DINGLETON GRAZING PROJECT

Heritage Impact Assessment for the Proposed Establishment of a Grazing Project on a Portion of the Farm Marsh 467, Dingleton, Gamagara Local Municipality, Northern Cape.

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DECLARATION OF INDEPENDENCE

The report has been compiled by PGS Heritage, an appointed Heritage Specialist for SLR (Pty) Ltd. The views stipulated in this report are purely objective and no other interests are displayed in the findings and recommendations of this Heritage Impact Assessment.

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Report Title	Heritage Impact Assessment for the proposed Grazing Project on a Portion of the Farm Marsh 467, Dingleton, Gamagara Local Municipality, Northern Cape Province.		
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EXPLANATION OF ABBREVIATIONS USED IN THIS DOCUMENT

Abbreviations	*Description*
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
CMP	Conservation Management Plan
CRM	Cultural Resource Management
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
ESA	Earlier Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LIA	Late Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PGS	PGS Heritage
PHRA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

EXECUTIVE SUMMARY

PGS Heritage was appointed by SLR (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), which forms part of the Environmental Impact Assessment (EIA) for the proposed grazing land and associated infrastructure on a portion of the Farm Marsh 467, Kathu, Northern Cape. The proposed activities can be viewed as activities typically found on farms in the direct surroundings, and will include fencing, the development of two boreholes (Marsh 1 and SW 740), the construction of a small steel dam at Marsh 1, the establishment of an above surface pipeline link between Marsh 1 and SW740 (the pipeline will only go underground to allow for the crossing of the tar road and will be 40mm in diameter), a small pipeline link between these two boreholes and two existing dams (this pipeline will also be above surface, will be placed along the existing fences and will also be 40mm in diameter) as well as the placement of troughs adjacent to the reservoirs. Initially the proposed activities also included access roads and firebreaks, but due to the significance of the nearby Kathu Pans, these have now been excluded from any future planned activities.

Due to the significance of the Stone Age sites from the surrounding landscape, Dr Maria van der Ryst was appointed to review the report and provide inputs in terms of the Stone Age.

An archival and historical desktop study was undertaken which was used to compile a historical layering of the study area within its regional context. This component indicated that the landscape within which the project area is located has a rich and diverse history.

A palaeontological desktop study for the proposed development was undertaken by Dr. Lloyd Rossouw of Palaeo Field Services. His report is included in this document under Appendix B. The conclusions of the report are as follows: *"The planned development and installation of infrastructure on Marsh 467 should result in minimal subsurface impact with regard to palaeontological remains. The creation of fire breaks* (which is not proposed anymore) *may result in the exposure of potentially fossil-capping calcretes, which could be seen as a positive palaeontological impact provided that it is accompanied by appropriate mitigation measures. The proposed development will not impact on the nearby heritage sensitive Kathu Pan Complex. Should future development within the study area require extensive excavations into in situ sediments, it is advised that such activities are preceded by a Phase 1 Palaeontological Impact Assessment".*

The National Heritage Site Nomination of the Kathu Archaeological Complex as a Grade 1 Heritage Site that consists of nine localities, Kathu Townlands, Kathu Bestwood, Kathu Uitkoms and the various Kathu Pan locations, demonstrates the importance of the archaeological heritage of the region (Walker et al, 2013; Walker et al, 2013; SAHRIS accessed April 2015). The scientific and heritage significance, and the occurrence of possible heritage resources, were taken into account in the HIA under review (Beaumont, 1990, 2004, 2013; Porrat et al, 2010; Herries, 2012; Chazan et al, 2012; Wilkins & Chazan, 2012; Walker et al, 2013; Walker et al, 2014; Orton and Walker 2015). The heritage desktop study component of the project was followed by fieldwork. The methodology comprised a walk-through of the study area by an experienced fieldwork team consisting of an archaeologist and archaeological assistant.

Only one site of heritage significance was identified. A low density scatter of stone tools was recorded (± 2-5 artefacts in 10m x 10m). The site is situated around and within a small pan in the central part of the study area. The small pan is located immediately to the north and approximately 25 m from one of the existing fences that will be re-fenced. The site covers an area of approximately 50 m in diameter, including the small pan. The artefacts were exposed due to some measure of sheet erosion towards the central part of the pan. The stone tools consisted mostly of MSA blades, scraper types and a few cores randomly scattered across the site. The identified lithics represent such a small and statistically insignificant sample that the cores and scrapers cannot be exclusively assigned to a specific time frame but overall the lithics are characteristic of the MSA. The lithics were recorded but not collected. In view of the very low density of the lithics and the nature of the proposed activities that require limited infrastructural developments no mitigation measures or actions are required for this site.

In the Kathu region the thickness of the sand formation that can be up to several metres usually masks underlying deposits. In view of the significant and often extensive deposits of subterranean Stone Age material present within the surrounds of the study area, the following general recommendations are mandatory:

- An archaeologist suitably qualified in Stone Age fieldwork and research must be appointed to undertake an Archaeological Watching Brief during the Construction Phase of the project.

- The appointed archaeologist will be responsible for the following:

- Provide training to the project Environmental Control Office (ECO) in Stone Age archaeology and the identification of Stone Age artefacts and sites. The ECO will be responsible for daily on-site monitoring during the Construction Phase with the appointed archaeologist visiting the site every two weeks.

- On-site assessment of any Stone Age material exposed during the development activities and the provision of recommendations for the way in which the exposed material must be mitigated.

- Compile and submit an archaeological monitoring report at the end of the monitoring process.

- During the daily on-site monitoring undertaken by the ECO and once every two weeks by the appointed archaeologist, all development work must be closely monitored. Should any Stone Age material or any archaeological material be identified, all development work in that area must immediately stop and the ECO or archaeologist (if he is already present on site) must demarcate a development-free area around the find. If the ECO made the discovery, the archaeologist must be contacted immediately to visit the site to assess the exposed material. The archaeologist will subsequently provide recommendations for the exposed material. These may range from destruction without mitigation (if the exposed material is found to be of little significance) to archaeological mitigation (if the exposed material is found to be significant).

Furthermore, the following general mitigation measures must also be adhered to:

- All work already in the process of being undertaken on site must be halted immediately to allow for the heritage impact assessment to be reviewed by the South African Heritage Resources Agency (SAHRA) first. Once no objection to the proposed development is received in writing from SAHRA, the activities can proceed.

- In future, local stones should not be used to pack against the new fences as can be seen in Figure 13 and 14 as this process may impact negatively on Stone Age sites.

The development of the proposed grazing land and associated infrastructure on a portion of the Farm Marsh 467, Kathu, Northern Cape can continue if the recommendations as outlined in this report are adhered to.

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1 INTRODUCTION

PGS Heritage was appointed by SLR (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), which forms part of the Environmental Impact Assessment (EIA) for the proposed Dingleton Grazing Project on a Portion of the Farm Marsh 467, Dingleton, Gamagara Local Municipality, Northern Cape Province.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur within the proposed development area. The Heritage Impact Assessment (HIA) aims to inform the Environmental Impact Assessment (EIA) in the development of a comprehensive Environmental Management Plan (EMP) to assist the developer in managing the identified heritage resources in a responsible manner in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This Heritage Impact Assessment was compiled by PGS Heritage, the staff of which has a combined experience of nearly 50 years in the heritage consulting industry and extensive experience in managing Heritage Impact Assessment (HIA) processes.

Polke Birkholtz, project manager and heritage specialist, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a professional archaeologist and is also a registered member of the Cultural Resource Management (CRM) Section of ASAPA. He has more than 16 years of experience in the industry.

Dr. Maria van der Ryst acted in advisory capacity as specialist for the Stone Age. She has undertaken extensive and in-depth research at several Stone Age and rock art localities. She has also conducted several Phase 2 Archaeological Impact Assessments with a focus on the Iron Age and the Stone Age and specialist studies on the Stone Age.

1.3 Assumptions and Limitations

The following assumptions and limitations can be identified:

1) Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage sites located during the fieldwork do not necessarily represent all the heritage sites present within the area. Should any heritage features or objects not included in the inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way, until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.

2) This HIA was conducted for the proposed activities outlined in Section 2.2. Should any additional activities be required that is not listed in this section, a heritage specialist must be contacted to establish whether these additional activities would require an amendment to the existing HIA.

3) It is important to note that this HIA is for proposed grazing activities as outlined in Section 2.2. In the event of any proposed change to the use of this particular locality under review, whether for extended farming practices, industrial, residential or any other development, an additional HIA will have to be conducted to assess the impact of this development on heritage.

1.4 Legislative Context

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

i. National Environmental Management Act (NEMA) Act 107 of 1998
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
iv. Development Facilitation Act (DFA) Act 67 of 1995

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

i. National Environmental Management Act (NEMA) Act 107 of 1998
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
    c. Environmental Impact Assessment (EIA) – Section (32)(2)(d)

d. EMP (EMP) – Section (34)(b)

ii. National Heritage Resources Act (NHRA) Act 25 of 1999

a. Protected Areas – Section 28;

b. Protection of Heritage Resources – Sections 34 to 36; and

c. Heritage Resources Management – Section 38

iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002

a. Section 39(3)

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…". The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage". In accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive and legally compatible HIA report is compiled.

1.5 Terminology and Abbreviations

Archaeological resources

i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;

ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including a 10m buffer area;

iii. wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;

iv. structures, features and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

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

Development

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

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

Fossil

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

Heritage

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

Heritage resources

This means place or object of cultural significance

Later Stone Age (LSA)

The archaeology of the last 20 000 years, associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800s associated with ironworking and farming activities such as herding and agriculture.

Middle Stone Age (MSA)

The archaeology of the Stone Age from 20 000/40 000-300 000/500 000 years ago – a period associated with early modern humans.

Earlier Stone Age (ESA)

The archaeology of the Stone Age from 500 000 years ago to >3 million years ago, associated with early stone tool production technologies and the Australopithecines, Paranthropines and early *Homo* spp.

Palaeontology

Any fossilised remains or fossil trace of animals or plants that lived in the geological past and any site, which contains such fossilised remains, or trace.

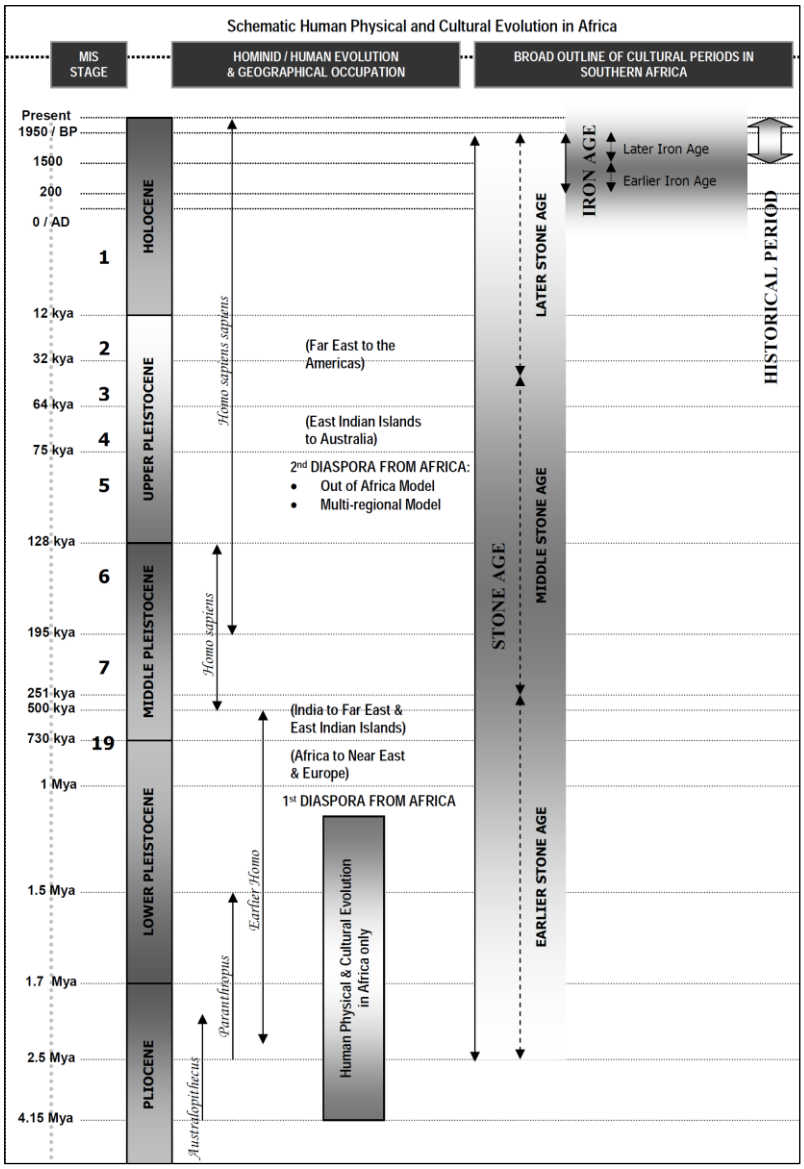

Figure 1 – Human and Cultural Time line in Africa (Morris, 2008).

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Coordinates	Dingleton Grazing Area: N: 27°36'7.45"S, 22°57'51.98"E SSE: 27°40'14.27"S, 23° 0'19.74"E SSW: 27°40'8.56"S, 27°40'8.56"S SW: 27°39'53.25"S, 22°58'37.51"E N by S: 27°38'4.39"S, 22°57'55.11"E
Property	Portion of the Farm Marsh 467.
Location	The proposed Dingleton Grazing land, with the associated infrastructure, is situated on a portion of the Farm Marsh 467 to the north-west of the town of Kathu in the Gamagara Local Municipality, Northern Cape Province. Except for a short pipeline section, the study area is situated west of the R380 provincial tar road between Kathu and Dibeng. The Sishen Airport is located directly opposite from the proposed development area. The tar road runs between these two localities
Extent	The proposed study area measures approximately 1 158 hectares.
Land Description	The study area comprises moderately flat plains with pans. Soils in the region are generally loose and sandy with low clay contents. According to the Gamagara Municipality's Spatial Development Framework (SDF, 2010), the study area is zoned for mining, while the existing land use is natural land with a few water bodies (SA Land Cover, 2009).

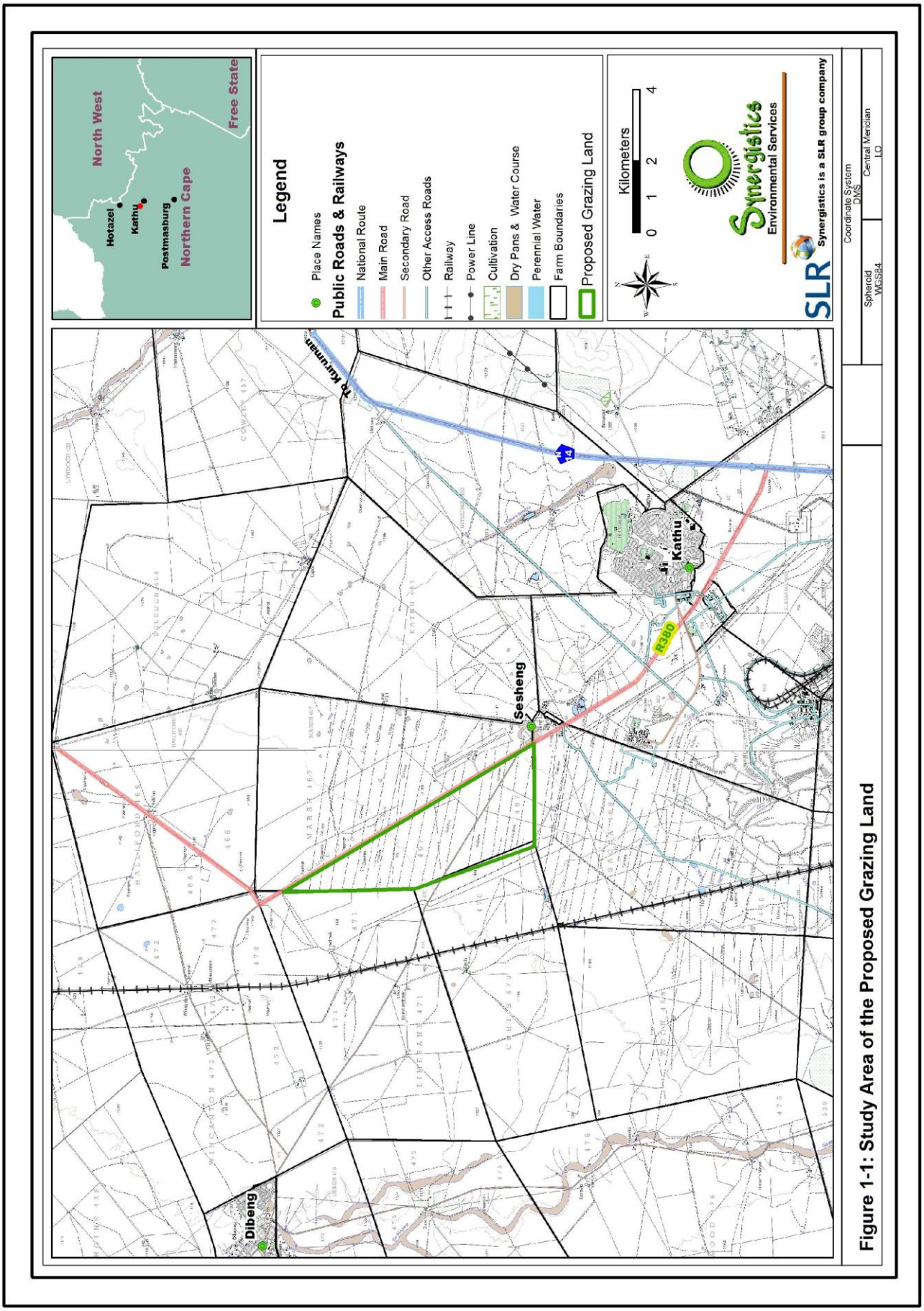

Figure 2 – The study area within its local context. This plan was supplied by the client.

2.2 Technical Project Description

Anglo American's Kumba Iron Ore (Kumba) proposes to resettle the residents of the town of Dingleton, situated immediately west of the current Sishen Iron Ore Mine (Sishen Mine) pit, to the Phase 4 (f - h) development on the Farm Sekgame 461 directly south-east of Kathu (hereafter referred to as the Host Site).

The resettlement of the Dingleton residents is necessary due to the continued progression of the Sishen opencast mine pit in a westerly direction and to:

- Provide for the continued access to the iron ore deposits that are currently sterilised by the 500 m buffer zone between the Sishen Mine and Dingleton Town.
- Provide space for the establishment of future mine infrastructure such as mine waste dumps to the west of the existing mine pit.
- Enable Sishen Mine to stay in operation and to produce iron ore at the grades demanded by clients and the world market.

The residents of Dingleton have raised various issues regarding living conditions in Dingleton, including noise, dust, vibration impacts, inadequate service delivery and the isolation of the town. The Sishen Iron Ore Company (Pty) Ltd (SIOC) has received a number of requests from the community of Dingleton to consider relocating them to a suitable area within Kathu.

Dingleton residents who are livestock owners have also indicated the need for relocation of their animals (e.g. goats, sheep, cattle, horses, donkeys and chickens) to land in close vicinity of the Host Site. The establishment of suitable grazing land (with directly associated infrastructure such as fences, two reservoirs, two boreholes and a short pipeline) will be provided on a Portion of the farm Marsh 467. This proposed grazing project represents the focus of this HIA.

The infrastructure proposed here comprise the following:

1) Fencing

The mine's representative/sub-contractor is to:

- Inspect all internal fences and gates of the camps within the boundaries of the grazing land, approximately 10 km.

- Compile findings in a short report with reference to the status of vermin proofing on fences.
- Decide upon suitable remedial measures to reinstate the existing camps.
- Repair fences and gates as per mutual agreement.

2) Water

The mine's representative/sub-contractor is to:

- Locate and confirm the three boreholes, i.e. Marsh 1, SW 740 and SW 741 which are earmarked for the grazing land water requirements.
- Develop only Marsh 1 and SW 740 at this stage.
- Prepare the boreholes for testing and/or equipping as may be required. The preparation may include re-drilling of the holes which has to be confirmed with the PIMS/QS team prior to any work done.
- Allow for borehole yield testing, all as per the SANS prescribed procedure.
- Supply all labour, plant and material for the equipping of the 2 said boreholes and installation of 3m dia x 8m high "Climax" wind pumps at SW740 and Marsh 1 including all concrete work and certification as per the manufacturer's instructions.
- Supply and install 1 x 6m dia x 1.8m high farm type tank of steel sheeting and concrete construction for Marsh 1.
- Seal Dams "24" and "28" as required.
- Supply all labour, plant and material to pipe the water from SW740 and Marsh 1 to Dam "24" and "28" and the newly constructed steel dam. The 40mm HDPE pipe is to be installed as far as is possible onto existing fence lines, only to be buried across gates and if no close-by fence exists.
- Supply and install six off 200 liter water troughs around dams, complete with ball valves, pipe work, etc. The troughs are to be fitted onto 6m x 4m x 125 thick concrete slabs.
- Allow one crossing of road R380 for the 40mm supply pipe from BH SW 740. Horizontal drilling may be required.

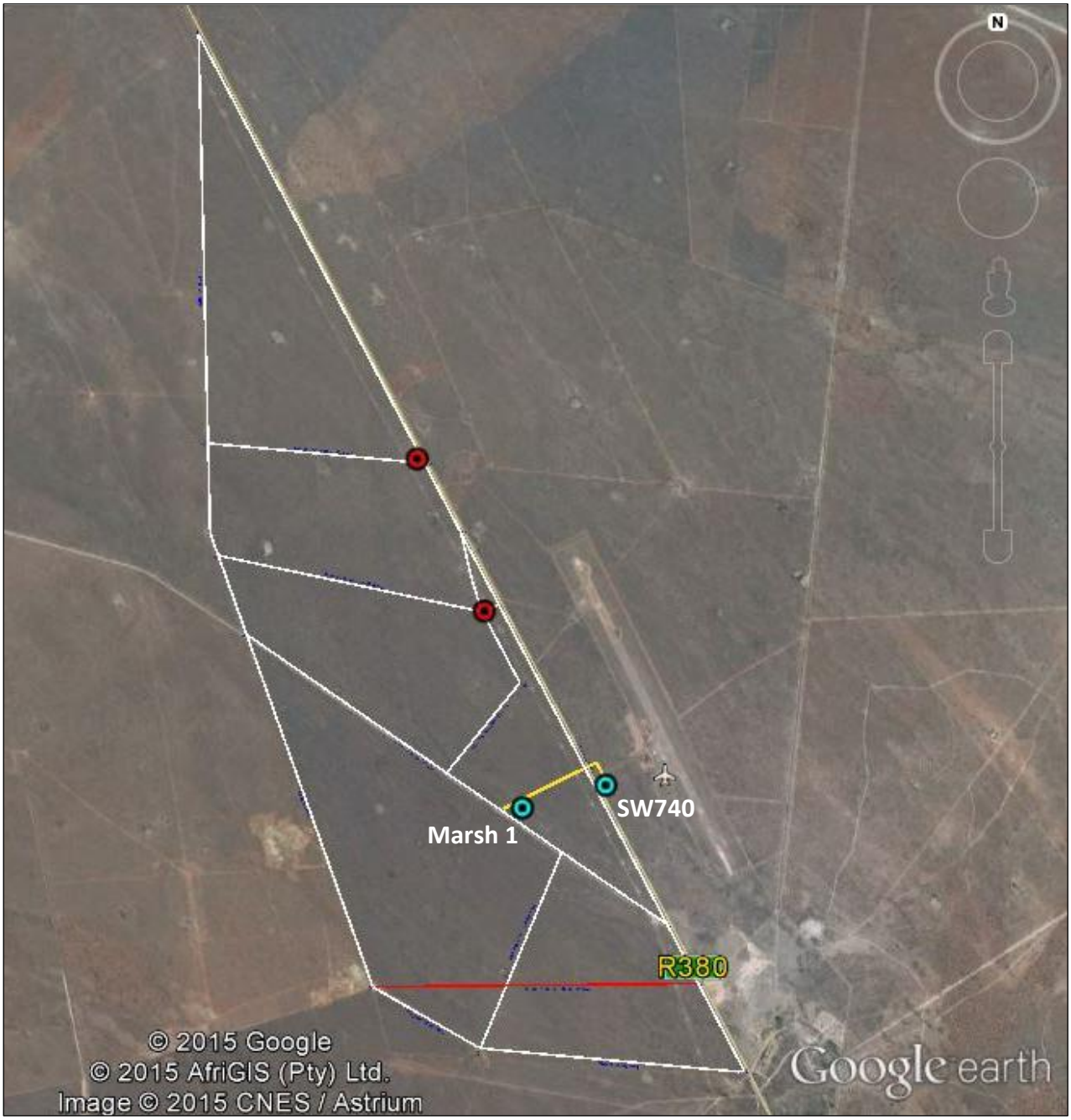

Figure 3 – Google Earth image which depicts the overall study area with the infrastructure required for the proposed grazing land namely fencing (white lines), a short water pipeline (yellow) two existing reservoirs (red markers) as well as two boreholes (blue markers). As discussed in the text, a new dam is proposed at the Marsh 1 borehole as well.

3 ASSESSMENT METHODOLOGY

3.1 Methodology for Assessing Heritage Site Significance

PGS Heritage was appointed by SLR (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), which forms part of the Environmental Impact Assessment (EIA) for the proposed grazing land and associated infrastructure on a portion of the Farm Marsh 467, Kathu, Northern Cape.

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

Step I – Literature Review: The background information to the field survey is based on archival and historical cartographic material assessed as part of the study as well as a study of available literature sources. An assessment of prior heritage and archaeological reports from the surrounding area was also made using SAHRIS.

Step II – Physical Survey: The physical survey was conducted on foot over the proposed footprints areas of the fences, water reservoirs, boreholes and short pipeline. The fieldwork was conducted on Tuesday, 3 February 2015 as well as Thursday, 5 March and Friday, 6 March 2015. The initial site visit was undertaken by an archaeologist Marko Hutten and Stone Age specialist Dr Maria van der Ryst. The subsequent fieldwork was conducted by Marko Hutten and an experienced fieldworker, Thomas Mulaudzi, who flanked the archaeologist during the survey. The survey focused on the study area as delimited by the client.

Step III – Report: The final step involved the compilation of a report which included the findings of both the desktop study and fieldwork. The report under review contains an assessment of the impact of proposed development on the identified heritage sites as well as mitigation measures.

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

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

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development position

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site

3.1.1 Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (SAHRA) (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report (see Table 1).

Table 1: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High/Medium	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium	Recording before destruction
Generally Protected C (GP.C)	Grade 4C	Low	Destruction

3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;

- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors, along with the equivalent quantitative rating scale for each of the aforementioned criteria, is given in

Table 2.

Table 2: Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	*Isolated corridor / proposed corridor*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

3.2.1 Significance Assessment

The significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these, since their importance in the rating scale is actually relative. For example, 10 structures younger than 60 years might be affected by a proposed development, and if destroyed the impact can be considered as VERY LOW in that the structures are all of Low Heritage Significance. If two of the structures are older than 60 years and of historic significance, and as a result of High Heritage Significance, the impact will be considered to be HIGH to VERY HIGH.

A more detailed description of the impact significance rating scale is given in Table 3 below.

Table 3: Description of the significance rating scale (based on Petts 2009:395)

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
	0	There is no impact at all - not even a very low impact on a party or system.

3.2.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in Table 4

Table 4: Description of the spatial significance rating scale

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of possible impacts, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect an area not exceeding the boundary of the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

3.2.3 Temporal/Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment.

The temporal or duration scale is rated according to criteria set out in
Table 5.

Table 5: Description of the temporal rating scale

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium-term	The environmental impact identified will operate for the duration of life of the project.
4	Long-term	The environmental impact identified will operate beyond the life of operation of the project.

5	Permanent	The environmental impact will be permanent.

3.2.4 Degree of Probability

The probability or likelihood of an impact occurring, will be outlined in Table 6 below.

Table 6: Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very likely
5	It's going to happen / has occurred

3.2.5 Degree of Certainty

As with all studies, it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used, as discussed in Table 7. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making.

Table 7: Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

3.2.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale, as described below:

$$\textbf{\textit{Impact Risk}} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown below:

Table 8: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Local	Medium Term	Could Happen	**Low**
Impact on heritage resources	2	3	3	3	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, which is divided by 3 to give a criterion rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the table below.

Table 9: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore, with reference to the example used for heritage structures above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

4 CURRENT STATUS QUO

4.1 Description of Study Area

Anglo American's Kumba Iron Ore (Kumba) proposes to resettle the residents of the town of Dingleton, situated immediately west of the current Sishen Iron Ore Mine (Sishen Mine) pit, to the Phase 4 (f - h) development on the Farm Sekgame 461 directly south-east of Kathu (hereafter referred to as the Host Site). Dingleton residents who are livestock owners have also indicated the need for relocation of their animals (e.g. goats, sheep, cattle, horses, donkeys and chickens) to land in a close vicinity of the Host Site. The establishment of suitable grazing land and associated infrastructure activities will be provided on a Portion of the farm Marsh 467.

The proposed study area measures approximately 1 158 hectares and it can be described as typical for the area being semi arid having relatively sparse vegetation and shallow soil. It is also relatively flat terrain (see Figure 4 and 5). The study area is bordered by the R380 tar road on the eastern side and the Kathu industrial area on its northern side. A power line transverses the study area on the eastern side (Figure 6 and 7).

The fencing in the study area comprises both old dilapidated fencing still needs to be replaced as well as newly erected fencing. The old fences include internal fencing as well as the boundary fence (see Figures 8, 9, 10 and 11). Figures 12 and 13 show previous fencing with additional stone packing below the fence. Recently erected new fencing can be seen running alongside the previous fence on the eastern side of the study area and also shows stone packing. These also illustrate the mechanical bush clearing results (by bulldozer or grader) and the disturbances these activities caused to the soil surface (Figures 14 and 15). New fencing also occurs along the southern boundaries of the area. Bush clearing activity during the erection of new fencing can be observed in Figure 16.

Existing watering facilities are present on the eastern side of the study area (Figures 17 and 18). These facilities will be upgraded during the project.

The presence of small livestock camps with associated dwellings was observed within the study area boundaries (see Figures 19, 20 and 21). These have been erected by people who are using

the grazing facility at present. Note that the structures are in close vicinity of the watering facilities.

Figure 4 – General view of the vegetation of the study area

Figure 5 – Another general view of the vegetation of the study area.

Figure 6 – View of a section of the power line which traverses the eastern end of the study area.

Figure 7 – Another view of the power line on the eastern end of the study area.

Figure 8 – View of existing internal fencing that will

Figure 9 – View of existing boundary fencing and

be upgraded during the project.

Figure 10 –View of existing fencing on the boundary of the study area.

gate that will be upgraded during the project.

Figure 11 – View of existing gate on the boundary of the study area that will be replaced.

Figure 12 –View of existing fencing that will be replaced.

Figure 13 – View of existing fencing showing stacked stones along the base of the fence.

Figure 14 –View of existing fencing alongside new fencing adjacent to the R380 road. This image also shows evidence for mechanical bush clearing and

Figure 15 – View of existing fencing alongside new fencing adjacent to the R380 road. The use of mechanical methods of bush clearing can again be

stone packing.

Figure 16 –Results of bush clearing activities during fence construction.

seen.

Figure 17 – View of present watering facilities

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Figure 18 –View of more existing watering facilities.

Figure 19 – Livestock camp

Figure 20 –More livestock camps found within the study area,

Figure 21 – One of the dwellings associated with the livestock camps.

5 DESKTOP STUDY FINDINGS

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

5.1 Previous Archaeological and Heritage Studies

Extensive impact assessments have been undertaken around Kathu (Orton and Walker, 2015). Research of the SAHRA APM Report Mapping Project records and the SAHRIS online database (http://www.sahra.org.za/sahris) determined that a great number of previous archaeological studies overlapped with or were adjacent to the study area. Several other previous archaeological or historical studies had been performed within the wider vicinity of the study area. A selection of previous studies for the area in the APM Report Mapping Project is listed in chronological order:

- Morris, D. & Beaumont, P.B. 1994. **Ouplaas 2 Rock Engravings, Danielskuil.** An unpublished report by the McGregor Museum on file at SAHRA as 1994-SAHRA-0025.

- Morris, D. 1999. **Proposed mining areas and properties at Ulco, Northern Cape, Including the vicinities of Gorrokop and Groot Kloof.** An unpublished report by the McGregor Museum on file at SAHRA as 1999-SAHRA-0055.

- Beaumont, P.B. 2000. **Archaeological Impact Assessment: Archaeological Scoping Survey for the purpose of an EMPR for the Sishen Iron Ore Mine.** An unpublished report by the McGregor Museum on file at SAHRA as 2000-SAHRA-0023.

- Morris, D. 2001. **Report on Assessment of Archaeological Resources in the vicinity of proposed mining at Morokwa.** An unpublished report by the McGregor Museum on file at SAHRA as 2001-SAHRA-0078.

- Beaumont, P.B. 2004. **Heritage EIA of two areas at Sishen Iron Ore Mine.** An unpublished report by the McGregor Museum on file at SAHRA as 2004-SAHRA-0067.

- Morris, D. 2005. **Report on a Phase 1 Archaeological Assessment of Proposed Mining Areas of the Farms Bruce, King, Mokaning and Parson, Between Postmasburg and Kathu, Northern Cape.** An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0032.

- Beaumont, P.B. 2005a. **Heritage Impact Assessment of an area of the Sishen Iron Ore Mine that may be covered by the Vliegveldt waste dump.** An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0230.

- Beaumont, P.B. 2005b. **Heritage Impact Assessment for EMPR Amendment for crusher at Sishen Iron Ore Mine.** An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0259.

- Beaumont, P.B. 2006a. **Phase 1 Heritage Impact Assessment Report on Erf 1439, Remainder of Erf 2974, Remainder of Portion 1 of the Farm Uitkoms 463, and Farms Kathu 465 and Sims 462 at and near Kathu in the Northern Cape Province.** An unpublished report by the McGregor Museum on file at SAHRA as 2006-SAHRA-0127.

- Beaumont, P.B. 2006b. **Phase 1 Heritage Impact Assessment Report on Portions A and B of the Farm Sims 462, Kgalagadi District, Northern Cape Province.** An unpublished report by the McGregor Museum on file at SAHRA as 2006-SAHRA-0165.

- Beaumont, P.B., 2006c. **Phase 1 Heritage Impact Assessment Report on Portion 48 and the remaining Portion of Portion 4 of the Farm Bestwood 459, Kgalagadi District, Northern Cape Province.** An Archaeological Impact Assessment report by the Archaeology Department, McGregor Museum, prepared for MEG Environmental Impact Studies.

- Dreyer, C. 2006. **First Phase Archaeological and Cultural Heritage Assessment of the proposed residential developments at the farm Hartnolls 458, Kathu, Northern Cape.** Accessed SAHRIS 14 August 2014.

- Beaumont, P.B. 2007. **Supplementary Archaeological Impact Assessment report on sites near or on the Farm Hartnolls 458, Kgalagadi District Municipality, Northern Cape Province.** Accessed SAHRIS 14 August 2014.

- Beaumont, P.B. 2008a. **Phase 1 Archaeological Impact Assessment Report on Portion 459/49 of the farm Bestwood 459 at Kathu, Kgalagadi District Municipality, Northern Cape Province.** Accessed SAHRIS 14 August 2014.

- Beaumont, P.B. 2008b. **Phase 1 Heritage Impact Assessment Report on a portion of the remainder of the farm Sekgame 461, Kathu, Gamagara Municipality, Northern Cape Province.** Accessed SAHRIS 14 August 2014.

- Dreyer, C. 2007. **First Phase Archaeological and Cultural Heritage Assessment of the Proposed Garona-Mercury Transmission Power Line, Northern Cape, North-West Province & Free State.** An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2007-SAHRA-0052.

- Dreyer, C. 2008a. **First Phase Archaeological and Cultural Heritage Assessment of the proposed residential developments at a portion of the remainder of the farm Bestwood 459 Rd, Kathu, Northern Cape.** An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2008-SAHRA-0433.

- Dreyer, C. 2008b. **First Phase Archaeological and Cultural Heritage Assessment of the proposed Bourke project, ballast site and crushing plant at Bruce Mine, Dingleton, near Kathu, Northern Cape.** An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2008-SAHRA-0666.

- Kaplan, J.M. 2008. **Phase 1 Archaeological Impact Assessment: proposed housing development, Erf 5168, Kathu, Northern Cape Province.** An unpublished report by the Agency for Cultural Resources Management on file at SAHRA as 2008-SAHRA-0487.

- Morris, D. 2008. **Archaeological and Heritage Phase 1 Impact Assessment for proposed upgrading of Sishen Mine diesel depot storage capacity at Kathu, Northern Cape.** An unpublished report by the McGregor Museum on file at SAHRA as 2008-SAHRA-0489.

- Morris, D. 2010. **Solar energy facilities. Specialist input for the environmental impact assessment phase and environmental management plan for the proposed Kathu-Sishen solar energy facilities, Northern Cape**. Accessed SAHRIS 13 August 2014.

- Van Schalkwyk, J. 2010. **Archaeological impact survey report for the proposed development of a solar power plant on the farm Bestwood 459, Kathu Region, Northern Cape Province**. Accessed SAHRIS 13 August 2014.

- Van der Ryst, MM and Küsel, SU. 2012**. Phase 2 specialist study of affected Stone Age locality at site SA02, a demarcated surface area, on the farm Nooitgedacht 469 (Woon 469).** Commissioned by Sishen Iron Ore Mine and AGES (Pty) Ltd.

- Dreyer, C. 2013. **First Phase Archaeological and Heritage assessment of the Vaal-Gamagara water pipeline project, Northern Cape: Revisit to the Kathu Pan archaeological site**. Report for MDA Environmental Consultants, Bloemfontein

- Beaumont, P.B. 2013. **Phase 2 archaeological permit mitigation report on a ~0.7 ha portion of the farm Bestwood 549, situated on the eastern outskirts of Kathu, John Taolo Gaetsewe District Municipality, Northern Cape Province.** Accessed SAHRIS 14 August 2014.

- Walker S.J.H., Chazan M., Lukich V. & Morris D. 2013**. A second Phase 2 archaeological data recovery at the site of Kathu Townlands for Erf 5116: Kathu, Northern Cape Province.** Accessed on SAHRIS 12 August 2014.

- Walker, S.J., Chazan, M & Morris, D. 2013. **Kathu Pan: location and significance. A report requested by SAHRA for the purpose of nomination.** Accessed SAHRIS 12 August 2014.

- Kaplan, J. **Heritage Impact Assessment proposed mixed use development in Kathu, Northern Cape Province. Remainder & Portion 1 of the Farm Sims 462, Kuruman RD**. Prepared for: Enviroafrica. Accessed on SAHRIS 14 August 2014.

- Walker, S. J. Chazan, M. and Morris, D. 2013**. Kathu Pan: location and significance. A report requested by SAHRA for the purpose of nomination**. SAHRIS accessed 20 April 2015.

- Morris, D. 2014. **Rectification and/or regularisation of activities relating to the Bestwood township development near Kathu, Northern Cape: Phase 1 Archaeological Impact Assessment.** Accessed on SAHRIS 12 August 2014.

- Orton, J. and Walker, S. 2015. **Heritage Impact Assessment for a proposed 132 kV power line, Kuruman Magisterial District, Northern Cape.** Report for Savannah Environmental (Pty) Ltd. Accessed on SAHRIS 12 August 2014.

Researching the SAHRIS online database (http://www.sahra.org.za/sahris) further studies were identified in the vicinity of the study area:

- SAHRIS case number 1063. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan for prospecting right in respect of manganese and sugillite on Portions 1 and 2 of the farm Curtis No. 470, situated in Magisterial District of Kuruman, Northern Cape.**

- SAHRIS case number 1089. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Programme for a mining right in respect of manganese and iron ore on Erf 416, 417, 418, 419, 420, 421, 422, remaining extent of Erf 423, 424, 426, 493, 548, 549, (a portion of Portion 548), 550 (a portion of Portion 548), 551(a portion of Portion 548), 569, 679 (a portion of Portion 548), and 681 (a portion of Portion 548) of farm Dingleton township (now Dingle) 543 remaining extent of Portion 2 (Doornvlei), Portions 7, 11 (a portion of Portion 2) and 13 (a portion of Portion 2) of the farm Gamagara 541, remaining extent of Portion 19 (a portion of Portion 1), Portion 24 (a portion of Portion 19) and 25 (a portion of Portion 19) of the farm Sishen 543, remaining extent of Portion 2 (Parson a) and Portion 6 (a portion of Portion 2) of the farm Parson 564, remaining extent, remaining extent of Portion 2 (Grensplaat) and Portion 4 (Stuk) of the farm Fritz No.540, situated in the Magisterial District of Kuruman, Northern Cape region.**

- SAHRIS case number 1332. **Resources Development Act 2002, (Act 28 of 2002) for the approval of an amendment to the Environmental Management Programme for a mining right in respect of iron ore on Portion 2, 6 and the remainder of farm Parson Po. 564, Portions 1,2,3 and the remainder of farm King No. 561, Portion 3,4,5 and the remainder of Bruce No.544, Portion 1,2,3,4,5 remainder of Mokaning No.560 situated in the Magisterial District of Kuruman, Northern Cape.**

- SAHRIS case number 1402. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act of 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan in respect of borrow pits 1,2,3,4,5,6,7,8 & 9 on Portion 19 of farm 543, remaining extent and Portion 1 of Gamagara 541, Portion 1 and Portion 2 of Fritz 540, remainder of Nooitgedacht 469 and remainder of Lylyveld 545, situated in the Magisterial District of Kuruman Northern Cape region.**

- SAHRIS case number 1411. **Consultation of scoping report submitted in terms of Section 22 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) in respect of remaining extent of Portion 1 (Barnadene) of farm sims No.462, remaining extent of and**

remaining extent and remaining extent of Portion 2 (Rusoord) and remaining extent of Portion 3 (Portion of Portion 1) of Farm Sacha No.468, remaining extent of Portion 4 of the farm Gamagara No.541, remaining extent of Portion 1 (lot a) of the farm Sishen No. 543, situated in the Magisterial District of Kuruman.

- SAHRIS case number 1505. **Environmental Impact Assessment and Environmental Management Programme.**

- SAHRIS case number 2516. **Consultation in terms of Section 40 of the Mineral and petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan for mining permit for aggregate gravel on the remainder of the farm Galway No.431, situated in the Magisterial District of Kuruman, Northern Cape region.**

- SAHRIS case number 2769. **Proposed construction of 400kV transmission line from Ferrum substation (Kathu) to Garona substation (Groblershoop) in the Northern Cape.**

- SAHRIS case number 3029. **Proposed Development of 3 500 Erven on 280 Ha of Vacant Land on a Portion of Remainder of Farm Sekgame 461, Kathu.**

- SAHRIS case number 3157. **Consultation in terms of section 40 of the mineral and petroleum resources development act 2002, (Act 28 of 2002) in respect of prospecting for manganese and iron ore on the farm Seldsden No.464 situated in the Magisterial District of Kuruman, Northern Cape Region.**

- SAHRIS case number 3615. **Proposed borrow pits associated with the upgrade of the Kimberley – Hotazel Railway Line**

- SAHRIS case number 3698. **Proposed relocation of the Vaal Gamagara water pipeline at the Sishen Iron Ore Mine.**

- SAHRIS case number 3701. **Proposed relocation of Rail and Associated Infrastructure at Sishen Iron Ore Mine.**

- SAHRIS case number 4456. **Proposed development of 380ha for residential uses, Kathu, Portion 175/1 and Portion 175/2, Joe Morolong Local Municipality, John Taolo District Municipality, Northern Cape Province.**

- SAHRIS case number 4785. **SAHRA comments for the Heritage Impact Assessment Report for the Kalahari Solar Power Project located on Farm Kathu 465, near Kathu within the Northern Province.**

- SAHRIS case number 4460. **Residential development on Remainder, and Portion 3 of Farm Bestwood 459 near the town of Kathu, Northern Cape.**

- SAHRIS case number 5323. **EIA and EMPr for the Proposed Solar CSP Integration Project: Project 2 - 400kV Power Line from Ferrum to the Solar Substation.**

- SAHRIS case number 5648. **The project will consist of the construction of an approximately 67km Double Circuit 400kV power line from the Manganore Substation to the Ferrum Substation, including the construction of the new Manganore TX (Transmission) Substation adjacent to the existing Manganore DX (Distribution) Substation. The line runs in a northerly direction through areas of the Tsantsabane, Ga-Segonyana and Gamagara Local Municipalities in the Northern Cape Province.**

Most of the studies listed above located surface scatters of Stone Age artefacts of limited significance (e.g. Dreyer 2008a, 2008b; Kaplan 2008; SAHRIS case number 3029) if not actual Stone Age sites. A few studies did not identify any heritage resources (e.g. Beaumont 2006; SAHRIS case number 1063; SAHRIS case number 2769; SAHRIS case number 5323) although in some cases this was possibly because the survey area had already been altered by mining activities (e.g. Dreyer 2008b). Many studies referred to the Kathu Pan site, an ancient limestone sinkhole formation, discovered in 1974 during the establishment of the town of Kathu and renowned for both significant palaeontological (including specimens from up to 850 000 years BP) and Stone Age deposits from 500 000 BP onwards (e.g. SAHRIS case number 4785). Equally, a number of studies consulted referred to the Uitkoms 1 site on Kathu Hill with its high number of Stone Age artefacts (e.g. SAHRIS case number 4785).

Four of the studies consulted on the SAHRIS website had no relevant documents available (SAHRIS case number 1089; SAHRIS case number 2516; SAHRIS case number 3157; SAHRIS case

number 3701). One study referred to heritage sites listed in an earlier impact assessment document, the latter not being available on the SAHRIS website (SAHRIS case number 1332). Some studies had documentation with no relevant heritage information (e.g. SAHRIS case number 1402) or documentation which referred to the need for completion of archaeological studies (e.g. SAHRIS case number 1411).

In a survey for the expansion of the Sishen Mine some distance to the south of the current study area Beaumont (2000) recorded surface LSA lithics which he stated were not associated with living sites. This study also listed a large number of Stone Age artefacts as well as two Iron Age collections from the near vicinity of the study area and accessioned in the McGregor Museum. Some distance to the south east of the study area Beaumont (2004) recorded only surface scatters of possible Acheulian lithics while later studies in approximately the same area located no heritage resources (Beaumont 2005a, 2005b) or, again, a few scattered stone tools of MSA appearance (Morris 2008). Morris (2001) undertook a survey 30 kilometres to the south, locating a surface scatters of stone artefacts, but noting that the area between Postmasburg and Kathu is known for specularite workings and that any development should take cognisance of this. In another survey some 15 kilometres south of the current study area Morris (2005) located scatters of stone artefacts on hills and plains, ceramic remains reflecting a Tswana settlement, and four cemeteries.

To the south-east of the study area Beaumont (2006) undertook a survey for the Kalahari Gholf en Jag development. While no significant new heritage resources were located in this survey the author referred to previous surveys and excavations undertaken on the properties involving nine archaeological sites. These included six of the Kathu Pan sites characterised variously by Late Pietersburg, Howiesons Poort, Wilton and Fauresmith technologies as well as Later Stone Age ceramics, the Kathu Townlands site, excavated in the 1980s and found to contain approximately 10 000 Acheulian artefacts per cubic metre, and a Late Iron Age site thought to be of Tswana origin (Beaumont 2006). A later survey for the same development concurred with the findings of this report that most of the area was devoid of heritage resources. However, it stressed the high importance of the Kathu Pan sites and recommended that its northern area be excluded from any development, especially as the use of GPS technology had improved the accuracy of mapping and it had been found that some of the sites now fell within the development area (SAHRIS case number 4456). Many of the other studies referred to these and other known heritage sites, for example specularite workings on the Gamagara River to the south west of Kathu (e.g. SAHRIS case number 3029).

Heritage remains that reflect former Tswana settlements are relatively rare in the study region. Morris (2006) in a letter (To M Geldenhuys 2006, McGregor Museum MMK 14 accessed SAHRIS 20 April 2015) on the Proposed development of residential units within and around the existing Sishen Golf Course, Erf 1439, Remainder of Erf 2974 and Remainder of Portion 1 of Uitkoms 463, Kathu, notes that a Tswana settlement seems to be present within the Kathu forest/game reserve north of the Golf Course on account of recorded ceramics, but he did not have access to the locality. Morris likely refers to the report by Beaumont (2006).

In a survey of two options for a power line route Dreyer (2007) noted the wealth of stone tool sites in the vicinity of Kathu, particularly extensive ESA sites and the presence of the Kathu cemetery, suggesting mitigation measures to avoid these. From a map supplied in a revised report dated to 2013 (Dreyer, 2013) it is evident that the linear alternatives covered by this report pass immediately south of the present study area. A survey for the Kalahari Solar Power project on a portion of the farm Kathu 465 located roughly 2 m north-east of the present study area, identified a number of Stone Age occurrences or findspots. This report also mentions Kathu Pan (Van Schalkwyk, 2010).

On the Ghaap Escarpment, Morris (1999) identified LSA and MSA lithics and referred to known rock painting sites at Groot Kloof. These paintings are of unusual quality and the most elaborate of their kind along the Ghaap escarpment (Morris 1999; SAHRIS case number 1505). Rock engravings at Lime Acres some 80 kilometres to the south east consist of 119 distinct images spread over some 22 dolomite rock slabs and are interesting in that they are fairly recent, depicting colonial scenes such as horses with riders and were likely engraved by Korana people descendants of Khoekhoen pastoralists (Morris & Beaumont 1994).

Van der Ryst & Küsel (2012) conducted a Phase 2 around a pan and surrounds for a proposed extension of the Sishen waste dump. Sampling of the lithics produced low to medium densities of MSA and LSA tool types on the plains and the periphery of the pan and surrounds. This is consistent with the results from several surveys as discussed above. Where Stone Age occurrences have been documented these are usually distributed either in fairly low scatters over large areas, or in very high densities where sources of in particular Banded Ironstone Formations (BIFs) outcrop. Surface sites around Kathu exhibit a palimpsest of prehistoric utilization and may contain lithics from all periods in the Stone Age succession.

It is therefore important to note a concern raised by Morris (2014: unpaged) that a "*consistent issue in the assessment of the presence or absence of archaeological deposits in and around Kathu … is the fact that the landscape is often capped by (1) calcrete (not uniformly ancient – Walker et al 2013) and (2) younger Gordonia Formation Aeolian sands (Almond 2014)*". That subsurface archaeological remains may occur under overlying soils and calcretes should be taken into account when archaeological and heritage surveys are undertaken. The clearing of topsoils during development activities frequently exposes archaeological deposits. In areas where BIFs outcrop there tends to be extremely high densities of lithics. BIFs are an excellent source of good toolstone. It was extensively used in the extraction of raw materials and the *in situ* manufacture of ESA Large Cutting Tools (LCT's) and for MSA assemblages. Significant exposures of siliceous BIFs in association with high levels of lithic production have been recorded at, for example, Kathu Townlands and Bestwood.

The LCT's from this area often contain very fine handaxes with some superb examples produced on banded ironstone. Lithics in some of the Acheulian deposits, but also in MSA levels, display a shiny silica skin. At Kathu Townlands an outcropping of banded ironstone that covers a large area of around 25 km contains enormous quantities of flaked items. This phenomenon is ascribed to the use of the high-grade bedrock ironstone as a source for raw materials and is supported by the high incidence of handaxe roughouts (Beaumont 2004b). The prepared core technique was used to produce the spectacular small handaxes, long blades, convergent flakes/points, scrapers found in Fauresmith collections.

The Kathu Complex sites contain important ESA Acheulian and transitional ESA/MSA Fauresmith assemblages (Beaumont, 1990, 2004, 2013; Herries, 2011; Chazan et al, 2012; Wilkins & Chazan, 2012, Walker et al, 2014). Walker et al (2014) suggest that the intensive occupation of the Kathu region can be linked to the availability of water resources. Current research projects are yielding important data on typologies, lithic technologies, technological innovations, complex spatial organization and also dates for the ESA Acheulian and for the MSA assemblages. Research at Kathu Pan 1 established a date of 500 000 years for a Fauresmith blade assemblage where blades were systematically removed from prepared cores (Wilkens & Chazan, 2012). It is argued that some of these were used as speartips (Rots et al, 2014; Wilkins et al, 2015).

Archaeological and palaeoenvironmental data from Kathu Pan and Kathu Townlands were used to reconstruct changes over time in the prehistoric environment (Beaumont 2004b). Associated faunal remains with some of the Acheulian include *Elephas recki recki*. These animals

disappeared at sites in East Africa such as at Olorgesailie, Kenya, at around 600 000/800 000 years ago (Beaumont, 2004b; McNabb, 2004). Biostratigraphy or faunal correlation is often used to date the southern African sites and gives some indication of the approximate age of some of the associated assemblages. More recently a combination of OSL and ESR/U-series dating (Porat et al, 2010; Herries, 2011; Walker et al, 2014) were used to date the transition to MSA tool forms. At Kathu Pan the transitional Fauresmith has been dated to ca. 500 000 BP (Porat et al, 2010). Kathu Pan is formed by a shallow depression with an internal drainage and a high water table.

North-east of Kathu several newly-found ESA sites with LCT's and an associated range of tools occur in sand quarries and on a hilltop at Uitkoms Farm and the Bestwood locality (Chazan et al, 2012). The residential and commercial developments at Bestwood and close to the Townlands demonstrate the importance of Phase 2 heritage studies in the Kathu region.

The concerns that Walker et al (2014:8) raise with regard to the impact of the exponential development should feature in any survey that is undertaken around Kathu. With reference to the general locality they urge that a "*broader landscape-based effort of subsurface testing including palaeo-landscape and paleo-environmental reconstruction is essential to our understanding of this extraordinary record. Sources of this information must be protected along with archaeological remains. Together with the other components of the Kathu Complex, this site represents a high density of hominin occupation that presents a challenge to reconstructions of hominin adaptations during the Early-Middle Pleistocene*".

Orton and Walker (2015:12) in remarking on the significance of Kathu again emphasize '*that the area is best regarded as an archaeological landscape rather than a collection of individual sites*'.

It is evident from the outline of previous archaeological and heritage studies in the surroundings of the present study area provided above that Kathu Pan represent a very significant archaeological site from this area. As a result, the Kathu Pan sites and their significance will be discussed in more detail below.

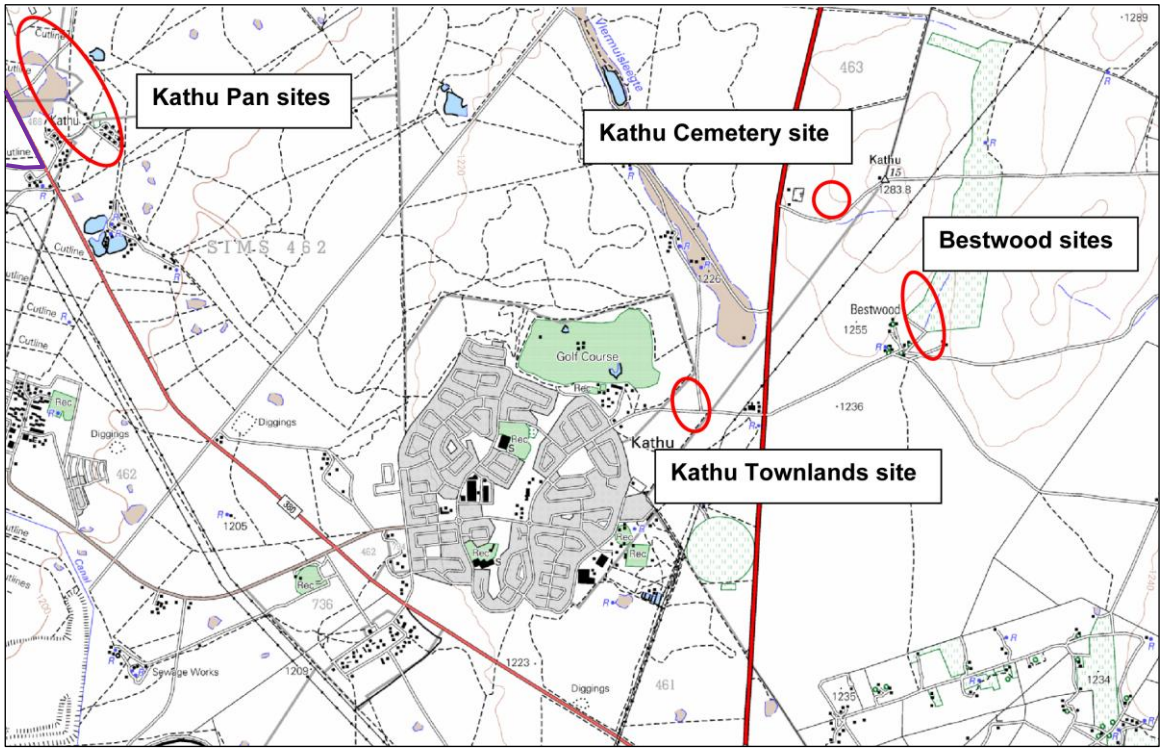

Figure 22 –This map depicts the positions of the sites collectively known as the Kathu Archaeological Compex. The south-eastern section of the present study area is depicted in purple line near the top left corner of the map. It is evident from this map that of all the sites forming part of the Kathu Archaeological Complex, the Kathu Pan sites are located the closest to the present study area.

5.2 The Kathu Pan Sites

The Kathu Pan has been described by Klein (1984) as the best paleoenvironmental sequence from the Kalahari Basin area. It is a broad surface of organic marshland that is located in the centre of four farms (Marsh 467, Sacha 468, Kathu 465 and Sims 462), 15 km north of Sishen.

In the past the pan would have been maintained by artesian seepage rather than surface waters (Klein 1984). Due to this, Butzer (1984) maintains that from a sedimentological perspective the Kathu Pan is unique. He points out that the long term ground water trends provide a filtered climatic record that affords unique evidence for protracted climatic intervals during the Pleistocene. The particular environment provided a range of subsistence resources as pointed out by Van Zinderen Bakker (1995: 101).

'*Since ESA times the water table at the pan has mostly been so high that, under natural conditions, it rises in summer above the peaty surface. This environment provided an oasis for prehistoric people and animals*'

However, since the extraction of ground water pumped to supply Kathu with water, the surface of this water body has not risen above the ground surface (Klein, 1984, Walker et al, 2013).

The pumping activities revealed a covered karst in the calcrete substrate of the Kathu Pan. Klein (1984) explains that although calcrete is commonly found 2-3m below the surface, an 8m drop of the watertable due to excessive ground water extraction has led to compaction of the numerous doline fills with collapse and partial exposure of the sedimentary sequence.

Due to the above-mentioned processes, the Kathu Pans has become an incredibly significant archaeological site. In 1974 handaxes and faunal remains were discovered in the walls of a newly formed doline near the farmstead of then farm manager Naas Viljoen. Viljoen called the McGregor Museum when his children discovered the artefacts whilst playing in the doline (Walker et al, 2013).

The first archaeologist to conduct work on the Kathu Pan sites was A.J B. Humphreys on 13 August 1975. Subsequently, P.B. Beaumont conducted extensive studies in the vicinity. Beaumont began his initial research in the area just after he was appointed to the McGregor Museum in 1978 (Walker et al, 2013). During this year several researchers visited the site. These included botanist Andy Gubb, pollen scientist Van Zinderen Bakker, Professor van der Merwe (University of Pretoria) as well as John Vogel (The Quaternary Dating Research Unit (QUADRU)).

In the article written by Walker et al (2013), the history of research on the pan is made clear. Walker et al (2013) describe the official excavations at the site referred to as KP1 in 1980 as this is where most research at the pan sites have been conducted. Excavations were then undertaken at KP1 – KP5 in 1982. In 1983 KP5, KP6 and KP7 were excavated. In 1984, surface collections were undertaken at KP11. In 1985 KP6 and KP8 were excavated and KP9 was excavated in 1990. Also in 1990, KP10 was mechanically dug, however no archaeological excavations were conducted. During 1990 to 2004 there was a gap in the research conducted in the area. Thereafter, Dr Chazan and other members of the research team on the Kathu Pan conducted further excavations and research at the site. It was through this extended research and a re-examination of previous work that KP1 was declared as a Grade 1 site in 2013.

In 1990 P.B. Beaumont created a schematic map, which depicts the localities and details of 11 sites within the Kathu Pan. The current team researching the site used this map and geo-rectified it atop the CDSM 1:50 000 map 2723CA (1972) in order to gain approximate GPS

coordinates for each of the localities previously mapped by Beaumont. The coordinates of the sites as determined by Walker et al 2013 can be viewed in Table 10 below. A twelfth site is included that has been discovered by Walker et al but has not yet been investigated.

A buffer zone has not yet been established around the Kathu Pan sites. According to Walker et al (2013) a considerable amount of fieldwork still needs to be undertaken to clarify the extent of the deposit. They noted that while the sink holes have offered windows into the deposits around the pan, and some excavations around the 1980s have offered clues to the deposits outside the sink holes, the overall extent of what the Kathu Pan sites have to offer is unknown.

The Kathu Pan is an exceptionally significant landscape, one of the reasons being that the archaeological deposits contain both ESA artefacts and associated fauna in near primary context (Walker et al 2013). This is unusual as only seven southern African sites contain ESA artefacts and bones in primary context (Cave of Hearths, Wonderwerk, Pomongwe, and the open air sites of Elandsfontain, Mwanganda, Namib IV and Kathu Pan) (Volman, 1984).

The second reason for the high significance of Kathu Pan is that it also includes stratified deposits from the MSA. Walker et al point out that most MSA sites are along the coast and in caves or shelters, whereas there are MSA deposits in an open-air setting in the interior at Kathu.

In conclusion, the Kathu Pan sites are of considerable significance due to the unique geology and formation of the dolines, which could be considered as windows into the past. Kathu Pan Site 1 contains a near perfect stratigraphy of the ESA, MSA and LSA that provides the best paleoenvironmental sequence from this area as well as a useful guide to archaeological events.

Two tables are presented below. Table 10 shows the estimated locations for the 11 Kathu Pan sites as revealed from an overlay of a 1990 diagram as well as a newly identified site all undertaken and calculated by Walker et. al. (2013).

In Table 11 below the distances between the Kathu Pan sites' coordinates and the proposed development is provided. These distances (see third column below) were calculated using the measurement function of Google Earth and represent the shortest possible distances between the site coordinates and the development area. It is also important to note that the nearest development component to each site was used to calculate the distances and the type of development located at each point is discussed in the second column below.

While these two tables depict the estimated positions of the Kathu Pan sites, it is important to note that these positions are estimated and secondly that the actual extent of the Kathu Pan archaeological deposits are not yet clear.

Table 10: Estimated locations for the 12 Kathu Pan Localities, modified from Walker et al (2013)

Name	Longitude	Latitude	Years of excavation
KP1	23.00814601000	-27.6666280000	1975, 1980,1982,2004, 2013
KP2	23.00766002000	-27.66598997000	1982
KP3	23.00763002000	-27.66624997000	1982
KP4	23.00681002000	-27.66558504000	1982
KP5	23.00774996000	-27.66686998000	1982, 1983
KP6	23.01121797000	-27.66987699000	1982, 1985
KP7	23.00978534830	-27.66367970850	1983
KP8	23.01154927120	-27.66949210770	1985
KP9	23.01165956040	-27.66929971700	1990
KP10	23.01146586850	-27.66922254850	1990
KP11	23.01189461260	-27.67067982070	1984
KP12	23.002633	-27.661842	NA

Table 11: Estimated locations for the 12 Kathu Pan Localities, modified from Walker et al (2013)

Name	Description of Nearest Development Component	Distance
KP1	Fencing along R380.	439.82 meters
KP2	Fencing along R380.	454.60 meters
KP3	Fencing along R380.	440.72 meters
KP4	Fencing along R380.	401.80 meters
KP5	Fencing along R380.	412.75 meters
KP6	Fencing on the study area's south-eastern corner.	609.94 meters
KP7	Fencing along R380.	762.18 meters
KP8	Fencing on the study area's south-eastern corner.	649.41 meters
KP9	Fencing on the study area's south-eastern corner.	663.96 meters
KP10	Fencing on the study area's south-eastern corner.	646.55 meters
KP11	Fencing on the study area's south-eastern corner.	676.93 meters
KP12	Fencing along R380.	231.51 meters

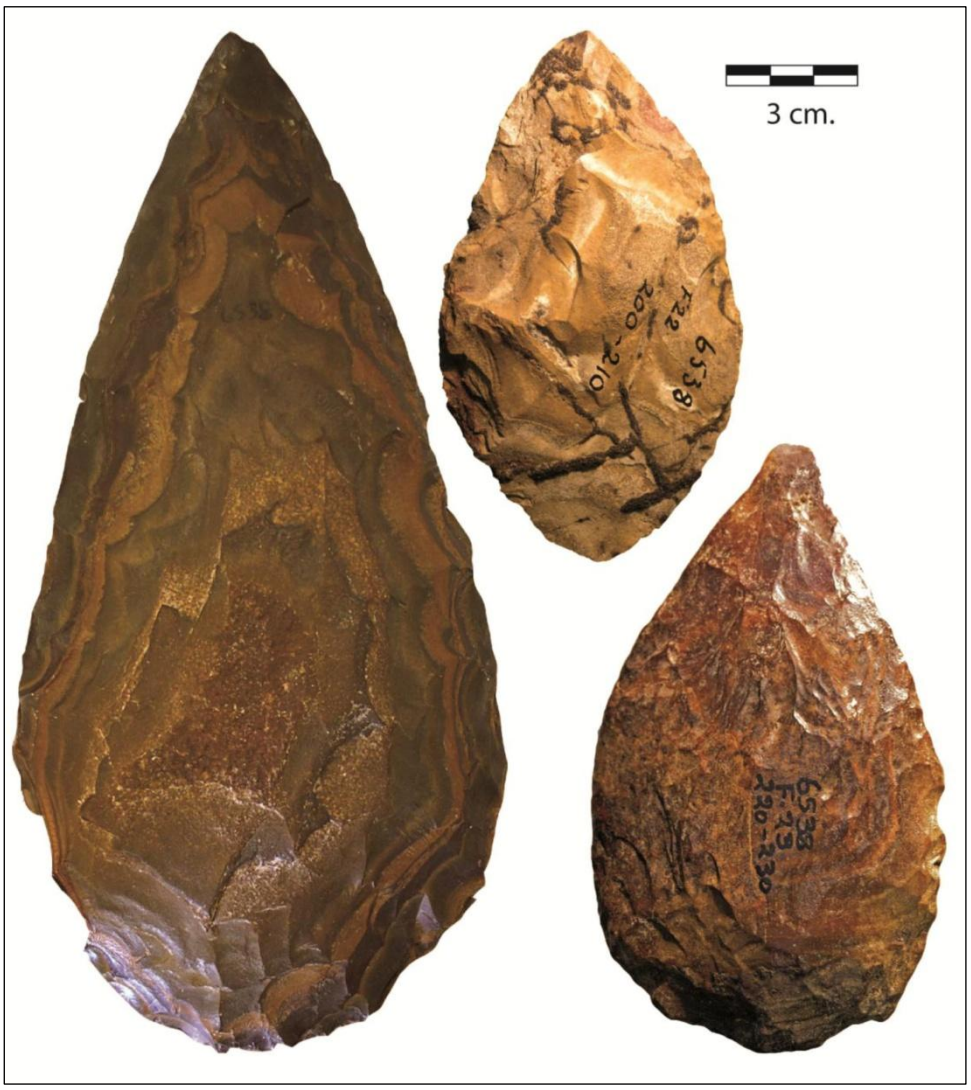

Figure 23 –Three handaxes recovered from the Kathu Pan sites (Walker et. al. 2013:15). The one on the left is numbered MCGM-6538-14 and was depicted on a South African stamp.

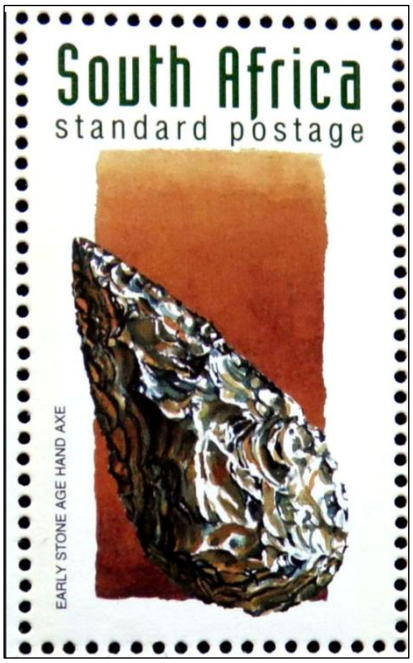

Figure 24

This 1998 South African stamp formed part of the Early South African History Stamp Series designed by artist Sue Dickinson. This particular stamp depicts the handaxe numbered as MCGM-6538-14 that was recovered from Kathu Pan (Walker et. al 2013:16).

5.3 Cartographic Evidence

5.3.1 Survey Diagram for the Farm Marsh

The image below depicts the first survey diagram for the farm Marsh and is dated to 18 August 1906. The survey diagram was obtained from the Surveyor-General of South Africa. It is signed by W.P. Pritchard for the Surveyor-General and is framed from actual surveys by the Government Land Surveyor J.C. Wessels.

This diagram indicates (on a section not depicted here) that on 18 August 1906 the farm was registered in the name of C.R. Mildenhall. This is supported by an archival file (KAB, T, 1017, 5722) which indicates that a mortgage bond was registered in the name of this person in 1906 for the farm Marsh.

The following observations can be made from the survey diagram:

- A road is shown crossing over the study area. This depicted road is located in almost the same position as the gravel road which crosses over the study area today.
- A total of four springs and three pans are depicted on the south-eastern corner of the farm. These water features are located in the same position where the Kathu Pan sites were discovered more than sixty years later.
- No road between Kathu and Debeng is shown crossing over the farm as is the case today with the R380 tar road. It is possible that the gravel road mentioned above may have provided access to Debeng.
- No farm houses or farming-related structures or features are depicted on the diagram.
- From a subsequent survey diagram dated to 7 December 2012 it is evident that a 15 m wide right-of-way servitude was registered on a section of the western boundary of the farm. This allowed for a road of this width to be utilized. This right of way was added to the first survey diagram depicted below.

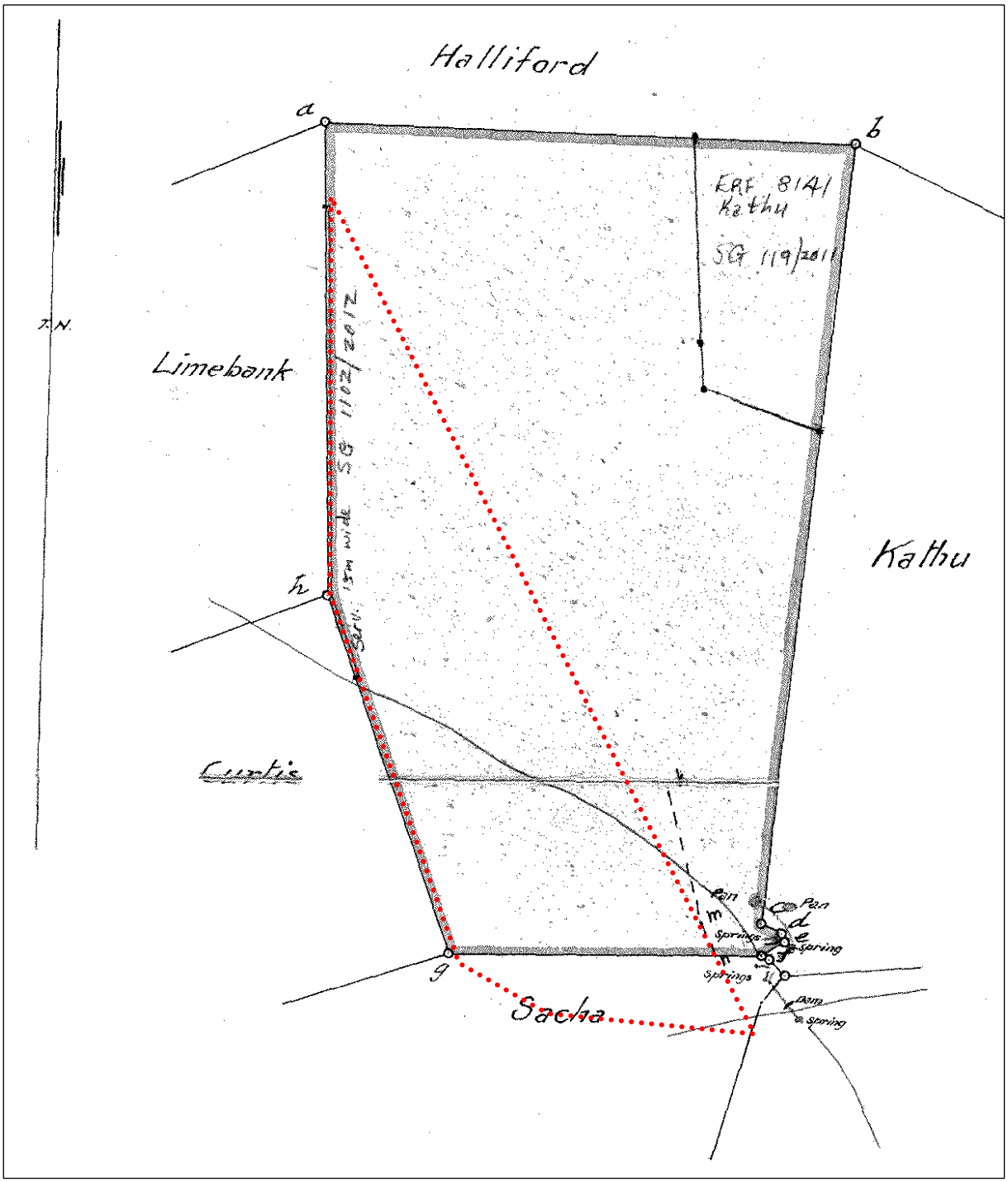

Figure 25 – This image represents a section of the first survey diagram for the farm Marsh that was compiled on 18 August 1906. A right-of-way servitude was added to the original survey diagram and reference to this can be found on the western boundary of the farm.

5.3.2 First Edition of the 1:50 000 2723CA and 2722DB Topographical Sheets

The figure below depicts a section of the First Edition of the 2723CA and 2722DB Topographical Sheets. The 2723CA sheet was printed in 1974 whereas the 2722DB sheet was based on aerial photography conducted in 1972, was surveyed in 1974 and printed in 1975 by the Director General of Surveys.

The following observations can be made from the map:

- No heritage sites or features are depicted within the study area.
- At the time the study area comprised farm land only with no evidence for buildings or mining-related infrastructure.
- A road passed through the study area at the time.
- Kathu Pan is shown directly to the south-east of the study area whereas six small pans are depicted within the study area boundaries.

5.3.3 Second Edition of the 2723CA and 2722DB Topographical Sheets

The figure below depicts sections of the Second Edition of the 2723CA and 2722DB Topographical Sheets. The sheets were surveyed in 2001.

The following observations can be made from the map:

- No potential heritage sites or features are depicted within the study area.
- At the time almost the entire study area had been prospected, as shown by the prospecting cut lines depicted on the map. Diggings are also shown on the northern end of the study.
- The development of mining activities in the surroundings of the study area in the years between the 1970s and 2001 can clearly be seen. Mining-related infrastructure such as power lines is also shown. Other development in proximity to the study area is the Sishen Airport directly opposite the R380 road of the study area.

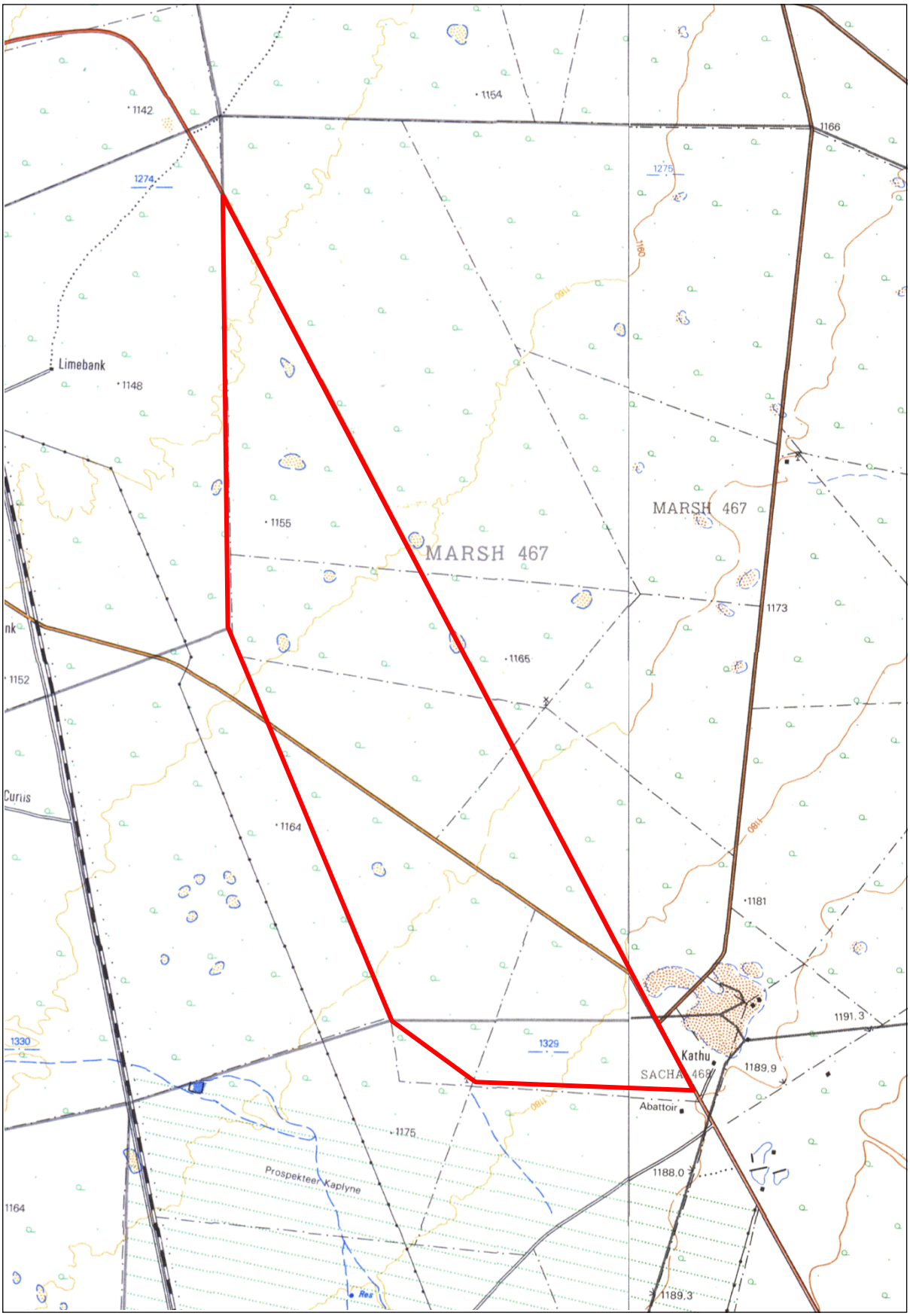

Figure 26 – First Edition of the 2723CA and 2722DB Topographical Sheets that were printed in 1974 and 1975. The study area is depicted in red.

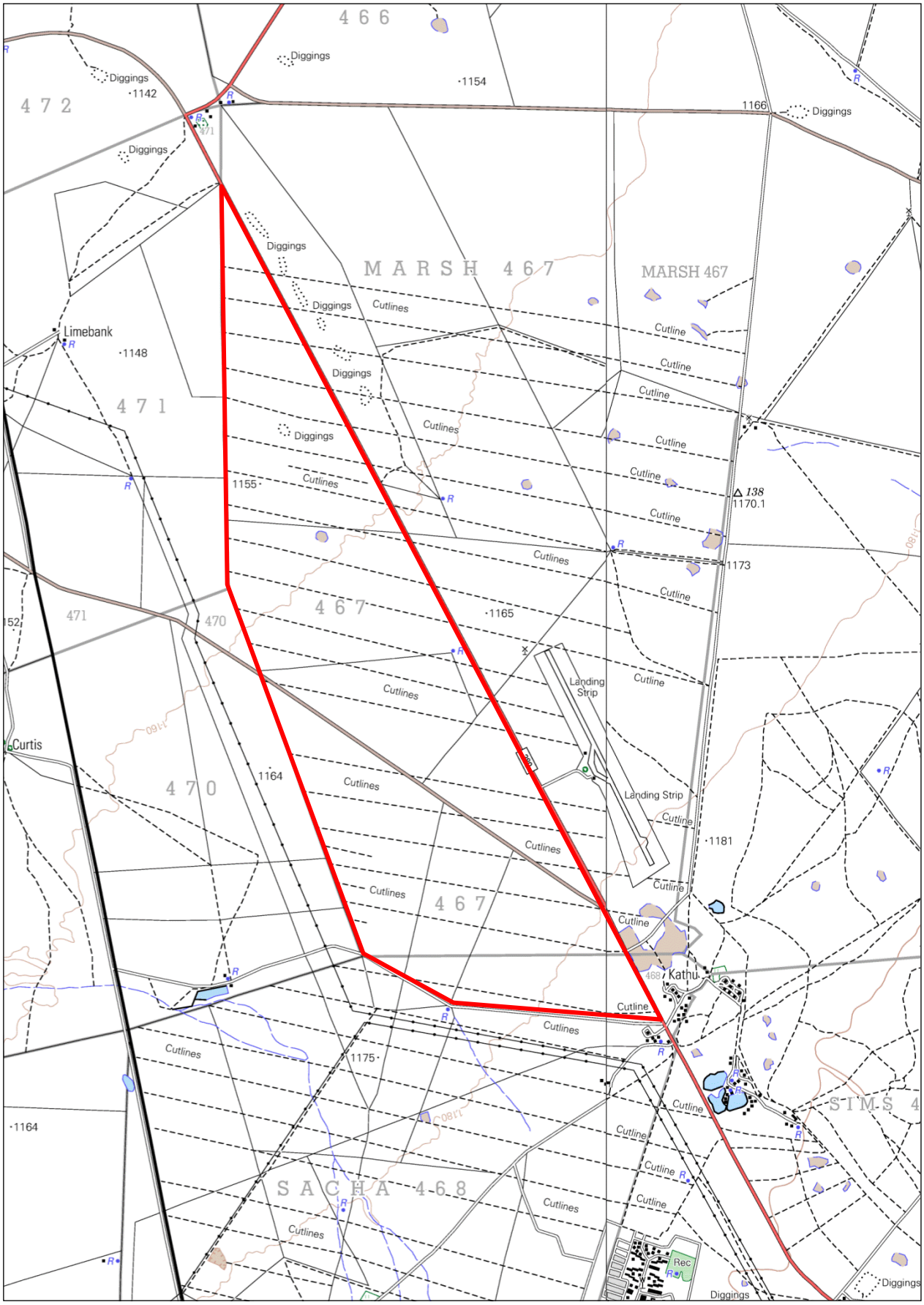

Figure 27 – Second Edition of the 2723CA and 2722DB Topographical Sheets surveyed in 2001. The study area is depicted in red.

5.4 Archaeological & Historical Sequence

DATE	DESCRIPTION
2.5 million to 250 000 years ago	The Earlier Stone Age (ESA) is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with more robust flaked tools. It dates to approximately <2 million years ago. The second technological phase is the Acheulian and comprises more refined stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago. A number of important ESA sites are known from the general vicinity, including the very significant ESA Kathu Pan and Kathu Townlands localities and also the Bestwood sites (Chazan et al, 2012). The Kathu Pan site is located directly opposite the R380 tar road from the southern end of the study area. The Kathu Townlands and Bestwood sites are located further to the south-east. Research at Kathu Townlands was first undertaken by P.B. Beaumont (1990, 2004). The locality has a remarkable high lithic density containing millions of ESA artefacts (Mitchell, 2002; Walker et al, 2013 Walker et al, 2014). Moreover, the interface between the ESA and MSA is also represented at Kathu Pan by the transitional lithic industry of the Fauresmith (Porat et al, 2010).
>250 000 to 40 000 years ago	The Middle Stone Age (MSA) is associated with flakes, points and blades manufactured by means of the prepared core technique. This phase is furthermore associated with modern humans and complex cognition (Wadley, 2013). MSA sites and occurrences had been identified in the direct vicinity of the study area, including the very significant Kathu Pan localities (Wilkins & Chazan, 2012). See also, for example, Beaumont (2009) and Kruger (2014).
40 000 years ago to the historic past	The Later Stone Age (LSA) is the third archaeological phase identified and is associated with an abundance of very small stone tools known as microliths. According to Beaumont (2000) pecked engravings, originally from the farms Sishen 543 and Bruce 544, were donated to the McGregor Museum with some engravings located on the grounds of the Sishen Iron Ore Mine as well. These two farms are situated approximately 7.4 km south of the study area. More engraving sites are known from further afield including one on the farm Palingpan, which is located 50.9 km south of the present study area.
800 AD – 820 AD	The archaeological excavations undertaken by Beaumont and Boshier (1974) and Thackeray, et al (1983) have revealed that the mining of specularite at Doornfontein and Tsantsabane/Blinkklipkop commenced during this time. Blinkklipkop for example is located approximately 72km SSE of the study area. During this initial period the mining activities would have been undertaken by San hunter-gatherers and Kora pastoralists. Only after the 17th century were such mining activities likely also undertaken by the Iron Age Tswana groups.
Early 1600s	The Tswana groups known as the Thlaping and Thlaro moved southward into the area presently known as the Northern Cape. A century later they were settled in areas as far south as Majeng (Langeberg), Tsantsabane (Postmasburg)

	and Tlhaka le Tlou (Daniëlskuil) (Snyman, 1986). In terms of the Thlaro specifically, Breutz (1963) states that after they broke away from the Hurutshe during the period between 1580 and 1610, they travelled along the Molopo River and the Southern Kalahari before arriving at the confluence of the Kudumane, Mosaweng and Molopo. From here they established themselves at Tsowe (west of Morokweng), Gatlhose, Majeng (Langeberg), Khoiise (Khuis on the Molopo River) and Tlhaka-la-Tlou (present day Daniëlskuil situated roughly 83.80 km south-east of the study area). It is evident that the study area and surrounding landscape would be been central within the overall settlement area of the two Tswana groups at the time.
c. 1770	During this time the Kora moved into the area. Due to their superior firearms they applied increasing pressure on the Thlaping and Thlaro groups. In the end the Thlaping moved into a north-eastern direction to settle in the general vicinity of Dithakong, north-east of present-day Kuruman. The Thlaro settled in areas to the west and north-west of the Thlaping (Snyman, 1986).
c. 1786 – c. 1795	The German deserter by the name of Jan Bloem established himself at Tsantsabane (Blinkklip) (Legassick, 2010). This place is located 5km north-east of the present-day town of Postmasburg. The settlement of Jan Bloem at the specularite mine may have been a way in which to control the valuable site and any trading activities associated with it.
c. 1795	Legassick (2010) confirms the presence of the Thlaping, Thlaro and Kora in the general vicinity of the study area during this time. This said the study area and surrounding landscape would have represented a western peripheral area of the overall landscape occupied by especially the Thlaping and Thlaro groups at the time. From a map depicted in Leggassick (2010:338) it is evident that at the time the Kora started moving in north-eastern direction from the areas along the central Orange river to the banks of the Harts River.
Early 1800s	After the threat of the Kora became less intensive, the Thlaping moved to the vicinity of present-day Kuruman. The Thlaro returned to the Langeberg, establishing them on a permanent basis there during the 1820s (Snyman, 1986). The settlement of the Thlaping in the vicinity of Kuruman occurred during the reign of Molehabangwe. This period in the history of the Thlaping was seen as a period of wealth and power, and at the time they even had control of the *sibello* quarry near Blinkklip (Legassick, 2010).
1801	The first known visit to this area by European explorers (i.e. excluding European renegades and fugitives such as Jan Bloem) took place in 1801. The journey was undertaken by P.J. Truter and Dr W. Somerville. They crossed over the Orange River in the vicinity of Prieska, and passed Blinkklip on their way to present-day Kuruman (Bergh, 1999). Although their exact route is not known, it is possible that their journey from present-day Postmasburg to Kuruman would have passed some distance to the east of the present study area.
1802 - 1813	During this year William Anderson and Cornelius Kramer, both of the London Missionary Society, established a mission station at a place called Leeuwenkuil. The focus of their work was a group known as the Bastards (Erasmus, 2004). This group could be described as a cultural conglomeration descending not only from relationships between different cultures and races (i.e. European and

	Khoi), but also comprised remnants of Khoi and San groups as well as freed slaves. The particular group later became known as the Griqua. Due to the problems caused by the presence of lions at Leeuwenkuil, the mission station was moved in 1805 to Klaarwater. On 7 August 1813 the name of the settlement which had sprung up here was renamed Griquatown. This came about as a result of a number of proposals made by Reverend John Campbell, the Director of the London Missionary Society who was visiting the mission stations from this area at the time. He suggested that "...*the Bastards change their name to 'Griqua' and that Klaarwater became Griquatown. This was because 'on consulting among themselves they found a majority were descended from a person of the name Griqua'*..." (Legassick, 2010). Griquatown is located 132km SSE of the present study area.
1805	During this year German explorer Martin Hinrich Carl Lichtenstein travelled through the general vicinity of the study area. After crossing the Orange River in the vicinity of present-day Prieska, Lichtenstein's party visited present-day Daniëlskuil, and by June 1805 they were at Blinkklip (Postmasburg), a well-known source for obtaining specular haematite. Archaeological investigations at Blinkklipkop (also known as Nauga) established a date of AD 800 for the utilization of this particular rich source (Thackeray, et al 1983). From here they travelled further north and reached the Kuruman River where they met Tswana-speaking people. They followed the river downstream for three days, after which they followed a tributary to reach Lattakoe. From here they turned south and reached the Orange River on 11 July 1805. While on his way to the Kuruman River (and to the south thereof), Lichtenstein visited a small settlement consisting of "*…about thirty flat spherical huts.*" Although the people staying here were herdsmen who looked after the cattle of richer people living on the Kuruman River, they indicated that San (Bushmen) were also present in the area (Lichtenstein, 1930). Although Lichtenstein was certainly not the first European explorer to travel through this area (the Truter and Somerville expedition had for example passed through this area in 1801), or for that matter the last (Burchell travelled through the area in 1811 followed by John Campbell in 1813) (Bergh, 1999), Lichtenstein did leave behind a written record of this journey providing a valuable glimpse into the early history of the general surroundings of the study area. What is also significant about the visit of Lichtenstein is that his journey took him from present-day Postmasburg to a place known as Tsenin which is located north-west of Kuruman. As a result he would have passed in close proximity to the present study area.
1813	During 1813 John Campbell of the London Missionary Society also visited the general vicinity of the study area. He arrived at Klaarwater on 9 June 1813, where he rested for a few days before continuing in a northern direction toward present-day Kuruman, passing through Blinkklip on the way (Bergh, 1999).

Figure 28

Reverend John Campbell (Campbell, 1815). He passed through the general vicinity of the study area during his travels from Klaarwater to Kuruman.

20 December 1820	On this day Andries Waterboer was elected as leader of Griquatown in the place of Berend Berends (Legassick, 2010). This period saw fission within the Griqua community, and it is not surprising that two long-term leaders moved away from Griquatown to establish autonomous settlements away from their former town. Berend Berends for example moved to Daniëlskuil (83.8km south-east of the study area), whereas Adam Kok II established himself in the vicinity of Campbell (145.5km south-east of the study area) (Legassick, 2010).
1821 – August 1828	During this period a group of Griqua became dissatisfied with Waterboer and moved away from Griquatown to first settle along the Modder River. This group was known as the Bergenaars and was supported by Kora and San elements (Cope, 1977). A section of the Bergenaars known as the Klein Bergenaars (Little Bergenaars) settled along the Langberg. This mountain range is located roughly 40km west of the present study area. The Bergenaars constantly attacked the Thlaro, Thlaphing as well as the Griqua. On three separate occasions (late 1824, July 1827 and December 1827) they attacked Griquatown itself. They also attacked the London Missionary Society station at Kuruman on several occasions with the last attack taking place in August 1828 (Cope, 1977).

1824	Robert Moffat of the London Missionary Society established the mission station at Kuruman (Erasmus, 2004).
Early 1830s	During this time Andries Waterboer stationed a number of Griqua families at a fountain north of Tsantsabane (Blinkklip) as well as at Daniëlskuil (Legassick, 2010).
22 April 1842	On this day a treaty was signed between Griqua leader Andries Waterboer and Thlaping leader Mahura at Mahura's settlement near Taungs. The agreement included a definition of the boundary between the two groups. The section of the agreed upon boundary closest to the study area ran from "...*the northerly point of the Langeberg and extending a little south of Nokaneng, and further half-way between Maremane and Klipfontein*..." (Legassick, 2010:291). While the exact location of Nokaneng is not currently known, the farms Klipfontein 437 and Maremane 678 are respectively situated 51.2km and 34km to the south. This suggests that the present study area was located north of the boundary line between the Griqua and the Thlaping as defined in the treaty. As such, the study area was defined within this treaty as forming part of the land of the Thlaping. However, it must be noted that this boundary line was not cast in stone. This boundary was very similar to an earlier one that was thought to have been agreed to during the 1820s as a boundary between the Griqua and the Thlaping (Legassick, 2010).
1850	During this time a Thlaro leader by the name of Molete and his baThlaro baga Keakopa followers moved away from the Korannaberg and established themselves at Gathlose, roughly 16.5km south-east of the study area. Breutz (1963) states that the land around Gathlose and Maremane used to belong to the Kora (Koranna) people and that they gave permission to Molete to settle here. After his death between 1885 and 1890, Molete was succeeded by Holele who ruled until his death during the Langberg Rebellion of 1897. Holele was succeeded by Kebiditswe John Holele who filled the post until 1912 when he was succeeded by his younger brother Kgosieng. Kgosieng ruled until he was pensioned on 28 February 1937, and was succeeded by Kebiditswe's son, Kgosietsiele Smous. Kgosietsiele died on 30 June 1956 and was succeeded by his son Frank Motsewakgosi Holele (Breutz, 1963). Likely between 1850 and 1860 the area known as Maremane (located directly north of Gathlose) was an outpost grazing area of the BaThlaro chief Makgolokwe and his son Toto. The first designated leader of this area was Isaak Thupane Thupane, followed by Toto's son Robanyane who fled to present-day Namibia after the Langberg Rebellion of 1897. He was succeeded by his father's brother Jan Molebane Toto. However, the government only recognised him as chief in 1912 up to which point John Holele of the Gathlose Reserve was appointed by the government to act for the Maremane area as well. Molebane was dismissed in 1925 and was succeeded in 1926 by his brother David Makgolokwe. David Makgolokwe remained at his post until his death in 1942 when he was succeeded by Puso Togelo who remained as leader until his death in 1954. He in turn was succeeded by Felix Kgosithebe Toto (Breutz, 1963).
1850 – 1855	During this period a Thlaro chief by the name of Isaak Thupane Thupane established himself at Logageng (Gatkoppies) near Postmasburg. He subsequently moved with his followers to Groenwater 453. During the time that Thupane was living at Logageng, Kgangeng discovered the fountain at

	Metsematale. Subsequently, the land was ceded by Waterboer to the Thlaro and Kgangeng and his followers settled at Groenwater as well. The farm Groenwater 453 is located 67.3km south-east of the present study area.
13 December 1852	After the death of Andries Waterboer, his son Nicolaas Waterboer became the leader of Griquatown. He ruled Griquatown until the annexation of the area by the British in 1871 (see below) (Legassick, 2010). It was during the rule of Nicolaas Waterboer that diamonds were discovered in the area which led to a period of claims and counter-claims between the Griqua, the Orange Free State as well as the Zuid-Afrikaansche Republiek and which eventually led to the annexation of the area.

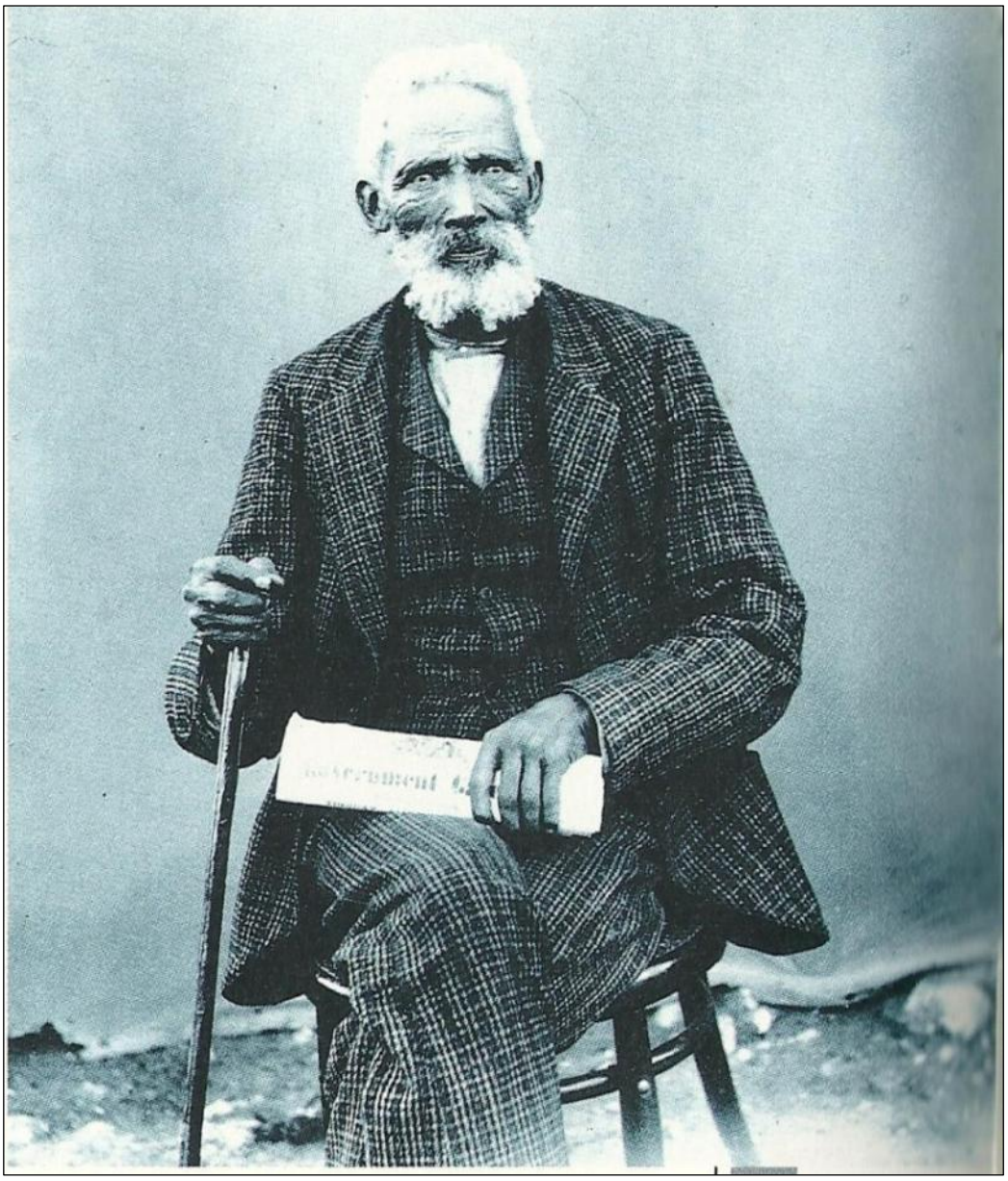

Figure 29

Nicolaas Waterboer, who succeeded as leader of Griquatown in 1852 after the death of his father Andries Waterboer (Reader's Digest, 1994:168).

Before 1856	During the period before 1856 the Thlaro leader Masibi occupied the area known as Skeyfontein, which is located 94.4km south of the study area.
1867	Diamonds were discovered for the first time in South Africa near Hopetown. Alluvial diamonds were also discovered along both banks of the Orange River (Van Staden, 1983).
27 October 1871	The area located in general terms between the Orange and Vaal Rivers and south of Kuruman was proclaimed as British Territory and named Griqualand West (www. wikipedia.org). The study area fell outside and to the north of this territory at the time.
1878	A rebellion broke out amongst some of the Tswana communities living in Griqualand West. This rebellion, which was a response to British expansion and colonialism, spread to the Langberg. A British force left Griqualand West in October 1878 and defeated the "rebels" at the Langberg (Snyman, 1986).
30 September 1885	Sir Charles Warren proclaims the area between the Molopo River and the northern boundary of Griqualand West as the Crown Colony of British Bechuanaland. Its western boundary was defined by the Molopo River and its eastern extremity reached as far as Mafeking. The proclamation followed on a military operation under Warren's command to occupy the Boer Republics of Stellaland and Goosen. As a result the Crown Colony of British Bechuanaland included the lands of the two republics as well as the land of various Tswana groups. (www.wikipedia.org). At the time the study area was located near the southern boundary of this newly proclaimed territory.

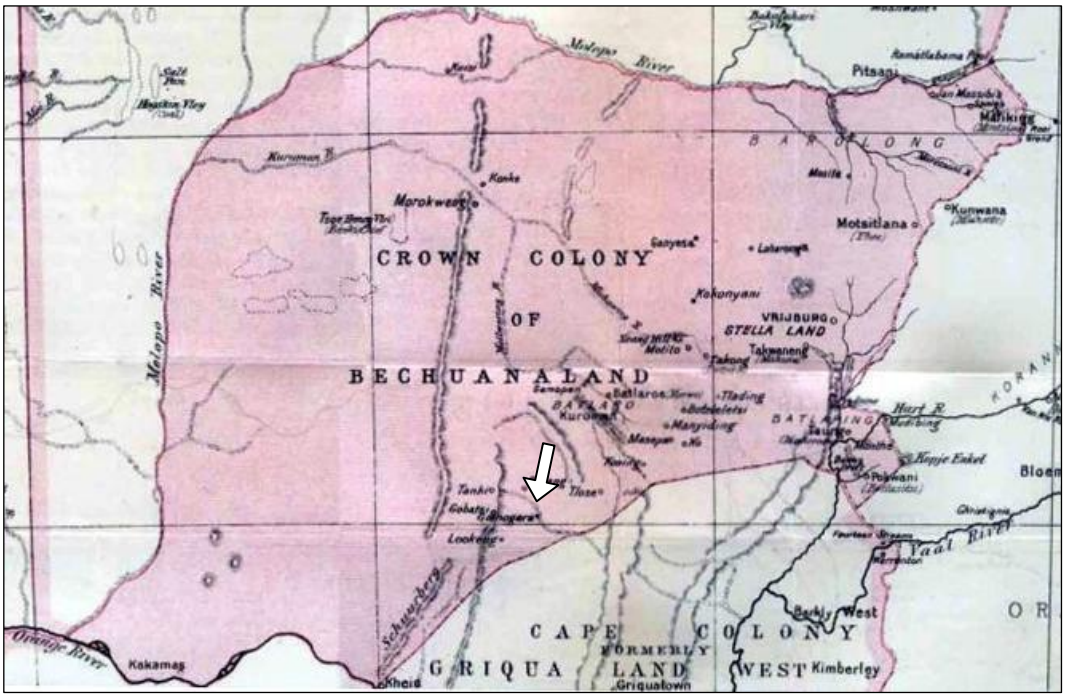

Figure 30

Section of a map titled "Sketch Map of British Bechuanaland" which is dated to May 1887 (www.wikipedia.com) (www.kaiserscross.com). The approximate position of the study area is shown by the arrow.

1886	As a result of the work of a commission appointed by the British rulers of the Crown Colony of British Bechuanaland, a number of so-called "native reserves" were established in this area. These included Deben (8km NNW of the study area), Gatlhose (16.5 km south-east of the study area), Maremane, Langberg (south-west of the study area) as well as Kathu (7.3km south of the study area) (Snyman, 1986). The establishment of so many "native reserves" in close proximity to the study area clearly support the suggestion made earlier that the study area was centrally located in the historic and prehistoric territories of Tswana groups such as the Thlaro and Thlaping. In the same year a trader by the name of John Ryan established a shop on the farm Bishop's Wood. This farm is located 8 km south-west of the study area.
16 November 1895	The Crown Colony of British Bechuanaland was annexed by the Cape Colony (www.wikipedia.org).
September 1896	During this time a viral disease affecting cattle (and some other species of even-toed ungulates) known as Rinderpest swept through Southern Africa (www.wikipedia.org). Although attempts were made to halt the spread of the disease from the north by erecting a fence between the boundaries of Griqualand West and Bechuanaland, this proved unsuccessful. Incidentally, only three gates were placed in this fence, namely at Gatlhose, Nelsonsfontein and Blikfontein (Snyman, 1988). Of these three places, Gatlhose is the closest and is situated 16.5 km south-east of the study area.

Figure 31- An everyday scene during the Rinderpest Epidemic (Snyman, 1983:20).

1897	The Rinderpest epidemic did not only have a massive socio-economic impact on the landsccape, it also resulted in the Langberg Rebellion of 1897. During this time conflict broke out between the authorities and a Thlaping leader from Taung, namely Galeshiwe. The conflict arose after infected cattle belonging to him were destroyed by representatives of the government as a way of curbing the spread of the disease. After killing an officer, Galishewe fled to the Thlaro leader Toto of the Langberg. Subsequently, a full-scale rebellion broke out (Breutz, 1963). The British authorities eventually mustered a military force

which included sections of the Cape Mounted Rifles and Bechuanaland Field Force and which on 14 March 1897 stood at roughly 1,000 men. Opposing this formidable and well equipped force supported by artillery the Tswana rebels possessed an army of roughly 1,500 men who from the start of the rebellion already experienced serious shortages in the way of provisions and ammunitions (Snyman, 1986).

Although most of the activities associated with the rebellion took place some distance to the west of the study area, the impact of the rebellion was felt throughout the surrounding landscape. Some noteworthy skirmishes took place on 9 May 1897 at Puduhush and on 30 July 1897 at Gamaluse and Gamasep. Furthermore, the main British force under the overall command of Lieutenant-Colonel E.H. Dalgety used the farm Bishop's Wood as a base of operations (Snyman, 1986). The farm Bishop's Wood is located 8 km south-west of the study area.

The rebellion was suppressed and came to an end with the surrender of rebel leader Toto, his son Robanyane and their Thlaro followers on 2 August 1897 (Snyman, 1986).

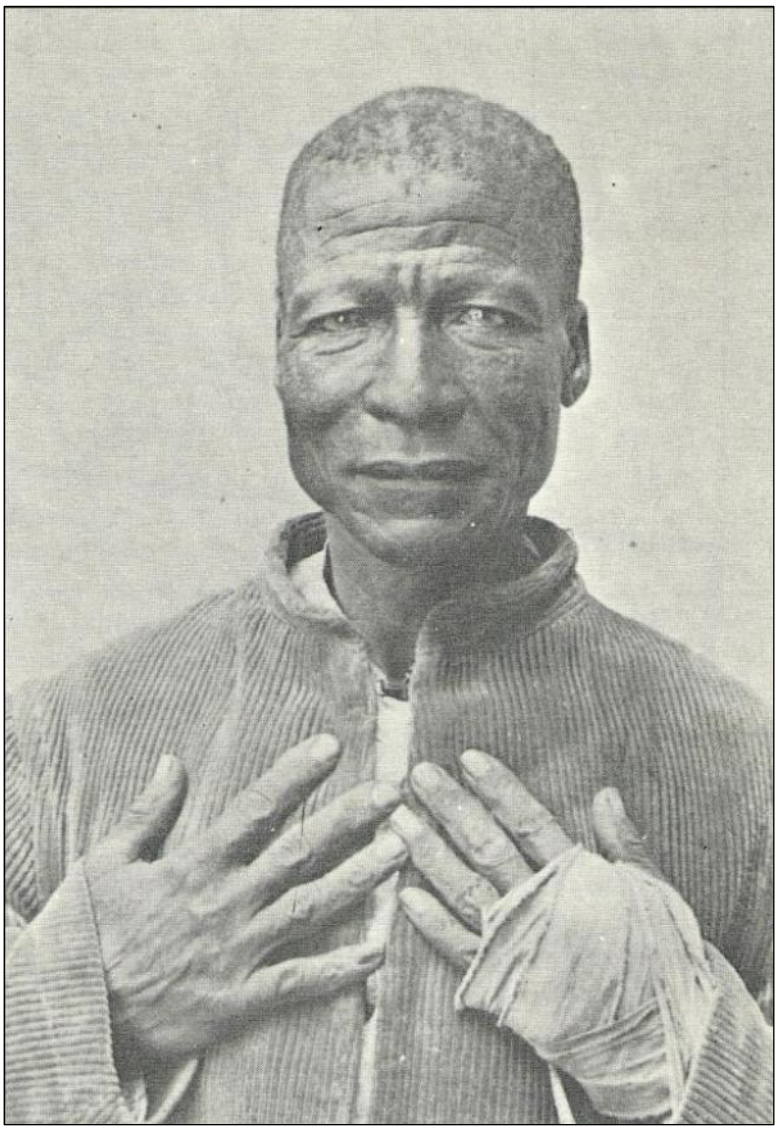

Figure 32

Toto, leader of the Thlaro along the Langberg (Snyman, 1986:17).

1899 - 1902	The South African War was fought between Great Britain and the Boer republics of the Zuid-Afrikaansche Republiek and Orange Free State. However, no skirmishes or battles from this war are known from the direct vicinity of the study area. The closest known battles and skirmishes to the present study area include Kareepan on 10 August 1901 and Doornfontein in February 1902 (Snyman, 1983).
1907	A number of trekboers from the southern Free State arrived in the general vicinity of the present study area (Erasmus, 2004).
1913	In this year the so-called "Native Locations" of Skeyfontein and Groenwater were established by Proclamation 131 of 1913 (Breutz, 1963).
1914	The town of Dibeng was laid out in 1914 on the banks of the Ga-Mogara River. This followed on the establishment of the Dibeng Dutch Reformed Church parish in 1909 (Erasmus, 2004). As indicated before, Dibeng is located 8.4 km north-west of the present study area.
1927	Gamagara Manganese Corporation Ltd and Central Manganese Ltd obtained options on farms in the vicinity of Lomoteng and Sishen (Snyman, 1988).
4 November 1930	On this day the extension of the railway line from Koopmansfontein to Postmasburg was officially opened by the Minister of Railways, C.W. Malan. This meant that Postmasburg was now one of the few towns in the Northern Cape which boasted a direct rail link. While the extension of the railway line to Beeshoek was built by the Manganese Corporation further extensions to Lohatla and Manganore (1936), Sishen (1953) and Hotazel (1961) were undertaken by the South African Railways (Snyman, 1983).
1930 - 1932	During 1930 an Englishman by the name of Pringle-Smith was appointed by S.A. Manganese to devise and execute a "...*thorough prospecting programme of S.A. Manganese's properties*..." (S.A. Manganese, 1977:46). This meant that the prospecting work undertaken in 1927 and which had been halted due to the poor financial climate and the lack of a railway link could now be proceeded with. Within a relatively short spate of time Pringle-Smith started opening up the beds on the farms Kapstewel and Doornput. However, the company did not have the market which for example the Manganese Corporation possessed at the time, and as a result the ore was stockpiled at these two farms. Pringle-Smith left the Postmasburg area in 1932 after the financial implications of the Great Depression worsened the situation for S.A. Manganese to such an extent that he was asked to agree to a much lower salary (S.A. Manganese, 1977).
Early 1930s	Due to the financial impacts of the Great Depression, a number of smaller manganese mining companies were closed down. A period of amalgamation followed which resulted in the South African Manganese Limited as well as the Associated Manganese Miners of South Africa Limited becoming the leaders in the manganese mining industry (Snyman, 1983).
c. 1932 - 1937	During this approximate period a geological assessment of the minerals and ore deposits of the Postmasburg District was undertaken by the South African Geological Survey. One member of the geological team was Dr Leslie Gray Boardman. His responsibility was to work on manganese and haematite deposits in the district. Apart from the manganese deposits near Postmasburg,

	Dr. Boardman also identified large deposits of iron ore deposits on farms along the northern end of their area of study including Sishen, Bruce and King (S.A. Manganese, 1977). These farms are located 7.3 km and 18 km south of the present study area.

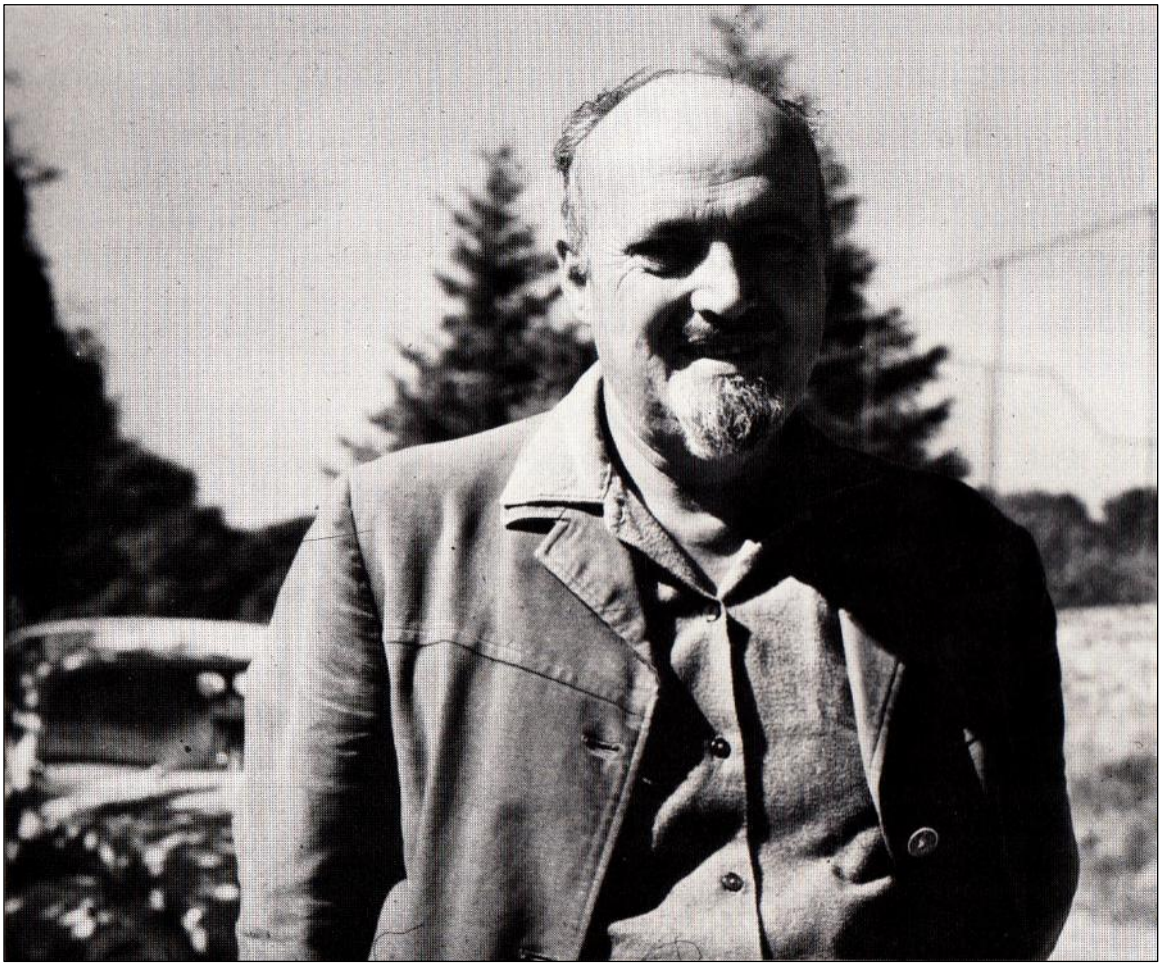

Figure 33 - Dr Leslie Gray Boardman, the geologist who during the 1930s realized the immense potential of the Sishen area for iron ore mining (S.A. Manganese, 1977:65).

c. 1936	After the willingness of the South African Railways Administration to extend the railway line from Postmasburg to Kapstewel and Lohatla became known, the entire manganese industry north of Postmasburg changed for the better. An example of this was that S.A. Manganese stepped up operations on the farm Kapstewel. The work here was overseen by Captain T.L.H. Shone (S.A. Manganese, 1977). The promise of railway extensions to this area also resulted in other mining activities such as the establishment of a mining company by the name of Gloucester Manganese. This company was established to mine the manganese deposits on the farm Gloucester. Shortly thereafter an amalgamation took place between Gloucester Manganese and the Manganese Corporation which resulted in the formation of the Associated Manganese Mines of South Africa Limited (Ammosal). Ammosal re-erected the old ore handling plant from Beeshoek on the farm Gloucester and the operations here represented a large portion of the total manganese production of 250,000 tons (S.A. Manganese, 1977).

1937	The farm to the east of Gloucester, named Lohatla, was now being viewed more favourably by S.A. Manganese. During this year they reached an agreement with the owner, which eventually resulted in the acquisition of the farm (S.A. Manganese, 1977). During the same year the company bought the freehold of the farm Klipfontein and also bought 600 morgen of the farm Kapstewel in order to build a staff village. This village was named Manganore (S.A. Manganese, 1977). The Lohatla mine village was also established during this time (Snyman, 1983). Furthermore, the African Metals Corporation Limited (Amcor) was established "…*to manufacture semi-processed iron and steel products*…" and in 1937 obtained the farm Demaneng for this purpose. However, this venture was a failure (Snyman, 1988:84).
Late 1940s	During this time the decision was made by two of the bigger role players in the manganese mining industry around Postmasburg for the mining of haematite iron ore to commence in earnest. S.A. Manganese in conjunction with the African Metals Corporation (Amcor) established a new company known as Manganore Iron Mining Ltd to work on the iron ore deposits owned by them. These deposits were *inter alia* located on the farms Klipfontein, Kapstewel and Doornput (S.A. Manganese, 1977).
c. 1950	At the time Dr L.G. Boardman was assessing the ore reserves at Manganore and Lohathla as well as the farm Lilyveld for S.A. Manganese. He found that the latter farm contained large quantities of haematite iron ore and persuaded the directors of S.A. Manganese to acquire the farm (S.A. Manganese, 1977). The farm Lilyveld is situated south-east to the study area and is roughly 11.1 km from the study area.
1953	Iscor commenced iron production at Sishen (Snyman, 1983). In the same year the railway line from Postmasburg to Sishen was extended to haul ore to Iscor's plants in Pretoria, Vanderbijlpark and Newcastle (Erasmus, 2004).
1958	At least by 1958 Manganore Iron Mining also owned mineral and surface rights on the farm Sekgame which occurs about 5.3 km south-east of the study area.
1973	In this year a second mine was opened at Sishen to supply export iron ore to Saldanha Bay. During the same year the town of Kathu was established to accommodate employees for the new mine (Erasmus, 2004).
1976 - 1977	During this time the Gatlhose and Maremane Communities were removed from their land and taken to the Shipton Farms in the then homeland of Bophutatswana. After their removal, the South African Government decided to establish a Battle School here. As the Khosis Community was still staying on the land, they were moved to a section of the original land roughly 14 000 hectares in extent. The Lohatla Battle School was subsequently established (www.lrc.org.za/Docs/Judgments/khosis.doc).
1977	During this year the 860km long Sishen-Saldanha railway line was completed (Erasmus, 2004).
1980	In 1980 the town of Kathu received municipal status (Erasmus, 2004).

5.5 Palaeontology

5.5.1 Introduction to Palaeontology

A palaeontological desktop study for the proposed development was undertaken by Dr. Lloyd Rossouw of Palaeo Field Services. His report is included in this report under Appendix B. With the exception of the section from the geological map, the discussion below were taken directly from this palaeontological desktop study report.

5.5.2 Geology of the Study Area

According to the 1: 250 000 scale geological map of the region (2722 Kuruman) the study area is underlain by surface limestones.

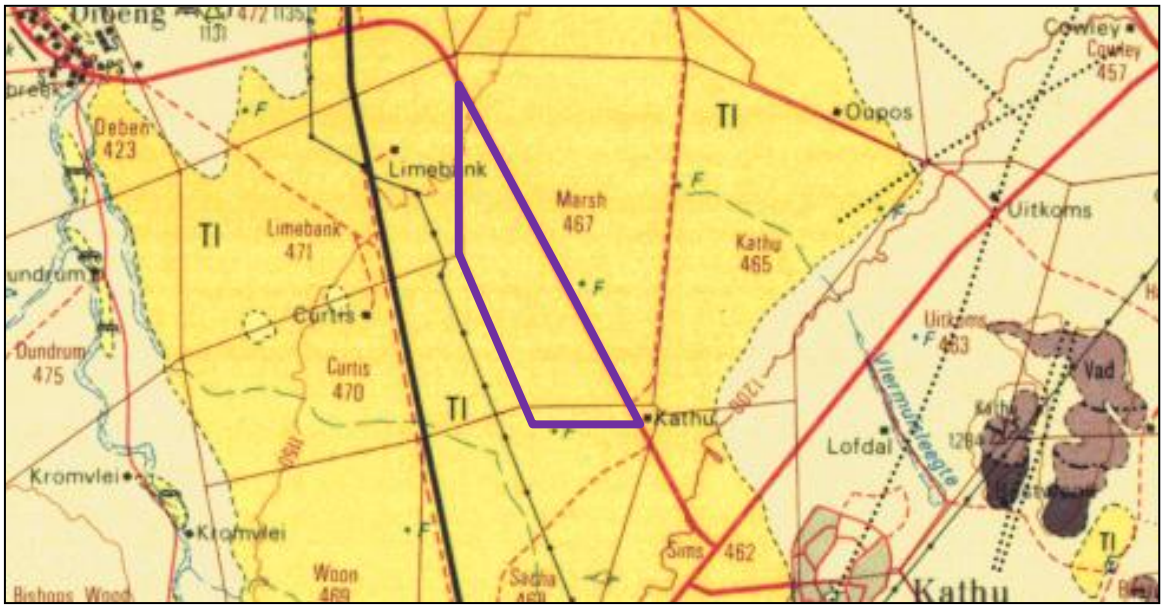

Figure 34 – Section of the 1:250 000 scale geological map (2722 Kuruman) showing the position of the study area on the farm Marsh 467.

5.5.3 Palaeontology of the Study Area

5.5.3.1 Regional Palaeontological Footprint

The Precambrian dolomites at the eastern edge of the Ghaap Plateau have been incised at various points by drainage lines that created gorges in which travertine deposits have formed. As a result, the tufas at Norlim (Buxton) near Taung contain solution caves which are

fossiliferous, including the one within the Thabaseek Tufa that produced the type specimen of Australopithecus australis. Situated about 600m north-west of the A. australis type site, another solution cavity called Equus Cave yielded the Quaternary fossil remains of more than 40 mammalian species, including the extinct taxa Equus capensis, Antidorcas bondi and Megalotragus priscus. To the southeast, the lower Vaal River basin and its tributaries represent important repositories of late Neogene fossil remains. Dating back to the late Cretaceous, the Vaal River is one of the principal fluvial conduits in southern Africa and its alluvial formations have yielded rare mammal fossils and stone tools so that at the turn of the 19th century, the Vaal River gravels represented the foremost fossil mammal locality in sub-Saharan Africa.

5.5.3.2 Local Palaeontological Footprint

Kathu Pan is a significant archaeological and paleontological site with several localities that is in the process of being proclaimed a national heritage site. The Kathu Pan dolines were investigated by Beaumont and colleagues (Butzer et al., 1978; Beaumont et al., 1984; Butzer, 1984; Beaumont, 1990, 2004), and have provided an excellent archaeological, palaeontological, sedimentary and palaeoclimatic sequence for the region, constrained by a series of radiocarbon dates for the upper levels. The site represents one of a series of 11 dolines that are developed within the Tertiary sequence of the Kalahari Group. Kathu Pan (centre c. 27° 39'50"S, E3° 0'30"E) is situated on a flat northward-sloping plain drained by the Ga-Mogara, a tributary of the Kuruman River, some 5,5 km north-west of Kathu Town and adjacent to the southeastern corner of the proposed study area. The pan covers about 30 ha and is shallow, with a rim only a few metres above the lowest point on its floor at c. 1178m, where the current natural water-table rises to above the present surface in summer, but lies 1 - 2m below it in mid-winter. Boreholes in the pan reveal that the superficial unconsolidated sediments are underlain by over 40m of calcrete, followed by about 30m of sands, clays and basal gravels, that collectively belong to the Tertiary-aged Kalahari Group. The pan covers three farm boundaries, with Site 1-5 being on the farm Sacha 468 , Site 7 being on the farm Kathu 465, and Sites 6 and Sites 8 -11 being on the farm Sims 462.

5.5.4 Statement of Significance and Recommendations

The planned development and installation of infrastructure on Marsh 467 should result in minimal subsurface impact with regard to palaeontological remains. The creation of fire breaks may result in the exposure of potentially fossil-capping calcretes, which could be seen as a

positive palaeontological impact provided that it is accompanied by appropriate mitigation measures. The proposed development will not impact on the nearby heritage sensitive Kathu Pan Complex. Should future development within the study area require extensive excavations into in situ sediments, it is advised that such activities are preceded by a Phase 1 Palaeontological Impact Assessment.

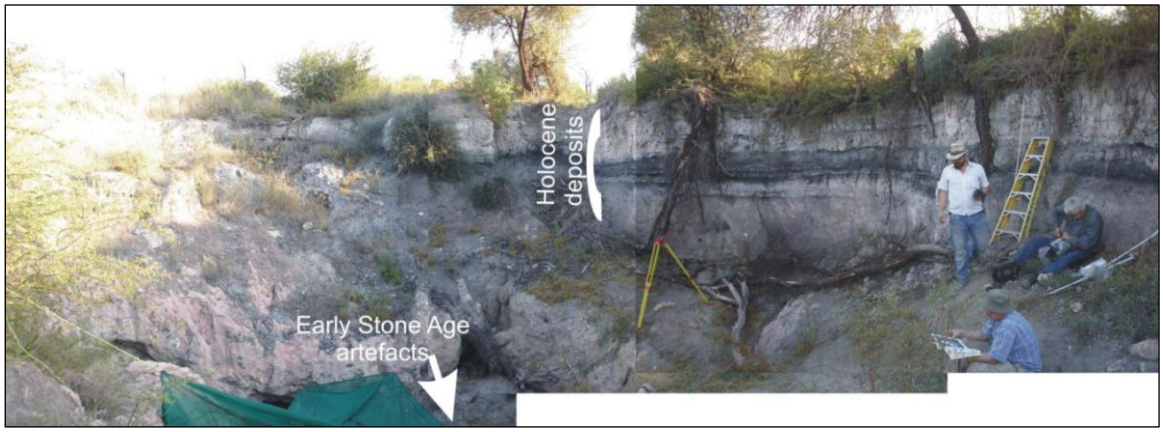

Figure 35 – The sinkhole at the Kathu Pan 1 site, looking south (Rossouw, 2015:11).

Figure 36 – Closer view of the Holocene deposit at the sinkhole at Kathu Pan 1 (Rossouw, 2015:1).

6 FIELDWORK FINDINGS

6.1 Introduction to Fieldwork Findings

A systematic drive through of the study area was undertaken by a fieldwork team comprising an archaeologist and field assistant. The team carried a hand-held GPS, and their track logs are depicted in blue on the image below.

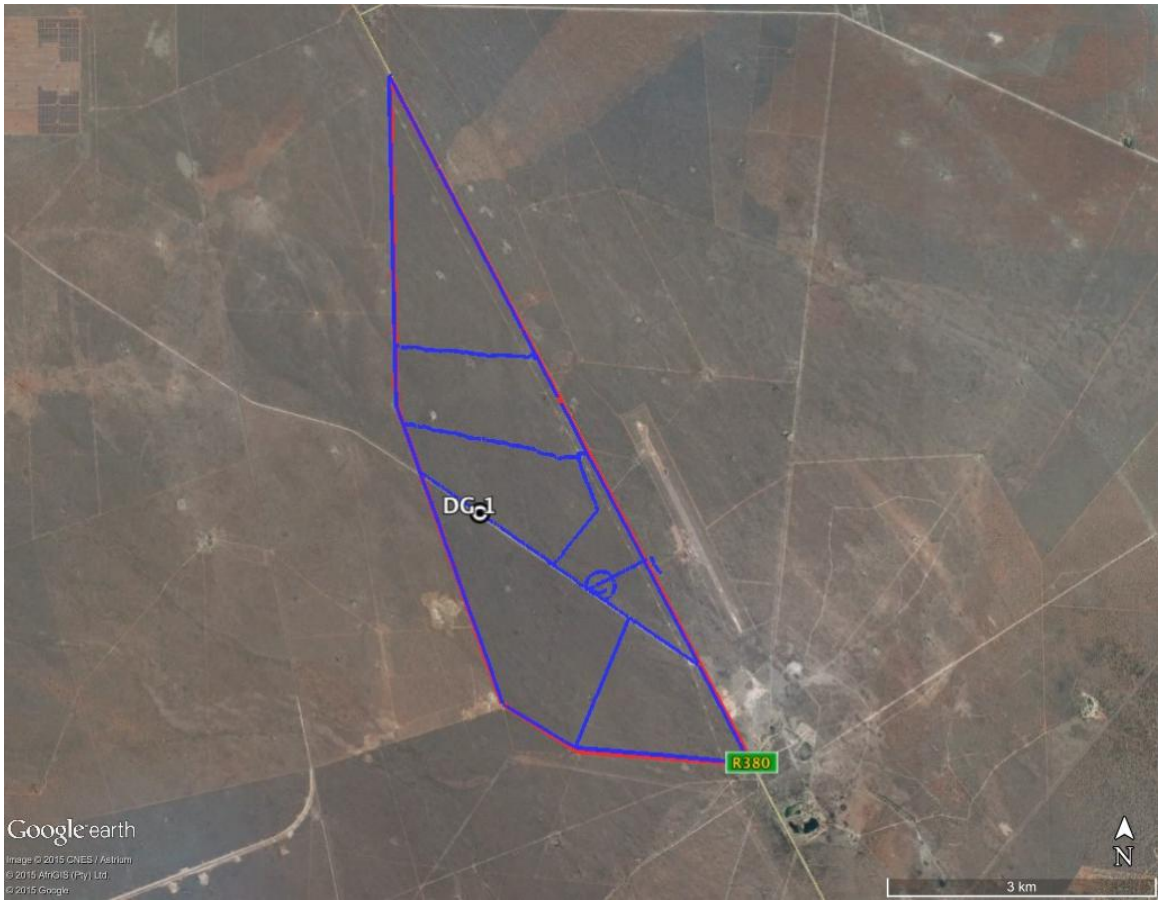

Figure 37 – Google Earth image depicting the overall study area in red. The recorded track logs (blue) and identified heritage site are depicted.

Only one archaeological site was identified, namely a low density surface lithic scatter associated with a small pan. The site was given an abbreviated name of DG (Dingleton) and was numbered DG 1. The identified heritage site will be discussed below.

This site will be discussed in more detail below.

6.2 Sites identified within or near the Study Area

6.2.1 DG 1

Site Coordinates:

S 27° 38' 43.4"
E 22° 58' 29.3"

Site Description:

A low density scatter of stone tools (± 2-5 artefacts in 10m x10m) was identified at this location. The site is situated around and within a small pan in the central part of the study area. The small pan is located just to the north and approximately 25 m from one of the existing fences to be re-fenced. The site covers an area of approximately 50 m in diameter including the small pan. The artefacts were exposed due to some measure of sheet erosion towards the central part of the pan. The stone tools consisted mostly of Middle Stone Age (MSA) blades and also several scrapers as well as a few cores scattered across the site. Fine-grained materials were used to produce the lithics. One of the cortical scraper tools on brown jasper exhibits an awl-like distal section where small flakes were removed in order to obtain an edge suitable for perforating tasks. This is a characteristic multi-purpose MSA scraper-awl. The identified lithics represent such a small sample that the cores and scrapers cannot be exclusively assigned to a specific time frame but overall the lithics are characteristic of the MSA. The lithics were recorded but not collected. The small sample likely represents some expedient on-site manufacture of tools required for hunting and gathering activities during what was probably a short visit to the small pan which served as a seasonal water resource. Expedient tools were typically made from locally available material when a tool was required for a task and required minimal investment of time/energy.

Site Significance:

Due to the lack of any concentration of artefacts, the site has very little scientific or historic significance. As a result, the site is deemed to be of Generally Protected C (Grade 4C), which represents a Low Significance. This indicates that the site may be destroyed without any further mitigation taking place.

Figure 38 - View of the small pan in which the artefacts are located.

Figure 39 – Close up view of the stone tools located within the pan.

7 IMPACT OF PROPOSED DEVELOPMENT ON HERITAGE RESOURCES

In this section the impact of the proposed development on the identified site will be calculated.

7.1 Impact of the Proposed Development on Site DG 1

In this section the impact of the proposed development on site DG 1 will be established. As shown elsewhere, Site 1 is a low density surface scatter of stone tools located roughly 25 m from one of the fences earmarked for re-fencing.

$$\text{Impact Risk} = \frac{(\text{Significance} + \text{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

$$\text{Impact Risk} = \frac{(2 + 3 + 3)}{3} \times \frac{3}{5}$$

Impact Risk = 1.6

Table 10: Risk Calculation for the Impact of the Development on Site DG 1

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	Low	Local	Medium-Term	Could Happen	**Low**
Impact on Site DG 1	2	3	3	3	**1.6**

This calculation has revealed that the impact risk of the proposed development on Site DG 1 falls within Impact Class 2, which represents a **Low Impact Risk**. As a result no mitigation would be required.

8 MITIGATION MEASURES AND GENERAL RECOMMENDATIONS

One heritage site was identified within the proposed grazing land and associated infrastructure on a portion of the Farm Marsh 467, Kathu, Northern Cape. The identified heritage site however, has very little heritage value or significance and no further heritage mitigation measures are required regarding this site.

However, in the Kathu region the thickness of the sand formation that can be up to several metres usually masks underlying deposits. In view of the significant and often extensive deposits of subterranean Stone Age material present within the surrounds of the study area, the following general recommendations are mandatory:

- An archaeologist suitably qualified in Stone Age fieldwork and research must be appointed to undertake an Archaeological Watching Brief during the Construction Phase of the project.

- The appointed archaeologist will be responsible for the following:

    - Provide training to the project Environmental Control Office (ECO) in Stone Age archaeology and the identification of Stone Age artefacts and sites. The ECO will be responsible for daily on-site monitoring during the Construction Phase with the appointed archaeologist visiting the site every two weeks.

    - On-site assessment of any Stone Age material exposed during the development activities and the provision of recommendations for the way in which the exposed material must be mitigated.

    - Compile and submit an archaeological monitoring report at the end of the monitoring process.

- During the daily on-site monitoring undertaken by the ECO and once every two weeks by the appointed archaeologist, all development work must be closely monitored. Should any Stone Age material or any archaeological material be identified, all development work in that area must immediately stop and the ECO or archaeologist (if he is already present on site) must demarcate a development-free area around the find. If the ECO made the discovery, the archaeologist must be contacted immediately to visit the site to assess the exposed material. The archaeologist will subsequently provide recommendations for the exposed material. These may range from destruction without mitigation (if the exposed material is found to be of little significance) to archaeological mitigation (if the exposed material is found to be significant).

Furthermore, the following general mitigation measures must also be adhered to:

- All work already in the process of being undertaken on site must be halted immediately to allow for the heritage impact assessment to be reviewed by the South African Heritage Resources Agency (SAHRA) first. Once no objection to the proposed development is received in writing from SAHRA, the activities can proceed.

- In future, any work on the firebreaks must not be done using plant machinery. During the fieldwork conducted it was noted that this was occurring, this should rather be done by hand. Furthermore, local stones should not be used to pack against the new fences as can be seen in Figure 13 and 14 as this process may impact negatively on Stone Age sites.

9 CONCLUSIONS

PGS Heritage was appointed by SLR (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), which forms part of the Environmental Impact Assessment (EIA) for the proposed grazing land and associated infrastructure on a portion of the Farm Marsh 467, Kathu, Northern Cape. The proposed activities can be viewed as activities typically found on farms in the direct surroundings, and will include fencing, the development of two boreholes (Marsh 1 and SW 740), the construction of a small steel dam at Marsh 1, the establishment of an above surface pipeline link between Marsh 1 and SW740 (the pipeline will only go underground to allow for the crossing of the tar road and will be 40mm in diameter), a small pipeline link between these two boreholes and two existing dams (this pipeline will also be above surface, will be placed along the existing fences and will also be 40mm in diameter) as well as the placement of troughs adjacent to the reservoirs. Initially the proposed activities also included access roads and firebreaks, but due to the significance of the nearby Kathu Pans, these have now been excluded from any future planned activities.

Due to the significance of the Stone Age sites from the surrounding landscape, Dr Maria van der Ryst was appointed to review the report and provide inputs in terms of the Stone Age.

An archival and historical desktop study was undertaken which was used to compile a historical layering of the study area within its regional context. This component indicated that the landscape within which the project area is located has a rich and diverse history.

A palaeontological desktop study for the proposed development was undertaken by Dr. Lloyd Rossouw of Palaeo Field Services. His report is included in this document under Appendix B. The

conclusions of the report are as follows: *"The planned development and installation of infrastructure on Marsh 467 should result in minimal subsurface impact with regard to palaeontological remains. The creation of fire breaks* (which is not proposed anymore) *may result in the exposure of potentially fossil-capping calcretes, which could be seen as a positive palaeontological impact provided that it is accompanied by appropriate mitigation measures. The proposed development will not impact on the nearby heritage sensitive Kathu Pan Complex. Should future development within the study area require extensive excavations into in situ sediments, it is advised that such activities are preceded by a Phase 1 Palaeontological Impact Assessment".*

The National Heritage Site Nomination of the Kathu Archaeological Complex as a Grade 1 Heritage Site that consists of nine localities, Kathu Townlands, Kathu Bestwood, Kathu Uitkoms and the various Kathu Pan locations, demonstrates the importance of the archaeological heritage of the region (Walker et al, 2013; Walker et al, 2013; SAHRIS accessed April 2015). The scientific and heritage significance, and the occurrence of possible heritage resources, were taken into account in the HIA under review (Beaumont, 1990, 2004, 2013; Porrat et al, 2010; Herries, 2012; Chazan et al, 2012; Wilkins & Chazan, 2012; Walker et al, 2013; Walker et al, 2014; Orton and Walker 2015). The heritage desktop study component of the project was followed by fieldwork. The methodology comprised a walk-through of the study area by an experienced fieldwork team consisting of an archaeologist and archaeological assistant.

Only one site of heritage significance was identified. A low density scatter of stone tools was recorded (± 2-5 artefacts in 10m x 10m). The site is situated around and within a small pan in the central part of the study area. The small pan is located immediately to the north and approximately 25 m from one of the existing fences that will be re-fenced. The site covers an area of approximately 50 m in diameter, including the small pan. The artefacts were exposed due to some measure of sheet erosion towards the central part of the pan. The stone tools consisted mostly of MSA blades, scraper types and a few cores randomly scattered across the site. The identified lithics represent such a small and statistically insignificant sample that the cores and scrapers cannot be exclusively assigned to a specific time frame but overall the lithics are characteristic of the MSA. The lithics were recorded but not collected. In view of the very low density of the lithics and the nature of the proposed activities that require limited infrastructural developments no mitigation measures or actions are required for this site.

In the Kathu region the thickness of the sand formation that can be up to several metres usually masks underlying deposits. In view of the significant and often extensive deposits of subterranean Stone Age material present within the surrounds of the study area, the following general recommendations are mandatory:

- An archaeologist suitably qualified in Stone Age fieldwork and research must be appointed to undertake an Archaeological Watching Brief during the Construction Phase of the project.

- The appointed archaeologist will be responsible for the following:
    - Provide training to the project Environmental Control Office (ECO) in Stone Age archaeology and the identification of Stone Age artefacts and sites. The ECO will be responsible for daily on-site monitoring during the Construction Phase with the appointed archaeologist visiting the site every two weeks.

    - On-site assessment of any Stone Age material exposed during the development activities and the provision of recommendations for the way in which the exposed material must be mitigated.

    - Compile and submit an archaeological monitoring report at the end of the monitoring process.

- During the daily on-site monitoring undertaken by the ECO and once every two weeks by the appointed archaeologist, all development work must be closely monitored. Should any Stone Age material or any archaeological material be identified, all development work in that area must immediately stop and the ECO or archaeologist (if he is already present on site) must demarcate a development-free area around the find. If the ECO made the discovery, the archaeologist must be contacted immediately to visit the site to assess the exposed material. The archaeologist will subsequently provide recommendations for the exposed material. These may range from destruction without mitigation (if the exposed material is found to be of little significance) to archaeological mitigation (if the exposed material is found to be significant).

Furthermore, the following general mitigation measures must also be adhered to:

- All work already in the process of being undertaken on site must be halted immediately to allow for the heritage impact assessment to be reviewed by the South African

Heritage Resources Agency (SAHRA) first. Once no objection to the proposed development is received in writing from SAHRA, the activities can proceed.

- In future, local stones should not be used to pack against the new fences as can be seen in Figure 13 and 14 as this process may impact negatively on Stone Age sites.

The development of the proposed grazing land and associated infrastructure on a portion of the Farm Marsh 467, Kathu, Northern Cape can continue if the recommendations as outlined in this report are adhered to.

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10.5 Historic Topographic Maps

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

Appendix A

LEGISLATIVE REQUIREMENTS – TERMINOLOGY AND ASSESSMENT CRITERIA

General principles

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In terms of the heritage legislation, permits are required to damage, destroy, alter, or disturb them. Furthermore, individuals who already possess heritage material are required to register it. The management of heritage resources is integrated with environmental resources and this means that, before development takes place, heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves which are older than 60 years and are not located in a cemetery (such as ancestral graves in rural areas), are protected. The legislation also protects the interests of communities that have an interest in the graves: they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resources authority and, if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the construction company's cost. Thus, the construction company will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:
An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection to, all historic and prehistoric cultural remains, including graves and human remains.

Graves and cemeteries

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinternment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the South African Heritage Resources Agency (SAHRA). The procedure for Consultation regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years, over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

Appendix B

PALAEONTOLOGICAL DESKTOP STUDY

See separate report.