineral resource, including smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case Activity 6 of Listing Notice 2 applies.
- GNR 327 – Activity 27: The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for:-
 - a) The undertaking of a linear activity; or
 - b) Maintenance purposes undertaken in accordance with a maintenance management plan.

1.3.2 Description of the activities to be undertaken:

Xhariep's prospecting activities for Iron Ore and Manganese Ore shall be conducted in nine phases over a period of 5 years.

- ❖ Non-invasive prospecting:
 - Phase 1: a site investigation of the application area will be undertaken to identify infrastructure and determine any potential problems that may need to be addressed.
 - Phase 2: in order to direct the exploration programme in an efficient manner, there will be a review of all available information and data. A desktop study will be undertaken of the metal potential of the area. Any anomalous features identified will be mapped in detail. The various rock types and the contacts will also be mapped.
 - Phases 4, 6 and 8: Drill samples will be collected in one-meter intervals and logging will be done by a qualified Geologist who will record the lithology, mineralogy, degree of mineralization and structural features. Mineralized samples will be analysed at an internationally recognized (ISO certified) laboratory.
 - Phase 9: All the drill sampling data will then be modelled to obtain a final interpretation of the portion of the deposit. A detailed feasibility report will be compiled after drilling operations have been completed to evaluate the economic viability of the project.
- ❖ Invasive prospecting:
 - Phase 3, 5 and 7: Percussion drilling will be used to identify the position of a suspected base metal deposit. The position of the boreholes is dependent on the **results of the review of historical activities**, geological mapping, desktop study and geophysical survey.

Eighty boreholes, approximately 50m deep each (can be more or less depending on results) are planned. The collar position of all boreholes will be surveyed. All drilling will be short term and undertaken by a contractor using truck-mounted equipment.

Angles percussion holes are planned to locate and intersect the mineralization. A traverse line or grid drilling is used to identify and define the extent of any mineralization. The sizes of the boreholes drilled will be determined by such factors as cost, proposed sampling, availability of drilling machines and the volume of sample required, among others.

Each drill site will be rehabilitated. The boreholes will be filled with drill chips and covered with topsoil.

1.3.3 Closure Objectives:

- The main closure objective of Xhariep's planned prospecting operation is to restore the site to its current land capability in a sustainable matter.
- To prevent the sterilization of any ore reserves.
- To prevent the establishment of any permanent structures of features.
- To manage and limit any impact to the surface and groundwater aquifers in such a way that an acceptable water quality and yield can still be obtained, when a closure certificate is issued.
- To establish a stable and self-sustainable vegetation cover.
- To limit and manage the visual impact of the prospecting activities.
- To safeguard the safety and health of humans and animals on the site.
- To close the prospecting operation efficiently, cost effectively and in accordance with Government Policy.

1.3.4 Rehabilitation Plan:

Rehabilitation of boreholes:

- All shallow boreholes (i.e. <10m) will be backfilled and levelled.
- All boreholes deeper than 10m will be covered with a metal plate and 1000mm of previously stored topsoil.

Final rehabilitation of access tracks and / or roads:

After rehabilitation has been completed, all roads will be ripped or ploughed, providing the landowner does not want them to remain that way and with written approval from the Director of Mineral Development of the Department of Mineral Resources.

Submission of information:

Reports on the rehabilitation and monitoring will be submitted biennially to the Department of Mineral Resources in Kimberley.

Maintenance (Aftercare):

Maintenance after closure will mainly concern the regular inspection and monitoring and / or completion of the re-vegetation programme for a period of at least two rainy seasons.

The aim of this EMP is for rehabilitation to be stable and self-sufficient, so that the least possible aftercare is required.

The aim with the closure of the prospecting operation will be to create an acceptable post-prospecting environment and land-use. Therefore all agreed commitments will be implemented by Prospecting Management.

After-effects following closure:

- Acid drainage
 - No potential for bad quality leach ate or acid drainage development exists.
- Long term impact on ground water and / or surface water
 - No after effect on the groundwater yield or quality or surface water quality is expected.
- Long term stability of rehabilitated land
 - One of the main aims of any rehabilitated ground will be to obtain a self-sustaining and stable end result. Xhariep's prospecting activities will not include bulk sampling which could impact on the stability of the land.

The rehabilitation activities proposed will ensure that the land reverts back to grazing land upon the closure of the prospecting right.

1.3.5 Motivation for the overall preferred site, activities and technology alternative:

- The property on which or location where it is proposed to undertake the activity: The Geological formation supports the possibility that the minerals applied for could be found within the application area.
- The operational aspects of the activity: Xhariep aims to minimize its impacts on the natural environment as much as possible and as such has opted to use only drilling as an invasive prospecting method.
- The technology to be used in the activity: A percussion drill rig will be used during phases 3, 5 and 7 of the prospecting activities. There are no alternatives to these types of drill rigs that will ensure high quality of samples for analysis.

1.4 Technical Scope of HIA

The Desktop HIA is meant to deliver, evaluate and inform on the following aspects:

- (a) The identification and mapping of all heritage resources in the area affected as found in documented literature and previous studies;

- (b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in the relevant legal descriptions, development proponent requirements and as per international best practise approaches and charters;
- (c) An assessment of the possible impact of the development on such heritage resources;
- (d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
- (e) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- (f) Plans for mitigation of any adverse effects during and after the completion of the proposed development.

The following categories of heritage objects are considered.

Graves: Places of interment including the contents, headstone or other marker of and any other structures on or associated with such place. This may include any of the following:

- 1) Ancestral graves,
- 2) Royal graves and graves of traditional leaders
- 3) Graves of victims of conflict i.e. graves of important individuals
- 4) Historical graves and cemeteries older than 60 years
- 5) Other human remains, buried or otherwise.

The removal of graves is subject to the following procedures:

- Notification of the impending removals (using local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the relevant controlling body;
- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

Movable objects: This includes objects such as historic or rare books and manuscripts, paintings, drawings, sculptures, statuettes and carvings; modern or historic religious items; historic costumes, jewellery and textiles; fragments of monuments or historic buildings; archaeological material; and natural history collections such as shells, flora, or minerals. Discoveries and access resulting from a project may increase the vulnerability of cultural objects to theft, trafficking or abuse. This may include any of the following:

- 1) Objects recovered from the soil or water including archaeological and paleontological objects and material, meteorites and rare geological specimens;
- 2) Ethnographic art and objects
- 3) Military objects
- 4) Objects of decorative art
- 5) Objects of fine art
- 6) Objects of scientific or technological interest
- 7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings
- 8) Any other prescribed categories, but excluding any object made by a living person.

Protection of Historic Battlefields

Heritage “Places”: A ‘place’ is defined as:

- a) A site, area or region;
- b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);

- c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and
- d) An open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.
- e) Traditional Buildings used in cultural ceremonies.

Heritage Structures: Refers to single or groups of architectural works found in urban or rural settings providing evidence of a particular civilisation, a significant development or a historic event. It includes groups of buildings, structures and open spaces constituting past or contemporary human settlements that are recognised as cohesive and valuable from an architectural, aesthetic, spiritual or socio-cultural perspective.

This may also include any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

Archaeological Sites

Archaeological sites comprise any combination of structural remains, artefacts, human or ecological elements and may be located entirely beneath, partially above, or entirely above the land or water surface. Archaeological material may be found anywhere on the earth's surface, singly or scattered over large areas. Such material includes burial areas, human remains, artefacts and fossils. Archaeological sites may include:

- a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- b) Rock art, being a 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 is older than 100 years including any area within 10 m of such representation; and
- c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked, whether on land or in the maritime cultural zone, and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

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

Sacred or Spiritual Sites: Refers to natural features with cultural significance, which may include sacred hills, mountains, landscapes, streams, rivers, waterfalls, caves and rocks; sacred trees or plants, groves and forests; carvings or paintings on exposed rock faces or in caves; and paleontological deposits of early human, animal or fossilised remains. This heritage may have significance to local community groups or minority populations.

1.5 Geographical / Spatial Scope of HIA

The geographic and spatial scope of the HIA centres on the proposed percussion boreholes on the Farm 703 – Portions 18, 19, 115 and the Remaining Extent of Portion 27 (as described under heading 1.2 Location of the Overall Activity). Any sites within the directly impacted study area (borehole footprints) that can be affected by the proposed development and, where known, are included in this report. Mitigation or secondary investigations will take this footprint as the spatial parameters of the study area.

1.6 Temporal Scope

The proposed project will consist of three phases;

- 1) Planning

- 2) Development
- 3) Operational

Due to the nature of the proposed development impacts on heritage sites are only anticipated during the development phase of the proposed project. The operational phase will be subject to further studies and at present there is still no defined decommissioning phase.

2. Legislative Context

2.1 National Legislation

Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

- (a) *Construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;*
- (b) *Construction of a bridge or similar structure exceeding 50 m in length; and*
- (c) *Any development, or other activity which will change the character of an area of land, or water –*
 - (1) *Exceeding 10 000 m² in extent;*
 - (2) *Involving three or more existing erven or subdivisions thereof; or*
 - (3) *Involving three or more erven, or subdivisions thereof, which have been consolidated within the past five years; or*
- (d) *The costs of which will exceed a sum set in terms of regulations; or*
- (e) *Any other category of development provided for in regulations.*

While the above describes the parameters of developments that fall under this Act., Section 38 (8) of the NHRA is applicable to this development. This section states that;

- (8) *The provisions of this section do not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (Act 73 of 1989), or the integrated environmental management guidelines issued by the Department of Environment Affairs and Tourism, or the Minerals Act, 1991 (Act 50 of 1991), or any other legislation: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.*

In regard to a development such as this that falls under Section 38 (8) of the NHRA, the requirements of Section 38 (3) applies to the subsequent reporting, stating that;

- (3) *The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:*
 - (a) *The identification and mapping of all heritage resources in the area affected;*
 - (b) *An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;*
 - (c) *An assessment of the impact of the development on such heritage resources;*
 - (d) *An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;*
 - (e) *The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;*
 - (f) *If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and*
 - (g) *Plans for mitigation of any adverse effects during and after the completion of the proposed development.*
 - 1) *Ancestral graves,*
 - 2) *Royal graves and graves of traditional leaders,*
 - 3) *Graves of victims of conflict (iv) graves of important individuals,*
 - 4) *Historical graves and cemeteries older than 60 years, and*
 - 5) *Other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);*

- (h) Movable objects, including ;
 - 1) Objects recovered from the soil or waters of South Africa including archaeological and paleontological objects and material, meteorites and rare geological specimens;
 - 2) Ethnographic art and objects;
 - 3) Military objects;
 - 4) Objects of decorative art;
 - 5) Objects of fine art;
 - 6) Objects of scientific or technological interest;
 - 7) Books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
 - 8) Any other prescribed categories, but excluding any object made by a living person;
- (i) Battlefields;
- (j) Traditional building techniques.

A **'place'** is defined as:

- a) A site, area or region;
- b) A building or other structure (which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure);
- c) A group of buildings or other structures (which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures); and (d) an open space, including a public square, street or park; and in relation to the management of a place, includes the immediate surroundings of a place.

'Structures' means any building, works, device, or other facility made by people and which is fixed to land and any fixtures, fittings and equipment associated therewith older than 60 years.

'Archaeological' means:

- a) Material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- b) Rock art, being a 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 is older than 100 years including any area within 10 m of such representation; and
- c) Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;
- d) Features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

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

'Grave' means a place of interment and includes the contents, headstone or other marker of and any other structures on or associated with such place. The South African Heritage Resources Agency (SAHRA) will only issue a permit for the alteration of a grave if it is satisfied that every reasonable effort has been made to contact and obtain permission from the families concerned.

The removal of graves is subject to the following procedures as outlined by the SAHRA:

- Notification of the impending removals (using English, Afrikaans and local language media and notices at the grave site);
- Consultation with individuals or communities related or known to the deceased;
- Satisfactory arrangements for the curation of human remains and / or headstones in a museum, where applicable;
- Procurement of a permit from the SAHRA;

- Appropriate arrangements for the exhumation (preferably by a suitably trained archaeologist) and re-interment (sometimes by a registered undertaker, in a formally proclaimed cemetery);
- Observation of rituals or ceremonies required by the families.

The limitations and assumptions associated with this heritage impact assessment are as follows;

- Sites were evaluated by means of description of the cultural landscape as indicated in the available databases.
- It was assumed that the site layout as provided by Xhariep Plant and Mining (Pty) Ltd. is accurate.
- We assumed that the public participation process performed as part of the Basic Assessment process will be sufficiently encompassing not to be repeated in the Heritage Assessment Phase.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years. (No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.)	No impact	None
	35	Archaeological, paleontological and meteor sites. (No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site.)	No impact	None
	36	Graves and burial sites. (No person may, without a permit issued by SAHRA or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered nu a local authority.)	No impact	None
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA? (This section provides for HIA which are not already covered under the ECA. Where they are covered under the ECA the provincial heritage resources authorities must be notified of a proposed project and must be consulted during the HIA process.)	Yes	HIA
		Regulation GNR 548 published on 2 June 2000 in terms of the NHRA.		

Table 2. NHRA Triggers

Action Trigger	Yes/No	Description
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	No	N/A

Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m ²	Yes	Prospecting Boreholes
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m ²	No	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

3. Methodology

3.1 Heritage Management

This study defines the heritage component of the Basic Assessment (BA) process being undertaken for the proposed percussion boreholes for Xhariep Plant and Mining (Pty) Ltd. This report attempts to evaluate both the accumulated heritage knowledge of the area and information derived from direct physical observations.

3.2 Inventory

Inventory studies involve the listing of previously documented archaeological resources within a proposed development area. The nature and scope of this type of study is defined primarily by the results of this overview study. In the case of site-specific developments, direct implementation of an inventory study may preclude the need for an overview.

There are a number of different methodological approaches to conducting inventory studies. Therefore, the proponent, in collaboration with the archaeological consultant, must develop an inventory plan for review and approval by the SAHRA prior to implementation (*Dincause, Dena F., H. Martin Wobst, Robert J. Hasenstab and David M. Lacy 1984*).

3.3 Evaluating Heritage Impacts

A combination of document research as well as the determination of the geographic suitability of areas and the evaluation of aerial photographs determined which areas could and should be accessed.

After plotting of the site on a GPS the areas were accessed using suitable combinations of vehicle access and access by foot.

Sites were documented by digital photography and geo-located with GPS readings using the WGS 84 datum. An aerial drone was used to evaluate the site from different heights and to improve coverage of the area.

Further techniques (where possible) included interviews with local inhabitants, visiting local museums and information centers and discussions with local experts. All this information was combined with information from an extensive literature study as well as the result of archival studies based on the SAHRA (South African Heritage Resource Agency) provincial databases.

This Heritage Impact Assessment relies on the analysis of written documents, maps, aerial photographs and other archival sources combined with the results of site investigations and interviews with effected people. Site investigations are not exhaustive and often focus on areas such as river confluence areas, elevated sites or occupational ruins.

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRIS (South African Heritage Resources Information System) Database of Heritage Studies
- Historic Maps
- 2622DA_1973, 1990 and 2003 Surveyor General Topographic Map series
- 2622DB_1973, 1990 and 2003 Surveyor General Topographic Map series
- 2622DC_1974, 1990 and 2003 Surveyor General Topographic Map series
- 2622DD_1973, 1990 and 2003 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2016 imagery
- Published articles and books
- JSTOR Article Archive

3.5 Consultations

The surface owners of the properties under application, surrounding landowners and various other identified interested and affected parties were notified of the proposed prospecting activities by means of registered post / email, with a draft BAR / EMPR attached thereto.

Any other interested and / or affected parties were also invited to register as such in advertisements that were placed in the Kathu Gazette (local newspaper) and Volksblad (regional newspaper). A notice board was also placed near the entrance road to the site. As part of this public participation process IAP's were asked to comment on any heritage related issues.

Identified I&AP's:

- Witstam Plase (Pty) Ltd.
- Boskraai Boerdery Trust
- Mr. H.J. le Roux
- Vlakwater Trust
- Saltrim Ranches (Pty) Ltd.
- Mr. H.A.G. Liebenberg
- W.F. du Preez Familie Trust
- Mr. B.G. Oosthuysen
- Mr. J.C. Theart
- Mr. J. Pienaar & Ms. C.M.M. Pienaar
- Mr. J.J. Olivier
- Mr. W.P. van der Walt
- Hauman Testamentere Trust
- Mr. L. Hauman
- National Government of the Republic of South Africa
- Municipal Councillor
- Ga-Segontana Local Municipality
- John Taola Gaetsewe District Municipality
- Eskom
- SANRAL
- Transnet
- Department: Agriculture, Land Reform and Rural Development
- Department: Environment and Nature Conservation
- Department: Public Works
- Department: Water and Sanitation

3.6 Assumptions

It was assumed that the impacted areas will be limited to the proposed percussion borehole footprints. It is furthermore assumed that the *PaleoSensitivity* Map provided on the SAHRIS platform is comprehensive enough to inform on actions in this regard. It is assumed that activities will be limited to prospecting.

3.7 Gaps / Limitations / Uncertainty

Very little information is available in terms of the heritage of this area due to the fact that little to no published research has been done here.

3.8 Specialist Specific Methodology

The scope of work includes:

- the identification and assessment of archaeological, cultural, historic, built and paleontological sites within the study area through the interpretation of landscapes and published information.

- Interrogation of project-specific aerial imagery
- Archival study of existing data and information for the study area
- Impact assessment has been performed according to the methodology as described in the relevant Section.

3.9 Impact Assessment Methodology

Degrees of Significance – Significance Criteria

There are several kinds of significance, including scientific, public, ethnic, historic and economic, that need to be considered when evaluating heritage resources. For any site, explicit criteria are used to measure these values.

Site integrity, or the degree to which a heritage site has been impaired or disturbed as a result of past land alteration, is an important consideration in evaluating site significance. In this regard, it is important to recognize that although an archaeological site has been disturbed, it may still contain important scientific information.

Heritage resources may be of scientific value in two respects. The potential to yield information, which, if properly recovered, will enhance understanding of Southern African human history, is one appropriate measure of scientific significance. In this respect, archaeological sites should be evaluated in terms of their potential to resolve current archaeological research problems. Scientific significance also refers to the potential for relevant contributions to other academic disciplines or to industry.

Public significance refers to the potential a site has for enhancing the public's understanding and appreciation of the past. The interpretive, educational and recreational potential of a site are valid indications of public value. Public significance criteria such as ease of access, land ownership, or scenic setting are often external to the site itself. The relevance of heritage resource data to private industry may also be interpreted as a particular kind of public significance.

Ethnic significance applies to heritage sites which have value to an ethnically distinct community or group of people. Determining the ethnic significance of an archaeological site may require consultation with persons having special knowledge of a particular site. It is essential that ethnic significance be assessed by someone properly trained in obtaining and evaluating such data.

Historic archaeological sites may relate to individuals or events that made an important, lasting contribution to the development of a particular locality or the province. Historically important sites also reflect or commemorate the historic socioeconomic character of an area. Sites having high historical value will also usually have high public value.

The economic or monetary value of a heritage site, where calculable, is also an important indication of significance. In some cases, it may be possible to project monetary benefits derived from the public's use of a heritage site as an educational or recreational facility. This may be accomplished by employing established economic evaluation methods; most of which have been developed for valuating outdoor recreation. The objective is to determine the willingness of users, including local residents and tourists, to pay for the experiences or services the site provides even though no payment is presently being made. Calculation of user benefits will normally require some study of the visitor population (*Smith, L.D. 1977*).

- **Rarity**
 - It possesses uncommon, rare or endangered aspects of natural or cultural heritage.
 - Importance for rare, endangered or uncommon structures, landscapes or phenomena.
- **Representivity**
 - It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects.
 - Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class.

- Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.

The table below illustrates how a site's heritage significance is determined

Table 3. Site's Heritage Significance

Spheres of Significance	High	Medium	Low
International			
National			
Provincial			
Regional			
Local			
Specific Community			

4. Assessment of Heritage Potential

4.1 Assessment Matrix

4.1.1 Determining Archaeological Significance

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (J) and Whitelaw (1997) for assessing archaeological significance has been developed for Eastern Cape settings (Morris 2007a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 4 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon and, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes any trace, even of only Type 1 quality, could be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation.

Table 4. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, NMC as used in Morris)

Class	Landform	Type 1	Type 2	Type 3
L1	Rocky Surface	Bedrock exposed	Some soil patches	Sandy/grassy patches
L2	Ploughed land	Far from water	In floodplain	On old river terrace
L3	Sandy ground, inland	Far from water	In floodplain or near features such as hill/dune	On old river terrace
L4	Sandy ground, coastal	>1 km from sea	Inland of dune cordon	Near rocky shore
L5	Water-logged deposit	Heavily vegetated	Running water	Sedimentary basin
L6	Developed urban	Heavily built-up with no known record of early settlement	Known early settlement, but buildings have basements	Buildings without extensive basements over known historical sites
L7	Lime/dolomite	>5 myrs	<5000 yrs	Between 5000 yrs and 5 myrs
L8	Rock shelter	Rocky floor	Loping floor or small area	Flat floor, high ceiling
Class	Archaeological traces	Type 1	Type 2	Type 3
A1	Area previously excavated	Little deposit remaining	More than half deposit remaining	High profile site
A2	Shell of bones visible	Dispersed scatter	Deposit <0.5 m thick	Deposit >0.5 m thick; shell and bone dense
A3	Stone artefacts or stone walling or other feature visible	Dispersed scatter	Deposit <0.5m thick	Deposit >0.5 m thick

Table 5. Site attributes and value assessment (adopted from Whitelaw 1997 as used in Morris)

Class	Landforms	Type 1	Type 2	Type 3
1	Length of sequence /context	No sequence Poor context	Limited sequence	Long sequence Favourable context

		Dispersed distribution		High density of arte / ecofacts
2	Presence of exceptional items (incl. regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

4.2 Assessing site value by attribute

Table 5 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

4.3 Impact Statement

4.3.1 Assessment of Impacts

A heritage resource impact may be broadly defined as the net change between the integrity of a heritage site with and without the proposed development. This change may be either beneficial or adverse.

Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource. For example, development may have a beneficial effect by preventing or lessening natural site erosion. Similarly, an action may serve to preserve a site for future investigation by covering it with a protective layer of fill. In other cases, the public or economic significance of an archaeological site may be enhanced by actions, which facilitate non-destructive public use. Although beneficial impacts are unlikely to occur frequently, they should be included in the assessment.

More commonly, the effects of a project on heritage sites are of an adverse nature. Adverse impacts occur under conditions that include:

- a) destruction or alteration of all or part of a heritage site;
- b) isolation of a site from its natural setting; and
- c) introduction of physical, chemical or visual elements that are out-of-character with the heritage resource and its setting.

Adverse effects can be more specifically defined as direct or indirect impacts. Direct impacts are the immediately demonstrable effects of a project which can be attributed to particular land modifying actions. They are directly caused by a project or its ancillary facilities and occur at the same time and place. The immediate consequences of a project action, such as slope failure following reservoir inundation, are also considered direct impacts.

Indirect impacts result from activities other than actual project actions. Nevertheless, they are clearly induced by a project and would not occur without it. For example, project development may induce changes in land use or population density, such as increased urban and recreational development, which may indirectly impact upon heritage sites. Increased vandalism of heritage sites, resulting from improved or newly introduced access, is also considered an indirect impact. Indirect impacts are much more difficult to assess and quantify than impacts of a direct nature.

Once all project related impacts are identified, it is necessary to determine their individual level-of-effect on heritage resources. This assessment is aimed at determining the extent or degree to which future

opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected by a proposed action. Therefore, the assessment provides a reasonable indication of the relative significance or importance of a particular impact. Normally, the assessment should follow site evaluation since it is important to know what heritage values may be adversely affected.

The assessment should include careful consideration of the following level-of-effect indicators, which are defined below:

- magnitude
- severity
- duration
- range
- frequency
- diversity
- cumulative effect
- rate of change

4.4 Indicators of Impact Severity

Magnitude

The amount of physical alteration or destruction, which can be expected. The resultant loss of heritage value is measured either in amount or degree of disturbance.

Severity

The irreversibility of an impact. Adverse impacts, which result in a totally irreversible and irretrievable loss of heritage value, are of the highest severity.

Duration

The length of time an adverse impact persists. Impacts may have short-term or temporary effects, or conversely, more persistent, long-term effects on heritage sites.

Range

The spatial distribution, whether widespread or site-specific, of an adverse impact.

Frequency

The number of times an impact can be expected. For example, an adverse impact of variable magnitude and severity may occur only once. An impact such as that resulting from cultivation may be of recurring or on-going nature.

Diversity

The number of different kinds of project-related actions expected to affect a heritage site.

Cumulative Effect

A progressive alteration or destruction of a site owing to the repetitive nature of one or more impacts.

Rate of Change

The rate at which an impact will effectively alter the integrity or physical condition of a heritage site. Although an important level-of-effect indicator, it is often difficult to estimate. Rate of change is normally assessed during or following project construction.

The level-of-effect assessment should be conducted and reported in a quantitative and objective fashion. The methodological approach, particularly the system of ranking level-of-effect indicators, must be rigorously documented and recommendations should be made with respect to managing uncertainties in the assessment. (*Zubrow, Ezra B.A., 1984*).

4.4.1 Pre-Contact Sites

There is a high possibility of encountering Stone Age deposits in this area. In mountainous areas rock art and Stone Age shelters could be found. The area is also known to contain and abundance of rock art sites.

4.4.2 Post-Contact Sites

Some farming structures and farm homesteads dating back to the colonial era could be encountered. There is a strong likelihood that burial or cemetery sites associated with these structures could be encountered. Due to the great distances between towns in this area, burials often occurred at home.

4.4.3 Built Environment

Historic Significance

No	Criteria	Significance Rating
1	Are any of the identified sites or buildings associated with a historical person or group? No	N/A
2	Are any of the buildings or identified sites associated with a historical event? No	N/A
3	Are any of the identified sites or buildings associated with a religious, economic social or political or educational activity? No	N/A
4	Are any of the identified sites or buildings of archaeological significance? No	N/A
5	Are any of the identified buildings or structures older than 60 years? No	N/A

Architectural Significance

No	Criteria	Rating
1	Are any of the buildings or structures an important example of a building type? No	N/A
2	Are any of the buildings outstanding examples of a particular style or period? No	N/A
3	Do any of the buildings contain fine architectural details and reflect exceptional craftsmanship? No	N/A
4	Are any of the buildings an example of an industrial, engineering or technological development? No	N/A
5	What is the state of the architectural and structural integrity of the building? No	N/A
6	Is the building's current and future use in sympathy with its original use (for which the building was designed)? N/A	-
7	Were the alterations done in sympathy with the original design? N/A	-
8	Were the additions and extensions done in sympathy with the original design?	

	N/A	-
9	Are any of the buildings or structures the work of a major architect, engineer or builder? No.	N/A

Spatial Significance

Even though each building needs to be evaluated as a single artefact the site still needs to be evaluated in terms of its significance in its geographic area, city, town, village, neighbourhood or precinct. This set of criteria determines the spatial significance.

No	Criteria	Rating
1	Can any of the identified buildings or structures be considered a landmark in the town or city? No	-
2	Do any of the buildings contribute to the character of the neighborhood? No	-
3	Do any of the buildings contribute to the character of the square or streetscape? No	-
4	Do any of the buildings form part of an important group of buildings? No	-

5. Impact Evaluation

This HIA Methodology assists in evaluating the overall effect of a proposed activity on the heritage environment. The determination of the effect of a heritage impact on a heritage parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the heritage practitioner through the process of heritage impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

5.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics, which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

5.2 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the heritage environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

5.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

NATURE		
Including a brief description of the impact of the heritage parameter being assessed in the context of the project. This criterion includes a brief written statement of the heritage aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact		

1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on a heritage parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which heritage resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the heritage parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		

This describes the cumulative effect of the impacts on the heritage parameter. A cumulative effect/impact is an effect, which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects.
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects.
3	Medium Cumulative impact	The impact would result in minor cumulative effects.
4	High Cumulative Impact	The impact would result in significant cumulative effects.
INTENSITY / MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the heritage parameter. The calculation of the significance of an impact uses the following formula:		
(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.		
The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.

74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

5.3 Assessing Visual Impact

Visual impacts of developments result when sites that are culturally celebrated are visually affected by a development. The exact parameters for the determination of visual impacts have not yet been rigidly defined and are still mostly open to interpretation. CNdV Architects and The Department of Environmental Affairs and Development Planning (2006) have developed some guidelines for the management of the visual impacts of wind turbines in the Western Cape, although these have not yet been formalised. In these guidelines they recommend a buffer zone of 1km around significant heritage sites to minimise the visual impact.

Due to the fact that the project will mainly involve sub-surface infrastructure it is not anticipated that any visual impacts will be encountered.

5.4 Assumptions and Restrictions

- It is assumed that the South African Heritage Resources Information System (SAHRIS) database locations are correct
- It is assumed that the paleontological information collected for the project is comprehensive.
- It is assumed that the social impact assessment and public participation process of the Basic Assessment will result in the identification of any intangible sites of heritage potential.

6. Assessment of Impacts

6.1 Impact Statement

6.1.1 Built Environment

Infrastructure:

- On-site gravel (farm) roads
- Secondary gravel roads accessing the farms
- Residences and associated infrastructure
- Windmills and relating agricultural infrastructure

Mitigation

None of the structures will be affected by the proposed prospecting activities.

6.1.2 Cultural Landscape

The following landscape types were identified during the study.

Landscapes Type	Description	Occurrence still possible?	Likely occurrence?
1 Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	Unlikely
2 Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes	Possible
3 Historic Built Environment	<ul style="list-style-type: none"> - Historical townscapes/streetscapes - Historical structures; i.e. older than 60 years - Formal public spaces - Formally declared urban conservation areas - Places associated with social identity/displacement 	No	No
4 Historic Farmland	<p>These possess distinctive patterns of settlement and historical features such as:</p> <ul style="list-style-type: none"> - Historical farm yards - Historical farm workers villages/settlements - Irrigation furrows - Tree alignments and groupings - Historical routes and pathways - Distinctive types of planting - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting. 	No	No
5 Historic rural town	<ul style="list-style-type: none"> - Historic mission settlements - Historic townscapes 	No	No
6 Pristine natural landscape	<ul style="list-style-type: none"> - Historical patterns of access to a natural amenity - Formally proclaimed nature reserves - Evidence of pre-colonial occupation - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages 	No	No

	<ul style="list-style-type: none"> - Historical structures/settlements older than 60 years - Pre-colonial or historical burial sites - Geological sites of cultural significance. 		
7 Relic Landscape	<ul style="list-style-type: none"> - Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement, 	No	No
8 Burial grounds and grave sites	<ul style="list-style-type: none"> - Pre-colonial burials (marked or unmarked, known or unknown) - Historical graves (marked or unmarked, known or unknown) - Graves of victims of conflict - Human remains (older than 100 years) - Associated burial goods (older than 100 years) - Burial architecture (older than 60 years) 	Yes,	Possible
9 Associated Landscapes	<ul style="list-style-type: none"> - Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes - Sites associated with displacement & contestation - Sites of political conflict/struggle - Sites associated with an historic event/person - Sites associated with public memory 	No	No
10 Historical Farmyard	<ul style="list-style-type: none"> - Setting of the yard and its context - Composition of structures - Historical/architectural value of individual structures - Tree alignments - Views to and from - Axial relationships - System of enclosure, e.g. defining walls - Systems of water reticulation and irrigation, e.g. furrows - Sites associated with slavery and farm labour - Colonial period archaeology 	No	No
11 Historic institutions	<ul style="list-style-type: none"> - Historical prisons - Hospital sites - Historical school/reformatory sites - Military bases 	No	No
12 Scenic visual	<ul style="list-style-type: none"> - Scenic routes 	No	No
13 Amenity landscape	<ul style="list-style-type: none"> - View sheds - View points - Views to and from - Gateway conditions - Distinctive representative landscape conditions - Scenic corridors 	No	No

6.1.3 Natural Landscape

The application area's altitude varies between 995m and 1 030m above sea level.

The landscape features for the areas located with the Molopo Bushveld Vegetation type can be described as follows: open woodland to a closed shrubland with *Acacia erioloba* and *Boscia Albitrunca* trees and *Lycium cinereum*, *L. hirsutum* and *Rhigozum trichotomum* shrubs. A grass layer is well developed in parts of the northeast, but usually fairly open.

The landscape features for the areas located within the Gordonia Duneveld Vegetation type can be described as follows: Parallel dunes about 3-8m above the plains.

The landscape features for the area located within the Kathu Bushveld Vegetation type can be described as follows: medium-tall tree layer with *Acacia erioloba* in places, but mostly open and including *Boscia albitrunca* as the predominant trees. The shrub layer generally consists of *A. mellifera*, *Diospyros lyciodes* and *Lycium hirsutum*. A grass layer is variable in cover.

There are a number of ephemeral pans within the application area.

6.1.4 Current Land Uses

The surface owners currently utilize the land under application for livestock farming purposes.

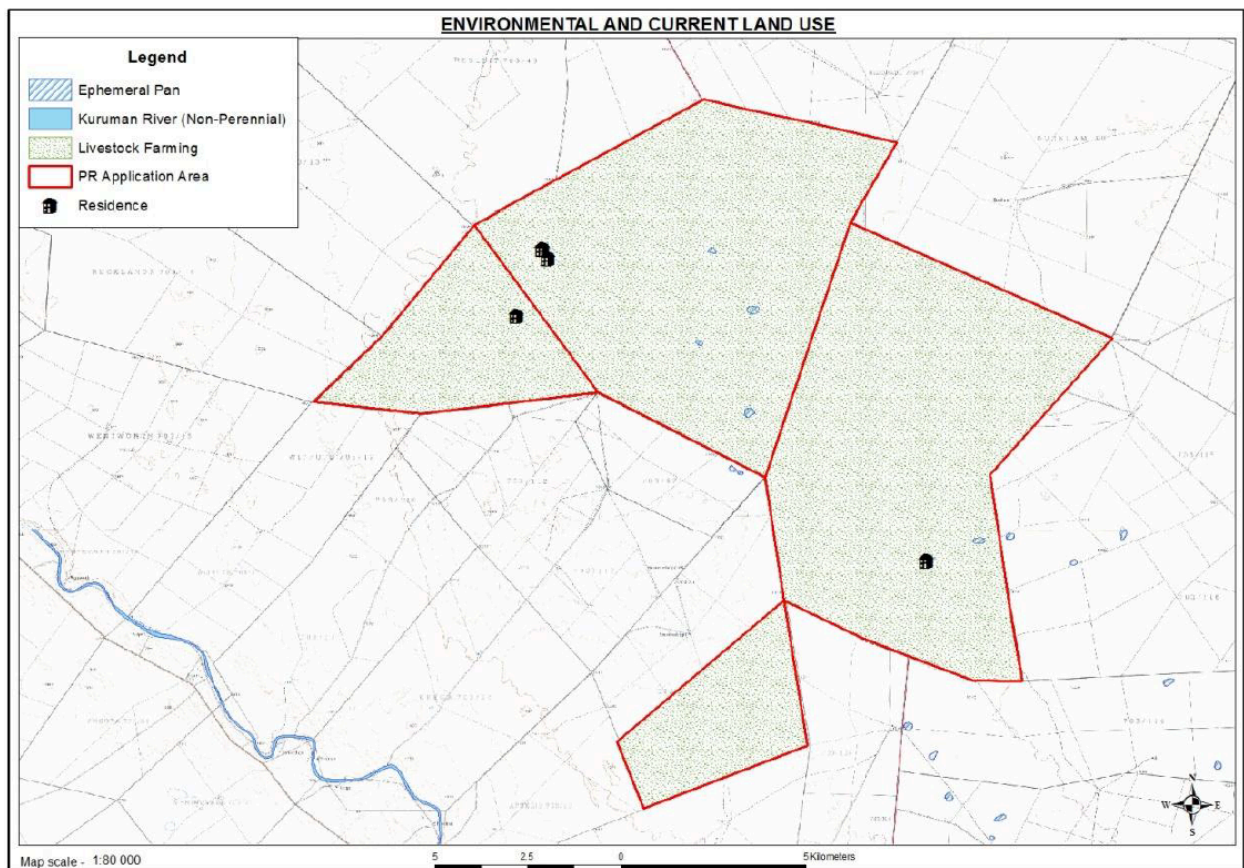


Figure 3. Environmental and Current Land Use

7. Measuring Impacts

In 2003 the SAHRA (South African Heritage Resources Agency) compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

- **Type of Resource**
 - Place
 - Archaeological Site
 - Structure
 - Grave
 - Palaeontological Feature
 - Geological Feature

- **Type of Significance**
 - Historic Value
 - Important in the community, or pattern of history
 - Important in the evolution of cultural landscapes and settlement patterns
 - Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
 - Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
 - Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.
 - It has strong or special association with the life or work of a person, group or organisation of importance in history
 - Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.
 - It has significance relating to the history of slavery
 - Importance for a direct link to the history of slavery in South Africa.

 - Aesthetic Value
 - It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.
 - Important to a community for aesthetic characteristics held in high esteem or otherwise valued by the community.
 - Importance for its creative, design or artistic excellence, innovation or achievement.
 - Importance for its contribution to the aesthetic values of the setting demonstrated by a landmark quality or having impact on important vistas or otherwise contributing to the identified aesthetic qualities of the cultural environs or the natural landscape within which it is located.
 - In the case of an historic precinct, importance for the aesthetic character created by the individual components which collectively form a significant streetscape, townscape or cultural environment.

 - Scientific Value
 - It has potential to yield information that will contribute to an understanding of natural or cultural heritage
 - Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
 - Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.

- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

a) Does the site contain evidence, which may substantively enhance understanding of culture history, culture process, and other aspects of local and regional prehistory?

- internal stratification and depth
- chronologically sensitive cultural items
- materials for absolute dating
- association with ancient landforms
- quantity and variety of tool type
- distinct intra-site activity areas
- tool types indicative of specific socio-economic or religious activity
- cultural features such as burials, dwellings, hearths, etc.
- diagnostic faunal and floral remains
- exotic cultural items and materials
- uniqueness or representativeness of the site
- integrity of the site

b) Does the site contain evidence which may be used for experimentation aimed at improving archaeological methods and techniques?

- monitoring impacts from artificial or natural agents
- site preservation or conservation experiments
- data recovery experiments
- sampling experiments
- intra-site spatial analysis

c) Does the site contain evidence which can make important contributions to paleo environmental studies?

- topographical, geomorphological context
- depositional character
- diagnostic faunal, floral data

d) Does the site contain evidence which can contribute to other scientific disciplines such as hydrology, geomorphology, pedology, meteorology, zoology, botany, forensic medicine, and environmental hazards research, or to industry including forestry and commercial fisheries?

○ Social Value / Public Significance

- It has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Importance as a place highly valued by a community or cultural group for reasons of social, cultural, religious, spiritual, symbolic, aesthetic or educational associations.
- Importance in contributing to a community's sense of place.

a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

- integrity of the site

- technical and economic feasibility of restoration and development for public use
 - visibility of cultural features and their ability to be easily interpreted
 - accessibility to the public
 - opportunities for protection against vandalism
 - representativeness and uniqueness of the site
 - aesthetics of the local setting
 - proximity to established recreation areas
 - present and potential land use
 - land ownership and administration
 - legal and jurisdictional status
 - local community attitude toward development
- b) Does the site receive visitation or use by tourists, local residents or school groups?
- Ethnic Significance

Does the site presently have traditional, social or religious importance to a particular group or community?

 - ethnographic or ethno-historic reference
 - documented local community recognition or, and concern for, the site
 - Economic Significance

What value of user-benefits may be placed on the site?

 - visitors' willingness-to-pay
 - visitors' travel costs
 - Scientific Significance

a) Does the site contain evidence, which may substantively enhance understanding of historic patterns of settlement and land use in a particular locality, regional or larger area?

b) Does the site contain evidence, which can make important contributions to other scientific disciplines or industry?
 - Historic Significance

a) Is the site associated with the early exploration, settlement, land use, or other aspect of southern Africa's cultural development?

b) Is the site associated with the life or activities of a particular historic figure, group, organization, or institution that has made a significant contribution to, or impact on, the community, province or nation?

c) Is the site associated with a particular historic event whether cultural, economic, military, religious, social or political that has made a significant contribution to, or impact on, the community, province or nation?

d) Is the site associated with a traditional recurring event in the history of the community, province, or nation, such as an annual celebration?
 - Public Significance

a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

 - visibility and accessibility to the public
 - ability of the site to be easily interpreted
 - opportunities for protection against vandalism
 - economic and engineering feasibility of reconstruction, restoration and maintenance
 - representativeness and uniqueness of the site
 - proximity to established recreation areas
 - compatibility with surrounding zoning regulations or land use

- land ownership and administration
 - local community attitude toward site preservation, development or destruction
 - present use of site
- b) Does the site receive visitation or use by tourists, local residents or school groups?
- o Other
- Is the site a commonly acknowledged landmark?
 - Does, or could, the site contribute to a sense of continuity or identity either alone or in conjunction with similar sites in the vicinity?
 - Is the site a good typical example of an early structure or device commonly used for a specific purpose throughout an area or period of time?
 - Is the site representative of a particular architectural style or pattern?

For each predicted impact, criteria are described. These criteria include the **magnitude** (size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale), as well as the **probability** (likelihood). The methodology is quantitative and generated through a spreadsheet but requires professional judgement in the application of the criteria.

When assessing impacts, broader considerations are also considered, these include the **confidence** with which the assessment was undertaken, the **reversibility** of the impact and the resource **irreplaceability**.

Calculations
(as applied in the excel spreadsheet 'Xhariep 2020.xls')

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **magnitude** (size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (magnitude + duration + extent).

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

The following tables show the scales used to classify the above variables and define each of the rating categories.

7.1 Magnitude

The magnitude refers to the degree of alteration of the affected environmental receptor. The relevant descriptor for magnitude is selected by the user (refer to Table).

Table 6. Description of magnitude and assigned numerical values

Numerical Rating	Magnitude	
	Category	Descriptors
1	Negligible	Natural and/ or social functions and/ or processes are negligibly altered

2	Very low	Natural and/ or social functions and/ or processes are slightly altered
3	Low	Natural and/ or social functions and/ or processes are somewhat altered
4	Moderate	Natural and/ or social functions and/ or processes are moderately altered
5	High	Natural and/ or social functions and/ or processes are notably altered
6	Very high	Natural and/ or social functions and/ or processes are majorly altered
7	Extremely high	Natural and/ or social functions and/ or processes are severely altered

*NOTE: Where applicable, the magnitude of the impact is related to a relevant standard or threshold or is based on specialist knowledge and understanding of that particular field.

7.2 Duration

The duration refers to the length of permanence of the impact on the environmental receptor. The relevant descriptor for duration is selected by the user (refer to Table).

Table 7. Description of duration and assigned numerical values

Numerical Rating	Duration	
	Category	Descriptors
1	Immediate	Impact will self-remedy immediately
2	Brief	Impact will not last longer than 1 year
3	Short term	Impact will last between 1 and 5 years
4	Medium term	Impact will last between 5 and 10 years
5	Long term	Impact will last between 10 and 15 years
6	On-going	Impact will last between 15 and 20 years
7	Permanent	Impact may be permanent, or in excess of 20 years

7.3 Extent

The extent refers to the geographical scale of impact on the environmental receptor. The relevant descriptor for extent is selected by the user (refer to Table).

Table 8. Description of extent and assigned numerical values

Numerical Rating	Extent	
	Category	Descriptors
1	Very limited	Impacts very limited / felt in isolated areas of the study area
2	Limited	Impacts limited to specific parts of the study area
3	Local	Impacts felt mostly throughout the study area
4	Municipal area	Impacts felt outside the study area, at a municipal level

5	Regional	Impacts felt outside the study area, at a regional / provincial level
6	National	Impacts felt outside the study area, at a national level
7	International	Impacts felt outside the study area, at an international level

7.4 Probability

To calculate the significance of an impact, the probability (or likelihood) of that impact occurring is also taken into account. (Refer to Table).

Table 9. Definition of probability ratings

Numerical Rating	Probability	
	Category	Descriptors
1	Highly unlikely / None	Expected never to happen
2	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
3	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
4	Probable	Has occurred here or elsewhere and could therefore occur
5	Likely	The impact may occur
6	Almost certain / Highly probable	It is most likely that the impact will occur
7	Certain / Definite	There are sound scientific reasons to expect that the impact will definitely occur

7.5 Significance

These are auto-calculated in the spreadsheet as described above and includes the following categories in Table 11. This table is for illustration only.

Table 10. Application of significance ratings

Range		Significance rating
-147	-109	Major (-)
-108	-73	Moderate (-)
-72	-36	Minor (-)
-35	-1	Negligible (-)
0	0	Neutral
1	35	Negligible (+)
36	72	Minor (+)
73	108	Moderate (+)

109	147	Major (+)
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The following, broader considerations will also be considered. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in Tables 12, 13 and 14 respectively.

Table 11. Definition of confidence ratings

Rating	Descriptor
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 12. Definition of reversibility ratings

Rating	Descriptor
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 13. Definition of irreplaceability ratings

Rating	Descriptor
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere

8. Description of Affected Environment

8.1 Map of Key Features

No sites were identified within the proposed study area and as such a Key Features Map would be redundant.

8.1.1 Findings

There is a possibility of encountering undocumented Stone Age deposits over the whole area as well as a possibility of encountering rock art sites in mountainous areas.

9. Baseline

Context Relevant to Project Location, Design, Operation, or Mitigation Decisions

9.1 Palaeontology

The online *PalaeoSensitivity* map on the SAHRIS website has been used to determine the sensitivity of the application area. In terms of this map the sensitivity of the application area falls within the green demarcation and is thus rated moderately sensitive, requiring a desktop study.

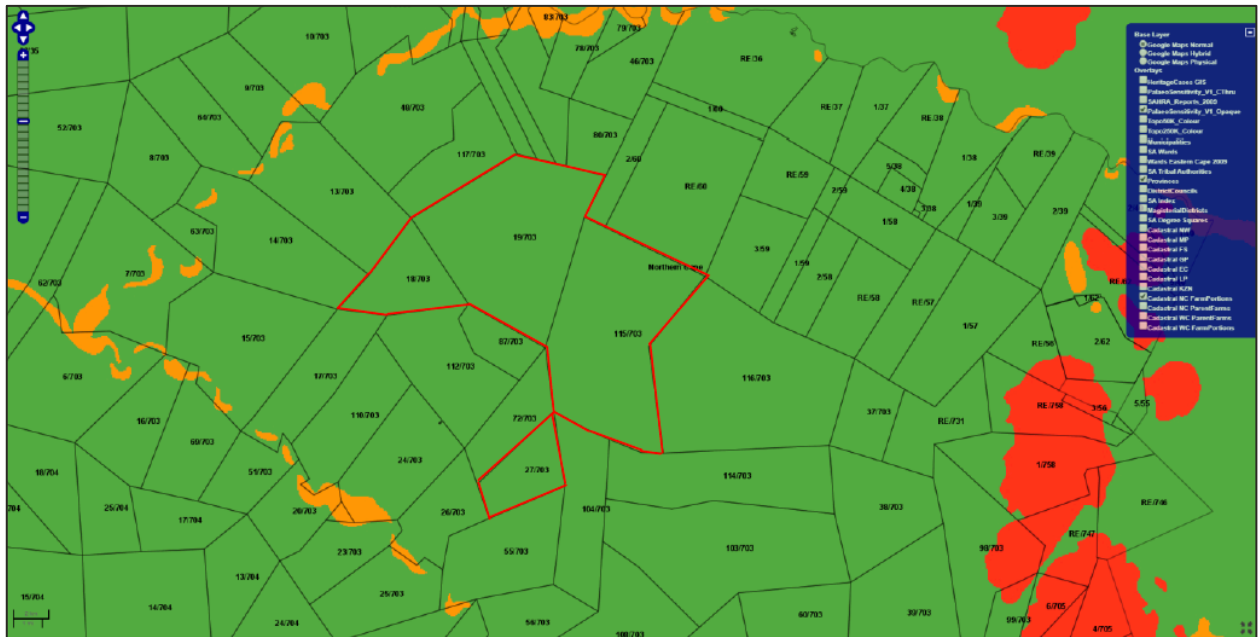


Figure 4. PalaeoSensitivity Map

Table 14. Palaeontological Sensitivity Classification

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

9.2 Stone Age

This area is home to all three of the known phases of the Stone Age, namely: The Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 22 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoi San cultural groups.

Early to Middle Stone Age sites are less common in this area, however rock-art sites and Late Stone Age sites are much better known (Clark 1959).

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods (Deacon 1984). This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades.

Specifically, The Wonderwerk Cave in the Kururman hills has provided much Stone Age information (Beaumont 1984, 2006).

Specularite mining is noted by Beaumont and Bashier (1974) at Doornfontein and Blinkklipkop between 800AD – 820AD.

A limited number of Rock-Art sites are located in this area, mostly due to the lack of suitable shelter sites.

9.3 Iron Age

Although there is documentary evidence of the large Iron Age Tswana village, Dithakong, located in the general area of the site the occurrence of this is still hotly contested and the findings of Cobbing have been largely discredited (Cobbing 1988, SAHRA ARC pers. comm).

More recent research by Jacobs shows occupational Tswana sites to occur during the later “Bantu Expansion” and “Proto-Difqane between c1750 and 1830 in the study area. Specifically, the Tlhaping and Tlharo chiefdoms are referred to here (N. J. Jacobs, 199). It is even suggested that some Sotho-Tswana people might have preceded the Tlhaping and Tlharo in this region. This is however not a recent postulation since Ellenberger and MacGregor already proposed earlier Iron Age communities in these areas as early as 1912 (Ellenberger & MacGregor, 1912).

Tswana Industry groups might have continued the specularite mining noted in the Stone Age during the Iron Age in this area from 1600 on.

According to Breutz (1963) Iron Age settlements could be found as far south as Gatlhose and Majeng, which are both within 25km of the study area. Such sites have also been identified at Danielskuil (Snyman, 1986). These groups were eventually driven from the area by the Kora (Snyman, 1986).

9.4 Historic Era

The precolonial history of the Northern Cape is reflected in a rich, mainly Stone Age, archaeological heritage. Cave sites include Wonderwerk Cave near Kuruman, which has a uniquely long sequence stretching from the turn of the twentieth century at the surface to more than 1 million (and possibly nearly 2 million) years in its basal layer (where stone tools, occurring in very low density, may be Oldowan).

Many sites across the province, mostly in open air locales or in sediments alongside rivers or pans, document Earlier, Middle and Later Stone Age habitation. From Later Stone Age times, mainly, there is a wealth of rock art sites – most of which are in the form of rock engravings such as at Wildebeest Kuil and many sites in the area known as IXam -ka !kau, in the Karoo. They occur on hilltops, slopes, rock outcrops and occasionally (as in the case of Driekops Eiland near Kimberley), in a river bed.

In the north eastern part of the province there are sites attributable to the Iron Age such as Dithakong. Environmental factors have meant that the spread of Iron Age farming westwards (from the 17th century – but dating from the early first millennium AD in the eastern part of South Africa) was constrained mainly to the area east of the Langeberg Mountains, but with evidence of influence as far as the Upington area in the eighteenth century. From that period the archaeological record also reflects the development of a complex colonial frontier when precolonial social formations were considerably disrupted and there is an increasing 'fabric heavy' imprint of built structures, ash-heaps, and so on.

The copper mines of Namaqualand, the diamond rush to the Kimberley and the manganese mines surrounding the study area resulted in industrial archaeological landscapes in those areas which herald the modern era in South African history.

Mfecane (also known as Difaquane or Lifaqane) was a period between 1815 and 1840 of widespread chaos and warfare among the indigenous ethnic communities in Southern Africa. Although the Northern Cape Province was not as severely affected by the Mfecane as the rest of the country, the displacement of the Tlokwa, Foken, Hlakwana and Phuting tribal groups triggered unrest.

The Great Trek of the Boers from the Cape (1836) brought large numbers of Voortrekkers up to the border of large regions known as Bechuanaland and Griqualand West, thereby coming into contact with the indigenous people of the areas. Conflicts centred around land claims between the Boers and the Tswana communities escalated in the 1860's.

The first Geologist to have surveyed the Northern Cape was Dr. A. W. Rogers of the Geological Commission of the Cape Colony in 1906. One of the features he noted was a small hill called Black Rock and reported on the presence of manganese ore at the base of the hill. In 1940 Associated Manganese Mines of South Africa acquired the manganese outcrop known as Black Rock and shortly afterwards started mining the deposit. The ore is extracted by both underground and open cast operations. Mines in the area include Wessels, N'Chwaning I, N'Chwaning II, Black Rock, Hotazel, Langdon, Devon, Perth, Smart, Adams, Mamatwan (largest opencast mine in the area), Middleplaats and Gloria. Gloria Mine was opened in 1978 (Kusel et.al. 2009: 3).

The strata bound ore deposits of the Kalahari Manganese field represent the largest land bound sedimentary manganese deposits in the world and originated from a single episode of manganese deposition about 2200 million years ago. A widespread hypothermal event occurred in the north western portion of the Kalahari Manganese field 1300 million years ago with temperatures reaching a maximum of 450 degrees centigrade in the Wessels, N'Chwaning and Black Rock areas. This event resulted in the upgrading of the Manganese- content of the ore and produced a wide range of rare minerals as well as mineral assemblages. Of the approximately 150 minerals, 10 have to date only been found in the Kalahari manganese field and a further 26 are found at four or fewer mineral localities worldwide (Kusel et.al. 2009: 3).

The town of Hotazel was registered in the 1950's, the name being a play on words meaning "hot as hell".

The Blinkklipkop (Blinkklip) site researched by Thackeray and Beaumont in the 1980's, could also be identified from sketches and descriptions by Burchell documented during his 1813 expedition through the area (Thackeray, 1983). The site is approximately 180km from the study area.

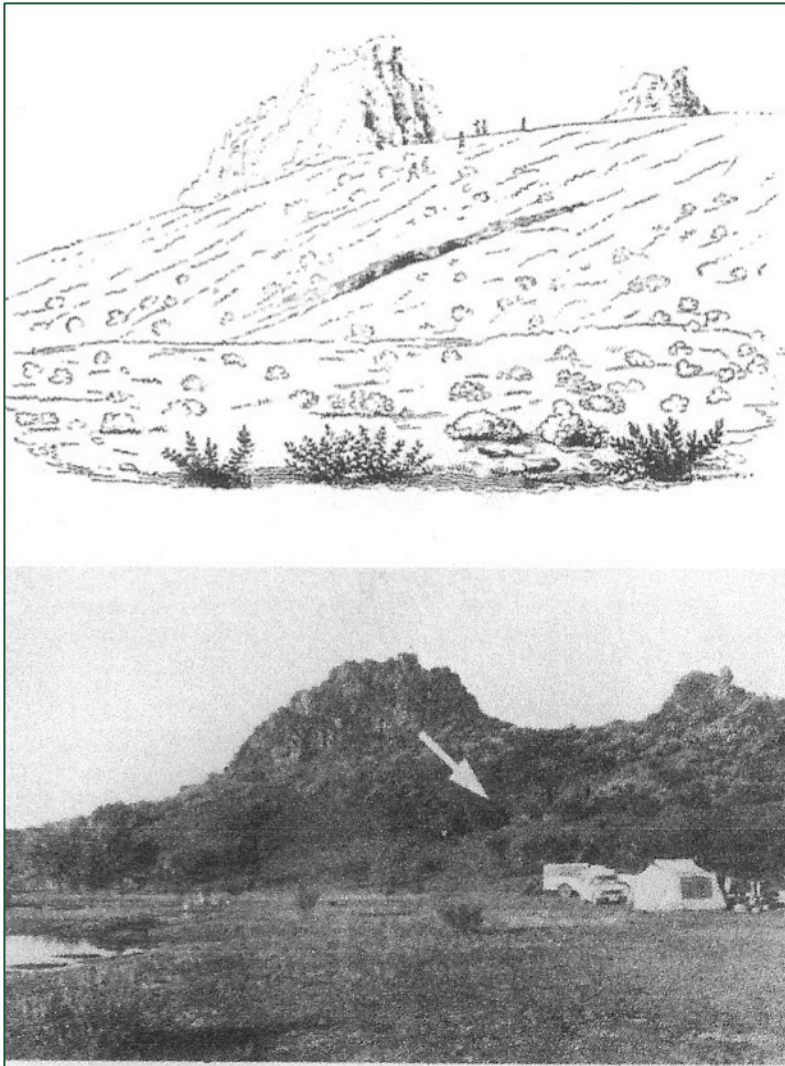
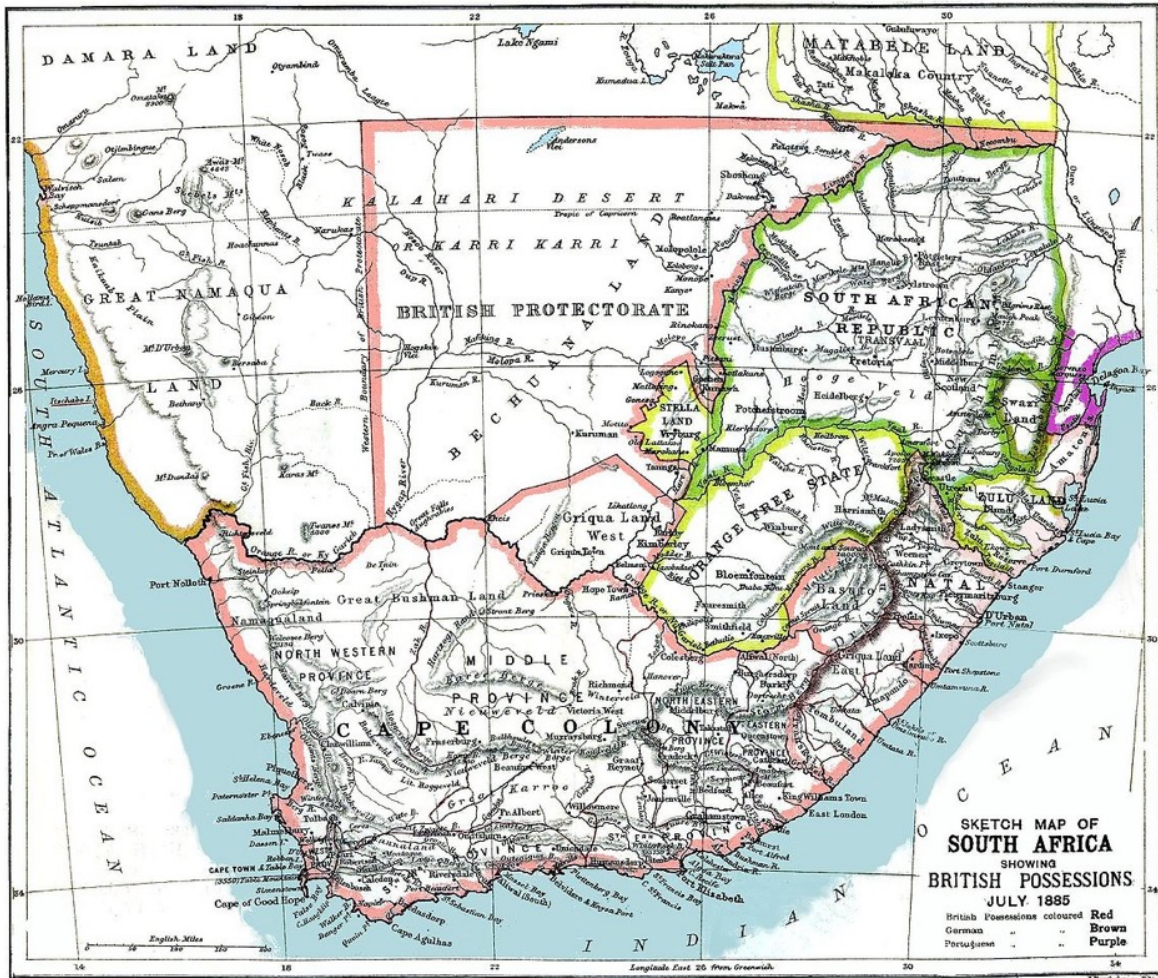


Figure 5. Sketch by Burchell compared by Thakeray (Thakeray, Tjackera & Beaumont, 1983)

By 1820 the Griqua was settling in the Blinkklipkop area (Legassick, 2010) to be followed by the Thlaro group under Isaak Thupane who settled close to present day Postmasburg (Breutz 1963). During the 1860's diamonds were discovered in the area leading to the British annexation of Griqualand in 1871 and the renaming as *Griqua Land West* (Legassick, 2010).



Scottish Geographical Magazine, 1885.

Figure 6. Historic Map showing Griqua Land West (Scottish Geographic Magazine, 1885)

After 1800 the Cape Government sent scouting parties out to the area. The Griqua Leader, Willem Visser settled on Blinkklipkop and it became a permanent Griqua outpost. The London Mission Society started a mission station, named Sibling, on Blinkklip in 1833.

With the outbreak of war between the British and the Boer Republics on 11 October 1899, this area was annexed by Boer Commandoes and was held for the next eight months. By March 1900 the whole Griqua Land West was under the control of Boer Commander P J de Villiers.

Sources:

- <https://www.sahistory.org.za/article/political-changes-1750-1835>
- <https://www.britannica.com/place/Northern-Cape>
- <https://www.sahistory.org.za/place/northern-cape>

Beaumont, P.B.; Vogel, J.C. 2006. "On a timescale for the past million years of human history in central South Africa". South African Journal of Science (102): 217-228.

Chazan, M; Ron, H.; Matmon, A.; Porat, N.; Goldberg, P.; Yates, R.; Avery, M.; Sumner, A.; Horwitz, L.K. 2008. Radiometric dating of the Earlier Stone Age sequence in Excavation I at Wonderwerk Cave, South Africa: preliminary results." Journal of Human Evolution. 55 (1):1-11.

Parkington, J.; Morris, D.; Rusch, N. 2008. Karoo rock engravings. Clanwilliam: Krakadouw Trust.

Morris, D.; Beaumont, P. 2004. Archaeology in the Northern Cape: some key sites. Kimberley: McGregor Museum.

9.5 Archival Research

Three main sources of information regarding the heritage sensitivity of this area could be identified. These were;

- Scientific publications on heritage related research in the area
- Previous heritage studies in the area as per the SAHRIS database
- Historic maps and figures as available in the National Archive

Scientific publications

Several publications on heritage related work in this area could be sourced. These include, but are not limited to;

- Humphreys, A.J.B. *Note on the Southern Limits of Iron Age Settlement in the Northern Cape*. The South African Archaeological Bulletin, Vol 31, No. 121/122 (jun., 1976), pp. 54-57.
- Forssman, T.R., Kuman, K, Leader, G.M., Gibbon, R.J. *A Later Stone Age Assemblage from Canteen Kopje, Northern Cape*. The South African Archaeological Bulletin, Vol. 65, No. 192 (December 2010), pp. 204-214.
- Couzens, R., Sadr, K. *Rippled Ware at Blinklipkop, Northern Cape*. The South African Archaeological Bulletin, Vol. 65, No. 192 (December 2010), pp. 196 – 203.
- Rudner, J., Rudner, I. *Rock-Art in the Thirstland Areas*. The South African Archaeological Bulletin, Vol.23, No. 91 (Dec., 1968), pp. 75-89.
- Humphreys, A.J.B., *Cultural Material from Burials on the Farm St. Cair, Douglas Area, Northern Cape*. The South African Archaeological Bulletin, Vol 37, No. 136 (Dec. 1982), pp. 68-70.

The literature study of the above publications resulted in several findings that guided investigations regarding the study area. The main points are;

- The identification of five pre-colonial specularite mines in the immediate vicinity of Postmasburg as identified by P.B. Beaumont and A.K. Boshier. These are as follows;
 1. Doornfontein – This is a site with a maximum length of 100m consisting of four chambers from which at least an estimated 45 000 metric tons of specularite was removed (Beaumont & Boshier, 1974). Although the specularite mining is discussed in detail there is however no discussion on the reasons for these large scale excavation. It is clear that the workings were that of Stone Age peoples and since specularite does not deliver good material for stone tool manufacture it begs the question why these extensive excavations exist in the first place.

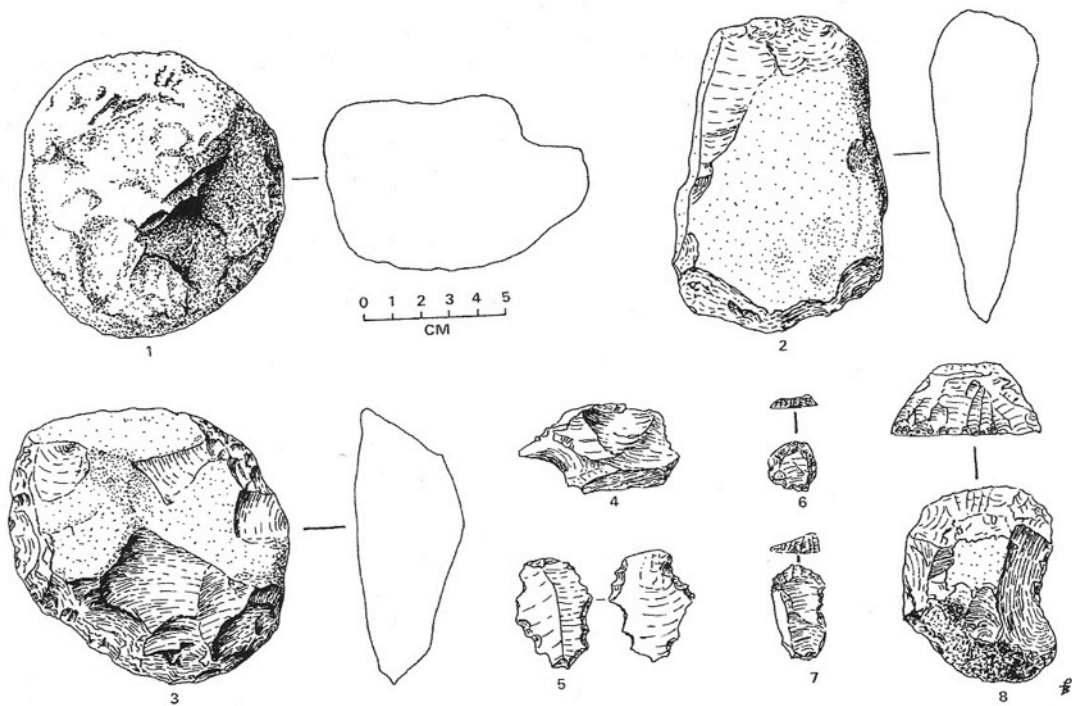


Figure 7. Stone Tools from Doornfontein (Beaumont & Boshier, 1974)

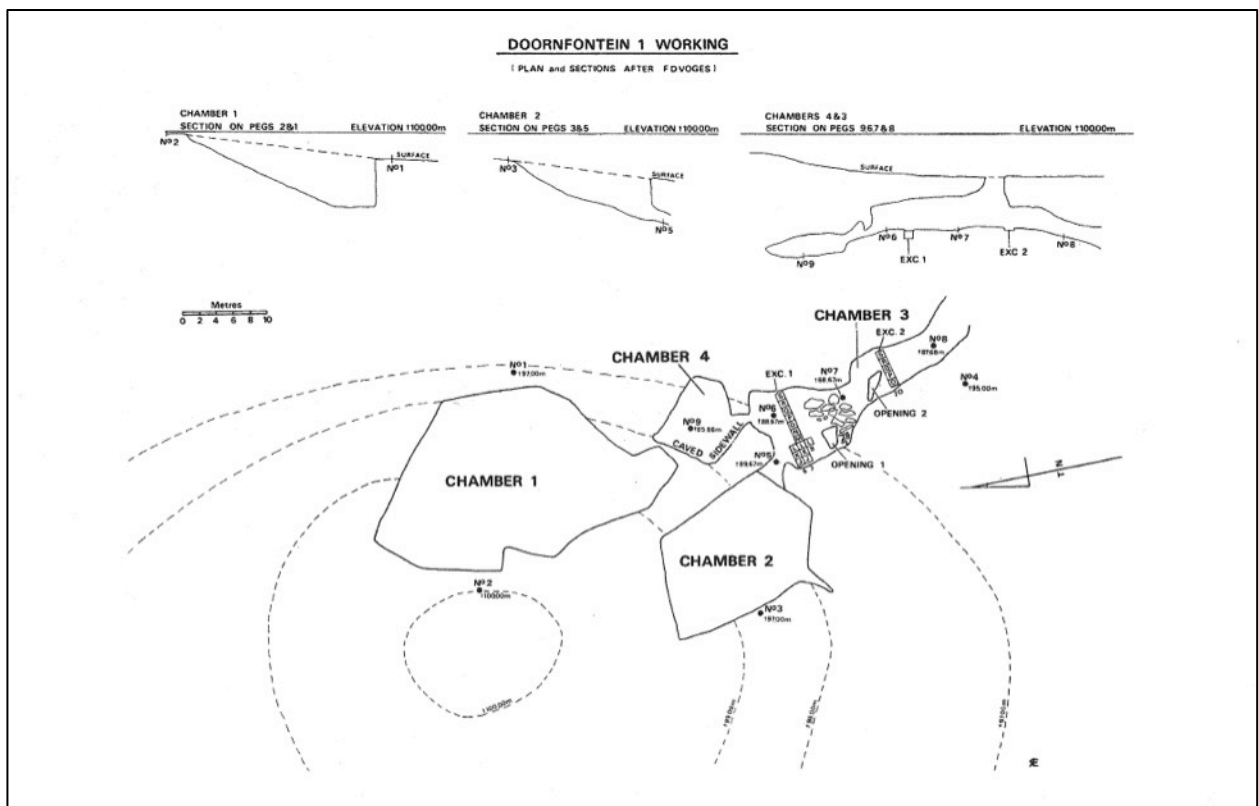


Figure 8. Layout figure for Doornfontein (Beaumont & Boshier, 1974)

2. Blinkklipkop – This is another pre-colonial specularite mine on a hill known as Blinkklipkop or Gatkoppies, 5km north-east of Postmasburg. In this analysis the authors gives a much more detailed description of the use of specularite as a decorative element for body decoration or even pottery decoration. Further examples of specularite use is also described in Burchell (1822-4), Cumming (1850 I:232), Livingstone (1858), Borchers (1861 : 73-4) and Stow (1905 : 436) (Thackeray, Thackeray & Beaumont, 1983). The size and extent of deposits at Blinkklipkop makes this probably the most important of the five sites.

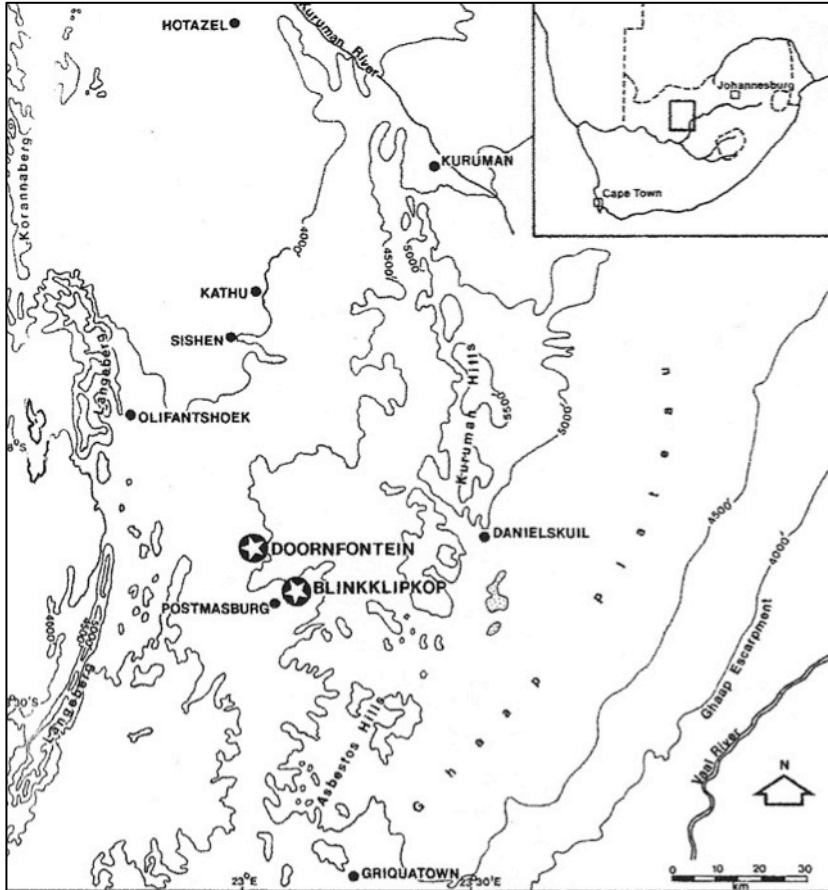


Figure 9. Location of Pre-Colonial Specularite Mines (Thackeray, Thackeray & Beaumont, 1983)

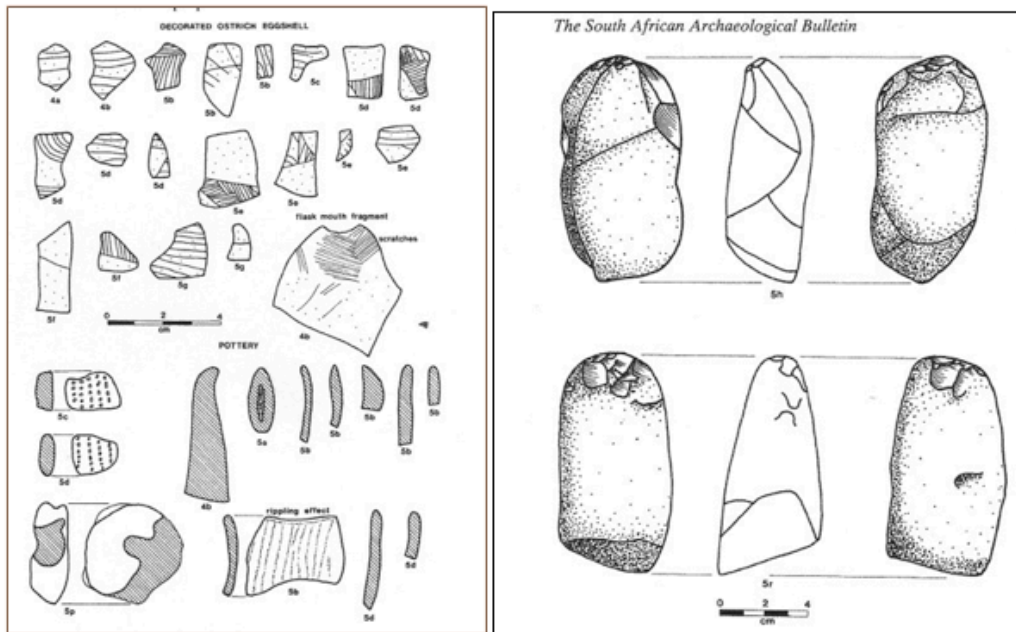


Figure 10. Decorated OEG and Mining Tools from Blinkklipkop (Thackeray, Thackeray & Beaumont, 1983)

3. Paling – Another large concentration of specularite is located on the farm Paling M87, 16km northwest of Postmasburg. The author does not indicate the extent of pre-colonial mining that actually took place here (Thackeray, Thackeray & Beaumont, 1983).
 4. Gloucester – A pre-colonial specularite mine is found on the farm Gloucester, 13,24km north of Postmasburg. Only mining pits are observed here (Thackeray, Thackeray & Beaumont, 1983).
 5. Huxley – The final documented occurrence of specularite mining is on the farm Huxley, 15,30km north of Potsmasburg. Only mining pits located at this site (Thackeray, Thackeray & Beaumont, 1983).
- The identification of petroglyphs of elephant, kudu, ostrich, etc. on the farm Beeshoek. Some geometric symbols similar to *Late Red Art* is also identified here by Judner in 1968 (Judner & Judner, 1969).
 - Petroglyphs are also identified at Koegrabie on the farm Eindgoed (Rudner & Rudner, 1968).

Significance of Scientific Information for the Study Area

The above information when analysed in detail forms a matrix within which the study area can be analysed, it furthermore also gives guidance to investigators to ensure that fieldwork is focussed on the possible occurrence of sites and features as outlined in these studies. The main points that have been derived from these studies are the possible occurrence of the following features within the study area;

- Possible pre-colonial specularite mining activities
- Sites with petroglyph rock art
- Sites with mining implements from the Stone Age
- Stone tool manufacturing sites

9.6 SAHRIS Database Studies

An extensive research into the SAHRIS database resulted in the identification of the following heritage related studies that have been performed over the last decade in the study area. Only studies within a radius of 50km from the study area were considered.

- Rossouw, L. 2012. Phase 1 Archaeological Impact Assessment of three proposed borrow pits along the R31 between Kuruman and Hotazel.
- De Kock, S. 2019. Integrated Heritage Impact Assessment – Proposed Hotazel Solar and Grid Connection on Remaining Extent (Portion 0) of the Farm York A 279, Remainder of Far, Hotazel 280 and Portion 11 of Farm York A 279. District of Hotazel, Northern Cape Province.
- Pelsler, A. 2012. A report on a Heritage Impact Assessment (AIA) for the Proposed photo-voltaic solar power generation plan on the Farm Adams 328 near Hotazel in the Northern Cape.
- 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.
- Pistorius, J.C.C. 2008. A Phase 1 heritage impact assessment (HIA) study for a proposed new powerline for the United Manganese of Kalahari (UMK) mine near Hotazel in the Northern Cape Province.
- Kaplan, J. 2010. Archaeological Impact Assessment for the proposed 132 kV UMK loop-in powerline near Hotazel, Northern Cape.
- Webley, L. 2018. Archaeological Impact Assessment: Proposed construction of the Hotazel Solar Facility (100 mw) on Remainder Farm York A 279 and 132 kV grid connection on Remainder of Farm Hotazel 280 and Portion 11 of Farm York A 279, John Taolo Gaetsewe District Municipality, Northern Cape.
- Groenewald, G. 2011. PIA. Farms York 279, Devon 277 and Telele 312, near Hotazel town in the John Taolo Gaetsewe District Municipality in the Northern Cape Province.
- Almond, J., Orton, J. 2016. Scoping Heritage Impact Assessment for the Proposed Hotazel Solar Farm, Kuruman Magisterial District, Northern Cape.
- Almond, J.E. 2019. Palaeontological heritage: combined desktop and field-based assessment: Proposed Upgrading of the 66kV network between Hotazel and Kathu, Northern Cape.
- Butler, E. 2019. Palaeontological Desktop Assessment for the Proposed Updated Environmental Management Programme (EMPr) for the Assmang (Pty) Ltd. Black Rock Mining Operations, Hotazel, Northern Cape.
- Butler, E. 2019. Palaeontological Desktop Assessment for the Proposed new Railway Bridge and Railway Line between Hotazel and the Gloria Mine, Northern Cape Province.
- Butler, E. 2020. Palaeontological Desktop Assessment for the Proposed Nchwaning Rail Balloon turn outs at Black Rock Mine Operations near Hotazel, Northern Cape Province.
- Kruger, N. 2019. Archaeological Impact Assessment (AIA) on various portions of the Farm Rhodes 269, the Remainder and Portion 2 of the Farm East 270, the Farm Kipling 271, the Remainder of the Farm Hotazel 280, the Farm Umtu 281 and the Remainder of the Farm Olive Pan 282 for the Proposed Double Circuit 132kV Powerline for the Rhodes 1, Rhodes 2, East 3 and East PV Plants to the Umtu Substation near Hotazel, Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Northern Cape Province.
- Fourie, W. 2015. The Proposed Upgrade of the 66kV network in the Kuruman area, Northern Cape Province: Heritage Impact Assessment.
- Van Vollenhoven, A. 2012. A Report on a Heritage Impact Assessment for the Proposed Main Street 778 (Pty) Ltd. Mining Right Application close to Hotazel, Northern Cape Province.
- Bamford, M. 2017. Palaeontological Impact Assessment for the Proposed new underground Khwara Manganese mine near Hotazel, Northern Cape Province.
- Dhlamini, G. 2020. Mamatwan Mine Section 24G Rectification Application, near Hotazel, Northern Cape Province.
- Van Ryneveld, K. 2010. Phase 1 Archaeological Impact Assessment. The Black Rock Powerline Project, Black Rock near Hotazel, Northern Cape, South Africa.
- Fourie, W. 2010. HIA. Proposed Lehating Mining (Pty) Ltd. underground manganese mine on Portions of the Farm Lehating 714, approximately 20km northwest of Hotazel, Northern Cape Province.
- Rossouw, L. 2015. Palaeontological Desktop Assessment of the Proposed new 40478 Vaal-Gamagara water pipeline between Sishen and Black Rock Mine near Hotazel, NC Province.
- Smeyatsky, I. 2018. Proposed Water Rock Dump Project at Tshipi Borwa Mine, near Hotazel, Northern Cape Province. Phase 1 – Heritage Impact Assessment.

- Bulter, E. 2019. Palaeontological Desktop Assessment for the Establishment of a Super Fines Store Facility at Gloria Mine, Black Rock Mine Operations, Hotazel, Northern Cape.
- Pelsler, A., van Vollenhoven, A. 2011. A Report on a Heritage Impact Assessment (HIA) for a Proposed new Rail Crossing over the Gamagara River for the Gloria Mine Operations, Assmang Black rock, on Gloria 266, north of Hotazel, Northern Cape Province.
- Fourie, W. 2010. Amari Kongoni Project for HCI Kusela Coal on the Farm Portions 1 and a Portion of the Remaining Extent on the Farm Kongani 311, Hotazel, Kgalagadi District Municipality of the Northern Cape Province.
- Pelsler, A. 2012. Report on a Heritage Impact Assessment (AIA) for the Proposed Photo-Voltaic Solar Power Generation Plant on the Farm Adam 328 near Hotazel in the Northern Cape Province.
- Bamford, M. 2019. Palaeontological Impact Assessment for the Proposed Prospecting Rights Application on a section of the Farm Nchwaning 267, near Hotazel, Northern Cape Province.
- Van Vollenhoven, A. 2019. A Report on a Heritage Impact Assessment for a Proposed new Overhead Powerline from the Black Rock Mine to the Gloria Mine, close to Hotazel, Northern Cape Province.
- 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.
- Fourie, W. 2020. Archaeological Monitoring for the Proposed R380 Road Diversion as part of the Mokala Manganese development north of the town of Hotazel, in the Gamgara Municipality, Northern Cape.

Relevance of Listed Heritage Studies for the Study Area

From the above it is obvious that the area around Hotazel has been subject to extensive heritage investigations in the recent past. The following guidelines could be extracted from these;

- There is a likelihood of encountering Stone Age deposits especially from the Middle – to Late Stone Age epoch.
- Rock art sites could be encountered in areas with sufficient exposed rock formations
- Specularite mining was common in the area at the turn of the century.
- Burials were often encountered close to pre- and post-contact occupational areas.

9.7 Historical Typographical Maps

Especially during the evaluation of historic structures, the use of archived historic maps is very handy. They give a direct chronological reference for such sites and also lead the investigation on the ground.

The following historic map sets are relevant for this study.

- 2622_DA 1973
- 2622_DA 1990
- 2622_DA 2003
- 2622_DB 1973
- 2622_DB 1990
- 2622_DB 2003
- 2622_DC 1974
- 2622_DC 1990
- 2622_DC 2003
- 2622_DD 1973
- 2622_DD 1990
- 2622_DD 2003

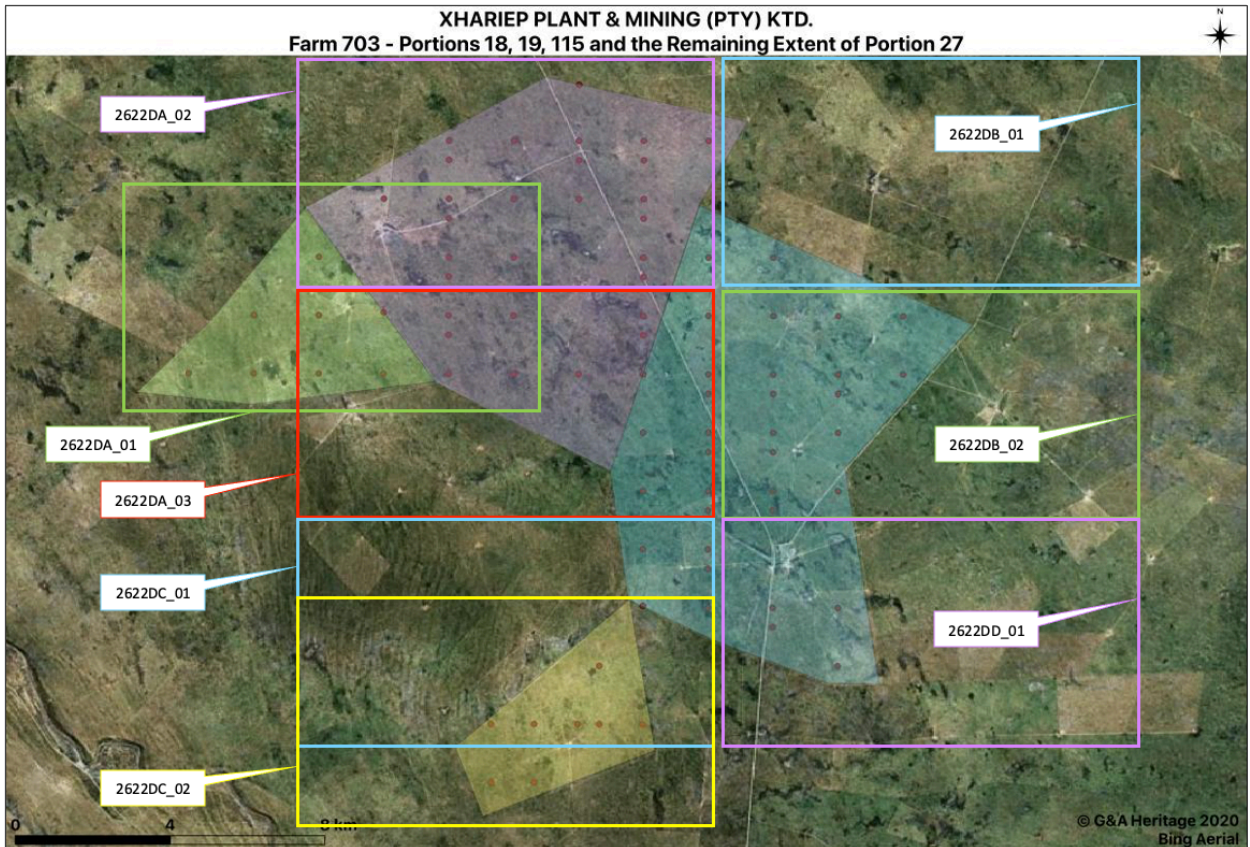


Figure 11. Key for Historical Maps

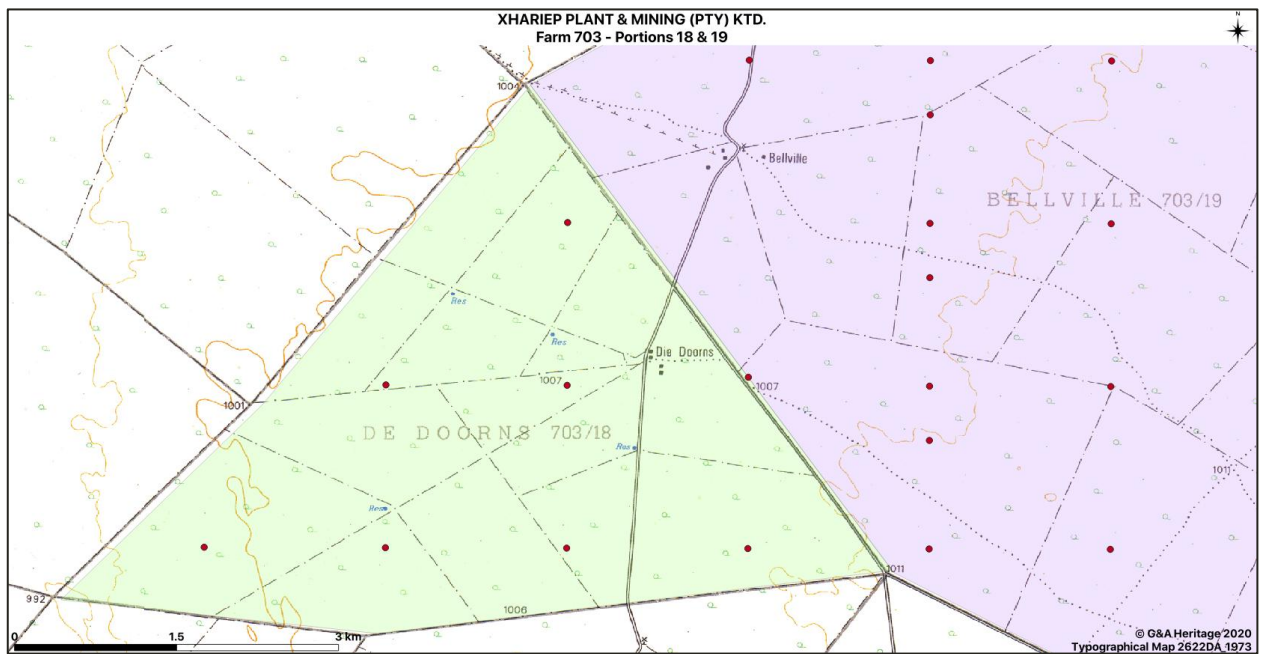


Figure 12. Topographical Map 2622DA_1973_01

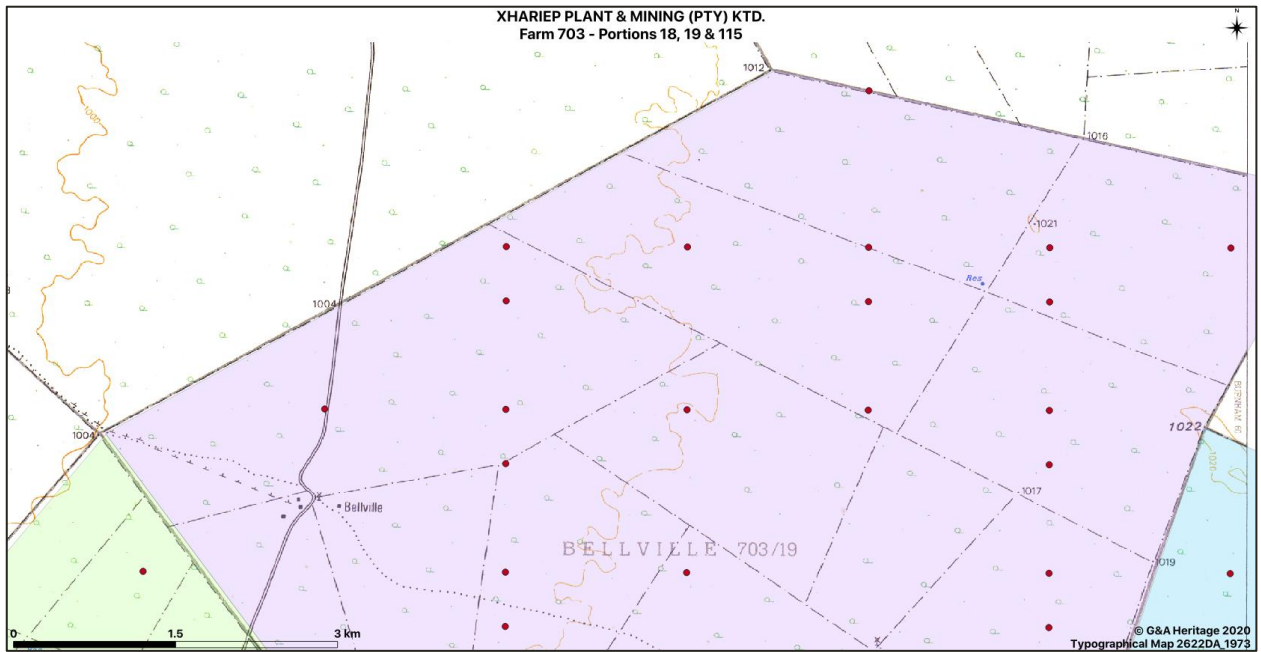


Figure 13. Topographical Map 2622DA_1973_02

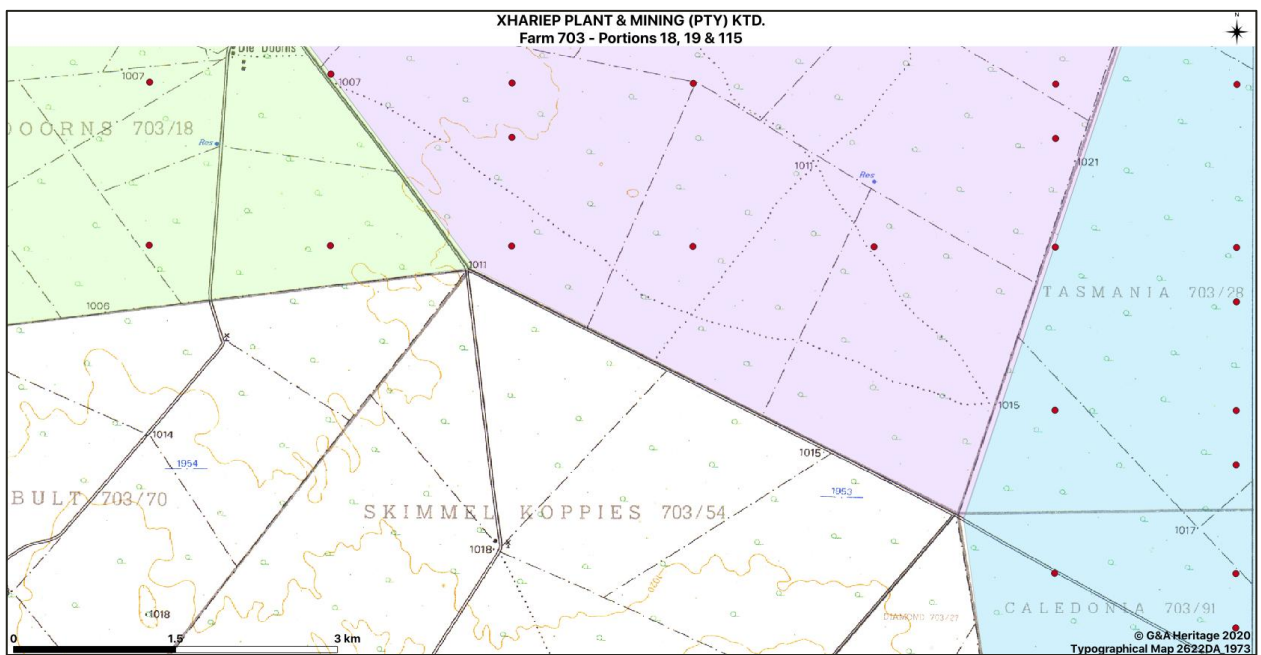


Figure 14. Topographical Map 2622DA_1973_03

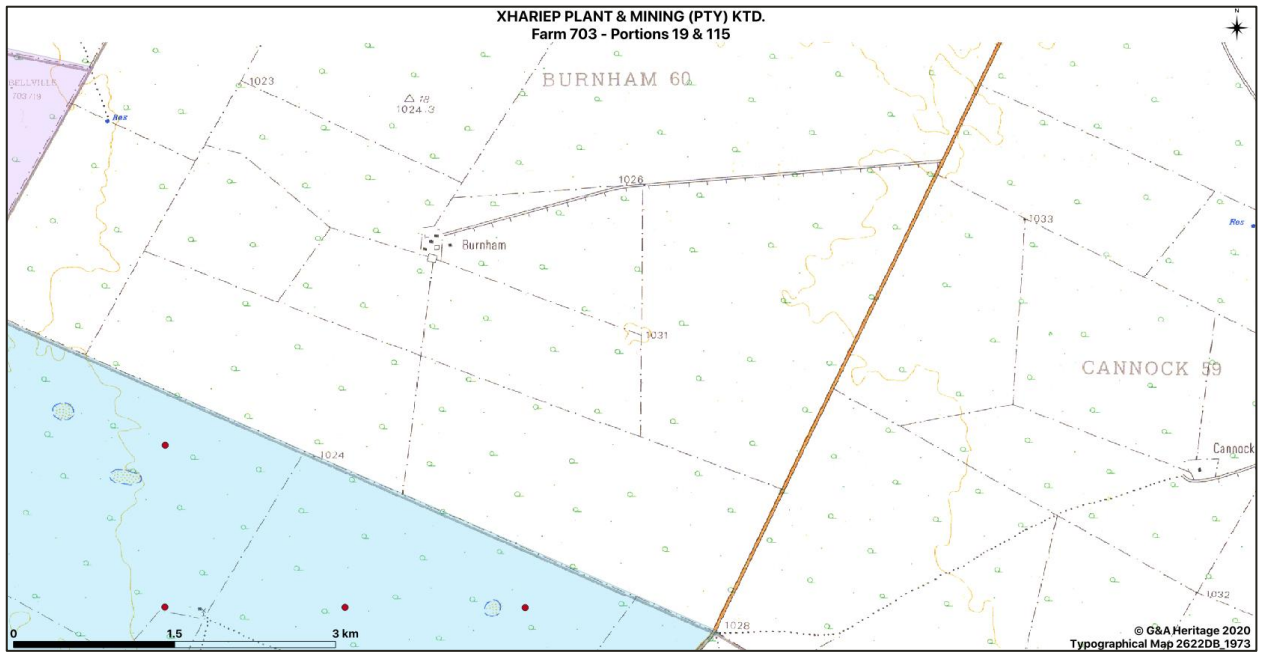


Figure 15. Topographical Map 2622DB_1973_01

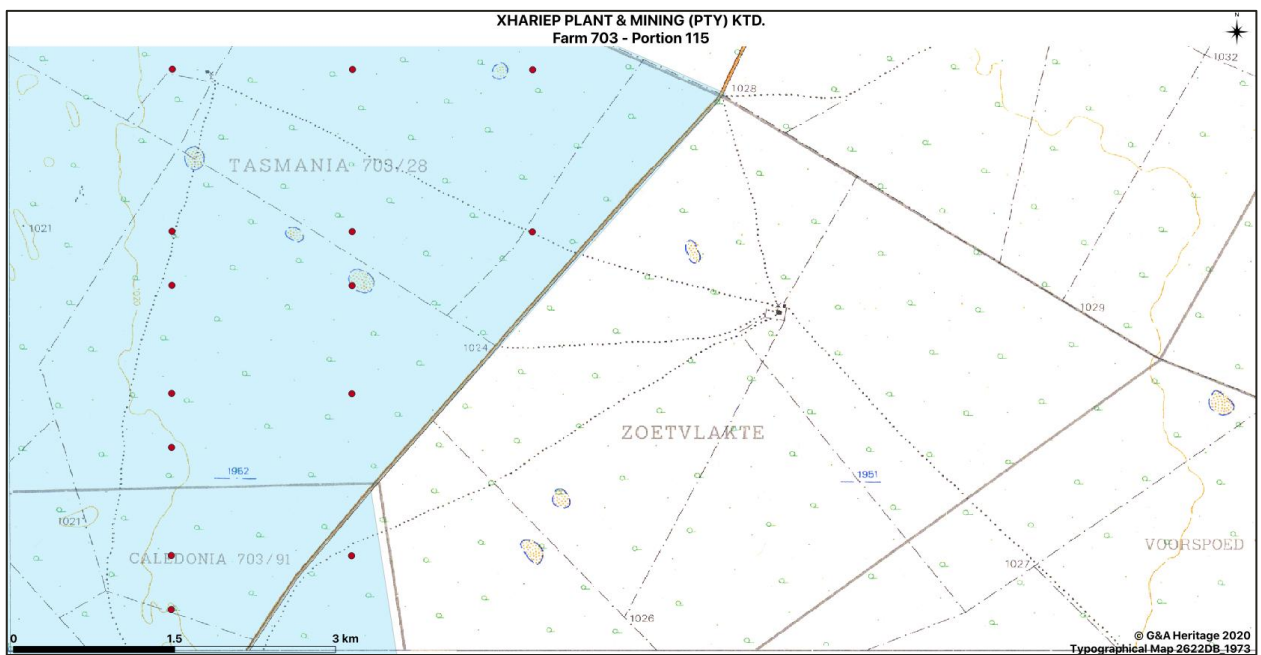


Figure 16. Topographical Map 2622DB_1973_02

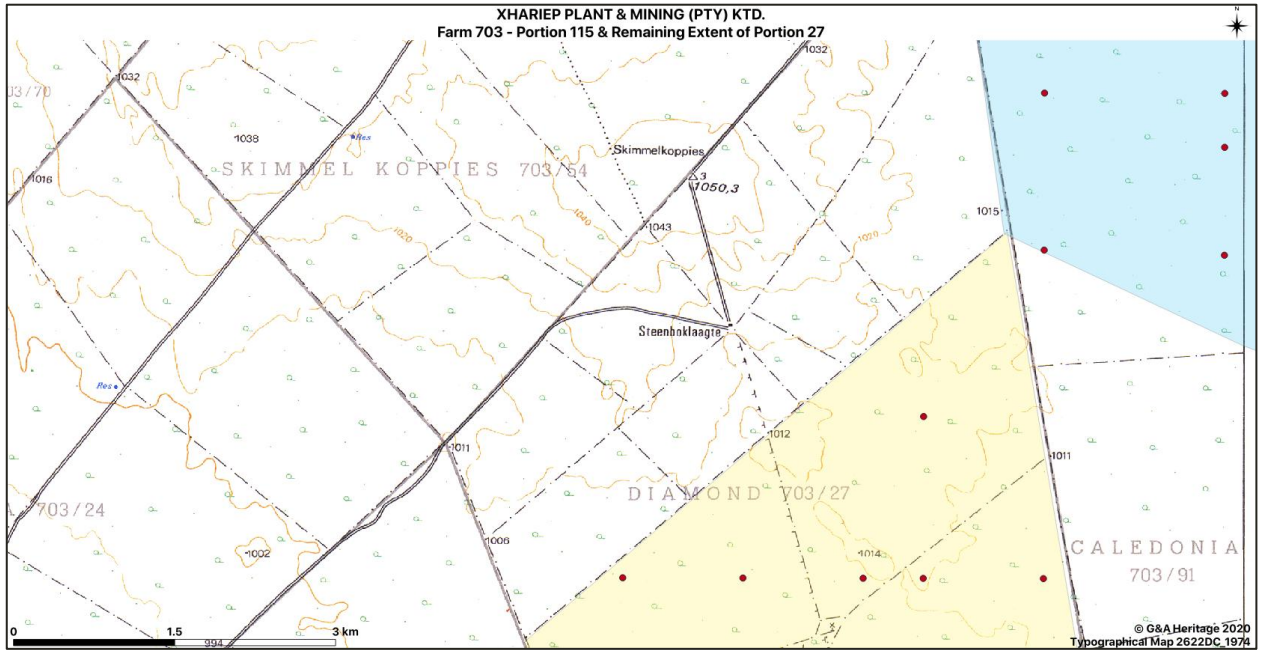


Figure 17. Topographical Map 2622DC_1974_01

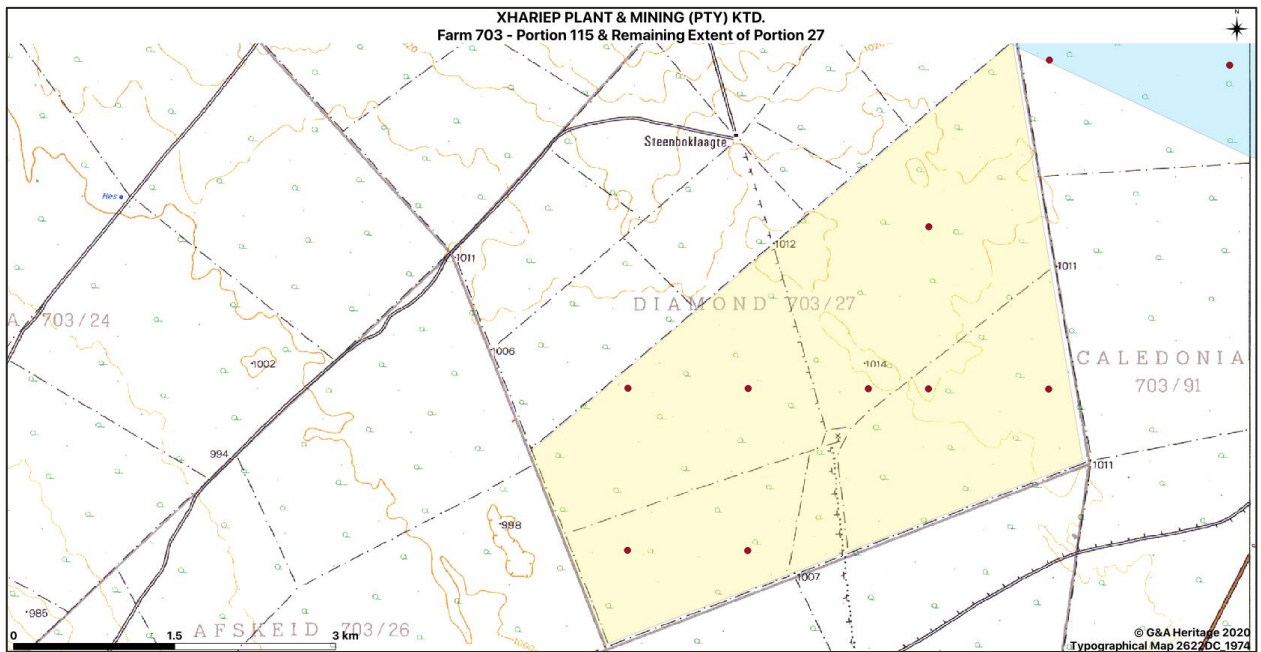


Figure 18. Topographical Map 2622DC_1974_02

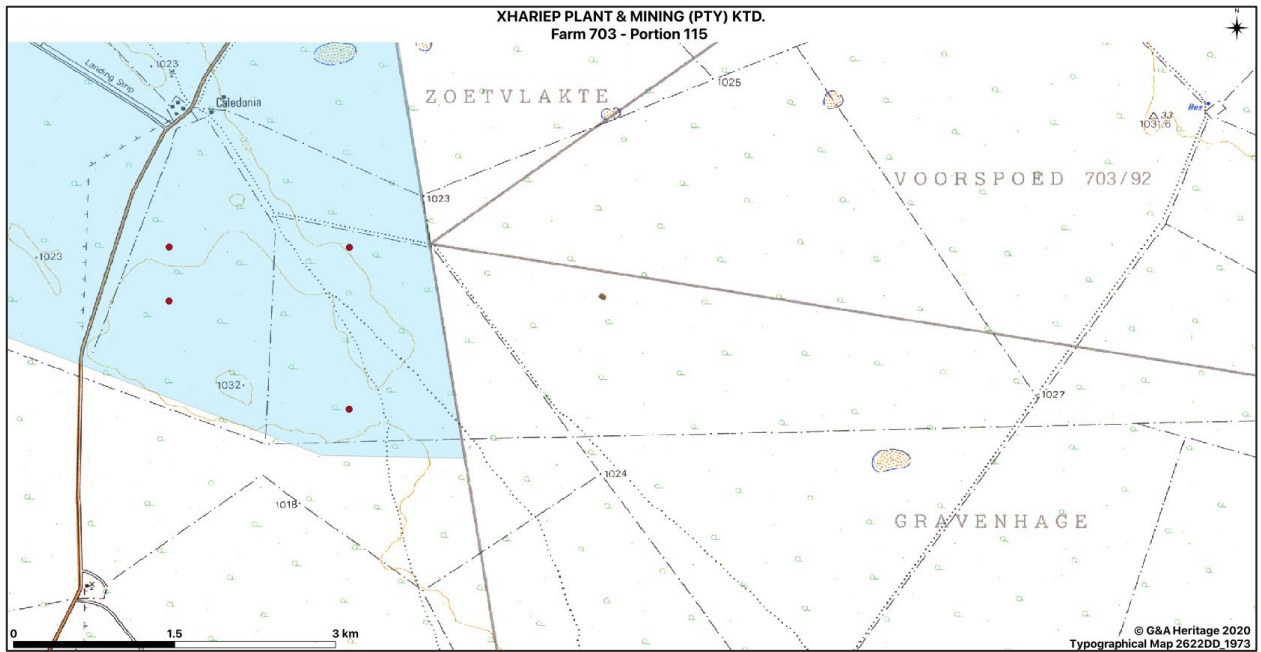


Figure 19. Topographical Map 2622DD_1973_01

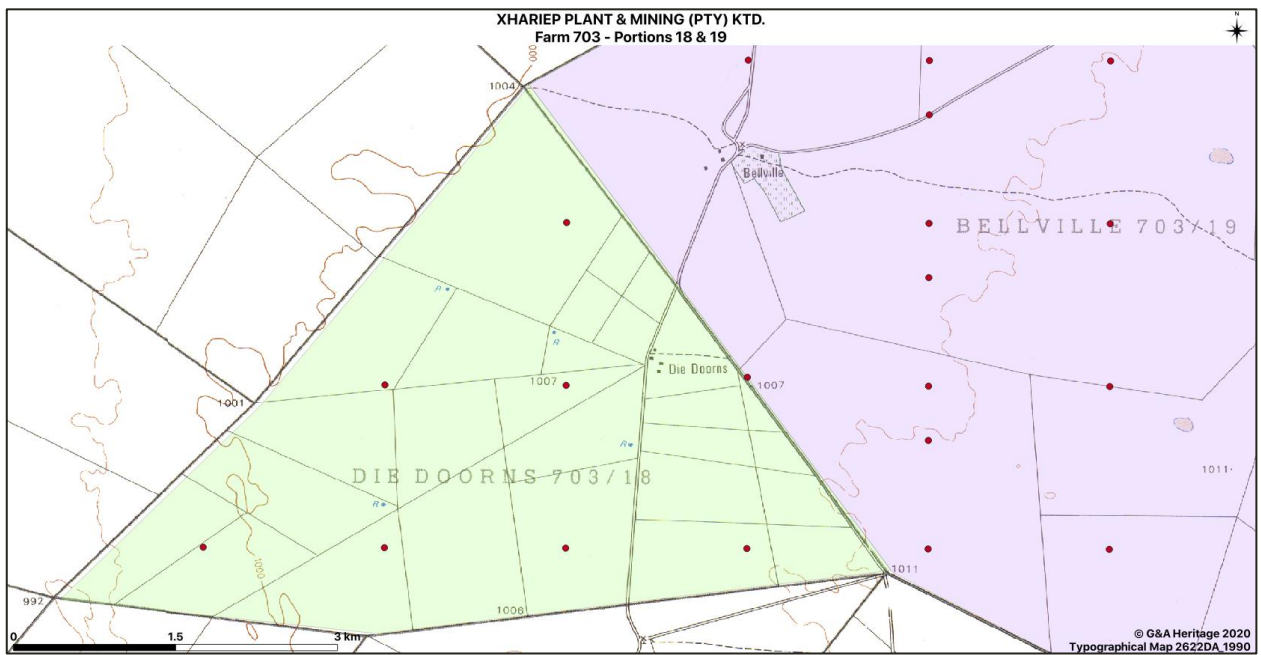


Figure 20. Topographical Map 2622DA_1990_01

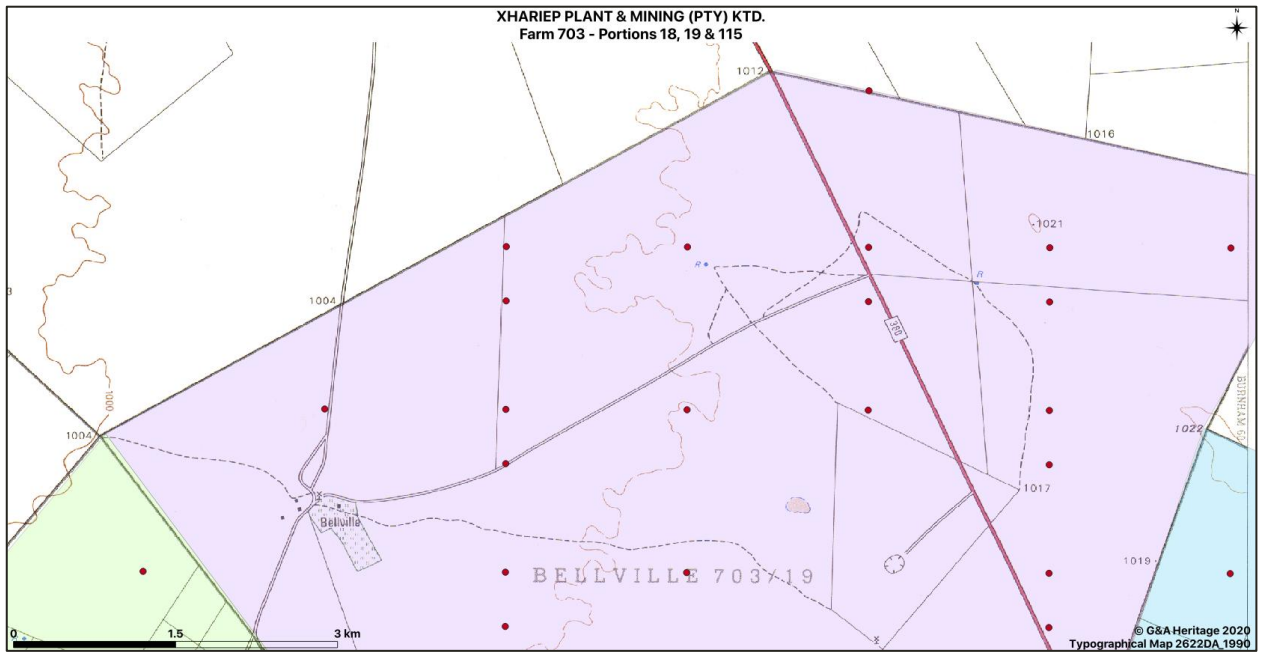


Figure 21. Topographical Map 2622DA_1990_02

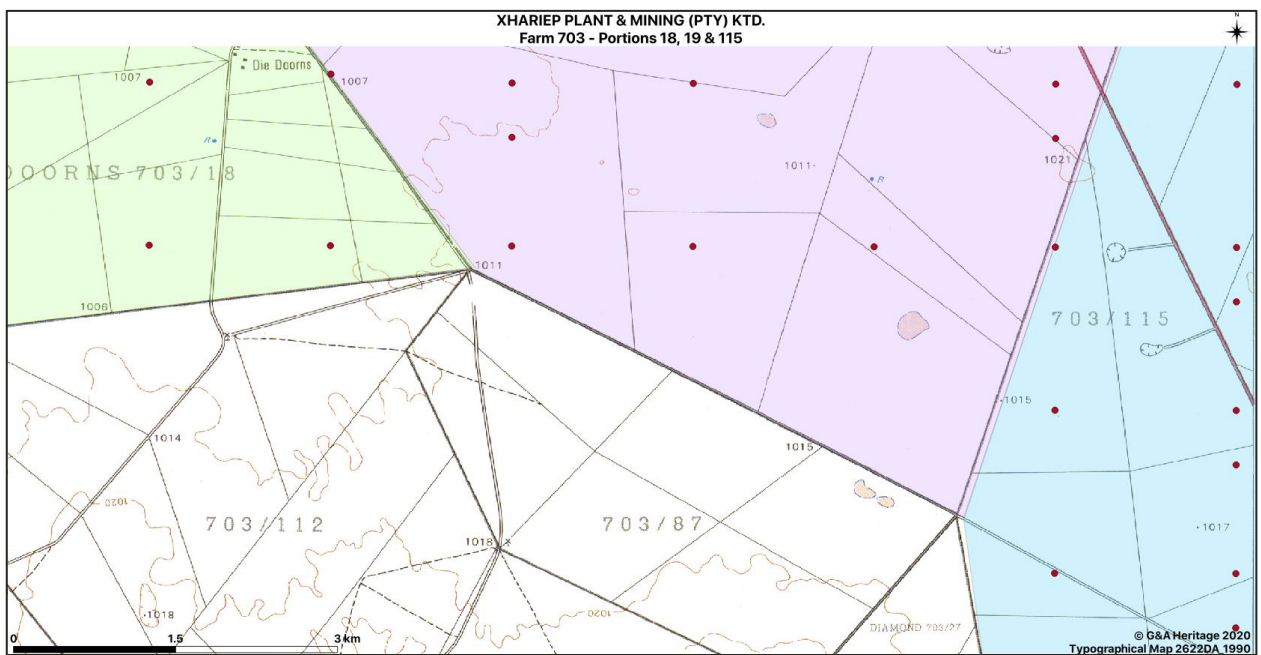


Figure 22. Topographical Map 2622DA_1990_03

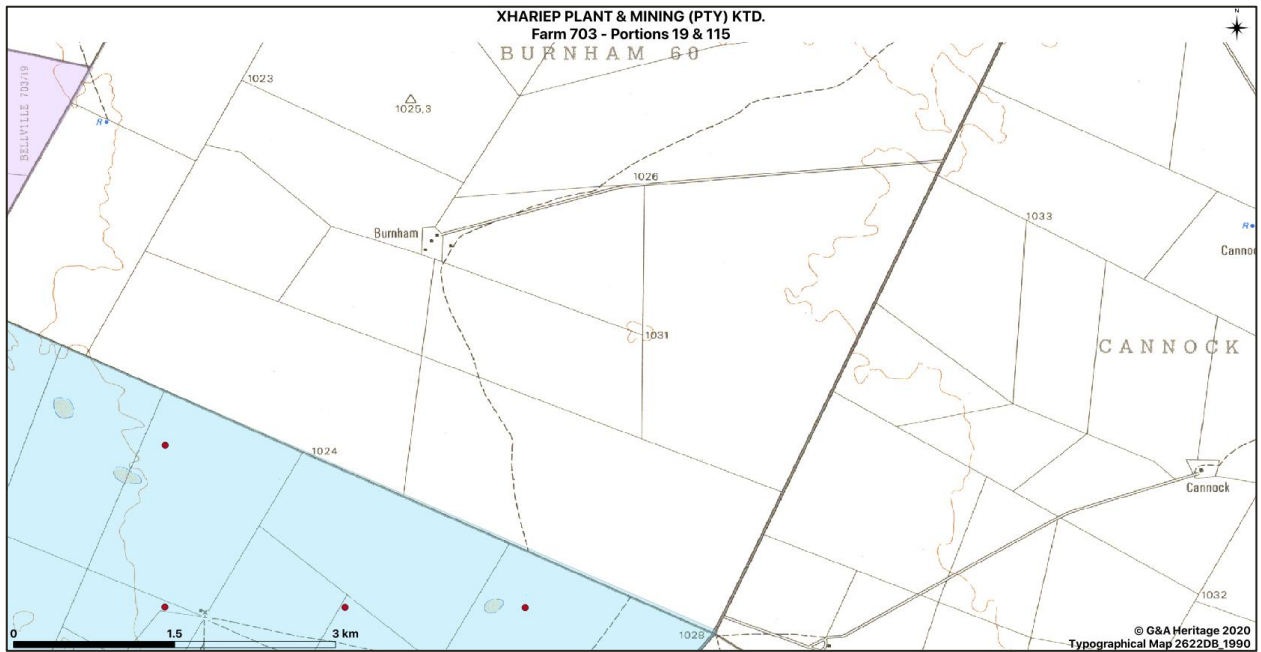


Figure 23. Topographical Map 2622DB_1990_01

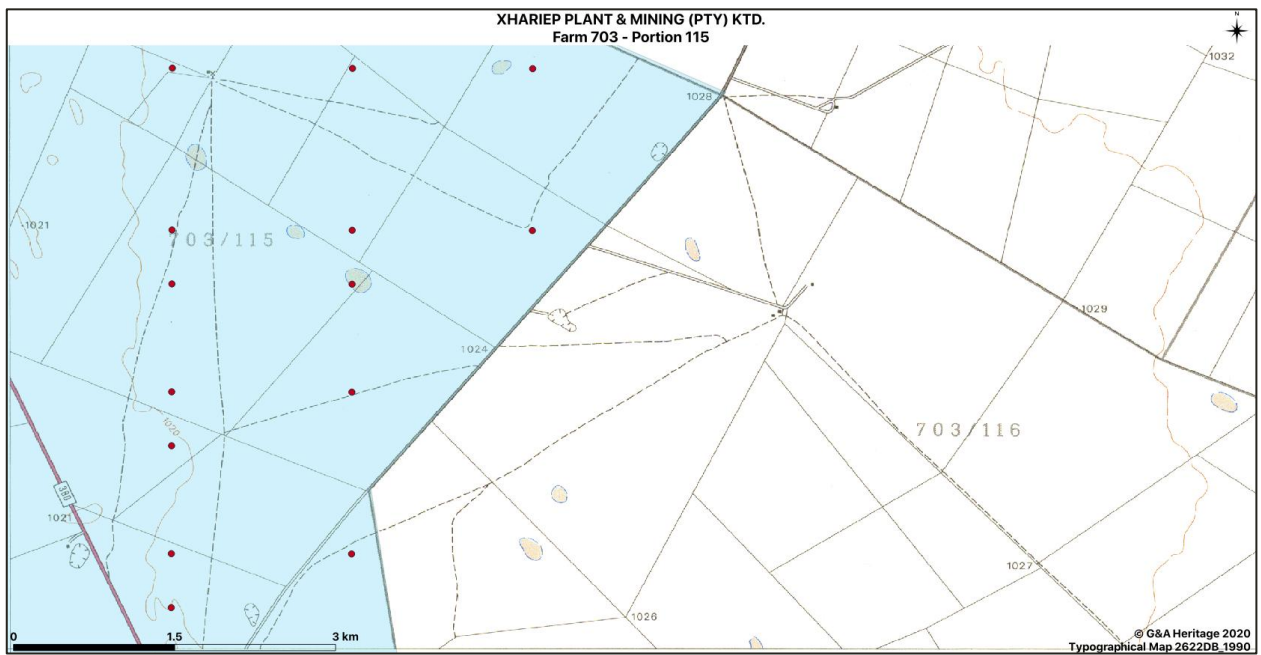


Figure 24. Topographical Map 2622DB_1990_02

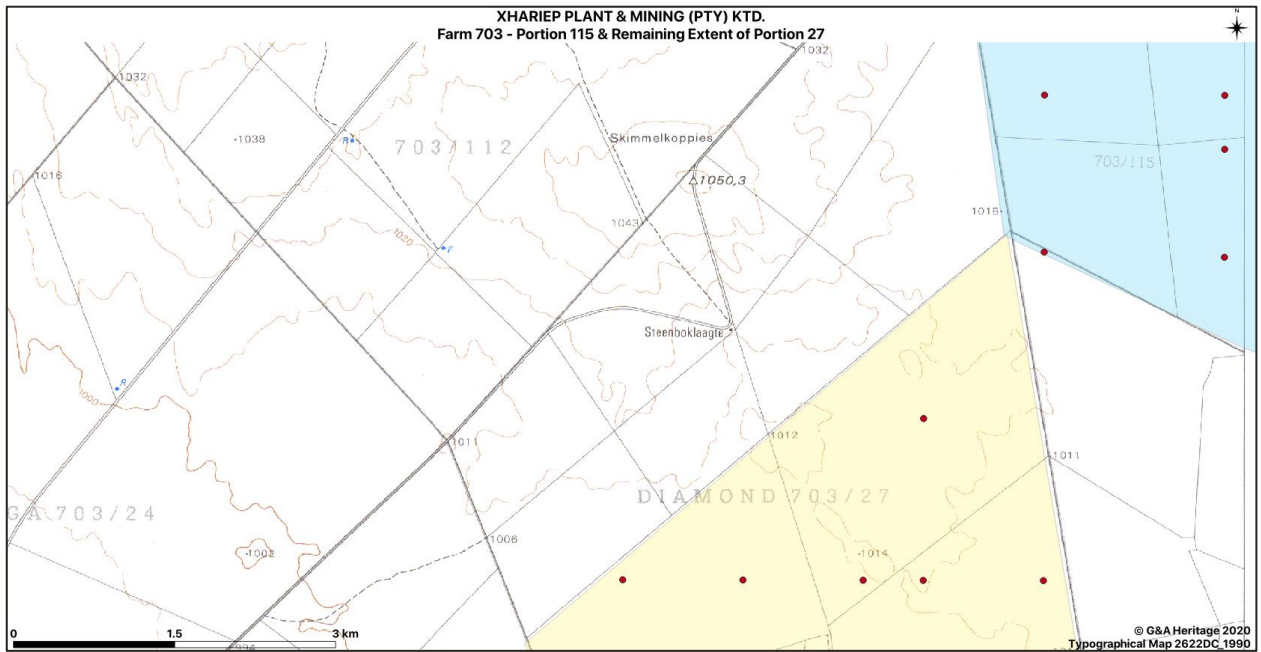


Figure 25. Topographical Map 2622DC_1990_01

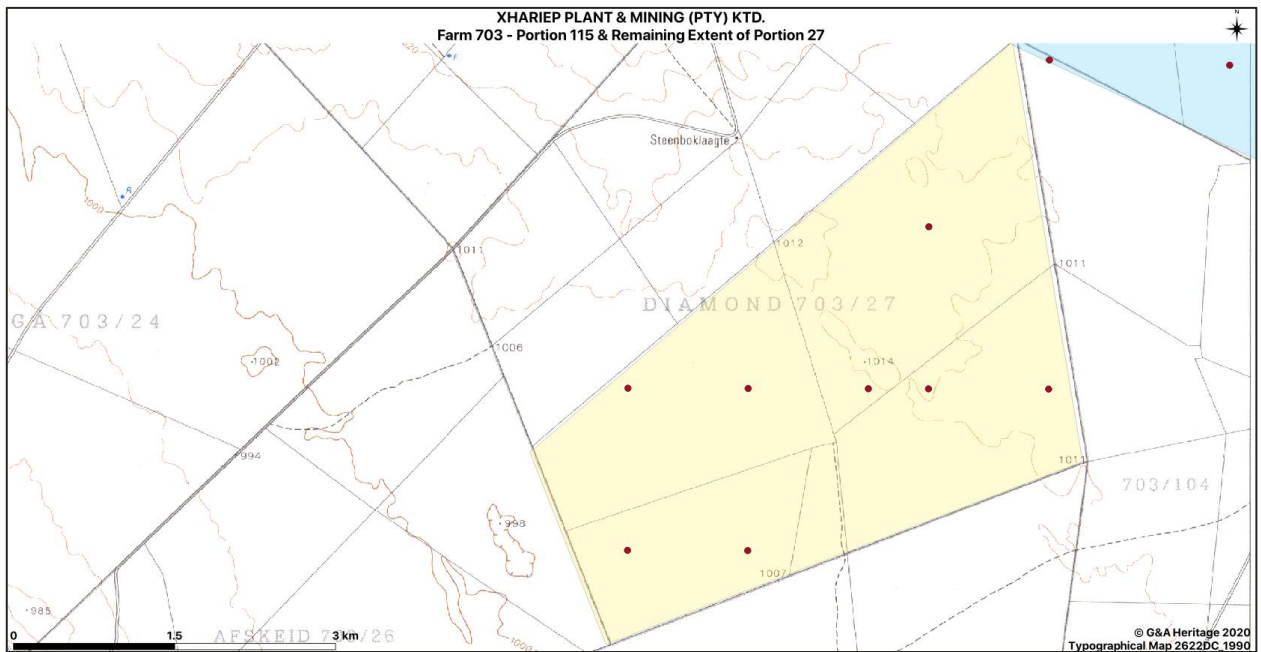


Figure 26. Topographical Map 2622DC_1990_02

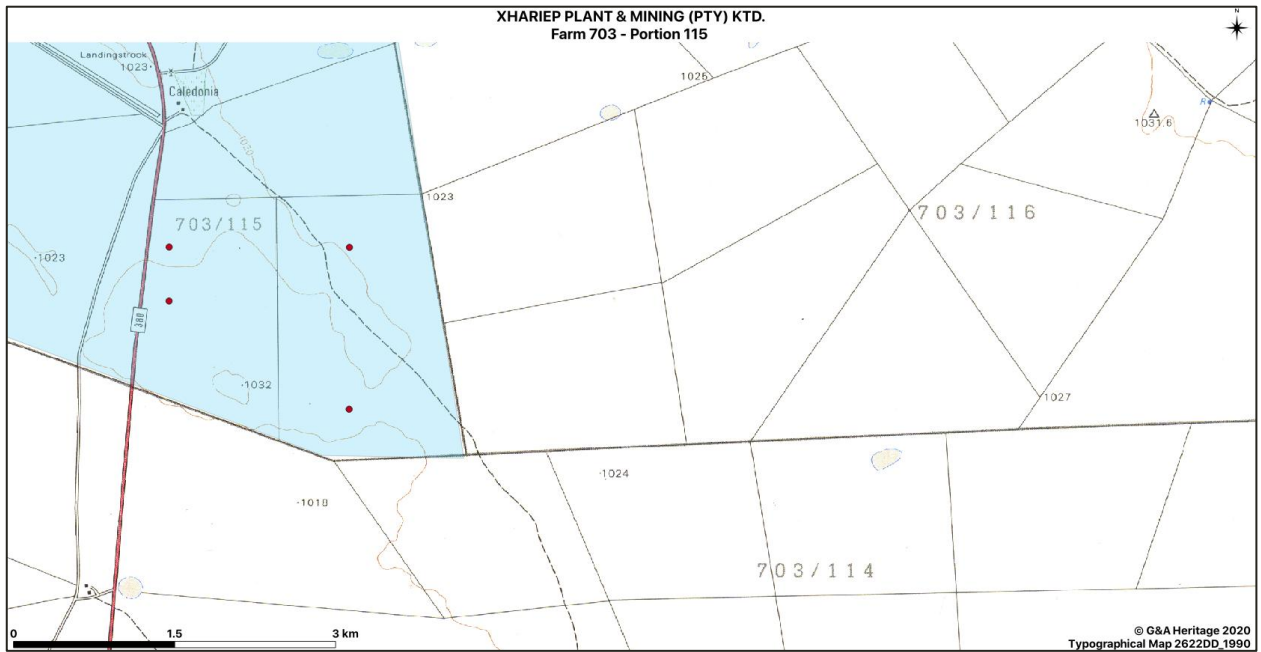


Figure 27. Topographical Map 2622DD_1990_01

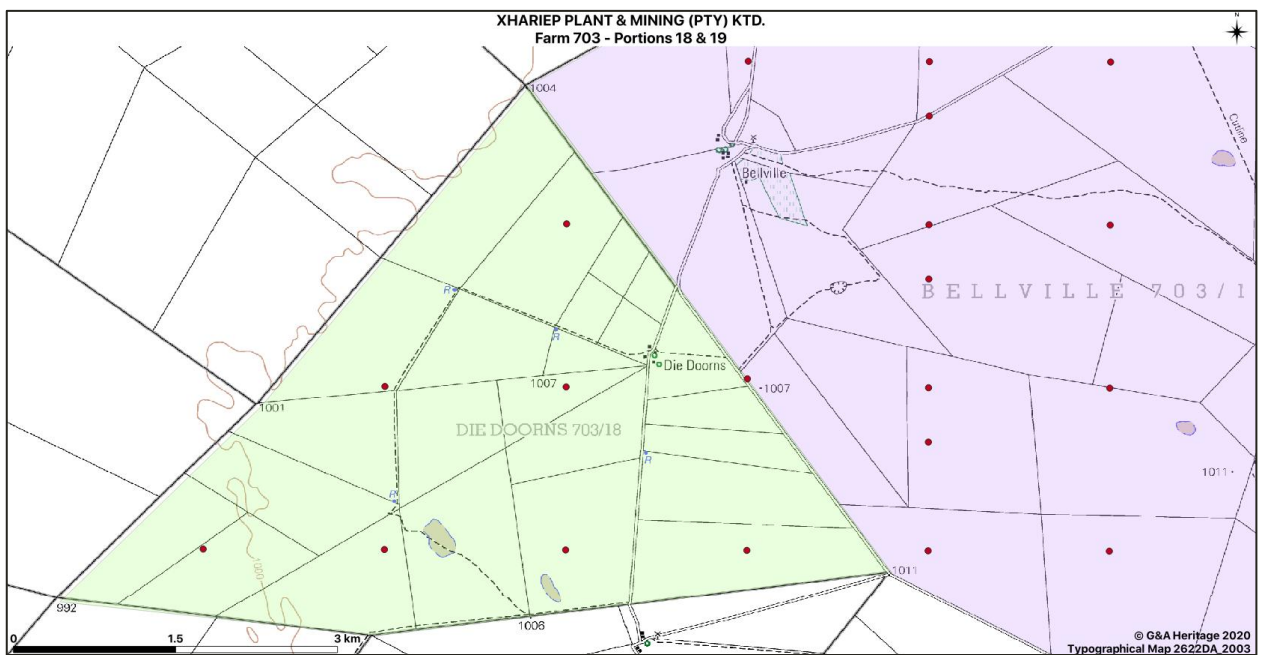


Figure 28. Topographical Map 2622DA_2003_01

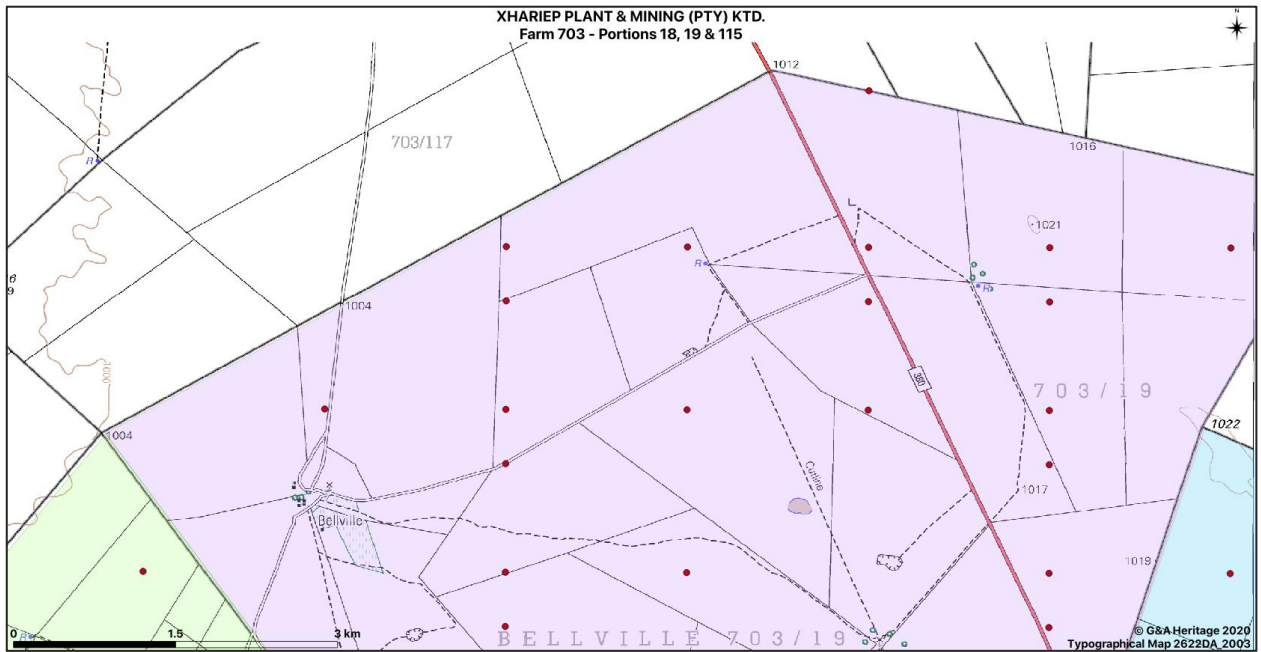


Figure 29. Topographical Map 2622DA_2003_02

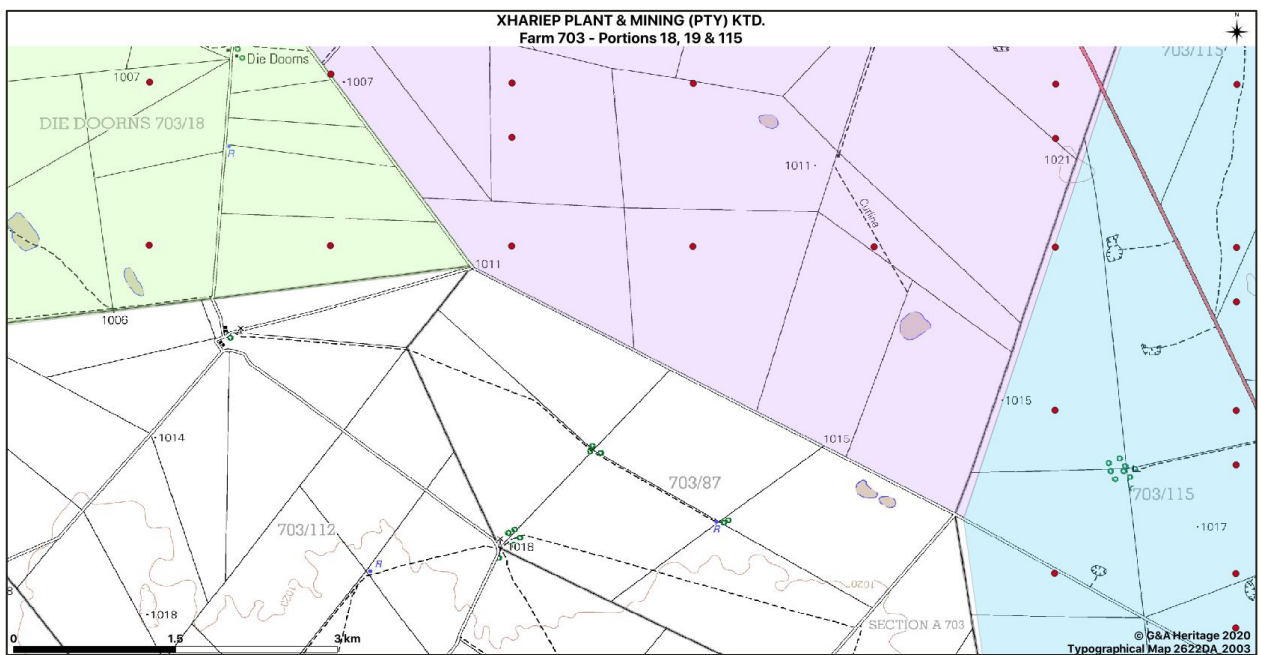


Figure 30. Topographical Map 2622DA_2003_03

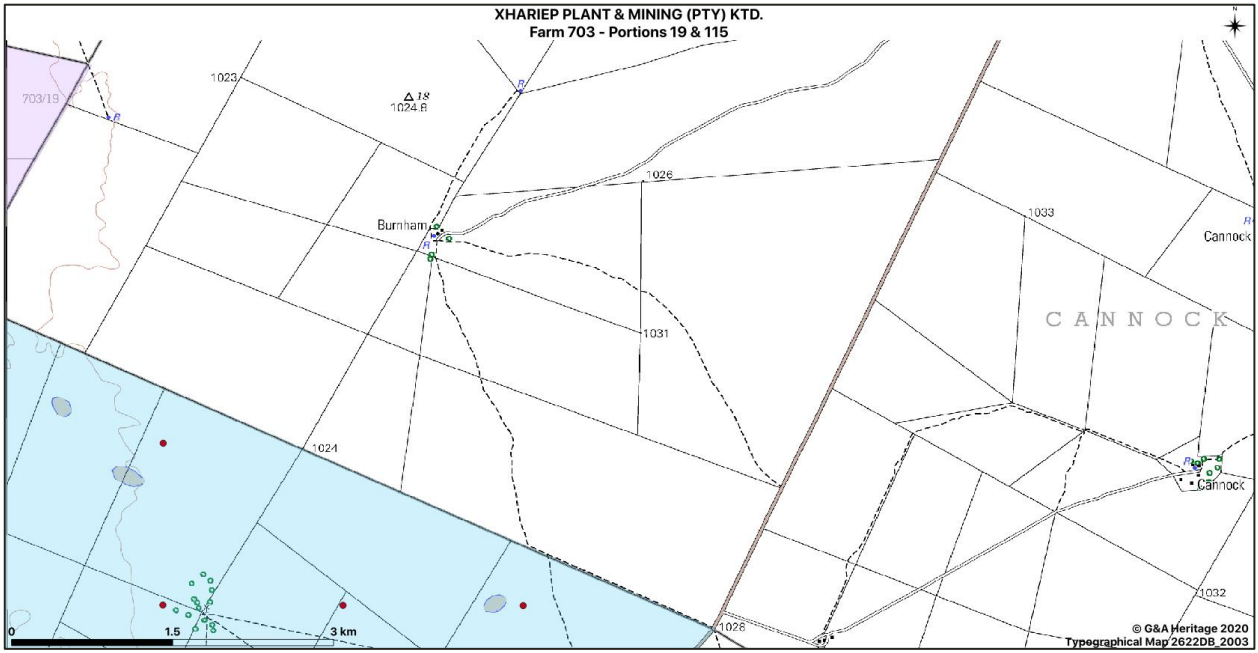


Figure 31. Topographical Map 2622DB_2003_01

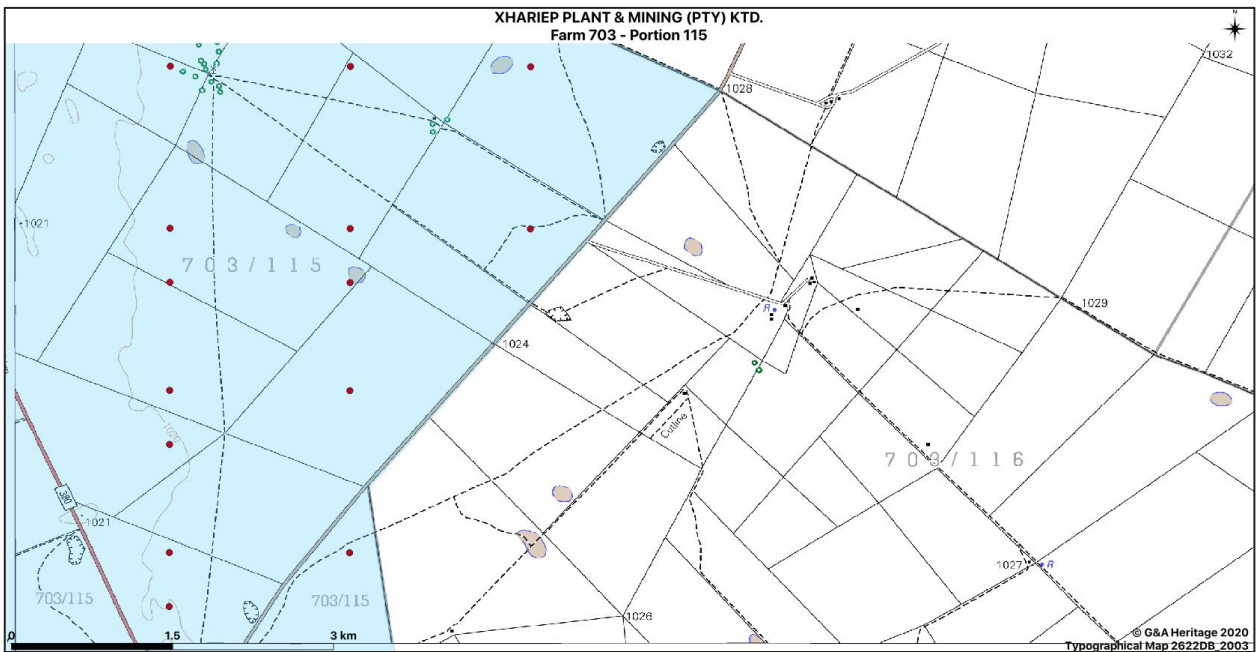


Figure 32. Topographical Map 2622DB_2003_2

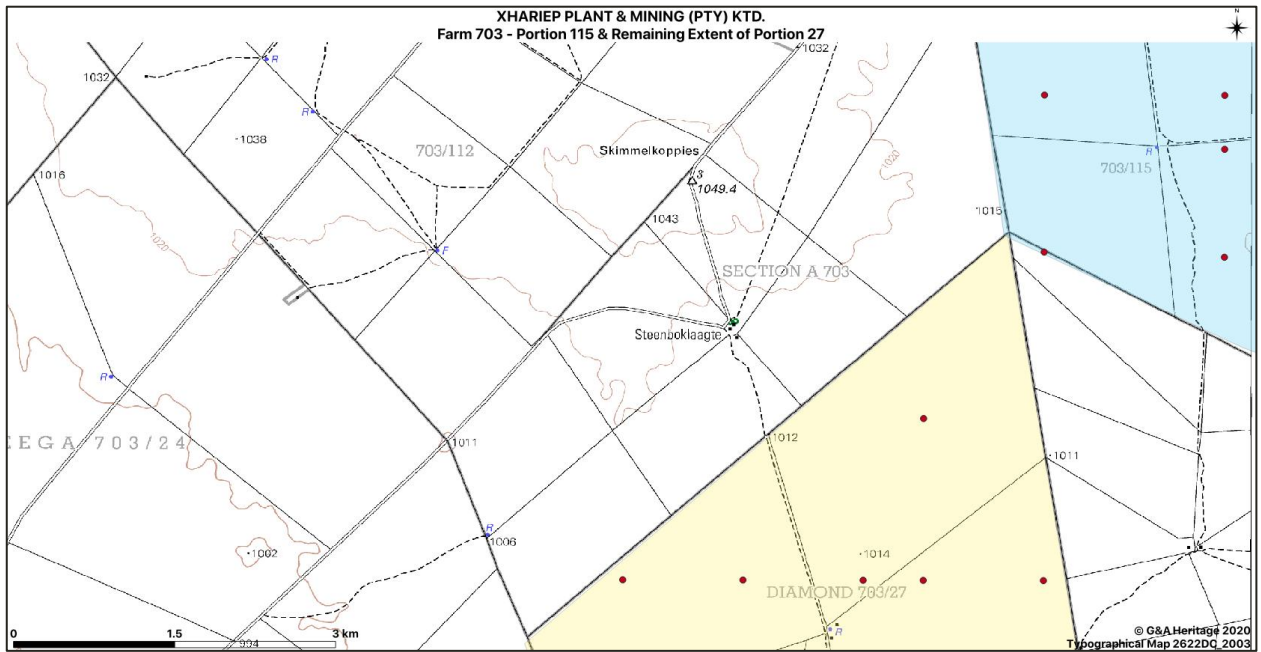


Figure 33. Topographical Map 2622DC_2003_01

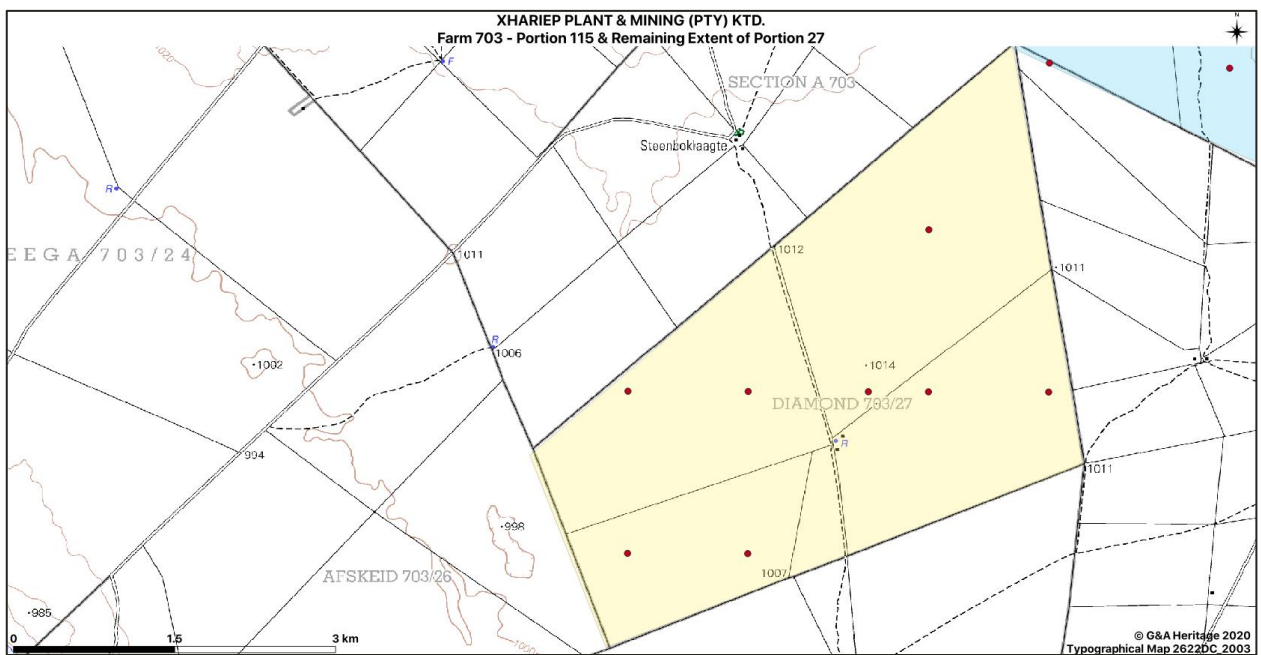


Figure 34. Topographical Map 2622DC_2003_02

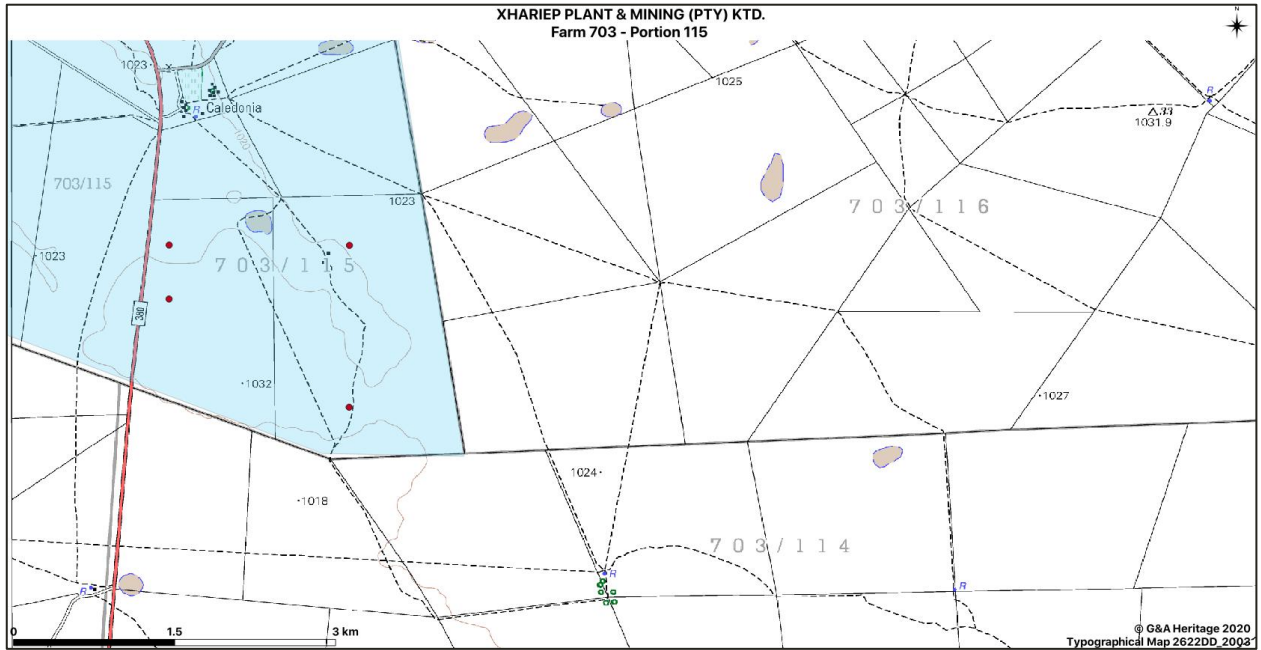


Figure 35. Topographical Map 2622DD_2003_01

9.8 Natural / Cultural Landscape

There are two broad vegetation types found within the area under application – Molopo Bushveld Vegetation Types (SVk11) and Kathu Bushveld Vegetation Type (SVk12). Small mammals and birds associated with these vegetation types are likely to be found.

The study area is situated with the Kalahari Manganese Fields. The manganese and associated iron of the Transvaal Supergroup were deposited in an ancient shallow sea on the border of the Kaapvaal Craton, hosting some of the oldest rocks on our continent.

10. Potential Heritage Impacts and Proposed Mitigation

Heritage Impact Assessment

11.1 Introduction and scope

This component will evaluate the potential impact that the proposed development could have on heritage sites and objects of community, cultural or scientific value. This includes archaeological, cultural heritage, built heritage and basic paleontological assessments to determine the impacts on heritage resources within the study area.

The scope of work includes:

- Identification and assessment of archaeological, cultural, historic, built and paleontological sites within the study area
- Archival study of existing data and information for the study area
- Compilation of a Desktop Heritage Impact Assessment (DHIA) Report.

11.2 Impact Assessment and Proposed Mitigation

Only archival information was utilised and no fieldwork was performed.

Damage to Graves and Burial Sites

None

Damage to Ceremonial Sites and Places-of-Power

None

Excavation of Palaeontological Materials

Unlikely

Ref:		3	
Project phase	Construction		
Impact	Excavation of Fossils		
Description of impact	Most of the proposed area is underlain by Kalahari Group Alluvial Sediment that is regarded to be poor in fossils. Fossils might occur under the manganese formations in the north of the site.		
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts	
Potential mitigation	A chance finds protocol for fossils should be included in the ESMP.		
Assessment	Without mitigation		With mitigation
Nature	Negative		Positive
Duration	Long term	Impact will last between 10 and 15 years	Short term impact will last between 1 and 5 years
Extent	Limited	Impacts limited to specific parts of the study area	Limited Impacts limited to specific parts of the study area
Magnitude	High	Natural and/ or social functions and/ or processes are notably altered	Low Natural and/ or social functions and/ or processes are somewhat altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	High The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium The resource is damaged irreparably but is represented elsewhere
Significance	Minor - negative		Negligible - positive
Comment on significance	Due to the limited research on palaeontology in this area, the recovery of fossils will actually be beneficial to science if the recovery is done correctly.		
Cumulative impacts	Mining activities (prospecting) in the area can result in a cumulative increased impact, but also an expansion of knowledge.		

Damage to Unidentified or Buried Archaeological Sites

Unlikely

Ref:		4	
Project phase	Construction		
Impact	Unidentified/Sub-surface Archaeological Remains		
Description of impact	Archaeological deposits not identified during the fieldwork or which are buried under the predominant and shifting alluvial sands could be uncovered during the prospecting activities.		
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts	
Potential mitigation	Chance Finds Protocol		
Assessment	Without mitigation		With mitigation
Nature	Negative		Positive
Duration	Short term	impact will last between 1 and 5 years	Long term Impact will last between 10 and 15 years
Extent	Local	Impacts felt mostly throughout the study area	Regional Impacts felt outside the study area, at a regional / provincial level
Magnitude	High	Natural and/ or social functions and/ or processes are notably altered	Moderate Natural and/ or social functions and/ or processes are moderately altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Likely The impact may occur
Confidence	Medium	Determination is based on common sense and general knowledge	High Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	High The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium The resource is damaged irreparably but is represented elsewhere
Significance	Negligible - negative		Minor - positive
Comment on significance	Although information on archaeological sites are scant, there is a possibility of encountering Stone Age sites. Documentation of archaeological sites as a result of access to previously inaccessible areas will be beneficial in regards to heritage research and archaeological knowledge within this area.		
Cumulative impacts	The growth of the iron and manganese mining industry could negatively affect sites (if they occur - none were identified during fieldwork) and the impact of further mining activities could compound this effect.		

11.3 No-Go Alternative

The no-go option will have the least impact on the potential archaeological components discussed in this report. It is not expected that there will be any significant change in the impact (or lack thereof) in regards to Palaeontological resources.

11.4 Conclusions and Recommendations

The study area was found to be basically devoid of any documented heritage sites. There is a strong likelihood that sites associated with the Stone Age could be found in this area. Mountainous areas could be home to rock art and Stone Age shelters.

The palaeontological significance of the site is moderate and a stand-alone Desktop Palaeontological Impact Assessment (PIA) will be submitted in conjunction with the Desktop Heritage Impact Assessment (HIA).

Due to the small footprint of the proposed prospecting activities it is not anticipated that this will have any significant impact on heritage resources. The possible presence of stone tools does however indicate the likely occurrence of such sites in other areas of the mining lease and should the prospecting lead to a mining rights application it is recommended that the whole area be subjected to a high-resolution heritage impact assessment.

Taking into consideration the findings this desktop study it is recommended that the plots identified for the prospect drilling be cleared through a pre-development walkdown by a qualified heritage practitioner. It is further recommended that the Chance Finds Protocol found in this report be incorporated in the Mining Development Management Plan and that it be made available to the site agent or Environmental Control Officer.

11.5 Chance Finds Protocol

It is important to note that, although unlikely, sub-surface remains of heritage sites could still be encountered during construction of the project. The following indicators of unmarked sub-surface sites could be encountered:

- Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
- Bone concentrations, either animal or human;
- Ceramic fragments such as pottery shards either historic or pre-contact;
- Stone concentrations of any formal nature.

The following recommendations are given should any sub-surface remains of heritage sites be identified as indicated above:

- All operators of excavation equipment should be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures should they be encountered.
- All construction in the immediate vicinity (50m radius of the site) should cease.
- The heritage practitioner should be informed as soon as possible.
- In the event of obvious human remains, all activities at the finds must be seized and the South African Police Services (SAPS) should be notified.
- Mitigation measures (such as refilling etc.) should not be attempted.
- The area in a 50m radius of the find should be cordoned off with hazard tape.
- Public access should be limited.
- The area should be placed under guard.
- No media statements should be released until such time as the heritage practitioner has had enough time to analyze the finds.

Palaeontological Sites:

- A site visit by a professional palaeontologists be commissioned by the developer well before the commencement of the invasive phases of the prospecting programme.
- The resulting palaeontological heritage assessment report should make recommendations for any mitigation or monitoring measures to be followed during siting, drilling and rehabilitation of the boreholes as well as for conservation of sedimentary borehole core material for future palaeontological analysis.
- Chance Fossil Finds Procedure as outlined in the Specialist Report should be followed:
 - Safeguarding of fossils.
 - Reporting of all significant finds to SAHRA.
 - Judicious sampling and recording of fossil material and associated geological data by a qualified palaeontologists.
 - Any fossil material collected should be curated within an approved repository (museum / university fossil collection).

The above mitigatory measure are tried and tested over many years in the prospecting / mining industry. Xhariesp will monitor the potential impacts throughout the life of operation, and mitigate any deviations detected. This has been proven to be very effective in existing operations.

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