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# HERITAGE IMPACT ASSESSMENT REPORT

## EIA PHASE

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Proposed establishment of the Karoshoek Valley Solar Park components on Sites 1.1, 1.3, 1.4, 2, 3, 4 & 5 on sites located south and east of Upington, Northern Cape Province.

Prepared By:



## **Credit Sheet**

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**Disclaimer;** Although all possible care is taken to identify all sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the study. G&A Heritage and its personnel will not be held liable for such oversights or for costs incurred as a result of such oversights.

## Statement of Independence

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

Signed off by S. Gaigher

A handwritten signature in black ink, appearing to read 'S. Gaigher', with a stylized flourish at the end.

**Site name and location:** Proposed establishment of the Karoshoek Solar Valley Park infrastructure, on a site located 30 km east of Upington, Northern Cape Province.

**Municipal Area:** Siyanda District Municipality.

**Developer:** FG Emvelo Energy (Pty) Ltd

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

Date of Report: 30 April 2012

## Management Summary

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 Karoshoek Solar Valley Park project. This will entail the construction of several concentrated solar power plants on seven different sites as well as a 400kV power line for grid integration. The solar generation technology for each of these sites are as follows;

Site reference	Project Name and Description	DEA Reference number
Site 2	Karoshoek CPVPD 1 (1 x 25 MW <b>Concentrating photovoltaic or parabolic dish</b> technology project)	14/12/16/3/3/2/292
	Karoshoek CPVPD 2 (1 x 25 MW <b>Concentrating photovoltaic or parabolic dish</b> technology project)	14/12/16/3/3/2/291
	Karoshoek CPVPD 3 (1 x 25 MW <b>Concentrating photovoltaic or parabolic dish</b> technology project)	14/12/16/3/3/2/290
	Karoshoek CPVPD 4 (1 x 25 MW <b>Concentrating photovoltaic or parabolic dish</b> technology project)	14/12/16/3/3/2/289
Site 1.1	Karoshoek LF 1 (1 x 100 MW <b>Linear Fresnel</b> )	14/12/16/3/3/2/293
Site 1.3	Karoshoek PT (1 x 100 MW <b>Parabolic Trough</b> )	14/12/16/3/3/2/294
Site 1.4	Karoshoek LFT 2 (1 x 100 MW <b>Linear Fresnel or Parabolic Trough</b> )	14/12/16/3/3/2/299
Site 3	Karoshoek Tower 1 (1 x 50MW <b>Tower</b> )	14/12/16/3/3/2/298
	Karoshoek Tower 2 (1 x 50MW <b>Tower</b> )	14/12/16/3/3/2/297
Site 4	Karoshoek LFTT 1 (1 X 100 MW <b>Linear Fresnel or Parabolic Trough or Tower</b> )	14/12/16/3/3/2/296
Site 5	Karoshoek LFTT 2 (1 X 100 MW <b>Linear Fresnel or Parabolic Trough or Tower</b> )	14/12/16/3/3/2/295
Grid connection	Electricity distribution line(s) which will connect to an on-site substation / switchyard	14/12/16/3/3/2/288

This study encompasses the Environmental Impact Assessment (EIA) phase of the heritage investigation.

The purpose of the scoping phase of the study is to determine the possible occurrence of sites with cultural heritage significance within the study area and the evaluation of the heritage significance of these sites as well as the possible impacts on such sites by the proposed developments.

## Findings

Artefacts associated with the Stone Age were identified on three of the proposed development sites (Site 1.4, Site 2 & Site 3). These were not found to be representative of

heritage sites and hold no matrix value in themselves. They do however indicate the possibility of unidentified sites being found in the area.

#### Recommendations

No site specific recommendations are necessary.

#### 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
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 for the Proposed Karoshoek Solar Valley Park Project

## Introduction

### Legislation and methodology

G&A Heritage was appointed by Savannah Environmental Pty (Ltd) to undertake a heritage impact assessment for the proposed Karoshoek Solar Valley Park Project. Section 27(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

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

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 scoping study are as follows;

- Field investigations were limited due to time constraints.
- 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 alignment as provided by Savannah Environmental cc is accurate.
- We assumed that the public participation process performed as part of the Scoping and Environmental Impact Reporting (S&EIR) process will be sufficiently encompassing not to be repeated in the Heritage Scoping Phase.

Table 1. Impacts on the NHRA Sections

Act	Section	Description	Possible Impact	Action
National Heritage Resources Act (NHRA)	34	Preservation of buildings older than 60 years	No impact	None
	35	Archaeological, paleontological and meteor sites	Possible Impact	HIA
	36	Graves and burial sites	Possible Impact	HIA
	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.	Yes	Various distribution power lines and access roads
Construction of a bridge or similar structure exceeding 50m in length.	No	N/A
Development exceeding 5000 m <sup>2</sup>	No	Karoshhoek Solar Valley Park
Development involving more than 3 erven or sub divisions	No	N/A
Development involving more than 3 erven or sub divisions that have been consolidated in the past 5 years	No	N/A
Re-zoning of site exceeding 10 000 m <sup>2</sup>	No	N/A
Any other development category, public open space, squares, parks or recreational grounds	No	N/A

## Background Information

### Proposed Karoshhoek Solar Valley Park Infrastructure

#### Project Description

FG Emvelo Energy (Pty) Ltd, an independent power developer of concentrating solar power plants, is in the process of investigating the possible establishment of the Karoshhoek Solar Valley Development, using various concentrating solar generation technologies, on sites located approximately 30 km east of Upington within the Khara Hais Local Municipality in the Northern Cape. The facility is proposed on the following farm portions;

- Portion 0 of Karos 959;
- Portion 3 of Annashoek 41;
- Portion 0 of Zandemm 944;
- Portion 2 of Matjiesrivier 41; and
- Portion RE of Matjiesrivier 41

The electricity that will potentially be generated by these solar power plants will be distributed from these sites and integrated with the existing power infrastructure through the construction of new the construction of a new electricity power line(s) which will connect on-site substation to the 400 kV Upington CSP Main Transmission Substation<sup>1</sup> or the 400 kV Niewenhoop substation or at a location recommended by Eskom within the North West grid. (New 132 kV lines that will connect to the existing 132 kV distribution lines running from the Gordonia Sub Station at Upington has been investigated though a separate heritage study for the connection of sites 1.1; 1.2; 1.3 and 2 to the Eskom grid (this <sup>2</sup>phase is being undertaken through a separate EIA process).

This project is in the Northern Cape, and has various components (refer to table below).

Site reference	Project Name and Description	DEA Reference number
Site 2	Karoshhoek CPVPD 1 (1 x 25 MW <b>Concentrating photovoltaic <u>or</u> parabolic dish</b> technology project)	14/12/16/3/3/2/292
	Karoshhoek CPVPD 2 (1 x 25 MW <b>Concentrating photovoltaic <u>or</u> parabolic dish</b> technology project)	14/12/16/3/3/2/291
	Karoshhoek CPVPD 3 (1 x 25 MW <b>Concentrating photovoltaic <u>or</u> parabolic dish</b> technology project)	14/12/16/3/3/2/290
	Karoshhoek CPVPD 4 (1 x 25 MW <b>Concentrating photovoltaic <u>or</u> parabolic dish</b> technology project)	14/12/16/3/3/2/289
Site 1.1	Karoshhoek LF 1 (1 x 100 MW <b>Linear Fresnel</b> )	14/12/16/3/3/2/293
Site 1.3	Karoshhoek PT (1 x 100 MW <b>Parabolic Trough</b> )	14/12/16/3/3/2/294
Site 1.4	Karoshhoek LFT 2 (1 x 100 MW <b>Linear Fresnel <u>or</u> Parabolic Trough</b> )	14/12/16/3/3/2/299
Site 3	Karoshhoek Tower 1 (1 x 50MW <b>Tower</b> )	14/12/16/3/3/2/298
	Karoshhoek Tower 2 (1 x 50MW <b>Tower</b> )	14/12/16/3/3/2/297
Site 4	Karoshhoek LFTT 1 (1 X 100 MW <b>Linear Fresnel <u>or</u> Parabolic Trough <u>or</u> Tower</b> )	14/12/16/3/3/2/296
Site 5	Karoshhoek LFTT 2 (1 X 100 MW <b>Linear Fresnel <u>or</u> Parabolic Trough <u>or</u> Tower</b> )	14/12/16/3/3/2/295

The following associated infrastructure will also be required for each Concentrated Solar Power (CSP) plant described above within the Karoshhoek Solar Valley Development:

- Power line(s) which will connect to the Upington CSP Main Transmission Substation
- Internal and external access roads
- Accommodation facilities; storerooms
- Temporary waste storage facilities may be required
- Water supply and waste water treatment

<sup>1</sup> This substation is planned to be constructed within Eskom's solar facility site. An EIA process for this substation (and associated power lines) is currently being undertaken by Zitholele Consulting (DEA Ref No: 12/12/20/2606). This substation is expected to be operational within the first quarter of 2016.

<sup>2</sup>DEA ref: 14/12/16/3/3/1/554

Each proposed plant within the Karoshoek Solar Valley Development will take approximately 2-3 years to construct.

The construction of the entire Karoshoek Solar Valley development is expected to take approximately 10-12 years.

Each of the seven sites under investigation is around 400ha in size.

### Site Location

The proposed development is located in an area approximately 30km south of the town of Upington in the Khara Hais Local Municipality, Northern Cape Province. The following farm sections might be affected by the proposed development

- Portion 0 of Karos 959;
- Portion 3 of Annashoek 41;
- Portion 0 of Zandemm 944;
- Portion 2 of Matjiesrivier 41; and
- Portion RE of Matjiesrivier 41

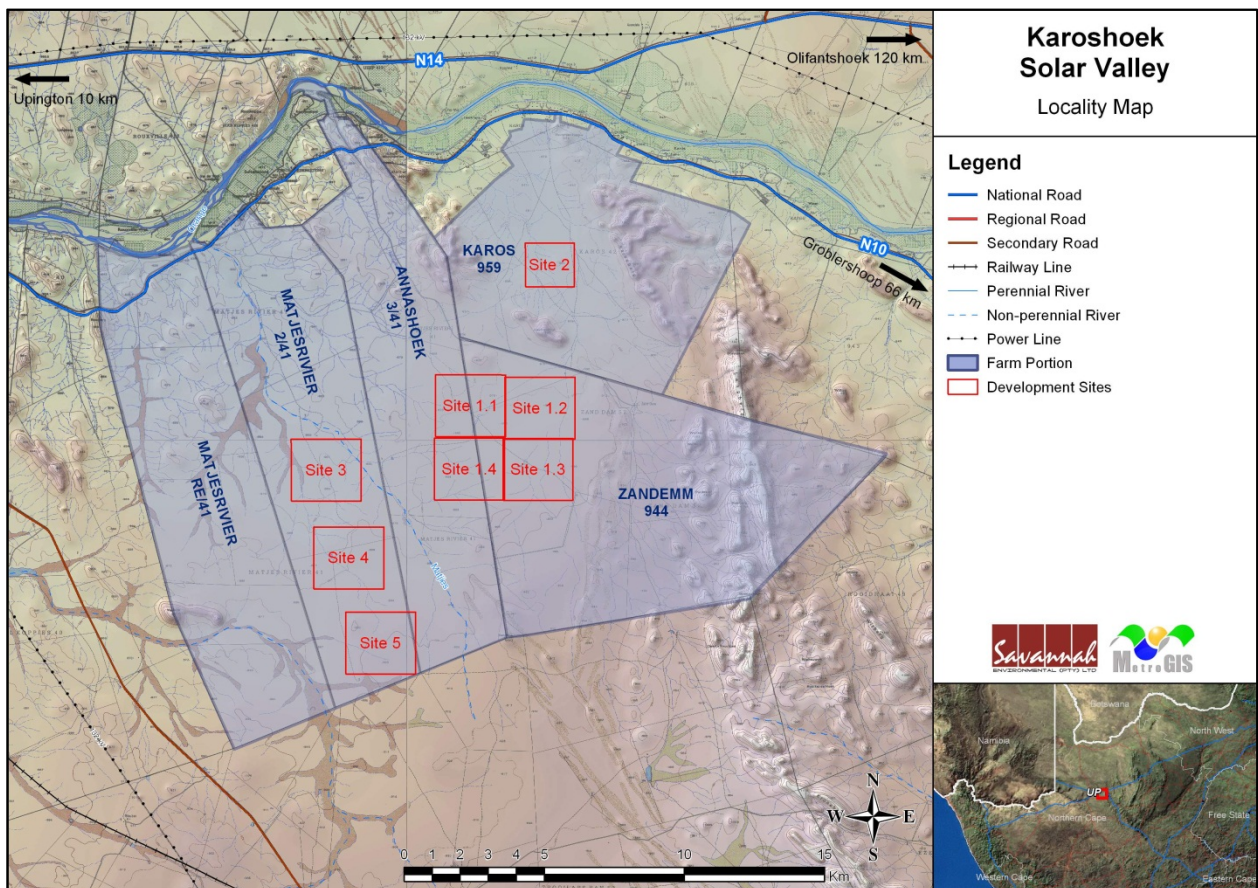


Figure. 1 Proposed Karoshoek Solar Valley Generation Sites

The different sites will be discussed individually while the regional descriptions will be combined.



Figure 2. General Landscape

**Alternatives Considered.**

No alternatives were considered.

**Methodology**

This study defines the heritage component of the Environmental Impact Assessment process being undertaken for the Proposed Karoshoek Solar Valley Park Project. It is described as a Heritage Impact Assessment. This report attempts to evaluate the accumulated heritage knowledge of the area as well as the heritage sensitivity of proposed development areas.

**Evaluating Heritage Impacts**

This Heritage Impact Assessment (HIA) relies on the analysis of written documents, maps, aerial photographs and other archival sources combined with the results of site investigations and interviews with effected people. Site investigations are not exhaustive and often focus on areas such as river confluence areas, elevated sites or occupational ruins.

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRA Database of Heritage Studies
- Upington Museum Information
- Internet Search
- Historic Maps
- 1936 and 1952 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2011 & 2003 imagery

- Published articles and books
- JSTOR Article Archive

### **Assessing Visual Impact**

Visual impacts of developments result when sites that are culturally celebrated are visually affected by a development. The exact parameters for the determination of visual impacts have not yet been rigidly defined and are still mostly open to interpretation. CNdV (Architects) and DEAP (2006) have developed some guidelines for the management of the visual impacts of wind turbines in the Western Cape, although these have not yet been formalized. In these guidelines they recommend a buffer zone of 1km around significant heritage sites to minimize the visual impact.

Similar studies have determined that power lines 132 kV and above are visible but not intrusive in daylight from 5km away. Power lines are however not seen as intrusive until they are 450m or closer to the observer. This aspect will vary especially in cases of cultural landscapes rather than cultural sites. In the case of cultural landscapes the sense of thoroughfare created by the power lines can be seen as detrimental to the landscape character and can significantly influence the "sense of place". The solar generation plant itself, due to its high levels of reflectivity could be visually intrusive to larger distances.



Figure 3. Reflective solar plants (parabolic troughs) proposed for Sites 1.3, 1.4, 4 and 5

### **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 phase 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.

### **Heritage Indicators within the Receiving Environment (Applicable to all Sites under investigation)**

#### **Regional Cultural Context**

##### **Stone Age**

This area is home to all three of the known phases of the Stone Age, namely: the Early- (2.5 million – 250 000 years ago), Middle- (250 000 – 22 000 years ago) and Late Stone Age (22 000 – 200 years ago). The Late Stone Age in this area also contains sites with rock art from the San and Khoi San cultural groups. Early to Middle Stone Age sites are less



common in this area, however rock-art sites and Late Stone Age sites are much better known.

During the Middle Stone Age, 200 000 years ago, modern man or Homo sapiens emerged, manufacturing a wider range of tools, with technologies more advanced than those from earlier periods. This enabled skilled hunter-gatherer bands to adapt to different environments. From this time onwards, rock shelters and caves were used for occupation and reoccupation over very long periods of time.

The Late Stone Age, considered to have started some 20 000 years ago, is associated with the predecessors of the San and Khoi Khoi. Stone Age hunter-gatherers lived well into the 19th century in some places in SA. Stone Age sites may occur all over the area where an unknown number may have been obliterated by mining activities, urbanisation, industrialisation, agriculture and other development activities during the past decades especially associated with the town of Upington.

A limited number of Rock-Art sites are located in this area, mostly due to the lack of suitable shelter sites.

### The Historic Era

Although the town which today is Upington only officially came to be named in 1884, its tempestuous prior history cannot be ignored. Long before white settlers reached the area, Korana Hottentots had settled at the ford in the Great River they called Gariep, the northern border of the Cape Colony. They had been ousted from their ancestral lands in the south and found a last refuge here, on the lush banks of the river. When, inevitably, eventually the white man followed, war broke out between them and the Korana, who had nowhere else to go. They were defeated and the few remaining tribespeople dispersed.

Earlier, a Dutch Reformed Mission had been established under the guidance of the Reverend C. Schreuder at Olijvenhouts Drift, as the ford was called by hunters and traders because of the many wild olivewood trees growing there.

In 1879, after the second and last Korana War, Sir Thomas Upington, Attorney-General of the Cape Colony, sent 80 policemen to the Drift to maintain law and order along the river. Commanded by Captain Dyason they set up camp under the trees, but by 1885 already barracks had been built where later the police station was erected. Dyason's police was very unpopular as they impounded loose animals and generally tried to keep order, while Schreuder only wanted to run a Mission. He venomously referred to the police as "'idle ne'erdowells'" and said of Dyason, "'we beseech to be delivered from such tyranny".'

Schreuder wanted the Mission to be moved elsewhere and in a letter dated the 11th of February 1884 writes, "'It is my wish that Olyvendrift or Upington not become a town but remain a Mission Station.'"

This was the first time the name Upington was officially written to denote the place known as Olijvenhouts Drift and then only out of resentment against the police sent by Thomas Upington.

### Cultural Landscape

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

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	Evidence of human occupation associated with	Yes	Unlikely

Archaeological	the following phases – Early-, Middle-, Late Stone Age, Early-, Late Iron Age, Pre-Contact Sites, Post-Contact Sites		
3 Historic Built Environment	<ul style="list-style-type: none"> <li>- Historical townscapes/streetscapes</li> <li>- Historical structures; i.e. older than 60 years</li> <li>- Formal public spaces</li> <li>- Formally declared urban conservation areas</li> <li>- Places associated with social identity/displacement</li> </ul>	No	No
4 Historic Farmland	<p>These possess distinctive patterns of settlement and historical features such as:</p> <ul style="list-style-type: none"> <li>- Historical farm yards</li> <li>- Historical farm workers villages/settlements</li> <li>- Irrigation furrows</li> <li>- Tree alignments and groupings</li> <li>- Historical routes and pathways</li> <li>- Distinctive types of planting</li> <li>- Distinctive architecture of cultivation e.g. planting blocks, trellising, terracing, ornamental planting.</li> </ul>	Yes	Likely
5 Historic rural town	<ul style="list-style-type: none"> <li>- Historic mission settlements</li> <li>- Historic townscapes</li> </ul>	No	No
6 Pristine natural landscape	<ul style="list-style-type: none"> <li>- Historical patterns of access to a natural amenity</li> <li>- Formally proclaimed nature reserves</li> <li>- Evidence of pre-colonial occupation</li> <li>- Scenic resources, e.g. view corridors, viewing sites, visual edges, visual linkages</li> <li>- Historical structures/settlements older than 60 years</li> <li>- Pre-colonial or historical burial sites</li> <li>- Geological sites of cultural significance.</li> </ul>	Yes	Likely
7 Relic Landscape	<ul style="list-style-type: none"> <li>- Past farming settlements</li> <li>- Past industrial sites</li> <li>- Places of isolation related to attitudes to medical treatment</li> <li>- Battle sites</li> <li>- Sites of displacement,</li> </ul>	No	Unlikely
8 Burial grounds and grave sites	<ul style="list-style-type: none"> <li>- Pre-colonial burials (marked or unmarked, known or unknown)</li> <li>- Historical graves (marked or unmarked, known or unknown)</li> <li>- Graves of victims of conflict</li> <li>- Human remains (older than 100 years)</li> <li>- Associated burial goods (older than 100 years)</li> <li>- Burial architecture (older than 60 years)</li> </ul>	Yes,	Likely
9 Associated Landscapes	<ul style="list-style-type: none"> <li>- Sites associated with living heritage e.g. initiation sites, harvesting of natural resources for traditional medicinal purposes</li> <li>- Sites associated with displacement &amp;</li> </ul>	No	No

	<ul style="list-style-type: none"> <li>- contestation</li> <li>- Sites of political conflict/struggle</li> <li>- Sites associated with an historic event/person</li> <li>- Sites associated with public memory</li> </ul>		
10 Historical Farmyard	<ul style="list-style-type: none"> <li>- Setting of the yard and its context</li> <li>- Composition of structures</li> <li>- Historical/architectural value of individual structures</li> <li>- Tree alignments</li> <li>- Views to and from</li> <li>- Axial relationships</li> <li>- System of enclosure, e.g. defining walls</li> <li>- Systems of water reticulation and irrigation, e.g. furrows</li> <li>- Sites associated with slavery and farm labour</li> <li>- Colonial period archaeology</li> </ul>	Yes	Irrigation farming within the Orange River Valley.
11 Historic institutions	<ul style="list-style-type: none"> <li>- Historical prisons</li> <li>- Hospital sites</li> <li>- Historical school/reformatory sites</li> <li>- Military bases</li> </ul>	No	Unlikely
12 Scenic visual	<ul style="list-style-type: none"> <li>- Scenic routes</li> </ul>	No	No
13 Amenity landscape	<ul style="list-style-type: none"> <li>- View sheds</li> <li>- View points</li> <li>- Views to and from</li> <li>- Gateway conditions</li> <li>- Distinctive representative landscape conditions</li> <li>- Scenic corridors</li> </ul>	No	No

### Impacts Anticipated

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

##### 1. HISTORIC VALUE

It is important in the community, or pattern of history

- o Important in the evolution of cultural landscapes and settlement patterns
- o Important in exhibiting density, richness or diversity of cultural features illustrating the human occupation and evolution of the nation, province, region or locality.
- o 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.

## 2. 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.

## 3. 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.

## 4. 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**

### 1. RARITY

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

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

2. 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 scoping study, as well as all other issues identified in 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.
- 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).

**a) Site 2**

**Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)**

*Nature of Impacts:* Placement of the solar power plant could negatively affect sites associated with the Middle to 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	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Long term (5)</b>	<b>Long term (5)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Medium (45)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Sites of final site placement and associated infrastructure should be investigated for possible archaeological sites by and archaeologist</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information</b>	

**Paleontological sites**

*Nature of Impacts:* No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the generation facility and associated infrastructure.

*Extent of Impact:* Localised damage to possible paleontological sites within the pylon foundations where bedrock is close to the surface or exposed.

Nature of Impact: Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (5)</b>
Magnitude	<b>Low (2)</b>	<b>Low (1)</b>
Probability	<b>Improbable (2)</b>	<b>Improbable (1)</b>
Significance	<b>Low (12)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Paleontological monitoring during construction should bedrock be disturbed</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

### **Mitigation**

Paleontological monitoring during excavation activities if bedrock is to be disturbed.

### **Cultural Landscape**

Several possible cultural landscape components were identified within the study corridors.

*Nature of Impacts:* The construction of the solar power plants could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

### **Mitigation**

None.



**b) Site 1.1.**

**Built Environment**

The area has some agricultural features such as fences, roads and concrete dams.

*Nature of Impacts:* The built environment could be affected by the placement of the solar site.

*Extent of Impact:* Localised damage to sites identified.

Nature of Impact: Impact on the Built Environment due to the construction of CSP plants		
	Without Mitigation	With Mitigation
Extent	<b>Local (1)</b>	<b>Local (1)</b>
Duration	<b>Short term (1)</b>	<b>Long term (1)</b>
Magnitude	<b>Low (3)</b>	<b>Low (3)</b>
Probability	<b>Improbable (1)</b>	<b>Improbable (1)</b>
Significance	<b>Low (5)</b>	<b>Low (5)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>None</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

**Mitigation**

None.

**Cultural Landscape**

Several possible cultural landscape components were identified within the study areas.

*Nature of Impacts:* The construction of the solar generation sites could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Alteration in the cultural characteristics of the landscape		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

**Mitigation**

No further mitigation is recommended.

**c) Site 1.3.**

**Cultural Landscape**

Several possible cultural landscape components were identified within the study areas.

*Nature of Impacts:* The construction of the solar power plants could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

**Mitigation**

No further mitigation is recommended.

**d) Site 1.4.**

**Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)**

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

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible post-contact Stone Age site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Long term (5)</b>	<b>Long term (5)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Medium (45)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Prior to construction sites of final site placement and associated infrastructure should be investigated for possible sites by and archaeologist</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information</b>	

**Paleontological sites**

*Nature of Impacts:* No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the generation facility and associated infrastructure.

*Extent of Impact:* Localised damage to possible paleontological sites within the pylon foundations where bedrock is close to the surface or exposed.

Nature of Impact: Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (5)</b>
Magnitude	<b>Low (2)</b>	<b>Low (1)</b>
Probability	<b>Improbable (2)</b>	<b>Improbable (1)</b>
Significance	<b>Low (12)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Paleontological monitoring during construction phase should bedrock be disturbed</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

**Mitigation**

Paleontological monitoring during excavation activities if bedrock is to be disturbed.

## Cultural Landscape

Several possible cultural landscape components were identified within the study areas.

*Nature of Impacts:* The construction of the solar generation sites could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>None</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

## Mitigation

None

**e) Site 3**

**Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)**

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

*Extent of Impacts:* Localised damage to the sites (see *Impact Statement* section for application).

Nature of Impact: Possible pre-contact Stone Age site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Long term (5)</b>	<b>Long term (5)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Medium (45)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Prior to construction sites of final site placement and associated infrastructure should be investigated for possible sites by and archaeologist</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information</b>	

**Paleontological sites**

*Nature of Impacts:* No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the generation facility and associated infrastructure.

*Extent of Impact:* Localised damage to possible paleontological sites within the pylon foundations where bedrock is close to the surface or exposed.

Nature of Impact: Damage to possible paleontological sites within the pylon foundations where bedrock is exposed or close to the surface.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (5)</b>
Magnitude	<b>Low (2)</b>	<b>Low (1)</b>
Probability	<b>Improbable (2)</b>	<b>Improbable (1)</b>
Significance	<b>Low (12)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Paleontological monitoring during construction should bedrock be disturbed</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

**Mitigation**

Paleontological monitoring during excavation activities if bedrock is to be disturbed.

### **Cultural Landscape**

Several possible cultural landscape components were identified within the study areas.

*Nature of Impacts:* The construction of the solar generation sites could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Impacts on Cultural Landscape		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

### **Mitigation**

No further mitigation is recommended.

**f) Site 4**

**Cultural Landscape**

Several possible cultural landscape components were identified within the study corridors.

*Nature of Impacts:* The construction of the solar power plants could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

**Mitigation**

No further mitigation is recommended.



**g) Site 5**

**Cultural Landscape**

Several possible cultural landscape components were identified within the study corridors.

*Nature of Impacts:* The construction of the solar power plant could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Impacts on the Cultural Landscape		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

## h) Grid Integration Infrastructure

### Archaeological Sites - Pre-Contact Heritage (Stone Age Sites)

All alignments of the proposed power lines

*Nature of Impacts:* The proposed power line alignment could negatively affect sites associated with the Stone Age.

*Extent of Impacts:* Localised damage to the sites

Nature of Impact: Possible pre-contact site could be damaged locally by excavation activities and associated activities		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Long term (5)</b>	<b>Long term (5)</b>
Magnitude	<b>High (8)</b>	<b>Low (1)</b>
Probability	<b>Probable (3)</b>	<b>Improbable (1)</b>
Significance	<b>Medium (45)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Irreversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Sites of final pylon placement and associated infrastructure should be investigated for possible sites by and archaeologist</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>Loss of heritage related information</b>	

### Paleontological sites

*Nature of Impacts:* No paleontological sites of high value could be identified. Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations.

*Extent of Impact:* Localised damage to possible paleontological sites within the pylon foundations where bedrock is close to the surface or exposed.

Nature of Impact: Paleontological sites could be affected if bedrock was to be disturbed during the excavation activities associated with the construction of the pylon foundations.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (5)</b>
Magnitude	<b>Low (2)</b>	<b>Low (1)</b>
Probability	<b>Improbable (2)</b>	<b>Improbable (1)</b>
Significance	<b>Low (12)</b>	<b>Low (8)</b>
Status	<b>Negative</b>	<b>Positive</b>
Reversibility	<b>Irreversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>Yes</b>	<b>No</b>
Can impacts be mitigated	<b>No</b>	<b>Yes</b>
Mitigation	<b>Paleontological monitoring where bedrock is exposed or close to the surface</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

### Mitigation

Paleontological monitoring during excavation activities if bedrock is to be disturbed.

### Built Environment

Although some built structures were noted, none will be affected by any of the alignments.

*Nature of Impacts:* No built environment sites were located within the proposed corridors.

*Extent of Impact:* No damage is anticipated as no sites were identified.

Nature of Impact: No sites falling within the Built Environment were identified within any of the power line corridors.		
	Without Mitigation	With Mitigation
Extent	<b>Local (1)</b>	<b>Local (1)</b>
Duration	<b>Short term (1)</b>	<b>Long term (1)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (1)</b>	<b>Improbable (1)</b>
Significance	<b>Low (3)</b>	<b>Low (3)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

### Mitigation

No sites were identified and therefore no mitigation is recommended.

### Cultural Landscape

Several possible cultural landscape components were identified within the study corridor.

*Nature of Impacts:* The construction of the power lines could result in alteration in the cultural characteristics of the landscape.

*Extent of Impact:* Limited impacts on the cultural landscape are anticipated.

Nature of Impact: Limited impacts on the cultural landscape are anticipated.		
	Without Mitigation	With Mitigation
Extent	<b>Local (2)</b>	<b>Local (2)</b>
Duration	<b>Short term (2)</b>	<b>Long term (2)</b>
Magnitude	<b>Low (1)</b>	<b>Low (1)</b>
Probability	<b>Improbable (3)</b>	<b>Improbable (3)</b>
Significance	<b>Low (15)</b>	<b>Low (15)</b>
Status	<b>Positive</b>	<b>Positive</b>
Reversibility	<b>Reversible</b>	<b>Reversible</b>
Irreplaceable loss of resource	<b>No</b>	<b>No</b>
Can impacts be mitigated	<b>Yes</b>	<b>Yes</b>
Mitigation	<b>No further mitigation is recommended</b>	
Cumulative impacts	<b>None</b>	
Residual impacts	<b>None</b>	

### Mitigation

No further mitigation is recommended.

## Heritage Management Planning

### Minimising the Impact on Archaeological Sites (as per the NHRA) Applicable to Sites 2, 1.4, 3 & Grid Integration Infrastructure

Objective 1: Minimising the impact on archaeological sites
The development of solar power plants and associated infrastructure could impact on unidentified 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
Placement of infrastructure should avoid potential sites of high archaeological sensitivity such as pans, rocky ridges and river beds.	Contracting of a heritage specialist to investigate final placement of infrastructure.	Before initiation of construction

Performance Indicator	No destruction of archaeological sites
Monitoring	Provided final investigation is performed no monitoring is needed

### Minimising the Impact on Paleontological Sites (as per the NHRA) Applicable to Sites 2, 1.4 & Grid Integration Infrastructure

Objective 1: Minimising the impact on Paleontological sites
The development of solar power plants and associated infrastructure could impact on unidentified sites of paleontological importance if bedrock was to be disturbed.

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

Mitigation: Action	Responsibility	Time Frame
Should the development impact on bedrock, such activities could affect paleontological resources.	Paleontological monitoring in areas where bedrock is expected to be disturbed.	During construction phase

Performance Indicator	No destruction of paleontological sites
Monitoring	Paleontological monitoring during the construction phase where bedrock is to be affected.

### Minimising the impact on the cultural landscape (as per the NHRA) Applicable to Sites 2, 1.1, 1.3, 1.4, 3, 4, 5 & Grid Integration Infrastructure

Objective 1: Minimising the impact on the cultural landscape
Although areas with components of important cultural landscapes were identified, no areas with significance high enough for alteration of the proposed project layout could be defined.

Project Component	Solar array, power lines, roads and construction camps
Potential Impact	Negative impacts on the cultural landscape

Activity/Risk source	Placement of infrastructure
Mitigation Target	Preservation of cultural landscape components

Mitigation: Action	Responsibility	Time Frame
No further action is required	None	None

Performance Indicator	No alteration to the cultural landscape
Monitoring	No monitoring is required

### **Minimising the impact on Unidentified Sites (as per the NHRA)**

#### **Applicable to Sites 2, 1.1, 1.3, 1.4, 3, 4, 5 & Grid Integration Infrastructure**

Objective 1: Minimising the impact on unidentified sites
Unidentified or sub-surface sites could still be encountered during the construction phase

Project Component	Solar arrays, roads, power lines and construction camps
Potential Impact	Destruction of unidentified sites
Activity/Risk source	Placement of Solar Array infrastructure
Mitigation Target	Minimize impact on unidentified sites

Mitigation: Action	Responsibility	Time Frame
Unidentified sites that are uncovered should be reported to SAHRA or the relevant provincial authority	Environmental officer	As soon as possible

Performance Indicator	No destruction of archaeological sites
Monitoring	Monitoring during construction phase

### **Minimising the impact on Burial and Grave Sites (as per the NHRA)**

#### **Applicable to Sites 2, 1.1, 1.3, 1.4, 3, 4, 5 & Grid Integration Infrastructure**

Objective 1: Minimising the impact on burial and grave sites
The placement of solar sites could impact on unidentified burial or grave sites

Project Component	Solar array, power lines, roads and construction camps
Potential Impact	Destruction of grave and burial sites
Activity/Risk source	Solar array and associated infrastructure
Mitigation Target	Mitigate impacts on burial or grave sites

Mitigation: Action	Responsibility	Time Frame
On uncovering a possible grave or burial site it is imperative that construction be ceased immediately. The area should be marked and a heritage practitioner should be informed immediately.	Environmental control officer	During construction phase

Performance Indicator	Mitigation of burial and grave sites
Monitoring	No monitoring is required

## **Conclusion**

The study area was investigated for sites of heritage significance that might be affected by the construction of the proposed solar power generation infrastructure. The only sign of sites of heritage potential were the limited scatterings of Middle to Late Stone Age tools found in various areas. These finds in themselves do not constitute sites but do indicate the possible occurrence of such sites.

Seven sites for the placement of Solar Power plants were investigated. Most of the areas investigated were found not to be geographically suitable for occupation. Due to the topographic requirements of the Solar Arrays these areas are by nature flat and featureless with limited possibilities of water intrusion. Traditionally people have congregated in areas where shelter is found in some geographic feature or in areas that are elevated above the surrounding landscape. Accesses to water sources are also a deciding factor in the location of occupational sites. None of these factors were present in the areas investigated. Some dry river beds were located in some of the sites; however these are not reliable sources of water.

The area could still contain the remains of nomadic hunter/gatherer camps and some areas with suitable substrates could have been used as quarries for material to produce Stone Age tools. No such sites were however identified during the site visit. We should however in this case apply the rule of *Absence of Evidence is not Evidence of Absence*.

In three areas scatterings of surface stone artifacts were noticed, however one of these were concentrated enough to be classified as Stone Age Sites. Their presence does indicate that such sites could still be found sub-surface. It is also important to remember that sites such as these do not offer silhouette, profiles such as Irons Age and Historic sites and they are therefore difficult to identify unless the observer is on top of the site or very close to it. Some such sites might therefore have been missed.

## Heritage sites identified

The following heritage related sites were identified on the areas investigated;

Site	Site name	Description	Location
2	KSP 001	Late Stone Age scatter (Pre-Contact)	28.44122°S 21.53818°E
	KSP 002	Livestock kraal (Living Heritage)	28.43999°S 21.55757°E
1.1	No sites		
1.3	No sites		
1.4	KSP 003	Middle Stone Age Scatter (Pre-Contact)	28.50682°S 21.52352°E
3	KSP 004	Late Stone Age Scatter (Pre-Contact)	28.50373°S 21.47926°E
4	No sites		
5	No sites		
Infrastructure	KSP 005	Late Stone Age scatter (Pre-Contact)	28.402588°S 21.485626°E

### Site KSP 001

Late Stone Age tool scatters;



A loose scattering of Late Stone Age (LSA) tools were found here. There is no indication that this site extends underground and there are also no indications that this was a manufacturing site. The material used seems to be hornfels and no local source could be identified on site. These tools are most likely out of context and were deposited by means of alluvial action.

### Site KSP 002

Livestock kraal

This is a living culture feature of the landscape indicating a livestock enclosure for either cattle or sheep.



### Site KSP 003

Middle Stone Age (MSA) scatter





This is a small out of context scatter of Middle Stone Age (MSA) tools. There were no further indications of a site.

**Site KSP 004**

Late Stone Age (LSA) scatter



A loose scattering of Late Stone Age (LSA) tools were found here. There is no indication that this site extends underground and there are also no indications that this was a manufacturing site. The material used seems to be hornfels and no local source could be identified on site. These tools are most likely out of context and were deposited by means of alluvial action.

**Site KSP 005**

Middle to Late Stone Age tool scatters;



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APPENDIX A  
General Methodology

## **Methodology**

### **Inventory**

Inventory studies involve the in-field survey and recording of archaeological resources within a proposed development area. The nature and scope of this type of study is defined primarily by the results of the overview study. In the case of site-specific developments, direct implementation of an inventory study may preclude the need for an overview.

There are a number of different methodological approaches to conducting inventory studies. Therefore, the proponent, in collaboration with the archaeological consultant, must develop an inventory plan for review and approval by the SAHRA prior to implementation (*Dincause, Dena F., H. Martin Wobst, Robert J. Hasenstab and David M. Lacy 1984*).

### **Significance Criteria**

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

Site integrity, or the degree to which a heritage site has been impaired or disturbed as a result of past land alteration, is an important consideration in evaluating site significance. In this regard, it is important to recognize that although an archaeological site has been disturbed, it may still contain important scientific information.

Heritage resources may be of scientific value in two respects. The potential to yield information which, if properly recovered, will enhance understanding of Southern African human history is one appropriate measure of scientific significance. In this respect, archaeological sites should be evaluated in terms of their potential to resolve current archaeological research problems. Scientific significance also refers to the potential for relevant contributions to other academic disciplines or to industry.

Public significance refers to the potential a site has for enhancing the public's understanding and appreciation of the past. The interpretive, educational and recreational potential of a site are valid indications of public value. Public significance criteria such as ease of access, land ownership, or scenic setting are often external to the site itself. The relevance of heritage resource data to private industry may also be interpreted as a particular kind of public significance.

Ethnic significance applies to heritage sites which have value to an ethnically distinct community or group of people. Determining the ethnic significance of an archaeological site may require consultation with persons having special knowledge of a particular site. It is essential that ethnic significance be assessed by someone properly trained in obtaining and evaluating such data.

Historic archaeological sites may relate to individuals or events that made an important, lasting contribution to the development of a particular locality or the province. Historically important sites also reflect or commemorate the historic socioeconomic character of an area. Sites having high historical value will also usually have high public value.

The economic or monetary value of a heritage site, where calculable, is also an important indication of significance. In some cases, it may be possible to project monetary benefits derived from the public's use of a heritage site as an educational or recreational facility. This may be accomplished by employing established economic evaluation methods; most of which have been developed for valuating outdoor recreation. The objective is to determine the willingness of users, including local residents and tourists, to pay for the experiences or services the site provides even though no payment is presently being made. Calculation of user benefits will normally require some study of the visitor population (*Smith, L.D. 1977*).

## **Assessing Impacts**

A heritage resource impact may be broadly defined as the net change between the integrity of a heritage site with and without the proposed development. This change may be either beneficial or adverse.

Beneficial impacts occur wherever a proposed development actively protects, preserves or enhances a heritage resource. For example, development may have a beneficial effect by preventing or lessening natural site erosion. Similarly, an action may serve to preserve a site for future investigation by covering it with a protective layer of fill. In other cases, the public or economic significance of an archaeological site may be enhanced by actions which facilitate non-destructive public use. Although beneficial impacts are unlikely to occur frequently, they should be included in the assessment.

More commonly, the effects of a project on heritage sites are of an adverse nature. Adverse impacts occur under conditions that include:

- (a) destruction or alteration of all or part of a heritage site;
- (b) isolation of a site from its natural setting; and
- (c) introduction of physical, chemical or visual elements that are out-of-character with the heritage resource and its setting.

Adverse effects can be more specifically defined as direct or indirect impacts. Direct impacts are the immediately demonstrable effects of a project which can be attributed to particular land modifying actions. They are directly caused by a project or its ancillary facilities and occur at the same time and place. The immediate consequences of a project action, such as slope failure following reservoir inundation, are also considered direct impacts.

Indirect impacts result from activities other than actual project actions. Nevertheless, they are clearly induced by a project and would not occur without it. For example, project development may induce changes in land use or population density, such as increased urban and recreational development, which may indirectly impact upon heritage sites. Increased vandalism of heritage sites, resulting from improved or newly introduced access, is also considered an indirect impact. Indirect impacts are much more difficult to assess and quantify than impacts of a direct nature.

Once all project related impacts are identified, it is necessary to determine their individual level-of-effect on heritage resources. This assessment is aimed at determining the extent or degree to which future opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected by a proposed action. Therefore, the assessment provides a reasonable indication of the relative significance or importance of a particular impact. Normally, the assessment should follow site evaluation since it is important to know what heritage values may be adversely affected.

The assessment should include careful consideration of the following level-of-effect indicators, which are defined in Appendix D:

- magnitude
- severity
- duration
- range
- frequency
- diversity
- cumulative effect
- rate of change

The level-of-effect assessment should be conducted and reported in a quantitative and objective fashion. The methodological approach, particularly the system of ranking level-of-effect indicators, must be rigorously documented and recommendations should be made with respect to managing uncertainties in the assessment. (*Zubrow, Ezra B.A., 1984*).

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

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

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

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

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

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

#### Scientific Significance

(a) Does the site contain evidence which may substantively enhance understanding of culture history, culture process, and other aspects of local and regional prehistory?

internal stratification and depth

chronologically sensitive cultural items

materials for absolute dating

association with ancient landforms

quantity and variety of tool type

distinct intra-site activity areas

tool types indicative of specific socio-economic or religious activity

cultural features such as burials, dwellings, hearths, etc.

diagnostic faunal and floral remains

exotic cultural items and materials

uniqueness or representativeness of the site

integrity of the site

(b) Does the site contain evidence which may be used for experimentation aimed at improving archaeological methods and techniques?

monitoring impacts from artificial or natural agents

site preservation or conservation experiments

data recovery experiments

sampling experiments

intra-site spatial analysis

(c) Does the site contain evidence which can make important contributions to paleoenvironmental studies?

topographical, geomorphological context

depositional character

diagnostic faunal, floral data

(d) Does the site contain evidence which can contribute to other scientific disciplines such as hydrology, geomorphology, pedology, meteorology, zoology, botany, forensic medicine, and environmental hazards research, or to industry including forestry and commercial fisheries?

#### Public Significance

(a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

integrity of the site

technical and economic feasibility of restoration and development for public use

visibility of cultural features and their ability to be easily interpreted

accessibility to the public

opportunities for protection against vandalism

representativeness and uniqueness of the site

aesthetics of the local setting

proximity to established recreation areas

present and potential land use

land ownership and administration

legal and jurisdictional status

local community attitude toward development

(b) Does the site receive visitation or use by tourists, local residents or school groups?

### Ethnic Significance

(a) Does the site presently have traditional, social or religious importance to a particular group or community?

ethnographic or ethno-historic reference

documented local community recognition or, and concern for, the site

### Economic Significance

(a) What value of user-benefits may be placed on the site?

visitors' willingness-to-pay

visitors' travel costs

### Scientific Significance

(a) Does the site contain evidence which may substantively enhance understanding of historic patterns of settlement and land use in a particular locality, regional or larger area?

(b) Does the site contain evidence which can make important contributions to other scientific disciplines or industry?

### Historic Significance

(a) Is the site associated with the early exploration, settlement, land use, or other aspect of southern Africa's cultural development?

(b) Is the site associated with the life or activities of a particular historic figure, group, organization, or institution that has made a significant contribution to, or impact on, the community, province or nation?

(c) Is the site associated with a particular historic event whether cultural, economic, military, religious, social or political that has made a significant contribution to, or impact on, the community, province or nation?

(d) Is the site associated with a traditional recurring event in the history of the community, province, or nation, such as an annual celebration?

### Public Significance

(a) Does the site have potential for public use in an interpretive, educational or recreational capacity?

visibility and accessibility to the public

ability of the site to be easily interpreted

opportunities for protection against vandalism

economic and engineering feasibility of reconstruction, restoration and maintenance

representativeness and uniqueness of the site

proximity to established recreation areas

compatibility with surrounding zoning regulations or land use

land ownership and administration

local community attitude toward site preservation, development or destruction

present use of site



(b) Does the site receive visitation or use by tourists, local residents or school groups?

#### Ethnic Significance

(a) Does the site presently have traditional, social or religious importance to a particular group or community?

#### Economic Significance

(a) What value of user-benefits may be placed on the site?

visitors' willingness-to-pay

visitors' travel costs

#### Integrity and Condition

(a) Does the site occupy its original location?

(b) Has the site undergone structural alterations? If so, to what degree has the site maintained its original structure?

(c) Does the original site retain most of its original materials?

(d) Has the site been disturbed by either natural or artificial means?

#### Other

(a) Is the site a commonly acknowledged landmark?

(b) Does, or could, the site contribute to a sense of continuity or identity either alone or in conjunction with similar sites in the vicinity?

(c) Is the site a good typical example of an early structure or device commonly used for a specific purpose throughout an area or period of time?

(d) Is the site representative of a particular architectural style or pattern?

#### Indicators of Impact Severity

##### **Magnitude**

The amount of physical alteration or destruction which can be expected. The resultant loss of heritage value is measured either in amount or degree of disturbance.

##### **Severity**

The irreversibility of an impact. Adverse impacts which result in a totally irreversible and irretrievable loss of heritage value are of the highest severity.

##### **Duration**

The length of time an adverse impact persists. Impacts may have short-term or temporary effects, or conversely, more persistent, long-term effects on heritage sites.

##### **Range**

The spatial distribution, whether widespread or site-specific, of an adverse impact.

**Frequency**

The number of times an impact can be expected. For example, an adverse impact of variable magnitude and severity may occur only once. An impact such as that resulting from cultivation may be of recurring or on-going nature.

**Diversity**

The number of different kinds of project-related actions expected to affect a heritage site.

**Cumulative**

A progressive alteration or destruction of a site owing to the repetitive nature of one or more impacts.

**Effect****Rate of Change**

The rate at which an impact will effectively alter the integrity or physical condition of a heritage site. Although an important level-of-effect indicator, it is often difficult to estimate. Rate of change is normally assessed during or following project construction.

APPENDIX B  
Location Maps

1:50 000 Map Location

