

# Heritage Impact Assessment Report

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HERITAGE IMPACT ASSESSMENT  
KOFFIEFONTEIN EMPOWERMENT JV:  
SOLAR PLANT AND BRICK MAKING  
PLANT FEASIBILITY STUDY  
AT KOFFIEFONTEIN MINE, FREE STATE PROVINCE.

PREPARED BY:



PREPARED FOR:



**GREENRSA (Pty)Ltd**

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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 OFF BY: STEPHAN GAIGHER



# MANAGEMENT SUMMARY

**Site name and location:** Koffiefontein Diamond Mine, Koffiefontein, Free State Province.

**Municipal Area:** Letsemeng Local Municipality, Xhariep District Municipality, Free State Province.

**Developer:** Petra Diamonds South Africa

**Consultant:** G&A Heritage, PO Box 522, Louis Trichardt, 0920, South Africa.  
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**Date of Report:** 11 October 2016

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 proposed Brick Making site, Slimes Dam, Alternative Solar Plant site and Rock Dump site at the Koffiefontein Diamond Mine in the Free State Province.

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

## Scope of Work

A Heritage Impact Assessment (including Archaeological, Cultural heritage, Built Heritage and Palaeontological Assessment) to determine the 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;
- Evaluate the potential impacts of construction and operation of the proposed development on archaeological, cultural, historical resources; built and palaeontological resources; and
- Recommend mitigation measures to 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 fieldwork investigations. The fieldwork is based on work previously commissioned by the Koffiefontein mine on the same property/study area

## Findings & Recommendations

The area was investigated during a previous study's field visit and previously by archival studies. Some Late Stone Age tools were identified on site. The LSA sites should be documented before construction commences. Specialists should be given the opportunity to collect the surface finds of LSA tools before construction. The excavation phase of the construction should be periodically monitored by a heritage specialist.

One area could possibly contain burial sites and should be monitored during construction.

## Fatal Flaws

No fatal flaws were identified.

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# LIST OF ABBREVIATIONS

Bp.....	Before Present
EIA .....	Early Iron Age
ESA.....	Early Stone Age
Fm .....	Femtometre ( $10^{-15}$ m)
GPS.....	Geographic Positioning System
HIA .....	Heritage Impact Assessment
LIA.....	Late Iron Age
LSA .....	Late Stone Age
MYA .....	Million Years Ago
MSA .....	Middle Stone Age
NHRA.....	National Heritage Resources Act no 22 of 1999
SAHRA.....	South African Heritage Resource Agency
S&EIR .....	Scoping & Environmental Impact Reporting
Um.....	Micrometre ( $10^{-6}$ m)
WGS 84 .....	World Geodetic System for 1984

## HERITAGE IMPACT REPORT

HERITAGE IMPACT ASSESSMENT: KOFFIEFONTEIN DIAMOND MINE,  
FREE STATE PROVINCE.

### INTRODUCTION

#### Legislation and methodology

G&A Heritage was appointed by GREENRSA (Pty) Ltd to undertake a heritage impact assessment for the proposed proposed Brick Making site, Slimes Dam, Alternative Solar Plant site and Rock Dump site at the Koffiefontein Diamond Mine on a Portion of the Farm Koffiefontein 733 in the Free State Province.

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 m<sup>2</sup> 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 regards 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;

- Field investigations were performed on foot and by vehicle where access was readily available.
- Sites were evaluated by means of description of the cultural landscape, direct observations and analysis of written sources and available databases.
- It was assumed that the site layout as provided by GREENRSA is accurate.
- We assumed that the public participation process performed as part of the Basic Assessment process was 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 impact	None
	35	Archaeological, paleontological and meteor sites	No impact	None
	36	Graves and burial sites	No impact	None
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA?	Yes	HIA

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 <sup>2</sup>	Yes	Proposed Brick Making site, Slimes Dam, Alternative Solar Plant site and Rock Dump site at the Koffiefontein Diamond Mine.
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 <sup>2</sup>	No	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A



## BACKGROUND INFORMATION

### KOFFIEFONTEIN DIAMOND MINE.

#### PROJECT DESCRIPTION

Proposed Brick Making site, Slimes Dam, Alternative Solar Plant site and Rock Dump site at the Koffiefontein Diamond Mine in the Free State Province.

GREENRSA (Pty) Ltd is the lead consultant on the project.

#### SITE LOCATION

Located at the Koffiefontein Diamond Mine in Koffiefontein, Free State Province.

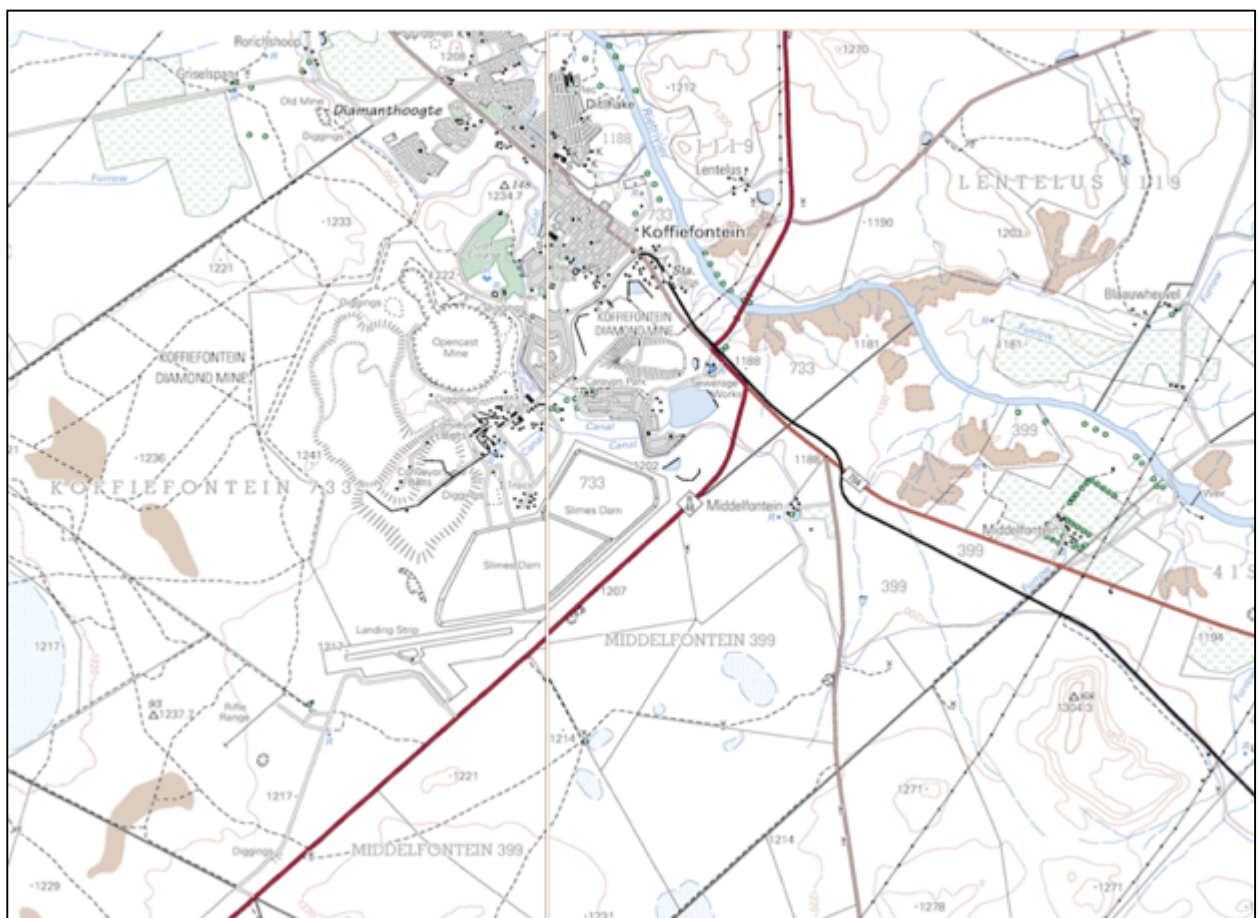


Figure 1. Site Location

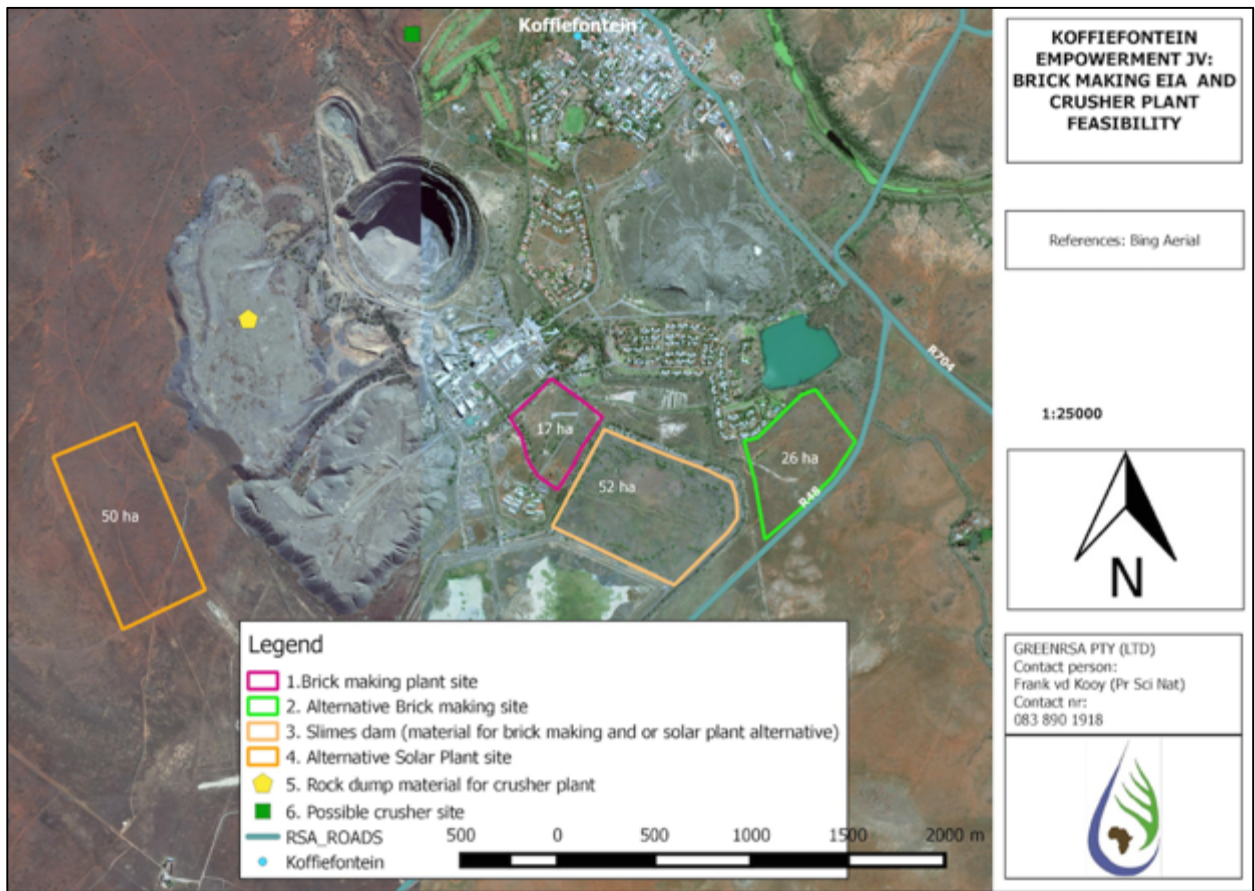


Figure 2. Locality Map

## GPS TRACK PATHS



Figure 3. GPS Track paths followed



## HERITAGE INDICATORS WITHIN THE RECEIVING ENVIRONMENT

### REGIONAL CULTURAL CONTEXT

#### PALEONTOLOGY

The Eccca Group forms part of the Karoo Supergroup. It conformably overlies the Dwyka Group and is conformably overlain by the Beaufort Group. It consists essentially of mudrock (shale), but sandstone-rich units occur towards the margins of the present main Karoo basin in the south, west and northeast, with coal seams also being present in the northeast. The age of the Eccca Group is Palaeozoic, Permian and approximately 545-250 Ma. Layers of coal are sandwiched between fossil rich layers of mudstone and sandstone.

The underlying sedimentary rocks in the region belong to the Beaufort Group of fossil – bearing strata with the Karoo Supergroup. An important feature of the Beaufort Group is rocks is its abundance of Permian-Triassic vertebrate fossil remains, which forms an almost complete record detailing millions of years of vertebrate evolution roughly between 280 and 200 million years ago. The Karoo geological strata within the affected area are generally accepted to be Late Permian in age and are assigned to the Dicynodon Assemblage Zone. This biozone is characterized by the presence of a distinctive and fairly common dicynodont genus. Therapsids and other vertebrate fossils from this biozone are usually found as dispersed and isolated specimens in mudrock horizons, associated with an abundance of calcareous nodules. Plant fossils (*Dadoxylon*, *Glossopteris*) and trace fossils (arthropod trails, worm burrows) are also present. The sediments assigned to the Dicynodon AZ are associated with stream deposits consisting of floodplain mudstones and subordinate, lenticular channel sandstone. Quaternary-age vertebrate fossils, assigned to the Pleistocene Period, have been recorded from various localities along the Honingspruit, Renosterspruit and Modder River near Koffiefontein and include the extinct species *Equus capensis*, *Megalotragus priscus*, *Pelorovis antiquus*, *Antidorcas bondi* and *Equus lylei*. (Rossouw, 2005).

#### 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) (Thackeray, 1992). The Late Stone Age in this area also contains sites with rock art from the San and Khoekhoen cultural groups.

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. 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 Khoekhoen. Stone Age sites may occur all over the area where an unknown number may have been obliterated by urbanisation, industrialisation, agriculture and other development activities during the past decade. Rock art sites are also found locally.

The study area is specifically noted for the occurrences of Fauresmith Industries. The Fauresmith Industry is noted for stone tools or flakes that are completely worked on both sides resulting in particularly pleasing forms of stone tools. Although the comprehensiveness of the Fauresmith has been in question in later research (AJB Humphreys, 1970), it remains one of the most important Stone Age Assemblages in

the Western Free State as well as in the Northern Cape Province. Goodwin and Van Riet Lowe performed the bulk of the research work in 1929 (Goodwin & Van Riet Lowe, 1929).

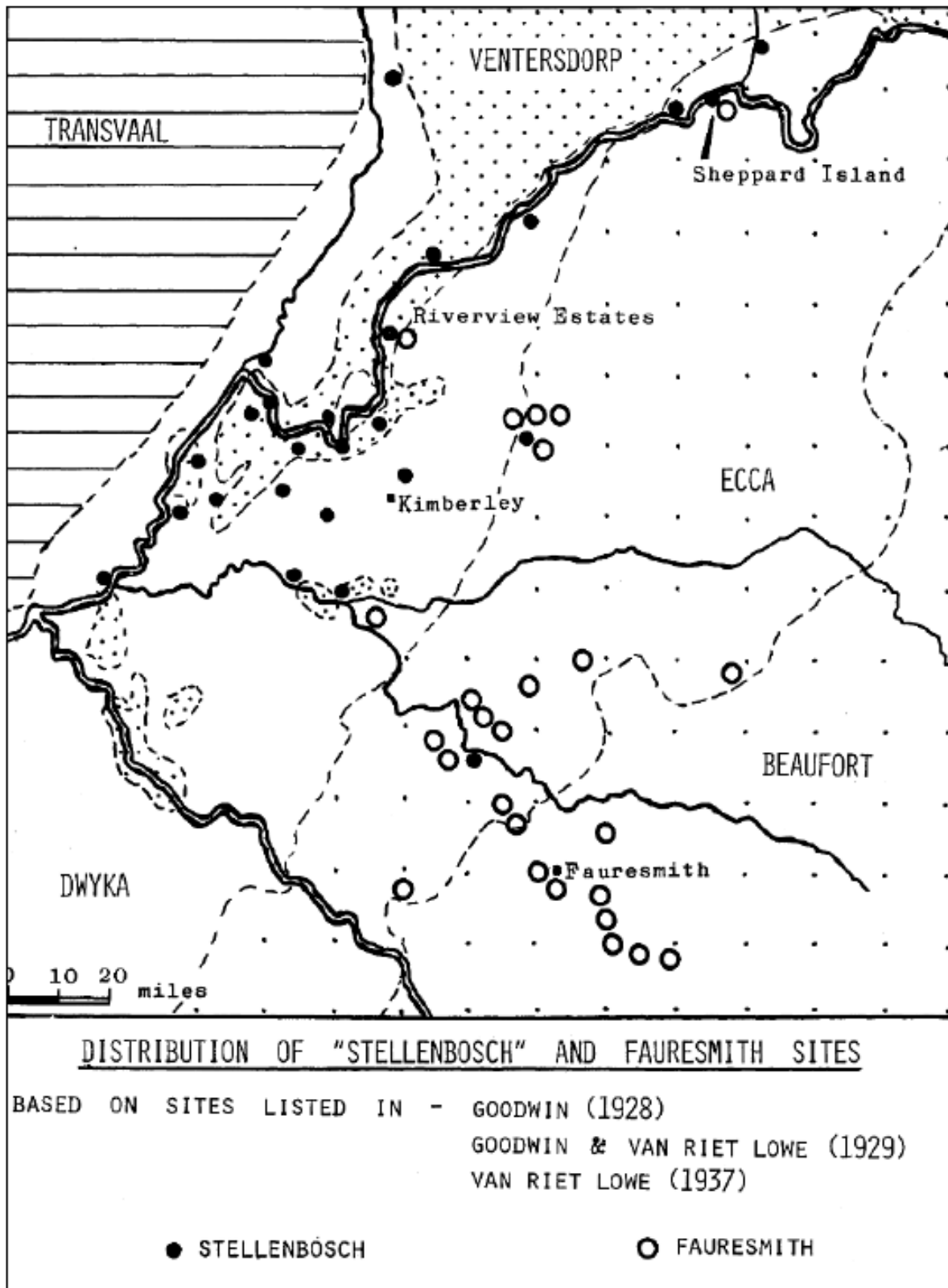


Figure 4. Distribution of Stellenbosch and Fauresmith Sites (Goodwin & Van Riet Lowe, 1929)

## IRON AGE

The Iron Age refers to a period subsequent to the introduction of iron-working, but prior to the appearance of European metal artefacts in this area. There is no strict chronological separation between the two phases, due to this date varying between sites and some overlapping even occurring on some sites. Although Iron Working designates the Age, these communities also produced other metals such as gold and copper, although bronze never occurred in the south African Iron Age era.

Recent research on the Iron Age of Southern Africa established that Negroid farmers were settled throughout the Gauteng, Limpopo and Northwest Provinces as well as the Northern half of the Free State Province long before the European colonisation of these area (Maggs, 1974). Maggs has also defined the southern limits of the Iron Age in the Free State Province prior to the Difaqane and the European colonisation (Maggs, 1974).

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

More recent research by Jacobs shows occupational Tswana sites to occur during the later “Bantu Expansion” and “Proto-Difaqane 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 postulations since Ellenberger and McGregor already proposed earlier Iron Age communities in these areas as early as 1912 (Ellenberger & McGregor, 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 close to the study area. Such sites have been identified at Danielskuil (Snyman, 1986). These groups were eventually driven from the area by the Kora (Snyman, 1986).

## TYPE R SETTLEMENTS

In this area between Kimberley and Bloemfontein we find a unique type of settlement that seems to fit between the Stone Age and the Iron Age with characteristics of both. This type of settlement was described by Maggs (Maggs, 1967) and dubbed *Type R Settlements*. The majority of these site is found within three kilometres off the Riet River in the Northern Cape and Western Free State Provinces.

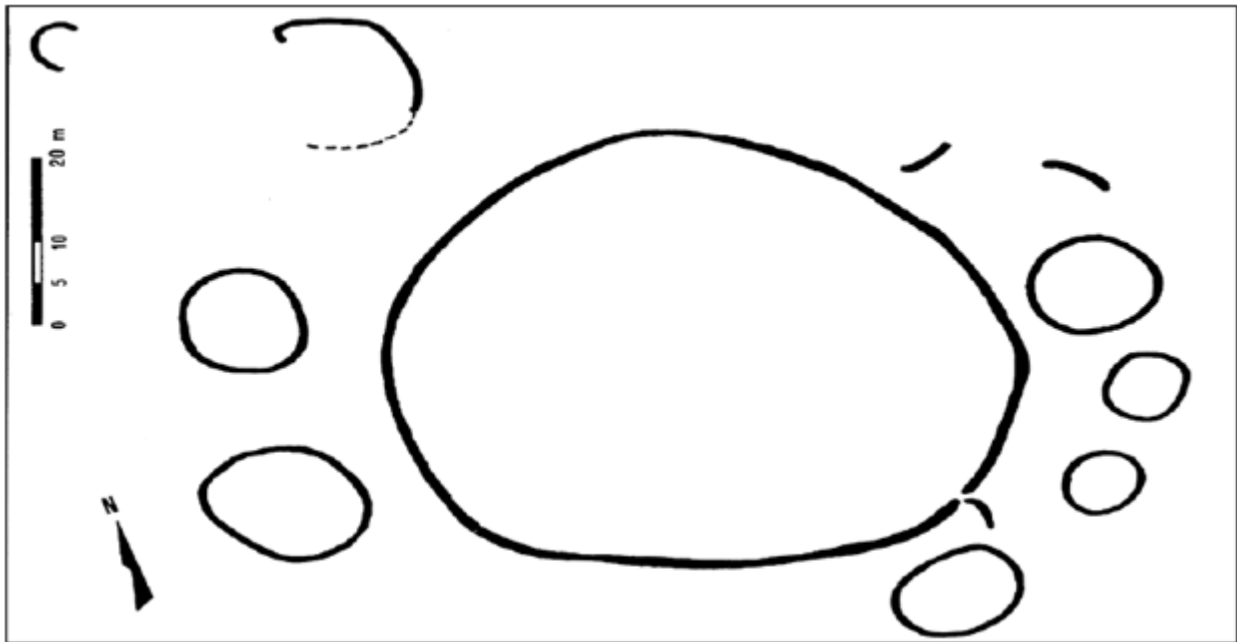


Figure 5. Khartoum I. A typical Type R Settlement in the Western Free Stat (Maggs, 1967)

The Type R Settlement units consist of one particularly large central enclosure with several smaller enclosures loosely arranged around it. The central enclosure varies from 20 – 170 m in diameter and probably served as a stock pen. The smaller enclosures per settlement unit and their entrances, where recognisable, tend to face inwards towards the central enclosure. Some were used for domestic activities but in general the archaeological evidence from these enclosures is equivocal that excavations have failed to yield significant finds. (Maggs, 1967).

Type R Settlement excavations have identified that the pottery found on these sites are distinctly different from that found on Iron Age sites to the North and while Late Stone Age artefacts have been identified on these sites, it is difficult to make a direct correlation between them and the inhabitants of the Type R Settlement. Copper and other trade tools have also been documented on these sites and the faunal remains suggest small herds of domesticated sheep and cattle and although animal husbandry seemed commonplace, there is no indication of plant propagation evident.

Radiocarbon dates retrieved for Type R Settlements indicate a date range of between 1380 and 1780. (Beaumont & Vogel, 1984).


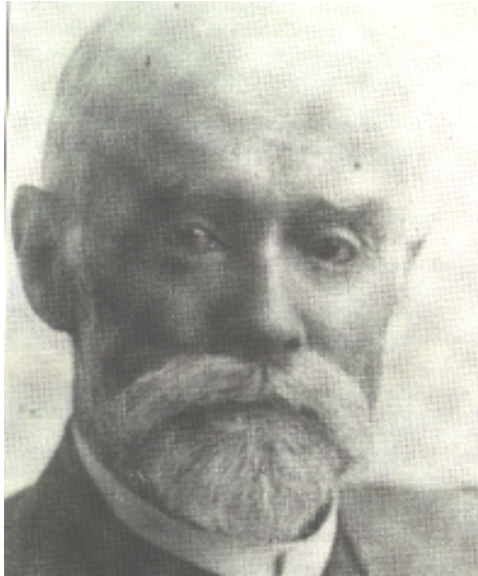
## THE HISTORIC ERA


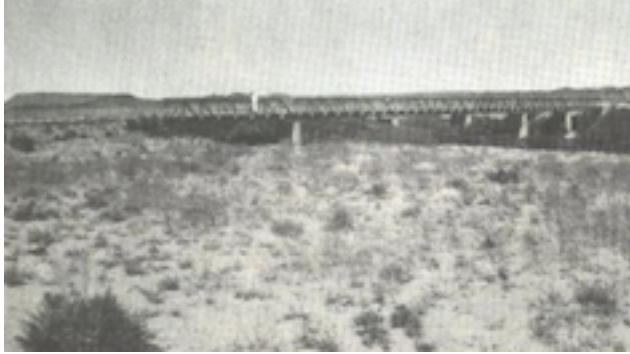




Figure 6. Entrance to Koffiefontein

DATE	DESCRIPTION
Early 1800's	Koffiefontein was a stopover spot for transport riders traveling between the coast and the diamond fields and gold mines to the north.
1819	The first white settlers in the Koffiefontein area was the "Trekboere". They came from the Colesberg area and other parts of the Northern Cape Colony and due to periodic droughts and poor fields, they were permitted to cross the Orange River. The huge stretch of country between the Orange- and Modder Rivers was unoccupied expect for a few small parties of Bushmen, who offered no resistance. They gradually settled with their families along the Ellenboog-and Riet River.
1823 - 1840	Rev. A. Faure of Graaff Reinet established a Mission Station at Philippolis to convert the Bushmen. Within three years, it became obvious that it was a failed effort. The missionaries, with the approval of the Cape Authorities, persuaded a number of Griqua families to settle at Philippolis. During the 1830's friction rose periodically between the Griqua families and the Whites, both claiming ownership of the territory. In 1834, the British and Adam Kok signed a treaty (known as the "Maitland Treaty"), which acknowledged only his claim to the entire territory between the Orange- and Modder Rivers. Rightful occupation by Whites could thereafter only be acquired through the Griquas and consequently Barend Jacobs Engelbrecht had to hire the parts he had been grazing from Klaas Kok. The lease drawn up in 1840 covered the farms later known as Koffiefontein, Blaauwheuwel, Lentelus and Rooidraai.
1844 - 1860	Engelbrecht bought the farm, but after three years the sale was annulled. To prevent further friction between the Griquas and Boers, the Governor Maitland divided the territory in two parts. No whites were allowed to own land south of the Riet River and it was to be a Griqua Reserve. Thereafter Engelbrecht re-established himself at Blaauwheuwel. When the British sovereignty was proclaimed over the territory between the Orange and Vaal Rivers in 1848, the Maitland Treaty was annulled. In 1854 the British withdrew and acknowledged the Republic of the Orange Free State. In 1855, Engelbrecht bought the parts north of the Riet River.



	In 1816 the Griqua problem was resolved for the Republic when Sir George Grey persuaded Adam Kok and all his Griquas to migrate to Griqualand East.
1870's – 1890's	Diamonds (of very good clarity: "first water") were discovered in the area and the town, Koffiefontein, developed as prospectors began to mine there. One thousand two hundred and forty-three claims were laid out in 1878 and by the 1890's several companies were mining the kimberlite pipe.
1878 – 1880	F.S.J. Rörich, the owner of several farms (including Koffyfontein) had a township, Rörichsburg, surveyed by Mr. Brand. De Beers was interested in the Koffiefontein Mine and during 1880 the London and Orange Free State Exploration Company, represented by Thomas Glasson Osborne, went to Rörich to negotiate the purchase of his farms. Rörich was asking £100 000, but refused to accept a cheque for the amount, he insisted to be paid in gold. Osborne had to return to Kimberley and in spite of gigantic efforts, only £80 000 could be raised. It is said that when Rörich saw the coins, he willing to accept it in full payment.
	 <p style="text-align: center;">Figure 7: S.F.G. Rorich</p>  <p style="text-align: center;">Figure 8: Thomas Glasson Osborne</p>
1880	On 29 November 1880 the transfer of Koffyfontein No.1 and of Ebenhauzer with the mines and township was registered in Bloemfontein. The name Rörichsburg was dropped.
1880 – 1890's	Mining continued from 1880 to 1885 when all claims were abandoned. The middle 80's were hampered by a severe economic depression. The diamond market was

	<p>faced with overproduction and falling prices. Cecil John Rhodes consolidated the diamond interest. Thereafter, he could control production and regulate the supply offered at the markets.</p>
1893	<p>Alfred Mosely bought a number of claims and formed the Koffyfontein Mines Ltd. The company headquarters were in London. James West was appointed the Manager.</p>
1894 - 1896	<p>Walter Stanley Whitworth, a qualified civil engineer, comes to Koffiefontein. His intention was to only be there two years, while working on the construction of railways, but he stayed for 60 years and became a very influential person in the community. Whitworth succeeded West as Mine Manager in 1896.</p>  <p>Figure 9: W.S. Whitworth</p>
1896	<p>A typhoid epidemic claims the lives of many people in the community. The total number of deaths was not recorded.</p>
1899 - 1902	<p>Koffiefontein's proximity to Mafikeng and Kimberley meant that the district saw a lot of military action during the Second Anglo-Boer War. After the Boer forces under command of General Brand and Commandant Hertzog attacked the town and mines, the British erected several blockhouses in October of 1900. These were involved in actions in the subsequent three months and at one point the Boers looted the town and the people of the town took refuge in the mine.</p>
1903	<p>Election of the first town council took place on 9 May 1903. Dr. Hunter was elected as the first Mayor.</p>
1911	<p>De Beers bought the claims at the mine and became the owners until 2006.</p>
1914 - 1915	<p>A bridge over the Riet River was completed in 1914 and the railway from Fauresmith to Koffiefontein was opened in 1915. Koffiefontein became more accessible to the outside world.</p>  <p>Figure 10: Road Bridge over the Riet River</p>
1914 - 1918	<p>During the First World War, the mine at Koffiefontein was closed and caused a serious local depression.</p>
1922	<p>A First World War Memorial was erected on a hill outside of the town.</p>

		
<p>Figure 11: First World War Memorial (Picture taken 15 April 1939)</p>		
1929 - 1940	<p>The town Council succeeded in July 1929 in getting the mine to supply electric current to the town and soon many of the houses had lights. The mine intended to close their power station and asked for arrangements to be made by the Council to take over the water and electricity supply to the town. The mine directors (under leadership of Whitworth) decided that they would built a small power station and donate it it to the Municipality.</p>	
1930's – 1940's	<p>During 1930 a number of mine workers were retrenched, by 1932 the rest were paid off. The unemployment triggered relief work at the construction of the Kalkfontein Dam.</p>	
1939 - 1945	<p>During World War II a large Concentration Camp was opened in the town. 2000 Italian P.O.W.'s, some German P.O.W.'s and about 800 South Africans, who were suspected of being pro-Nazi, were interned. Among them were F.C. Erasmus and John Vorster.</p> <p>Italian P.O.W. artist Titta Fasciotti decorated the walls of the camp with portraits of King Victor Emmanuel II and Benito Mussolini. These paintings are now preserved.</p> 	
<p>Figure 12: Titta Fasciotti's paintings at the Concentration Camp</p>		
1950	<p>A cheese factory was opened outside of Koffiefontein.</p>	
1970	<p>The town's electricity supply was linked up with Eskom and two power lines from the Transformer station near Monument Kopje was constructed.</p>	
1980 - 1992	<p>Dr. D.C. McGill campaigned for a celebration of the town's beginnings in 1880, but because of poor contact between Bloemfontein and Koffiefontein the early years; the Free State archives contained very little information on the early history of the town. The proclamation of the town was dated 24 November 1892, thus Koffiefontein celebrated its first Centennial on 24 November 1992. (An unofficial commemoration was held on 29 November 1980 to acknowledge the first 12 years of the town's existence.)</p>	
2002	<p>In April 2002, during operations to rework earlier dumps, thirty-six skeletons were excavated at the Koffiefontein Diamond Mine dump. Archival documents suggest</p>	

	that these individuals were mine workers who died in the 1896 typhoid epidemic. These skeletons were discovered at the edge of a graveyard. The mine ceased operations in that section and the graveyard was left intact.
2007	Petra Diamonds bought the Koffiefontein Mine from De Beers and are currently still the owners and in operation.

Sources:

- Gardner F. Williams, "History of Diamond Mines in South Africa"
- D.C. McGill, "A History of Koffiefontein Mine and Town"
- Picture Credits: D.C. McGill, "A History of Koffiefontein Mine and Town"
- O.L. Nel, "Agter die Doringdraad"
- E.N. L'Abbe, Z.L. Henderson & M. Loots. Uncovering a nineteenth-century typhoid Epidemic at the Koffiefontein Mine, South

### PREVIOUSLY IDENTIFIED SITES

During the archival study several sites within the direct surrounding areas from the study area was identified.

Henderson identified the following sites during a 2002 heritage study performed on the proposed mining area (Henderson, 2002);

### Mining Areas

The first claims at Koffiefontein were mined during the 1870's. As such the main shafts at the Koffiefontein and Ebenezer Pipes are of historic importance due to their age and their association with the mining history of the Western Free State and Northern Cape Provinces.

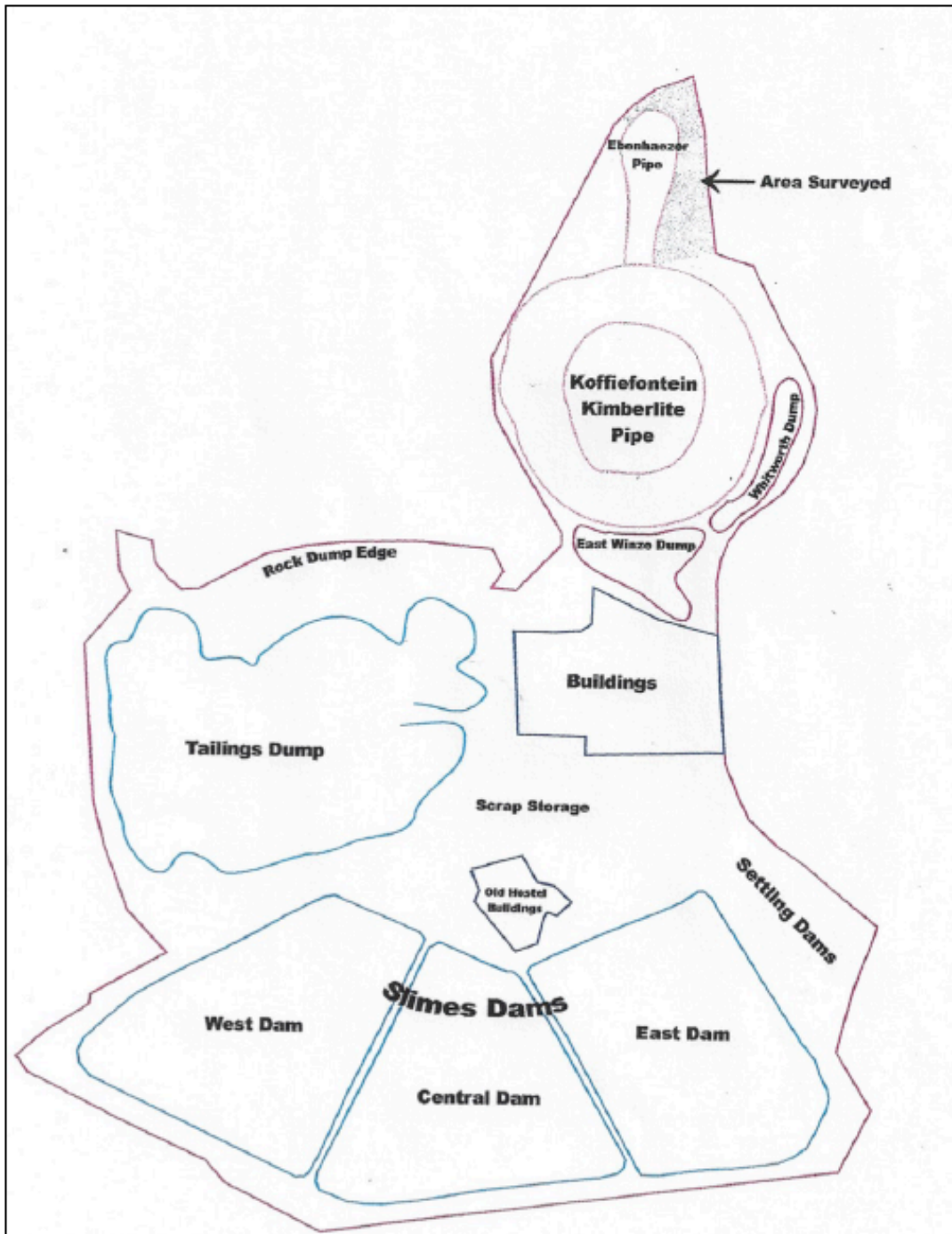


Figure 13. Area surveyed by Henderson in 2002 (Henderson, 2002)

### The Guard House

This structure is supposedly more than 100 years old and was used during the Second World War during the phase when the area was used as an internment camp.



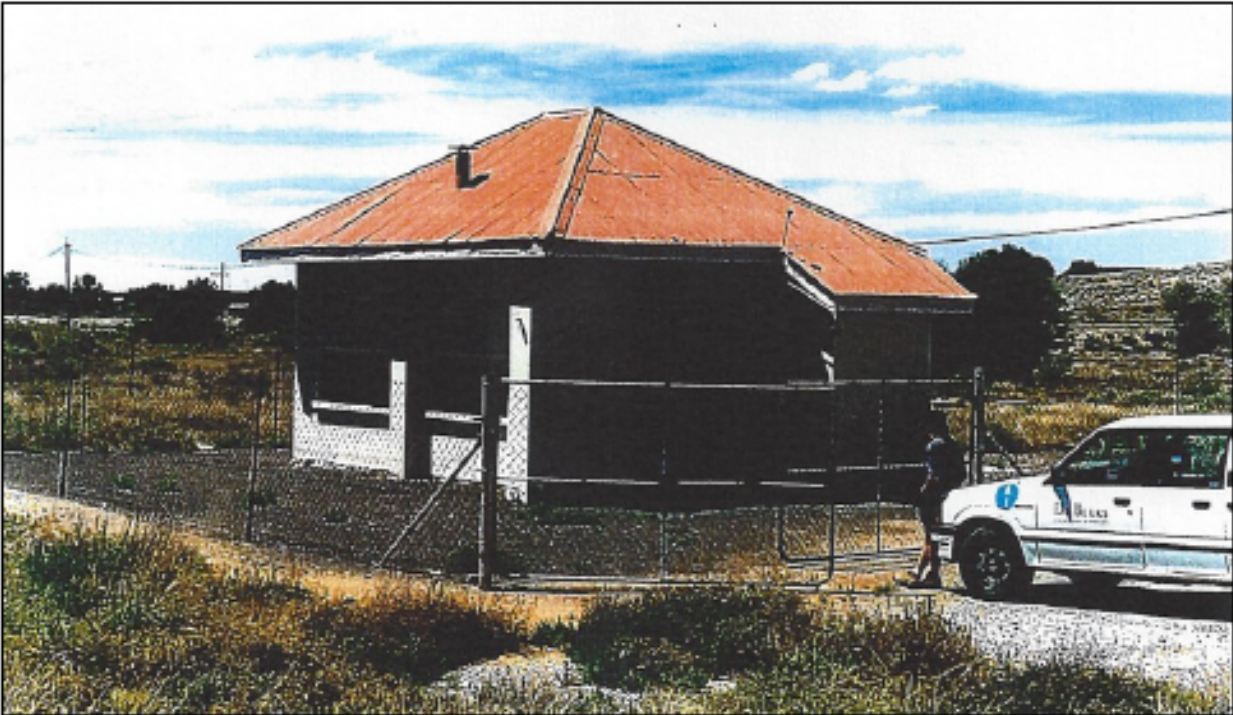


Figure 14. The Guardhouse (courtesy of Henderson, 2002)

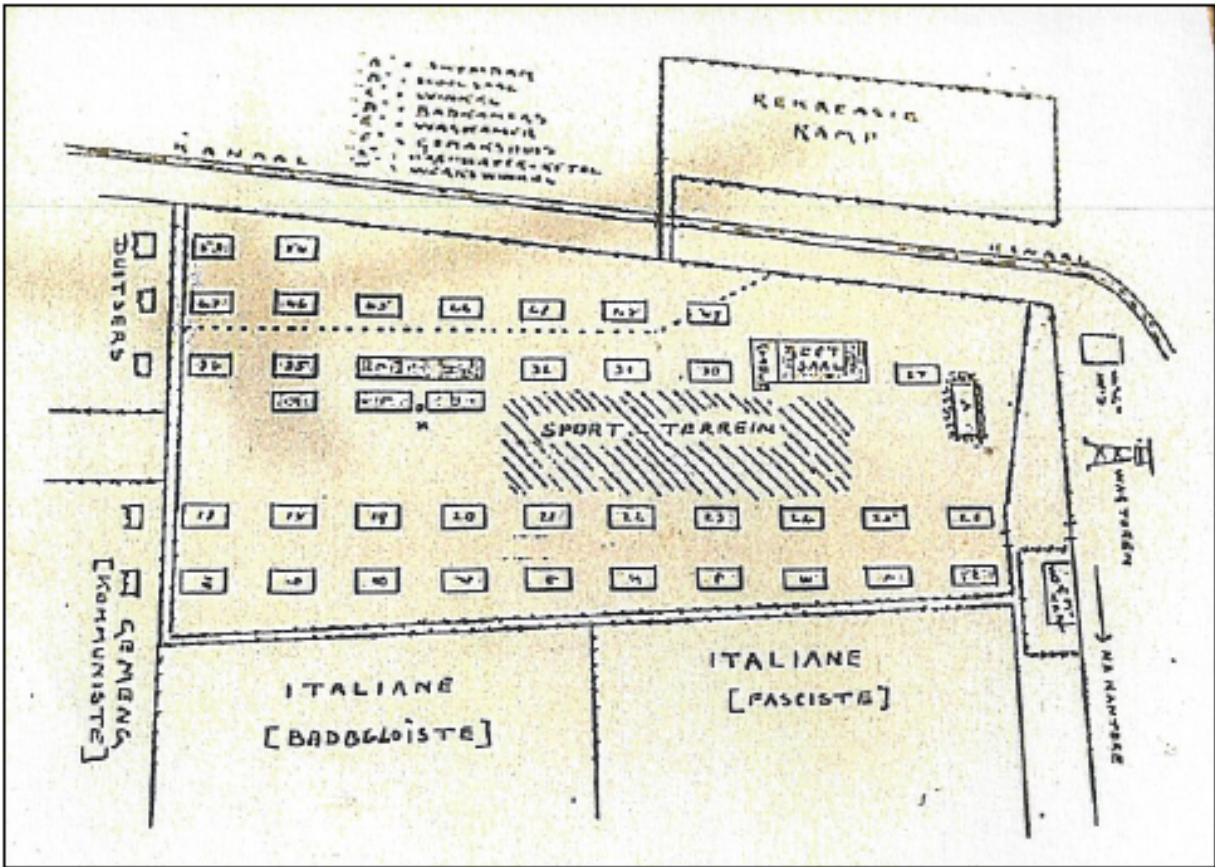


Figure 15. Diagram of Internment Camp (Henderson, 2002)



### Engravings behind the Manager's House

Four engravings were identified on the koppie behind the Manager's house on the Game Farm. Two engravings occur at the base of the koppie with two more towards the top. The engravings are pecked and outline drawings of several animals such as eland and wildebeest (Henderson, 2002).



Figure 16. Engravings identified by Henderson (Henderson, 2002)



Figure 17. Engravings identified by Henderson (Henderson, 2002)

### The Quarry

Basalt was mined to the north of the mine during the 1970's. It seems like there were some burial sites



here as a single human skull was recovered during the 2002 survey from this area (Henderson, 2002).

### Koppies behind the Golf Course

This site contains historic graffiti and inscriptions on the rocky koppie located behind the Golf Course at the mine. The inscriptions are concentrated on rocks around the base of a cross, erected at the summit of the koppie (Henderson, 2002).



Figure 18. Location of sites identified by Henderson (Henderson, 2002)

### The Fort or Skans

On the koppie closer to town a stone walled skans or fort is located. This probably dates from around 1900 when Koffiefontein was taken over by the British. The fort was most probably built by the British under the command of Captain J.W. Robertson for the protection of the mine.





artefacts and homfels here. The type of stone tool is not further discussed.

### **Kraals and Structures at *Shotists Point 26 & 27***

These structures are probably the remains of the original Farmhouse Structures and are older than 60 years and therefore should be preserved (Henderson, 2002).



Figure 20. Kraal walls on site (Henderson, 2002)

### **CULTURAL LANDSCAPE**

The cultural landscape is very much associated with mining activities as found around Kimberley in the Northern Cape Province. The expansion of these activities are not thought to have more negative influences in the cultural landscape, however, it should be done in such a way as not to impact negatively on this.

### **BUILT ENVIRONMENT**

No built environment sites of historic importance were located within the study area. Some farming components are found here (feeding troughs, livestock enclosures, fences and paths). None of these are of historic importance. A modern airfield and control house can be found on the site. To the west a small hunting camp with slaughtering facilities and accommodation is located. None of these are of historic significance.

On the northern section of the site a 100m long stone mound of between 1 and 2 meters wide is found. This is either rocks cleared from a access path or rocks used to cover a water pipeline. Either way, the rock barrier is not of any historical significance.



Figure 21. Stone ridge on northern section of the study area

### HISTORICAL MAPS

Through analysis of the available historic 1:50 000 topographical maps it is possible to identify any structures that might not have been visible during the present. The following maps could be sourced for the study area;



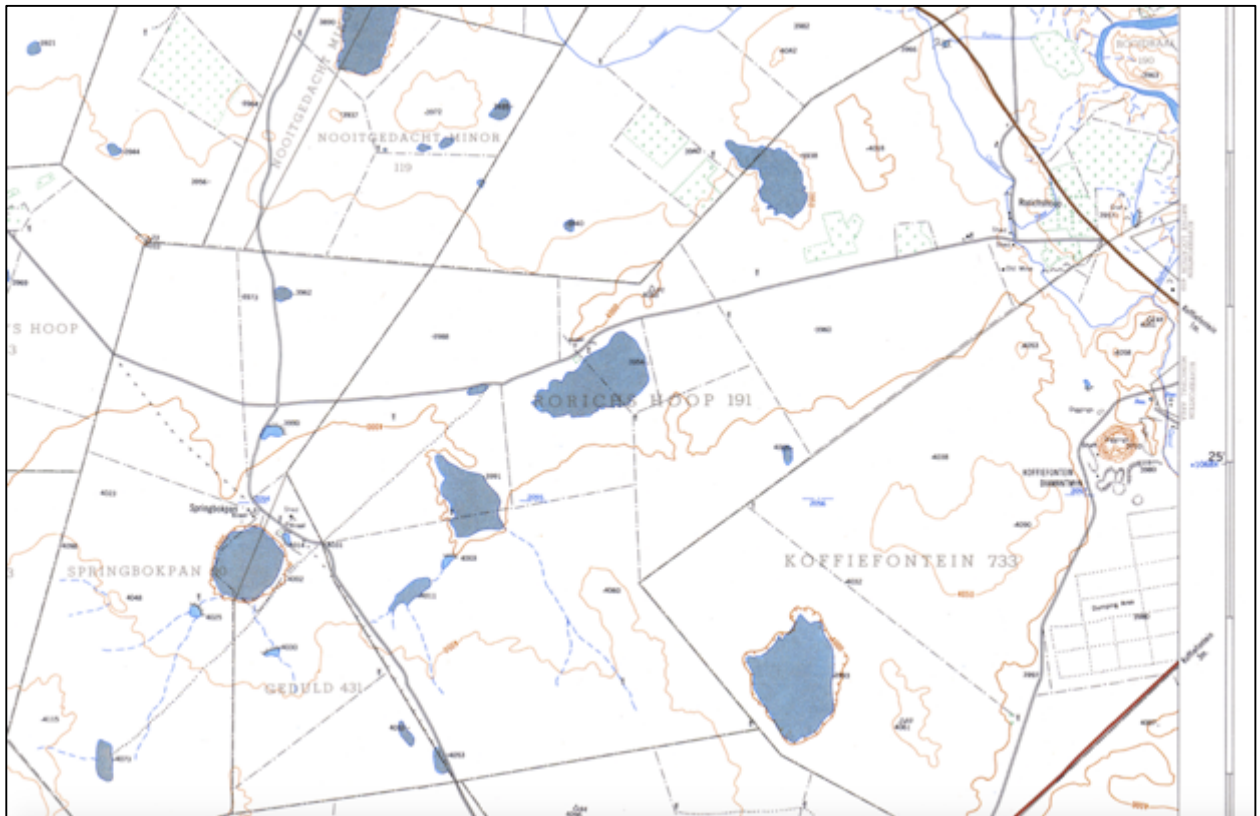


Figure 22. Topographical Map 2924 BD 1967

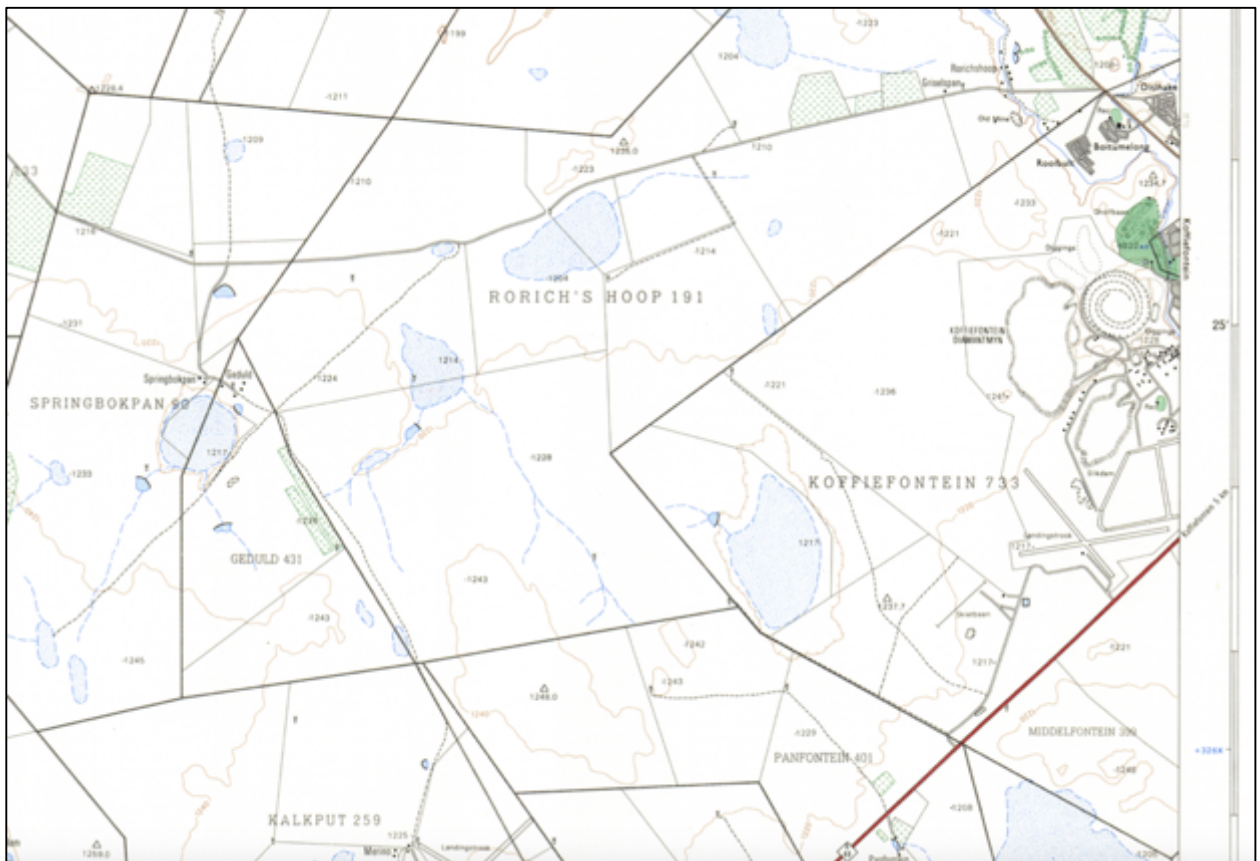


Figure 23. Topographical Map 2924 BD 1988

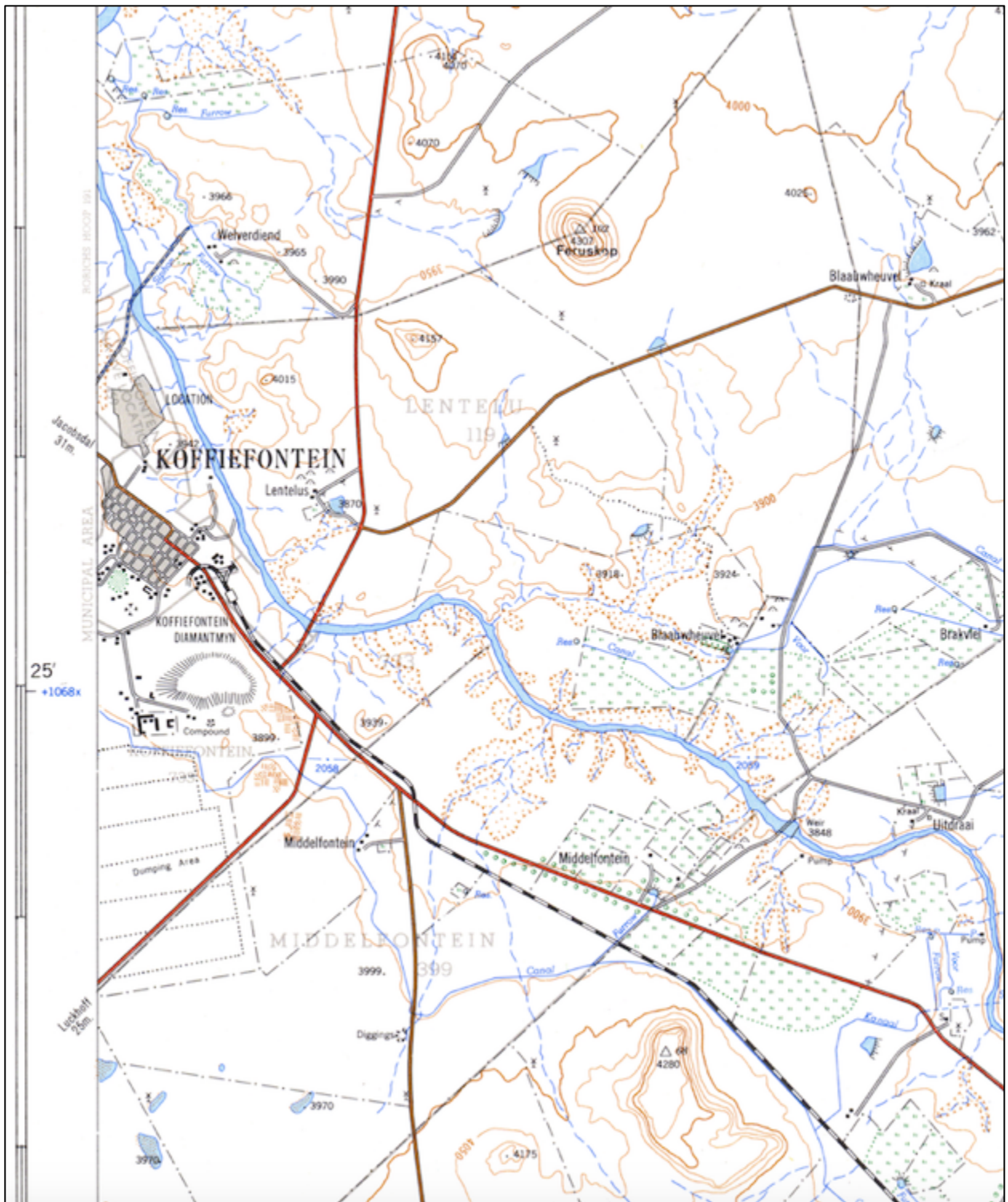


Figure 24. Topographical Map 2925 AC 2967



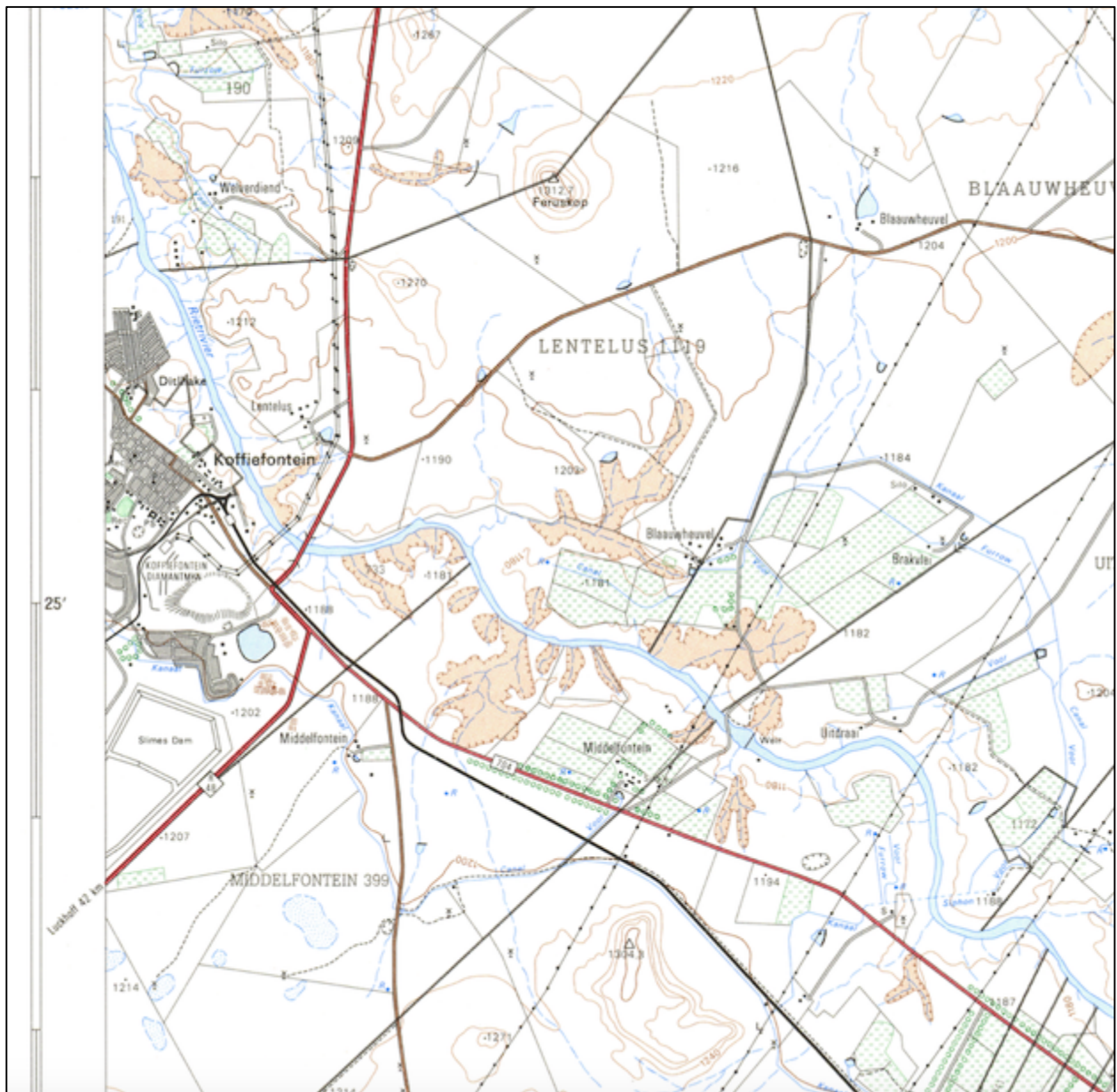


Figure 25. Topographical Map 2925 AC 1988

### PREVIOUS STUDIES

#### Previous HIA's (Koffiefontein):

- Henderson, Z. 2001. Archaeological Survey for De Beers Consolidated Mines, Koffiefontein Mine, a Division of Central Mines.
- Henderson, Z. 2004. Heritage Survey for De Beers Consolidated Mines, Koffiefontein Mine.
- Henderson, Z. 2003. Report on the Excavation of an Informal Graveyard in the Whitworth Dump, De Beers Mine, Koffiefontein.

#### Previous HIA's (Xhariep):

- Loudine, P. 2013. Heritage Impact Assessment of the Proposed Pipeline on subdivision 16 & Remain Extent of the farm Jagersfontein no. 14 in the Magisterial District of Xhariep, Free State Province.
- Webley, L., Botha-Brink, J., Salomon, A. 2012. Heritage Impact Assessment: Proposed

Construction of the Ruimte Photovoltaic Solar Energy Facility, Wagenmaker's Drift 24, Xhariep District Municipality, Free State.

Previous HIA's (Jagersfontein):

- Loudine, P. 2009. Phase 1 Impact Assessment of the Dormant Jagersfontein Mine (Free State) in terms of Archaeological and other Heritage Sites.
- Rossouw, L. 2014. Phase 1 Heritage Impact Assessment of a proposed new landfill site near Jagersfontein, Kopanong Local Municipality, FS Province.
- Dreyer, C. 2006. First Phase Archaeological Heritage Investigation of the Jagersfontein Bulk Water Supply Scheme, Free State.

## FINDINGS

### RESULTS OF THE SURVEY

#### PALAEONTOLOGY

Palaeontology was not investigated.

#### ARCHAEOLOGY

The area was investigated for Stone Age as well as Iron Age Sites. Although no Iron Age Sites were identified within the study area, the occurrence of these is still possible.

#### REGISTER OF THE SITES IDENTIFIED

No.	Description	GPS	Association	Significance
001	LSA Site	S 29° 26' 26,9" E 24° 59' 49,3"	Late Stone Age	Medium
002	LSA Site	S 29° 26' 25,9" E 24° 59' 48,2"	Late Stone Age	Medium

### Stone Age Sites

Two sites with clusters of finished stone tools dating to the Late Stone Age were identified with the study area.

#### Site 001

GPS

S 29° 26' 26,9"

E 24° 59' 49,3"

This is a small surface scatter of Late Stone Age artefacts. The tools consist mainly of small microlithic scrapers and some blade remnants. The area where the tools are found is around 8m x 5m in size, giving it a surface coverage of around 40m<sup>2</sup>. The scatter does not contain any cores or discarded flakes, suggesting that this was not a production site, but rather the result of alluvial settlement deposit. No associated deposits were found on the site. Maximum tool density was around 2 tools/m<sup>2</sup>.

The site is flat with little foliage coverage.





Figure 26. Location of Site 001



Figure 27. Stone microlithic tools at Site 001





Figure 28. Stone tools *in situ* at Site 001



Figure 29. Stone tools *in situ* at Site 001



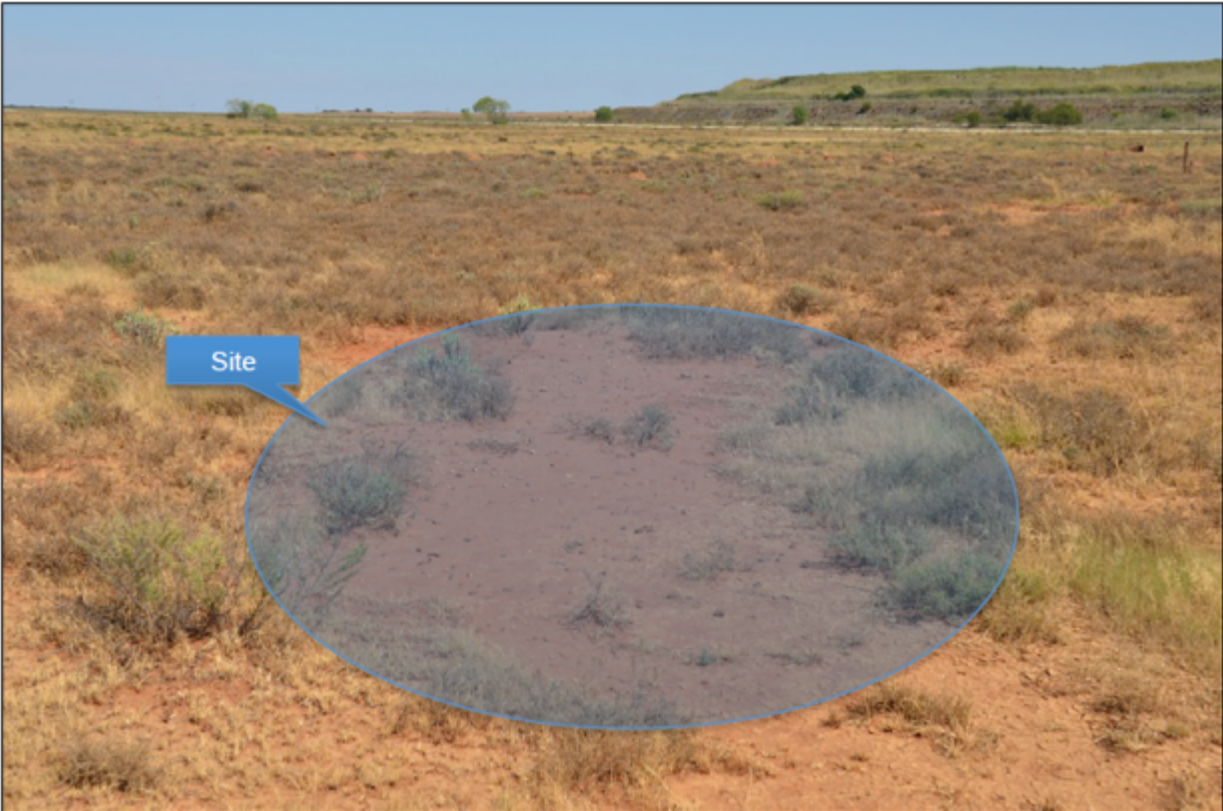


Figure 30. Area with LSA Stone tool concentrations



Figure 31. Surface of Site 001



Figure 32. General condition of surface at Site 001

### Site 002

GPS

S 29° 26' 25,9"

E 24° 59' 48,2"

This site is similar to Site 001 with Late Stone Age stone tools scattered loosely on the surface. The site is roughly 60m<sup>2</sup>. Stone tool densities do not exceed 2 tools/m<sup>2</sup>.





Figure 33. Location of Site 002



Figure 34. Stone tools at Site 002



Figure 35. Stone tools *in situ* at Site 002





Figure 36. Surface of Site 002

### POSSIBLE HIGH RISK AREA

During the investigations on foot of the area south of the airfield, a large area is disturbed material and excavated spaces were noted. A large area containing haphazard heaps of stones were also noted. At the time investigators believed that these were the result of the construction of the airfield. The area is extremely rocky and it was assumed that these mounds were the result of clearing away rocks from the airfield site.

Although it is still the most likely scenario, the archival study did produce some information that could indicate another explanation for these heaps. During February 1896 an enteric fever broke out under the mine workers at Koffiefontein Mine. The epidemic continued until August 1896 and during its height in

April / May it was claiming the lives of nearly 30 people every day. The Mine Manager at the time, Walter Whitworth noted that the mine was eventually overwhelmed by the amount of deaths and that in a desperate move they started to bury the dead in the tailings of the mine (L'Abbe, Henderson & Loots, 2003). During the expansion of the mine in April 2002, several graves were uncovered and eventually 38 graves were exhumed from the area before the mine decided to close activities in this area. It is expected that several other burial grounds could be found in and around the existing mine.

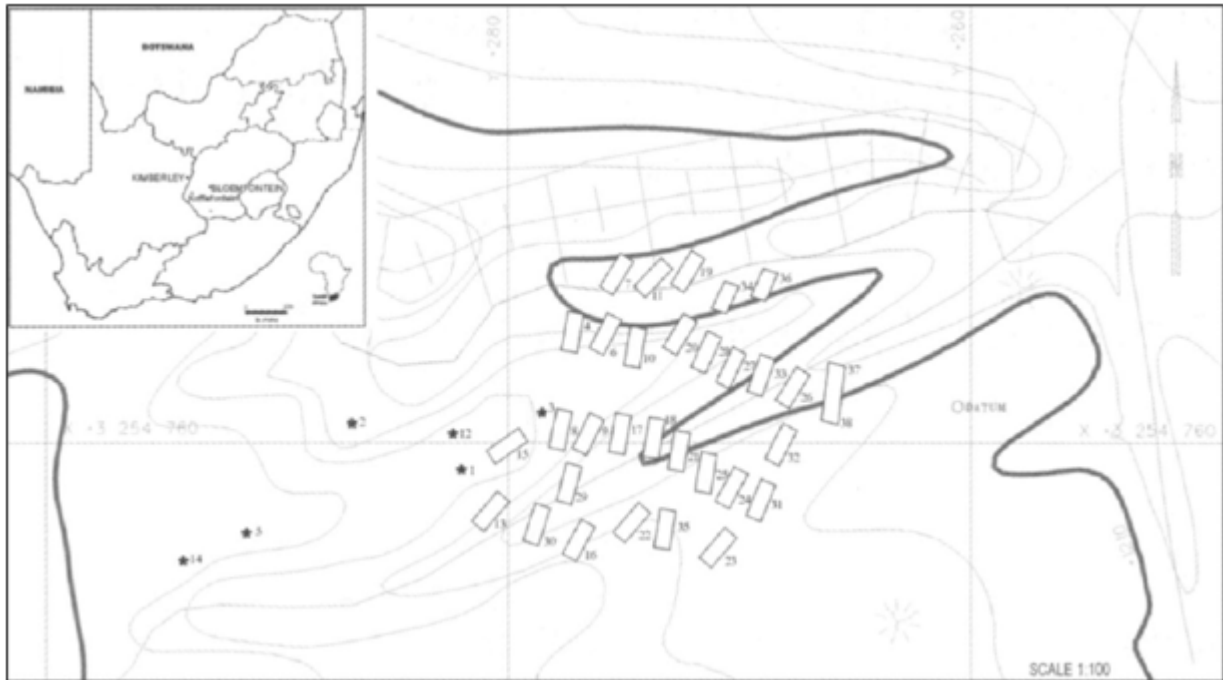


Figure 37. Location of the excavated graves at Koffiefontein (L'Abbe, Henderson & Loots, 2003)

During the field investigations, the stone mounds identified was originally thought to be the result of rock clearing for the construction of the airfield. After the information recovered from the archival study indicated the possibility of graves with the area, the prospect of these rock mounds being possible gravesites were postulated. Although these site are in most likelihood not burial sites, the occurrence of such sites is so common that the area will have to be monitored during construction to ensure that no further damage is suffered to burial sites in the area.





Figure 38. Area with stone mounds



Figure 39. Rock Mounds



Figure 40. Disturbed area around rock mounds



Figure 41. Area with stone mounds



## METHODOLOGY

This study defines the heritage component of the EIA process being undertaken for the proposed proposed Brick Making site, Slimes Dam, Alternative Solar Plant site and Rock Dump site at the Koffiefontein Diamond Mine in the Free State Province.

This study is informed mainly by document studies and specialist knowledge of the area supplemented by fieldwork. After a site meeting with Mine Management, the study area was accessed by vehicle and on foot.

It is described as a first phase (HIA). This report attempts to evaluate both the accumulated heritage knowledge of the area as well as information derived from direct physical observations.

## INVENTORY

Inventory studies involve the in-field survey and recording of archaeological resources within a proposed development area. The nature and scope of this type of study is defined primarily by the results of the 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*).

## 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.

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
- Internet Search
- Historic Maps
- 1967, 1988 and 2005 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2016 imagery
- Published articles and books

- JSTOR Article Archive

## FIELDWORK

Fieldwork for this study was performed on the 24<sup>th</sup> of February 2015. Most of the areas were found to be accessible by vehicle. Areas of possible significance were investigated on foot. The survey was tracked using GPS and a track file in GPX format is available on request.

The study was mainly focused on systematic field surveys of the study area. The majority of the proposed construction site is barren.

Where sites were identified it was documented photographically and plotted using GPS with the WGS 84 datum point as reference. The image, figure 3 on page 15, shows the GPS track paths for both the on-foot and car reconnaissance of the study area.

The study area was surveyed using standard archaeological surveying methods. The area was surveyed using directional parameters supplied by the GPS and surveyed by foot. This technique has proven to result in the maximum coverage of an area. This action is defined as;

*'an archaeologist being present in the course of the carrying-out of the development works (which may include conservation works), so as to identify and protect archaeological deposits, features or objects which may be uncovered or otherwise affected by the works'* (DAHGI 1999a, 28).

Standard archaeological documentation formats were employed in the description of sites. Using standard site documentation forms as comparable medium, it enabled the surveyors to evaluate the relative importance of sites found. Furthermore GPS (Global Positioning System) readings of all finds and sites were taken. This information was then plotted using a **Garmin Colorado** GPS (WGS 84- datum).

Indicators such as surface finds, plant growth anomalies, local information and topography were used in identifying sites of possible archaeological importance. Test probes were done at intervals to determine sub-surface occurrence of archaeological material. The importance of sites was assessed by comparisons with published information as well as comparative collections.

*Test excavation is that form of archaeological excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location, which it is proposed to develop (though not normally to fully investigate those deposits or features) and allow an assessment to be made of the archaeological impact of the proposed development. It may also be referred to as archaeological testing'* (DAHGI 1999a, 27).

*'Test excavation should not be confused with, or referred to as, archaeological assessment which is the overall process of assessing the archaeological impact of development. Test excavation is one of the techniques in carrying out archaeological assessment which may also include, as appropriate, documentary research, field walking, examination of upstanding or visible features or structures, examination of aerial photographs, satellite or other remote sensing imagery, geophysical survey, and topographical assessment'* (DAHGI 1999b, 18).

## 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
- Paleontological Feature
- Geological Feature

## TYPE OF SIGNIFICANCE

### HISTORIC VALUE

It is 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 paleoenvironmental 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

(a) 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

(a) 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?

### OTHER



- (a) Is the site a commonly acknowledged landmark?
- (b) Does, or could, the site contribute to a sense of continuity or identity either alone or in conjunction with similar sites in the vicinity?
- (c) 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?
- (d) Is the site representative of a particular architectural style or pattern?

## DEGREES OF SIGNIFICANCE

### SIGNIFICANCE CRITERIA

There are several kinds of significance, including scientific, public, ethnic, historic and economic, that need to be taken into account when evaluating heritage resources. For any site, explicit criteria are used to measure these values. Checklists of criteria for evaluating pre-contact and post-contact archaeological sites are provided in Appendix B and Appendix C. These checklists are not intended to be exhaustive or inflexible. Innovative approaches to site evaluation which emphasize quantitative analysis and objectivity are encouraged. The process used to derive a measure of relative site significance must be rigorously documented, particularly the system for ranking or weighting various evaluated criteria.

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

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

## ASSESSMENT OF HERITAGE POTENTIAL

### ASSESSMENT MATRIX

#### 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 1 (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 1: 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	Known early settlement, but	Buildings without extensive basements

		early settlement	buildings have 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 2: 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 Dispersed distribution	Limited sequence	Long sequence Favourable context 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

## ASSESSING SITE VALUE BY ATTRIBUTE

Table 2 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.

## IMPACT STATEMENT

### 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

## 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*).

**POST-CONTACT SITES**

No sites associated with the post-contact era will be affected by the proposed development.

**BUILT ENVIRONMENT****HISTORIC SIGNIFICANCE**

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

**ARCHITECTURAL SIGNIFICANCE**

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



	N/A	-
8	<b>Were the additions and extensions done in sympathy with the original design?</b> N/A	-
9	<b>Are any of the buildings or structures the work of a major architect, engineer or builder?</b> 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	<b>Can any of the identified buildings or structures be considered a landmark in the town or city?</b> No	-
2	<b>Do any of the buildings contribute to the character of the neighborhood?</b> No	-
3	<b>Do any of the buildings contribute to the character of the square or streetscape?</b> No	-
4	<b>Do any of the buildings form part of an important group of buildings?</b> No	-

## 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.

## 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 if 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.

## 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.

### 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:

<b>NATURE</b>		
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.		
<b>GEOGRAPHICAL EXTENT</b>		
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.
<b>PROBABILITY</b>		
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).
<b>REVERSIBILITY</b>		
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.

<b>IRREPLACEABLE LOSS OF RESOURCES</b>		
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.
<b>DURATION</b>		
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).
<b>CUMULATIVE EFFECT</b>		
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.
<b>INTENSITY / MAGNITUDE</b>		
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.
<b>SIGNIFICANCE</b>		
<p>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:</p> <p><b>(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.</b></p> <p>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.</p>		
<b>Points</b>	<b>Impact Significance Rating</b>	<b>Description</b>
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.
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## ANTICIPATED IMPACT OF THE DEVELOPMENT

### KOFFIEFONTEIN MINE SITE 001 & 002

IMPACT TABLE FORMAT		
Heritage component	<i>Heritage sites of significance</i>	
Issue/Impact/Heritage Impact/Nature	Proposed Brick Making site, Slimes Dam, Alternative Solar Plant site and Rock Dump site at the Koffiefontein Diamond Mine in the Free State Province.	
<i>Extent</i>	<i>Local</i>	
<i>Probability</i>	<i>Unlikely</i>	
<i>Reversibility</i>	<i>Totally Reversible</i>	
<i>Irreplaceable loss of resources</i>	<i>Insignificant loss of resources</i>	
<i>Duration</i>	<i>Medium term</i>	
<i>Cumulative effect</i>	<i>Low cumulative effect</i>	
<i>Intensity/magnitude</i>	<i>Low</i>	
<i>Significance Rating of Potential Impact</i>	<i>8 points. The impact will have a low negative impact rating.</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	1	1
Reversibility	2	2
Irreplaceable loss	1	1
Duration	2	2
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	8 (low negative)	8 (low negative)
Mitigation measure	<i>Should any graves be identified during the construction phase of the project the attached recommendations should be followed in the mitigation of them.</i>	

### 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.

## 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.

## ASSESSMENT OF IMPACTS

### BUILT ENVIRONMENT

Some structures associated with rural living were identified;

- Brick outbuildings (modern and historic)
- Barb-wire fences (modern)
- Mud-brick huts (modern)
- Dirt roads (modern)
- Footpaths

### Mitigation

None of the structures will be affected by the construction activities.

### CULTURAL LANDSCAPE

The following landscape types were identified during the study.

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

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

### Mitigation

It is recommended that the development designs take into account the positive and negative characteristics of the existing cultural landscape type and that they endeavor to promote the positive aspects while at the same time mitigating the negative aspects.

## RESOURCE MANAGEMENT RECOMMENDATIONS

Although unlikely, sub-surface remains of heritage sites could still be encountered during the construction activities associated with the project. Such sites would offer no surface indication of their presence due to the high state of alterations in some areas as well as heavy plant cover in other areas. 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 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 sufficient time to analyze the finds.

## SITE SELECTION

### BRICK MAKING SITE

*Site 1* is preferred over *Site 2*. *Site 1* has been altered to a much greater level than *Site 1* and the possibility of encountering or damaging sites of heritage significance is much less here.

### SOLAR PLANT

*Site 3* is preferred over *Site 4*. *Site 3* is located within an old slimes dam while *Site 4* is located in a greenfield area. The construction of the slimes dam would already have caused the maximum amount of impact.



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