

ARCHAEOLOGICAL IMPACT ASSESSMENT

FOR THE PROPOSED ORKNEY SOLAR FARM, NORTH WEST
PROVINCE

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General

The possibility of unmarked or informal graves and subsurface finds cannot be excluded. If any possible finds are made during construction, the operations must be stopped and a qualified archaeologist contacted for an assessment of the find/s.

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- o Recommendations delivered to the Client.

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EXECUTIVE SUMMARY

Site name and location: Genesis Orkney Solar (Pty) Ltd propose the construction of a commercial photovoltaic (PV) solar energy facility (known as the Orkney Solar Farm) situated on a site approximately 11.8km south west from the town of Orkney and north west of the Vaal River. The solar farm will be located within the Farm Wolvehuis 114 on the Remaining Extent of Portion 7 and the Remaining Extent of Portion 21. The proposed project site falls under the jurisdiction of the City of Matlosana Local Municipality and within the greater Dr Kenneth Kaunda District Municipality in the North West Province.

1: 50 000 Topographic Map: 2726 BA.

EIA Consultant: Savannah Environmental (Pty) Ltd

Developer: Genesis Orkney Solar (Pty)

Heritage Consultant: Heritage Contracts and Archaeological Consulting CC (HCAC).

Contact person: Jaco van der Walt Tel: +27 82 373 8491 E –mail jaco.heritage@gmail.com.

Date of Report: 9 December 2016.

Findings of the Assessment:

HCAC was appointed to assess the study area in terms of the archaeological component of Section 35 of the NHRA as part of the Environmental Impact Assessment (EIA) for the project. No significant Stone Age sites were recorded in the study area and no ceramics or stone walls attributed to the Iron Age were recorded. Similarly, no sites of archaeological significance were recorded by other studies in the area (e.g. Roodt 2011, Coetzee 2012; van der Walt 2016). No further mitigation prior to construction is recommended in terms of the archaeological component of Section 35 for the proposed development to proceed.

In terms of the built environment of the area (Section 34), no standing structures older than 60 years occur within the study area. The foundations of several demolished structures were however recorded, but these structures are demolished to the extent that it is of no significance other than recording it in this report.

In terms of Section 36 of the Act two burial sites were recorded in the study area. Graves should ideally be preserved *in-situ* or alternatively relocated according to existing legislation. Due to the subsurface nature of archaeological remains and the fact that more

graves can occur anywhere on the landscape, it is recommended that a chance find procedure is implemented for the project as part of the EMPr.

No scenic significant cultural landscapes or viewsapes were noted during the fieldwork within the area and HCAC concurs with the independent visual specialist report (Marshall 2016) that there are no significant visual issues that would prevent the implementation of this project. Due to the lack of significant heritage features in the study area there is from an archaeological point of view no reason why the development cannot commence based on approval from SAHRA.

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ABBREVIATIONS

AIA: Archaeological Impact Assessment
ASAPA: Association of South African Professional Archaeologists
BIA: Basic Impact Assessment
CRM: Cultural Resource Management
ECO: Environmental Control Officer
EIA: Environmental Impact Assessment*
EIA: Early Iron Age*
EIA Practitioner: Environmental Impact Assessment Practitioner
EMP: Environmental Management Plan
ESA: Early Stone Age
GPS: Global Positioning System
HIA: Heritage Impact Assessment
LIA: Late Iron Age
LSA: Late Stone Age
MEC: Member of the Executive Council
MIA: Middle Iron Age
MPRDA: Mineral and Petroleum Resources Development Act
MSA: Middle Stone Age
NEMA: National Environmental Management Act
PRHA: Provincial Heritage Resource Agency
SADC: Southern African Development Community
SAHRA: South African Heritage Resources Agency

**Although EIA refers to both Environmental Impact Assessment and the Early Iron Age both are internationally accepted abbreviations and must be read and interpreted in the context it is used.*

GLOSSARY

Archaeological site (remains of human activity over 100 years old)

Early Stone Age (~ 2.6 million to 250 000 years ago)

Middle Stone Age (~ 250 000 to 40-25 000 years ago)

Later Stone Age (~ 40-25 000, to recently, 100 years ago)

The Iron Age (~ AD 400 to 1840)

Historic (~ AD 1840 to 1950)

Historic building (over 60 years old)

1. BACKGROUND INFORMATION

Heritage Contracts and Archaeological Consulting CC (**HCAC**) was appointed to conduct an Archaeological Impact Assessment for the proposed Orkney Solar Farm project as part of the EIA process.

The aim of the study is to identify cultural heritage sites, document, and assess their importance within the local, provincial and national context. It serves to assess the impact of the proposed project on non-renewable heritage resources, and to submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. It is also conducted to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

The report outlines the approach and methodology utilised before and during the survey, which includes: Phase 1, a scoping study (Van der Walt 2015) that included collection from various sources and consultations; Phase 2, the physical surveying of the study area on foot and by vehicle; Phase 3, reporting the outcome of the study.

General site conditions were recorded by means of photographs, GPS locations, and site descriptions. Possible impacts were identified and mitigation measures are proposed in the following report.

This report must also be submitted to the SAHRA for review.

1.1. Terms of Reference

Desktop study

Conduct a brief desktop study where information on the area is collected to provide a background setting of the archaeology that can be expected in the area.

Field study

Conduct a field study to: a) systematically survey the proposed project area to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points identified as significant areas; c) determine the levels of significance of the various types of heritage resources recorded in the project area.

Reporting

Report on the identification of anticipated and cumulative impacts that the operational units of the proposed project activity may have on the identified heritage resources for all 3 phases of the project; i.e., construction, operation and decommissioning phases. Consider alternatives, should any significant sites be impacted adversely by the proposed project. Ensure that all studies and results comply with Heritage legislation and the code of ethics and guidelines of ASAPA.

To assist the developer in managing the discovered heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999).

1.2. Archaeological Legislation and Best Practice

Phase 1, an AIA or a HIA is a pre-requisite for development in South Africa as prescribed by SAHRA and stipulated by legislation. The overall purpose of heritage specialist input is to:

- » Identify any heritage resources, which may be affected;
- » Assess the nature and degree of significance of such resources;
- » Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;
- » Assess the negative and positive impact of the development on these resources;
- » Make recommendations for the appropriate heritage management of these impacts.

The AIA or HIA, as a specialist sub-section of the EIA, is required under the National Heritage Resources Act NHRA of 1999 (Act 25 of 1999), Section 23(2) (b) of the NEMA and Section S. 39 (3) (b) (iii) of the MPRDA.

The AIA should be submitted, as part of the EIA, BIA or EMPr, to the PHRA if established in the province or to SAHRA. SAHRA will ultimately be responsible for the professional evaluation of Phase 1 AIA reports upon which review comments will be issued. 'Best practice' requires Phase 1 AIA reports and additional development information, as per the EIA, BIA/EMPr, to be submitted in duplicate to SAHRA after completion of the study. SAHRA accepts Phase 1 AIA reports authored by professional archaeologists, accredited with ASAPA or with a proven ability to do archaeological work.

Minimum accreditation requirements include an Honours degree in archaeology or related discipline and 3 years post-university CRM experience (field supervisor level). Minimum standards for reports, site documentation and descriptions are set by ASAPA in collaboration with SAHRA. ASAPA is based in South Africa, representing professional archaeology in the SADC region. ASAPA is primarily involved in the overseeing of ethical practice and standards regarding the archaeological profession. Membership is based on proposal and secondment by other professional members.

Phase 1 AIA's are primarily concerned with the location and identification of heritage sites situated within a proposed development area. Identified sites should be assessed according to their significance. Relevant conservation or Phase 2 mitigation recommendations should be made. Recommendations are subject to evaluation by SAHRA.

Conservation or Phase 2 mitigation recommendations, as approved by SAHRA, are to be used as guidelines in the developer's decision making process.

Phase 2 archaeological projects are primarily based on salvage/mitigation excavations preceding development destruction or impact on a site. Phase 2 excavations can only be conducted with a permit, issued by SAHRA to the appointed archaeologist. Permit conditions are prescribed by SAHRA and includes (as minimum requirements) reporting back strategies to SAHRA and deposition of excavated material at an accredited repository.

In the event of a site conservation option being preferred by the developer, a site management plan, prepared by a professional archaeologist and approved by SAHRA, will suffice as minimum requirement.

After mitigation of a site, a destruction permit must be applied for from SAHRA by the client before development may proceed.

Human remains older than 60 years are protected by the National Heritage Resources Act, with reference to Section 36. Graves older than 60 years, but younger than 100 years fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act), as well as the Human

Tissues Act (Act 65 of 1983), and are the jurisdiction of SAHRA. The procedure for Consultation Regarding Burial Grounds and Graves (Section 36[5]) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in this age category, located inside a formal cemetery administrated by a local authority, require the same authorisation as set out for graves younger than 60 years, in addition to SAHRA authorisation. If the grave is not situated inside a formal cemetery, but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws, set by the cemetery authority, must be adhered to.

Human remains that are less than 60 years old are protected under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925), as well as the Human Tissues Act (Act 65 of 1983), and are the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning; or in some cases, the MEC for Housing and Welfare. Authorisation for exhumation and reinternment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. To handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

1.3. Description of Study Area

1.3.1 Location Data

The proposed solar energy facility (known as the Orkney Solar Farm) is situated on a site approximately 11.8km south west from the town of Orkney and north west of the Vaal River (Figure 1). The solar farm will be located within the Farm Wolvehuis 114 on the Remaining Extent of Portion 7 and the Remaining Extent of Portion 21. The study area falls under the jurisdiction of the City of Matlosana Local Municipality and within the greater Dr Kenneth Kaunda District Municipality in the North West Province.

The study area is classified as belonging to the Grassland Biome and to a lesser extent to the Savannah Biome. The vegetation and landscape is described by Mucina and Rutherford (2006) as moderately undulating and is restricted to the Vaal-Vet Sandy Grassland vegetation type.

1.3.2. Location Map

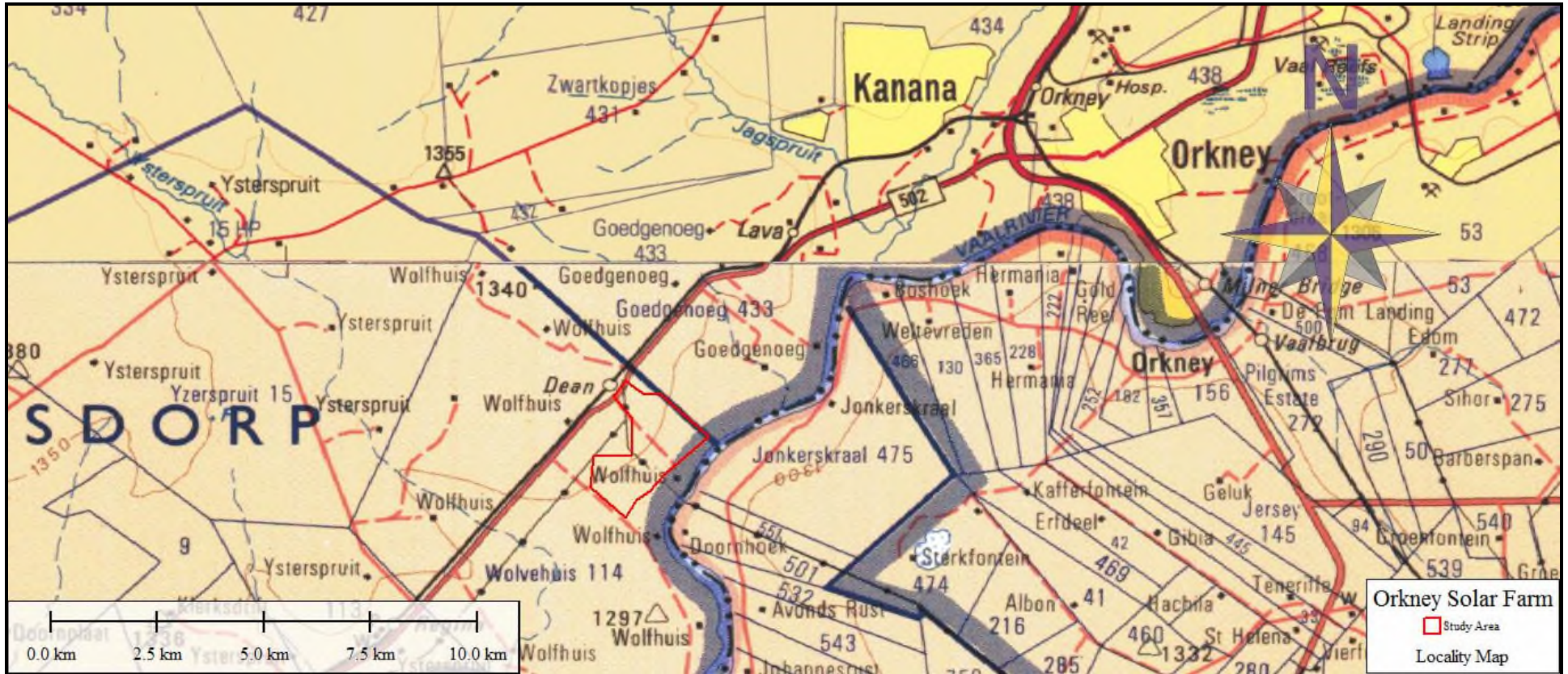


Figure 1. Locality Map of the Orkney Solar Farm development footprint located on the Remaining Extent of Portion 7 and the Remaining Extent of Portion 21 of the farm Wolvehuis 114

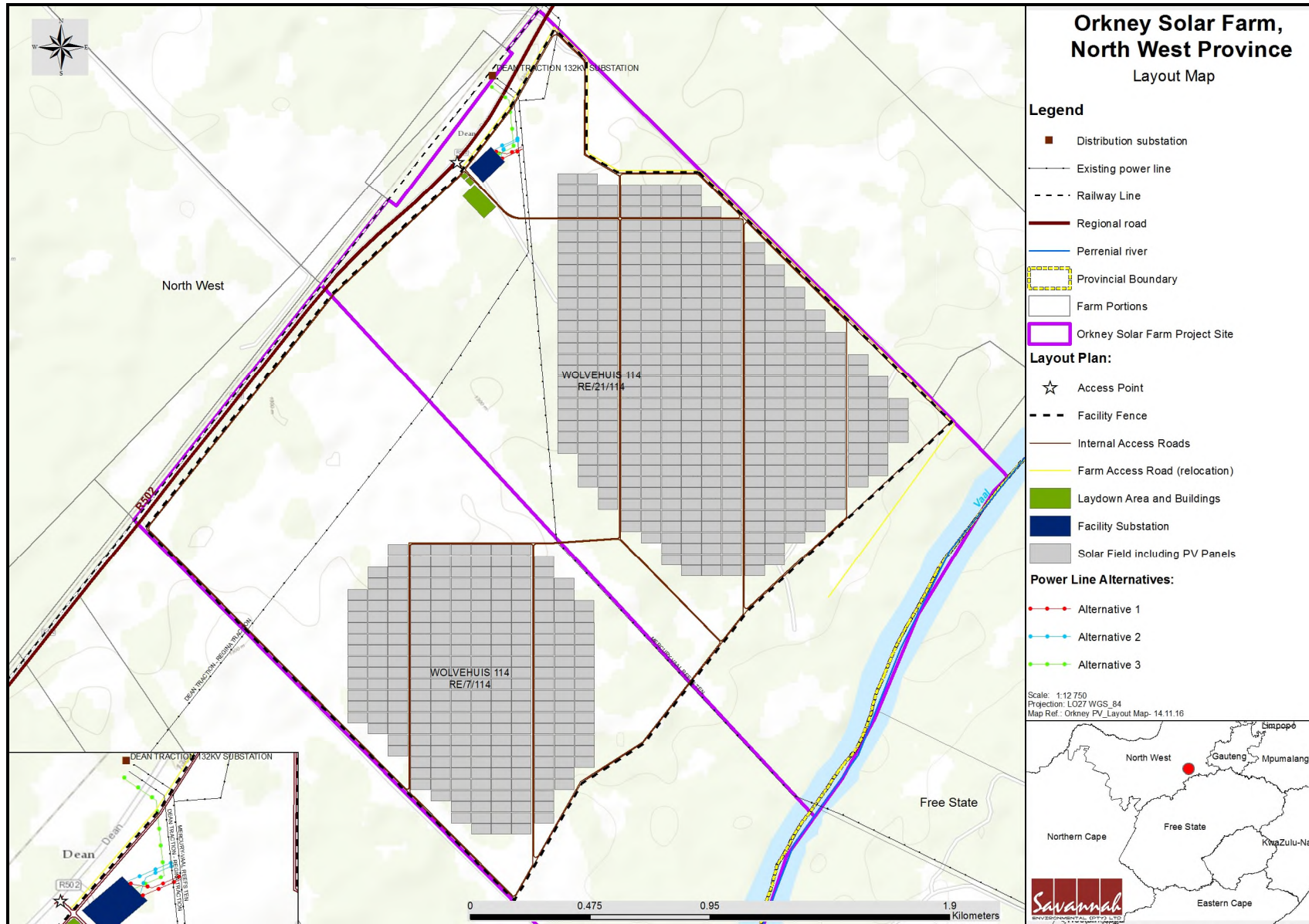


Figure 2. Orkney Solar Farm layout map as provided by Savannah Environmental (Pty) Ltd.

2. APPROACH AND METHODOLOGY

The aim of the study is to cover archaeological databases to compile background information of the archaeology that can be expected in the study area followed by field verification; this was accomplished by means of the following phases.

2.1 Phase 1 - Scoping Study

The first phase comprised of a desktop study, scanning existing records for archaeological sites, historical sites, graves, architecture (structures older than 60 years) of the area. The following approach was followed:

2.1.1 Literature Search

This was conducted by utilising data stored in the national archives and published reports relevant to the area. The aim of this is to extract data and information on the area in question.

2.1.2 Information Collection

SAHRIS was consulted to collect data from previously conducted CRM projects in the region to provide a comprehensive account of the history of the study area.

2.1.3 Consultation

No public consultation was done by the author as a separate public participation process is facilitated by the Environmental Consultant.

2.1.4 Google Earth and Mapping Survey

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located.

2.1.5 Genealogical Society of South Africa

The database of the Genealogical Society was consulted to collect data on any known graves in the area.

2.2 Phase 2 - Physical Surveying

Due to the nature of cultural remains, the majority of which occurs below surface, a field survey of the proposed study area of 350ha was conducted. The study area was surveyed by means of vehicle and extensive pedestrian surveys during the week of the 1st of December 2016.

The survey was aimed at covering the proposed development footprint, focussing on specific areas on the landscape that would be more likely to contain archaeological and/or other heritage remains like drainage lines, rocky outcrops as well as slight elevations in the natural topography. These areas were searched more intensively, but many other areas were walked in order to confirm expectations in those areas. Track logs of the areas covered were taken (Figure 3).

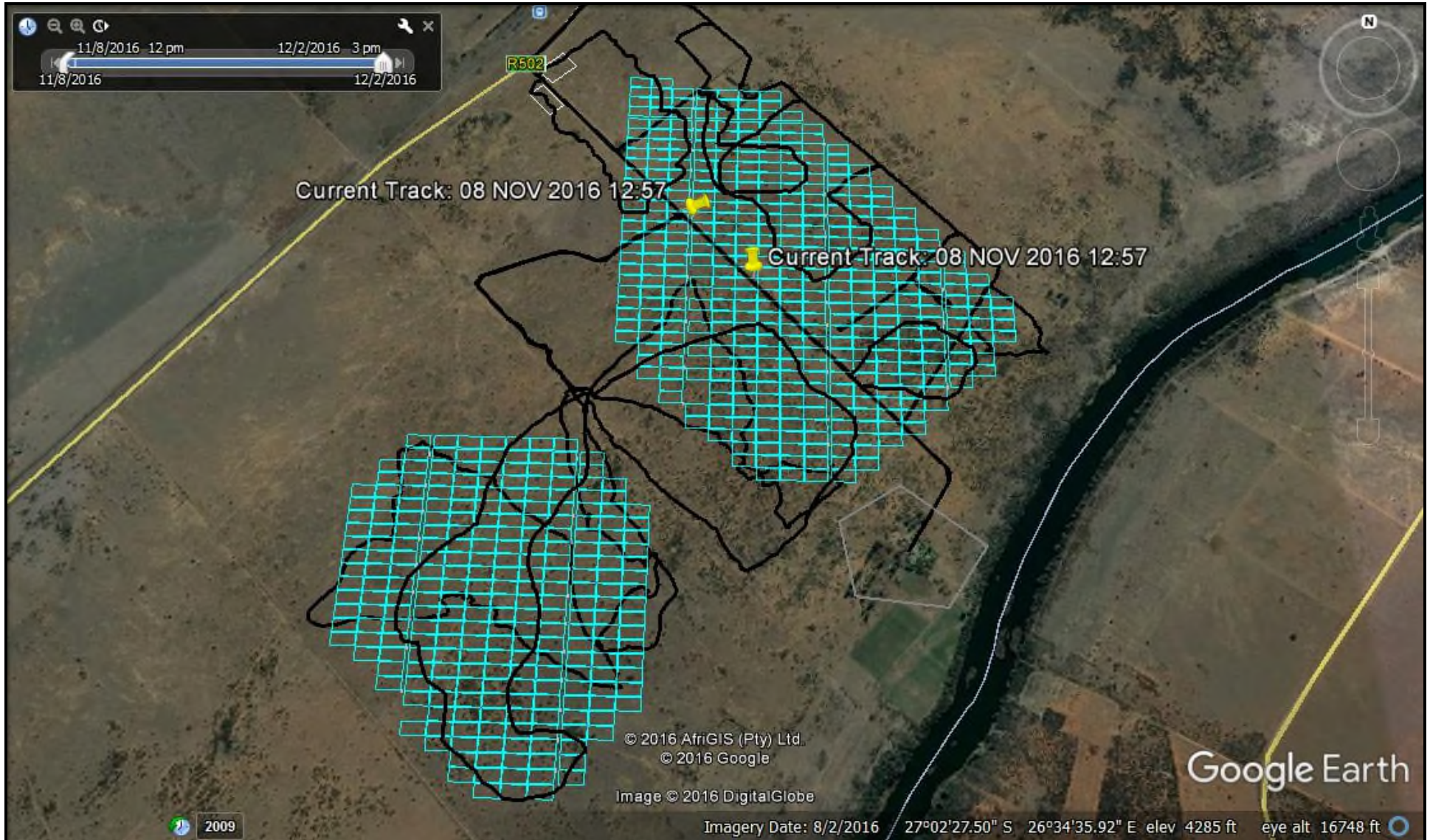


Figure 3. Track logs of the areas surveyed indicated in black with the solar field indicated in turquoise.

2.3. Restrictions

Due to the subsurface nature of archaeological artefacts, the possibility exists that some features or artefacts may not have been discovered/recorded during the survey and the possible occurrence of unmarked graves and other cultural material cannot be excluded. This report only deals with the footprint area of the proposed development as indicated in Figure 2 & 3.

Thick vegetation cover especially in the south eastern portion influenced archaeological visibility. Although HCAC surveyed the area as thoroughly as possible, it is incumbent upon the developer to stop operations and inform the relevant heritage agency should further cultural remains, such as graves, stone tool scatters, artefacts, bones or fossils, be exposed during the process of development.

3. NATURE OF THE DEVELOPMENT

The contracted capacity of the solar farm will be up to 100MW and is proposed to accommodate several arrays of tracking or static PV panels, and associated infrastructure on the proposed project site.

The solar farm will include the following infrastructure:

- » Arrays of PV panels (either a static or tracking PV system) with a capacity of up to 100MW
- » Mounting structures to support the PV panels.
- » On-site inverters to convert the power from a direct current to an alternating current and a substation to facilitate the connection between the solar farm and the Eskom electricity grid.
- » A new 132kV power line between the on-site substation and the Eskom grid connection point.
- » Cabling between the project components, to be laid underground where practical.
- » Offices and workshop areas for maintenance and storage.
- » Temporary laydown areas.
- » Internal access roads and fencing.

Three alternative grid connection options are being considered for the connection of the solar farm to the national grid. These alternatives include: a turn-in turn-out connection to the Mercury – Vaal Reefs Ten 132kV power line, a turn-in turn-out connection to the Dean Traction – Regina Traction 132kV power line; and a direct connection to the Dean Traction 132kV power line.

4. HISTORICAL AND ARCHAEOLOGICAL BACKGROUND OF THE STUDY AREA

4.1 Databases Consulted

Three unpublished CRM projects were conducted in the general study area (Coetzee 2012, Pelser 2012 van der Walt 2016). Coetzee (2012) conducted a study to the north (5 km east of Orkney) and recorded no archaeological material; he did however record two demolished structures, younger than 60 years. Pelser (2012) also conducted a study to the north (close to Klerksdorp) and recorded Stone Age sites associated with water sources. The study by van der Walt (2016) recorded no sites of archaeological significance although several demolished mine structures were recorded.

Genealogical Society and Google Earth Monuments

No cemeteries are indicated for the farm (study area) under investigation.

4.2. Brief background to the study area

The history of the surrounding area will be briefly discussed. Sources for the history of the area surrounding the study area include secondary source material, maps, electronic sources, and archival documents.

4.2.1. Historical background of the area

4.2.1.1. Stone Age

The Stone Age is divided in the Early; Middle and Late Stone Age. It refers to the earliest people of South Africa who mainly relied on stone for their tools.

Early Stone Age: The period from \pm 2.5 million yrs. - \pm 250 000 yrs. ago. Acheulean stone tools are dominant. No Acheulean sites are on record near the study area, but isolated finds may be possible. However, isolated finds have little value. Therefore, the project is unlikely to disturb a site of significance. The lack of any ESA sites was confirmed during the field investigation.

Middle Stone Age: The Middle Stone Age includes various lithic industries in SA dating from \pm 250 000 yrs. – 25 000 yrs. before present. This period is first associated with archaic Homo sapiens and later Homo sapiens sapiens. Material culture includes stone tools with prepared platforms and stone tools attached to handles.

Late Stone Age: The period from \pm 25 000-yrs before present to the period of contact with either Iron Age farmers or European colonists. This period is associated with Homo sapiens sapiens. Material culture from this period includes: microlithic stone tools; ostrich

eggshell beads and rock art. Sites located in the open are usually poorly preserved and therefore have less value than sites in caves or rock shelters.

Since there are no caves in the study area no LSA sites of significance were recorded and no isolated finds or occurrences were recorded. The Matlwase LSA site is on record and is located close to Wolmaransstad (Bergh 1999). According to Bergh there are no known Stone Age sites close to the study area, although a number of rock engraving sites are known to occur in the larger geographical area (Bergh 1999: 4-5).

4.2.1.2. The Iron Age

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- The Early Iron Age: Most of the first millennium AD.
- The Middle Iron Age: 10th to 13th centuries AD.
- The Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living. No Sites dating to the Early or Middle Iron Age have been recorded or is expected in the study area. The same goes for the Later Iron Age period where the study area is situated outside the southern periphery of distribution of Late Iron Age settlements in the North West Province. However, to the north west of the study area towards Zeerust and towards Mafikeng, the area is well known for Later Iron Age stone walled settlements archaeologically referred to as Molokwane settlements (Pistorius 1992, Booyens 1998, Huffman 2007). *Geskiedenisatlas van Suid-Afrika* (1999) recorded some 88 Late Iron Age sites towards Klerksdorp. No sites dating to this period was recorded in the study area.

There are some Late Iron Age sites in the larger geographical area north and west of the town of Klerksdorp (Bergh 1999: 6-7). Some well-known examples are Platberg (Wells 1933) and Buisfontein (Thabeng) (Maggs 1976). Another site Palmietfontein (30km north of Klerksdorp), excavated in 1975 by D.A. White. An article on this work also indicated that the area north of Klerksdorp is relatively rich in terms of Late Iron Age sites, and that the Rolong capital of Thabeng lies within this area (White 1977: 89). Based on the research by Huffman it is possible that sites are related to the Olifantspoort facies of the Urewe Tradition, dating to around AD 1500-1700, and the Thabeng facies of the same tradition (AD 1700-1840) could possibly be found in the area (Huffman 2007).

The well-known rock art site of Bosworth that also included Later Stone Age artefacts (Mason 1962) is located to the north of the study area.

4.3. General History of the greater area.

During the Second Boer War (1899-1902), there were many battles in the Klerksdorp area and the area also housed a large concentration camp. Just under a thousand graves of the victims of the concentration camps, mostly of Boer women and children can still be visited today in the old cemetery just outside of Klerksdorp. The most famous battle in the Klerksdorp area is the Battle of Ysterspruit. The Boer General, Koos de la Rey, achieved a great victory and this battle is one of the most celebrated of the general's career. It was this battle in which the Boer soldiers pioneered the art of firing from horseback. On April 11, 1920, Rooiwal, near Klerksdorp, saw the battle of Rooiwal, the last major engagement of the war, where a Boer charge was beaten off by entrenched British troops.

Sites relating to the Anglo Boer War have been recorded and indicated by Meyer (1971), Breytenbach (1978), Van den Berg (1996) as well as Scheepers-Strydom (1970) for the greater study area.

4.4. Brief History of Orkney

"Orkn" is the ancient Islandic word for sea lion, and "Ey" a Nordic word meaning island. The sea lion is the emblem of the town. The town was named after Orkney Isles off the north coast of Scotland, the birthplace of Simon Fraser, one of the gold mining pioneers of the 1880s. The town was proclaimed in 1940 on the farm Witkoppen, where Fraser had first started gold mining (http://www.orkney.co.za/history_orkney).

The town was laid out by a Scot by the name of Maconachie. His naming of the streets was interesting: he used the names of poets and authors from the British Isles. The rule was broken as Afrikaner nationalism grew dominant in the 1960's, and some of the UK literary names were replaced (http://www.orkney.co.za/history_orkney).

Orkney became rather famous in the late 1980s and early 1990s as the setting for a popular Afrikaans television sitcom called Orkney Snork Nie. The word "snork" means "snore": so the joke in the title means "Orkney doesn't snore". Even further back the Afrikaans jab at the sleepy town was "Ook nie dorp nie; ook nie plaas nie". In this the pun is on the "ook nie" ('also not' or 'neither') sounding like "Orkney"; and the full meaning being "neither town nor farm"(http://www.orkney.co.za/history_orkney).

The notion of "sleepy" is misleading. Some of the deepest and richest gold mines have been worked in the area for decades. But the social life for the youth was better in Klerksdorp. The Orkney Stadium Disaster, when 42 fans died at the stadium in 1991, was the second worst sporting disaster in South Africa (http://www.orkney.co.za/history_orkney).

5. HERITAGE SITE SIGNIFICANCE AND MITIGATION MEASURES

The presence and distribution of heritage resources define a 'heritage landscape'. In this landscape, every site is relevant. In addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire project area, or a representative sample, depending on the nature of the project. In the case of the proposed project the local extent of its impact necessitates a representative sample and only the footprint of the areas demarcated for development were surveyed. In all initial investigations, however, the specialists are responsible only for the identification of resources visible on the surface. This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The following criteria were used to establish site significance:

- » The unique nature of a site;
- » The integrity of the archaeological/cultural heritage deposits;
- » The wider historic, archaeological and geographic context of the site;
- » The location of the site in relation to other similar sites or features;
- » The depth of the archaeological deposit (when it can be determined/is known);
- » The preservation condition of the sites;
- » Potential to answer present research questions.

Furthermore, the National Heritage Resources Act (Act No 25 of 1999, Sec 3) distinguishes nine criteria for places and objects to qualify as 'part of the national estate' if they have cultural significance or other special value. These criteria are:

- » Its importance in/to the community, or pattern of South Africa's history;
- » Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- » Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- » Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- » Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- » Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- » Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- » Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa;
- » Sites of significance relating to the history of slavery in South Africa.

5.1. Field Rating of Sites

Site significance classification standards prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purpose of this report. The recommendations for each site should be read in conjunction with section 7 of this report.

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria provided by the client:

- » 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 **consequences (magnitude)**, quantified on a scale from 0-10. 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). Lastly 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).

6. BASELINE STUDY-DESCRIPTION OF SITES

It is important to note that the entire farm was not surveyed but only the development footprint (Figure 2 & 3). The topography of the study area is relatively flat and covered by veld grass (Figure 4 & 5) without any major topographical features like pans or hills. In the south eastern section of the study area the vegetation is thick limiting archaeological visibility. The study area has been used almost exclusively for grazing purposes (Figure 7).

During the survey no traces of any significant archaeological remains were identified but two cemeteries and the foundations of 7 demolished structures interpreted as farm labourer dwellings were identified together with a stone cairn of unknown purpose (Table 2 & Figure 17). Widely dispersed scatters of isolated MSA tools (Figure 7) were identified in the study area. The artefacts are scattered too sparsely to be of any significance apart from noting their presence, which has been done so in this report.

Table 1: Recorded sites

Field Number	Type Site	*Longitude	Latitude	Elevation
6491	Cemetery	26° 34' 21.2340" E	27° 02' 38.3711" S	1299.046509
6501	Ruin	26° 34' 26.1299" E	27° 02' 43.1339" S	1295.354126
6511	Ruin	26° 34' 28.9235" E	27° 02' 42.3168" S	1296.487793
6521	Stone Cairn	26° 34' 11.2404" E	27° 02' 48.7537" S	1298.334351
6531	Ruin	26° 34' 39.4463" E	27° 02' 32.0317" S	1297.272705
6541	Ruin	26° 34' 25.3127" E	27° 01' 50.5847" S	1311.437988
6551	Ruin	26° 34' 33.7692" E	27° 01' 44.0003" S	1309.336426
6561	Ruin	26° 34' 38.9101" E	27° 01' 42.6828" S	1306.776855
6571	Cemetery	26° 35' 09.7908" E	27° 02' 17.9017" S	1291.952759
6581	Ruin	26° 34' 37.4002" E	27° 02' 37.2244" S	1298.272705

*GPS accuracy approximately 5 meters.



Figure 4: General site conditions in the study area.



Figure 5: General site conditions in the study area.



Figure 6: Thick vegetation in south eastern portion



Figure 7. Ventral view of artefacts. *Scale in cm.*

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Ruins. (Field No 6051, 6511, 6531, 6541, 6551, 6561 and 6581).

Field Number	Field No 6051, 6511, 6531, 6541, 6551, 6561 and 6581.
Type of Site	Recent.
Geographical Setting	Low laying areas.
Current Condition of site	Demolished.
Description and type of artefacts, approximate age and significant features of the site.	<ul style="list-style-type: none"> » 6501 consists of the rectangular stone foundations of a structure measuring 4 x 8 meters. » 6511 is located just to the east of 6510 and is presumably associated with this site. It consists of the stone foundations of a slightly larger structure measuring 8 x 16 meters. » 6531 consists of the remains of two rectangular structures marked by stone foundations measuring approximately 7 x 3 meters. Associated with these two features is a small midden with modern artefacts including glass, wire and cans. » 6541 is a large feature marked by cement bricks, measuring approximately 8 x 6 meters. » 6551 and 6561 are associated and are located in an area where trees were planted as a wind break. The features consist of the demolished remains of cement brick and concrete structures. <p>All these structures are associated with farm labourer dwellings.</p>
Depth and stratification of the site	Unknown



Figure 8: Remains of ruin at 6501



Figure 9: Remains of ruin at 6511







Figure 10: Remains of ruin from 6531



Figure 11: Remains at 6561

<p>Statement of Significance</p>	<p>Due to the extent of the demolition of the features and the lack of features apart from the foundations it is considered to be of a low significance.</p>
<p>Field Rating (Recommended grading or field significance) of the site:</p>	<p>Generally Protected C (GP.C).</p>
<p>Recommendations</p>	<p>Although these sites are of low significance it must be kept in mind that sites like these might contain unmarked graves or the graves of stillborn and it is recommended that these sites are preserved and demarcated with danger tape during the construction period. If these sites cannot be preserved the lack of graves on these sites should be confirmed during the social consultation process. If graves are present on the site these should be protected <i>in situ</i> and if this is not possible relocated with the required permits. A chance find procedure must be included in the EMP to monitor and mitigate accidental finds. Graves are of high social significance.</p>

Cemeteries (Field No 6491 & 6571).

Field Number	Field No 6491 & 6571.	
Type of Site	Recent graves.	
Geographical Setting	Low laying areas.	
Current Condition of site	Overgrown.	
Description and type of artefacts, approximate age and significant features of the site.	At Field No 6491 at least 12 graves are recorded. The graves are overgrown and consist of graves with stone packed grave dressings. The graves are aligned east to west. One grave has a cement headstone with some inscription that could not be deciphered. At Field No 6571 approximately 8 graves occur that are also highly overgrown. Two of these graves have headstones with the oldest visible date of the deceased 1962.	
		
		
Statement of Significance	High social significance.	
Field Rating (Recommended grading or field significance) of the site:	Generally Protected A (GP.A).	

Recommendations	Although it is possible to relocate graves (adhering to all legal requirements) this must be seen as a last resort. It is rather recommended that the cemeteries are preserved <i>in situ</i> with a 20 meter buffer. It is expected that more graves could occur in the study area and this should be confirmed during the public participation process.
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Stone cairn (Field no 6521)

Field Number	Field No. 6521
Type of Site	Stone Cairn of unknown purpose.
Geographical Setting	Low laying areas.
Current Condition of site	Overgrown.
Description and type of artefacts, approximate age and significant features of the site.	This is a stone cairn of unknown purpose located next to a road and an erosion donga. The cairn measures 0,8 x 1,2 m and is orientated roughly east to west. The cairn is associated with stone packed features to prevent erosion and could be part of this.

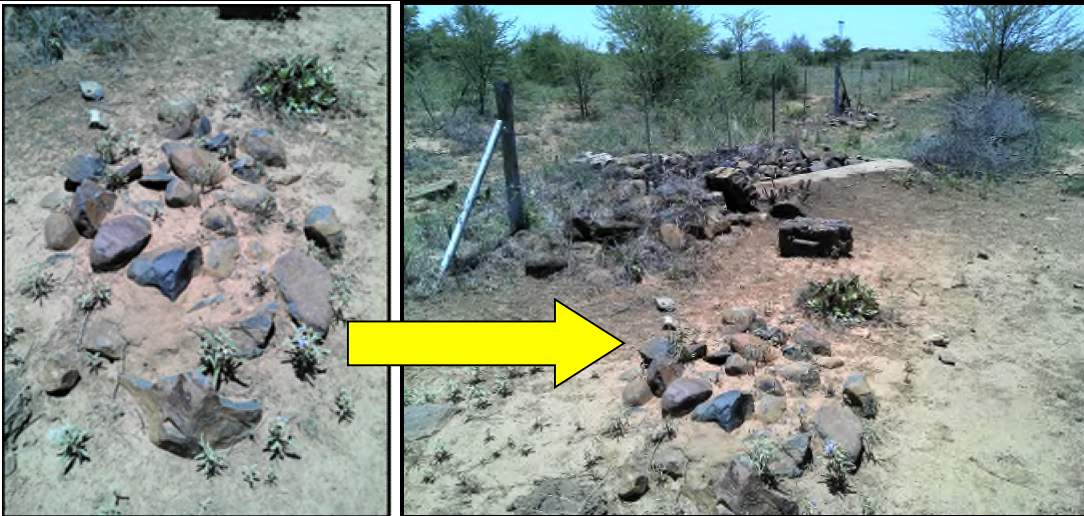


Figure 16: Stone packed cairn of unknown purpose. .

Statement of Significance	No Significance unless the cairn is confirmed to be a grave in which case it is of high social significance.
Recommendations	It is recommended that if the cairn will be impacted on it should be determined through social consultation whether the cairn represents a grave. If the results of social consultation are inconclusive ground penetrating radar can be used to determine whether the cairn is a grave. Alternatively a 10m buffer can be applied around the cairn and be fenced off to ensure the preservation of the site.

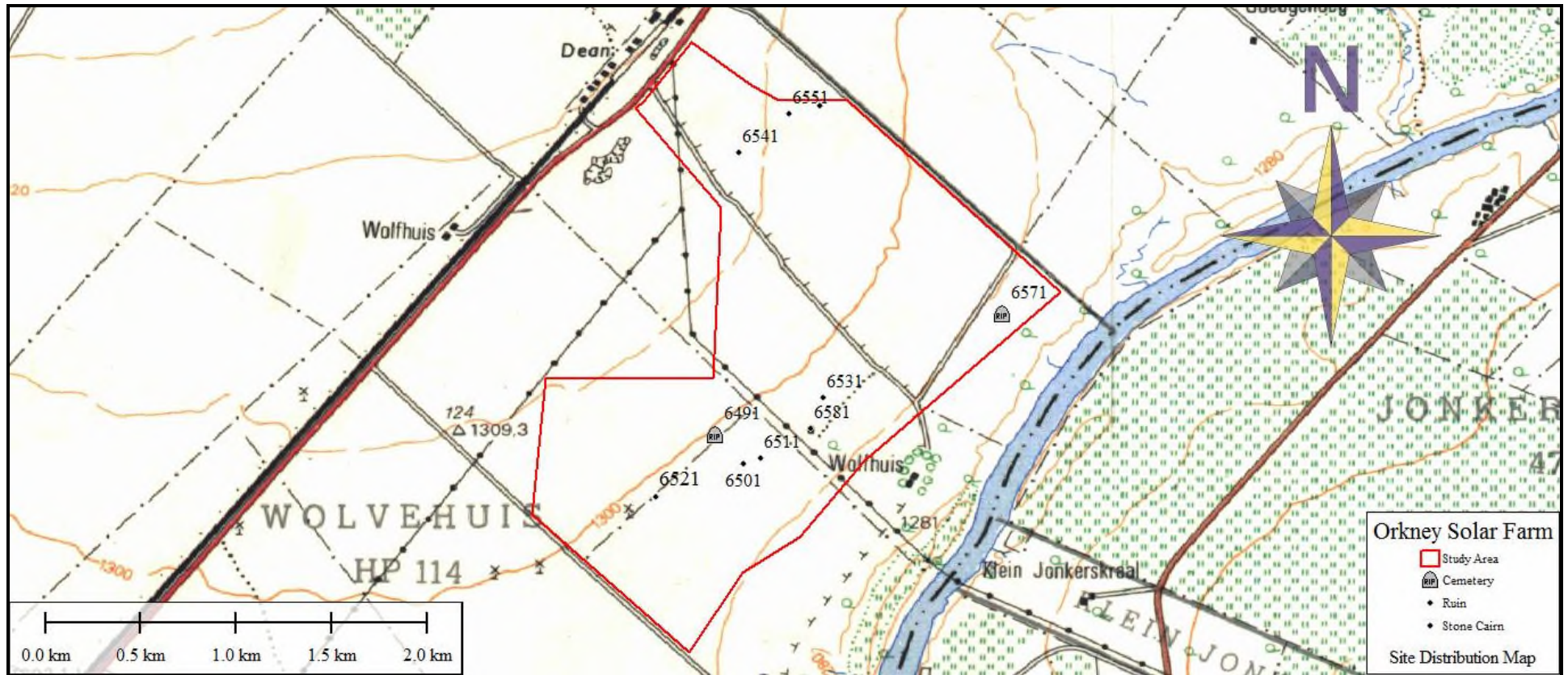


Figure 17. Site distribution map of the recorded sites identified within the development footprint of the Orkney Solar Farm

6.1. Impact evaluation of the proposed project on heritage resources

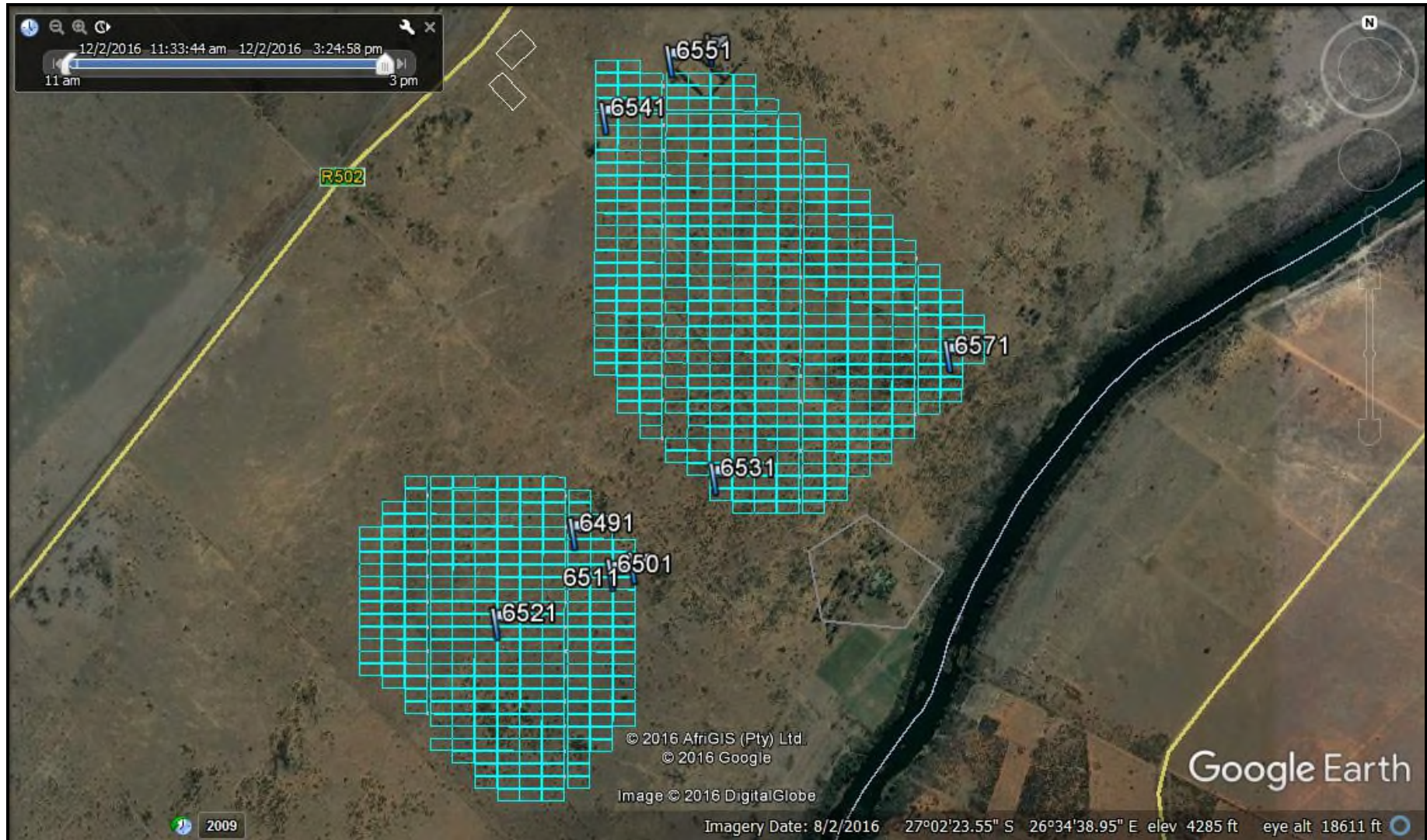


Figure 18. Solar panel field in relation to recorded sites identified during the fieldwork

Demolished ruins (Field No 6051, 6511, 6531, 6541, 6551, 6561 and 6581).

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects specifically relating to demolished ruins located within the development footprint.		
	Without mitigation	With mitigation (Preservation/ excavation of site)
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Probable (3)	Not Probable (2)
Significance	Medium (33)	Low (18)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or excavation of sites.
Mitigation: The structures are demolished to the extent that it has no significance apart from recording its presence as done in this report. Although these sites are of low significance it must be kept in mind that sites like these might contain unmarked graves or the graves of stillborn babies. and it is recommended that this should be confirmed during the social consultation process. If graves are present on these sites these should be protected <i>in situ</i> and if this is not possible relocated with the required permits. A chance find procedure must also be included in the EMP to monitor and mitigate accidental finds.		
Cumulative impacts: In any archaeological contexts the impacts are once-off permanent destructive events.		
Residual Impacts: N.A		

Cemeteries (Field no 6491 and 6571) and the Stone cairn (Field no 6521) if it is confirmed to be a grave.

Nature: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological and paleontological material or objects specifically relating to the cemeteries and the stone cairn located within the development footprint.		
	Without mitigation	With mitigation (Preservation/ excavation of site)
Extent	Local (3)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (5)	Low (3)
Probability	Probable (4)	Improbable (2)
Significance	Medium (52)	Low (30)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or excavation of sites.
Mitigation:		

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It is recommended that cemeteries and graves should be preserved *in situ*, fenced with a 20 m buffer zone and an access gate for family members. If this is not possible the graves can be relocated with the required permits and adhering to the legislation. It is recommended that if the cairn will be impacted on it should be determined through social consultation whether the cairn represents a grave. If the results of social consultation are inconclusive ground penetrating radar can be used to determine whether the cairn is a grave. Alternatively a 10m buffer can be applied around the cairn and be fenced off to ensure the preservation of the site. If these recommendations are adhered to the impact on heritage resources will be acceptable.

Cumulative impacts:

In any archaeological contexts the impacts are once-off permanent destructive events.

Residual Impacts:

N.A

Cumulative Assessment

Through CRM studies for developments in the area heritage sites are identified and protected from accidental damage, this can be regarded as a positive impact as it adds to the heritage database of the area. The following projects and their results were taken into account.

Project Name	Location	Approximate distance from the Orkney Solar Farm site (measured from the centre)	Project Status
Solar Energy Facility on Omega 342	Farm Omega 342	~35km to the west	In process
Vaal River Solar Energy Facility 1	Portions 3 and 7 of Farm Vaalkop and portion 200 of Farm Nooitgedacht 434	~19km to the north west	Authorisation granted
Vaal River Solar Energy Facility 2	Portions 3 and 7 of Farm Vaalkop and portion 200 of Farm Nooitgedacht 434	~21km to the north west	Authorisation granted
Vaal River Solar Energy Facility 3	Portions 3 and 7 of Farm Vaalkop and portion 200 of Farm Nooitgedacht 434	~20km to the north west	Authorisation granted
Buffels Solar 1 Solar Energy Facility near Orkney	Portion 5 of the farm Hartebeestfontein 422 IP	~30km to the north west	In process
Buffels Solar 2 Solar Energy Facility near Orkney	Portion 57 of the farm Hartebeestfontein 422 IP	~32km to the north west	In process
Bokmoso PV Energy Facility near Leeudoringstad	Farm Matjesspruit 145	~22km to the west	Authorisation granted

The heritage studies for these projects identified very few heritage resources and the broader study area is considered to be of low archaeological significance, subject to the implementation of the project specific EMPs. The impact of the Orkney Solar Farm project on heritage resources can be mitigated to acceptable levels.

Cumulative Impact Assessment

Nature: Heritage impacts associated with the establishment of solar energy facilities on the archaeology of the greater area.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects within the area
Extent	Local (2)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (3)
Probability	Probable (3)	Probable (3)
Significance	30 (Medium to Low)	30 (Medium to Low)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes, if present.	Yes, unless sites can be preserved.
Can impacts be mitigated?	Yes	Through preservation or documentation of sites.

Mitigation:

Identified resources are being recorded and mitigated for projects such as these that would have otherwise remained unidentified. In terms of the impact on the cultural landscape the impact is considered low, as currently it is characterised by agricultural activities. The implementation of the project specific EMP for each project will ensure the preservation and protection of heritage features.

Cumulative impacts:

If sites are destroyed this results in the depletion of archaeological record of the area. However, if sites are identified, preserved or recorded and mitigated this adds to the archaeological record of the area.

Residual Impacts:

In any archaeological contexts the impacts are once-off permanent destructive events.

7. CONCLUSIONS AND RECOMMENDATIONS

HCAC was appointed to assess the study area in terms of the archaeological component of Section 35 of the NHRA as part of the Environmental Impact Assessment (EIA) for the Orkney Solar Farm. No significant Stone Age sites were recorded in the study area and no ceramics or stone walls attributed to the Iron Age were recorded. Similarly no sites of archaeological significance were recorded by other studies in the area (e.g. Roodt 2011, Coetzee 2012; van der Walt 2016). No further mitigation prior to construction is recommended in terms of the archaeological component of Section 35 for the proposed development to proceed.

In terms of the built environment of the area (Section 34), no standing structures older than 60 years occur within the study area. The foundations of several demolished structures were however recorded, but these structures are demolished to the extent that it is of no significance other than recording it in this report. None of these structures are indicated on 1:50 000 maps prior to the 1990's and are therefore assumed not to be older than 60 years. Sites like these could however contain unmarked graves.

In terms of Section 36 of the Act two burial sites (cemeteries) were recorded in the study area. Graves should ideally be preserved *in-situ* and fenced off with an access gate for family members and a 20 m buffer zone. Alternatively graves can be relocated according to existing legislation but this must be seen as a last resort. More graves can be expected within the study area that was not identified during the field survey and it is therefore recommended that through the social consultation process the presence of unknown graves must be confirmed in the study area as well as at the demolished ruins and cairn.

Due to the subsurface nature of archaeological remains and the fact that graves occur subterranean, it is recommended that a chance find procedure is implemented for the project as part of the EMPr.

No scenic significant cultural landscapes or viewsapes were noted during the fieldwork within the area this assessment concurs with the independent visual specialist report (Marshall 2016) that there are no significant visual issues that would prevent the implementation of this project. Due to the lack of significant heritage features in the study area there is from an archaeological point of view no reason why the development cannot commence provided that the recommendations made in this report are adhered to and based on approval from SAHRA.

Table 2: EMPR management measures

OBJECTIVE: To preserve and mitigate non-renewable heritage resources in the study area.	
Project component/s	Heritage resources can be impacted by the pre-construction and construction activities of the project.
Potential Impact	Irreplaceable loss of heritage resources in the study area and depletion of the archaeological database of the area.
Activity/risk source	Activities such as vegetation clearing and digging foundations could destroy archaeological resources.
Mitigation: Target/Objective	An environmental management plan that considers heritage resources in the event of any future extensions of infrastructure or identification of heritage resources. Graves should ideally be preserved <i>in-situ</i> and fenced off with an access gate for family members and a 20 m buffer zone. Alternatively graves can be relocated according to existing legislation, but this must be seen as a last resort. More graves can be expected within the study area that was not identified during the field survey and it is therefore recommended that through the social consultation process the presence of unknown graves must be confirmed in the study area as well as at the demolished ruins and cairn.

Mitigation: Action/control	Responsibility	Timeframe
Implement a Chance Finds Procedure to ensure that if any heritage resources are uncovered that these are reported and correctly mitigated.	ECO	Pre-construction and construction
More graves can be expected within the study area that was not identified during the field survey and it is therefore recommended that through the social consultation process the presence of unknown graves must be confirmed in the study area as well as at the demolished ruins and cairn.	Social team	Prior to construction

Performance Indicator	Heritage impacts should be considered in any future development in the area. Implementation of a chance find procedure i.e. immediate reporting to relevant heritage authorities of any heritage feature discovered during any phase of development or operation of the facility.
Monitoring	The ECO should monitor the possible occurrence of heritage resources regularly.

Chance finds procedure

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- If during the pre-construction phase, construction, operation or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.
- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

The study area is surrounded by industrial and agricultural developments and no significant cultural landscapes or viewsapes were noted during the fieldwork.

7.1 Reasoned Opinion

From a heritage perspective the proposed project is acceptable, if the above recommendations are adhered to and based on approval from SAHRA, HCAC is of the opinion that the development can continue as the development will not impact negatively on the archaeological record of the area. If during the pre-construction phase or during construction, any archaeological finds are made (e.g. graves, stone tools, and skeletal material), the operations must be stopped, and the archaeologist must be contacted for an assessment of the finds. Due to the subsurface nature of archaeological material and graves the possibility of the occurrence of unmarked or informal graves and subsurface finds cannot be excluded, but can be easily mitigated by preserving the sites *in-situ* within the development or in the case of graves be relocated (however as a last resort).

8. PROJECT TEAM

Jaco van der Walt, Project Manager

9. STATEMENT OF COMPETENCY

I (Jaco van der Walt) am a member of ASAPA (no 159), and accredited in the following fields of the CRM Section of the association: Iron Age Archaeology, Colonial Period Archaeology, Stone Age Archaeology and Grave Relocation. This accreditation is also acknowledged by SAHRA and AMAFA.

I have been involved in research and contract work in South Africa, Botswana, Zimbabwe, Mozambique, Tanzania and the DRC; having conducted more than 300 AIA's since 2000.

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