

HERITAGE IMPACT ASSESSMENT REPORT

Proposed establishment of a Wind Energy Generation Facility near Springfontein in the Free State Province.

Prepared By:



FOR



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, cursive script.

Site name and location: Proposed establishment of the Springfontein Wind Energy Generation Facility as well as the associated grid integration infrastructure.

Municipal Area: Xharieb District Municipality.

Developer: South African Mainstream Renewable Power Springfontein (Pty) Ltd.

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

Date of Report: 15 October 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 proposed Springfontein Wind Energy Generation Plant.

This study encompasses the Heritage Impact Assessment component of the environmental management process.

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

Findings

No sites of heritage potential could be identified in the proposed study area.

Recommendations

Although no heritage sites could be identified on the surface, subsurface Stone Age remains could still be found. People involved in excavations should be made attentive to this. South African War sites that do leave little or no surface remains could be found in the area. The development layout has been forwarded to the War Museum in Bloemfontein to determine whether any sites might be affected. After two months no replay has been forthcoming from them.

Fatal Flaws

No fatal flaws were identified.

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List of Abbreviations

Bp	Before Present
BASIC	ASSESSMENT 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
WGS 84	World Geodetic System for 1984
WHS	World Heritage Site

Heritage Impact Assessment Report for the Proposed Mainstream Springfontein Wind Energy Facility

Introduction

Legislation and methodology

G&A Heritage was appointed by Savannah Environmental (Pty) Ltd to undertake a heritage impact Assessment study for the proposed Springfontein Wind Energy Facility. Section 31(1) of the South African Heritage Resources Act (25 of 1999) requires that a heritage study is undertaken for:

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

This study focusses on 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.

'Palaeontological' 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.

Background Information Proposed Mainstream Springfontein Wind Energy Facility

Project Description

The proposed facility would have a generating capacity of between 85-170MW (depending on the choice of turbine) and will include the following infrastructure:

- Between 30 – 65 wind turbines (between 1.5 - 4 MW in capacity)
- Cabling between the turbines, to be laid underground where practical.
- Internal access roads to each turbine.
- Workshop area / office for control, maintenance and storage. The options for grid connection include either:
 - Loop-in and Loop out of the existing Besembos-Signal 132kV line which occur on the site (on farm Stock Port RE/283); or
 - Develop a new power line to the future planned Eskom Besembos substation (which is located south of Springfontein).

Site Location

The project is proposed on the following farms: The remainder of Farm Stock Port R283, The remainder of Spioenkop 461, Portion 0 of Farm Ou Spioenkop 467, Portion 0 of Farm Mist Kuil 412 and Portion 0 of Farm Bankfontein 519, which are located in the Kopanong Local Municipality.

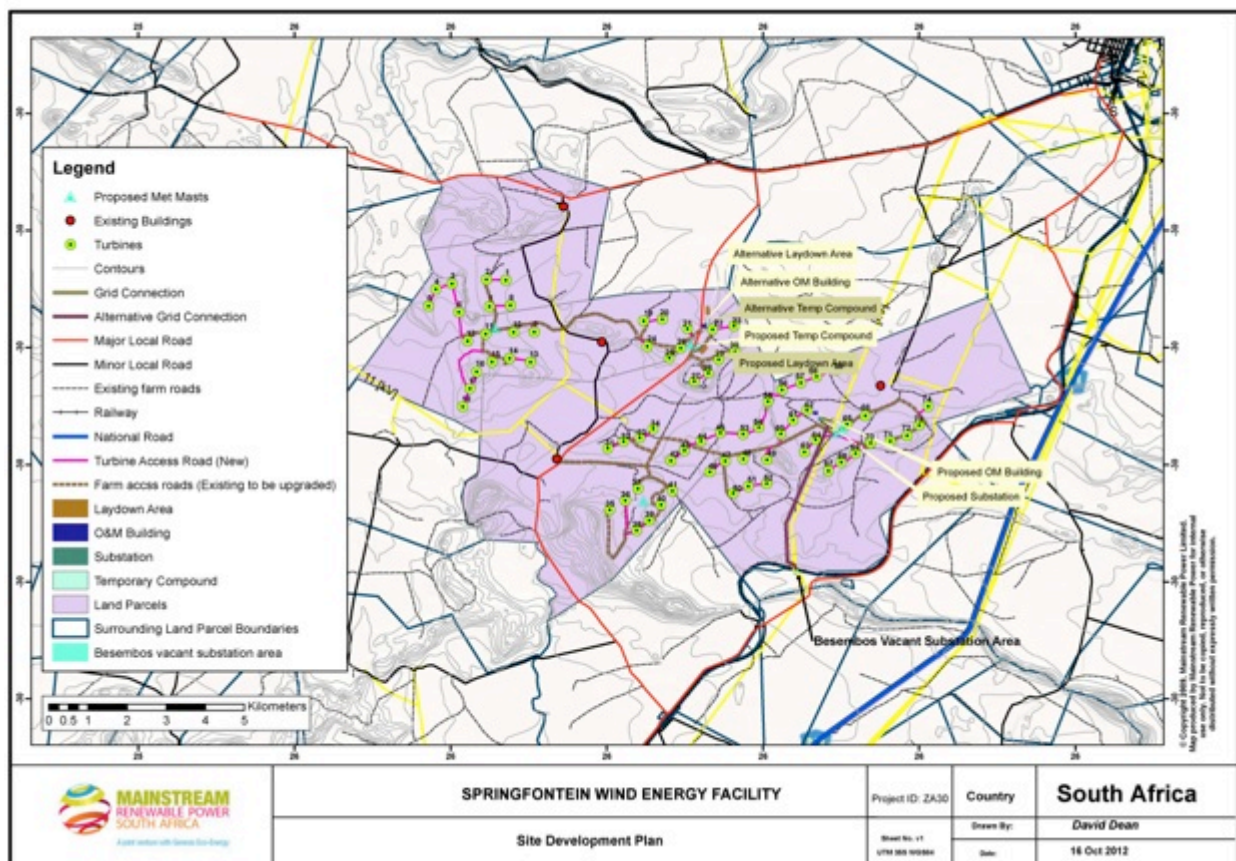


Figure 1. Study Area



Figure 2. Aerial view of study area with turbine placements

Methodology

This study defines the heritage component of the Environmental Impact Assessment process being undertaken for the Springfontein Wind Energy Facility. It is described as a Heritage Impact Assessment Report. This report attempts to evaluate the accumulated heritage knowledge of the area as well as its heritage sensitivity towards the proposed development.

Evaluating Heritage Impacts

This report relies on the analysis of written documents, maps, aerial photographs and other archival sources as well as site investigations.

The following documents were consulted in this study;

- South African National Archive Documents
- SAHRA Database of Heritage Studies
- Colesberg-Kemper Museum Information
- The Anglo-Boer War Museum (exhibits closed during visit)
- Internet Search
- Historic Maps
- 1936 and 1952 Surveyor General Topographic Map series
- 1952 1:10 000 aerial photo survey
- Google Earth 2011, 2009 & 2003 imagery
- Published articles and books
- JSTOR Article Archive
- Genealogical Society of South Africa
- South African Rock Art Digital Archive (SARADA)
- Rock Art Research Institute (RARI)

Assumptions and Restrictions

- It is assumed that the SAHRA database locations are correct
- It is assumed that the proposed layout as supplied by Savannah Environmental (Pty) Ltd is correct.

Heritage Indicators within the Receiving Environment Regional Cultural Context

Palaeontology

The Palaeontology of the study area is discussed in a separate specialist report.

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 Springfontein.

The density of Stone Age sites within the Karoo system has been postulated to be as much as 16 sites per square kilometer (Smith 2009) with areas such as the Seacow river producing over 16 000 sites. This is however an average number with sites displaying a clustering nature on the whole.

Classic Stone Age locations such as Smithfield (the original location of the Smithfield Industry) is located only 80km to the east of the study area.

The following Stone Age components could be encountered in this area;

- The presence of Acheulian stone artefacts of Early Stone Age origin which are older than 100 000 years.
- Middle Stone Age artefacts dating from approximately 100 000 to 30 000 years ago.
- Later Stone Age artefacts dating to within the last 30 000 years.
- The presence of Khoikhoi herders within the area over the last 1500 years.
- Rock art, in the form of paintings or engravings, dating mainly to the last 5000 years (please see section under Rock Art).

Rock Art

Rock art is found in small concentrations in the Southern Freestate. This is mostly due to the geographic suitability of some areas, providing protection from the elements in the way of rock shelters, overhangs and caves. These sites are known for rock paintings while rock engravings occur over a larger variety of geological formations. These engravings are found mainly on andesite outcrops, although they also occur occasionally on basalt, dolomite, dolerite, gneiss granite and even on sandstone. Rock "pecking" engravings are known from a site close to Springfontein town.

The SARADA data base of rock art indicates that rock paintings and engravings occur at various localities within the Southern Freestate / Northern Karoo area.

Iron Age

According to Dreyer (2012) and Maggs (1976), no Iron Age sites are located in the Southern Freestate, south of Bloemfontein, in low-lying areas.

The Historic Era

The town was established in 1904 on the farm Hartleydale, which was part of the farm Springfontein. The name Springfontein, which is Afrikaans for "jumping spring", stems from the existence of a spring on the farm. A village management board was established in 1904 and the town attained municipal status in 1912. Farming with sheep, cattle and maize is prevalent in the district, and in the early part of the twentieth century the Springfontein Creameries were one of the main employers.

The town is an important railway junction on the main line to Johannesburg, being the point where the Bloemfontein line converges with the East London and Port Elizabeth lines and where a westward line to other Free State towns commences (Springfontein Tourism Board).

The Springfontein area was significant during the South African War due to the location of the largest concentration camp for Boer woman and children. It is estimated that 704 woman and children died in this camp and today over 200 graves are located in the camp cemetery on the perimeter of the town of Springfontein.

Built Environment

Most of the study area falls within an undeveloped rural landscape with little or no built structures. The only built structures expected to be encountered in this area would be farm homesteads and their associated infrastructures. It is not anticipated that any of these structures would be affected by the proposed development.

Should the developers decide to utilise any of the existing structures for their operations and this entails alterations to the buildings it is recommended that they subject these to further study before such actions.



Figure 3. Springfontein Concentration Camp Cemetery

Several skirmish sites related to the South African War is also found in the area and it is expected that indications of these, such as spent cartridges, tin cans etc. could be expected in the study area.



Figure 4. General landscape

Previous Studies in the Area

Several heritage related studies have recently been performed in this area among these are;

- DREYER, J. 2007. Archaeological and cultural heritage assessment of the proposed residential developments at Springfontein, Free State. EIA Report for Phethogo Environmental Consultants, Bloemfontein.
- DREYER, J. 2010. First phase archaeological and heritage assessment of the proposed 66KVA power line from Ruigtevallei (Oranjekrag) to Reddersburg, Free State. EIA Report for Enviroworks Environmental Consultants, Bloemfontein.
- JANSEN VAN VUUREN, D. 20 January 2012. Visual Impact Assessment for the Construction of a Photovoltaic Power Plant near Springfontein, Free State. MetroGIS submitted to CSIR.
- PISTORIUS, J.C.C. 1994. Eskom Archaeological Site Identification Guide. Johannesburg: Eskom.

Archival studies also revealed that the Welsh Medical Corps were active in the region in the early 20th century and in fact operated a hospital in what is now Springfontein (J. Lynn Thomas, 1901).

A good narrative and illustrated history of the concentration camps and the work of prominent civil activists such as Emily Hobhouse can be found in Michael Godby's 2006

publication *Confronting Horror: Emily Hobhouse and the Concentration Camp Photographs of the South African War* (Godby, 2006).

None of the studies performed in this general area indicated any sites of high heritage significance were to be found in the study area.

Due to the general sensitivity of the area in regards of South African War sites (Anglo-Boer War), it was felt prudent to expand the document study further to include more sources of information. The following literature sources were studied as all of them refer to war sites in this area;

- The War In South Africa. William Thomson. The British Medical Journal, Vol. 2, No. 2065 (Jul. 28, 1900), pp. 249-253
- Reminiscences Of The Welsh Hospital In South Africa (Springfontein And Pretoria). J. Lynn Thomas. The British Medical Journal, Vol. 1, No. 2103 (Apr. 20, 1901), pp. 942-945.
- Social Suffering and the Politics of Pain: Observations on the Concentration Camps in the Anglo-Boer War. 1899-1902. Jenny de Reuck. English in Africa, Vol. 26, No. 2 (Oct., 1999), pp. 69-88.
- Waging Total War in South Africa: Some Centenary Writings on the Anglo-Boer War, 1899-1902. Bill Nasson. The Journal of Military History, Vol. 66, No. 3 (Jul., 2002), pp. 813-828.
- The Hall Handbook of the Anglo-Boer War, 1899-1902 by Darrell Hall, Fransjohan Pretorius, Gilbert Toralge; Encyclopedia of the Boer War, 1899-1902 by Martin F. Marix Evans.

Further to these investigations, the following online resources were also consulted. Where possible information on the proposed development was sent through to these organisations for possible comment. None was unfortunately forthcoming;

- British National Archive (online www.britishnationalarchive.com)
- Anglo Boer War Museum Archive (Website)
- South African History Online (Website)
- www.battlefieldsregionguide.co.za
- www.boer.co.za

During the study period the War Museum in Bloemfontein was visited on two occasions to investigate the site further, however the museum was closed on both occasions and no further information could be found.

Impact Assessment

Nature: Possible damage to heritage sites		
	Without mitigation	With mitigation
Extent	High (3)	Low (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	36 (Medium)	24 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be	Yes	Yes

mitigated?		
Mitigation: Mitigation Measures	Supply Anglo-Boer War Museum with layout for comment	
Cumulative impacts: Cumulative Impacts	None	
Residual Impacts: Residual Impacts	None	

Assessment of Alternatives (Power Line, Location of Construction Camp and Offices)

All the power line options showed the same measure of heritage significance. Any of the alternatives can be chosen with the same measure of impact.

Heritage Management Planning

Minimising the Impact on Archaeological Sites (as per the NHRA) (for EMP)

Objective 1: Minimising the impact on archaeological sites
The development of wind turbines and associated infrastructure could impact on unidentified sites of archaeological importance.

Project Component	Turbines, roads, power lines and construction camps
Potential Impact	Destruction of Stone Age (specifically Smithfield A) sites
Activity/Risk source	Turbine foundations, power lines and roads
Mitigation Target	Conserve archaeological sites

Mitigation: Action	Responsibility	Time Frame
Brief construction workers on possible Stone Age finds.	Contracting of a Stone Age heritage specialist to train construction crew on basic identification of Stone Tools.	Before initiation of construction

Performance Indicator	No destruction of archaeological sites
Monitoring	No monitoring is needed

Minimising the impact on conflict sites (South African War) (as per the NHRA)

Objective 1: Minimising the impact on possible war sites
Skirmish and battle sites often leave very little physical evidence of their location. Due to the type of area preferred for the placement of wind turbines, it is possible that they will have an effect on unidentified war sites.

Project Component	Wind turbines, power lines, roads and construction camps
Potential Impact	Negative impacts on battle and skirmish sites
Activity/Risk source	Placement of infrastructure
Mitigation Target	Preservation of war sites

Mitigation: Action	Responsibility	Time Frame
The layout plan for the wind generation plant should be made available to the Anglo Boer War Museum in Bloemfontein for comment.	Project manager.	Before final layout.

Performance Indicator	No damage to war sites
Monitoring	As per museum requirements

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

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

Project Component	Wind turbine, power lines, roads and construction camps
Potential Impact	Destruction of grave and burial sites
Activity/Risk source	Turbines 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	Throughout construction phase

Recommendations

The area proposed for the development of the Springfontein Wind Energy Facility is located in an undeveloped rural area south of the town of Springfontein. This study as well as the scoping study indicated that there is a very slight chance of encountering sites of Iron Age origin or sites within the Built Environment components. More likely will be the occurrence of sites within the Stone Age and Palaeontological as well as the Historic spheres. Site investigation of the turbine placements and associated infrastructure showed no indications of any Stone Age or historic sites.

There is a possibility of conflict sites from the South African War being located on some of the ridges identified for the placement of the turbines (these are strategic both in military as well as wind energy terms). The location of these sites is often only documented and very little or no evidence is found on the ground or under the ground. The information in this report was made available to the Anglo-Boer War Museum in Bloemfontein for comment. Although the literature study for this study was exhaustive, institutions such as the museum often have access to more detailed information.

After extensive source studies it became evident that the closest sites associated with the South African Conflict was the concentration camps in Springfontein town and some dilapidated block houses to the east of the study area. No sites associated with this conflict could however be identified in the study area.

It is important to note that, though the area under investigation is quite large (+/- 85 km²), the footprint impact of the development will be very small compared to the study area as a whole.

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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 Effect

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

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.

GPS Track Paths

(GPX files available from G&A Heritage on request)