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PROJECT 2010/56

HERITAGE IMPACT ASSESSMENT REPORT REV 1: PROPOSED SOLAR POWER STATION ON THE REMAINDER OF PORTION 1 (KNOWN AS DIE HOEK) AND A PORTION OF PORTION 2 OF THE FARM KLEIN ZWART-BAST 188, KENHARDT REGISTRATION DIVISION, SIYANDA DISTRICT MUNICIPALITY, NORTHERN CAPE PROVINCE

PREPARED FOR

Brian Gardner
EScience Associates (Pty) Ltd
Johannesburg

DATE: 1 February 2011

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EXECUTIVE SUMMARY

This report contains a heritage impact assessment (HIA) investigation in accordance with the provisions of Sections 38(1) and 38(3) of the *National Heritage Resources Act* (25/1999) for purposes of enabling the Northern Cape Provincial Heritage Resources Authority to consider authorising a proposed change of land use and establishment and operation of a solar power station on a land parcel consisting of the Remainder of Portion 1 (also known as Die Hoek) and a Portion of Portion 2 (surveyed for the ESKOM Aries substation) of the farm Klein Zwart-Bast 188. The feasibility area is located approximately 39 km south-west of the village of Kenhardt.[1] Access is from a gravel road that connects the R 27 south of Kenhardt with the R 358 south of Pofadder. The Sishen-Saldanha railway line is about 700 m south of the feasibility area.

This HIA also forms part of the process of obtaining the necessary environmental authorisations for the proposed development. Although the HIA is conducted in accordance with different legislation, it is (in this case) not a stand-alone process but forms part of the EIA, as provided for in Section 38 of the NHRA.

This report is the main HIA report.

The report is accompanied by a separate archaeological impact assessment (AIA) report by A Pelser of Archaetnos Cultural and Cultural Resource Consultants. A number of archaeological sites, features and objects of significance were identified during the assessment. Most of the sites and finds date to the Stone Age, although there were some historical finds as well. The AIA report gives a discussion of these finds and observations made during the fieldwork and also gives an indication of the methodology followed. It also indicates how to deal with any archaeological material that may be unearthed or disturbed during the development activities.

Prof B Rubidge, University of the Witwatersrand, has been requested to prepare a separate palaeontological impact assessment (PIA) desktop study and report.

The wider area consists of working (operating) grazing farms located in an Arid Karoo environment. These farms display typical heritage-associated features that occur in this environment, such as large size, fences, tracks, drainage lines, sandy and gravely areas, rocky outcrops, sparse vegetation, and occasional walls for retaining water. The few farmsteads are clustered close to water sources and main roads and very little else regarding the built environment exists in the interior further away from the river due to the circumstance that the region has always been thinly populated. Scatterings of stone artefacts and ostrich shell fragments often are a relic of much earlier human habitation.

As a cultural landscape this environment can be classified as historic farmland and, to a lesser extent, a historic archaeological landscape.

The proposed project is located on an irregularly-shaped area with boundaries defined by cadastral divisions and the gravel road between Kenhardt and Pofadder. The main visual characteristics of this relatively flat land parcel are a drainage line (dry river bed), vehicle tracks, transmission power lines, an ESKOM substation to the east (Aries) and shrubland vegetation.

The approximate corner co-ordinates are:[2]

KZB 1 29°29'29.78"S 20°47'22.52"E
KZB 2 29°29'46.85"S 20°47'32.03"E
KZB 3 29°30'23.91"S 20°47'21.89"E
KZB 4 29°30'36.60"S 20°46'50.35"E
KZB 5 29°29'52.03"S 20°46'27.37"E

The intended development comprises the change of land use to and the construction and operation of a photo-voltaic (PV) solar power facility, and this provided the following "triggers" for an HIA:

- Development affecting an area larger than 5000 square meters (the actual PV plant will cover approximately 20 hectares although the feasibility area is much larger)

[1] Figure 1
[2] Created by the heritage consultant

- The region is known for its Stone Age artefacts

The general aim of any HIA is to ensure that the needs of socio-economic development are balanced by the needs to preserve significant heritage resources.

The purpose of this report is to identify and assess features of heritage significance, identify possible impacts and propose management measures to mitigate negative impacts. This information must enable the relevant heritage authority to approve the proposed development as required in terms of Section 38 of the NHRA.

The investigation was conducted as follows:

- Desktop study, including perusal of existing archaeological reports, historic maps, cadastral diagrams and general publications about the broader area
- Field survey in January 2011, during which sections of the feasibility area were investigated on foot. The most likely site for the solar power facility (closest to the Aries substation) was investigated more thoroughly. Certain parts of the landscape (sandier sections) were found generally to exhibit lower evidence of archaeological artefacts and were checked at random intervals, while other features that were more likely to have been foci for past human activity (e.g. outcrops, drainage lines etc.) were sampled more systematically. The stony and gravelly sections of the feasibility area were found to exhibit high evidence of archaeological artefacts. In general the archaeological visibility was excellent. Although GPS coordinates were taken on many locales (Sites), many more sites (scatters and concentrations of stone tools) were not recorded as it became clear during the assessment that most of the area is covered by Stone Age material and that it would be a near impossible task taking the scope and time-frame of the assessment into consideration to mark all the finds. Apart from a single Martini-Henry rifle cartridge casing, the remains of small unidentified stone-walled structures (outside the area) and some water retaining walls (dam walls in the dry river bed), no significant heritage features associated with colonial (post-archaeological) settlement are evident.

Heritage impacts may happen either during construction or operation, or both, and are categorised as:

- Neutral (no impact)
- Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries
- Indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment
- Cumulative impacts that are combinations of the above

The predicted heritage development impacts on the site during construction are:

- In the case of outcrops and the flat sections of the feasibility area: High direct negative impact
- Curious workers and visitors may damage, remove or destroy archaeological artefacts surrounding the construction site

The predicted heritage development impacts on the site during operation are:

- Neutral with regard to the actual solar power facility site (assuming it would have been sampled before construction)
- Potentially negative with regard to the areas around the solar power facility site, e.g. curious workers and visitors may damage, remove or destroy archaeological artefacts surrounding the facility

The assessment of the visual impact on the environment is a separate investigation by a visual impact specialist.

Heritage impacts can be managed through one or a combination of the following measures:

- Mitigation (minimising adverse impacts through further documentation and research and similar activities before a place or collection of objects is altered or destroyed)
- Avoidance (staying away from heritage features)
- Compensation (balancing of making good the destruction of one heritage feature by the preservation of another one)
- Enhancement (positive impacts on heritage features)

- Rehabilitation (re-use of preserved heritage features)
- Interpretation (providing information on heritage features)
- Memorialisation (retaining the memory of important heritage features that have been destroyed)
- No action
- Relocation (historic equipment, graves)
- Alternatives

Of the above measures, a combination of interpretation and mitigation (Phase 2 archaeological investigation) applies in the case of this project.

This report complies as follows with the provisions of Section 38 (3) of the *National Heritage Resources Act* (Act 25 of 1999):

(a) Identification and mapping of heritage resources
(b) Cultural significance
(c) Predicted impacts
(f) Impact management measures and alternatives before construction

See Table 1 (below).

TABLE 1: Identification of heritage features, impacts and mitigation measures

S 3(2) NHRA heritage resource	(a) Identification		(b) Significance	(c) Impact		(d) Recommended impact management
	Site	GPS		Study area	Impact type, certainty and significance	
Buildings, structures, places and equipment of cultural significance	5	29°30'7.90"S 20°46'57.30"E	Low (local)	Centre of area	Neutral (no impact)	Remains of earth dam wall across dry river bed, with Stone Age artefacts. The dry river bed seems unsuitable for as a site for the project and therefore no impact is anticipated. No action.
	8	29°30'27.50"S 20°46'57.50"E	Low (local)	SW portion of area	Neutral (no impact)	Remains of low earth wall; function unclear. The structure has low significance and is in a poor condition, not worth preserving. No action.
	12	29°30'24.16"S 20°47'11.34"E	Low (local)	Near southern boundary of area	Neutral (no impact)	Remains of earth dam wall across dry river bed. The dry river bed seems unsuitable for as a site for the project and therefore no impact is anticipated. No action.
	13	29°30'20.45"S 20°47'22.60"E	Low (local)	On extreme eastern periphery of area	Neutral (no impact)	Remains of low earth wall across dry river bed. The structure has low significance and is in a poor condition, not worth preserving; also is located on the area periphery. No action.
	10, 11	See AIA report	Low (local)	Outside area boundaries	Neutral (no impact)	No action
Areas to which oral traditions are attached or which are associated with intangible heritage	None	-	-	-	-	No action
Historical settlements and landscapes	None	-	-	-	-	No action
Landscapes and natural features of cultural	None	-	-	-	-	No action

S 3(2) NHRA heritage resource	(a) Identification		(b) Significance	(c) Impact		(d) Recommended impact management
	Site	GPS		Study area	Impact type, certainty and significance	
significance						
Geological sites of scientific or cultural importance	None	-	-	-	-	No action
Archaeological and palaeontological sites	Chance finds	Unknown	Low local?	Entire?	Unknown	Mitigation: Report and evaluate any sub-surface graves or large scatters of artefacts when found
	Around hillocks and boulder clusters and on rocky outcrops	See AIA report for sampled sites	Medium to high regional	Entire	Possibly medium negative (depending on location of solar facility)	Mitigation: Phase 2 archaeological investigation through systematic collection, mapping and excavation of the selected site for the project before construction.
Graves and burial sites	None	-	-	-	-	No action
Features associated with labour history	None	-	-	-	-	
Movable objects	Spent Martini-Hendry cartridge, fragments of tins, bottles etc	-	-	-	-	

(d) Social and economic benefits

The development will have direct benefits related to the conservation of heritage resources (artefacts) since, through mitigation (sampling and mapping) the project represents an opportunity to learn more about them. If sub-surface important archaeological and palaeontological features are exposed during site preparation activities, this may also present an opportunity to conduct a similar Phase 2 (archaeological and palaeontological) investigation that may generate new information, before such features may be destroyed.

The project has the potential to create sustainable employment in the Northern Cape while addressing some of the fundamental drivers of Climate Change. Being one of the pioneers of solar power in South Africa the project has the inherent role of developing solar power technology for the region. The viability and success of this project is strategic to paving the way for sustainable power technologies in this region. This is a project of strategic and national importance and capable of enhancing South Africa's position in the global technology arena while aligning with the commitments made by South Africa in Copenhagen.

(e) Public consultation

This is part of the EIA process.

(g) Mitigation during construction

Any sub-surface chance finds (graves, human remains, concentrations of stone tools, pottery, bones or metal items) during site preparation and construction work should be monitored. Should anything be discovered, work on the particular spot should be suspended and Archaetnos should be informed so that an inspection and evaluation of the finds can be made.

Findings and recommendations

The feasibility area proposed for the solar power facility is located in a cultural landscape classified primarily as a historical farming landscape and secondarily as an archaeological landscape. The primary

class of landscape is of low to medium heritage sensitivity because it is because it is able to absorb new development with some adverse effects on heritage features.

Besides very large numbers of Stone Age artefacts (scatters and sites or clusters) and a few earth walls, no other significant heritage resources were identified. With little archaeological research done in the area to date the sites are of medium to high significance.

The predicted heritage impacts during construction are medium to high negative, since the entire feasibility area is covered with Stone Age artefacts, irrespective of the final selected project site. The whole area can therefore be marked as a Stone Age site, with potentially millions of artefacts present. The area is therefore very significant and mitigation measures will have to be implemented before any development takes place.

The predicted impacts during operation are neutral, provided that that the site sections that have not been selected for the project are avoided to prevent damage, destruction or removal.

Visual intrusion as an indirect impact may be an issue, but this is assessed by another specialist. Noise, dust, pollution and restrictions of access patterns as indirect impacts are also not issues.

The nature and significance of what has been found in terms of heritage is not of such importance that the proposed project should be suspended or stopped or that another feasibility area should be identified, provided that the recommended mitigation measures are adopted.

There are no compelling reasons not to authorise the proposed solar power facility and the proposed development can continue provided that the following mitigation measures are adopted to minimise predicted and unpredicted adverse impacts on heritage features:

1. In order to minimise the risk of adverse impacts on archaeological sites and artefacts (associated with the construction of transmission links), the proposed solar power facility should be located as close as possible to the Aries substation.
2. With little or no archaeological research done previously in the area as well as the fact that there is so much material present (covering basically the totality of the assessed area), it is recommended that mitigation measures are implemented to minimize the impact of the development on the Stone Age sites in the area. This would include systematic sampling of stone tools, mapping and drawing of the sites and finds, as well as archaeological excavations at Site 7 in order to collect as much material and information on the Stone Age utilization of the area. This mitigation need not be done for the total area, but only in the area earmarked for the solar panel plant (20 hectare area). As soon as its precise location is known these mitigation measures should be undertaken. If Site 7 can be avoided (buffer zone placed around the outcrop on which it is located) no further mitigation measures would be required.
3. It is also recommended that an Information Plaque, containing information on the archaeology and history of the area, be erected at the Solar Power Plant's office.
   Finally, it should be noted that the subterranean presence of archaeological and/or historical sites, features or artefacts are always a distinct possibility. Care should therefore be taken during any development activities that if any of these are accidentally discovered, a qualified archaeologist be called in to investigate.
4. Workers involved with construction and operation should be empowered through training to recognise archaeological artefacts.

RC DE JONG

Date: 1 February 2011

1. REPORT CONTEXT

1.1 General notes

1. The structure of this report is based on:

    - SOUTH AFRICAN HERITAGE RESOURCES AGENCY, Heritage Impact Assessment: Notification of intent to develop (form)
    - DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING, PROVINCIAL GOVERNMENT OF THE WESTERN CAPE, 2005, Guideline for involving heritage specialists in EIA processes (document)
    - DEPARTMENT OF ENVIRONMENT AFFAIRS AND TOURISM, Integrated Environmental Management Guidelines
    - SOUTH AFRICAN HERITAGE RESOURCES AGENCY, 2006, *Minimum standards: Archaeological and palaeontological components of impact assessment reports* (unpublished).
    - PROVINCIAL HERITAGE RESOURCES AUTHORITY GAUTENG, 2010, *Report requirements for HIA reports* (unpublished).
    - WORLD BANK, *Environmental Assessment Sourcebook Update No 8, September 1994: Cultural Heritage in Environmental Assessment.*
    - Best-practice HIA reports submitted by Cultmatrix and other heritage consultants

2. This report is informed by the *National Heritage Resources Act* (25/1999) (NHRA) and is consistent with the various ICOMOS charters for places of cultural significance.

3. Recommendations contained in this application do not exempt the applicant from complying with any national, provincial and municipal legislation or other regulatory requirements, including any protection or management or general provision in terms of the NHRA.

4. Rights and responsibilities that arise from this report are those of the applicant and not that of heritage consultant. The consultant assumes no responsibility for compliance with conditions that may be required by SAHRA in terms of this report.

5. The heritage consultant assumes no responsibility whatsoever for any loss or damages that may be suffered as a direct or indirect result of information contained in this application. Any claim that may however arise is limited to the amount paid to the consultant for services rendered to compile this report.

6. Although all possible care is taken to identify all sites of cultural importance during the survey of study areas, the nature of archaeological and historical sites are as such that it always is possible that hidden or subterranean sites could be overlooked during the study. The heritage consultant will not be held liable for such oversights or for costs incurred as a result thereof.

7. Although all possible care is taken to identify all sites of cultural importance during the survey of study areas, the nature of archaeological and historical sites are as such that it always is possible that hidden or subterranean sites could be overlooked during the study. The heritage consultant will not be held liable for such oversights or for costs incurred as a result thereof.

1.2 Purpose of the report

The purpose of this report is to identify and assess features of heritage significance, identify possible impacts and propose management measures to mitigate negative impacts. This information must enable the relevant heritage authority to decide about the approval of the proposed development as required in terms of Section 38 of the NHRA.

The below table lists and describes the three general categories of heritage impact assessment studies and reports, which offices are involved (i.e. to which SAHRA or provincial offices reports will be submitted) and which type of response is required from these offices.

TABLE 2: Applicable category of heritage impact assessment study and report

Type of study and report	Aim	SAHRA office involved	Requested SAHRA response
Screening: Not this report	The aim of the screening investigation is to provide an informed heritage-related opinion about the proposed development by an appropriate heritage specialist. The objectives of this investigation are to screen potential heritage issues through a site inspection, to develop a broad understanding of heritage policy-related context, to review any existing data on the history and heritage significance of the site, to check if the site has any formal heritage status, to discuss the proposed development with heritage contacts and to scan the development proposals. The result of this investigation is a brief statement indicating potential heritage impacts/issues and the need for further investigation.	-	-
		-	-
		-	-
Scoping (basic assessment): Not this report	The aim of the scoping investigation is to analyse heritage issues and how to manage them within the context of the proposed development. The objectives are to assess heritage significance (involving site inspections and basic desktop and archival research); to identify the need for further detailed inputs by heritage specialists, to consult with local heritage groups and experts, to review the general compatibility of the development proposals with heritage policy and to assess the acceptability of the proposed development from a heritage perspective. The result of this investigation is a heritage scoping report indicating the presence/absence of heritage resources and how to manage them in the context of the proposed development.	-	-
		-	-
		-	-
Full HIA: This report	The aim of the full HIA investigation is to analyse and recommend heritage management mitigation measures and monitoring programmes. The objectives are to analyse heritage issues, to research the chronology of the site and its role in the broader context, to undertake a comprehensive assessment of heritage significance, to analyse the nature and scale of the proposed development, to consult with local heritage groups and experts as part of the broader EIA stakeholder engagement process, to establish the compatibility of the proposed development with heritage and other statutory frameworks and to assess alternatives in order to promote heritage conservation issues.	Northern Cape Provincial Heritage Resources Authority	Approval of development
		SAHRA Palaeontology, Archaeology and Meteorites Unit	Comments
		-	-

1.3 Terms of reference (in accordance with NHRA Section 38(3))

- To survey the proposed feasibility area
- To identify and map heritage resources that may be affected directly and
- To assess the cultural significance of these heritage resources
- To assess the impact of the development on these heritage resources
- To assess the benefits of conserving these heritage resources in relationship to the socio-economic benefits of the development
- To provide the public with an opportunity to comment on the heritage aspects of the proposed development
- To consider alternatives if heritage resources will be affected in a negative manner
- To determine methods to mitigate negative impacts before, during and after site preparation activities

1.4 History of the report

This report is the first report for this particular project. In September 2006 David Morris (McGregor Museum, Kimberley) prepared an Archaeological Impact Assessment report for the proposed Aries-Garona ESKOM power transmission line, and this report included general information about the project area.[3]

1.5 Legal context of the report

ACT	COMPONENT	IMPLICATION	RELEVANCE	COMPLIANCE
NHRA	S 34	Impacts on buildings and structures older than 60 years	None	-
	S 35	Impacts on archaeological and palaeontological heritage resources	Stone Age artefact scatters	Permits for sampling and destruction of selected project site; avoid remaining sites
	S 36	Impacts on graves	None	-
	S 37	Impacts on public monuments	None present	-
	S 38	Developments requiring an HIA	Development is listed activity	Full HIA
NEMA	EIA Regulations	Activities requiring an EIA	Development is subject to an EIA	HIA is part of EIA
Other	-	-	-	-

1.6 Planning context of the report

The key enablers behind this project include:

- SA Government's initiative to introduce Independent Power Producers (IPPs) into South Africa's generation arena through Eskom's Multi-Site Baseload IPP program.
- SA Government's initiative to introduce clean Renewable Energies into South Africa's generation mix through NERSA's REFIT program.
- Intensive Energy User's initiative to enhance their security of supply and in doing so, participate in assisting SA Government by adding extra capacity to the Grid.

1.7 Development criteria in terms of Section 38 of the NHRA

1.7	Development criteria in terms of Section 38(1)	Yes/No details
1.7.1	Construction of road, wall, power line, pipeline, canal or other linear form of development or barrier exceeding 300m in length	Yes (internal roads and feeder line to ESKOM system)
1.7.2	Construction of bridge or similar structure exceeding 50m in length	No
1.7.3	Development exceeding 5000 sq m	Yes
1.7.4	Development involving three or more existing erven or subdivisions	No
1.7.5	Development involving three or more erven or divisions that have been consolidated within past five years	No
1.7.6	Rezoning of site exceeding 10 000 sq m	Yes
1.7.7	Any other development category, public open space, squares, parks, recreation grounds	No

1.8 Property details

1.8	Property details	
1.8.1	Name and location of property	Klein Zwart-Bast 188, Kenhardt RD
1.8.2	Erf or farm numbers	Portion of Portion 6
1.8.3	Magisterial district	Kenhardt
1.8.4	Closest town	Kenhardt
1.8.5	Local authority	Siyanda District Municipality (there is no other local authority)
1.8.5	Current use	Agricultural
1.8.5	Current zoning	Agricultural
1.8.5	Predominant land use of	Agricultural, transport, (roads), power transmission

[3] See Appendix 2

1.8	Property details	
	surrounding properties	
1.8.9	Total extent of property	20 ha to be used for the actual solar power facility

1.9 Property ownership

1.9	Property owners	
1.9.1	Farm	Klein Zwart-Bast
1.9.2	Name and contract address	Ohna de Bruin
1.9.3	Telephone number	Mob 083 242 5484
1.9.4	Fax number	Fax 054 332 3014
1.9.5	E-mail	oberholtzer@webmail.co.za

1.10 Developer

1.10	Developer	
1.10.1	Name and contact address	Bio Therm Energy in partnership with Aurora Power Solutions, Nautica Building, Water Club Complex, Beach Road, Mouille Point, Cape Town
1.10.2	Telephone number	(021) 421-9764
1.10.3	Fax	(086) 513-8648
1.10.4	E-mail	info@apsolutions.co.za

1.11 Environmental practitioner

1.11	Environmental Specialist	
1.11.1	Name and contact address	Brian Gardner, EScience Associates
1.11.2	Telephone number	
1.11.3	Fax	
1.11.4	E-mail	

1.12 Heritage assessment practitioners

	Specialist 1	
1.12.1	Name and contact address	Dr RC de Jong, 129 Malherbe Street, Capital Park, 0084 Pretoria
1.12.2	Qualifications and field of expertise	PhD (Cultural History) UP (1990), Post-Graduate Museology Diploma UP (1979), generalist heritage management specialist with experience in museums and heritage since 1983
1.12.3	Relevant experience in study area	HIA for farming development on Kakamas North Holding 189 west of area
1.12.4	Telephone number	(082) 577-4741
1.12.5	Fax number	(086) 612-7383
1.12.6	E-mail	cultmat@iafrica.com

	Specialist 2	
1.12.1	Name and contact address	A J Pelser, Archaetnos cc
1.12.2	Qualifications and field of expertise	BA (UNISA), BA (Hons) (Archaeology), MA (Archaeology) (Wits), general heritage management specialist with experience in museums and heritage, ASAPA accredited archaeologist
1.12.3	Relevant experience in study area	AIA and grave relocations at Postmasburg
1.12.4	Telephone number	(083) 459-3091
1.12.5	Fax number	(086) 520-0673

1.12.6	E-mail	Antonp21@yahoo.com

2. DEVELOPMENT CONTEXT

2.1 Feasibility area location and boundaries

The feasibility area is located approximately 39 km south-west of the village of Kenhardt.[4] Access is from a gravel road that connects the R 27 south of Kenhardt with the R 358 south of Pofadder. The Sishen-Saldanha railway line is about 700 m south of the feasibility area.

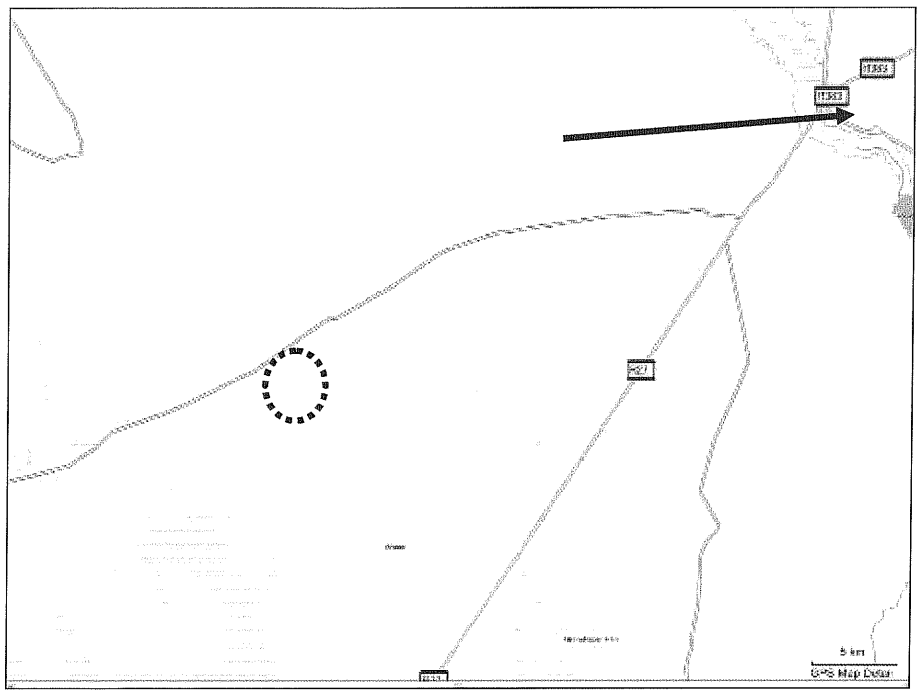

FIGURE 1: General location of the feasibility area – the arrow indicates Kenhardt

2.2 Description of distinguishing regional features

2.2.1 Environmental features

TABLE 3: Environmental features

COMPONENT	DESCRIPTION
Acocks veld type	Arid Karoo and Desert False Grassveld
Geological and mining	None on the area
Geology	Tillite
Hydrology	Seasonal tributaries (drainage lines)
Land cover	Shrubland
Land use	Grazing
Vegetation	Bushmanland

[4] Figure 1

COMPONENT	DESCRIPTION
Landscape sensitivity index	1-3 (low to medium)
Slope	0-9%
Terrain morphology	Slightly irregular plains
Wetlands	None

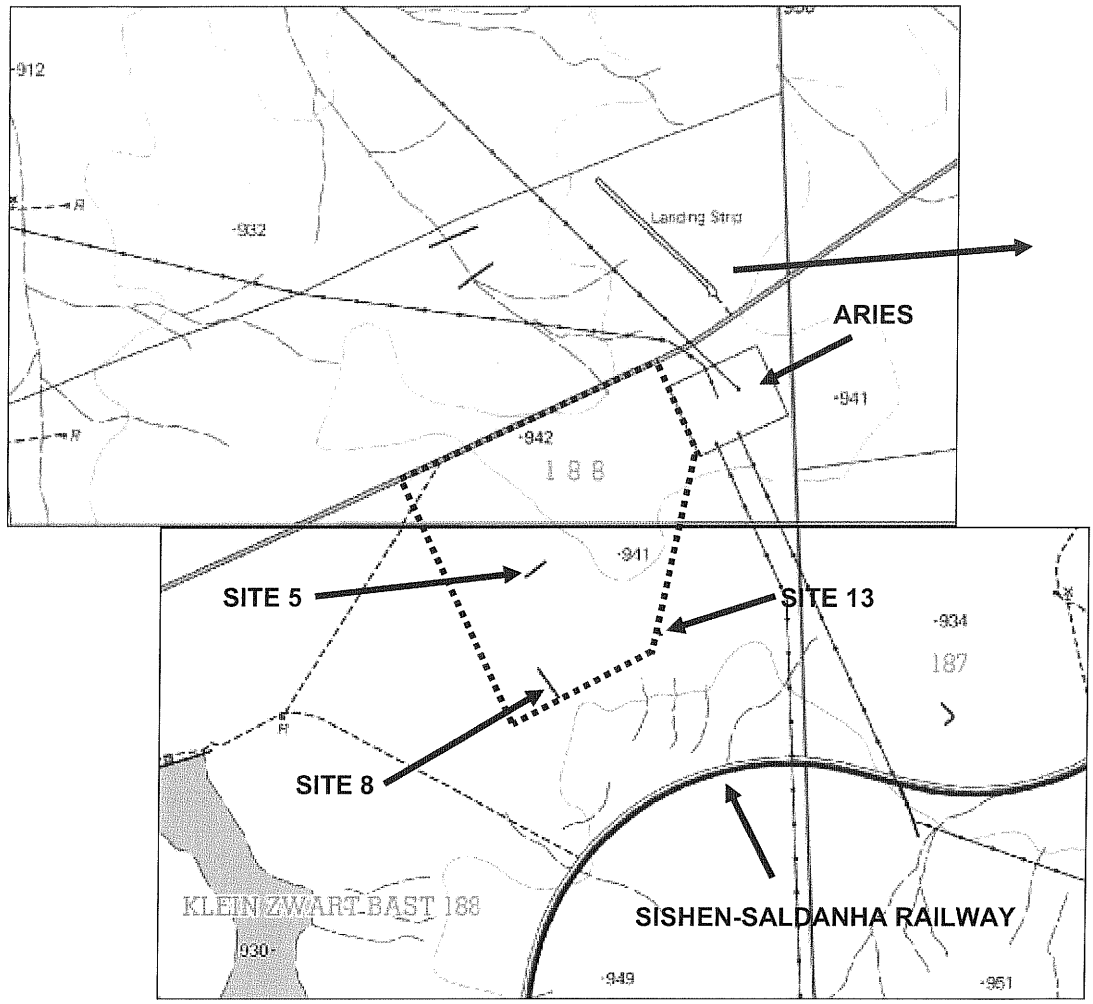

FIGURE 2: Sections of 2920 BD Grootriet (2003), top, and 2920 DB Sonderhuis (2003), bottom, indicating the feasibility area boundaries and some of the identified heritage features

2.2.2 Heritage features

TABLE 4: Heritage features

S 3(2) NHRA heritage resource	DESCRIPTION
Buildings, structures, places and equipment of cultural significance	Tracks, fences, transmission lines, earthen dam walls and similar structures
Areas to which oral traditions are attached or which are associated with intangible heritage	None
Historical settlements and	None

S 3(2) NHRA heritage resource	DESCRIPTION
landscapes	
Landscapes and natural features of cultural significance	Archaeological landscape and historic farmland
Geological sites of scientific or cultural importance	None
Archaeological and palaeontological sites	Large concentration of artefacts and ostrich shell fragments associated with all Stone Age periods
Graves and burial grounds	Not inside study area
Areas of significance related to labour history	None
Movable objects	None

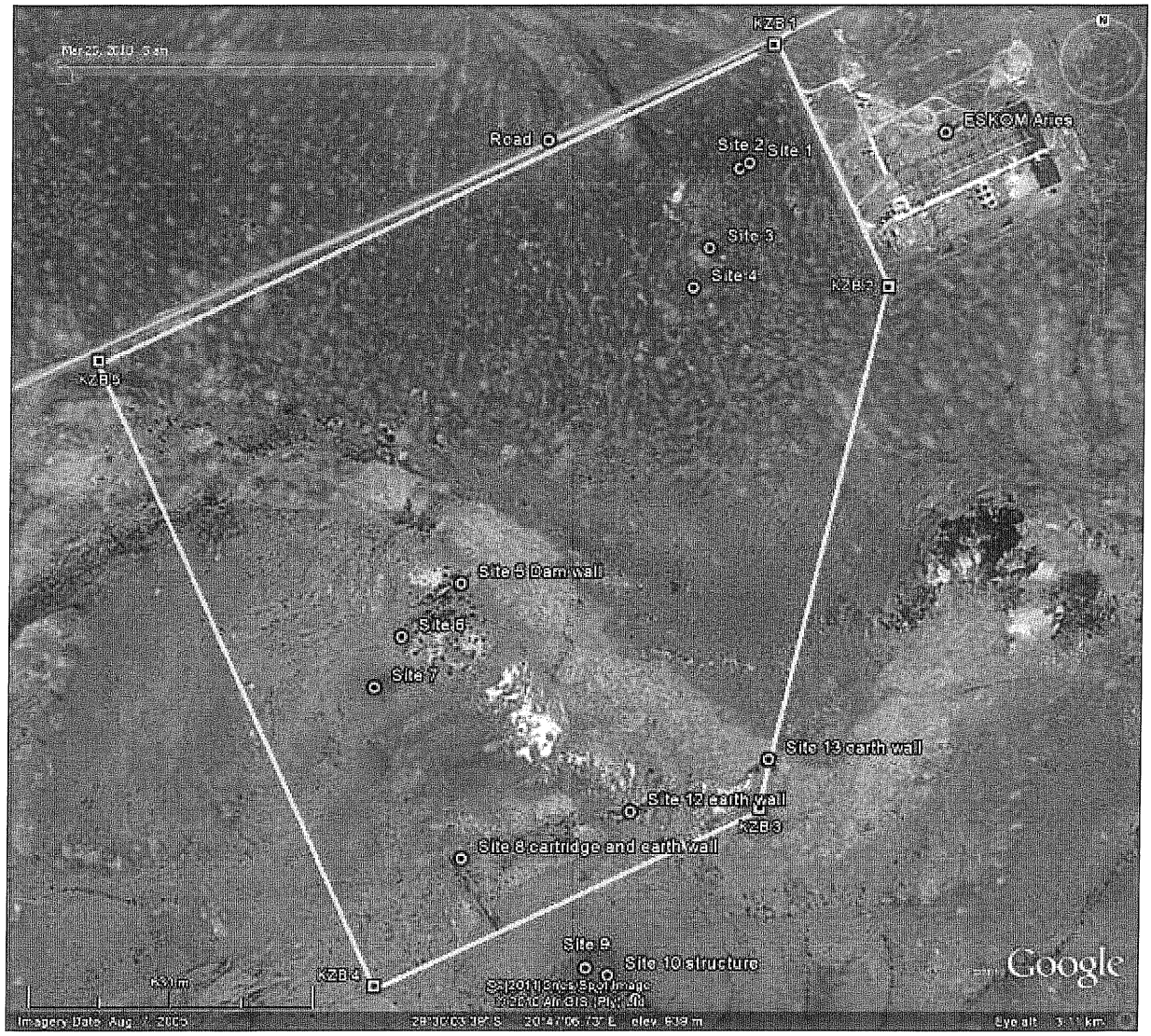

FIGURE 3: Google Earth image (2005) of the feasibility area indicating the location of identified heritage features

2.2.3 Feasibility area description

The proposed project is located on an irregularly-shaped area with boundaries defined by cadastral divisions and the gravel road between Kenhardt and Pofadder. The main visual characteristics of this

relatively flat land parcel are a drainage line (dry river bed), vehicle tracks, transmission power lines, an ESKOM substation to the east (Aries) and shrubland vegetation.

The approximate corner co-ordinates are:[5]

KZB 1 29°29'29.78"S 20°47'22.52"E
KZB 2 29°29'46.85"S 20°47'32.03"E
KZB 3 29°30'23.91"S 20°47'21.89"E
KZB 4 29°30'36.60"S 20°46'50.35"E
KZB 5 29°29'52.03"S 20°46'27.37"E

2.2.4 Surrounding environment

AREA	DESCRIPTION
East	ESKOM Aries substation and farm land
North	Gravel road
West	Farm land
South	Sishen-Saldanha railway and farm land

2.3 Development description

2.3	Development description	
2.3.1	Nature of proposed development	Photo voltaic solar power station (see Appendix 4 for more details)
2.3.2	Predicted impacts on heritage value of site and contents	Medium to high negative (irrespective of final selected site)
2.3.3	Structures older than 60 years affected by proposed development	No
2.3.4	Rezoning or change of land use	Yes: Solar power generation
2.3.5	Construction work	Yes: Installation of panels etc.
2.3.6	Total floor area of proposed development	20 hectares
2.3.7	Extent of land coverage of development	20 hectares plus infrastructure
2.3.8	Earth moving and excavation	Yes
2.3.9	Number of storeys	-
2.3.10	Maximum height above ground level	-
2.3.11	Monetary value development	Not available
2.3.12	Time frames	Urgent

[5] Created by the heritage consultant

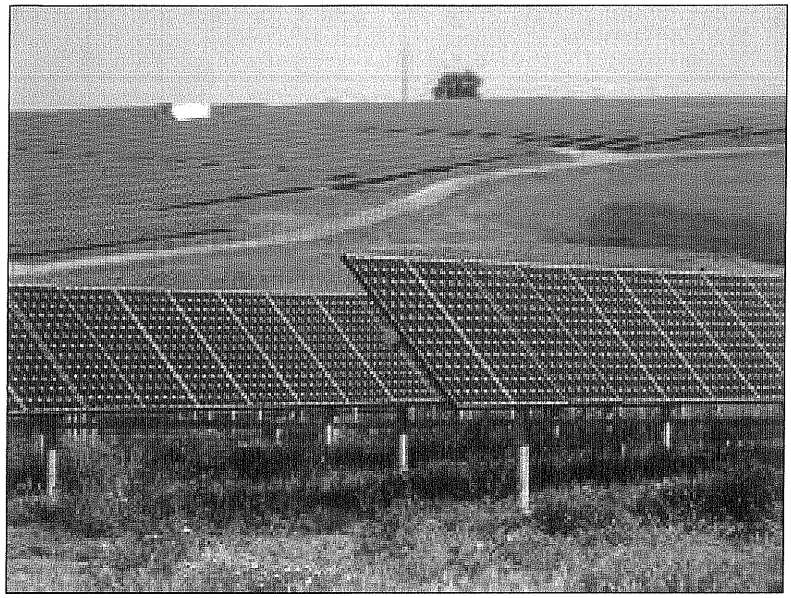

FIGURE 4: Impression of the physical and visual impact of the proposed solar power facility

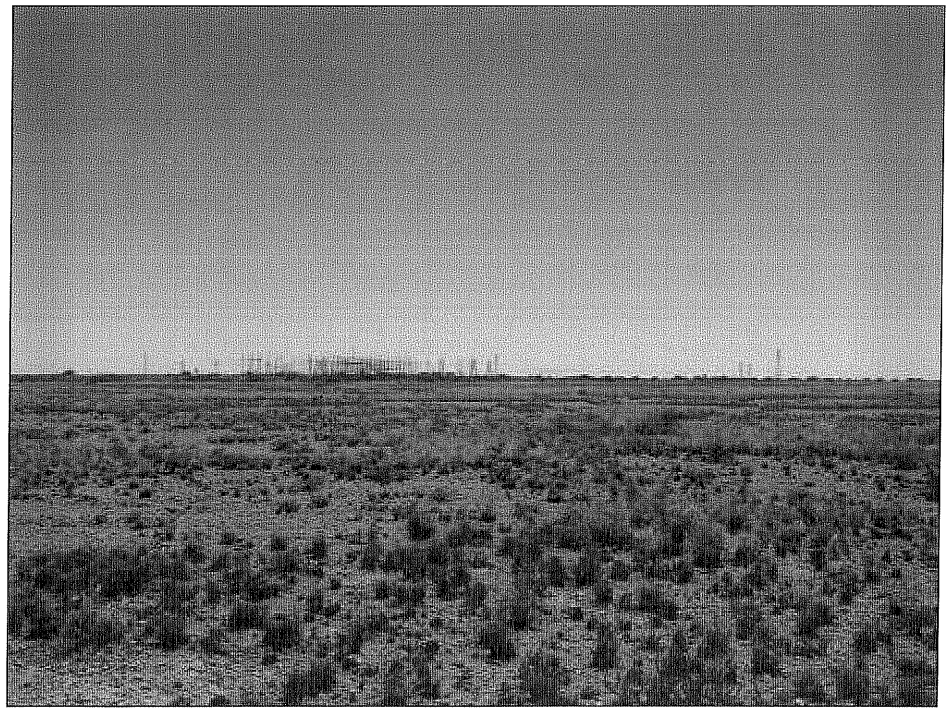

FIGURE 5: View across the north-eastern section of the feasibility area with the Aries substation in the distance

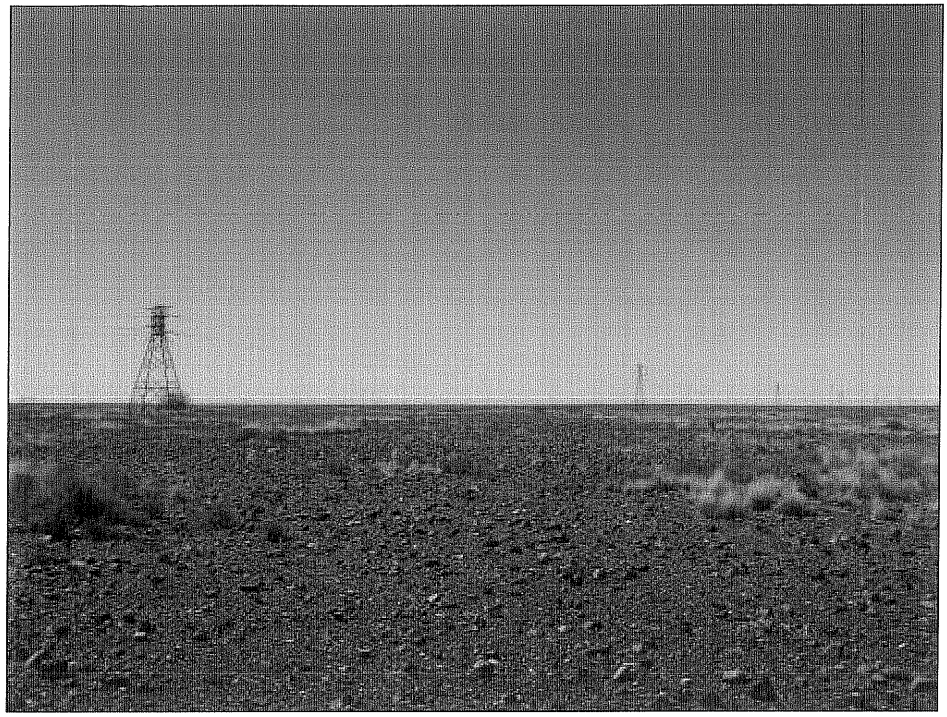

FIGURE 6: General impression of the landscape of the feasibility area

3. HERITAGE IMPACT PREDICTION

3.1 Cultural landscape evidence

The concept of cultural landscapes is of more recent origin and, although the definitions of the National Heritage Resources Act bear reference, is primarily grounded in international doctrinal texts in the form of Charters and Recommendations produced by ICOMOS and UNESCO. The most recent and authoritative text is the World Heritage Cultural Landscapes handbook, published by the World Heritage Centre (2009).

The term "cultural landscape" embraces a diversity of manifestations of the interaction between humankind and its natural environment. Cultural landscapes often reflect specific techniques of sustainable *land-use*, considering the characteristics and limits of the natural environment they are established in, and a specific spiritual relation to nature. Cultural landscapes are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal. They are categorized on the basis both of their value and of their representativity in terms of a clearly defined geo-cultural *region* and also for their capacity to illustrate the essential and distinct cultural elements of such regions. The term "cultural landscape" embraces a diversity of manifestations of the interaction between humankind and its natural environment.

The World Heritage Committee distinguishes between three categories of cultural landscapes:

- Clearly defined landscapes, designed and created intentionally by people, such as parkland and urban areas

- Organically evolved landscapes that has developed over time, including relic landscapes (where a certain activity has ceased to exist) and continuing landscapes (which retain an active social role and where the evolutionary process is still in progress)
- Associative landscapes, which are essentially natural landscapes with significant human associations in the realm of the intangible heritage

All three categories exist in the study area. However, they are too broad in terms of the practical mapping and assessment of heritage elements; hence, the following criteria for classifying the type of cultural landscape have been used:

TABLE 5: Cultural landscape classification

HERITAGE LANDSCAPE CONTEXT	ELEMENTS	EVIDENCE
A. PALAEONTOLOGICAL LANDSCAPE CONTEXT	Fossil remains. Such resources are typically found in specific geographical areas, e.g. the Karoo and are embedded in ancient rock and limestone/calcrete formations.	None
B. ARCHAEOLOGICAL LANDSCAPE CONTEXT (SCONDARY LANDSCAPE)	**Archaeological remains dating to the following periods:** • **Early Stone Age** • **Middle Stone Age** • **Late Stone Age** • **Early Iron Age** • **Late Iron Age** • **Historical**	**Sites and collections of Stone Age artefacts across entire site**
C. HISTORICAL BUILT URBAN LANDSCAPE CONTEXT	• 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	None
D. HISTORICAL FARMLAND CONTEXT (PRIMARY LANDSCAPE)	**These possess distinctive patterns of settlement and historical features such as:** • **Historical farm werfs** • **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.**	**Historic farm land**
E. HISTORICAL RURAL TOWN CONTEXT	• Historical mission settlements • Historical townscapes	None
F. PRISTINE/NATURAL LANDSCAPE CONTEXT	• 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.	None
G. RELIC LANDSCAPE CONTEXT	• Past farming settlements • Past industrial sites • Places of isolation related to attitudes to medical	None

	treatment • Battle sites • Sites of displacement,	
H. BURIAL GROUND & GRAVE SITE CONTEXT	• Pre-colonial burials (marked or unmarked, known or unknown) • Historical graves (marked or unmarked, known or unknown) • Human remains (older than 100 years) • Associated burial goods (older than 100 years) • Burial architecture (older than 60 years)	None
I. ASSOCIATED LANDSCAPE CONTEXT	• 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	None
J. HISTORICAL FARM WERF CONTEXT	• Setting of werf 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. werf walls • Systems of water reticulation and irrigation, e.g. furrows • Sites associated with slavery and farm labour • Colonial period archaeology	None
K. HISTORICAL INSTITUTIONAL LANDSCAPE CONTEXT	• Historical prisons • Hospital sites • Historical school/reformatory sites • Military bases	None
L. SCENIC/VISUAL	• Scenic routes	None
K. AMENITY LANDSCAPE CONTEXT	• View sheds • View points • Views to and from • Gateway conditions • Distinctive representative landscape conditions • Scenic corridors	

3.2 Determining levels of sensitivity and potential impacts

Sensitivity is the ability of a cultural landscape (or heritage resource) to absorb changes or adapt to changes whilst maintaining an acceptable degree of cultural significance.

Within the context of this study, levels of sensitivity can generally be associated with certain classes or categories of cultural landscapes as tabulated below.

TABLE 6: Relationship between cultural landscape classes and levels of sensitivity

Sensitivity level	Implication	Landscape class	Evidence
D	Ability to absorb without adverse effects and very little mitigation	Relic landscapes	Of little or no intrinsic, associational or contextual heritage value due to disturbed, degraded conditions or extent of irreversible damage
C	**Ability to absorb with some adverse effects and some mitigation**	**Historical farmland Historical farm werfs Institutional landscapes**	**Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context**

B	Ability to absorb with considerable adverse effects and intensive mitigation	Burial grounds and graves Palaeontological and archaeological landscapes Associated landscapes	Of moderate to high intrinsic, associational and contextual value within a local context
A	No or very little ability to absorb	Historical built environments Natural landscapes Amenity/Visual/Scenic landscapes	Of high intrinsic, associational and contextual heritage value within a national, provincial and local context

3.3 Determining potential impacts

TABLE 7: Categories of development types

CATEGORY	DESCRIPTION	EVIDENCE
A: Minimal intensity development	• No rezoning involved; within existing use rights • No subdivision involved • Upgrading of existing infrastructure within existing envelopes • Minor internal changes to existing structures • New building footprints limited to less than 1000m2	No
B: Low-intensity development	• Spot rezoning with no change to overall zoning of a site • Linear development less than 100m • Building footprints between 1000m2-2000m2 • Minor changes to external envelop of existing structures (less than 25%) • Minor changes in relation to bulk and height of immediately adjacent structures (less than 25%).	No
C: Moderate intensity development	• Rezoning of a site between 5000m2-10 000m2 • Linear development between 100m and 300m • Building footprints between 2000m2 and 5000m2 • Substantial changes to external envelop of existing structures (more than 50%) • Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 50%)	No
D: High intensity development	• Rezoning of a site in excess of 10 000m2 • Linear development in excess of 300m • Any development changing the character of a site exceeding 5000m2 or involving the subdivision of a site into three or more erven • Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 100%)	Photo voltaic solar power facility

3.4 Expected impact significance

TABLE 8: Expected impact significance matrix

HERITAGE CONTEXT	TYPE OF DEVELOPMENT			
	CATEGORY A	CATEGORY B	CATEGORY C	CATEGORY D
A: High heritage value	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected	Very high heritage impact expected
B: Medium to high heritage value	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected
C: Medium to low heritage value	Little or no heritage impact expected	Minimal heritage impact expected	Moderate heritage impact expected	**High heritage impact expected**
D: Low heritage value	Little or no heritage impact expected	Little or no heritage impact expected	Minimal heritage value expected	Moderate heritage impact expected

In terms of the above matrix, the predicted or anticipated impact of the proposed solar power plant on heritage features will be high. This impact can be reduced by mitigating (Phase 2 archaeological investigation) the impact on the site that has been selected for the proposed solar power facility, before construction starts.

4. HERITAGE IMPACT ASSESSMENT

4.1 Approach

4.1.1 Definitions and assumptions

The following aspects have a direct bearing on the investigation and the resulting report:

- *Cultural (heritage) resources* are all non-physical and physical human-made occurrences, as well as natural occurrences that are associated with human activity. These include all sites, structures and artefacts of importance, either individually or in groups, in the history, architecture and archaeology of human (cultural) development.

- The *cultural significance* of sites and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these.

- The *value* is related to concepts such as *worth*, *merit*, *attraction* or *appeal*, concepts that are associated with the (current) usefulness and condition of a place or an object. Hence, in the development area, there are instances where elements of the place have a high level of significance but a lower level of value.

- It must be kept in mind that significance and value are not mutually exclusive, and that the evaluation of any feature is based on a combination or balance between the two.

- Isolated occurrences: findings of artefacts or other remains located apart from archaeological sites. Although these are noted and samples are collected, it is not used in impact assessment and therefore do not feature in the report.

- Traditional cultural use: resources which are culturally important to people.

- All archaeological remains, artificial features and structures older than 100 years and historic structures older than 60 years are protected by the relevant legislation, in this case the National Heritage Resources Act (NHRA) (Act No. 25 of 1999). No archaeological artefact, assemblage or settlement (site) and no historical building or structure older than 60 years may be altered, moved or destroyed without the necessary authorisation from the South African Heritage Resources Agency (SAHRA) or a provincial heritage resources authority. Full cognisance is taken of this Act in making recommendations in this report.

- The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3, and the Australian ICOMOS Charter (also known as the Burra Charter) are used when determining the cultural significance or other special value of archaeological or historical sites.

- It should be kept in mind that archaeological deposits usually occur below ground level. Should artefacts or skeletal material be revealed at the site during construction, such activities should be halted, and it would be required that the heritage consultants would be required to be notified in order for an investigation and evaluation of the find(s) to take place (*cf.* NHRA (Act No. 25 of 1999), Section 36 (6)).

4.1.2 Limiting/Restricting factors

The investigation has been influenced by the following factors related to the overall HIA:

- Unpredictability of buried archaeological remains (absence of evidence does not mean evidence of absence)
- Due to the size of the area and time constrains, only sections could be sampled (surveyed) in detail. However, it can be assumed that whatever was identified here in terms of heritage features (mainly Stone Age artefacts) applies to the entire area.

4.1.3 Field work

Field survey in January 2011, during which sections of the feasibility area were investigated on foot. The most likely site for the solar power facility (closest to the Aries substation) was investigated more thoroughly. Certain parts of the landscape (sandier sections) were found generally to exhibit lower evidence of archaeological artefacts and were checked at random intervals, while other features that were more likely to have been foci for past human activity (e.g. outcrops, drainage lines etc.) were sampled more systematically. The stony and gravelly sections of the feasibility area were found to exhibit high evidence of archaeological artefacts. In general the archaeological visibility was excellent. Although GPS coordinates were taken on many locales (Sites), many more sites (scatters and concentrations of stone tools) were not recorded as it became clear during the assessment that most of the area is covered by Stone Age material and that it would be a near impossible task taking the scope and time-frame of the assessment into consideration to mark all the finds. Apart from a single Martini-Henry rifle cartridge casing, the remains of small unidentified stone-walled structures (outside the site) and some water retaining walls (dam walls in the dry river bed), no significant heritage features associated with colonial (post-archaeological) settlement are evident.

4.1.4 Desktop study

- Published literature
- Aerial images (contemporary)
- Cadastral farm diagrams
- Archival records
- Maps (contemporary and historic)
- Unpublished reports
- Internet

4.1.5 Verbal information

- Land-owner

4.2 General issues of area and context

4.2.1 Context		
	(check box of all relevant categories)	*Brief description/explanation*
	Urban environmental context	• Tracks • Fences • Power lines • Earth walls • Stone-walled structures
x	Rural environmental context	
	Natural environmental context	
Formal protection (NHRA)		
	Is the property part of a protected area (S. 28)?	No
	Is the property part of a heritage area (S. 31)?	No
Other		
	Is the property near to or visible from any protected heritage sites?	No
	Is the property part of a conservation area or special area in terms of the Zoning Scheme?	No
	Does the area form part of a historical settlement or townscape?	No
x	Does the area form part of a rural cultural landscape?	Yes: Farm land
x	Does the area form part of a natural landscape of cultural significance?	Yes: Archaeological landscape
	Is the area within or adjacent to a scenic route?	No

	Is the property within or adjacent to any other area which has special environmental or heritage protection?	No
	Does the general context or any adjoining properties have cultural significance?	No

4.2.2 Property features and characteristics		
	(check box if YES)	*Brief description*
x	Have there been any previous development impacts on the property	Yes: Roads, tracks, fences, power lines, earth walls
x	Are there any significant landscape features on the property?	Dry river bed
	Are there any sites or features of geological significance on the property?	No
x	Does the property have any rocky outcrops on it?	Yes
	Does the property have any fresh water sources (springs, streams, rivers) on or alongside it?	Yes (west of area , outside boundaries)
	Does the property have any sea frontage?	No
	Does the property form part of a coastal dune system?	No
	Are there any marine shell heaps or scatters on the property?	No
	Is the property or part thereof on land reclaimed from the sea?	No

4.2.3 Heritage resources on the property		
	(check box if present on the property)	*Name / List / Brief description*
Formal protections (NHRA)		
	National heritage site (S. 27)	No
	Provincial heritage site (S. 27)	No
	Provisional protection (s.29)	No
	Place listed in heritage register (S. 30)	No
General protections (NHRA)		
	structures older than 60 years (S. 34)	No
x	archaeological site or material (S. 35)	Stone Age artefacts
	palaeontological site or material (S. 35)	No
	graves or burial grounds (S. 36)	No
	public monuments or memorials (S. 37)	No
Other		
	Any heritage resource identified in a heritage survey (state author and date of survey and survey grading/s)	No
	Any other heritage resources (describe)	No

4.2.4 Property history and associations		
	(check box if YES)	*Brief description/explanation*
x	Provide a brief history of the property (e.g. when granted, previous owners and uses).	See Appendix 1
	Is the property associated with any important persons or groups?	No
	Is the property associated with any important events, activities or public memory?	No
	Does the property have any direct association with the history of slavery?	No
	Is the property associated with or used for living heritage?	No
	Are there any oral traditions attached to the property?	No

4.3 Summarised identification and significance assessment of heritage resources

See Appendix 3 for significance assessment criteria

TABLE 9: Identification and significance assessment of heritage features

S 3(2) NHRA heritage resource category	ELEMENTS	INDICATORS OF HERITAGE SIGNIFICANCE										CUMULATIVE SIGNIFICANCE RATING (TOTAL 30) 1-9 = Low 10-19 = Medium 20-30 = High
		HISTORICAL	RARE	SCIENTIFIC	TYPICAL	AESTHETIC	TECHNOLOGICAL	PERSON COMMUNITY	LANDMARK	MATERIAL CONDITION	SUSTAINABILITY	
Buildings, structures, places and equipment of cultural significance	Earth walls, stone-walled structures	1	0	0	1	0	0	1	1	1	1	6 = Low
Areas to which oral traditions are attached or which are associated with intangible heritage	None	-	-	-	-	-	-	-	-	-	-	-
Historical settlements and landscapes	None	-	-	-	-	-	-	-	-	-	-	-
Landscapes and natural features of cultural significance	None	-	-	-	-	-	-	-	-	-	-	-
Geological sites of scientific or cultural importance	None	-	-	-	-	-	-	-	-	-	-	-
Archaeological and palaeontological sites	Stone Age artefacts	3	2	3	3	1	3	2	0	3	0	21 = High
Graves and burial grounds	None	-	-	-	-	-	-	-	-	-	-	-

Areas of significance related to labour history	None	-	-	-	-	-	-	-	-	-	-	-
Movable objects	None	-	-	-	-	-	-	-	-	-	-	-

4.4 Impact assessment

4.4.1 General remarks

Heritage impacts may happen either during construction or operation, or both, and are categorised as:

- Neutral (no impact)
- Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries
- Indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment
- Cumulative impacts that are combinations of the above

The predicted heritage development impacts on the site during construction are:

- In the case of outcrops and the flat sections of the feasibility area: High direct negative impact
- Curious workers and visitors may damage, remove or destroy archaeological artefacts surrounding the construction site

The predicted heritage development impacts on the site during operation are:

- Neutral with regard to the actual solar power facility site (assuming it would have been sampled before construction)
- Potentially negative with regard to the areas around the solar power facility site, e.g. curious workers and visitors may damage, remove or destroy archaeological artefacts surrounding the facility

The assessment of the visual impact on the environment is a separate investigation by a visual impact specialist.

Heritage impacts can be managed through one or a combination of the following measures:

- Mitigation (minimising adverse impacts through further documentation and research and similar activities before a place or collection of objects is altered or destroyed)
- Avoidance (staying away from heritage features)
- Compensation (balancing of making good the destruction of one heritage feature by the preservation of another one)
- Enhancement (positive impacts on heritage features)
- Rehabilitation (re-use of preserved heritage features)
- Interpretation (providing information on heritage features)
- Memorialisation (retaining the memory of important heritage features that have been destroyed)
- No action
- Relocation (historic equipment, graves)
- Alternatives

Of the above measures, a combination of interpretation and mitigation (Phase 2 archaeological investigation) applies in the case of this project.

4.4.2 Stone Age sites

The accompanying Archaeological Impact Assessment (AIA) report contains details regarding the location and significance of sites.

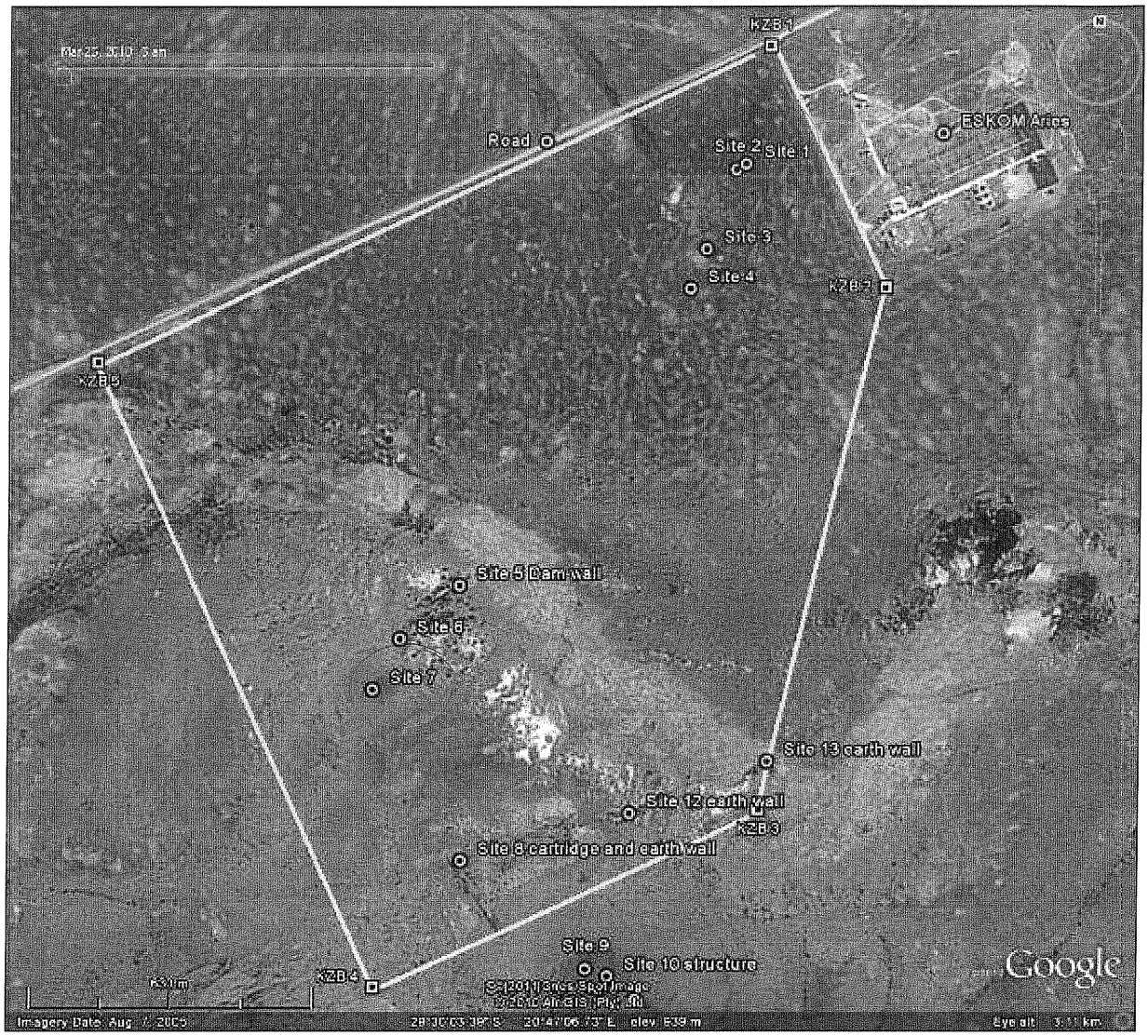

FIGURE 7: Google Earth image (2005) of the development area indicating the archaeological and historical sites that were investigated in some detail

FIGURE 8: Early and Middle Stone Age artefacts (Photo: RC de Jong)

4.4.3 Historic built environment sites

S 3(2) NHRA heritage resource	(a) Identification		(b) Significance	(c) Impact		(d) Recommended impact management
	Site	GPS		Study area	Impact type, certainty and significance	
Buildings, structures, places and equipment of cultural significance	5	29°30'7.90"S 20°46'57.30"E	Low (local)	Centre of area	Neutral (no impact)	Remains of earth dam wall across dry river bed, with Stone Age artefacts. The dry river bed seems unsuitable for as a site for the project and therefore no impact is anticipated. No action.
	8	29°30'27.50"S 20°46'57.50"E	Low (local)	SW portion of area	Neutral (no impact)	Remains of low earth wall; function unclear. The structure has low significance and is in a poor condition, not worth preserving. No action.
	12	29°30'24.16"S 20°47'11.34"E	Low (local)	Near southern boundary of area	Neutral (no impact)	Remains of earth dam wall across dry river bed. The dry river bed seems unsuitable for as a site for the project and therefore no impact is anticipated. No action.
	13	29°30'20.45"S 20°47'22.60"E	Low (local)	On extreme eastern periphery of area	Neutral (no impact)	Remains of low earth wall across dry river bed. The structure has low significance and is in a poor condition, not worth preserving; also is located on the area periphery. No action.
	10, 11	See AIA report	Low (local)	Outside area boundaries	Neutral (no impact)	No action

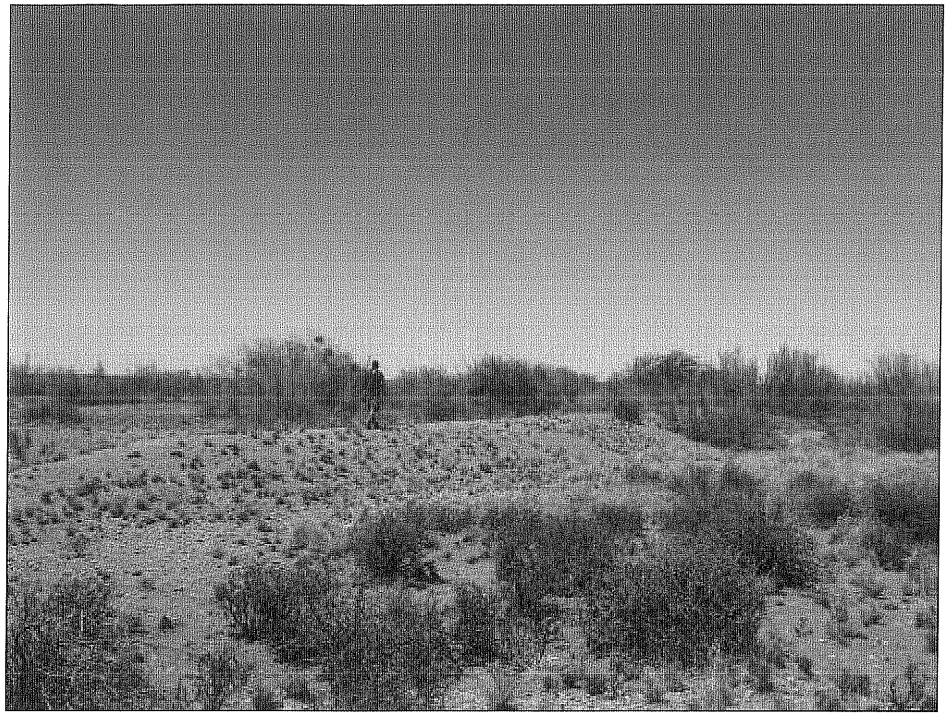

FIGURE 9: Earth retaining wall constructed across the dry river bed at Site 5

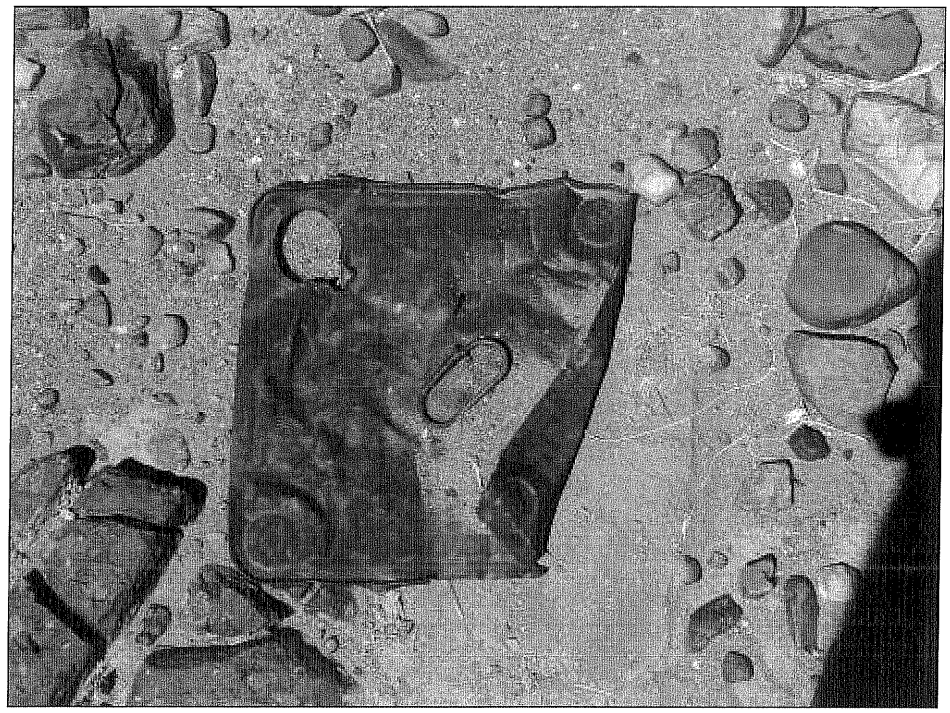

FIGURE 10: Remains of paraffin can indicating human activities during historical times

4.4.3 Summarised impact assessment

TABLE 10: Identification of heritage features, impacts and impact management measures

S 3(2) NHRA heritage resource	(a) Identification		(b) Significance	(c) Impact		(d) Recommended impact management
	Site	GPS		Study area	Impact type, certainty and significance	
Buildings, structures, places and equipment of cultural significance	5	29°30'7.90"S 20°46'57.30"E	Low (local)	Centre of area	Neutral (no impact)	Remains of earth dam wall across dry river bed, with Stone Age artefacts. The dry river bed seems unsuitable for as a site for the project and therefore no impact is anticipated. No action.
	8	29°30'27.50"S 20°46'57.50"E	Low (local)	SW portion of area	Neutral (no impact)	Remains of low earth wall; function unclear. The structure has low significance and is in a poor condition, not worth preserving. No action.
	12	29°30'24.16"S 20°47'11.34"E	Low (local)	Near southern boundary of area	Neutral (no impact)	Remains of earth dam wall across dry river bed. The dry river bed seems unsuitable for as a site for the project and therefore no impact is anticipated. No action.
	13	29°30'20.45"S 20°47'22.60"E	Low (local)	On extreme eastern periphery of area	Neutral (no impact)	Remains of low earth wall across dry river bed. The structure has low significance and is in a poor condition, not worth preserving; also is located on the area periphery. No action.
	10, 11	See AIA report	Low (local)	Outside area boundaries	Neutral (no impact)	No action
Areas to which oral traditions are attached or which are associated with intangible heritage	None	-	-	-	-	No action
Historical settlements and landscapes	None	-	-	-	-	No action
Landscapes and natural features of cultural significance	None	-	-	-	-	No action
Geological sites of scientific or cultural importance	None	-	-	-	-	No action
Archaeological and palaeontological sites	Chance finds	Unknown	Low local?	Entire?	Unknown	Mitigation: Report and evaluate any sub-surface graves or large scatters of artefacts when found
	Around hillocks and boulder clusters and on rocky outcrops	See AIA report for sampled sites	Medium to high regional	Entire	Possibly medium negative (depending on location of solar facility)	Mitigation: Phase 2 archaeological investigation through systematic collection, mapping and excavation of the selected site for the project before construction.
Graves and burial sites	None	-	-	-	-	No action
Features associated with labour history	None	-	-	-	-	

S 3(2) NHRA heritage resource	(a) Identification		(b) Significance	(c) Impact		(d) Recommended impact management
	Site	GPS		Study area	Impact type, certainty and significance	
Movable objects	Spent Martini-Henry cartridge, fragments of tins, bottles etc	-	-	-	-	

4.5 Social and economic benefits

The development will have direct benefits related to the conservation of heritage resources (artefacts) since, through mitigation (sampling and mapping) the project represents an opportunity to learn more about them. If sub-surface important archaeological and palaeontological features are exposed during site preparation activities, this may also present an opportunity to conduct a similar Phase 2 (archaeological and palaeontological) investigation that may generate new information, before such features may be destroyed.

The project has the potential to create sustainable employment in the Northern Cape while addressing some of the fundamental drivers of Climate Change. Being one of the pioneers of solar power in South Africa the project has the inherent role of developing solar power technology for the region. The viability and success of this project is strategic to paving the way for sustainable power technologies in this region. This is a project of strategic and national importance and capable of enhancing South Africa's position in the global technology arena while aligning with the commitments made by South Africa in Copenhagen.

4.6 Consultation with affected communities

This is part of the EIA process.

4.7 Identification of other risk sources

The following project actions may impact negatively on any potential palaeontological and archaeological sites and remains.

The actions are likely to occur during the construction phases of the proposed project:

- Earthworks and excavations may expose or uncover more objects and artefacts and unmarked human burials.
- Curious workers and visitors may damage, destroy or remove archaeological artefacts

The actions are likely to occur during the operation phase of the proposed project:

- Curious workers and visitors may damage, destroy or remove archaeological artefacts

4.8 Key mitigation and enhancement measures during site preparation and construction

- Monitor for sub-surface chance finds (e.g. burial sites, old waste disposal sites, ruins, foundations, Stone Age tools, bones, etc)

4.9 Consideration of alternatives

The nature and significance of what has been found in terms of heritage is not of such importance that the proposed location for the development should be changed or that other alternatives should be considered.

4.10 Summarised findings and recommendations

The feasibility area proposed for the solar power facility is located in a cultural landscape classified primarily as a historical farming landscape and secondarily as an archaeological landscape. The primary

class of landscape is of low to medium heritage sensitivity because it is because it is able to absorb new development with some adverse effects on heritage features.

Besides very large numbers of Stone Age artefacts (scatters and sites or clusters) and a few earth walls, no other significant heritage resources were identified. With little archaeological research done in the area to date the sites are of medium to high significance.

The predicted heritage impacts during construction are medium to high negative, since the entire feasibility area is covered with Stone Age artefacts, irrespective of the final selected project site. The whole area can therefore be marked as a Stone Age site, with potentially millions of artefacts present. The area is therefore very significant and mitigation measures will have to be implemented before any development takes place.

The predicted impacts during operation are neutral, provided that that the area sections that have not been selected for the project are avoided to prevent damage, destruction or removal.

Visual intrusion as an indirect impact may be an issue, but this is assessed by another specialist. Noise, dust, pollution and restrictions of access patterns as indirect impacts are also not issues.

There are no compelling reasons not to authorise the proposed solar power facility and the proposed development can continue provided that the following mitigation measures are adopted to minimise predicted and unpredicted adverse impacts on heritage features:

1. In order to minimise the risk of adverse impacts on archaeological sites and artefacts (associated with the construction of transmission links), the proposed solar power facility should be located as close as possible to the Aries substation.
2. With little or no archaeological research done previously in the area as well as the fact that there is so much material present (covering basically the totality of the assessed area), it is recommended that mitigation measures are implemented to minimize the impact of the development on the Stone Age sites in the area. This would include systematic sampling of stone tools, mapping and drawing of the sites and finds, as well as archaeological excavations at Site 7 in order to collect as much material and information on the Stone Age utilization of the area. This mitigation need not be done for the total area, but only in the area earmarked for the solar panel plant (20 hectare area). As soon as its precise location is known these mitigation measures should be undertaken. If Site 7 can be avoided (buffer zone placed around the outcrop on which it is located) no further mitigation measures would be required.
3. It is also recommended that an Information Plaque, containing information on the archaeology and history of the area, be erected at the Solar Power Plant's office.
4. Finally, it should be noted that the subterranean presence of archaeological and/or historical sites, features or artefacts are always a distinct possibility. Care should therefore be taken during any development activities that if any of these are accidentally discovered, a qualified archaeologist be called in to investigate.
5. Workers involved with construction and operation should be empowered through training to recognise archaeological artefacts.

APPENDIX 1: SOCIO-CULTURAL HISTORY OF DEVELOPMENT AREA

When the Swedish-born traveller and explorer Hendrik Wikar reached the middle and lower reaches of the Orange River in 1778 after a long land journey that started in Cape Town, he met Khoisan communities who called themselves the *Einiqua*, or *River People*, divided into three "kraals": the Namnykoa near the Augrabies Falls, the Kaukoa on islands west of Keimoes, and the Aukokoa of Kanoneiland and other islands to the east. He was followed by Robert Gordon, a Cape officer who was appointed to survey the interior. Gordon likewise documented the people and the landscape. Many years later the Gordonia District was named after him. Both Wikar and Gordon probably would have travelled past the area where Klein Zwart-Bast is located.

The Einiqua were not the first communities who lived along the Orange River. Occupation of the larger region took place since the Early Stone Age, with occurrences of Middle Stone Age more frequent than the Early Stone Age. However, it is mostly during the Later Stone Age when population density increased. The Stone Age artefacts that were found on the feasibility area in the course of the investigation are significant remnants associated with this period of human settlement, characterised by nomadic movement dictated by the availability of water, game, edible plants, shelter and material to manufacture tools and weapons. The spread of Iron Age communities did not extend this far to the west.

By 1730 the first wave of *Trekboere* reached the lower Orange River, nomadic farmers who periodically settled where there was water and grazing for their livestock. One of the reasons the Cape Northern Frontier stayed an open frontier until the 19th century was the climate and environment. It was very dry and communities had to be nomadic to survive and never owned land because they would have to move when the season changed. The interior of the Cape Colony was very dry and not fertile enough for large crops and farmers could only live around springs or fountains that produced water all year round. The Karoo formed part of the interior of the Cape Colony and couldn't provide permanent grazing for animals. This situation forced the Dutch farmers to expand towards the north and northwest into the Kalahari to find more fertile land.

Very few of them chose to settle permanently, even after the Orange River was proclaimed as the Cape Colony's northern border in December 1847. However, the Cape Colonial government did not have the resources to manage this vast area, which was regarded as a semi-desert only suitable to the *Trekboere* and the Khoisan communities (in particular the Korana) who likewise led a nomadic lifestyle.

Droughts and other environmental factors eventually resulted in increasing competition between the *Trekboere* and the Khoisan communities, which increased in violence in the mid-1860s and ended in the First Korana War of 1868-1869. This was exacerbated when the colonial government started granting grazing licenses to the *Trekboere* in 1867.

The Cape Colonial Government sent a special magistrate and border police force to the Kenhardt area in 1868 to serve as a buffer against the Koranas. For a long time it was the most remote white settlement in the North-Western Cape. As a town it was founded on the Hartbees River in 1876. Nothing is known about the origin of the name. A village management board was established in 1881, attaining municipal status in 1909.

The spread of white colonial settlement lead to the formal surveying and proclamation of farms, amongst them the farm Klein-Zwart-Bast. Little is known about its history. The farm was formally surveyed in 1883, with Portion 1 (named *Die* Hoek) surveyed in 1944. Portion 2 was surveyed for the Aries substation and transmission line servitudes. The farm was named after the occurrence of the bladder-nut or swartbas (*Diospyros* whyteana).

It appears as if colonial farmers started occupying and farming the land permanently in the early 20th century. Before that the farm may have been occupied sporadically for grazing and hunting purposes, as evidenced from the spent Martini-Henry cartridge (a type of fire-arm commonly used in the 1880s and 1890s). The land was suitable only for grazing karakul and other fat-tailed sheep breeds and hence, apart from fencing, access tracks and fences, little else was needed in terms of permanent infrastructure. What is currently in existence is of modern origin and has no specific heritage significance.

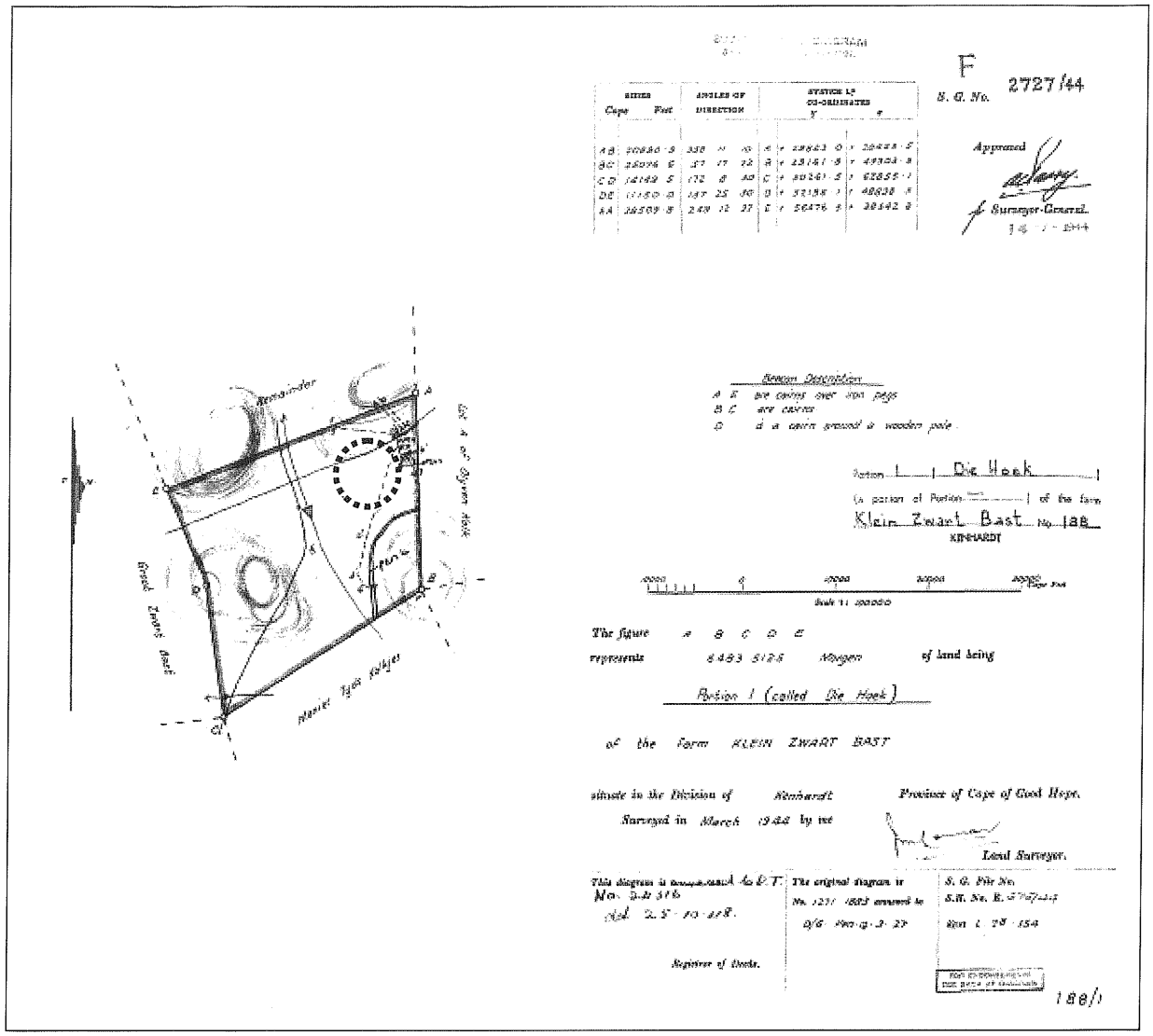

FIGURE 11: Survey diagram (1944) of Portion 1 (Die Hoek) indicating the location of the feasibility area

The Anglo-Boer War (1899-1902) directly affected the Kenhardt region. The invasion of the Natal and Cape colonies was part of the Boer military strategy. Natal was not a happy hunting ground for the Boers because of the overwhelming British strength. If Boer dreams of a colonial rebellion were to be realised anywhere then it was in the Cape, with its rural population of Dutch-speaking inhabitants, rather than Natal, with its loyal British settlers. But the Cape, though burnt by the passage of war, did not flare into uncontrollable conflagration. The Cape had been invaded at the very outset of the war. By March 1900 Boer forces had taken Prieska, Kenhardt, Kakamas and Upington, attracting rebel support in the process. But Cronje's defeat at Paardeberg and the despatch of British columns to recapture the northern towns meant the collapse of this invasion by the end of June 1900.

As early as May 1900 young coloured men in the Upington district were formed into the Border Scouts and came to number 786 members at their peak, a huge number for the sparsely populated regions they represented. They were supported by the Bushmanland Borderers from the Kenhardt district (600 strong) and the Namaqualand Border Scouts from the west (300 strong). The primary function of these local militias was to patrol the region and defend its towns, although on occasions they came into direct armed conflict with Boer forces. The battle of Naroegas, or Nouroegas occurred between Kenhardt and Upington, a desolate part of Bushmanland, on 23 May 1901. There is rough agreement that a group of Border Scouts ambushed a Boer commando under the leadership of the notorious Edwin Conroy and inflicted a defeat upon them.

The remains of the stone-walled structures (just outside the feasibility area) resemble the type of military enclosures favoured for watch-keeping purposes, although their exact origin still must be established.

APPENDIX 2: INFORMATION SOURCES USED IN THIS REPORT

Databases

Environmental Potential Atlas, Department of Environmental Affairs and Tourism.
Heritage Sites Database, Pretoria
SAHRA database of archaeological impact assessment reports (2009)

Literature

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Living with the land. A manual for documenting cultural landscapes in the Northwest Territories. Yellowknife (Canada), 2007.

National Heritage Resources Act (Act 25 of 1999)

PALGRAVE, Keith Coates, 2002, *Trees of Southern Africa*. New edition edited by Meg Coates Palgrave. Struik: Cape Town.

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Standard Encyclopedia of Southern Africa.

WILSON, MGC, & ANHAEUSSER, CR, 1998, *The mineral resources of South Africa*, Council for Geoscience Handbook 16. Pretoria: Council for Geoscience.

Unpublished reports

MORRIS, D, 2006, *Archaeological Specialist Input to the EIA Phase for the proposed Aries-Garona ESKOM Transmission Power Line, Northern Cape and Comment on the Garona Substation Extension.* Unpublished Report September 2006 for Tswelopele Environmental.

Maps

2920 BD Grootriet (1971, 2003)
2920 DB Sonderhuis (1971, 2003)
Cadastral diagrams of the farm (Chief Surveyor-General)
Maps (and other information) provided by client

Aerial photos

Google Earth 2005

Internet

http://www.getaway.co.za/article/into-the-cape---the-anglo-boer-wars-1999-09-01

APPENDIX 3: GLOSSARY OF TERMS

Cultural significance (Burra Charter)

Aesthetic, historic, scientific, social or spiritual importance, meaning or noteworthiness for past, present or future generations

Cultural significance is embodied in the place itself (intrinsic significance), its fabric, setting, use, associations, meanings, records, related places and related objects.

Cultural significance is assessed in terms of the following criteria, some of which are embodied in the NHRA:

- Historic value: Material or intangible evidence resulting from changing social, political and environmental circumstances or conditions
- Rarity: Unique or unusual features also possess rarity value, apart from their age. Section 34 of the NHRA provided general protection for all structures older than 60 years. This does not imply that recently erected structures cannot possess rarity, or for that matter cultural value.
- Scientific value: Indicates research potential (the capacity to yield more knowledge)
- Typical: Indicates that the feature is a good example of a certain class or type of heritage resource
- Aesthetic: Other than artistic or architectural expression, aesthetic value can also be evident in craftsmanship, technique, visual cohesion (harmony), visual evidence of permanence and stability, setting etc.
- Technological: Indicates value in terms of a technological achievement
- Personal/Community: Indicates value in terms of association with a certain person, community, organisation or cultural group
- Landmark: A sense of place or belonging involves the physical and visual relationship between a feature and its environment.
- Condition (material integrity): Indicates substantial evidence of authentic fabric with minor degree of lost or obliterated fabric; also refers to a structure's restoration potential
- Sustainability: The potential for lasting economic viability (use) and the perpetuation of the original use or part thereof.

Heritage resources/features (NHRA)

Any place or object of cultural significance, including:
(a) places, buildings, structures and equipment of cultural significance;
(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 of cultural significance;
(e) geological sites of scientific or cultural importance;
(f) archaeological and palaeontological sites;
(g) graves and burial grounds, including—
(i) ancestral graves;
(ii) royal graves and graves of traditional leaders;
(iii) graves of victims of conflict;
(iv) graves of individuals designated by the Minister by notice in the *Gazette*;
(v) historical graves and cemeteries; and
(vi) other human remains, which are not covered in terms of the Human Tissue Act, 1983 Act No. 65 of 1983);
(h) sites of significance relating to the history of slavery in South Africa;
(i) movable objects, including—

(i) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
(ii) objects to which oral traditions are attached or which are associated with living heritage;
(iii) ethnographic art and objects;
(iv) military objects;

(v) objects of decorative or fine art;
(vi) objects of scientific or technological interest; and
(vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

Heritage significance (NHRA)

(a) its importance in the community, or pattern of South Africa's history;
(b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
(c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
(d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
(e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
(g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
(h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
(i) sites of significance relating to the history of slavery in South Africa.

Historic period

Since the arrival of the white settlers - c. AD 1840 in this part of the country

Impact

A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space

Impact assessment

Issues that cannot be resolved during screening (Level 1) and scoping (Level 2) and thus require further investigation

Intangible heritage

Defined in terms of the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (2003) as:

- Oral traditions and expressions, including language as a vehicle of the intangible cultural heritage;
- Performing arts;
- Social practices, rituals and festive events;
- Knowledge and practices concerning nature and the universe;
- Traditional craftsmanship.

The "intangible cultural heritage" means the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. This intangible cultural heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity.

Visual and social impact assessments as part of an HIA are directly associated with intangible cultural heritage.

Iron Age

Early Iron Age (EIA)	AD 200 - AD 1000
Late Iron Age (LIA)	AD 1000 - AD 1830

changed in rev report

Issue

A question that asks what the impact of the proposed development will be on some element of the environment

Maintenance

Keeping something in good health or repair

Management actions

Actions that enhance benefits associated with a proposed development or avoid, mitigate, restore, rehabilitate or compensate for the negative impacts

Preservation

Conservation activities that consolidate and maintain the existing form, material and integrity of a cultural resource

Reconstruction

Re-erecting a structure on its original site using original components

Rehabilitation

Re-using an original building or structure for its historic purpose or placing it in a new use that requires minimal change to the building or structure characteristics and its site and environment.

Restoration

Returning the existing fabric of a place to a known earlier state by removing additions or by reassembling existing components

SAHRA - South African Heritage Resources Agency

Stone Age

a bit too early

Early Stone Age (ESA)	2 000 000 - 150 000 Before Present
Middle Stone Age (MSA)	150 000 - 30 000 BP
Late Stone Age (LSA)	30 000 - until c. AD 200

Value

Worth, conservation utility, desirability to conserve etc in terms of physical condition, level of significance (importance), economy (feasibility), possible new uses and associations/comparisons with similar features elsewhere

APPENDIX 4: TECHNICAL INFORMATION ABOUT THE PROPOSED PROJECT

PV Array technical details:

- Distance between panel rows – 5.7m
- Height of panels above ground – 1.32m at the lower end and 3.004m at the high end
- Number of panels in a row – 5m buffer from the boundary fence, 240 panels in a double row, 5m access road in between the row, another 240 panels in a double row and a 5m buffer from the boundary fence
- Number of rows – up to 48 rows of panels
- Panels have a junction box located below the rows where all connections between rows meet up. Underground cables run from this box to the inverter/ transformer house at 400V DC

Auxiliary onsite structures:

- Inverter/ transformer building – Eight (8) 6mX3m brick buildings located within the PV array each containing a 1250kW inverter and a 400V/22kV step up transformer
- Combined guard house/ control room – One (1) 100m^2 brick building on the perimeter of the plant. Guardhouse will include a small kitchen and toilet. Building will include a storeroom for spare parts kept onsite. Control room will contain switchgear and monitoring equipment for the PV plant. The buildings will be a standard height of approximately 3m high.
- Small substation for the plant will be located on the outside of the control room. It will have an AC bus bar for connections from the 22kV side of the transformers. These cables will also be routed underground at 22kV. Transmission lines to the grid connection point will leave the plant from the substation.
- Cable trenches will be approximately 600mm (0.6m) deep and 400mm (0.4m) wide and backfilled with sand. Manhole covers will be placed every 40m or each direction change. A concrete slab will be placed where vehicles pass over cable trenches