

Heritage Impact Assessment Report

HERITAGE IMPACT ASSESSMENT (HIA) REPORT, EIA
PHASE FOR THE PROPOSED SIRIUS SOLAR PROJECT
NEAR UPINGTON IN THE NORTHERN CAPE PROVINCE

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Statement of Independence

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

SIGNED OFF BY: STEPHAN GAIGHER



EXECUTIVE SUMMARY

Site name and location: Sirius Solar Project on the Remainder of the Farm Tungsten Lodge 638

Municipal Area: //Khara Hais Local Municipality.

Developer: Aurora Power Solutions

Consultant: G&A Heritage, PO Box 522, Louis Trichardt, 0920, South Africa. 38A Vorster Str. Louis Trichardt, 0920

Date of Report: 29 October 2013

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

This study focuses on the development of the 2 X 75 MW Sirius solar energy facility sites on the farm Tungsten Lodge near Upington.

This study relays the information gathered from the Environmental Impact Assessment (EIA) phase of the Heritage sensitivity investigations.

Findings

Several scatterings of Stone Age tools were identified in both the study areas. These, with the exception of one Middle Stone Age (MSA) tool, were all related to the Later Stone Age (LSA). The finds were not concentrated or diverse enough to be classified as unique sites and therefore hold little archaeological value.

Recommendations

It is recommended that an appropriate institution be allowed to collect any significant individual tools from the deposit areas before and during construction. Monitoring of construction excavations by a qualified heritage practitioner are recommended to take place periodically for the duration of the construction program to ensure that no sub-surface sites are damaged.

Fatal Flaws

No fatal flaws were identified.

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LIST OF ABBREVIATIONS

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

HERITAGE IMPACT ASSESSMENT REPORT

HERITAGE IMPACT ASSESSMENT REPORT FOR THE PROPOSED SIRIUS SOLAR PROJECTS 1 & 2

INTRODUCTION

Legislation and methodology

G&A Heritage was appointed by Savannah Environmental cc to undertake a Heritage Impact Assessment for the proposed Sirius 1 & 2 Solar Energy Projects. Section 38(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

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

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

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

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

- (3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2) (a): Provided that the following must be included:
 - (a) The identification and mapping of all heritage resources in the area affected;
 - (b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7;
 - (c) an assessment of the impact of the development on such heritage resources;
 - (d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
 - (e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
 - (f) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

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

A heritage impact assessment is not limited to archaeological artefacts, historical buildings and graves. It is far more encompassing and includes intangible and invisible resources such as places, oral traditions and rituals. A heritage resource is defined as any place or object of cultural significance i.e. of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. This includes the following:

- (a) places, buildings, structures and equipment;
- (b) places to which oral traditions are attached or which are associated with living heritage;
- (c) historical settlements and townscapes;
- (d) landscapes and natural features;
- (e) geological sites of scientific or cultural importance;
- (f) archaeological and paleontological sites;
- (g) graves and burial grounds, including –
 - (1) ancestral graves,
 - (2) royal graves and graves of traditional leaders,
 - (3) graves of victims of conflict (iv) graves of important individuals,
 - (4) historical graves and cemeteries older than 60 years, and
 - (5) other human remains which are not covered under the Human Tissues Act, 1983 (Act No.65 of 1983 as amended);
- (h) movable objects, including ;
 - (1) objects recovered from the soil or waters of South Africa including archaeological and paleontological objects and material, meteorites and rare geological specimens;
 - (2) ethnographic art and objects;
 - (3) military objects;
 - (4) objects of decorative art;
 - (5) objects of fine art;
 - (6) objects of scientific or technological interest;
 - (7) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings; and
 - (8) any other prescribed categories, but excluding any object made by a living person;
- (i) battlefields;
- (j) traditional building techniques.

A 'place' is defined as:

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

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

'Archaeological' means:

- (a) material remains resulting from human activity which are in a state of disuse and are in or on land and are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- (b) rock art, being a form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and is older than 100 years including any area within 10 m of such representation; and
- (c) wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land or in the maritime cultural zone referred to in section 5 of the

Maritime Zones Act 1994 (Act 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which are older than 60 years or which in terms of national legislation are considered to be worthy of conservation;

(d) features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

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

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

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

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

The limitations and assumptions associated with this study are as follows;

- Sites were evaluated by means of description of the cultural landscape and analysis of written sources and available databases.
- It was assumed that the power line and solar facility alignments/placements as provided by the developer is accurate.
- We assumed that the public participation process performed as part of the Environmental Impact Assessment process will be sufficiently encompassing not to be repeated in the Heritage Impact Assessment.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years	No impact	None
	35	Archaeological, paleontological and meteor sites	Yes	Collection of artifacts
	36	Graves and burial sites	Possible Impact	Management plan
	37	Protection of public monuments	No impact	None
	38	Does activity trigger a HIA?	Yes	HIA

Table 2. NHRA Triggers

Action Trigger	Yes/No	Description
Construction of a road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length.	No	N/A
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m ²	Yes	Sirius Solar 1&2

Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m ²	Yes	Possible rezoning
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

BACKGROUND INFORMATION

PROPOSED PHASE ONE AND PHASE TWO OF THE SIRIUS SOLAR ENERGY FACILITY

PROJECT DESCRIPTION

Aurora Power Solutions is proposing to establish two 75MW commercial photovoltaic solar energy facilities on a site approximately 20 km southwest of Upington, Northern Cape Province. A broader area of approximately 500 ha is being considered within which the two facilities will be developed. Each facility will have a capacity of up to 75MW. Each facility would include the following infrastructure:

- Arrays of photovoltaic (PV) panels
- Mounting structure for PV panels.
- Cabling between the project components, to be lain underground where practical.
- A new on-site substation and power line to evacuate the power from the facilities into the Eskom grid.
- Internal access roads and fencing.
- Workshop area for maintenance, storage, and offices.

SITE LOCATION

The proposed projects will be located on the remaining extent of Farm Tungsten Lodge 638. This property falls within the Khara Hais Local Municipality. The study area is located within 20km of the town of Upington in the Northern Cape Province.

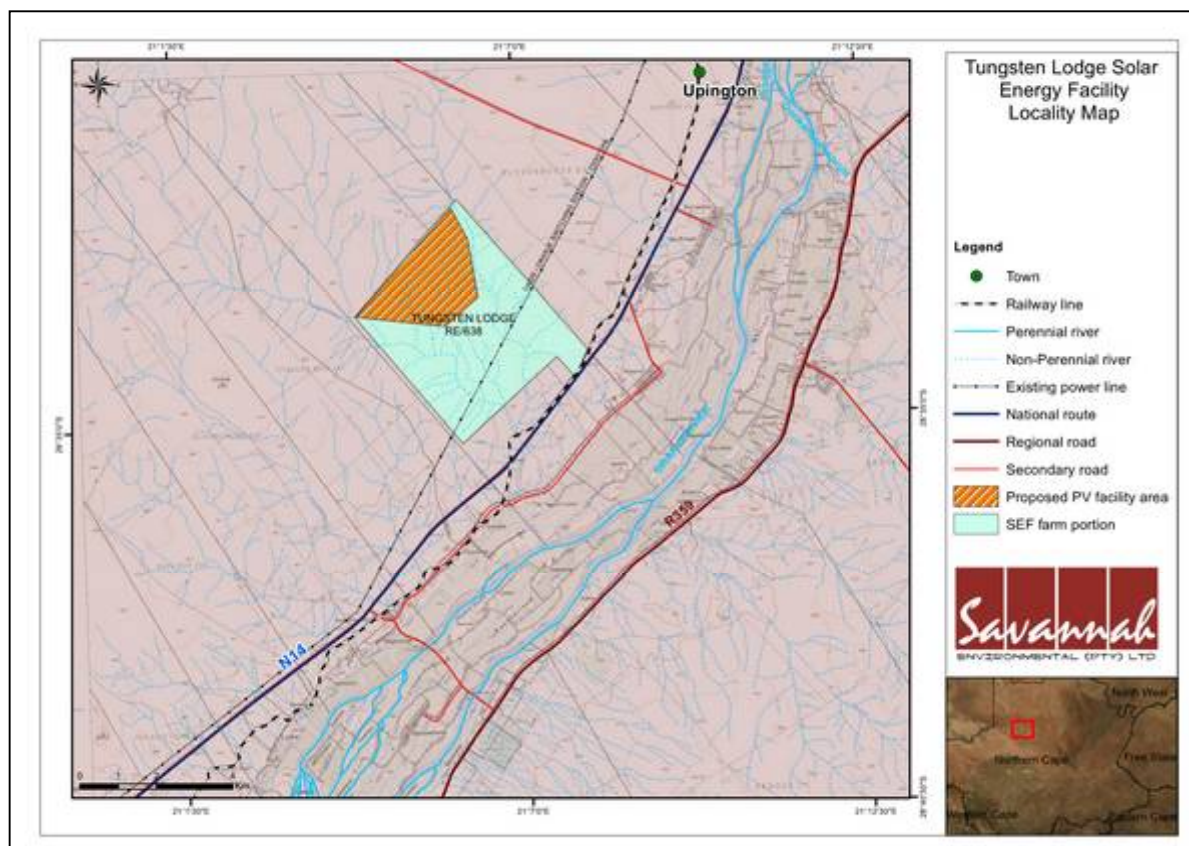


Figure 1. Location of study area

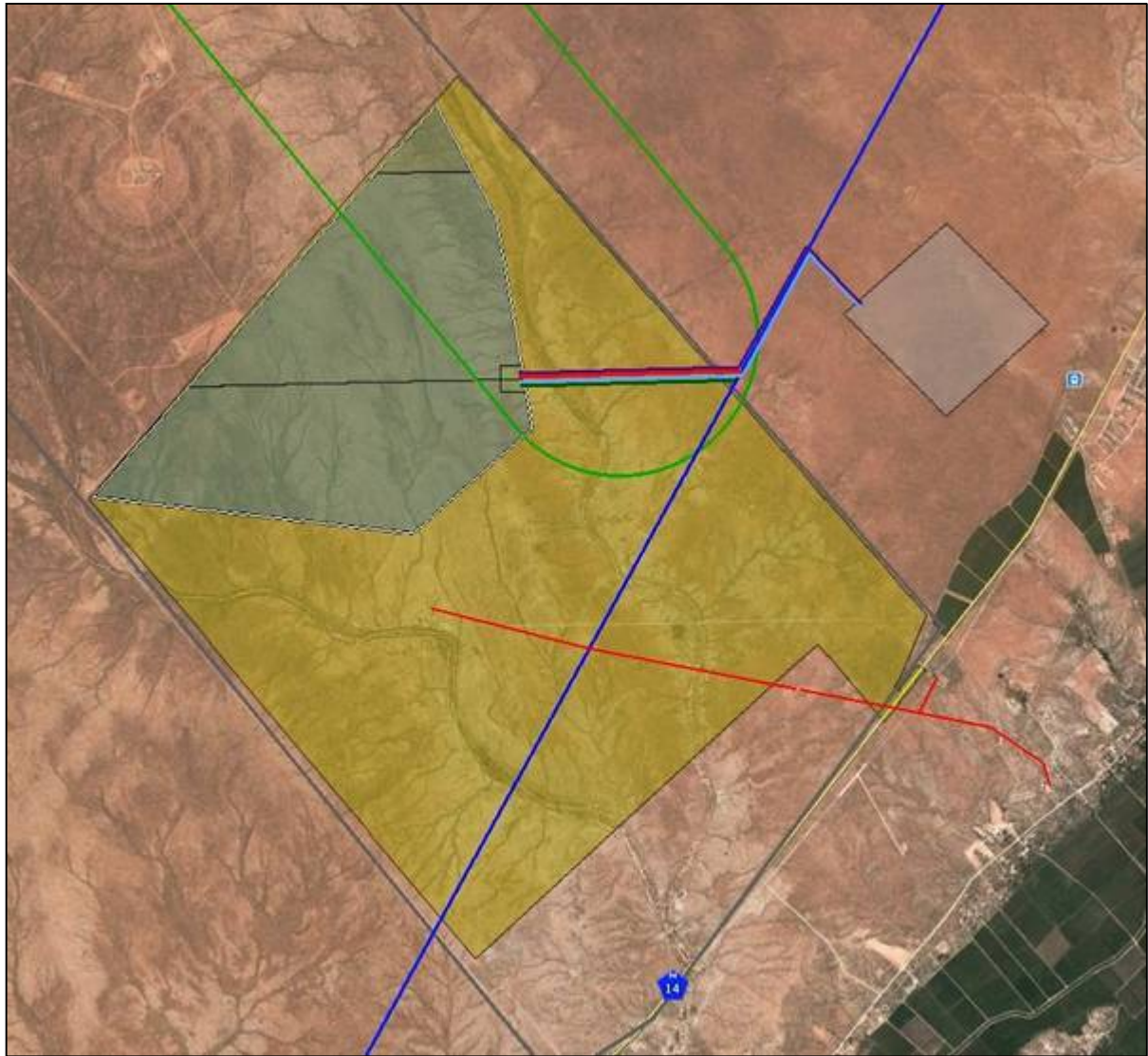


Figure 2. Aerial Image of Study Area

ALTERNATIVES CONSIDERED

POWER LINE ALTERNATIVES

Each of the two Phases of the development had identified two possible alternative alignments for the connecting power lines between the new proposed sub station and the solar farms. These all followed roughly the same alignments as indicated below;



Figure 3. Phase 1 Alternative 1



Figure 4. Phase 1 Alternative 2

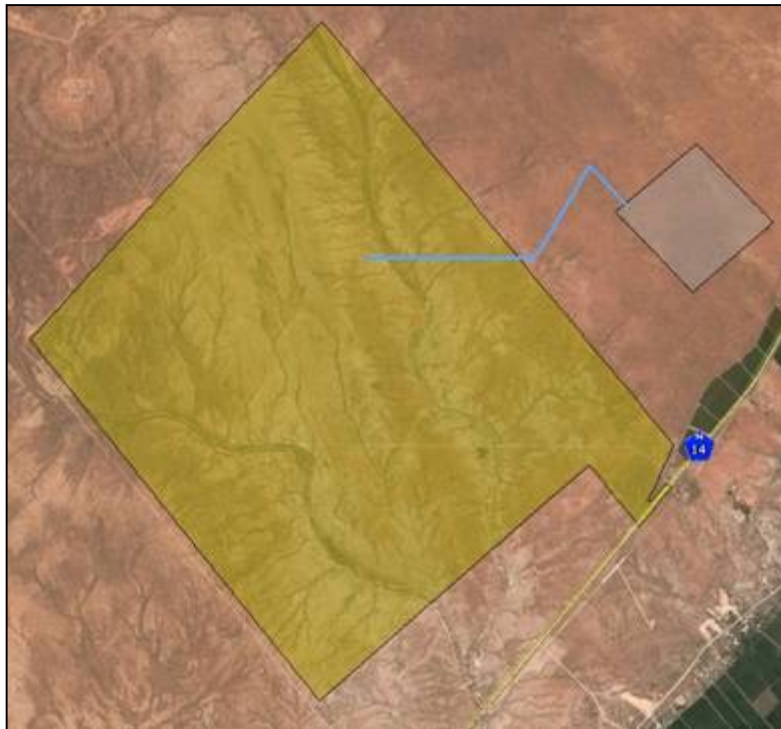


Figure 5. Phase 2 Alternative 1



Figure 6. Phase2 Alternative 2

These proposed alternative alignments were investigated together with the proposed sub-station site. Below are the GPS track paths for this phase of the investigation.

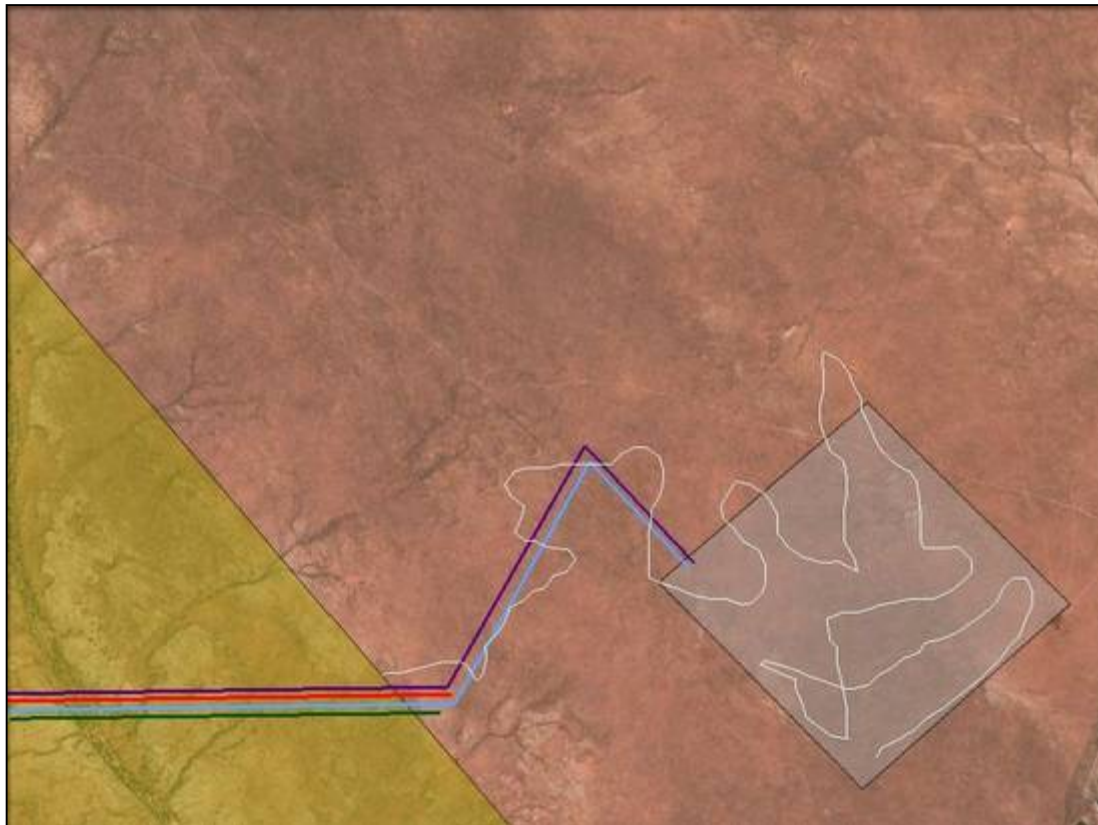


Figure 7. Power Line and Sub Station GPS Track Paths

METHODOLOGY

This study defines the heritage component of the EIA process being undertaken for the Sirius Solar Projects. It is described as a Heritage Impact Assessment Study. This report attempts to evaluate the accumulated heritage knowledge of the area.

ASSUMPTIONS AND RESTRICTIONS

- It is assumed that the SAHRA database locations are correct
- It is assumed that the social impact assessment and public participation process of the EIA will result in the identification of any intangible sites of heritage potential.
- It is assumed that the visual impact assessment performed as part of the EIA phase will be encompassing enough not to be repeated in the HIA.
- As much of the site as possible was investigated; however a 100% coverage was not possible due to heavy plant growth.

FIELD METHODOLOGY

The proposed Sirius Solar Project consists of two phases. The full development areas are described in this report, however to facilitate simpler fieldwork methodology the area was divided into two sections. Although the two project areas were defined more strictly in the project literature – as illustrated in Figure 2 – the fieldwork demanded that the site be more clearly divided into two trapezium sections as per Figure 3 below. Before field investigation were undergone an interview with the farm owner Willem Louw was held to determine if they were aware of any historic structures or graves on the site. Mr Louw indicated that there were no such features to his knowledge.

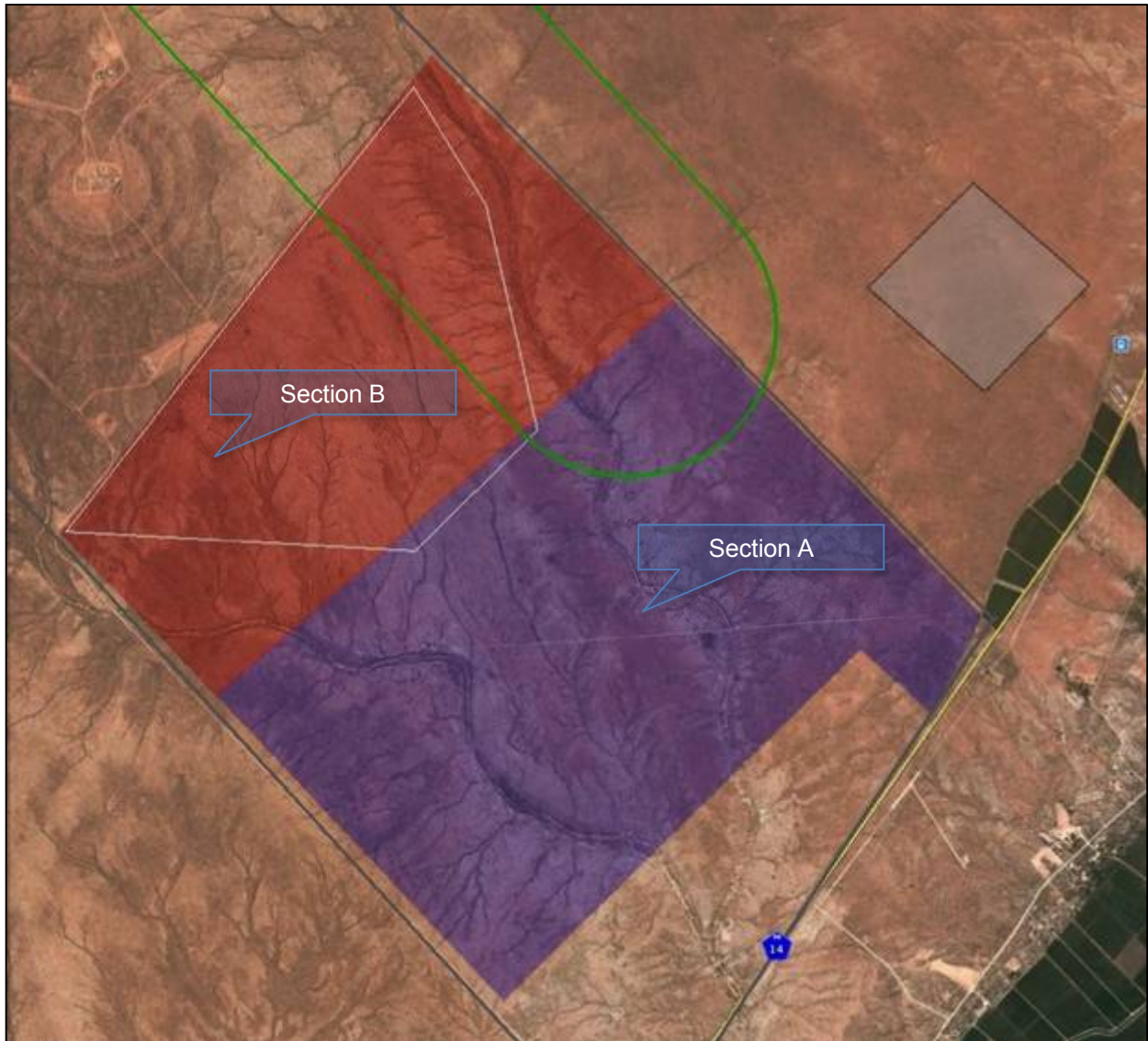


Figure 8. Fieldwork sections for survey purposes

The proposed substation location is indicated in light grey. Although this division guided the survey the plotted heritage sites will still be discussed as per the provided development footprint.

The loop-in and loop-out power supply lines will be discussed separately.

FIELDWORK SECTION A

Fieldwork Section A was defined as the southern section of the two described in the above methodology. This is the largest section and is indicated in purple in Figure 3. Section A is the area within which the PV panels for Phase 1 and Phase 2 will be located. The area is defined by two prominent off-run streambeds. Several dirt tracts that made access by vehicle fairly easy cross the area. The low vegetation cover and lack of trees made visual assessment easy as well. The few isolated areas were accessed on foot. The dry streambeds were identified during the scoping study as possible areas of occupation or other human activity. During the fieldwork these beds proved to be mostly sterile bedrock and alluvial sand deposits. These proved not to be conducive to the preservation of occupational deposits.

The GPS track paths are also indicated on Figure 4 as logged by the Garmin Oregon handheld GPS set to the WGS 84 datum.

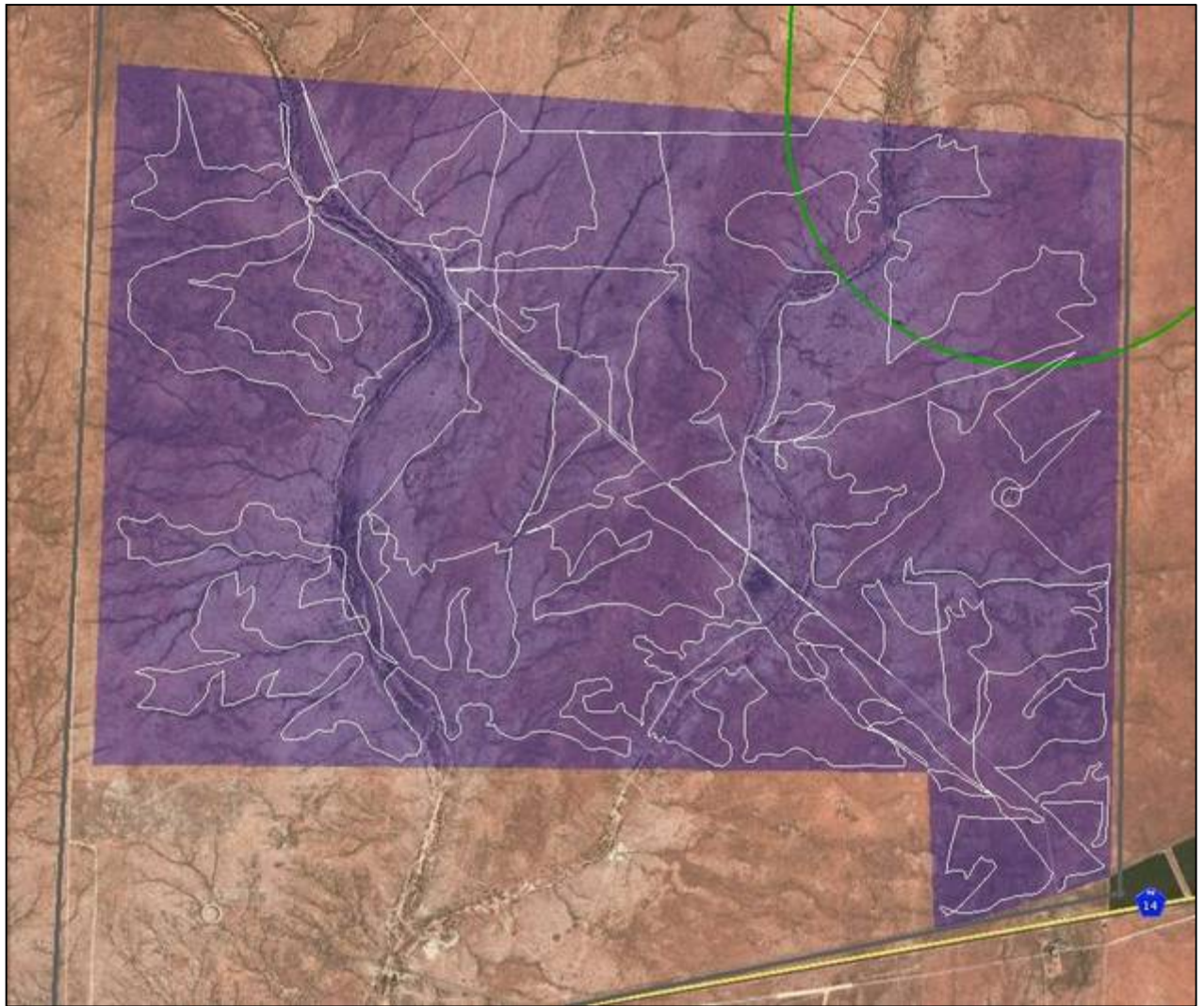


Figure 9. Section A fieldwork and GPS track paths



Figure 10. Environment at Section A

FIELDWORK SECTION B

This section of the study area is mostly associated with the second phase project project. The area is smaller than Section A and borders on the northern side of the farm boundary associate with the Khi Solar One Concentrated Solar Power (CSP) facility which is currently being constructed. This area contains more dried pans than the southern section, while the dry riverbeds circumvent the area. Most of the site consists of open sand-veld with low shrub growth, which was easily assessed visually. Small run-off drainage veins are found all over the area. On the western side of the site the remains of a large holiday complex is found. Most of the site is in a state of decay and disuse as well as being subjected to scavenging of building materials, presumably by the local inhabitants.

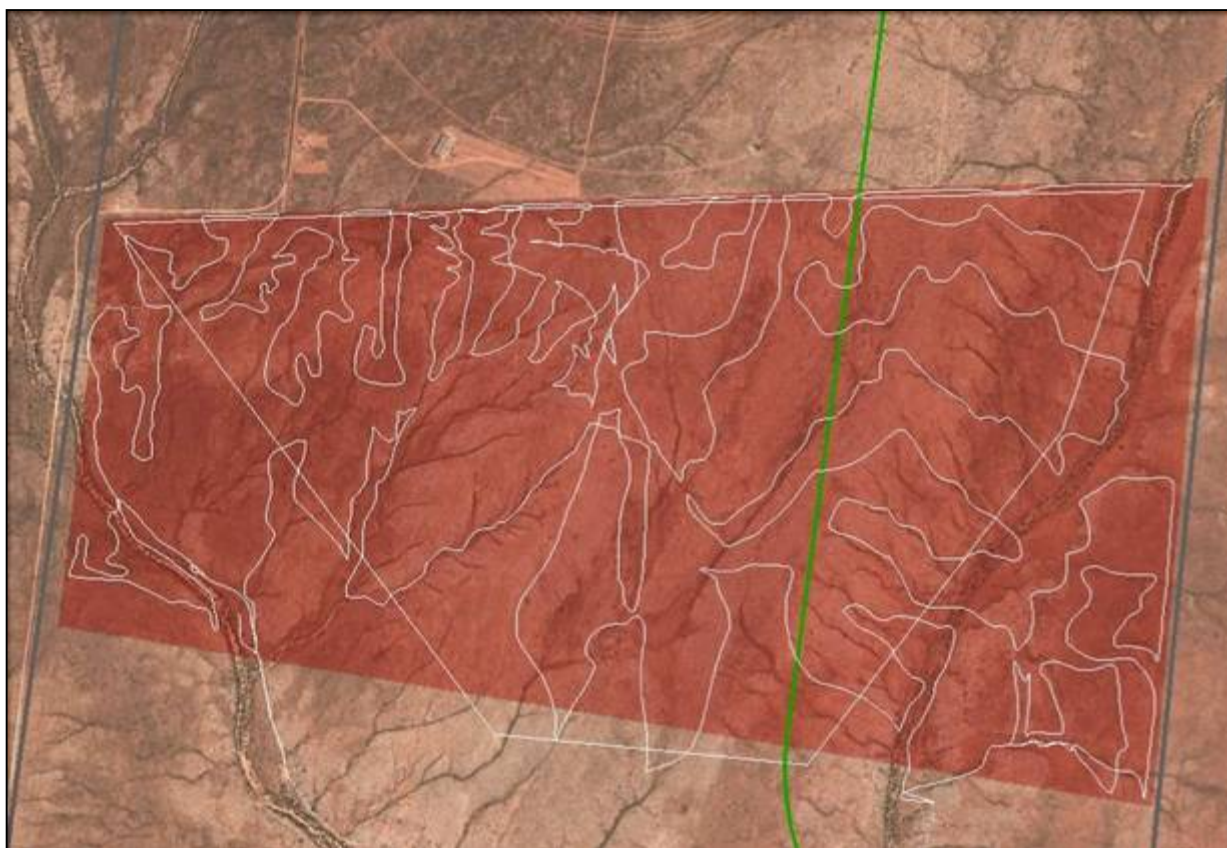


Figure 11. Section B with GPS tracts



Figure 12. Environment at Section B

ACCESS ROADS, POWER LINES AND SUB-STATION

The above features were investigated either as part of either Section A and B where possible and where they were located outside of the specified study areas their corridors were assessed separately. The proposed location of the sub-station as shown on Figure 2 was investigated on its own.

SCOPING REPORT FEATURES

During the scoping phase of the project deep gullies with what appears to be stone walling was reported. The owner, Mr Louw, was asked about these features and he indicated that these were natural fissures in the area and the stone walling was recent attempts to shore up these crevices to prevent livestock and wild animals from falling into them. They have since been filled.



Figure 13. Natural fissures on site

ASSESSING VISUAL IMPACT

The development of several solar facilities in this area is starting to highlight the visual impact that especially CSP plants have on the surrounding environment. The mirror array itself is only visible from a couple of kilometers away, however the central tower is visible from much greater distances. The proposed Sirius project is however proposed to utilize photovoltaic arrays, which do not have the central-tower and as a result have a much lower visual impact than a CSP Plant. The accumulated impact of these energy plants is therefore more significant and should be taken into account when assessing the visual impact of the project.



Figure 14. Construction of the neighbouring Khi Solar One CSP Plant

HERITAGE INDICATORS WITHIN THE RECEIVING ENVIRONMENT

REGIONAL CULTURAL CONTEXT

PALEONTOLOGY

Paleontology does not form part of this study and was evaluated by a qualified paleontologist during the scoping phase of the project.

STONE AGE

The archaeological record of this region involves the timespan from the Earlier Stone Age (1 500 000 to about 270 000 years ago), through the Middle Stone Age (about 270 000 – 40 000 years ago), to the Later Stone Age. Towards the east the last 2000 years showed an increase in ceramic sites as well as Iron Age expansions sometimes in conjunction with Stone Age communities (Morris & Beaumont 2004). In contrast with this the areas towards the west could possibly sustain specialized foraging for much longer. In the absence of rock outcrops, no rock art sites are known.

Earlier Stone Age sites have been documented to the south of Eenzaamheid Pan in areas strewn with Dwyka tillite, which provided ample raw material. John Masson (2006) has reported such material at Eenzaamheid Pan.

Eroded dunes to the north of the site often result in the exposure of earlier Stone Age materials.

Other known sites in the region are Biesje Poort 2, about 10 km to the west, where an extensive Doornfontein site was dated to 1400 BP (Beaumont et al. 1995), and Renosterkop, 10km to the south west, where two Ceramic LSA sites were found, the one, in a small shelter (Morris & Beaumont 1991). This site and another cave site closer to Keimoes (Smith 1995), are the only regional sites to have yielded stratified successions, with both indicating a MSA presence of likely early MIS 5 age and then LSA occupations of the Holocene.

Some Acheulean sites are found on the farms Droëhout and Ratel Draai, however these are not stratified (Beaumont *et al.* 1995).

Late Holocene Later Stone Age (LSA) sites are often mentioned in surveys in the wider region and along the Orange River (e.g. Morris & Beaumont 1991; Beaumont et al. 1995). These are most probably short-duration occupations by groups of hunter-gatherers. In contrast, there are substantial herder encampments along the Orange River floodplain itself (Morris & Beaumont 1991) and in the hills north of Kakamas (Parsons 2003).

Beaumont et al. (1995:240-1) notes a widespread low-density stone artefact scatter of Pleistocene age across much of Bushmanland to the south where raw materials from Dwyka glacial till produced mainly quartzite cobble. Similar occurrences have been noted north of Upington closer to the study area, in situations where raw materials are abundant. Systematic collections of this material at Olyvenkolk south west of Kenhardt and Maans Pannen east of Gamoep could be separated out by abrasion state into a fresh component of Middle Stone Age (MSA) with prepared cores, blades and points, and a large aggregate of moderately to heavily weathered Earlier Stone Age (ESA) (Beaumont et al. 1995). It can therefore be anticipated that similar finds could be made within the study area.

The ESA included Victoria West cores on dolerite and quartzite, at sites such as Hondeblaf close to the

study area, long blades, and a very low incidence of hand axes and cleavers. The Middle and Lower Pleistocene possibly had a climate more conducive to occupation. This is suggested by the known reliance of Acheulean communities on quite restricted ecological ranges, with proximity to water being a recurrent factor in the distribution of sites (Parsons 2003).

Very low density “off-site” scatters of ESA and MSA material has been noted over large areas on plains both north and south of the Orange River where raw materials are less readily to hand. These most likely reflect opportunistic knapping of nodules of raw material. These once again could also be anticipated on site (Parsons 2003).

Webley (2009) mentions the possibility of discovering Middle Stone Age artifacts on the dune plains. Such artifacts have been reported by Morris (2007a) from the Groblershoop area, while Webley, Lanham & Miller (2010) have recovered similar scatters to the east of the Langeberg. These have been found on the edge of calcrete-lined pans and in road cuttings (Webley & Halkett, 2010).

Both Middle and Later Stone Age sites have been reported from amongst the dunes to the south of the Langeberg, at Witsand (Morris 1990). The LSA here is classified as Wilton and includes scrapers and backed pieces. Some sites also contain pottery and are termed Ceramic LSA assemblages. Webley, Lanham & Miller (2010) have found a ceramic LSA site on the farm Gaston some 20km northeast in the foothills of the Langeberg Mountains (Webley & Halkett, 2010).

IRON AGE

Morris (1990) reports that the area to the west of the Langeberg was once settled by the BaTlhaping. He notes that 35 km due north of Witsand lies the modern farm of Nokanna, which he says equates with the former BaTlhaping capital of Nokana or Nokaneng. Historically, the Trekboers traversed this area during the late 19th century.

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

THE HISTORIC ERA

The German missionary Rev Schröder founded the town of Upington, originally known as Olijvenhoutsdrift, in 1871 as part of a mission station. The town was renamed in 1884 after Sir Thomas Upington, who was the Prime Minister of the Cape Colony and who visited the town in 1884. In 1895 British Bechuanaland became part of the Cape Colony, which meant that the Lower Orange River regions, Gordonia, Namaqualand and Bushman land, now fell under the Cape Colonial Government (www.sahistory.co.za).

PREVIOUS STUDIES

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

- Heritage Impact Assessment for the Proposed Establishment of the Ilanga Solar Thermal Power Plant, near Upington, Northern Cape
- Heritage Impact Assessment of the proposed Hydropower station on the Orange River at Neus Island on the farm Zwartbooisberg, east of Kakamas, Northern Cape
- First Phase Archaeological & Heritage Assessment of the Housing Developments at Melkstroom 563, Upington, Northern Cape
- An Archaeological Impact Assessment (REPORT 5): Proposed Construction of a Substation Between FERRUM-GARONA and Associated Loop in and Loop out Lines, OLIFANTSHOEK, NORTHERN CAPE
- Blocuso solar (Pty) Ltd Heritage Study
- Phase 1 Archaeological Impact Assessment Report on Portions of the Farm Alheit near Kakamas, Siyanda District Municipality, Northern Cape Province.
- Phase 1 Archaeological Impact Assessment Report on Portions of the Farm Alheit near Kakamas,

Siyanda District Municipality, Northern Cape Province.

- HIA for the construction of five substations along the Sishen-Saldanha railway line.
- Report on a Phase 1 Archaeological Assessment of the site of proposed Borrow Pits for road-building purposes along Road MR 897 in the vicinity of Swartkop, Jooste Island, near Upington, Northern Cape.
- Report on a Phase 1 Archaeological Assessment of the site of proposed Borrow Pits for road-building purposes along Road DR 3322 at Karakoel near Upington, Northern Cape.
- Screening Phase Heritage Assessment of the proposed PV solar park near Keimoes, Northern Cape.
- Heritage Impact Assessment Report for the Proposed Establishment of the African Rainbow Energy, Upington.
- Heritage Scoping Assessment for the Proposed Establishment of the Medenergy Upington PV Power Plant.
- AIA for For the proposed OfriZX Photovoltaic Plant. Keimoes, Northern Cape.
- Heritage Impact Assessment of the proposed new power-line route south of the river to Kakamas, Northern Cape.
- Archaeological Impact Assessment for the Environmental Impact Management Plan for the Proposed Upington Solar Thermal Plant, Northern Cape Province.
- Heritage Impact Assessment for the Proposed Kangnas Wind and Solar Energy Facilities, Namakwa Magisterial District, Northern Cape
- Proposed Kwartelspan PV Power Station I and Associated Infrastructure, Pixley ka Seme District Municipality, Northern Cape Province.
- Proposed residential development of 100 erven and associated infrastructure on Portion 1 of Farm No 139, Gordonia Road, Mier Municipality, Northern Cape Province.
- Cultural heritage study for the proposed SASOL CSP Project.
- Final Heritage Impact Assessment Report: Proposed Land Use Change to Provide for Agricultural Activities on Portions of the Remainder of the Farm Keboes 37, Kai! Garib Municipality, Northern Cape Province.

The result of most of these investigations showed surface scatters of MSA and LSA stone tools within study areas close to the current study area. Much of these were also located close to geographic features such as streambeds or hills as well as seasonal pans. Some investigations showed MSA hand axes located in open flat areas. Some historic remains were also noted in some of these studies.

HERITAGE INVENTORY FOR THE STUDY AREA

SITE 001

GPS 28° 34' 03" S
21° 07' 54" S

This is a small scattering of Late stone Age microlithic stone tools located on the edge of a small pan which is currently being used as a loading ramp for a small livestock enclosure and watering trough. The location did not display any characteristics of being either a manufacturing or occupational site. It is possible that the site occurred as a result of the small pan although its occurrence might be ephemeral. Mostly fully formed re-worked microliths were recovered from a general density of around one tool per 3 m². One partial blade was recovered while no cores could be seen. The concentration of tools seemed to be limited to a 8m X 5m.



Figure 15. Location of site



Figure 16. A sample of microliths located at Site 001



Figure 17. Artefacts *in situ*

Animal burrows in the close vicinity of the site were inspected to determine if there were any underlying deposits at this site. No indications of sub-surface deposits were evident.

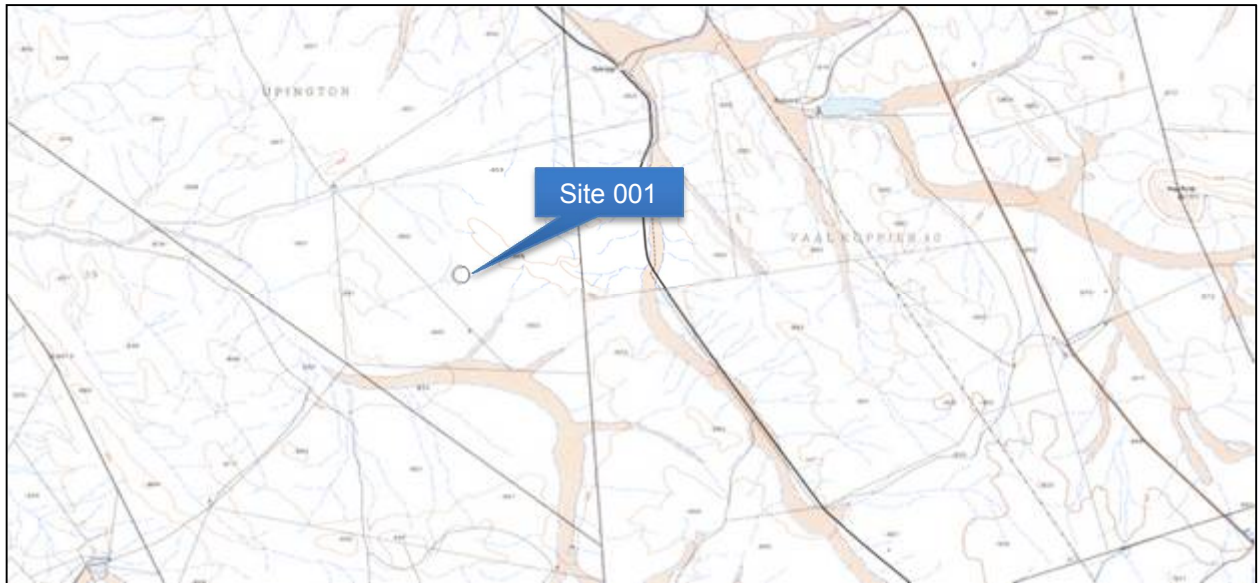


Figure 18. 1:50 000 location of Site 001

SITE 002

GPS 28° 34' 01" S
21° 07' 24" E

This site consists of two areas containing microlithic LSA tools. The one area produced a single prepared percussion level core although no further evidence of manufacturing could be identified. As with Site 001 the concentrations were 2-3m² to one tool. Investigations of animal burrows showed no signs of sub-surface deposits. The area was characterised by quartz outcrops manifested in linear concentrations of quartz deposits. The rest of the site is characterised by low shrub and red sand substrates.



Figure 19. Location of Site 002



Figure 20. Sample of stone tools from Site 002



Figure 21. Artefacts *in situ* at Site 002



Figure 22. Artefacts *in situ* at Site 002



Figure 23. 1:50 000 location of Site 002

SITE 003

GPS 28° 34' 13" S
21° 07' 02" E

This site is located on the edge of a run-off ditch. It only consisted of a few LSA artefacts with no further deposits. This find is most likely the result of alluvial run-off.



Figure 24. Location of Site 003



Figure 25. Finds at Site 003



Figure 26. Microlithic tool *in situ* at Site 003

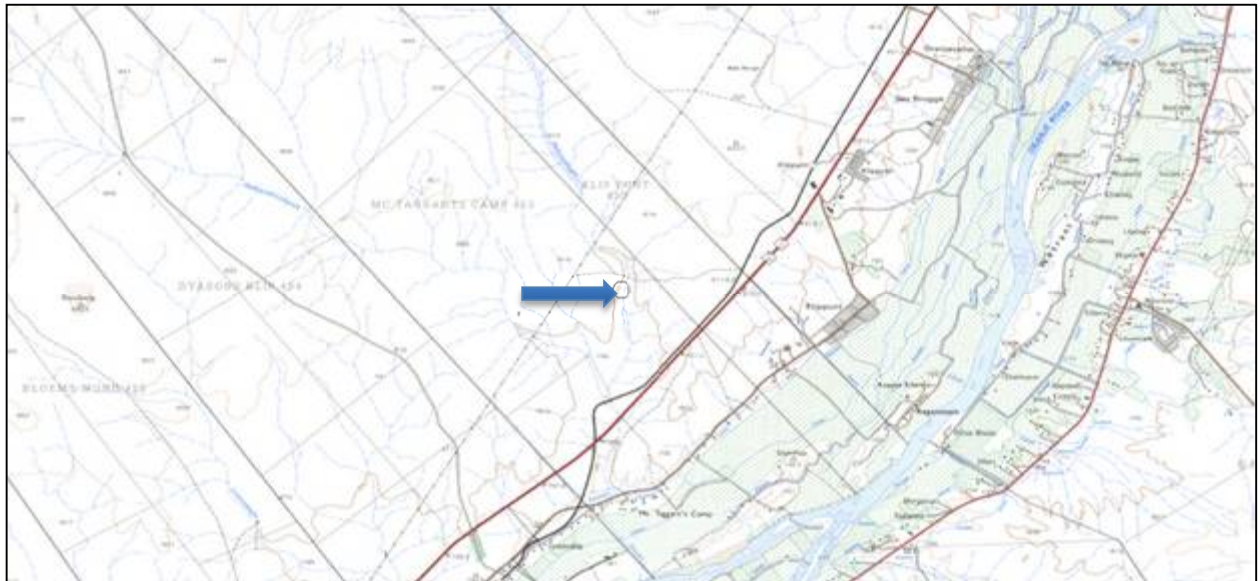


Figure 27. 1:50 000 location of Site 003

SITE 004

GPS 28° 33' 59" S
21° 05' 52" S

The remains of a holiday resort are located at this site. Most of the buildings are in a state of decay. The site was the original Tungsten Lodge and forms part of the Built Environment. Although the site is not older than 60 years it is prominent enough to possibly have some cultural significance. It is important to note that the arbitrary age of 60 years as stated in the NHRA is only one of the characteristics that could result in a site's heritage significance. There are many built environment structures that have high

heritage significance that are younger than 60 years.



Figure 28. Remains of lodge at Site 004

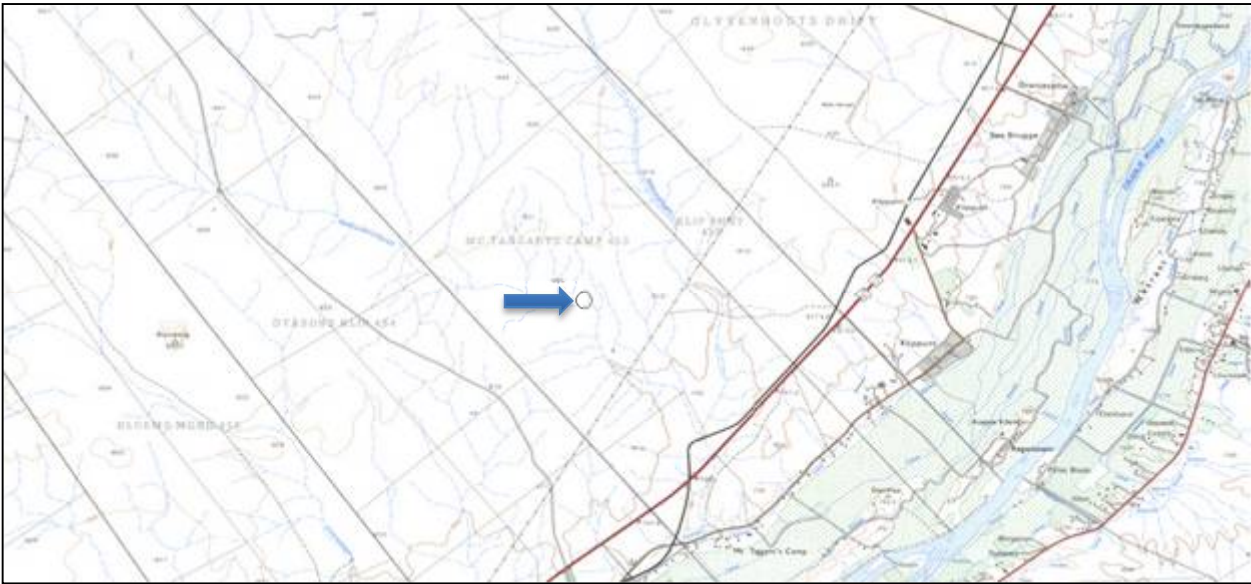


Figure 29. 1:50 000 location of Site 004

ASSESSMENT OF HERITAGE POTENTIAL**ASSESSMENT MATRIX****DETERMINING ARCHAEOLOGICAL SIGNIFICANCE**

In addition to guidelines provided by the National Heritage Resources Act (Act No. 25 of 1999), a set of criteria based on Deacon (J) and Whitelaw (1997) for assessing archaeological significance has been developed for Northern Cape settings (Morris 2000a). These criteria include estimation of landform potential (in terms of its capacity to contain archaeological traces) and assessing the value to any archaeological traces (in terms of their attributes or their capacity to be construed as evidence, given that evidence is not given but constructed by the investigator).

Estimating site potential

Table 1 (below) is a classification of landforms and visible archaeological traces used for estimating the potential of archaeological sites (after J. Deacon and, National Monuments Council). Type 3 sites tend to be those with higher archaeological potential, but there are notable exceptions to this rule, for example the renowned rock engravings site Driekopseiland near Kimberley which is on landform L1 Type 1 – normally a setting of lowest expected potential. It should also be noted that, generally, the older a site the poorer the preservation, so that sometimes any trace, even of only Type 1 quality, could be of exceptional significance. In light of this, estimation of potential will always be a matter for archaeological observation and interpretation (Morris, 2010).

Table 1. Classification of landforms and visible archaeological traces for estimating the potential for archaeological sites (after J. Deacon, NMC as used in Morris)

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

Table 2. Site attributes and value assessment (adapted from Whitelaw 1997 as used in Morris)

Class	Landforms	Type 1	Type 2	Type 3
1	Length of sequence /context	No sequence Poor context Dispersed distribution	Limited sequence	Long sequence Favourable context High density of arte / ecofacts
2	Presence of exceptional items (incl. regional rarity)	Absent	Present	Major element
3	Organic preservation	Absent	Present	Major element
4	Potential for future archaeological investigation	Low	Medium	High
5	Potential for public display	Low	Medium	High
6	Aesthetic appeal	Low	Medium	High
7	Potential for implementation of a long-term management plan	Low	Medium	High

Assessing site value by attribute

Table 2 is adapted from Whitelaw (1997), who developed an approach for selecting sites meriting heritage recognition status in KwaZulu-Natal. It is a means of judging a site's archaeological value by ranking the relative strengths of a range of attributes (given in the second column of the table). While aspects of this matrix remain qualitative, attribute assessment is a good indicator of the general archaeological significance of a site, with Type 3 attributes being those of highest significance.

MEASURING IMPACTS

In 2003 the SAHRA compiled the following guidelines to evaluate the cultural significance of individual heritage resources:

TYPE OF RESOURCE

- Place
- Archaeological Site
- Structure
- Grave
- Paleontological Feature
- Geological Feature

TYPE OF SIGNIFICANCE

HISTORIC VALUE

It is important in the community, or pattern of history

- Important in the evolution of cultural landscapes and settlement patterns
- Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
- Important for association with events, developments or cultural phases that have had a significant role in the human occupation and evolution of the nation, province, region or community.
- Important as an example for technical, creative, design or artistic excellence, innovation or achievement in a particular period.

It has strong or special association with the life or work of a person, group or organisation of importance in history

- Importance for close associations with individuals, groups or organisations whose life, works or activities have been significant within the history of the nation, province, region or community.

It has significance relating to the history of slavery

- Importance for a direct link to the history of slavery in South Africa.

AESTHETIC VALUE

It is important in exhibiting particular aesthetic characteristics valued by a community or cultural group.

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

SCIENTIFIC VALUE

It has potential to yield information that will contribute to an understanding of natural or cultural heritage

- Importance for information contributing to a wider understanding of natural or cultural history by virtue of its use as a research site, teaching site, type locality, reference or benchmark site.
- Importance for information contributing to a wider understanding of the origin of the universe or of the development of the earth.
- Importance for information contributing to a wider understanding of the origin of life; the development of plant or animal species, or the biological or cultural development of hominid or human species.
- Importance for its potential to yield information contributing to a wider understanding of the history of human occupation of the nation, Province, region or locality.
- It is important in demonstrating a high degree of creative or technical achievement at a particular period
- Importance for its technical innovation or achievement.

SOCIAL VALUE

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

DEGREES OF SIGNIFICANCE

RARITY

It possesses uncommon, rare or endangered aspects of natural or cultural heritage.

- Importance for rare, endangered or uncommon structures, landscapes or phenomena.

REPRESENTIVITY

- It is important in demonstrating the principal characteristics of a particular class of natural or cultural places or objects.
- Importance in demonstrating the principal characteristics of a range of landscapes or environments, the attributes of which identify it as being characteristic of its class.
- Importance in demonstrating the principal characteristics of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province, region or locality.

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

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

What other similar sites may be compared to this site?

IMPACT STATEMENT

Assessment of Impacts

Direct, indirect and cumulative impacts of the issues identified through the EIA phase are assessed in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The duration, wherein it will be indicated whether:
 - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
 - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
 - medium-term (5–15 years) – assigned a score of 3;
 - long term (> 15 years) - assigned a score of 4; or
 - permanent - assigned a score of 5;
- The magnitude, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The probability of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- The significance, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- The status, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.

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- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

$$S=(E+D+M)P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

IMPACT STATEMENT

PALEONTOLOGICAL SITES

Palaeontology was evaluated during the scoping phase of the project.

PRE-CONTACT SITES

Site 001, 002 & 003

Due to the small amount of stone tools identified on these sites and the distinct absence of flakes and cores (with the exception of the one core at Site 003) it is very possible that the finds here were displaced from another area as a result of the water flow action. These stone tool are neither unique nor concentrated enough to warrant preservation of these sites.

Nature of Impacts: Placement of the solar power plant could negatively affect sites associated with the Late Stone Age.

Extent of Impacts: Localised damage to the sites

Nature of Impact: Possible pre-contact Stone Age site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	Local (2)	Local (2)
Duration	Long term (5)	Long term (5)
Magnitude	Low (1)	Low (1)
Probability	Improbable (1)	Improbable (1)
Significance	Low (8)	Low (8)
Status	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resource	No	No
Can impacts be mitigated	Yes	Yes
Mitigation	No mitigation.	
Cumulative impacts	The growth of renewable energy plants in the Northern Cape could result in a compounding effect as to regards the loss of Stone Tools.	
Residual impacts	Loss of low significance heritage related information.	

Mitigation

An appropriate tertiary institute should collect representative samples of the stone tools located on these

LSA sites, under a SAHRA issued permit.

BUILT ENVIRONMENT

One prominent building (Site 004) was located on the north-western boundary of the study area. This was however found to be the remains of building for the Tungsten Lodge, construction was initiated in 2000 and therefore it holds no heritage significance.

Several other smaller built structures of recent nature, such as single room houses and concrete reservoirs are located in the study area, however according to the owner none of these are of historic nature or older than 60 years.

CULTURAL LANDSCAPE

The following landscape types could possibly be present in the study area.

Landscape Type	Description	Occurrence still possible?	Likely occurrence?
1 Paleontological	Mostly fossil remains. Remains include microbial fossils such as found in Baberton Greenstones	Yes, sub-surface	Unlikely
2 Archaeological	Evidence of human occupation associated with the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites	Yes	Sites 001, 002, & 003
3 Historic Built Environment	<ul style="list-style-type: none"> - Historical townscapes/streetscapes - Historical structures; i.e. older than 60 years - Formal public spaces - Formally declared urban conservation areas - Places associated with social identity/displacement 	No	No
4 Historic Farmland	<p>These possess distinctive patterns of settlement and historical features such as:</p> <ul style="list-style-type: none"> - Historical farm yards - Historical farm workers villages/settlements - Irrigation furrows - Tree alignments and groupings - Historical routes and pathways - Distinctive types of planting - Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting. 	No	Unlikely
5 Historic rural town	<ul style="list-style-type: none"> - Historic mission settlements - Historic townscapes 	No	No
6 Pristine natural landscape	<ul style="list-style-type: none"> - Historical patterns of access to a natural amenity - Formally proclaimed nature reserves - Evidence of pre-colonial occupation - Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages - Historical structures/settlements older than 60 years - Pre-colonial or historical burial sites - Geological sites of cultural significance. 	No	No
7 Relic Landscape	<ul style="list-style-type: none"> - Past farming settlements - Past industrial sites - Places of isolation related to attitudes to medical treatment - Battle sites - Sites of displacement, 	No	No

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

VISUAL IMPACT

The proposed developments of both Sirius 1 & Sirius 2 will be low-profile photovoltaic installations that will not be visible from more than a few kilometres. The panels are also treated with a non-reflective coating that will ensure that excessive reflection is not achieved. As such the stand-alone development of these energy parks would be negligible. There is however a CSP Plant that is already being constructed right alongside of the proposed Sirius 2 development. The height of the central tower causes it to be visible for up to 30km away and instinctively draws the viewer's sight to this area. For this reason the new development could have a compounded effect on the visual landscape when combined with the existing CSA.

This study does however only focus on the possible visual impact that the development could have on sites of heritage significance. As such no prominent sites in the direct vicinity of the proposed development will suffer negative impacts due to the development of either the Sirius 1 or the Sirius 2 project.

POWER LINE ALTERNATIVES – PREFERRED CHOICE

The two alternative power line alignments for both Phase 1 and Phase 2 were investigated. As these

alignments roughly follow the same route there is no preferred alignments as their impact will be similar. In both cases however Alternative 2 connects to the existing infrastructure earlier than Alternative 1 and therefore the impact of both Alternative 2 for Phase 1 and Phase 2 should be conceivably less than the impact of Alternative 1. No important sites were identified in these alignment corridors or on the sub-station site.

The table below is a condensation of the choices available and how they rate against each other in regards to their heritage sensitivity.

Preferred	The alternative will result in a low impact / reduce the impact
Not Preferred	The alternative will result in a high impact / increase the impact
Favourable	The impact will be relatively insignificant
No Preference	Both alternatives will result in similar impacts

CHOICE OF ALIGNMENT

Alternative	Preference	Reasons
PHASE 1		
Alternative 1		Sub-surface sites could still be intact
Alternative 2		Connecting to the existing line will limit new damage to unaltered areas
PHASE 2		
Alternative 1		Sub-surface sites could still be intact
Alternative 2		Connecting to the existing line will limit new damage to unaltered areas

HERITAGE MANAGEMENT PLAN

MINIMISING IMPACTS ON ARCHAEOLOGICAL SITES

Objective 1: Minimising the impact on archaeological sites

The development of solar generation facility and associated infrastructure could impact on sites of archaeological importance.

Project Component	Solar Array, roads, power lines and construction camps
Potential Impact	Destruction of archaeological sites
Activity/Risk source	Solar array foundations, power lines and roads
Mitigation Target	Conserve archaeological sites

Mitigation: Action	Responsibility	Time Frame
1. Surface collection of LSA microliths by interested tertiary institutions before construction.	1. Interested and qualified institution.	1. Before construction commences, during construction phase.
2. Periodic monitoring of excavation activities during the construction period to ensure that no sub-surface deposits are missed.	2. Contracted heritage practitioner	2. During construction period.

Performance Indicator	No destruction of archaeological sites
Monitoring	During construction phase

CONCLUSION

The remaining extent of the Farm Tungsten Lodge was initially subjected to a heritage scoping study in.

The scoping study found that the two major run-off drainages on the site could house indications of human occupation. Furthermore the possibility of early mining activities was also reported. Thereafter a HIA and site survey was conducted. After exhaustive site investigations into the area's heritage potential it was found that none of the drainage lines runs produced any significant sites and that the fissures reported was natural and had been filled to prevent animals from falling into them. In some areas light concentrations of LSA microlithic stone tools were recorded. These are however very common in the Northern Cape Province and the areas contained on of the other defining characteristics of unique Stone Age sites. It was found that none of the tool concentration warranted protection or mitigation action.

The occurrence of these Stone Tools strongly suggests that a better-defined site could be located nearby or very well sub-surface. Due to the area's close proximity to the Orange River, it is prone to alluvial deposits that could bury any Stone Age sites. It is therefore recommended that a suitably qualified heritage practitioner be appointed by the developer to perform periodic inspections of excavated materials (preferably fortnightly) to ensure than no sub-surface sites be damaged.

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