SOLAR RESERVE SOUTH AFRICA (PTY) LTD

PROPOSED CONSTRUCTION OF 132KV POWER LINE AND SWITCHYARD ASSOCIATED WITH THE REDSTONE SOLAR THERMAL ENERGY PLANT IN THE NORTHERN CAPE PROVINCE

Heritage Impact Assessment

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Declaration of Independence

The report has been completed by PGS Heritage & Grave Relocation Consultants an appointed Heritage Specialist for SiVest. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in the Heritage Impact Assessment Process that includes the Scoping as well as this final report

HERITAGE CONSULTANT: PGS Heritage & Grave Relocation Consultants

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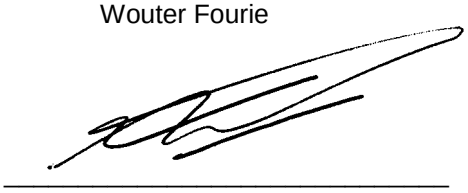
SIGNATURE: 

Executive Summary

PGS Heritage & Grave Relocation Consultants was appointed by SiVest Environmental Division to undertake a Heritage Impact Report that forms part of the Environmental Impact Assessment (EIA) for the Proposed Construction of 132kv Power Line and Switchyard Associated with the Redstone Solar Thermal Energy Plant in the Northern Cape Province.

Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant.

The survey yielded 17 heritage related sites. 8 Archaeological sites (Stone Age find spots), Two formal cemeteries, 3 possible grave sites and 4 historical sites. Section 4.1.3 lists and describes all the sites in detail.

Table 1, gives a summary of the number of sites located in each of the Corridors.

Table 1: Heritage Resources per Corridor

	Corridor A - Exclusive	**Corridor B - exclusive**	**In both Corridors**
Site Count	5 (5 not significant)	2 (1 significant)	9

From this table it is evident that both Corridors will have an equal impact on heritage resources. Mitigating the impact of Corridor B on the significant site (**MHR002**) is very good and will result in a low impact on the site.

Both Corridors will have an equal impact on the overlapping section close to the proposed Lesedi PV Substation, and due to the proposed infrastructure may contribute to the cumulative impact on heritage resources in this area. This impact can only be minimised through micro design of the Lesedi substation and final power line Corridor.

Table 2: Comparison of summarised impacts on environmental parameters

Environmental parameter	**Issues**	**Rating prior to mitigation**	**Average**	**Rating post mitigation**	**Average**
Heritage	Chance finds	-24	Low negative	-11	Low negative
	Destruction of cemetery	-72	High negative	-12	Low negative
	Impact on known heritage resources	-33	Medium negative	-13	Medium Negative
			- 43		**-12**
			High Negative Impact		Low Negative Impact

Archaeological Sites

Although a number of Stone Age occurrences have been identified in the two Corridors, they are of low significance and no further mitigation is required.

Cemeteries and Possible cemeteries

AC02 - PGS09 and HMR2

It is recommended that the development layout be adjusted to accommodate the cemeteries and that the cemeteries e fenced with a 10 meter buffer.

It is further recommended that in the event that the cemeteries cannot be incorporated in to the development thee graves be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:

- A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
- Site notices indicating the intent of the relocation
- Newspaper Notice indicating the intent of the relocation
- A permit from the local authority;
- A permit from the Provincial Department of health;
- A permit from the South African Heritage Resources Agency if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
- An exhumation process that keeps the dignity of the remains and family intact;
- An exhumation process that will safeguard the legal implications towards the developer;
- The whole process must be done by a reputable company that are well versed in relocations;
- The process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the development company.

Historical Structures

- Adjust Corridors and position of pylons to avoid these structures
- **PGS11-13** and **ACO13** mitigation in the form of a watching brief and monitoring at these sites during construction.
- However best practice would be to do test excavations to ascertain the presence of possible infant burials at each of these sites.
- **ACO02** and its associated farmstead and structure will require a destruction permit under Section 34 of the NHRA.
- The permit will entail initial documentation of the layout and condition of the farmstead and its structures with layout sketches and detailed photography, after which the destruction permit can be applied for with the backing of the documentary evidence.
- This documentation must be done by a qualified heritage practitioner

Further to these recommendations the general Heritage Management Guideline in Sections 6 needs to be incorporated in to the EMP for the project.

The overall impact of the development on heritage resources is seen as acceptably low and can impacts can be mitigated to acceptable levels.

The following general mitigation measures are recommended:

a. A monitoring plan must be agreed upon by all the stakeholders for the different phases of the project focussing on the areas where earthmoving will occur.
b. If during construction any possible finds are made, the operations must be stopped and the qualified archaeologist be contacted for an assessment of the find.
c. Should substantial fossil remains (e.g. well-preserved fossil fish, reptiles or petrified wood) be exposed during construction, however, the ECO should carefully safeguard these, preferably in situ, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.
d. A management plan must be developed for managing the heritage resources in the surface area impacted by operations during construction and operation of the development. This includes basic training for construction staff on possible finds, action steps for mitigation measures, surface collections, excavations, and communication routes to follow in the case of a discovery.

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HERITAGE IMPACT ASSESSMENT

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1 INTRODUCTION

PGS Heritage & Grave Relocation Consultants was appointed by SiVest Environmental Division to undertake a Heritage Impact Report that forms part of the Environmental Impact Assessment (EIA) for the Proposed Construction of 132kv Power Line and Switchyard Associated with the Redstone Solar Thermal Energy Plant in the 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 in the proposed development area. The Heritage Impact Assessment aims to inform the Environmental Impact Assessment in the development of a comprehensive Environmental Management Plan to assist the developer in managing the discovered 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

There Heritage Impact Assessment (Including the Scoping and this Report) was compiled by PGS Heritage & Grave Relocation Consultants (PGS).

The staff at PGS has a combined experience of nearly 40 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, Principal Archaeologist for this project, and the two field archaeologist, Henk Steyn and Marko Hutton are registered with the Association of Southern African Professional Archaeologists (ASAPA) and has CRM accreditation within the said organisation.

1.3 Assumptions and Limitations

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

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist had been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development the procedures and requirements pertaining to graves and burials will apply as set out below.

The field work was focussed on the centre line of 100 meters wide with selective checking of the wider 500 meter buffer for each Corridor. Any major deviation from this 100 meter centre buffer will require the evaluation of the pylon foot print and access route areas by an archaeologist before construction commence.

A section of field work on the alignments was not completed due to access issues on Portion 37 of Farm 458 on the property of Petra Mines (**Figure 1)**

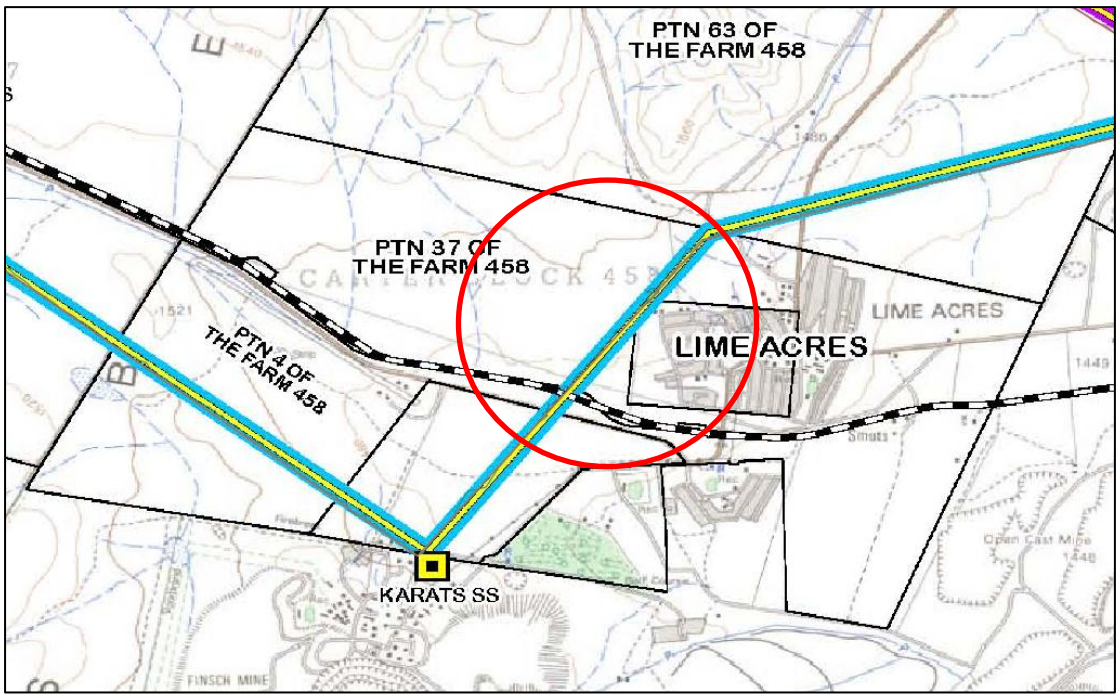

Figure 1: Section of Corridor A excluded from the field work (circled in Red)

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 Impacts Assessment (EIA) – Section (32)(2)(d)
    d. Environmental Management Plan (EMP) – Section (34)(b)
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
    a. Protection of Heritage resources – Sections 34 to 36; and
    b. Heritage Resources Management – Section 38
iii. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
    a. Section 39(3)
iv. Development Facilitation Act (DFA) Act 67 of 1995
    a. The GNR.1 of 7 January 2000: Regulations and rules in terms of the Development Facilitation Act, 1995. Section 31.

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 NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008):

The NEMA 23(2)(b) states that an integrated environmental management plan should, "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage".

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008).

Terminology and Abbreviations

Abbreviations	***Description***
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Agency
PSSA	Palaeontological Society of South Africa
ROD	Record of Decision
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency

- **Archaeological resources**

This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;

- wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;
- features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

- **Cultural significance**

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

- **Development**

  This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:
  - construction, alteration, demolition, removal or change in use of a place or a structure at a place;
  - carrying out any works on or over or under a place;
  - subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
  - constructing or putting up for display signs or boards;
  - any change to the natural or existing condition or topography of land; and
  - any removal or destruction of trees, or removal of vegetation or topsoil

- **Early Stone Age**

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

- **Fossil**

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

- **Heritage**

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

- **Heritage resources**

  This means any place or object of cultural significance

- **Holocene**

  The most recent geological time period which commenced 10 000 years ago.

- **Late Stone Age**

  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 1800's, associated with iron-working and farming activities such as herding and agriculture.

- **Middle Stone Age**

  The archaeology of the Stone Age between 20-300 000 years ago, associated with early modern humans.

- **Palaeontology**

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

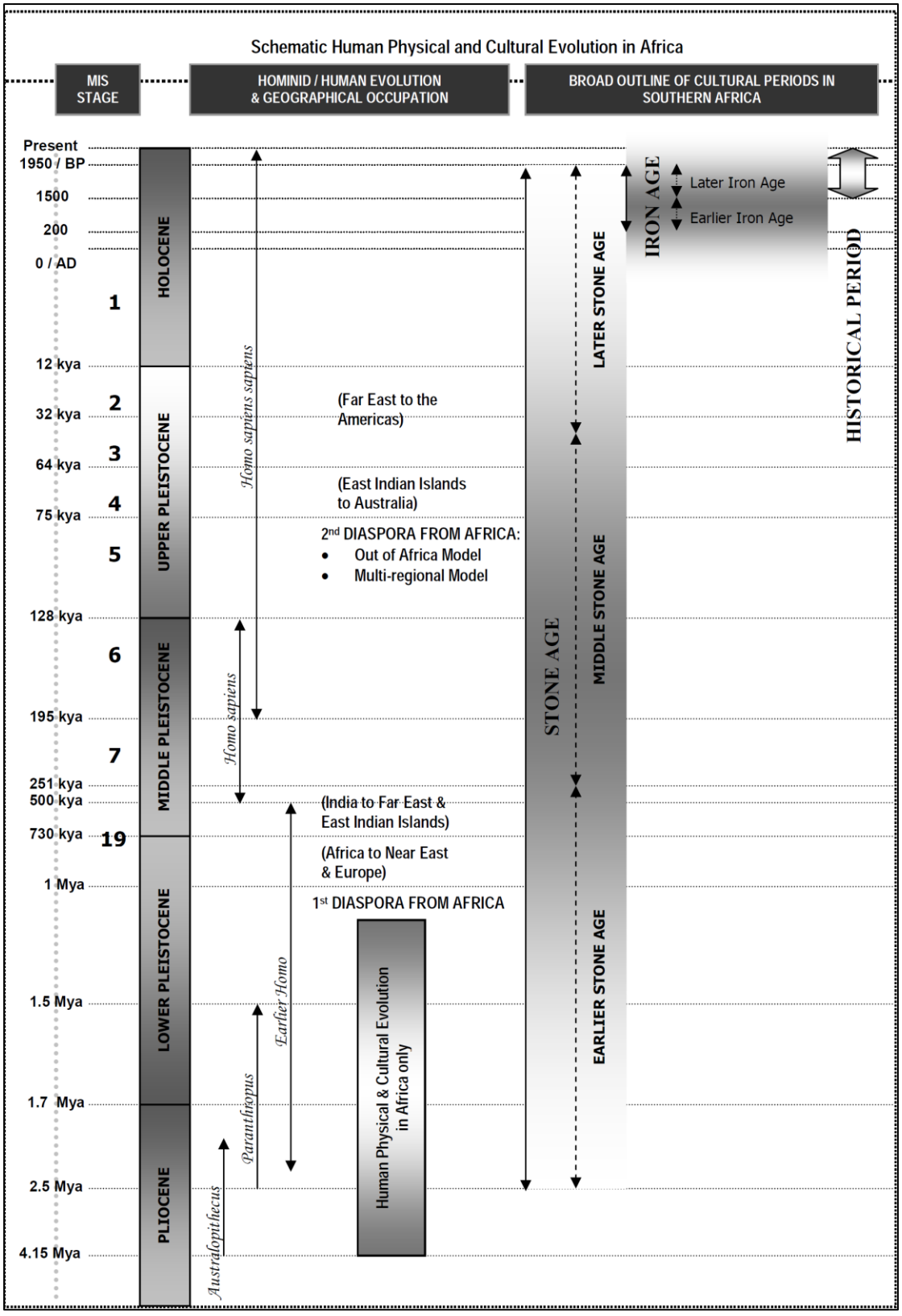

Figure 2: Human and Cultural Timeline in Africa (Morris, 2008)

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Technical Project Description

SolarReserve South Africa (Pty) Ltd (hereafter referred to as SolarReserve) has appointed SiVEST to undertake a Basic Assessment (BA) process for the proposed construction of a 132kV (kilovolt) overhead distribution power line and switchyard associated with the Redstone Solar Thermal Energy Plant in the Northern Cape Province. Eskom Holdings Soc Limited (hereafter referred to as Eskom) will be the owner of the 132kV power line and the switchyard, which will be constructed and maintained according to their vendor and policies. The 132kV overhead distribution power line is proposed to run from the Redstone Solar Thermal Energy Plant on the Humansrus farm (remainder of the Farm 469) to Silverstreams Substation, near Lime Acres. Two solar photovoltaic (PV) power plants (known as Jasper and Lesedi), are also being proposed on the Humansrus farm. In this regard, the proposed switchyards associated with each PV substation may need to be extended to accommodate the new proposed 132kV power line.

Although the proposed Redstone Solar Thermal Energy Plant is yet to be constructed, it has been granted an Environmental Authorisation. This proposed project therefore forms part of the country's strategies to meet future energy consumption requirements through the use of renewable energy, as it will feed energy from the proposed Solar Power Plant into the national grid.

2.2 Project Description

The proposed project consists of the following main activities:

- Construct 1 x switchyard directly adjacent to the proposed Redstone Solar Thermal Energy Plant Substation.
- Construct 1 x 132kV overhead power line from the proposed Redstone Solar Thermal Energy Plant Substation to Silverstreams Substation, near Lime Acres.
- Construct 1 x 132kV overhead power line from the proposed Redstone Solar Thermal Energy Plant Substation to each PV Power Plant switching station.
- Extension of the 132kV busbar in the PV Power Plant switching stations.
- Install 1 x 132kV feeder bay in the PV Power Plant switching stations.
- Install 3 x 132kV feeder bays in Siverstreams Substation.
- Create a loop-in configuration to Silverstreams Substation by reconfiguring the existing Olien – Karats 132kV power line currently crossing Silverstreams Substation.
- Construct a 3x40MVA 11/132kV step-up substation with 2 x 132kV feeder bays at the proposed the Redstone Solar Thermal Energy Plant.

The power line will consist of a series of towers located approximately 200m apart, depending on the terrain and soil conditions. The exact tower type to be used will be determined (based on load and other calculations) during the final design stages of the power line. It is however likely that the Single Steel Pole tower type (e.g. ESKOM D-DT 7649/1) will be used in combination with the Steel Lattice Type Towers at bend points and where greater distances need to be spanned. The Single Steel Pole tower type is between 18m and 25m in height. A photograph of this proposed tower is included in Figure 3 below.

Figure 3: Tower Type

The exact location of the towers will also be determined during the final design stages of the power line.

Two (2) route corridor alternatives, that are approximately 500m wide, will be assessed during the Basic Assessment for the proposed 132kV power line. These are as follows:

Alternative 1A – approximately 17km (blue)
Alternative 1B – approximately 26km (purple

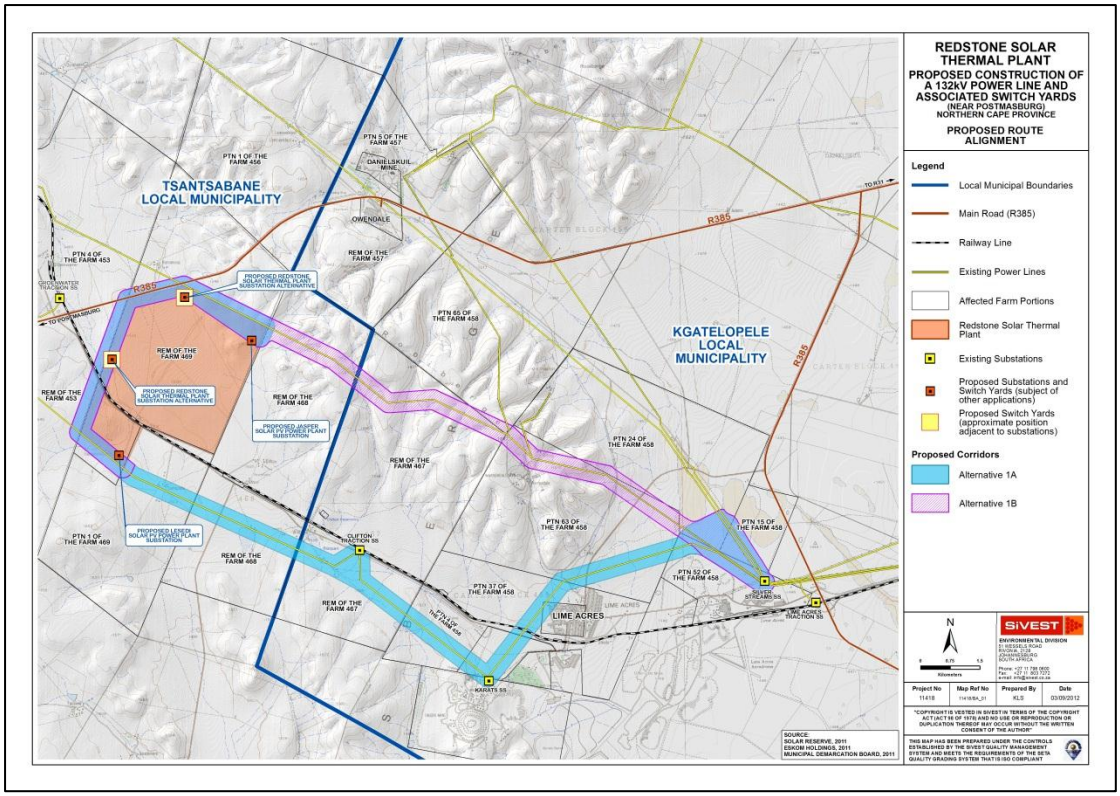

Figure 4: Locality Map

The 500m wide corridors have been proposed for each route alternative to allow flexibility when determining the final route Corridor, however only a 31m wide servitude would be required for the proposed 132kV power line. As such, the 31m wide servitude would be positioned within the 500m wide corridor.

3 ASSESSMENT METHODOLOGY

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

This Heritage Impact Assessment (HIA) report was compiled by PGS Heritage and Grave Relocation Consultants (PGS) for the proposed. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002). The HIA process consisted of three steps:

- Step I – Literature Review: The background information to the field survey leans greatly on the Heritage Scoping Report completed by PGS for this site in September 2010.

- Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by qualified archaeologists (February 2011), aimed at

locating and documenting sites falling within and adjacent to the proposed development footprint.

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

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

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
    - Density of scatter (dispersed scatter)
        - Low - <10/50m^2
        - Medium - 10-50/50m^2
        - High - >50/50m^2
- **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 pylon position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

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

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (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.

Table 3: 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 Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	-	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	-	Low Significance	Destruction

3.1 Methodology for Impact Assessment

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

3.1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 4**.

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

3.1.2 Impact Rating System

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

- planning
- construction
- operation
- decommissioning

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

- Rating System Used To Classify Impacts

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

Table 4: Description

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).

2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.

IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).

2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).

CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY/ MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.

4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".

74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

4 CURRENT STATUS QUO

4.1.1 Background History

Archaeology

Stone Age

The Early inhabitants of Griqualand, both west and east, were the San people historical referred to as the Bushmen. Henderson (2000) describes some of the empirical evidence that points to the presence of the San people in the interior regions of South Africa. Among the things Henderson describes are the stone tool scatter and rock engravings near water course and/or sources such as springs; engravings are also noted as a common feature in small Koppies that define the landscape of the interior regions of South Africa.

Such evidence is corroborated with finds made in the study area in a study conducted in the survey area in 2010 by Webley. The field work found concentrations of Stone Age material around the dry pans close to the study area (**Figure 5**).

Other material culture found in the region that point to the presence of San people in the region include remains of ostrich shell-beads and ostrich egg-shell that were used by the San people to carry water and as drinking vessels. James Backhouse (1844), describing his journey to Klaarwater (modern-day Griquatown) in 1839, notes stopping at Spuigslang Fountain where he observed Bushmen women and their children coming to the fountain for water using egg-shell for bottles and vessels. Henderson identifies the same localities in her 2000 report namely 'Spuigslang Fountain' and the 'Farm Spoedaan' in the Hay District. The similar egg-shell remains that Backhouse notes to have seen being used by the Bushmen women and children have been found in the area south-east of Hay District (Henderson, 2000).

General consensus between archaeologists working in the Northern Cape is that archaeological remains are mostly grouped around water sources (river systems, springs and pans) and other geographical structures such as ranges of hills or shelters found in broken country. These observations by various archaeologists in the 1970-1990, have been corroborated by more recent archaeological surveys for developments such as PGS (2009-2010), Webley & Halkett (2008), Webley et al. (2010), Webley & Halkett (2010), Morris (2008, 2010) and, Van Reyneveld (2005).

Archaeological excavations done at two specularite mines Doornfontein (Beaumont & Boshier, 1974) and Blinkklipkop (Thackery & Beaumont, 1983) produced artefacts and radiocarbon data dating back to 800 AD. The data also reflects an occupation from around

800AD up to around 1850AD, with glass beads, metal items indicating European contact in the upper layers.

Figure 5: Low density scatter of MSA finds (Webley, 2010)

Rock Art

The Northern Cape is well known for its rock art in the form of rock painting and engravings, with the archaeological databases at the National Museum in Bloemfontein and the McGregor Museum in Kimberley containing hundreds of documented rock art sites with archaeological field work on projects such as transmission line construction leading to the discovery of new sites (PGS, 2010).

Known engraving sites close to the study area are at (**Figure 6**):

- Danielskuil: Ouplaas (Morris & Beaumont, 1994), Townlands (Collins, 1973; Wilman, 1933);
- Lime Acres: Carter Block (Morris, 2008; Wilman, 1933);
- The farm Lemoenkloof just north of the study area (pers. Comms with Mst. Scholtz)

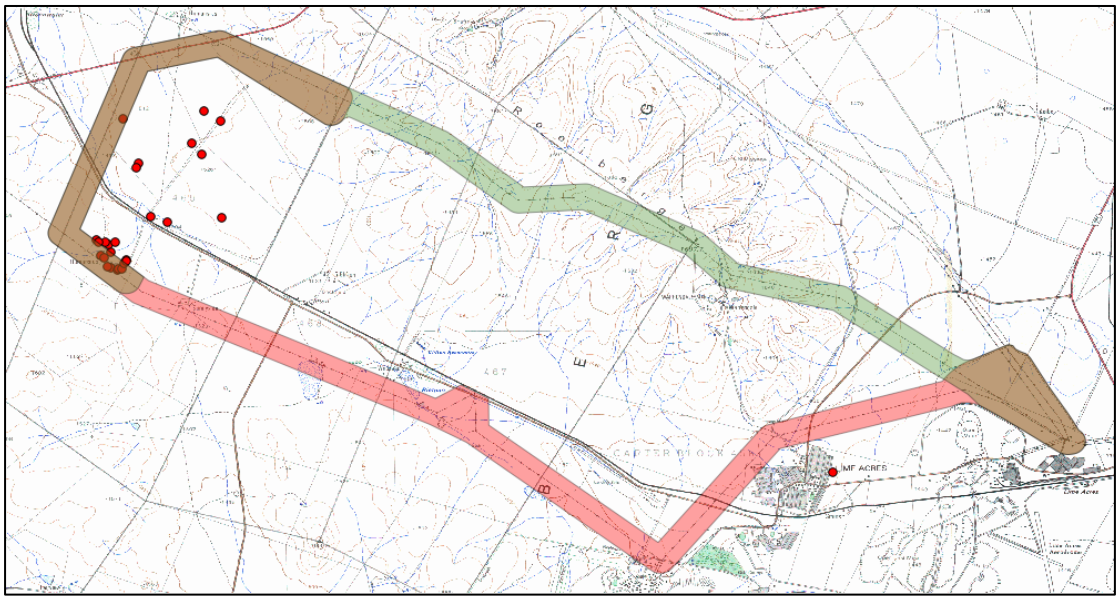

Figure 6: Known heritage resources in general study area

Iron Age

Iron Age expansion southwards past Kuruman in to the Ghaap plato and towards Postmasburg is dated to the 1600's (Humphreys, 1976 and Thackeray, 1983). Definite dates for Tswana presense in the Postmasburg area are around 1805 when Lichtenstein visited the area and noted the mining activities of the Tswana (probably the Thlaping) tribes in the area.

The area of Danielskuil was named by the Thlaro as *Thlaka la tlou* (reeds of the elephant) and with the Thlaping they settled the area from Campbell in the east to Postmasburg and towards the Langeberg close to Olifantshoek in the west before 1770 (Snyman, 1988) (**Figure 7**).

The Korana expansion after 1770 started to drive the Thlaro and Thlaping further north towards Kuruman (Shillington, 1985).

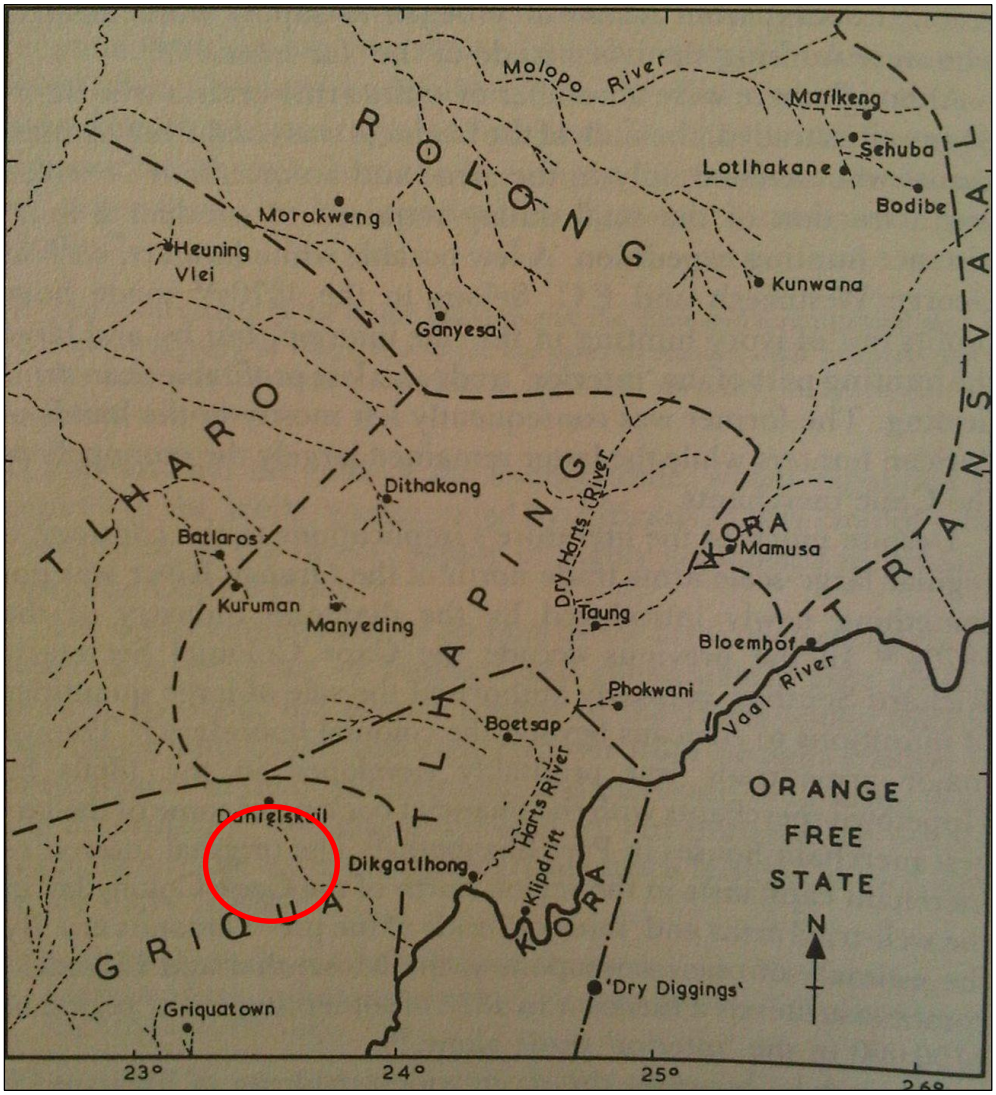

Figure 7: Thlaping and Thlaro areas of residence, 1800-1870

Post 1800's

Ouzman (2005) traces the Korana to what he calls "pre-colonial Kora" in the Cape Province and their father (of "frontier Korana") to James Bloem, a 'white' Prussian from Thuringa who immigrated to the Cape in 1780, escaping to Namaqualand after accusations of murdering his wife.

Historical Context

Below we trace the formation of the Griqua nation and the establishment and the development of Griqualand in order to observe the evolution of the cultural landscape of Hay District where our study site is located.

The Formation of the Griqua Nation and the Establishment of Griqualand

The establishment of Griqualand, now characterised by Griquatown (south-west) and Campbell (south-east of the study area) and Daniëlskuil (Griequaland West) among the popular towns of Griqualand came about with the trekking of the so called 'Bastaards'- a name that acknowledges multiple ethnogenesis (Ross, 1976) in Ouzman (2005) and '....other lesser privileged inhabitants from the Cape Colony during a period when their rights to land and livestock were being eroded in Cape Colony' (Cronje, 2006). In the Cape they had been conscripted to serve in the commandos established by the Cape Government. Not incline to conscription, and possibly other laws of the Cape Colony they decided; under the leadership of Adam Kok I (1710-1795)(**Figure 8**), to trek (emigrate) to the interior regions of the country; in the processes occupying areas of land in the Orange River region.

It is here that in the second half of the 18th century Adam Kok I and his followers became dominant inhabitants of the region. However, following his emancipation in the mid-18th century, Kok I is suggested to have moved to the area immediate of Piketberg where in 1751 he acquired grazing rights to a farm, Stinkfontein, from the Dutch East India Company. It is here that a number of Khoi (Hottentots) descents, namely the Goringhaiqua and the Namaqua and some 'Bastaards' attached to Adam Kok I group first established themselves. Adam Kok I possibly got married to the daughter of the Xarixuriqua chief; a move that could have potentially strengthen his hold and enhanced his status among his group and followers as the leader of the newly formed nation to be later called, the Griqua's (circa. 1813).

Adam Kok I initiated longstanding relations between himself, his successors and the administrators of the Cape Colony; in the process attracting either official support and/or sanctions (Cronje, 2006). This led to his recognition by the Cape Colony as the headman over the Khoi in the region, subsequently assuming the title of a chief or captaincy, Kaptyn as referred to in the Affairs of the Cape of Good Hope, 1871. His stay in the area did not last long as they had to move to the Kamiesberg area to escape increasing pressure and encroachment by the farmers who were moving west coast of the Cape Colony in their search for new lands for grazing and cultivation. Access to water sources also played a significant role in this encroachment.

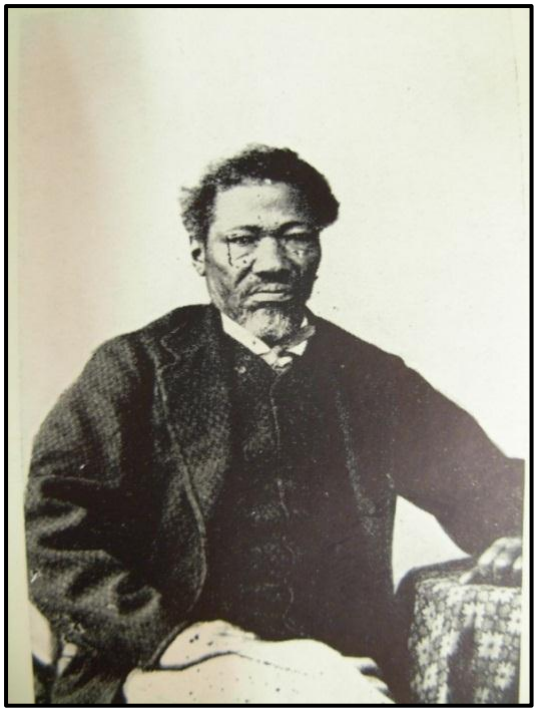

Figure 8: Adam Kok I

Another resettlement by Kok and his group took place when he sent his son, Cornelius I, to explore the area along the Orange River; during this process several cattle posts were established for grazing purposes. Cronje (2006) suggests that, "in the course of time they increasingly adopted the Cape Dutch language but gave it their own idiom"; this became the language for the Griqua people. This is important because language is a defining trait of any nation and many Griqua people still speak Afrikaans to this day. However, the identity politics and rights to land of this newly formed nation did not end there as they continued for many generations to come which included periods of contestation for chieftainship and land between and among the Griqua's and many other nations, both 'black' and 'white'.

These contestations were pertinent in the period after Kok I stepped down as the chief of the Griqua people in Campbell, relinquishing his powers as chief to his son Cornelius Kok I. At the same time Adam Kok II (in Griquatown in 1816) was elected by London Missionary Society (LMS) as the overall chief in Griquatown.

The LMS tried to persuade the Griqua to abolish their hereditary leadership in favour of elected officials. Kok and Barend Barends did not take well to this proposed practice and moved away with their followers –Kok to Campbell and Barends to Daniëlskuil (Snyman, 1988).

The San residing at Daniëlskuil was not impressed with the new arrivals and a period of conflict resulted between Barends' Griqua and the local San inhabitants. This continued until 1820 when Jager Afrikaner (San representative) and Barends proclaimed a truce. The Griqua stayed fairly autonomous up to 1860 after which landowner's right and the expansion of the colonial empire started to encroach on their land.

In the 1860's this dispute of ownership of the Campbell lands and the surrounding areas between the Orange Free State and the Zuid Afrikaansche Republiek of the Transvaal on the one hand and Waterboer supported by the Cape Government on the other resulted in the eventual demise of the Griqua territory.

"The basis of Free State claims to the Campbell lands was the deed of sale dated December 1861 signed by Henry Harvey who purported to be the authorised agent of Adam Kok III" (Cronje, 2006). Meaning that Kok III had sold land to the Orange Free State without consulting with Waterboer, a process which had been negated by Sir Cathcart's devaluation of the treaty that had been sign earlier between Andries Waterboer and D'Urban. In the process Henry Harvey had also sold land of Kok III which did not belong to the Griqua government seated in Philippolis. Fires of these land claim sagas where propelled further when diamond field were discovered in the region.

This led to the 1871 discussion between Barkly (who had personally visited the area and the newly discovered diamond fields at Kimberley), the Presidents of the Orange Free State and the Zuid Afrikaansche Republiek to submit the border dispute with Waterboer to arbitration.

This process of border negotiation and arbitration ended with the 1871 declaration by Barkly (who had acceded to Waterboer's request) of Griqualand West as a British territory. This resulted in the division of Griqualand into Western and the Eastern parts.

By 1880 the whole of Griqualand West was under Cape rule and numerous locations were set aside for the Southern Tswana. The locations furthest to the west were those of Daniëlskuil, Groenwater, Blinkklip and Skeifontein (**Figure 9**) (Shillington, 1985).

The Hay district

The Hay district is named after Lieutenant- General Charles Craufurd Hay. C.C. Hay was Lieutenant- General and Acting Governor of the Cape Colony in 1870. Hay was born 1809 and passed away in 1873 on the Isle of Wight. Hay accepted the position of lieutenant-general at the Cape on 25 January 1869, when Sir Philip Wodehouse left the Cape. Hay then acted as Governor and High Commissioner from 20 May until 31 December 1870.

During these months he resided over the dispute of the Griekwa Chief Nicolaas Waterboer and the Free State Government. Hay accepted Waterboer's Claims and championed his cause against the Free State government that proclaimed the Campbell Lands as Free State Territory.

His protracted handling of the situation lead to numerous treaties after him stepping down as Acting Governor and leaving South Africa to settle on the Isle of Wight. (Standard Encyclopaedia of Southern Africa).

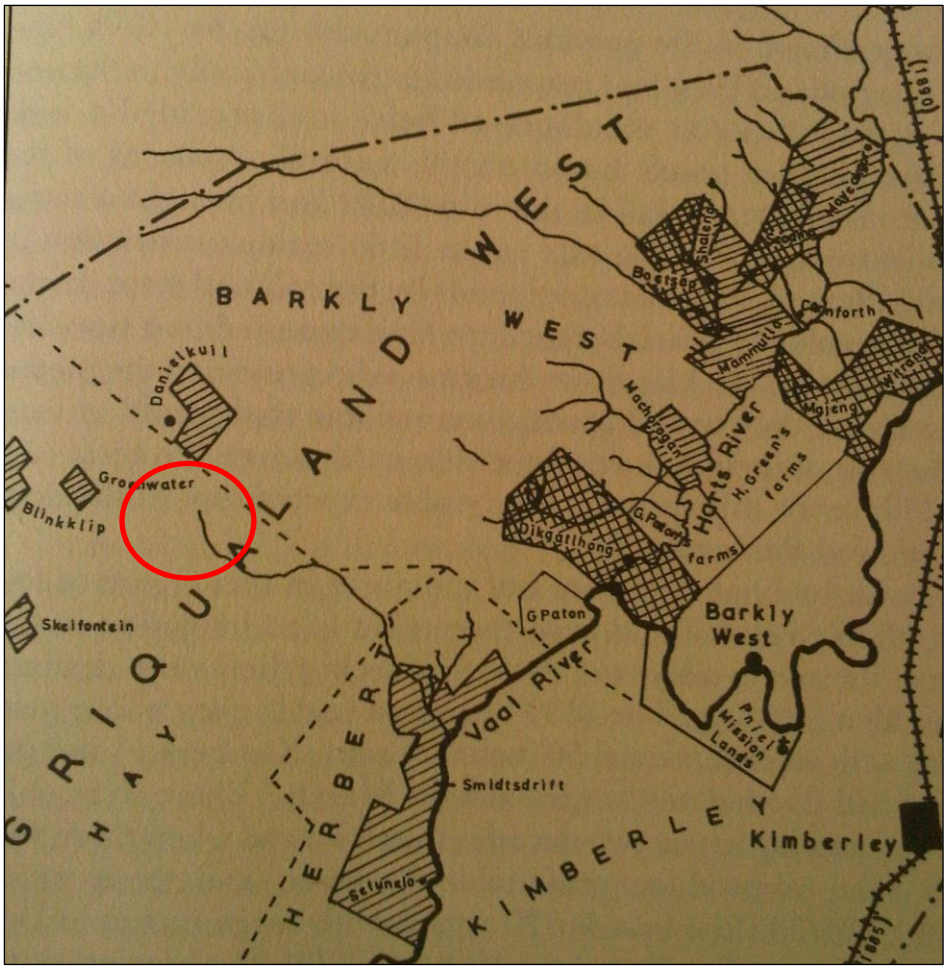

Figure 9: Griqualand West locations, 1880-1900 (Shillington, 1985)

4.1.2 Field work findings

A survey of the two Corridors provided for the study was conducted at the end of August 2012. Due to the nature of cultural remains, with the majority of artefacts occurring below surface, an intensive foot-survey that covered the study area was conducted. The fieldwork consisted of a walk down of the centre Corridor of the two 500 meter wide corridors by a team of Archaeologists and heritage specialist from PGS.

The field work was focussed on the centre line of 100 meters wide with selective checking of the wider 500 meter buffer for each Corridor. Any major deviation from this 100 meter centre buffer will require the evaluation of the pylon foot print and access route areas by an archaeologist before construction commence.

The site is predominantly covered in Savannah grassland, falls within Northern Cape Savannah Biome and it is generally flat dominated by plains in the north western section of the Corridor B (**Figure 10**). While the middle section of Corridor B is characterised by mountainous terrain (**Figure 11**). Large sections of Corridor A is characterised by grazing areas (Figure 12: Over grazed sections of Corridor A

Figure 10: View of study area in north western section of Corridors

Figure 11: Mountainous terrain in the mid-section of Corridor B

Figure 12: Over grazed sections of Corridor A

4.1.3 Heritage Sites

The survey yielded eight Stone Age find spots of low significance and further 4 heritage sites of high significance.

Refer to ***Appendix A*** for positions relative to the Corridors.

Stone Age Occurrence

Table 5: Stone Age Occurrences

Site Number	GPS Co-ordinates	Type	Description	Heritage Significance	Corridor
HMR3	S28 20 53.7 E23 24 37.2	Stone artefacts	3 MSA retouched pieces	Low	**A**
HMR4	S28 20 34.2 E23 23 40.2	Stone artefacts	Barbed retouched MSA flake	Low	**A**
HMR5	S28 20 29.4 E23 23 28.8	Stone artefacts	ESA hand axe and MSA retouched flakes	Low	**A**

HMR6	S28 17 05.3 E23 22 19.4	Stone artefacts	MSA core	Low	**B**
HMR7	S28 17 06.0 E23 22 06.1	Stone artefacts	ESA hand Axe	Low	**B**
HMR12	S28 20 57.8 E23 24 36.8	Stone artefacts	MSA scatter of flakes and cores	Low	**A**
ACO03	S28 19 16.7 E23 21 01.4	Stone artefacts	Miscellaneous scatter of ESA and LSA stone tools at the water seepage behind the house.	Low	**A and B**
HMR13	S28 21 07.6 E23 24 57.6	Stone artefacts	ESA Hand Axe	Low	**A**

These find spots and occurrences of Stone Age finds are graded as of low significance and no further mitigation is required on any of these spots.

Heritage Sites

Cemeteries

Possible Graves

During the field work 3 sites with stone cairns were identified as possible graves. The stone cairns aligned east west, which is the general Corridor of graves buried as part of a Christian burial practice. It is unlikely that the site is a cemetery but this must be confirmed before construction activity takes place.

Table 6: possible Cemeteries

Site Number	**GPS Co-ordinates**	**Type**	**Description**	**Heritage Significance**	**Corridor**
ACO012	S28 19 24.3 E23 21 07.4	Stone Cairn	Artificial mound of stone. It may be a grave?	If grave - High	**A and B Proposed Lesedi substation area**
ACO014	S28 19 25.0 E23 21 14.2	Stone Cairn	Artificial mound of stone. It may be a grave?	If grave - High	**A and B Proposed Lesedi substation area**
ACO015	S28 19 22.1	Stone	Artificial mound of	If grave –	**A and B**

	E23 21 16.1	Cairn	stone, with 3 ceramic fragments on the top.	High	**Proposed Lesedi substation area**

Up to such time as it can be confirmed otherwise these sites must be considered as possible graves and handled as such. These 3 sites receive a provisional **heritage significance grading of 3B**. All 3 sites fall in or close to the area earmarked for the Lesedi PV Substation while and within the Alternative A and B Corridor.

Mitigation:

- Adjust the development layout and demarcate site with at least a 10 meter buffer.
- In the event that the sites cannot be excluded from the development foot print a grave relocation process as described in Section 5 of this reports needs to be implemented.

Identified Cemeteries

ACO2 – PGS09
Coordinates: S28 19 18.2 E23 21 03.4

A small informal partially fenced cemetery with 5 graves (***Figure 13***) was identified at this location. The graves were stoned packed and placed in a two lines and all dressings had and east to west orientation.

The graves are associated with the farmstead of which the cemetery forms part of. A single headstone (***Figure 14***) dating from 1913 was found on site.

Site size: Approximately 10m x 10m.
Although the Lesedi PV Substation development and the Corridor corridor A and B has been proposed in close proximity to the cemetery a direct impact on the cemetery is not foreseen. Heritage significance of the site is seen as of High significance and rated as **Grade 3B**.

Mitigation:

- Adjust the development layout and demarcate site with at least a 10 meter buffer.
- In the event that the sites cannot be excluded from the development foot print a grave relocation process as described in Section 5 of this reports needs to be implemented.

Figure 13: Graves in between cactus growth

Figure 14: Headstone in farmstead cemetery

HMR 002

GPS: S28 20 58.0 E23 30 52.8

An informal cemetery with approximately 70 informal graves was identified at this location. The cemetery was recently fenced by the PPC mine due to its close proximity to the mine and its activities (± 300m).

The graves were placed in six unequal lines and all were orientated from west to east (**Figure 15**). Most of the graves had informal, oval shaped mounds of packed rock as grave dressings, but two graves had more formal, granite outlined dressings with inscribed granite headstones (**Figure 16**).

Some of the graves had grave goods placed on the dressings. Most of the graves were also overgrown with grass and other vegetation. Other graves were recently cleared of vegetation and maintained which indicated recent involvement of the relevant families.

Site size: Approximately 40m x 20m.

The cemetery falls within the **Corridor B** corridor, but direct impact on the cemetery is not foreseen. Heritage significance of the site is seen as of High significance and rated as **Grade 3B**.

Mitigation:

- Adjust the development layout and demarcate site with at least a 10 meter buffer.
- In the event that the sites cannot be excluded from the development foot print a grave relocation process as described in Section 5 of this reports needs to be implemented.

Figure 15: View of cemetery

Figure 16: Dressing and headstone in cemetery

Historical Structures

Table 7: Historical Structures

Site Number	GPS Co-ordinates	Type	Description	Significance	Corridor
ACO02 **Figure 17**	S28 19 18.2 E23 21 03.2	Humansrus homestead	This includes the ruined house, shed, old dam/kraal	Low	**A and B Proposed Lesedi substation area**
ACO04	S28 19 23.8 E23 21 05.4	Stone kraal	A circular stone kraal beneath the transmission lines and close to the homestead	Low	**A and B Proposed Lesedi substation area A and B Proposed Lesedi substation area**
ACO013 **Figure 18**	S28 19 26.2 E23 21 11.4	3 stone features	3 stone features comprising rectangular stone structures, possibly the outlines of workers' cottages from early 20th century.	Low - Possible infant burials	**A and B Proposed Lesedi substation area**
ACO016	S28 19 20.0 E23 21 16.9	Stone Kraal	Rectangular stone kraal, measuring 20 m x 37 m.	Low	**A and B Proposed Lesedi substation area**

The sites identified as being part of the historical background of the development area all probably date back to the past 100 years with the single headstone in PGS09 indicating a date of around 1913 for the farm to have been inhabited.

It must be noted that most of the historical architectural structures has a **heritage significance rating of Generally Protected GP.C**.

Figure 17: Main house at ACO02

Figure 18: Paved entrance of hut at ACO013

Most of these sites will be impacted to some lesser manor by the proposed **Proposed Lesedi substation** and proposed A and B Corridors. The impacts of the proposed development on these sites are rated as **negative Low**.

An exception is the possibility of infant burials at the farm worker sites of **PGS11-13** and **ACO13**

Mitigation:

- Adjust Corridors and position of pylons to avoid these structures
- **PGS11-13** and **ACO13** mitigation in the form of a watching brief and monitoring at these sites during construction.
- However best practice would be to do test excavations to ascertain the presence of possible infant burials at each of these sites.
- **ACO02** and its associated farmstead and structure will require a destruction permit under Section 34 of the NHRA.
- The permit will entail initial documentation of the layout and condition of the farmstead and its structures with layout sketches and detailed photography, after which the destruction permit can be applied for with the backing of the documentary evidence.
- This documentation must be done by a qualified heritage practitioner

5 IMPACT ASSESSMENT

5.1 Impact Matrix

Table 8: Rating Matrix for impacts in the Construction phase

Chance finds

IMPACT TABLE FORMAT	
Environmental Parameter	*Discovery of previously unidentified heritage sites (archaeological, historical or grave sites)*
Issue/Impact/Environmental Effect/Nature	*During construction activity and earthmoving archaeological material could be unearthed that was previously unidentified due to its position.*
Extent	*In most cases confined to small areas on the site*
Probability	*Due to the close proximity to water course, localised archaeological finds may possibly occur*
Reversibility	*In most cases where such finds are made damaged is irreversible*
Irreplaceable loss of resources	*Significant loss but in most cases the scientific data recovered will mitigate such losses*
Duration	*Permanent*

IMPACT TABLE FORMAT		
Cumulative effect	*Low cumulative impact*	
Intensity/magnitude	*Medium*	
Significance Rating	*The impact is anticipated as being low and localised but will vary due to type of heritage find that could be made*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	4	2
Irreplaceable loss	4	3
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-24(Low negative)	-11 (low negative)
Mitigation measures	*A heritage monitoring program that will identify finds during construction will be able to mitigate the impact on the finds through scientific documentation of finds and provide valuable data on any finds made.*	

Known Heritage Sites

IMPACT TABLE FORMAT	
Environmental Parameter	*Identified heritage sites and areas*
Issue/Impact/Environmental Effect/Nature	*Due to the nature of the development it is possible that some sites will be impacted and impossible to avoid in the layout plan of the project*
Extent	*In most cases confined to small areas on the site*
Probability	*Possible impact on the cluster of sites around the Lesedi substation area*
Reversibility	*In most cases where a site cannot be excluded and needs to be destructed the impact is irreversable*
Irreplaceable loss of resources	*Significant loss but in most cases the scientific data recovered will mitigate such losses*
Duration	*Permanent*
Cumulative effect	*Low cumulative impact*
Intensity/magnitude	*Medium*

IMPACT TABLE FORMAT		
Significance Rating	*The impact is anticipated as being low and localised but will vary due to type of heritage find that could be made*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	4	2
Irreplaceable loss	4	3
Duration	4	4
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-32 (Medium negative)	-13 (low negative)
Mitigation measures	*Mitigation measures as recommended with each identified site and,* *A heritage monitoring program that will identify finds during construction will be able to mitigate the impact on the finds through scientific documentation of finds and provide valuable data on any finds made.*	

IMPACT TABLE FORMAT	
Environmental Parameter	Destruction of Cemetery – Corridor Option 1_A
Issue/Impact/Environmental Effect/Nature	Destruction of cemeteries during construction
Extent	Limited to the site where the cemetery occurs on Option 1_A
Probability	Possible if no mitigation measures have been applied
Reversibility	Only reversibel through avoidance of cemetery or relocation as last option
Irreplaceable loss of resources	Cultural resources are irreplaceable
Duration	If the cemetery is not avoided and destroyed without mitigation measures the loss will be permanent
Cumulative effect	Low impact is expected
Intensity/magnitude	A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily

Significance Rating	*The impact is anticipated as being high and localised but can be mitigated to low if the Corridor is designed to exclude the graves from any infrastructure development*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	2	1
Intensity/magnitude	4	2
Significance rating	-72 (high negative)	-12 (low negative)
Mitigation measures	*Adjust the Corridor layout and demarcate site with at least a 10 meter buffer.* *In the event that the sites cannot be excluded from the Corridor an pylon placement a grave relocation process as described in Section 5 of this reports needs to be implemented.*	

Table 9: Rating Matrix for impacts on decommissioning phase

IMPACT TABLE FORMAT	
Environmental Parameter	*Discovery of previously unidentified heritage sites (archaeological, historical or grave sites)*
Issue/Impact/Environmental Effect/Nature	*During decommissioning activity and earthmoving archaeological material could be unearthed that was previously unidentified due to its position.*
Extent	*In most cases confined to small areas on the site*
Probability	*Due to the close proximity to water course, localised archaeological finds may possibly occur*
Reversibility	*In most cases where such finds are made damaged is irreversible*
Irreplaceable loss of resources	*Significant loss but in most cases the scientific data recovered will mitigate such losses*
Duration	*Permanent*
Cumulative effect	*Low cumulative impact*
Intensity/magnitude	*Magnitude dependent on type of finds made – however in most cases Medium*

IMPACT TABLE FORMAT		
Significance Rating	*The impact is anticipated as being low and localised but will vary due to type of heritage find that could be made*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	4	2
Irreplaceable loss	4	3
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-24 (Low negative)	-11 (low negative)
Mitigation measures	*A heritage monitoring program that will identify finds during decommissioning will be able to mitigate the impact on the finds through scientific documentation of finds and provide valuable data on any finds made.*	

5.2 Confidence in Impact Assessment

It is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some heritage sites.

The impact assessment conducted for heritage sites assumes the possibility of finding heritage resources during the project life and has been conducted as such.

5.3 Cumulative Impacts

None foreseen

5.4 Reversibility of Impacts

Although heritage resources are seen as non-renewable the mitigation of impacts on possible finds through scientific documentation will provided sufficient mitigation on the impacts on possible heritage resources.

6 MITIGATION MEASURES

6.1 Management Guidelines

1. The National Heritage Resources Act (Act 25 of 1999) states that, any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, transmission line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site-

  (i) exceeding 5 000 m^2 in extent; or

  (ii) involving three or more existing erven or subdivisions thereof; or

  (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

  (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In the event that an area previously not included in an archaeological or cultural resources survey is to be disturbed, the South African Heritage Resources Agency (SAHRA) needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment.

2. In the event that a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA).

This survey and evaluation must include:

(a) The identification and mapping of all heritage resources in the area affected;

(b) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Cultural Resources Act;

(c) An assessment of the impact of the development on such heritage resources;

(d) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(e) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(f) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(g) Plans for mitigation of any adverse effects during and after the completion of the proposed development.

3. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:
   a. Heritage;
   b. Graves;
   c. Archaeological finds; and
   d. Historical Structures.

   This module must be tailor made to include all possible finds that could be expected in that area of construction.
4. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
5. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
6. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
7. After mitigation an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
8. If during the initial survey sites of cultural significance is discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.
9. In the event that human remains are uncovered or previously unknown graves are discovered a qualified archaeologist needs to be contacted and an evaluation of the finds made.
10. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA needs to be followed. This includes an extensive social consultation process.

The definition of an archaeological/palaeontological monitoring programme is a formal program of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

The purpose of an archaeological/palaeontological monitoring programme is:

- To allow, within the resources available, the preservation by record of archaeological/palaeontological deposits, the presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an

archaeological/palaeontological find has been made for which the resources allocated to the watching brief itself are not sufficient to support treatment to a satisfactory and proper standard.

- A monitoring is not intended to reduce the requirement for excavation or preservation of known or inferred deposits, and it is intended to guide, not replace, any requirement for contingent excavation or preservation of possible deposits.
- The objective of the monitoring is to establish and make available information about the archaeological resource existing on a site.

Table 10: Roles and responsibilities of archaeological and heritage management

ROLE	RESPONSIBILITY	IMPLEMENTATION
A responsible specialist needs to be allocated and should sit in at all relevant meetings, especially when changes in design are discussed, and liaise with SAHRA.	The client	Archaeologist and a competent archaeology supportive team
If chance finds and/or graves or burial grounds are identified during construction or operational phases, a specialist must be contacted in due course for evaluation.	The client	Archaeologist and a competent archaeology supportive team
Comply with defined national and local cultural heritage regulations on management plans for identified sites.	The client	Environmental Consultancy and the Archaeologist
Consult the managers, local communities and other key stakeholders on mitigation of archaeological sites.	The client	Environmental Consultancy and the Archaeologist
Implement additional programs, as appropriate, to promote the safeguarding of our cultural heritage. (i.e. integrate the archaeological components into employee induction course).	The client	Environmental Consultancy and the Archaeologist,
If required, conservation or relocation of burial grounds and/or graves according to the applicable regulations and legislation.	The client	Archaeologist, and/or competent authority for relocation services
Ensure that recommendations made in the Heritage Report are adhered to.	The client	The client
Provision of services and activities related to the management and monitoring of significant archaeological sites.	The client	Environmental Consultancy and the Archaeologist
After the specialist/archaeologist has been appointed, comprehensive feedback reports should be submitted to relevant authorities during each phase of development.	Client and Archaeologist	Archaeologist

6.2 All phases of the project

6.2.1 Archaeology

Based on the findings of the HIA, all stakeholders and key personnel should undergo an archaeological induction course during this phase. Induction courses generally form part of the employees' overall training and the archaeological component can easily be integrated into these training sessions. Two courses should be organised – one aimed more at managers and supervisors, highlighting the value of this exercise and the appropriate communication channels that should be followed after chance finds, and the second targeting the actual workers and getting them to recognize artefacts, features and significant sites. This needs to be supervised by a qualified archaeologist. This course should be reinforced by posters reminding operators of the possibility of finding archaeological/palaeontological sites.

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camps area and small scale infrastructure development associated with the project.

It is possible that cultural material will be exposed during operations and may be recoverable, but this is the high-cost front of the operation, and so any delays should be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, but construction trenches do offer a window into the past and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project and these must be catered for. Temporary infrastructure is often changed or added to the subsequent history of the project. In general these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction phase, it is important to recognize any significant material being unearthed, making and to make the correct judgment on which actions should be taken. A responsible archaeologist/palaeontologist must be appointed for this commission. This person does not have to be a permanent employee, but needs to sit in at relevant meetings, for example when changes in design are discussed, and notify SAHRA of these changes. The archaeologist would inspect the site and any development recurrently, with more frequent visits to the actual workface and operational areas.

In addition, feedback reports can be submitted by the archaeologist to the client and SAHRA to ensure effective monitoring. This archaeological monitoring and feedback strategy should be incorporated into the Environmental Management Plan (EMP) of the project. Should an archaeological/palaeontological site or cultural material be discovered during construction (or operation), such as burials or grave sites, the project needs to be able to call on a qualified expert to make a decision on what is required and if it is necessary to carry out emergency recovery. SAHRA would need to be informed and may give advice on procedure. The

developers therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the material and data are recovered. The project thus needs to have an archaeologist/palaeontologist available to do such work. This provision can be made in an archaeological/palaeontological monitoring programme.

6.2.2 Graves

In the case where a grave is identified during construction the following measures must be taken.

Mitigation of graves will require a fence around the cemetery with a buffer of at least 20 meters.

If graves are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the remains a rescue permit must be applied for with SAHRA and the local South African Police Services must be notified of the find.

Where it is then recommended that the graves be relocated a full grave relocation process that includes comprehensive social consultation must be followed.

The grave relocation process must include:

i. A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
ii. Site notices indicating the intent of the relocation
iii. Newspaper Notice indicating the intent of the relocation
iv. A permit from the local authority;
v. A permit from the Provincial Department of health;
vi. A permit from the South African Heritage Resources Agency if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
vii. An exhumation process that keeps the dignity of the remains intact;
viii. An exhumation process that will safeguard the legal implications towards the developing company;
ix. The whole process must be done by a reputable company that are well versed in relocations;
x. The process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the developing company.

7 CONCLUSIONS AND RECOMMENDATIONS

The background research, that forms part of the HIA, has shown that the area between Postmasburg and Daniëlskuil generally referred to as the Ghaap plato has a rich history of

occupation from the Stone Age with hunter gatherers to the Thlaping and Thlaro during the Iron Age period. The 1800's saw the rise of the Griqua people in the area and their loss of sovereignty after 1880 to Cape rule.

The survey yielded 17 heritage related sites. 8 Archaeological sites (Stone Age find spots), Two formal cemeteries, 3 possible grave sites and 4 historical sites. Section 4.1.3 lists and describes all the sites in detail.

Table 11, gives a summary of the number of sites located in each of the Corridors.

Table 11: Heritage Resources per Corridor

	Corridor A - Exclusive	**Corridor B - exclusive**	**In both Corridors**
Site Count	5	2	9

From this table it is evident that both Corridors will have an equal impact on heritage resources. Mitigating the impact of Corridor B on the significant site (**MHR002**) is very good and will result in a low impact on the site.

Both Corridors will have an equal impact on the overlapping section close to the proposed Lesedi PV Substation, and due to the proposed infrastructure may contribute to the cumulative impact on heritage resources in this area. This impact can only be minimised through micro design of the Lesedi substation and final power line Corridor.

Refer to Appendix A for positions of the heritage sites and find spots relative to the Corridors.

Archaeological Sites
Although a number of Stone Age occurrences have been identified in the two Corridors, they are of low significance and no further mitigation is required.

Cemeteries and Possible cemeteries

AC02 - PGS09 and HMR2
It is recommended that the development layout be adjusted to accommodate the cemeteries and that the cemeteries e fenced with a 10 meter buffer.

It is further recommended that in the event that the cemeteries cannot be incorporated in to the development thee graves be relocated after a full grave relocation process that includes comprehensive social consultation. The grave relocation process must include:

- A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
- Site notices indicating the intent of the relocation
- Newspaper Notice indicating the intent of the relocation
- A permit from the local authority;

- A permit from the Provincial Department of health;
- A permit from the South African Heritage Resources Agency if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
- An exhumation process that keeps the dignity of the remains and family intact;
- An exhumation process that will safeguard the legal implications towards the developer;
- The whole process must be done by a reputable company that are well versed in relocations;
- The process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the development company.

Historical Structures

- Adjust Corridors and position of pylons to avoid these structures
- **PGS11-13** and **ACO13** mitigation in the form of a watching brief and monitoring at these sites during construction.
- However best practice would be to do test excavations to ascertain the presence of possible infant burials at each of these sites.
- **ACO02** and its associated farmstead and structure will require a destruction permit under Section 34 of the NHRA.
- The permit will entail initial documentation of the layout and condition of the farmstead and its structures with layout sketches and detailed photography, after which the destruction permit can be applied for with the backing of the documentary evidence.
- This documentation must be done by a qualified heritage practitioner

Further to these recommendations the general Heritage Management Guideline in Sections 6 needs to be incorporated in to the EMP for the project.

The overall impact of the development on heritage resources is seen as acceptably low and can impacts can be mitigated to acceptable levels.

The following general mitigation measures are recommended:

e. A monitoring plan must be agreed upon by all the stakeholders for the different phases of the project focussing on the areas where earthmoving will occur.
f. If during construction any possible finds are made, the operations must be stopped and the qualified archaeologist be contacted for an assessment of the find.
g. Should substantial fossil remains (e.g. well-preserved fossil fish, reptiles or petrified wood) be exposed during construction, however, the ECO should carefully safeguard these, preferably in situ, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.
h. A management plan must be developed for managing the heritage resources in the surface area impacted by operations during construction and operation of the development. This includes basic training for construction staff on possible finds, action

steps for mitigation measures, surface collections, excavations, and communication routes to follow in the case of a discovery.

8 REFERENCES

BEAUMONT, P. B. & BOSHIER A. K. 1974. *Report on Test Excavations in a Prehistoric Pigment Mine near Postmasburg, Northern Cape*. The South African Archaeological Bulletin, Vol. 29, No. 113/114 (Jun., 1974), pp. 41-59

COLLINS, S. 1973. *Rock-Engravings of the Daniëlskuil Townlands*. The South African Archaeological Bulletin, Vol. 28, No. 109/110 (Jun., 1973), pp. 49-57.

CRONJE, J. 2006. *The Griqua of the Northern Cape: Land ownership, identity and leadership*. Sol Plaatjie Educational Trust, 32 Angel Street, Kimberley, 8301.

FOURIE, WOUTER. 2008. Archaeological Impact Assessments within South African Legislation. South African Archaeological Bulletin 63 (187): 77–85, 2008

GRIQUALAND WEST. IMP. *Blue Book, 1871*. N 3772, Kimberley Public Library Correspondence Respecting the Affairs of the Cape of Good Hope, Presented to both houses of Parliament by Command of the Majesty 17th August 1871. William Clowes & Sons, Stamford Street & Claring Gross for her Majesty's Stationary Office

HENDERSON, ZOË. 2000. Transgariep Brach Outing to Excavate an Ostrich Eggshell Cache on Thomas's farm, Belmont, Northern Cape. The Digging Stick: Vol 17 (2).

HUMPRYES, A.J.B. *Note on the Southern Limits of Iron Age Settlement in the Northen Cape*. The South African Archaeological Bulletin, Vol. 31, No. 121/122 (Jun., 1976), pp. 54-57

HUMPHREYS, A.J.B. & THACKERAY, A. I. (1983) *Ghaap and Gariep: Later Stone Age studies in the Northern Cape*. The South African Archaeological Society Monograph Series No 2. Cape Town.

MORRIS, DAVID. 2008. *Archaeological and Heritage Impact Assessment on Remainder of Carter Block 458, near Lime Acres, Northern Cape*. McGregor Museum.

MORRIS, DAVID, 2010. Specialist input fort the Scoping Phase of the Environmental Impact Assessment for the proposed Pofadder Solar Thermal Facility, Northern Cape Province. McGregor Museum.

MORRIS, DAVID & BEAUMONT, P.B. 1994. *Ouplaas 2: Rock engravings, Daniëlskuil*. McGregor Museum.

OUZMAN, S. 2005. The Magical Art of a Raider Nation: Central South Africa's Korana Rock Art. Goodwin Series: Vol 9.

PGS HERITAGE & GRAVE RELOCATION CONSULTANTS, 2010.*Perseus Hydra Transmission Line, Archaeological Walk down*. Completed for Eskom

PGS HERITAGE & GRAVE RELOCATION CONSULTANTS, 2010. Heritage Scoping, Prospecting activities on the Portions 1 and 2 of Farms 558 "Lovedale", 559 "Kleinbegin" and 521 "Rooigrond", Hay District, Northern Cape Province

ROSS, R. 1975. *The !Kora Wars on the Orange River, 1830-1880*. The Journal of African History. 16(4)

SHILLINGTON, K. 1985. *The Colonisation of the Southern Tswana, 1870-1900*. Ravan Press (Pty) Ltd. Braamfontein.

SNYMAN, P.H.R. 1988. *Danielskuil, van Griekwa-buitepos tot dienssentrum*. HSRC. Pretoria.

THACKERAY, A. I, THACKERY, J.F. & BEAUMONT, P.B. (1983*) Excavations at the Blinkklipkop Specularite Mine near Postmasburg, Northern Cape.* South African Archaeological Bulletin Vol 38, No 137:17-25

WEBLEY, L. 2010. *Heritage Impact Assessment of Proposed Groenwater Solar Array, Northern Cape Province.* ACO cc

WILMAN, M. 1933. *The rock engravings of Griqualand West and Bechuanaland, South Africa*. Cambridge:Deighton, Bell & Co. Ltd.

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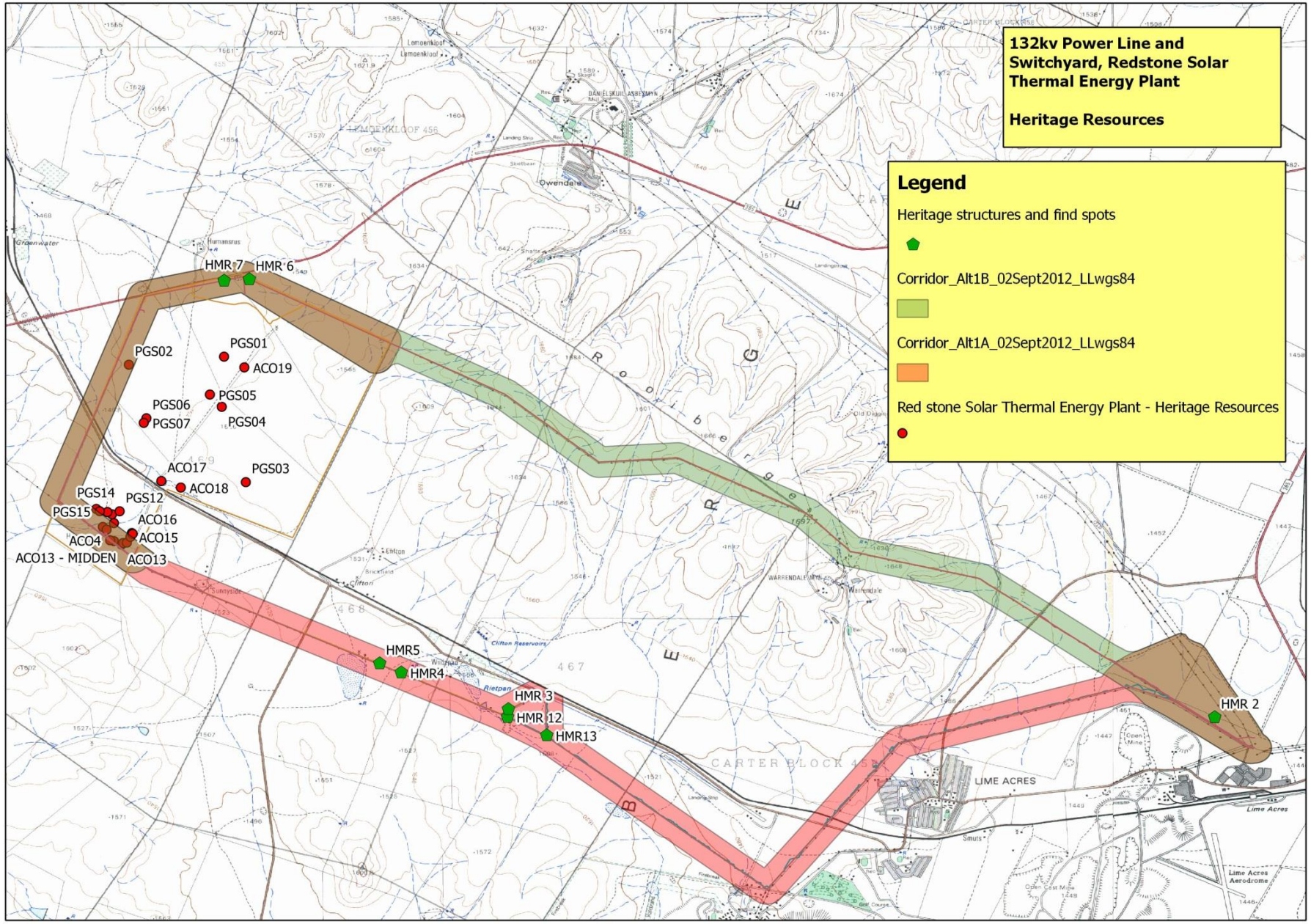
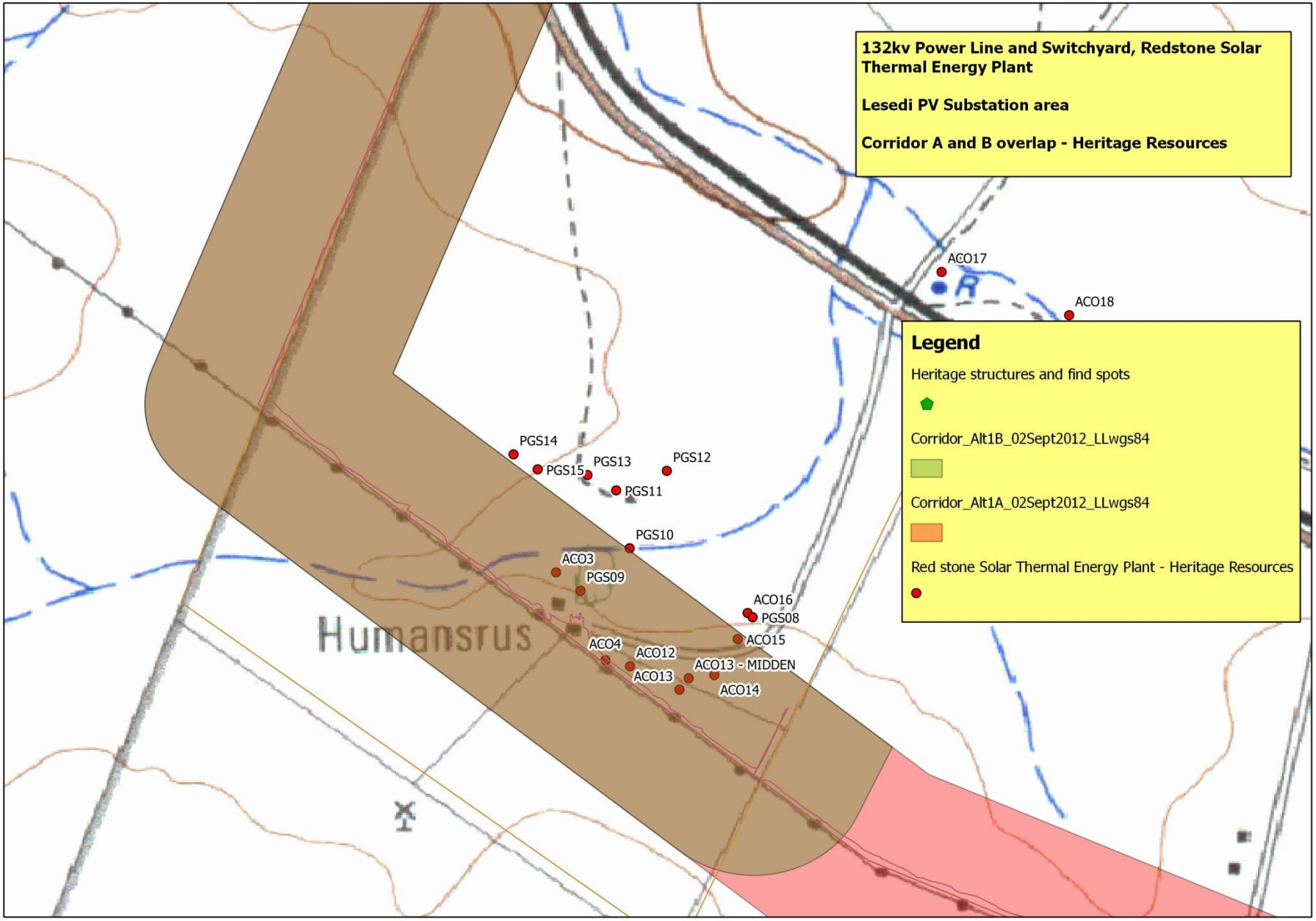
Appendix A

MAP OF HERITAGE SITE


132kv Power Line and Switchyard, Redstone Solar Thermal Energy Plant
Heritage Resources
Legend
Heritage structures and find spots
Corridor_Alt1B_02Sept2012_LLwgs84
Corridor_Alt1A_02Sept2012_LLwgs84
Red stone Solar Thermal Energy Plant - Heritage Resources
HMR 7
HMR 6
PGS02
PGS01
ACO19
PGS05
PGS06
PGS07
PGS04
ACO17
PGS03
ACO18
PGS14
PGS12
PGS15
ACO16
ACO4
ACO15
ACO13 - MIDDEN
ACO13
HMR5
HMR4
HMR 3
HMR 12
HMR13
HMR 2
Owendale
Clifton
Clifton Reservoirs
Rietpan
Waterdale
LIME ACRES
Lime Acres
Lime Acres Aerodrome
Smuts
Rooiberge
B
CARTER BLOCK 458


132kv Power Line and Switchyard, Redstone Solar Thermal Energy Plant
Lesedi PV Substation area
Corridor A and B overlap - Heritage Resources
Legend
Heritage structures and find spots
Corridor_Alt1B_02Sept2012_LLwgs84
Corridor_Alt1A_02Sept2012_LLwgs84
Red stone Solar Thermal Energy Plant - Heritage Resources
ACO17
ACO18
PGS14
PGS15
PGS13
PGS12
PGS11
PGS10
ACO3
PGS09
ACO16
PGS08
ACO15
ACO4
ACO12
ACO13 - MIDDEN
ACO13
ACO14
Humansrus