

**ENVIRONMENTAL IMPACT ASSESSMENT HERITAGE REPORT:
PROPOSED CONSTRUCTION OF A 90 MW PHOTOVOLTAIC
POWER FACILITY ON THE FARM WAAI PLAATS AT DRENNAN,
GREAT FISH RIVER VALLEY EASTERN CAPE
PROVINCE**

(Assessment conducted under Section 38(8) of the
National Heritage Resources Act 25 of 1999)

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GLOSSARY

Archaeology: Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Early Stone Age: The archaeology of the Stone Age between 700 000 and 2500 000 years ago.

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Holocene: The most recent geological time period which commenced 10 000 years ago.

Late Stone Age: The archaeology of the last 20 000 years associated with fully modern people.

Middle Stone Age: The archaeology of the Stone Age between 20-300 000 years ago associated with early modern humans.

National Estate: The collective heritage assets of the Nation

Palaeontology: 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.

Pleistocene: A geological time period (of 3 million – 20 000 years ago).

SAHRA: South African Heritage Resources Agency – the compliance authority which protects national heritage.

Structure (historic:) Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.

Trekboer. A farmer who moves stock from locality to locality on a seasonal cycle.

Wreck (protected): A ship or an aeroplane or any part thereof that lies on land or in the sea within South Africa is protected if it is more than 60 years old.

Acronyms

DEA	Department of Environmental Affairs
ESA	Early Stone Age
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency
PHS	Provincial Heritage site

EXECUTIVE SUMMARY

ACO Associates cc were appointed by ERM Southern Africa (Pty) Ltd, on behalf of the proponent, Solaire Direct, for the construction of a proposed 90 MW photovoltaic power facility on a portion of the farm Waai Plaats at Drennan between Cradock and Cookhouse in the Great Fish River Valley

A survey of the land was conducted by Liesbet Schietecatte and Tim Hart in July 2012. The desktop Palaeontological Impact Assessment (PIA) was conducted by Dr Graham Avery of Iziko Museums of Cape Town....

The following heritage indicators were identified:

- According to the desktop PIA report, the proposed site is located in a palaeontologically-sensitive region with a hard rock base of the potentially fossiliferous Permian (circa 250 Ma (million years old) Balfour Formation and more recent (circa 20 Ma to the present) alluvial sediments, which may also contain fossil and sub-fossil remains.
A stone alignment or kraal thought to be of pre-colonial age lies in the development area.
- Two stone cairns, possibly pre-colonial burial cairns lie in the development area.
- There is an abandoned historical square stone kraal in the development area.
- No buildings were recorded or near the proposed site.
- The Cultural Landscape is grasslands used as pastures for livestock and game. It is considered of low significance but lies within the scenic context of the Fish River Valley

The following mitigation measures are recommended:

- Palaeontological mitigation is required. The study area lies on ancient bedrock rocks of the Balfour formation which have high fossil potential. A pre-disturbance site visit is recommended followed by monitoring of the earthworks phase of the development by a professional palaeontologist. If significant material is found it will need to be excavated/sampled and housed at a regional or national museum. The Environmental Control Officer (ECO) responsible for the development must remain aware that all sedimentary deposits have the potential to contain fossils and he/she should thus monitor all substantial excavations into sedimentary bedrock for fossil remains. If any fossils are found during construction, SAHRA should be notified immediately;
- The two possible graves (DRN 11 and DRN 14) automatically get a very high significance rating in heritage terms as they are covered by legislation at national level and the procedures for their exhumation are long and onerous. It is recommended that a 10 m buffer zone be implemented around each potential grave and they are left undisturbed or a permit for exhumation of the graves be applied for and the contents of the graves be subject to basic forensic assessment and be relocated. The process of exhumation will require consultation with interested parties which will need to include local residents and Khoisan interest groups (who have become quite well established in the Eastern Cape). The process can take in excess of 4 months to obtain a permit.
- The pre-colonial stone kraal (DRN 13) is a good example of its kind and should be considered to be worthy of a grade IIIA rating (which means of high local significance) on account of its complete and original condition. The best mitigation scenario is that it is conserved in-situ within a 10 m radius of exclusion from the perimeter of the kraal, or the kraal must be thoroughly recorded by an archaeologist

by means of photographs and measured drawings, then a permit applied for from the Eastern Cape Provincial Heritage Resources Authority for its demolition.

- The historic kraal (DRN 15) is of a form which is well represented in the Karoo and not considered especially important. Under ideal circumstances it should be conserved, however should it be necessary to demolish it, this can be done under a demolition permit issued by the Eastern Cape Provincial Heritage Resources Authority.

The proposed area for the facility is acceptable; however the above mitigation will be necessary.

TABLE OF CONTENTS

1. INTRODUCTION.....	7
2. DEVELOPMENT PROPOSALS.....	7
3. TERMS OF REFERENCE	8
4. LEGISLATION.....	8
5. RECEIVING ENVIRONMENT.....	9
5.1 Palaeontological Background.....	10
5.2 Archaeological Background.....	11
5.3 Historical Background.....	12
6. METHDOLOGY.....	14
6.1 Limitations.....	14
7. Assessment of impacts	14
7.1 Impacts to palaeontology.....	14
7.2 Archaeology	15
7.3 Built Environment.....	17
7.4 Landscape and setting.....	17
7.5 Heritage objects.....	18
8. Mitigation	18
8.1 Palaeontology	18
8.2 Archaeology	19
9. REFERENCES.....	20

[Appendix 1](#)

[Appendix 2](#)

1. INTRODUCTION

ACO Associates cc were appointed by ERM Southern Africa (Pty) Ltd on behalf of the proponent, Solaire Direct, to provide specialist heritage input into the full Environmental Impact Assessment (EIA) for the construction of the proposed Drennan photovoltaic power facility Portion 15, of Portion 1, of the Farm Waai Plaats (no. 550) at Drennan. The proposed facility will be situated on the western side of the Great Fish River Valley, about 40 km east of Cradock down the N10.

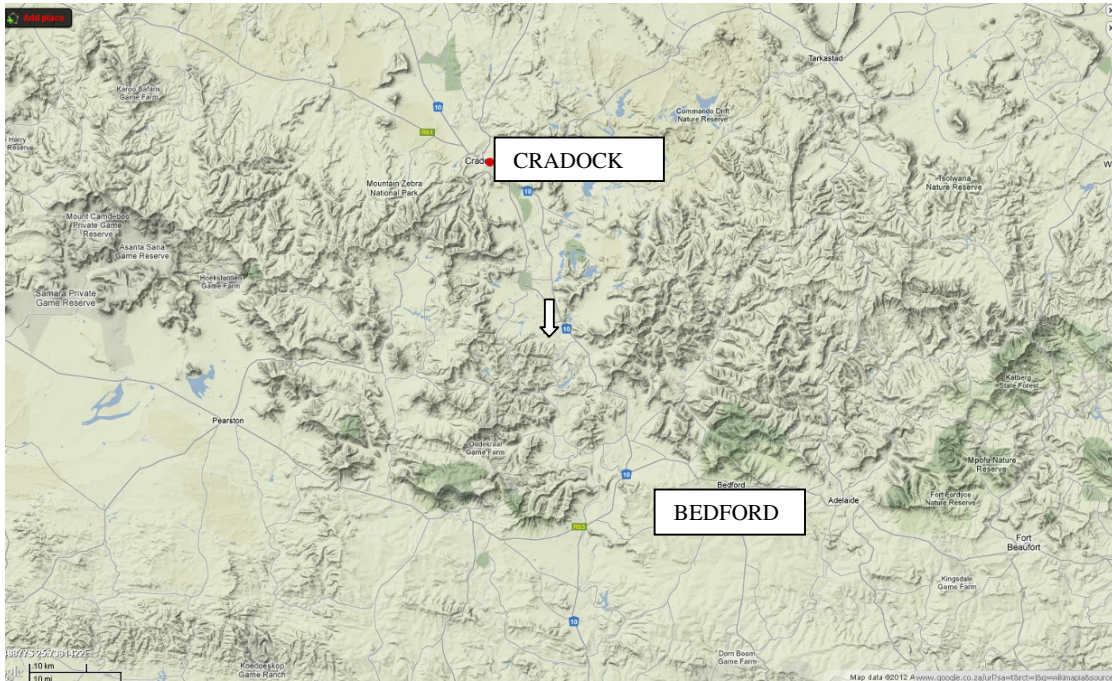


Figure 1: Location of the proposed PV power facility located between Bedford and Cradock on the N10.

2. DEVELOPMENT PROPOSALS

It is anticipated that the project will feed a total of 90 MWs into the national grid. The key components of the proposed PV power plant include the following:

- PV solar panels/modules (arranged in arrays);
- PV module mountings;
- DC-AC current inverters and transformers;
- New 2500m² grid connection substation;
- New 4000m² substation;
- Underground cabling/ overhead power lines;
- On-site buildings (including an operational control centre, office, ablutions and a guard house);
- Access roads and internal road network; and
- Ancillary infrastructure.

The proposed development will include PV solar panels. The PV panels will be mounted on aluminium fixed frame structures approximately 3.33m in height from the ground. The aluminium structures will be mounted on steel screw piles or concrete foundations 1500mm deep, depending on soil conditions. The distance or spacing between rows will be approximately 6.2m. The 132kV power from the new grid connection substation will be connected to the existing Eskom grid. Existing gravel roads will be upgraded to 6m in width. It is anticipated that the proposed activity will involve ground levelling in the affected areas hence there will be significant disturbance of surface deposits. A proposed location for the PV facility has been provided, however this may undergo change during the EIA process.

3. TERMS OF REFERENCE

The assessment includes:

- A desk top study to determine the pre-history and history of the property;
- A site visit to locate and map heritage resources;
- The rating of significance of heritage resources on the property;
- An assessment of whether the construction of the solar facility will result in a loss of significant heritage resources;
- Recommendations for mitigation if necessary; and
- A proposed location for the PV facility was provided, however it was requested that the specialist teams consider this in broader context of the study area and indicate the suitability of the position of the proposed facility.

4. LEGISLATION

The National Heritage Resources Act, No 25 of 1999 (Section 38 (1)) makes provision for a compulsory notification of the intent to development when any development exceeding 5000m² in extent, or any road or linear development exceeding 300m in length is proposed.

The NHRA provides protection for the following categories of heritage resources:

- Cultural landscapes (Section 3(3))
- Buildings and structures greater than 60 years of age(Section 34)
- Archaeological sites greater than 100 years of age(Section 35)
- Palaeontological sites and specimens
- Shipwrecks and aircraft wrecks
- Graves and grave yards (Section 36).

With respect to the Cultural Landscape, the Visual Impact Assessment (VIA) is being conducted by a VIA specialist. Nevertheless, in terms of Section 3 (2)(d) of the NHRA, No 25 of 1999, the national estate may include "landscapes and natural features of cultural significance". It is important that the VIA specialist examines the impact of the development on the cultural landscape or consults with a heritage practitioner in this regard.

The Palaeontological Impact specialist report was conducted by Dr Graham Avery of the Iziko Museums of Cape Town. The report is attached in full at the end of this HIA (Appendix 2).

5. RECEIVING ENVIRONMENT

It is proposed to construct the PV power facility on an east facing slope on the western side of the Great Fish River Valley close to Drennan Station on the Midland Railway system.



Plate 1: A panorama over the landscape looking east over the Great Fish River valley and Drennan Station. The development site lies behind the photographer.

The proposed development area takes the form of a flat shoulder or terrace of land on the Western Side of the Great Fish River Valley. The ground is un-developed apart from a wind pump and dam, tracks and a 400 kV transmission line and service road. The land which is typically eastern Karoo is stony (shales, hornfels and dolerites) and devoid of large trees. Used for grazing only, the land also contained a herd of springbok and a number of Kudu, noted during the site visit. The N10, the main route through the area lies on the east side of the river about 5 km east of the site.



Plate 2: View to the west over the development site.

5.1 Palaeontological Background

The Great Karoo is one of the world's most important repositories of palaeontological information about the evolution on both marine and terrestrial plants and animals. In popular literature it is described thus:

*“The **Karoo Supergroup** is the largest stratigraphic unit in Southern Africa, covering almost two thirds of the present land surface, including central Cape Province, almost all of Orange Free State, western Natal, much of south-east Transvaal, Zambia, Zimbabwe and Malawi. The basins in which it was deposited formed during the formation and breakup of Pangea.*

Its strata, mostly shales and sandstones, record an almost continuous sequence of marine glacial to terrestrial deposition from the Late Carboniferous to the Early Jurassic, a period of about a hundred million years. These accumulated in a retroarc foreland basin called the “main Karoo” Basin. This basin was formed by the subduction and orogenesis along the boundary of Gondwana (the past African continent) and the Panthalassan Sea (paleo-Pacific).^[2] Its sediments attain a maximum cumulative thickness of 12 km, with the overlying basaltic lavas (the Drakensberg Group) at least 1.4 km thick.¹

Fossils include plants (both macro-fossils and pollen), rare insects and fish, common and diverse tetrapods (mostly therapsid reptiles, temnospondyl amphibians, and in the upper strata dinosaurs), and ichnofossils. Their biostratigraphy has been used as the international standard for global correlation of Permian to Jurassic nonmarine strata”. (2012 Wikipedia: http://en.wikipedia.org/wiki/Karoo_Supergroup)

The geology of the Drennan area contains Late Permian rocks, which are between 255 and 252 million years old and belong to the Balfour Formation of the Beaufort Group, Karoo Supergroup. These rocks consist mostly of mudstones and siltstones. The Beaufort Group is world-renowned for its rich fossil record. They contain some of the most significant evidence for the origins of dinosaurs, mammals and turtles as well as fossil plant remains. The rocks of the Beaufort Group are sub-divided into assemblage zones according to the various vertebrate fossils found in each zone. Genoegeesam falls within the *Dicynodon* Assemblage Zone, named after the most common dicynodont therapsid fossil found in the zone. The Dicynodon Assemblage Zone fauna include fish, amphibians, reptiles and numerous species of therapsids (the ancient ancestors of mammals).



Figure 2: Artists reconstruction of a *Dicynodon* (Wikimedia commons)

5.2 Archaeological Background

Very little is known of this part of the Eastern Cape as little systematic archaeological work has been done. The Albany Museum in Grahamstown has received donations of stone implements from members of the public from as early as the 1880s. Many of these collections were received from Cradock area – where freshwater mussel middens containing stone implements and pottery were recorded from the banks of the Fish River. A certain JJ Kissack from Cradock started making donations of implements to the Museum during the 1930s. His collections included Early and Middle Stone Age material, including artefacts from the Conway station (near to the site).

We can therefore anticipate that the study area will contain artefactual material dating to the Early Stone Age and Middle Stone Age (MSA) of the Pleistocene epoch (*3 million – 20 000 years ago*). This material is often noted in eroded areas, or on terraces in river valleys. Under very rare circumstances it is found in undisturbed contexts in association with fossil bone. Such sites enjoy high status in research terms as they have the potential to produce significant information about early human behaviour. A survey by Webley & Hart (2010) on the farms Denmark and Groene Vallei on the R61 to the west of Cradock, identified surface scatters of MSA and Late Stone Age (LSA) artefact scatters along a rocky ledge on Denmark and a “factory” or “quarry” site on Groene Vallei.

Excavations by Hewitt (1931) at Tafelberg Hall and by Deacon (1976) at Highlands Rock Shelter near Cradock have produced LSA materials from both rock shelters. Deacon (1976) has two dates of 4 500BP and 3570BP from Highlands Rock Shelter. Illustrations of stone tools in Deacon’s (1976) monograph show that both sites contained end scrapers and backed microliths on indurated shale. Deacon also refers to excavations by Pat Kramer of a freshwater shell midden on the Fish River but this unfortunately was never published.

However, the most comprehensive survey of LSA archaeology from open sites was conducted by CG Sampson over a period of 30 years. His study area comprises the Zeekoe Valley (Seacow River Valley), situated between Middelburg and Richmond (Sampson 1992), at least 50km west of the proposed facility. His detailed research has resulted in a comprehensive body of information which we may “borrow from” in terms of predicting the pre-colonial sensitivity of the area.

We may predict with some confidence that there will be LSA sites within the study area. These are attributed to the ancestors of the San people and Khoekhoen pastoralists (after 2000 years ago). The legacy of the San includes numerous open sites while traces of their presence can also be found in most large rock shelters, often in the form of rock art. They frequently settled a short distance from permanent water sources (springs or waterholes) and made use of natural shelters such as rock outcrops or large boulders. In the Great Karoo natural elevated features such as dolerite dykes and ridges played a significant role in San settlement patterns. Sampson’s surveys have revealed that LSA sites are very seldom found on the flat Karoo plains but almost always are associated with natural foci – especially dolerite dikes. The introduction of pastoralism (sheep and goats, later cattle) roughly 2000 years along with the arrival of the Khoekhoen was a significant event that broke the ancient tradition of hunting and gathering. According to the historic records the Khoekhoen herders were divided into large tribal communities, distributed along the coastal plains and up as far as Graaff Reinet. These transhumant communities (herding cattle and sheep) may have utilized the grazing opportunities of the Karoo on a seasonal basis but information on this is sketchy. The San appear to have retreated to the Great Karoo with the arrival of the first Dutch Trekboers in the mid-18th century. Here they managed to eke out an existence which includes hunting, gathering and raiding the livestock of the Trekboers, resulting in the “Bushman War” which continued for almost 60 years. Eventually the *kommandos* which were dispatched from regional centers such as Graaff Reinet prevailed, and the “wild bushman” of the Karoo were rendered extinct by the early 19th century.

5.3 Historical Background

Sampson has recorded the spread of European settlement into the Seacow River Valley, which is located to the west of Middelburg. According to Sampson *et al* (1994), the first Trekboers settled in the headwaters of the Seacow River valley in the 1770s but many were driven out by attacks from Bushmen. A few farms were re-occupied in the 1780s and 1790s. “Land seizures from resident Bushmen were legitimised by the granting of Loan Places, i.e. rectangular 3000 morgen tracts of Karoo veld separated by unclaimed land” (Neville et al 1994:65).

Colonial Period

European farmers (*Trekboere*) were the vanguard of formal colonisation and accelerated granting of land by the British Colonial Government. The farms in the Fish River Valley were all occupied by Dutch speaking farmers by 1825. The implication of this is that the farmers (who were probably *trekboers*) had by that time already informally occupied the land, the deeds of which were made official by the British Colonial Government.

In 1813, the Cradock Proclamation gave the right to Loan Place holders to apply for their lands to be granted to them in Perpetual Quitrent. “By 1840, swarms of these contiguous quitrent farms were in place, separated by vast, unchartered tracts of Crown Land which served, among other things, as a *refugium* for surviving Bushmen” (Sampson 1994a: 65).

Farmers were urged to make peace with the San through gifts of meat, tobacco and trinkets. Between 1825 and 1840, travellers reported increasing numbers of farm Bushmen acting as herders and servants. By the 1840s, when the first towns sprung up around the valley, most unattached Bushmen were partly acculturated and some were drawn into slum communities where they lost their identities.

From the beginning of the British occupation of the Eastern Cape, tensions developed with farming Xhosa groups who ventured southwards out of the summer rainfall areas to seek season grazing for their herds. During much of the 18th century the frontier wars took place. The Fish River a fortified frontier zone between the colony of the Cape Province and the Xhosa nation, who for much of the 19th century did their utmost to drive out the settlers (Mostert 1992).

The historic road into the interior from Algoa Bay seems to have followed quite closely the route of the railway line or the N10 but meandered more towards Somerset East rather than Cookhouse. Skead (2007) indicates the area as having been open Karoo veld in parts, but mostly vast plains of sweet grassland. Early travelers noted the presence of large games animals on the coastal plains, as well as hippos in the Fish River.

Craddock was established as a sub-drostdy to Graaff-Reinet in the context of increasing tension with the Xhosa across the Fish River. Slow to develop as a town it increased status due to the construction of a church in 1842 made it a more desirable place to reside. With the blossoming of the wool trade Craddock became a regional center. Today it is considered one of the finest heritage towns in the country as a result of local conservation efforts.

Cookhouse however seems to have played a minor role in those early years seldom receiving mention. The area derived its name from an early British military camp kitchen, however indications are that little physical evidence exists today.

Drennan itself is not a town but a railway station on the midland railway system. This railway was one of three core routes that were constructed between the main ports of British held parts of South Africa to Aar between 1870 and 1890. Drennan is likely to have been constructed circa 1881-1882. This railway system was later heavily fortified during the second Boer War.



Plate 3: Archaeologist Tim Hart records a circular stone feature on the edge of the study area

6. METHODOLOGY

The survey was conducted by Tim Hart (MA) and Liesbet Schietecatte (MA MSC) on 36-29 July 2012. All identified heritage sites/archaeological occurrences were plotted with a Garmin GPS-map62s handheld GPS, photographed and their significance rated. No archaeological material was removed from the project area, but recorded and photographed *in situ*. The reader of this report is referred to the appendices which contain the details of the archaeological observations made in the field.

The desktop Palaeontological Impact Assessment was conducted by Dr Graham Avery of Iziko Museums of Cape Town.

6.1 Limitations

There were no restrictions to the survey. Visibility was good and the landowner enabled access to the property.

7. ASSESSMENT OF IMPACTS

Details of archaeological and palaeontological finds are indicated in Appendices 1 and 2.

7.1 Impacts to palaeontology

With regard the palaeontology of the area (see Appendix 2 at the end of the report) the Palaeontological Impact Assessment has indicated that the rocks of the area belong to the

Beaufort Group which is world-renowned for its rich fossil record. Fossils are potentially present in shales in the area, however the presence of dolerite extrusions and dykes as well as indurated rock means that well preserved fossils are an unlikely occurrence on the surface. Excavations that involve excavation into or exposure of bedrock are likely to impact fossil material.

Table 1: Impacts to Palaeontology

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Permanent (loss of palaeontological resources is permanent)	n/a
Intensity	High	Low
Probability	Low	Low
Confidence	Medium	Medium
Significance	High	Low
Nature of cumulative impact	High	
Can impact be reversed?	No, palaeontological resources are non-renewable	
Impact may cause irreversible loss of resources	Yes, if fossils are destroyed.	
Can impact be mitigated?	The site must be subject to a pre-disturbance site inspection and a palaeontologist must conduct site inspections during bulk earthworks. Any fossil material found will need to be excavated or sampled and curated at a regional or national museum.	

7.2 Archaeology

The archaeological findings are discussed in detail in Appendix 1.

Four archaeological sites were found within the study area. There is a very well preserved Koekhoen stone kraal/alignment (circa 1000 – 1400 AD) (DRN13), an historic kraal (DRN 15) and two potential pre-colonial graves (DRN 11 and DRN 14).

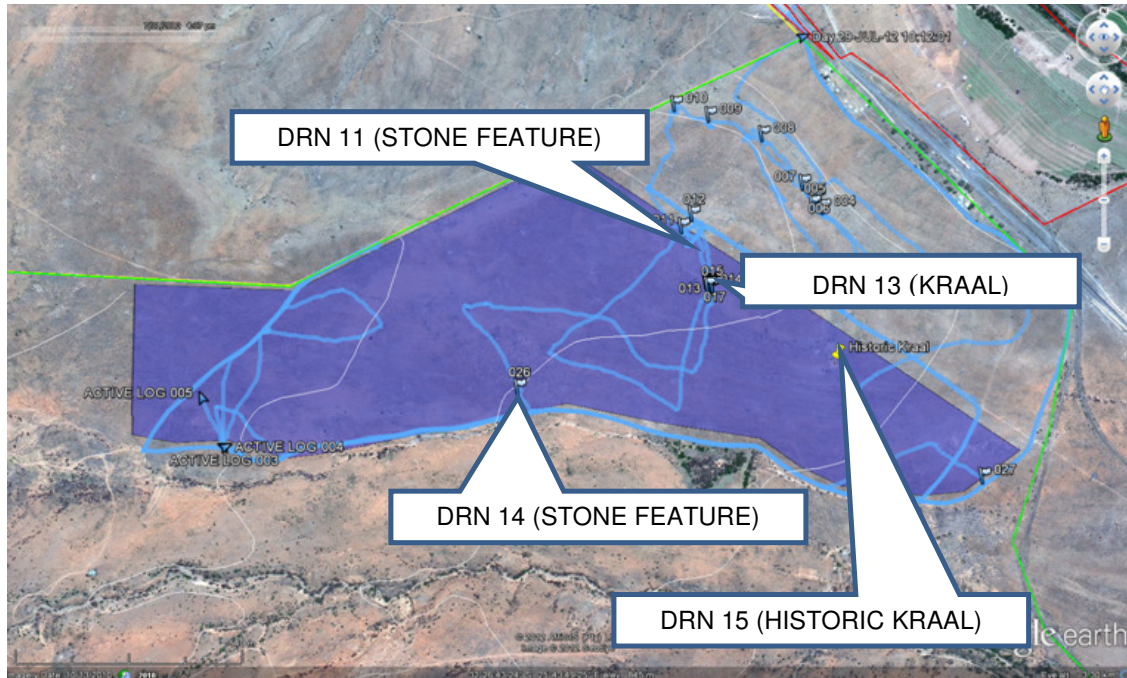


Figure 3: The study area showing archaeological sites found within its boundaries. Note that more are found between the eastern edge of the study area and Drennan Station.

The kraal (DRN 13) is best conserved in-situ due to its completeness, however if this is not possible, it will need to be destroyed under a permit issued by the Eastern Cape Provincial Heritage Resources Authority (ECPHRA). For this to happen it will need to be recorded and documented first by an archaeologist.

The two possible graves (DRN 11 and 14 both of which lie close to the edge of the proposed site) are best left in-situ in a 10 m buffer zone as the process of exhumation is time consuming, costly and requires its own public process in terms of section 36 of the National Heritage Resources Act 25 of 1999.

The historical kraal (DRN 15) is well represented in the karoo but protected under the NHRA. This may be demolished subject to a permit being issued by ECPHRA.

Table 2: Impacts to Pre-colonial Archaeology (Stone Cairns DRN 11 and DRN 14, and Kraals DRN 13 and DRN 15)

The impact of the construction of the PV power facility on the pre-colonial archaeology is potentially high and mitigation is required.

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Permanent (loss of archaeological resources is permanent)	n/a
Intensity	High	Low
Probability	Medium	Low
Confidence	Medium	Medium
Significance	High/Critical	Medium (-ve): If permit

		obtained and graves and kraals destroyed.
		Negligible: If grave and kraal sites completely avoided and left in-situ with no preservation or documentation.
		Moderate (+ve): If grave and kraal sites are avoided, documented by an archaeologist and preservation action undertaken.
Nature of cumulative impact	Low	
Can impact be reversed?	No, archaeological resources are non-renewable	
Impact may cause irreversible loss of resources	Yes, damage to grave sites would be irreversible, and well preserved early Khoekhoen kraals are rare.	
Can impact be mitigated?	Yes, either by the correct permit and regulatory process requirements or by avoidance or by avoidance and preservation.	

7.3 Built Environment

There are no buildings apart from a disused historic kraal on or close to the study area apart from station buildings at Drennan which are typical railway buildings built after the mid-twentieth century. These are mostly in very poor condition, some occupied by farm workers, others vandalised and stripped.

Table 3: Impacts to the Built Environment

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	n/a	n/a
Intensity	Low	Low
Probability	Low	Low
Confidence	High	High
Significance	Low	Low
Nature of cumulative impact	None	
Can impact be reversed?	No	
Impact may cause irreversible loss of resources	No.	
Can impact be mitigated?	No	

7.4 Landscape and Setting.

While the Fish River Valley contains a mosaic of cultivated land in and along the river flood plain, the study area is at a higher elevation and well above the cultivated land. Although it is technically agricultural land, it is uncultivated and used for grazing. Springbok and Kudu were seen on the property. The land is best described as having wilderness qualities rather

than being part of a human made of agricultural landscape. Being far from any significant heritage places, impacts to broader heritage context are not expected.

There are no buildings on or close to the study area apart from station buildings at Drennan which are typical railway buildings built after the mid-twentieth century. These are mostly in very poor condition, some occupied by farm workers, others vandalised and stripped.

Table 4: Impacts to Landscape and Setting

Criteria	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Long-term	Long-term
Intensity	Low	Low
Probability	Low	Low
Confidence	Medium	Medium
Significance	Low	Low
Nature of cumulative impact	None	
Can impact be reversed?	Yes, after facility is decommissioned	
Impact may cause irreversible loss of resources	The visual impact of the proposed development on the farm N10 must be assessed by the Visual Impact Specialist.	
Can impact be mitigated?	Yes, the Visual Impact Specialist will indicate if this is required.	

7.5 Heritage Objects

The remains of an abandoned car (circa 1920 vintage) lie to the southern side of the site. While not of major significance it is protected under the NHRA and should be left in-situ.

8. MITIGATION

8.1 Palaeontology

The site should be inspected by a palaeontologist before disturbance, thereafter bulk earth works and excavation for foundations/infrastructure should be monitored by a palaeontologist. The frequency of this to be worked out *a priori* with the contractor to minimize time spent on site.

If possible, geotechnical information together with the proposed locations and depths of excavations for foundations and/or infrastructure should be provided prior to the commencement of construction. This may enable a better estimation of the time(s) when monitoring would be necessary.

Protocols for dealing with palaeontological/palynological (fossil pollens) monitoring and possible further mitigation must be included within the brief of the appointed palaeontologist.

Any material recovered will be lodged in the collections of Iziko South African Museum or a regional museum with suitable curatorial capacity.

8.2 Archaeology

The area presently identified for the proposed activity is acceptable, provided that a moderate amount of mitigation is undertaken.

Stone cairns DRN 11 and DRN 14

The two possible graves automatically get a high significance rating in heritage terms as they are covered by legislation at national level and the procedures for their exhumation are long and onerous. It is recommended that a 10 m buffer zone be implemented around each potential grave and they are left undisturbed.

Or

A permit for exhumation of the graves be applied for and the contents of the graves be subject to basic forensic assessment and be relocated. The process of exhumation will require consultation with interested parties which will need to include local residents and Khoisan interest groups (who have become quite well established in the Eastern Cape). The process can take in excess of 4 months to obtain a permit.

Pre-colonial kraal DRN 13 (wpt 13-25)

The pre-colonial stone kraal is good example of its kind and should be considered to be worthy of a grade IIIA rating (which means of high local significance) on account of its complete and original condition. The following mitigation measures could be applied:

- The kraal could be destroyed; the kraal must be thoroughly recorded by a qualified archaeologist by means of photographs and measured drawings, then a permit applied for from the Eastern Cape Provincial Heritage Resources Authority for its demolition (a permit may not be granted).;
- The kraal could be avoided and left in-situ within a 10 m radius of exclusion from the perimeter of the kraal; or
- The kraal could be avoided from development, left in-situ and conservation action implemented by a qualified archaeologist including recording and documenting the site.

The last option is the preferred and recommended option yielding a Medium positive impact significance.

Historic kraal DRN 15

The historic kraal is of a form which is well represented in the Karoo and not considered especially important. Under ideal circumstances it should be conserved, however should it be necessary to demolish it, this can be done under a demolition permit issued by ECPHRA. The following mitigation measures could be applied:

- The kraal could be destroyed; the kraal must be thoroughly recorded by a qualified archaeologist by means of photographs and measured drawings, then a permit applied for from the Eastern Cape Provincial Heritage Resources Authority for its demolition;
- The kraal could be avoided and left in-situ within a 10 m radius of exclusion from the perimeter of the kraal; or
- The kraal could be avoided from development, left in-situ and conservation action implemented by a qualified archaeologist including recording and documenting the site.

The last option is the preferred and recommended option yielding a Medium positive impact significance.

In general, it is recommended that should the proposed project be authorised, an archaeologist should as part of the environmental management plan conduct a second site visit to mark out the areas of sensitivity with coloured flags so that these can be avoided during construction activities if this course of action is chosen.

Other areas

A cautionary note is issued: the Fish River facing slope is archaeologically sensitive and should be considered a no go area – no access roads, fences or human intervention. In this area there are numerous stone features that appear to make up a complex of pre-colonial kraals.

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Appendix 1: Drennan archaeological findings.

Introduction

The archaeology of the Eastern Karoo is rich but not widely studied. Thanks to the lifelong work of Garth Sampson and his students, the archaeology of parts of the central karoo has been described. Sampson commenced his research in the area that was to be affected by the Orange River Scheme in the early 1960's (among the first heritage rescue archaeology projects ever done in South Africa) excavating a number of rock shelters in the catchments of the great dams of the Orange River. From the information he gained he was able to make the first descriptions of the regional sequence of human settlement and wrote a number of monographs on the subject in subsequent years. In the 1980's he commenced the biggest archaeological survey in Africa which was set in the Zeekoe River Valley roughly between the towns of Nieuwbethesda and Hanover, Richmond and Middleberg. The work is still in progress and is considered to be the last word on the archaeology of the region. The study area situated near Cradock is close enough for Sampson and several generations of post-graduate students work to be directly relevant.

Sampson's summary of findings contained in his atlas of Stone Age Settlement in the Upper Sea Cow River Valley documents a long sequence of successive Stone Age industries dating back from the Early Stone Age (in excess of 250 000 years ago) to the proto-historic period when the Karoo was temporarily occupied by Khoekhoen herding groups, broken up "bushman" communities who were gradually displaced by the advance of the Trekboers.

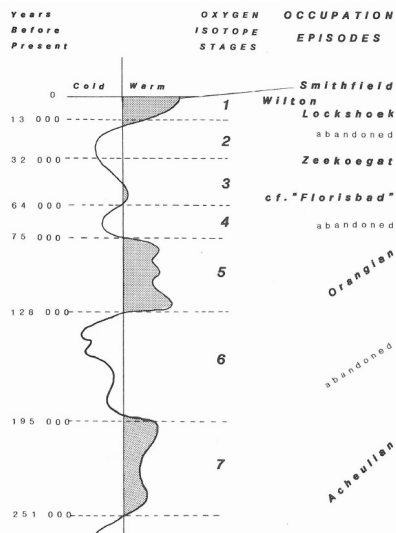


Figure 1 The occupation sequence of the great Karoo proposed by Garth Sampson

The archaeology of the Drennan site falls in neatly with Sampson's findings. Sampson and his team from Southern Methodist University were the first archaeologists to document the pre-colonial stone kraals associated with a Khoekhoen cultural in South Africa. This was the first conclusive proof the archaeology of the highly mobile khoisan speaking herding people was visible on the South African landscape. One of his postgraduate students, Tim Hart studied the stone kraals in depth and was able to tentatively date the appearance of herding groups in the great Karoo to the mini-ice age of around 1400 AD when the climate enjoyed a wet spell and the Karoo was probably grassland dominated to the extent that could support both sheep and cattle. In subsequent years Hart and others have observed stone kraals in the high Karoo near Sutherland, the Moodenaars Karoo and on the Great escarpment showing that this early farming occupation of the Great Karoo was a much wider phenomenon than originally thought. It must be noted that these ephemeral stone kraals take a practised eye

to see, and are easily distinguishable from the much more robust circular and square European origin kraals (circular and square) that are to be found on almost every karoo farm.

Drennan findings

The site survey which covered a much wider area than the proposed portion of land to be used for the proposed photovoltaic facility revealed the presence of a number of early kraals and kraal complexes that are commensurate with those described by Sampson (1985) and

Hart (1987). This information was immediately passed on to ERM with the result that the boundary of the study area could be adjusted to mainly avoid the kraal complex, hence the findings within the proposed project area have been reduced. Nevertheless there remain a few significant archaeological sites within the study area including a really well preserved prehistoric kraal. Most of the prehistoric kraals are mainly situated just back from the low ridge which overlooks the Drennan station and housing. Several have been disturbed by some small-scale historical stone quarrying which we assumed was to source raw material for construction of the historic railwayman's cottage (used as a hunting lodge) on an adjacent piece of land. An inventory of the findings is presented below.

DRN 04 (wpt 4)

A circular stone alignment of approximately 8x5 m of piled stone (not coursed walling) which is in appearance typical of pre-colonial stone kraals described by Sampson 1985 and Hart 1987.

DRN 05 (wpt 5)

A stone "kraal" similar to the above but smaller. Present are sundry stone piles and cairns.

DRN 06 (wpt 6)

A possible stone kraal on the edge of the ridge which has been partially destroyed by a historic quarry.

DRN 07 (wpt 7)

A rock shelf on the edge of the ridge that stretches along the ridge for about 30 m. There is clear evidence of blocks being cut out suggesting this is an historic quarry.

DRN 08 (wpt 8)

A small sunken stone enclosure – deposits have increased in depth on the outside edges over time. This is likely to be a pre-colonial stock pen.

DRN 09 (wpt 9)

A "classic" Khoekhoe kraal typical of those seen in the upper karoo and as far as Namaqualand. This one (piled stone) is about 10 m in diameter, has a smaller enclosure near its entrance which is ethnographically similar to what the Nama term a "lammerkraal".

DRN 10 (wpt 10)

A piled stone alignment that may have been part of a kraal.

DRN 11 (wpt 11) ***Within the study area***

A formal stone pile that has been damaged by an aardvark excavation. This is typically what happens to graves in this area. The site is likely to be a pre-colonial burial site associated with the kraal complex.

DRN 12 (wpt 12)

A well-formed stone kraal of about 5 m diameter.

DRN 13 (wpt 13-25) ***Within the study area***

A very large and well preserved pre-colonial kraal with a "lammerkraal" at its entrance (15x15m). This is the best preserved example on the site and lies within the study area.

DRN 14 (wpt 26) ***Within the study area***

Stone feature- a possible pre-colonial grave.

DRN 15 ***Within the study area.*** An historic stone kraal.

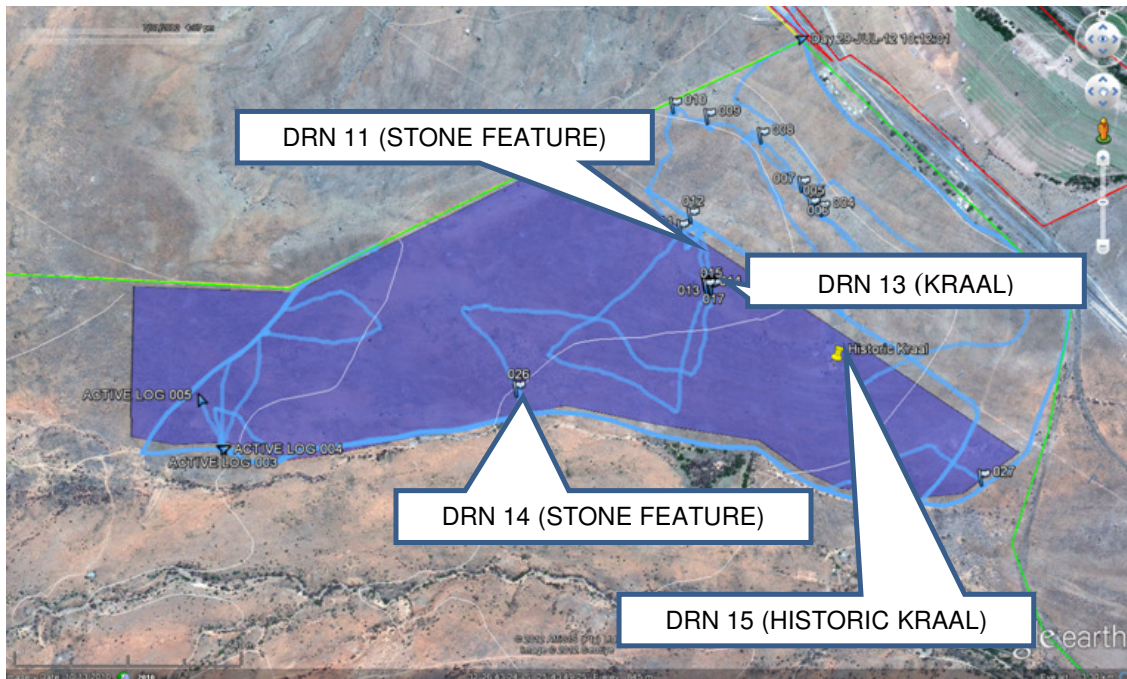


Figure 2: Location of archaeological finds within the study area

Recommendations for mitigation

Stone cairns DRN 11 and DRN 14

The two possible graves automatically get a very high significance rating in heritage terms as they are covered by legislation at national level and the procedures for their exhumation are long and onerous. It is recommended that a 10 m buffer zone be implemented around each potential grave and they are left undisturbed.

or

A permit for exhumation of the graves be applied for and the contents of the graves be subject to basic forensic assessment and be relocated. The process of exhumation will require consultation with interested parties which will need to include local residents and Khoisan interest groups (who have become quite well established in the Eastern Cape). The process can take in excess of 4 months to obtain a permit.

Pre-colonial kraal DRN 13 (wpt 13-25)

The pre-colonial stone kraal is good example of its kind and should be considered to be worthy of a grade IIIA rating (which means of high local significance) on account of its complete and original condition. The best mitigation scenario is that it is conserved in-situ within a 10 m radius of exclusion from the perimeter of the kraal.

or

The kraal must be thoroughly recorded by an archaeologist by means of photographs and measured drawings, then a permit applied for from the Eastern Cape Provincial Heritage Resources Authority for its demolition.

Historic kraal DRN 15

The historic kraal is of a form which is well represented in the Karoo and not considered especially important. Under ideal circumstances it should be conserved, however should it be necessary to demolish it, this can be done under a demolition permit issued by the Eastern Cape Provincial Heritage Resources Authority.

In general, it is recommended that should the proposed project be authorised, an archaeologist should as part of the environmental management plan conduct a second site visit to mark out the areas of sensitivity with coloured flags so that these can be avoided during construction activities.

Other areas

A cautionary note is issued: the Fish River facing slope is archaeological sensitive and should be considered a no go area – no access roads, fences or human intervention.

Conclusion

The Drennan kraal complex is part of what appears to be a Karoo wide phenomenon that is associated with certain kinds of landscape. Unfortunately archaeological knowledge of the kraal phenomenon remains in its early stages. A great deal more research is need on the general spatial distribution of these herder sites, however indications are that certain environments were favoured, notably escarpments and high lying areas.

While the Drennan area is archaeological interesting, much of the study area is located outside the area of archaeological interest. There are unfortunately 3 areas of high importance that are situated within the study area – namely two potential grave sites, a pre-colonial stone kraal and an historic Kraal. Provided that these sites, which are of limit size are mitigated or conserved, the project is considered acceptable in archaeological terms.



Figure 3: DRN 13 A piled stone kraal typical of those previously described in the central Karoo.



Figure 4: DRN 14 A possible burial cairn



Figure 5: DRN 11 A possible burial cairn that has been opened by Aardvarks.

**Palaeontological Assessment
proposed Project on Waai Plaats
Drennan (3225BC Mortimer)**

Prepared by

Graham Avery

(Sole Proprietor)

Archaeozoology, Stone Age Archaeology and Quaternary Palaeontology

May, 2013

Contents

Executive Summary	28
Location of the Proposed Sites	29
Method.....	30
Results of the Study.....	30
Geology and lithology	30
Description of proposed site.....	31
Palaeontological Potential	33
Conclusion	34
Recommendations	35
Heritage Permits Required	35
References.....	35

Executive Summary

Graham Avery was commissioned by Tim Hart, ACO-Associates cc on behalf of their client to conduct a field and desk top survey of the palaeontological potential of the proposed Drennan Project (herein referred to as the Drennan Site).

Applicant: ACO-Associates cc on behalf of their client
Proposed activity: Development of Wind Farm
Location: 32°26'41.42" S; 25°43' 54.89" E (centre point)

The proposed site is located in a palaeontologically-sensitive region with a hard rock base of the potentially fossiliferous Permian (circa 250 Ma (million years old) Balfour Formation and more recent (circa 20 Ma to the present) alluvial sediments, which may also contain fossil and sub-fossil remains. Any excavation for foundations and/or infrastructure that penetrates into underlying older rocks or sediments may encounter fossils. Fossil finds would be significant and would require careful recording and possible systematic excavation. Excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that enable observations to be made about our past biodiversity and environments.

Collaboration between the contractor and a suitably-qualified palaeontologist will be required prior to and during construction excavations so that palaeontological information and/or material can be recorded. Mitigation may extend beyond monitoring if warranted.

Provided that the recommendations of this assessment are complied with, there is no palaeontological reason why the proposed development should not proceed.

Location of the Proposed Sites

The proposed area falls on 1:50 000 topographical map 3225BC Mortimer, 32°26'41.42" S; 25°43' 54.89" E (centre point). Detail is shown on Figures 1, 2.

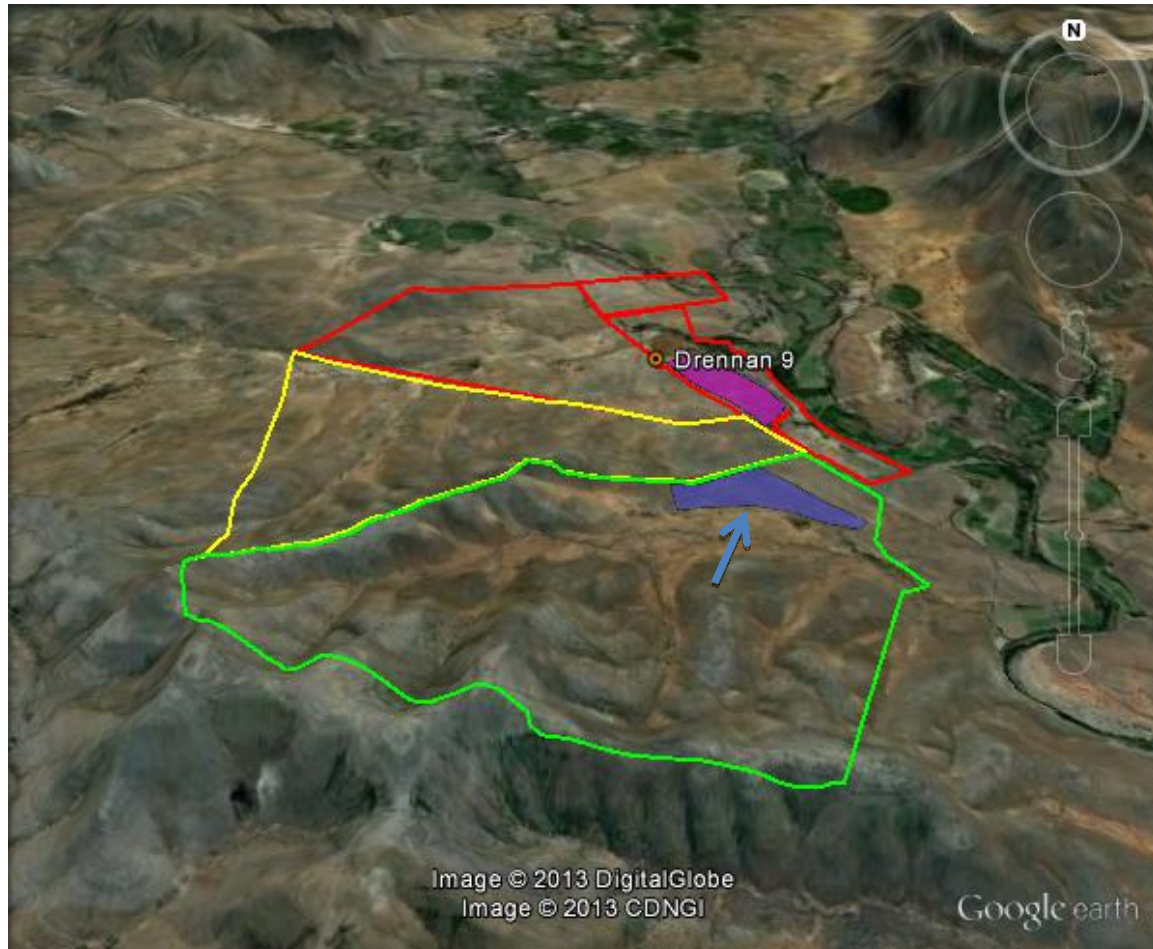


Figure 1. Google earth view showing the outlines of alternative options. The blue area (arrowed) is the subject of this study.

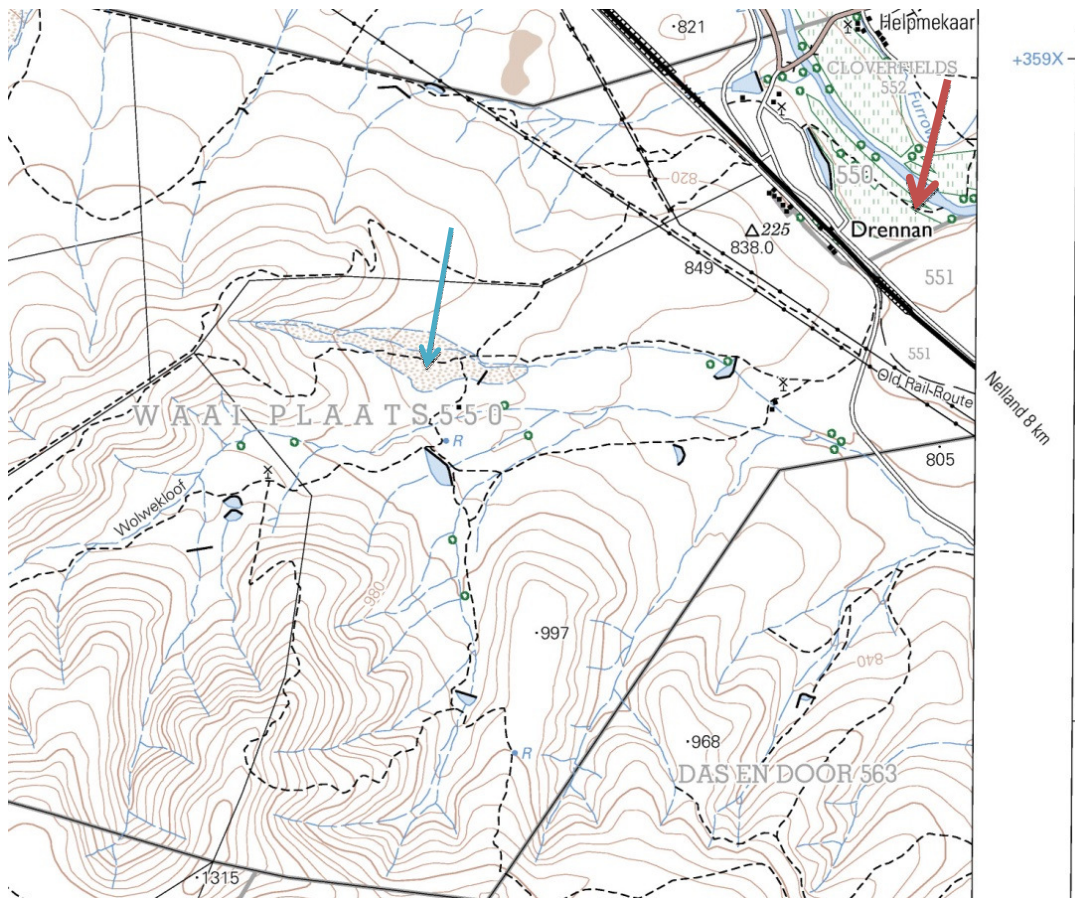


Figure 2. Location of Drennan Station (red arrow) and proposed site area (blue arrow).

Method

As requested, a desk top study of the proposed Drennan site area was conducted by Dr G. Avery Archaeozoologist (Figures 1, 2). The 1:250 000 Geological Series 3318 Cape Town map was consulted for background information (Figure 3).

The focus here has been to illustrate the potential of sub-surface sediments through the geological context and observations in the general vicinity.

Results of the Study

Geology and lithology

The geology of the area is shown on Figure 3, which describes the ancient hard rocks of the Karoo Group Balfour Formation (250 Ma (million years old) and more recent alluvial sediments of Late Tertiary Neogene Period (Miocene, Pliocene Epochs (20 to 2.6 Ma) to Quaternary Period (Pleistocene to Holocene Epochs (2.6 Ma to Present).

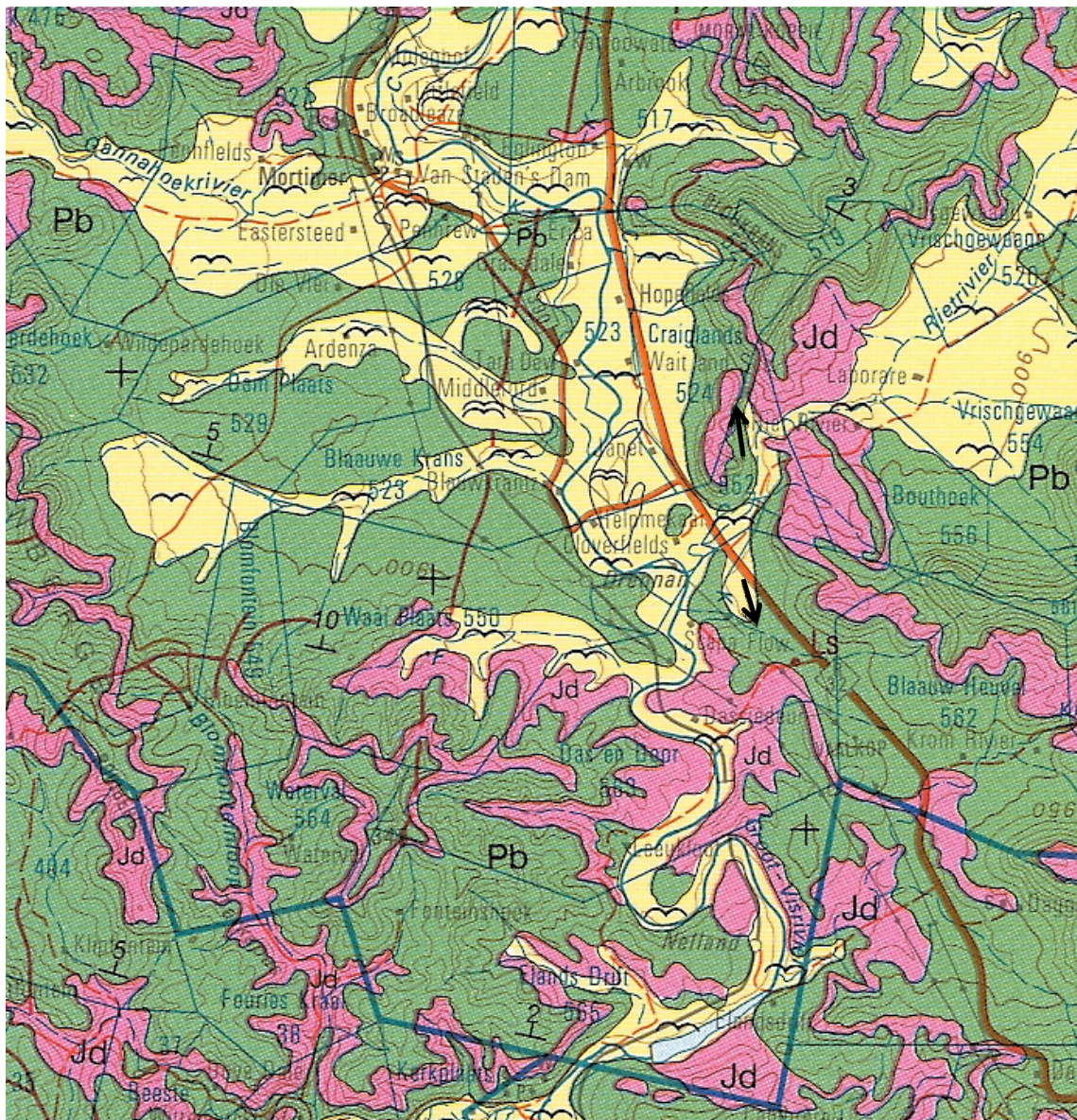


Figure 3. Surface geology excerpted from 1:250 000 Geological Series 3224 Graaf Reinet. The approximate location of the Site is arrowed. Pb (mudstone, greenish, grey, red in places; sandstone, occasional thin cherty bands = fossiliferous Balfour Formation of the Adelaide Subgroup, Permian/Triassic Epoch Beaufort Group of the Karoo Supergroup; Jd (dolerite) = later, non-fossiliferous intrusions during the Jurassic Epoch; Yellow areas are Late Tertiary to Quaternary alluvium, which is potentially fossiliferous.

Description of proposed site

The Drennan study area is generally flat, with a grass-and scattered small bush-covered rocky surface (Figures 4-6).



Figure 4. Example of the landscape on the proposed Drennan Site (Photo: T. Hart).



Figure 5. View from the proposed Drennan Site towards the Great Fish River Valley (Photo: T. Hart).



Figure 6. Close up view of the rocky surface of the proposed Drennan Site (Photo: T. Hart).

Palaeontological Potential

The Drennan Site is situated in a palaeontologically sensitive and important area of the ancient Karoo Basin (Johnson, et al. 2009; Rubidge, et al. 1995; Smith 1990).

“The Karoo Supergroup covers almost two thirds of the present land surface of southern Africa. Its strata record an almost continuous sequence of continental sedimentation that began in the Permo-Carboniferous (280 Ma) and terminated in the early Jurassic 100 million years later. The glacio-marine to terrestrial sequences accumulated in a variety of tectonically controlled depositories under progressively more arid climatic conditions. Numerous vertebrate fossils are preserved in these rocks, including fish, amphibians, primitive aquatic reptiles, primitive land reptiles, more advanced mammal-like reptiles, dinosaurs and even the earliest mammals” (Smith 1990).

Fossilized plant remains are common in parts. Iziko South African Museum’s Karoo Palaeontology section holds Balfour and Katberg Formation vertebrate and plant fossils from the Cradock area in its collection (S. Kaal, Iziko Museums of South Africa, pers. comm.).

Thus, excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that enable observations otherwise impossible to be made.

No reference to surface palaeontological material specifically on the Drennan Site was found, although fossils have been recorded in the Cradock area. Since the proposed Drennan Site has been disturbed, the surface potential of the proposed Drennan site may be minimal, although it is not possible to exclude the possibility that fossils do occur there. It is possible that fossils or sub-fossils of interest could be encountered during any excavation that cuts into underlying older hard rock and alluvial sediments.

In addition to the potential within the Balfour Formation rocks, small pockets of bone can occur, for instance, where bone accumulators like hyaenas, Jackals or porcupines used holes/burrows dug by aardvarks; older and younger younger sediments, too, may contain ancient wetland deposits and/or more-recent fossils. In addition to fossil bones and molluscs, there is the potential for encountering macro-plant remains and pollens of considerable age in wetland deposits. Thus, foundations excavated into rocks and sediments on the Drennan Site may intersect fossil-bearing deposits. If so, there is the potential to provide opportunities for observations not otherwise accessible to researchers.

Such probabilities could be better assessed if location of units and geotechnical information and details of the depth to which any excavations will extend, were available. They would greatly assist in assessing estimating whether and where monitoring may be necessary during construction.

Comments

Based on its geology and regional finds in Iziko Museums of South Africa, the Drennan site has palaeontological potential. However, with limited information available on the recorded occurrence of fossils on the proposed site, good communication with contractors and on-site monitoring during excavations will be required to minimise any potential loss.

More systematic mitigation may be required if the context of any fossil material encountered warrants more than just recording and collection.

Conclusion

While no direct fossil evidence was found for the Drennan site, this does not mean that potential is lacking. Excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover potentially-important fossil material that enables observations to be made on geology, past sea levels, climates, environments and biodiversity, that would otherwise be impossible.

Palaeontological remains are often rare and, if encountered, must be recorded by an appropriately qualified person. As examples of potential, the richness of the globally important Langebaanweg (West Coast Fossil Park) fossil landscape (Hendey 1981) and the Swartklip hyaena accumulation (Klein 1975) and their important contributions to knowledge should not be lost sight of. It is further noted that a valley, to the west of the Drennan site, is named “Wolvekloof”, which is suggestive of the historic (at least) presence of hyaenas and the potential that their bone accumulations might be found in the area.

Given the palaeontological potential of the area, mitigationary action, beyond simple recording and recovery during monitoring, including the possibility of systematic excavations, may be necessary.

Provided that the recommendations in this report are followed, current information indicates that the proposed development will not impact significantly on palaeontological remains. Appropriately conducted the development may provide opportunities to access rare fossil material and to better understand the local geological sequence.

Provided that the recommendations herein are adhered to the proposed development can be allowed to proceed from the palaeontological perspective.

Recommendations

Bulk earth works and excavation for foundations/infrastructure should be monitored by a palaeontologist. The frequency of this to be worked out *a priori* with the contractor to minimize time spent on site.

If possible, geotechnical information together with the proposed locations and depths of excavations for foundations and/or infrastructure should be provided prior to the commencement of construction. This may enable a better estimation of the time(s) when monitoring would be necessary.

Protocols for dealing with palaeontological/palynological (fossil pollens) monitoring and possible further mitigation must be included in the Environmental Management Plan (EMP).

Any material recovered will be lodged in the collections of Iziko South African Museum.

Funds must be available *a priori* to cover costs.

Heritage Permits Required

The primary heritage legislation that needs to be considered is The South African Heritage Resources Act 25 of 1999 and regulations (details at www.sahra.org.za). All heritage material, including human burials, is included.

Clearance in terms of the National Heritage Act of 1999 will be required before the development can proceed. Locally, a permit will be required from Heritage Western Cape; in the event of a burial being exposed; potential delays could be minimized by obtaining this before construction is initiated. If human remains are encountered, the South African Heritage resources Agency (SAHRA) must also be contacted, but no bones may be further moved until an archaeologist or palaeontologist has assessed them and permission of SAHRA is granted. SAHRA must be contacted immediately through the appointed palaeontologist or archaeologist and laid down procedures, including notification of the SAPS, must be followed.

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