HERITAGE IMPACT ASSESSMENT:

PROPOSED SUNVELD SOLAR ENERGY FACILITY ON DOORNFONTEIN A 118 AND KRUISPAD 120, PIKETBERG MAGISTERIAL DISTRICT, WESTERN CAPE

Required under Section 38(8) of the National Heritage Resources Act (No. 25 of 1999)

HWC Case No.: HWC23091509MS0918

Report for:

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1st draft: 16 February 2024
Final report:

SUMMARY

1. Site Name

Sunveld PV Solar Energy Facility

2. Location

Off R399, east of Velddrif
Doornfontein A 118 and Kruispad 120
Centre point at S32° 48’ 30” E18° 16’ 43”.

3. Locality Plan

Red polygons = farms, white polygon = project site with layout detail enclosed.

4. Description of Proposed Development

A photovoltaic solar energy facility is proposed on the site. The solar panels will be installed in pockets of lower sensitivity and linked by roads and electrical cables. Ancillary infrastructure includes substations, access roads, laydown areas, offices, ablutions, guard houses.

5. Heritage Resources Identified

Some fossil shell was observed in one place, but its context was uncertain. Nevertheless, the palaeontological study has identified the possibility of significant fossils being present beneath the low sensitivity surface sands. Although the chances of such finds in deeper strata are small, any fossils found could potentially be of high scientific significance.

A number of archaeological sites occur both inside and outside of the development footprint. Importantly, it was noted that the visibility and apparent density of these sites changes seasonally after ploughing, planting and fallow periods. Some sites were dense enough to merit mitigation and others were more ephemeral. It is likely that such sites are widely distributed in the local landscape and are difficult to assess because of the variability in surface appearance.

Built heritage resources (including some Provincial Heritage Sites) occur in the wider area but no buildings of any sort are located within 1 km of the proposed footprint. This aspect of heritage was thus deemed to not be of further concern.

The cultural landscape is a significant heritage resource with the Berg River floodplain and R399 scenic route being the primary concerns.

6. Anticipated Impacts on Heritage Resources

Due to the lack of surface exposure of sensitive formations, the potential impacts to fossils cannot be predicted.

Several archaeological sites fall within he proposed footprint. While some are currently dese enough to merit mitigation work, others are less dense but could have more artefacts hidden beneath the surface. It is likely that other sites have not been seen at all and will be entirely lost during development.

Impacts to built heritage are not expected.

While the Berg River should not be adversely affected, the visual study has identified areas within 500 m of the R399 as sensitive and development in those areas could compromise views along that road corridor.

7. Recommendations

It is recommended that the proposed Solar PV facility be authorised, but subject to the following recommendations which should be included as conditions of authorisation:

- Palaeontological monitoring will be required. This should be done with an approved Workplan so that any fossils found can be immediately studied and removed without delay to the project;
- A Fossil Chance Finds Procedure must be included in the project EMPr;
- Training in the identification of fossils should be given to workers at the start of construction;
- A pre-construction archaeological survey of the site must be carried out to determine whether any further archaeological sites have become visible;

- Test excavations and/or mitigation as required must be carried out at all recorded sites where the potential for obtaining a meaningful assemblage is likely regardless of their visibility at the time of construction;
- Fencing should be placed around the various development footprints and not enclose larger areas of landscape;
- Lighting mitigation such as downlighters and motion-detectors must be employed throughout the project;
- Where technically feasible, structures are to be painted in a mid-grey/brown colour;
- Screening trees to be planted per visual consultant specifications;
- Low berms (2.5 m) to be constructed and vegetated with local Strandveld vegetation;
- A landscape architect must be engaged to design and oversee implementation of the visual mitigation measures;
- If any fossils, archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

8. **Author/s and Date**

Heritage Impact Assessment: Jayson Orton, ASHA Consulting (Pty) Ltd, 16 February 2024
Palaeontological specialist study: Graham Avery, February 2024
Visual impact Assessment: Stephen Stead, Visual Resource Management Africa cc

Glossary

Core: a stone from which other pieces (flakes and blades) have been intentionally removed.

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Flake: a piece of stone intentionally removed from a core. Flakes are identifiable by certain features related to the point at which the core was struck.

Holocene: The geological period spanning the last approximately 10-12 000 years.

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

Later Stone Age: Period of the Stone Age extending over the last approximately 20 000 years.

Middle Stone Age: Period of the Stone Age extending approximately between 200 000 and 20 000 years ago.

Pleistocene: The geological period beginning approximately 2.5 million years ago and preceding the Holocene.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BA: Basic Assessment

CRM: Cultural Resources Management

DFFE: Department of Forestry, Fisheries and the Environment

EA: Environmental Authorisation

ECO: Environmental Control Officer

EGI: Electricity Grid Infrastructure

EIA: Environmental Impact Assessment

EMPr: Environmental Management Program

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

HV: High Voltage

HWC: Heritage Western Cape

LSA: Later Stone Age

MSA: Middle Stone Age

NCW: Not Conservation Worthy

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25 of 1999)

NHS: National Heritage Site

NID: Notification of Intent to Develop

PHS: Provincial Heritage Site

PPP: Public Participation Process

REDZ: Renewable Energy Development Zone

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

Contents

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by Sunveld Energy (Pty) Ltd to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of a solar energy facility on the farms Doornfontein A 118 and Kruispad 120, just inland of Velddrif, Western Cape (Figure 1). The centre of the site is at approximately S32° 48' 30" E18° 16' 43".

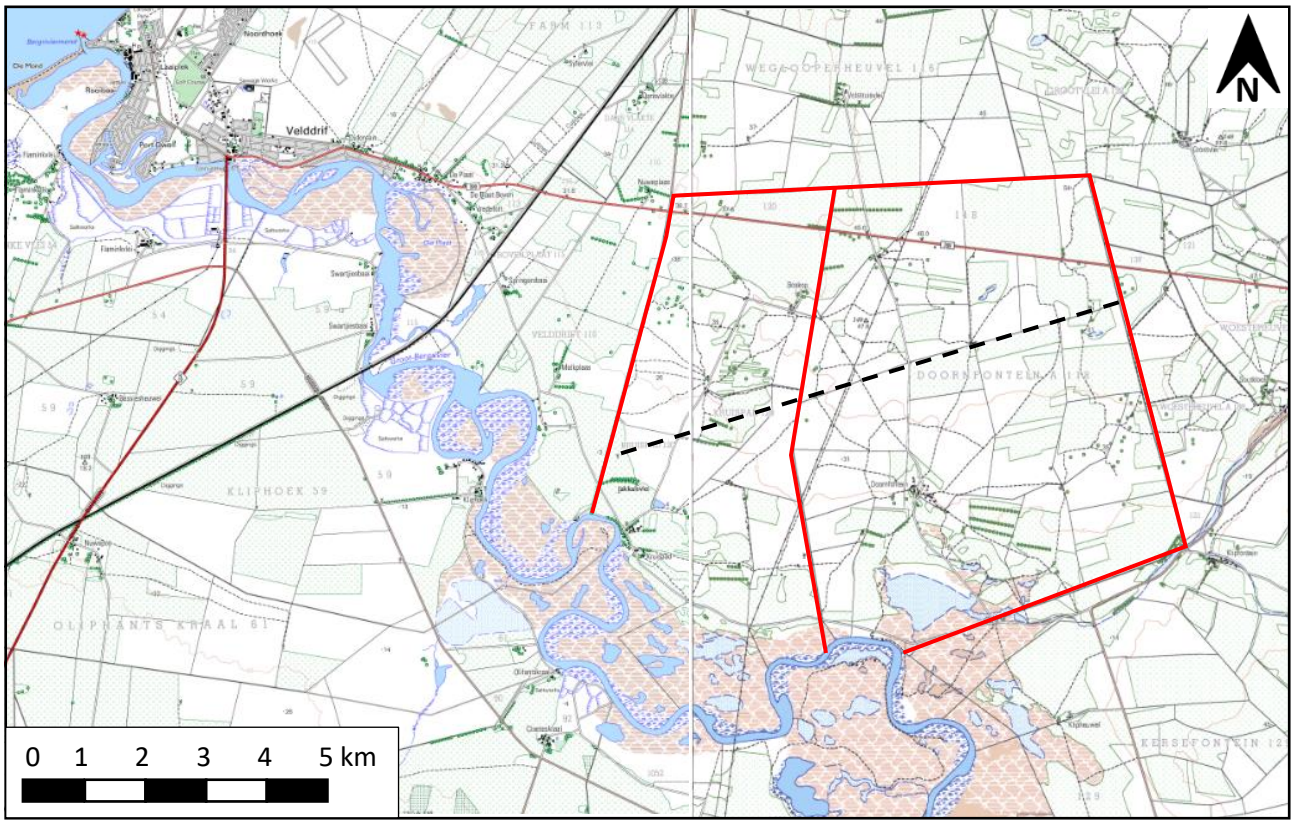

Figure 1: *Extract from 1:50 000 topographic map* 3218CC & CD *showing the location of the site. Red polygons (closed by the Olifants River) indicate the two farms, while the PV study area is located north of the black dashed line Source of basemap: Chief Directorate: National Geo-Spatial Information. Website: www.ngi.gov.za.*

1.1. The proposed project

1.1.1. Project description

Project Name	**Sunveld Energy PV and BESS**	
Site Details		
Size of the property	Description and Size in hectares of the affected property (Size as per the Deed is in brackets).	**PV/BESS Site**: Remaining Extent of the farm Kruispad 120 : size 2684.71 (2586.32) Remaining Extent of the farm Doornfontein 118: size 3801.30 (3807.04) TOTAL hectares of optioned properties = 6486.01 (6393.36)

Size of the study area	Size in ha of initial study area.	2360 ha
Development Footprint	This includes the total footprint of PV panels, BESS auxiliary buildings, On-site Substation, Mini-Substations, Inverter stations and internal roads.	The Total Development area is **723 ha** including: PV 702ha, 2 x On-Site Substations 9ha, permanent auxiliary structures (buildings, lay-down areas) 10ha and access roads 2ha. (BESS x 2 footprints are within PV footprints 29ha) (Mini Subs, Inverters and internal roads are distributed within the PV footprint (internal roads 4m wide total 23ha)) Total Fenced Area is 885 ha. (Note: The 2 On-site Substations (these are 2 Collector and Switching Substations of 300MVA each, collecting many inputs (from PV or BESS) of 33kV, transforming to 132kV outputs) footprints are included here although they are part of the EGI too. The input of 33kV is the project-side until it is transformed to 132kV which will be part of the EGI-side. The EGI will be transferred to ESKOM. The On-site Substations will be in areas of overlap of the project development footprint and the EGI.)
PV Technology Details		
Capacity of the facility	Capacity of the PV facility (in MW)	Net generation (contracted) capacity of up to 600 MW_{AC}, which will consist of 12 sites or projects that may be developed singly or in groups in a phased-development approach. Each of the 12 x 50MW sites will be self-sufficient up to the point of an On-site substation or a Collective BESS.
Solar Technology selection	Type of technology	Solar photovoltaic (PV) technology (mono-facial or bifacial) with fixed, single or double axis tracking mounting structures, as well as associated infrastructure, which will include: • Laydown area; • Access and Internal road network; • Auxiliary buildings (33kV switch room, gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.); • Facility (IPP) substation; • Inverter-station, transformers and internal electrical reticulation (underground cabling); • Rainwater Tanks; and • Perimeter fencing and security infrastructure.
	Structure height	PV panels with a maximum height of ± 3m above the ground
	Surface area to be covered (including associated infrastructure such as roads)	702 ha
	Structure orientation	Preferred technology - single axis track used in portrait orientation with strings of 1x ±30 panels. Mounting using hammered in uprights (as a worst case there will be 400mm diameter holes and some may need lateral support using pegged out cables, depending on soil type/profile). Alternatives technologies: fixed-tilt: north-facing at a defined angle of tilt, single or double axis tracking: mounted in a north-south orientation, tracking from east to west.

	Laydown area dimensions	Approximately 2 ha temporary laydown area will be required for each 50MW site and will be situated within the assessed footprint Temporary lay down area total at any one time will probably not exceed 8 ha due to development in stages . These will be temporary except for a permanent laydown of 2ha which is to remain.
BESS Technology Details		
BESS technology section	Capacity of BESS facility (in MWh)	2400 MWh OR 4 hours at a maximum of 600MW per hour in the night
	Type of technology (preferred)	Redox Flow, -Vanadium Redox Flow Battery (VRB)
	Type of technology (alternatives)	Solid State including Lithium-Ion, Sodium-Ion and others, Liquid Metal (https://ambri.com/). Other technology types may be considered
	Structure height	Containerised batteries less than 5m high except for lightening conductors and vent pipes. Storage tanks may be required for the VRB and could be 6m high, if the non-containerised type of VRB battery is installed.
	Surface area to be covered (including associated infrastructure such as roads)	29 ha (including electrolyte storage tanks of 18 ha for redox flow battery)
	Structure locations	2 sites each ± 14 ha, near the On-Site Substations

Own-Build Grid Connection	
Size and capacity of on-site substation	Two On-Site Substation Complexes each 300 MVA. Substations each with a 75x75m base, within a 200m x200m fenced area. These are collector/switching substations with 33kV input from the Mini-substations and transforming to 132kV to be routed via overhead powerlines to the MTS
Length and capacity of on-site powerlines / cabling.	The PV will feed into inverters will be distributed in the PV areas, each will have a 2m x 2m mounting platform. Inverters will feed into mini-substation collectors in containers will also be placed in the PV areas. Each Mini-Substation will collect from Inverters via 800V underground cables. From each Mini-substation to an On-site Substation Complex there will be 33kV underground cables. This is where 33kV is transformed to 132kV. From On-site Substation Complex 2 (Sub 2) to On-site Substation Complex 1 (Sub 1) is 1.5km via one 132kV overhead powerlines. The EGI corridor is then routed towards Aurora MTS with 2 x 132kV overhead powerlines. 8km of this 28km route is on the project farms. **The full Sunveld EGI including the 2 x On-Site Substations is part of a separate BA and application.**
Auxiliary Infrastructure	
Additional Infrastructure	• Auxiliary buildings of approximately 1.5 ha, including (but not limited to) gate houses, ablutions, workshop, storage and warehousing areas, site offices and a control centre. • Rain water tanks; and • Electrified perimeter fencing not exceeding 3.5 m in height. And approximately 34 km in length around the perimeters
Details of access roads	During construction 4 access points (RAP 1 to RAP 4) from the R399 may be used. These will be 5m wide upgraded, existing roads and tracks. These total 4km (2ha). Only the

	central access points (RAP1 and RAP2) and routes North and South from them, totalling 1km, will be permanent.
Details of internal roads	A network of approximately 34km of gravel internal access roads, each with a width of up to ± 4 m, will be constructed to provide access to the various components of each facility.
Extent of areas required for laydown of materials and equipment	Approximately 6 ha of temporary laydown areas will be required. A permanent laydown area of a maximum of 2 ha will remain for operations.

Component	**Description/ Dimensions**
Location of the site	The project site is situated approximately 11 km East of Velddrif in the Western Cape Province.
Respective surface areas to be covered by different components of the project (including associated infrastructure such as roads, buildings, etc.) which when combined make up the full development footprint.	• PV structures/ modules area: Up to 702 ha within the PV areas are o Internal roads: Approximately 23 ha (4m wide) o Battery Energy Storage System (BESS): Up to 29 ha (designated within the PV footprint areas) • Access Road: Approximately 2ha (5m wide) • 2 xOn-Site Facility substations: Up to 9 ha • Ancillary Buildings: Up to 2 ha • 4 x Laydown areas (temporary and permanent): 8 ha TOTAL 723ha In a fenced area of 885 ha (The 2 On-site substations and overhead powerlines from them, occupy an Electrical Grid Infrastructure (EGI) corridor, The part of the EGI containing the 2 on-site substations and their connecting corridor is part of the project and fenced area.)
SG Codes	Kruispad: 0/120 : C05800000000012000000 Doornfontein 0/118 : C05800000000011800000
Preferred Site access	The Sunveld Energy PV and BESS project's main site access point is located about 11 km East of Velddrif along the R399. This allows access to both the North and South of the R399. The PV areas will be accessed from the R399 at possibly 4 points during the construction phase with only the central one (consisting of access routes to the North and South of the R399 points named RAP 1 and RAP 2) remaining permanent. The access roads will use existing gravel roads that may need upgrading to provide access roads of 5 m with gravel/hard surfaces A network of gravel internal access roads, each with a width of up to ± 4 m, will be constructed to provide access to the various components of the Sunveld Energy development.
Export capacity	Up to 600 MW. Each of the 12 x 50 MW sites will have distributed inverters and lead via underground cables to 10 distributed 330 kVA Mini-substations. The mini substations will feed via underground cables to the 2 x 300MVA On-Site Substations or the 2 BESS's, then to the MTS (via overhead 132kV cables). The total of the 2 BESS's can provide 4 hours of 600MW and <u>will make use of the same On-Site Substations to connect to the MTS during the night.</u>
Proposed technology	Mono-facial or Bifacial PV panels, mounted on either single-axis tracking, fixed-tilt and/or double-axis tracking systems
Height of installed panels from ground level	Solar panels with a maximum height of ± 3 m from above the ground.

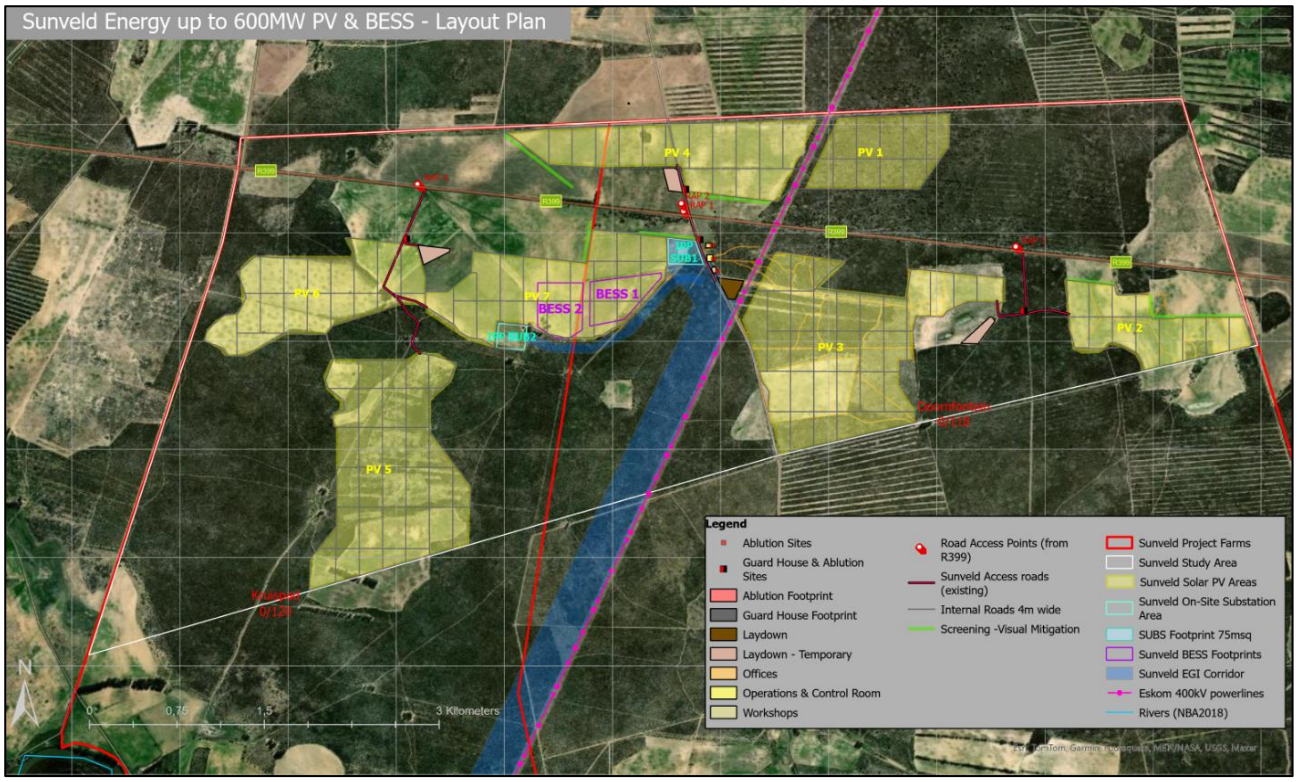

Figure 2: *Layout of the project.*

1.1.2. Identification of alternatives

Only one site is being investigated but the proponent has designed the preferred facility layout to avoid the main environmental sensitivities identified by the various specialists. The current farming activities would continue on the remainder of the farms. This scenario will be assessed against the No-Go option which entails not building the project and allowing the current farming activities to continue over the entirety of the two farms.

The proponent is also considering different options for mounting the solar panels as well as different types of battery technology. None of these are relevant to the heritage study, however, and are thus not specifically addressed as alternatives in this report.

1.1.3. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant, since excavations for foundations and/or services may impact on archaeological and/or palaeontological remains, while all above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

1.2. Terms of reference

ASHA Consulting was asked to:

- Describe regional and local features of the receiving environment;
- Conduct desktop research;
- Conduct a field survey to search for sensitive areas and sites of heritage significance;

- Map sensitive features and provide spatial data to inform the final project layout;
- Assess the potential impacts on identified heritage resources within a Heritage Impact Assessment (HIA) report that complied with the requirements of both the NHRA and Appendix 6 of the NEMA EIA regulations;
- Identify relevant legislation and legal requirements; and
- Provide recommendations on possible mitigation measures and management guidelines.

A Notification of Intent to Develop (NID) was submitted to HWC. They responded on 17th October 2023 with the following:

RESPONSE TO NOTIFICATION OF INTENT TO DEVELOP: HERIATGE IMPACT ASSESSMENT REQUIRED
In terms of Section 38(8) of the National Heritage Resources Act (Act 25 of 1999) and the Western Cape Provincial Gazette 6061, Notice 298 of 2003

NOTIFICATION OF INTENT TO DEVELOP: PROPOSED DEVELOPMENT, CONSTRUCTION, AND OPERATING AN UP TO 600 MW SOLAR PV FACILITY AND ASSOCIATE INFRASTRUCTURE, DOORNFONTEIN A 118 AND KRUISPAD 120, FARM 118 AND 120 VELDDRIF., SUBMITTED IN TERMS OF SECTION 38(1) OF THE NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

The matter above has reference.

Heritage Western Cape is in receipt of your application for the above matter. This matter was discussed at the Heritage Officers Meeting (HOMS) held on 9 October 2023.

You are hereby notified that, since there is reason to believe that the proposed Development, Construction, and Operating an up to 600 mw Solar PV facility and associate infrastructure, Doornfontein a 118 and Kruispad 120, Farm 118 and 120 Velddrif will impact on heritage resources, HWC requires that a Heritage Impact Assessment (HIA) that satisfies the provisions of Section 38(3) of the NHRA be submitted. Section 38(3) of the NHRA provides

(3) The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): ***Provided that the following must be included:***

(a) The identification and mapping of all heritage resources in the area affected.
(b) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7.
(c) an assessment of the impact of the development on such heritage resources.
(d) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.
(e) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources.
(f) if heritage resources will be adversely affected by the proposed development, The consideration of alternatives; and
(g) plans for mitigation of any adverse effects during and after the completion of the proposed development.

(Our emphasis)
This HIA must in addition have specific reference to the following:
- Archaeological Impact Assessment
- Palaeontological Impact Assessment
- Visual Impact Assessment

The HIA must have an overall assessment of the impacts to heritage resources which are not limited to the specific studies referenced above.

The required HIA must have an integrated set of recommendations.

The comments of relevant registered conservation bodies; all Interested and Affected parties; and the relevant Municipality must be requested and included in the HIA where provided. Proof of these requests must be supplied.

1.3. Scope and purpose of the report

An HIA is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate)

without undue negative impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued by them for consideration by the National Department of Forestry, Fisheries and the Environment (DFFE) who will review the Basic Assessment (BA) and grant or refuse authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting Heritage Impact Assessments and archaeological specialist studies in South Africa (primarily in the Western Cape and Northern Cape provinces) since 2004 (please see curriculum vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP; Member #43) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

1.5. Declaration of independence

ASHA Consulting (Pty) Ltd and its consultants have no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

2. LEGISLATIVE CONTEXT

2.1. National Heritage Resources Act (NHRA) No. 25 of 1999

The NHRA protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: prehistoric and historical material (including ruins) more than 100 years old as well as military remains more than 75 years old, palaeontological material and meteorites;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: “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”;
- Palaeontological material: “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”;
- Archaeological material: a) “material 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"; b) "rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation"; c) "wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation"; and d) "features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found";

- Grave: "means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place"; and
- Public monuments and memorials: "all monuments and memorials a) "erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

Section 3(3) describes the types of cultural significance that a place or object might have in order to be considered part of the national estate. These are as follows:

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

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, some of the points in Section 3(3) speak directly to cultural landscapes.

2.2. Approvals and permits

2.2.1. Assessment Phase

Section 38(8) of the NHRA states that if an impact assessment is required under any legislation other than the NHRA then it must include a heritage component that satisfies the requirements of S.38(3). Furthermore, the comments of the relevant heritage authority must be sought and considered by the consenting authority prior to the issuing of a decision. Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to a BA. The present report provides the heritage component. HWC is required to provide comment on the proposed project in order to facilitate final decision making by the DFFE.

2.2.2. Construction Phase

If archaeological or palaeontological mitigation is required prior to construction, then the appointed archaeologist or palaeontologist would need to obtain a workplan approval from HWC. This would be issued in their name. This is so that the heritage authority can ensure that the appointed practitioner has proposed an appropriate methodology that will result in the mitigation being undertaken properly.

2.3. Guidelines

HWC have issued minimum standards documents for HIAs and specialist studies. There is also a Western Cape Provincial guideline for heritage specialists working in an EIA context and which is generally useful. The reporting has been prepared in accordance with these guidelines. The relevant documents are as follows:

- Heritage Western Cape. 2016. Grading: purpose and management implications.
- Heritage Western Cape. 2019. Public consultation guidelines.
- Heritage Western Cape. 2021. Guide for Minimum Standards for Archaeology and Palaeontology reports submitted to Heritage Western Cape.
- Heritage Western Cape. 2021. Notification of Intent to Develop, Heritage Impact Assessment, (Pre-Application) Basic Assessment Reports, Scoping Reports and Environmental Impact Assessments, Guidelines for submission to Heritage Western Cape.
- Winter, S. & Baumann, N. 2005. Guideline for involving heritage specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 E. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

2.4. Application timeline

The application to DFFE under NEMA is currently in the pre-application phase with final submission planned for 5th April 2024.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. The information sources used in this report are presented in Table 1

with relevant dates of each source referenced in the text as needed. Data were also collected via a field survey. The data quality is suitable for the purpose of informing this report.

Table 1: *Information sources used in this assessment.*

Data / Information	Source	Date	Type	Description
Maps	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical and current 1:50 000 topographic maps of the study area and immediate surrounds
Aerial photographs	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical aerial photography of the study area and immediate surrounds
Aerial photographs	Google Earth	Various	Spatial	Recent and historical aerial photography of the study area and immediate surrounds
Cadastral data	CapeFarmMapper (http://gis.elsenburg.com/apps/cfm/#)	Current	Spatial	Cadastral boundaries, extents and aerial photography
Cadastral data	Chief Directorate: National Geo-Spatial Information	Various	Survey diagrams	Historical and current survey diagrams, property survey and registration dates
Background data	South African Heritage Resources Information System (SAHRIS)	Various	Reports	Previous impact assessments for any developments in the vicinity of the study area
Palaeontological sensitivity	South African Heritage Resources Information System (SAHRIS)	Current	Spatial	Map showing palaeontological sensitivity and required actions based on the sensitivity.
Background data	Books, journals, websites	Various	Books, journals, websites	Historical and current literature describing the study area and any relevant aspects of cultural heritage.
Screening Tool maps	DFFE	Current	Spatial	Potential sensitivity of the study area

3.2. Field survey

The site was subjected to a detailed foot survey on 29th May to 3rd June 2023. The survey focused on the areas proposed for development. After generation of the final layouts, a further survey on 19th to 21st January 2024 served to fill in some gaps and examine areas affected by changes to the layout. These were during winter and summer respectively. Although the season makes no meaningful difference to indigenous vegetation covering in this area, the summer survey did have marginally better visibility for the archaeological survey in the arable lands. Other heritage resources are not affected by seasonality. During the survey the positions of finds and survey tracks were

recorded on a hand-held Garmin Global Positioning System (GPS) receiver set to the WGS84 datum (Figure 3). Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

It should be noted that the amount of time between the dates of the field inspection and final report do not materially affect the outcome of the report.

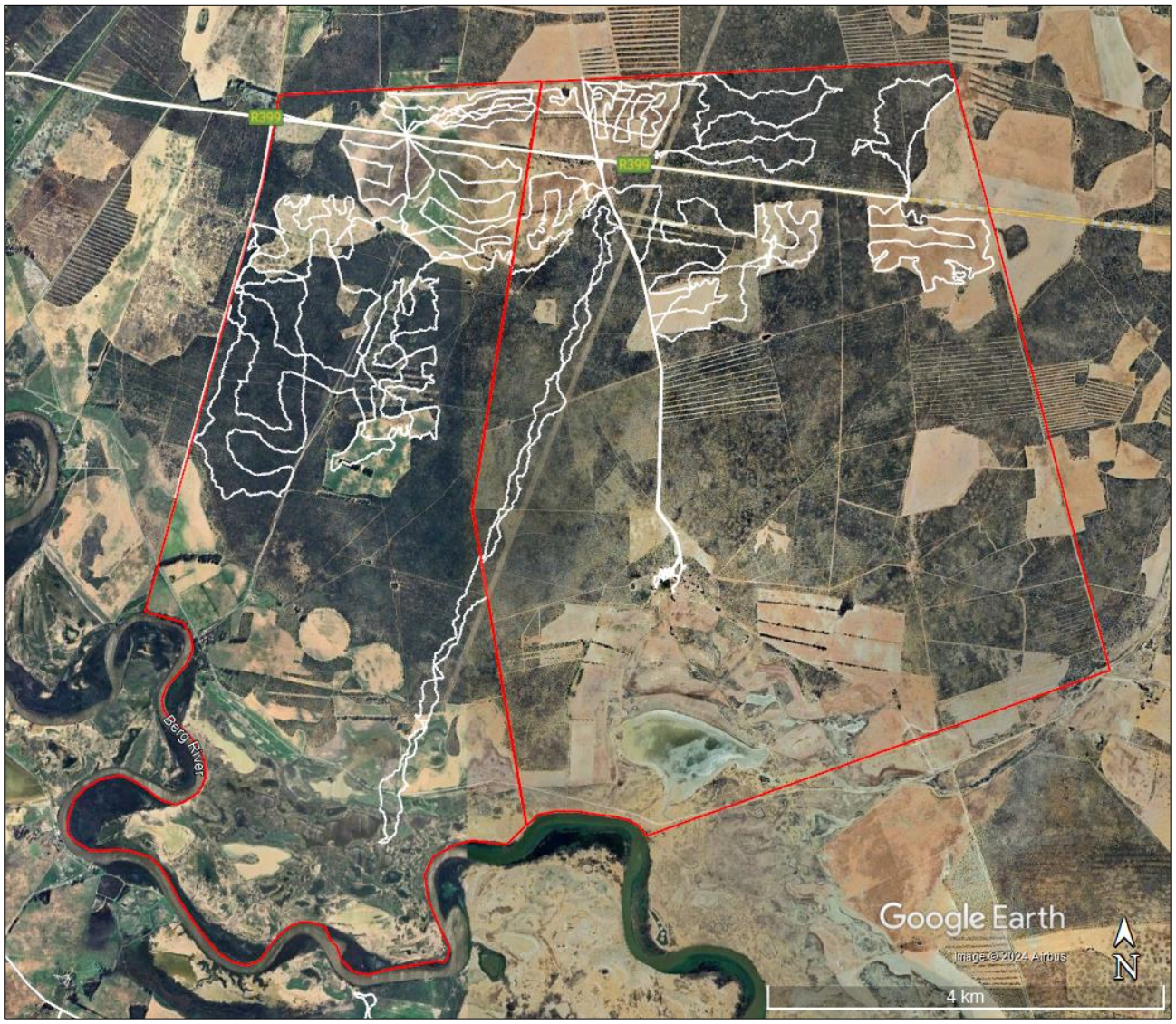

Figure 3: *Aerial view of the study area (red polygons) showing the survey tracks (white lines).*

3.3. Specialist studies

The archaeological specialist study was carried out by the author of the HIA and included as a chapter within the HIA. The palaeontological study was conducted by Dr Graham Avery, while the visual study was done by Stephen Stead. Both these reports are summarised within the HIA and appended in full.

3.4. Impact assessment

For consistency among specialist studies, the impact assessment was conducted through application of a methodology supplied by Cape EAPrac.

3.5. Grading

S.7(1) of the NHRA provides for the grading of heritage resources into those of National (Grade I), Provincial (Grade II) and Local (Grade III) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade I and II resources are intended to be managed by the national and provincial heritage resources authorities respectively, while Grade III resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. Heritage Western Cape (2016), however, uses a system in which resources of local significance are divided into Grade IIIA, IIIB and IIIC. These approximately equate to high, medium and low local significance, while sites of very low or no significance (and generally not requiring mitigation or other interventions) are referred to as Not Conservation Worthy (NCW).

3.6. Consultation

The NHRA requires consultation as part of an HIA but, since the present study falls within the context of a BA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the HIA. However, the heritage consultant ensured that the required parties were included in the list of people and organisations consulted. Interested and affected parties would have the opportunity to provide comment on the heritage aspects of the project during the PPP.

3.7. Assumptions and limitations

The field study was carried out at the surface only and hence any completely buried archaeological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface or, in ploughed areas, the true density of those materials revealed. The site was large, so the survey focused on the layout. However, with a repeat visit it is assumed that significant sites within the layout will not have been missed. It is assumed that the findings would be indicative of the overall pattern on the landscape. It is assumed that the information provided for the assessment is an accurate reflection of the development proposal.

Cumulative impacts are difficult to assess due to the potentially variable site conditions that would have been experienced in different areas and in different seasons. Survey quality is thus likely to be variable. As such, some assumptions need to be made in terms of what and how much heritage might be impacted by other developments in the broader area.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The site lies in an area best considered as rural. The R399 bisects the northern part of the study area but other local roads are all gravel or sand. The landscape is a patchwork of natural and agricultural lands but is crossed from north to south by an existing high voltage (HV) powerline which runs to the Aurora Main Transmission Substation (MTS) located some 42 km south of the site. The site does not fall within a Renewable Energy Development Zone (REDZ) but is entirely within the Western Electricity Grid Infrastructure (EGI) Corridor.

Figure 4: *Aerial view of the study area (red polygons = affected farms) showing the landscape context and position of the existing Eskom HV powerline (green line).*

4.2. Site description

The site is generally a flat landscape, but towards the south there is a gentle slope down towards the Berg River floodplain. It is a patchwork of waist- to shoulder-high indigenous vegetation and arable lands with the latter largely lying fallow during the surveys. One area in the east had become badly deflated and was covered by mobile sand. Figures 5 to 15 show a selection of views characterising the study area.

Figure 5: *View towards the east across the south-western part of the study area, south of the R399 (May/June 2023).*

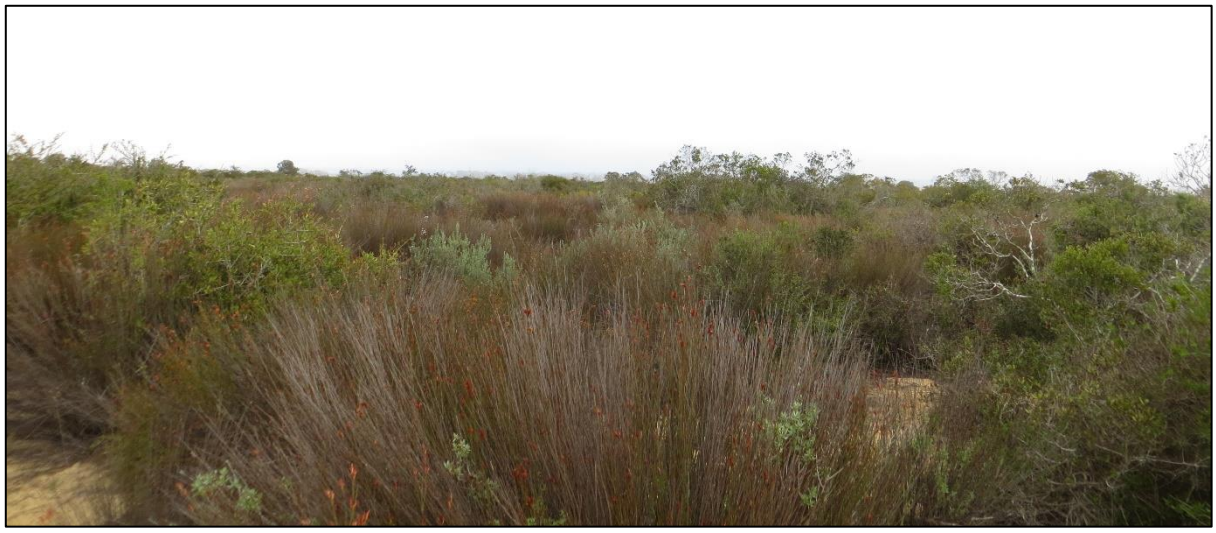

Figure 6: *View towards the northeast across the western part of the study area in an area of indigenous vegetation, south of the R399 (May/June 2023).*

Figure 7: *View towards the east in the western part of the study area (January 2024).*

Figure 8: *View towards the northeast across the western part of the study area in an area of arable land, south of the R399 (May/June 2023).*

Figure 9: *View towards the east through the northern part of the study area, north of the R399 (May/June 2023).*

Figure 10: *View towards the west in the north-central part of the study area, north of the R399 (May/June 2023).*

Figure 11: *Looking west across a small endorheic pan in the north-eastern part of the study area (January 2024).*

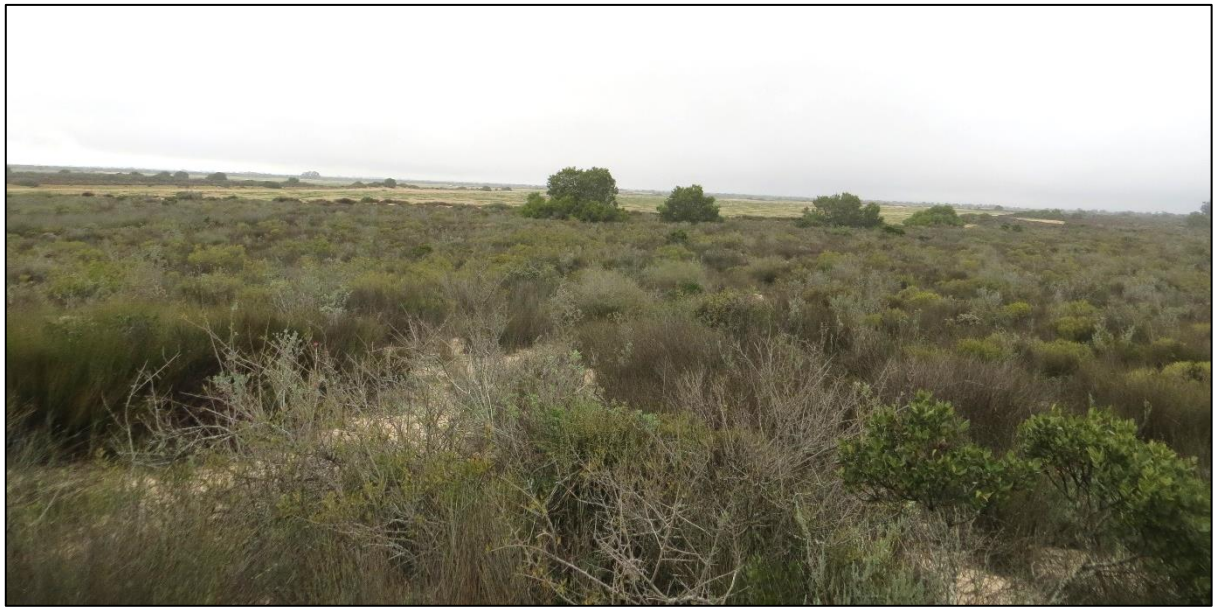

Figure 12: *View towards the south in the north-eastern corner of the study area, north of the R399 (May/June 2023).*

Figure 13: *View towards the west in the eastern part of the study area, south of the R399 (May/June 2023).*

Figure 14: *An area of deflating and mobile dune sand in an old arable land in the eastern part of the study area (January 2024).*

Figure 15: *View towards the west in the centre of the study area, south of the R399, with calcrete fragments on the surface (January 2024).*

5. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project. A full illustrated list is provided in Appendix 2, and the mapping is shown in Figures 16 to 21.

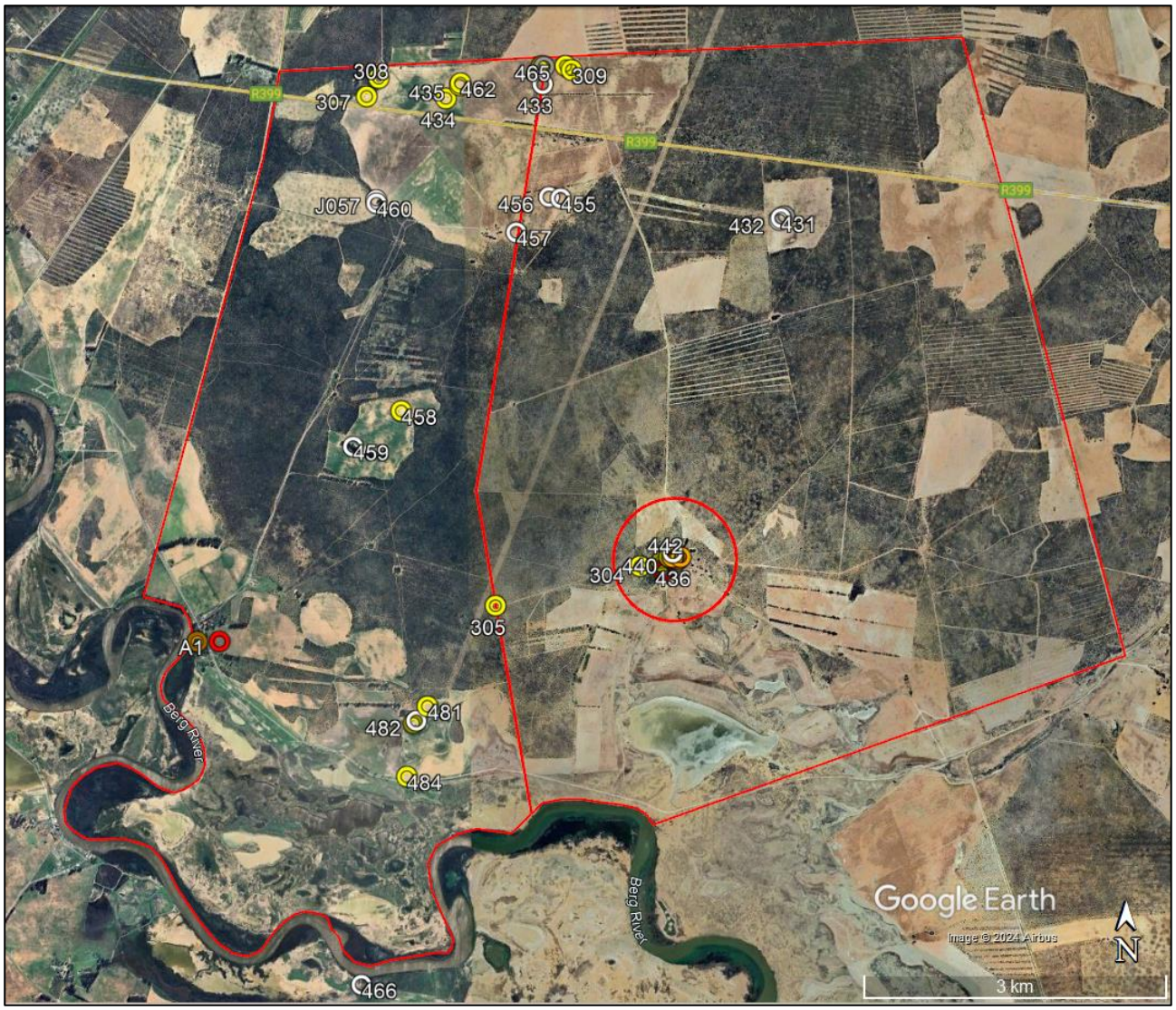

Figure 16: *Aerial view of the study area (farm portions in red) showing the locations of the recorded sites by grade. Red = Grade IIIC, orange = Grave IIIB, yellow = Grade IIIC, white = NCW.*

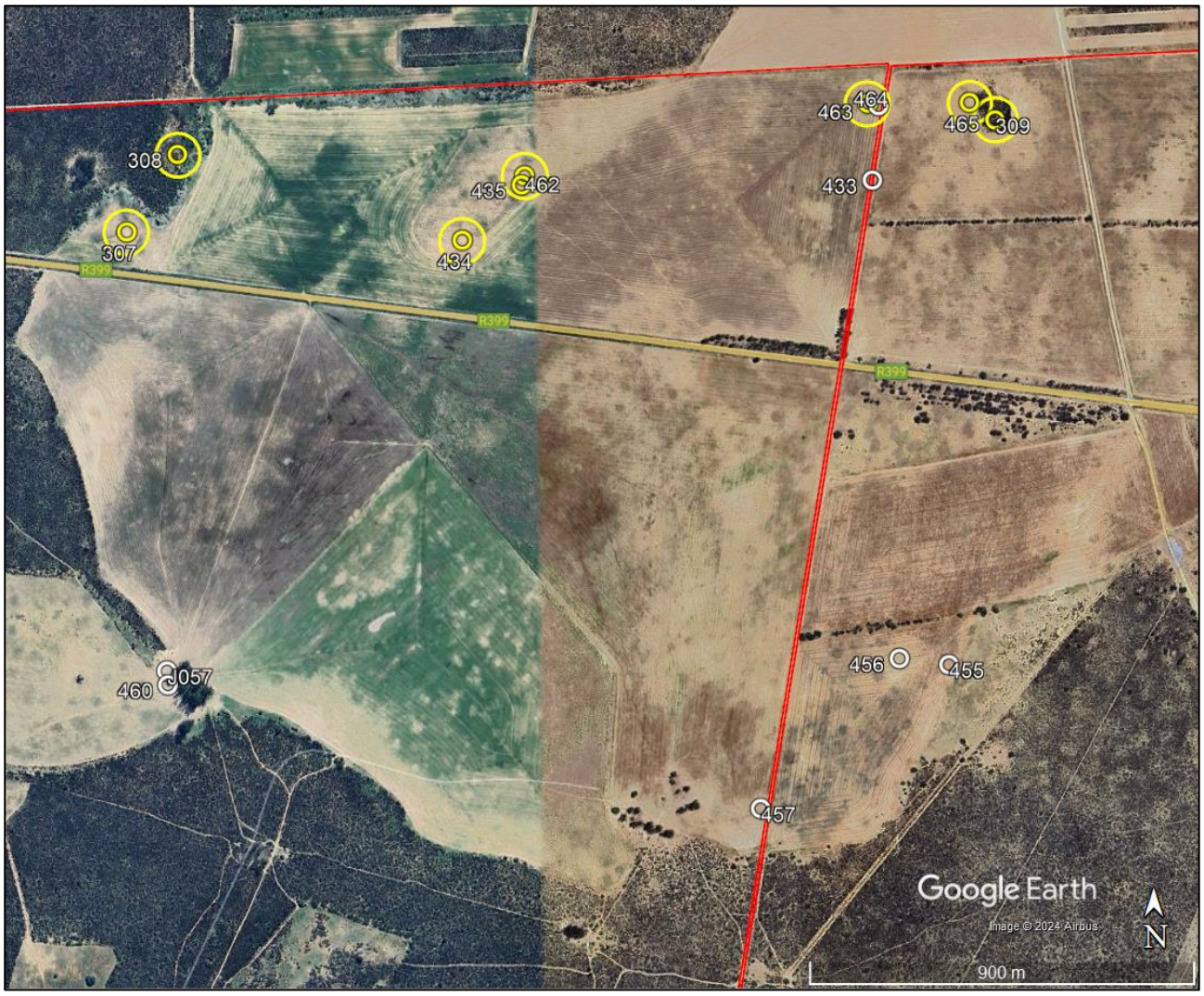

Figure 17: *Enlargement of Figure 16.*

Figure 18: *Enlargement of Figure 16.*

Figure 19: *Enlargement of Figure 16.*

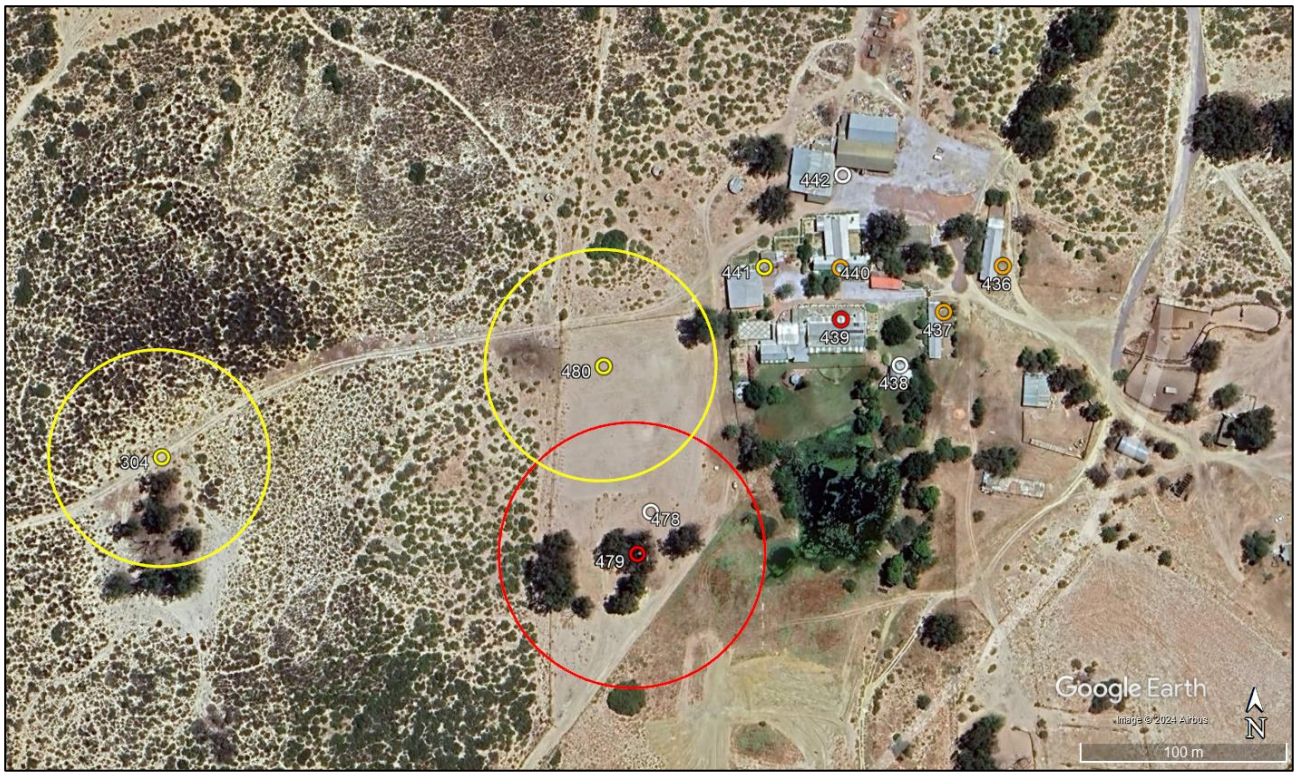

Figure 20: *Enlargement of Figure 16.*

Figure 21: *Enlargement of Figure 16.*

5.1. Palaeontology

The SAHRIS Palaeosensitivity Map shows the development site to be of low sensitivity (Figure 22). However, Avery (2024) notes that this sensitivity applies to the surface sediments, the Witzand Formation, which consist of Holocene-aged white aeolian sands which seldom contain any fossils. Beneath this sand lie the Langebaan and Springfontyn Formations which are "sediments ranging from the Middle to Late Pleistocene, which are known to include sparse fossiliferous sediments, palaeo land surfaces, with bones and ichnofossils (trace fossils, such as termite nests, burrows and tracks, and stone artefacts and peats). Notably, they can also include intrusive bone accumulations introduced later in crevices or old burrows in the Langebaan Formation calcretes when used by brown hyaenas as dens" (Avery 2024:10). The famous Elandsfotein fossil locality to the south of the Aurora MTS occurs in Springfontyn sediments, while Langebaanweg (i.e. West Coast Fossil Park) is within the Langebaan Formation but has Varswater Formation deeper down. Avery concludes that while fossils are likely to be sparse, if found they could be of potentially high cultural significance and should be rescued from harm.

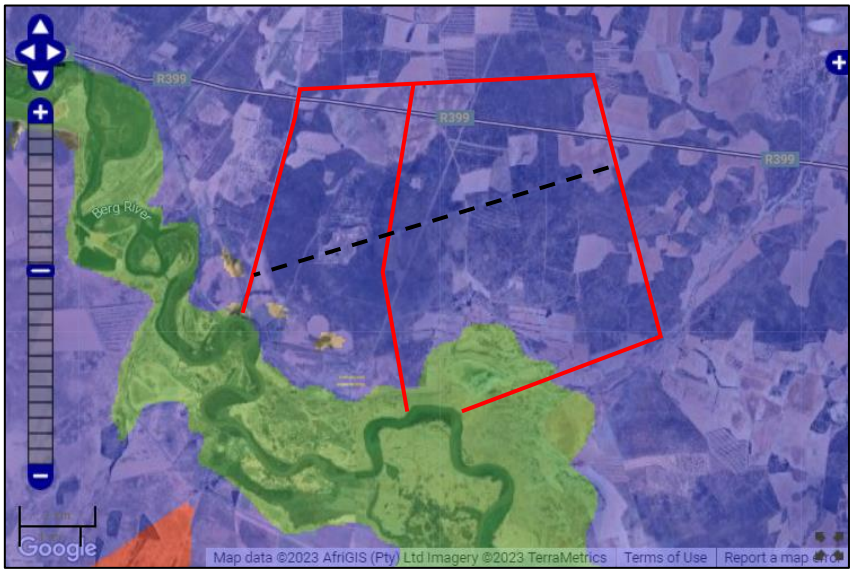

Figure 22: *Extract from the SAHRIS Palaeosensitivity Map showing the site (north of dashed line) to be of low palaeontological sensitivity (blue shading).*

The archaeological survey located fossil shell in one area near the Berg River floodplain (waypoint 482), but its context was uncertain.

It is noted that the West Coast Fossil Park (Langebaanweg fossil site) located 20 km southwest of the study area is a declared Provincial Heritage Site (PHS) and National Heritage Site (NHS).

5.2. Archaeology

5.2.1. Desktop study

The Vredenburg Peninsula to the southwest has received a large amount of research attention over the last three or more decades, especially concerning the relationship between pre-colonial hunter-gatherer and herder societies. It has also seen many commercial surveys done over the latter part of that time. This area is all granite geology which is very different to the aeolian sands deposited

over the present study area and surroundings. Some work has also examined parts of the St Helena Bay sandy coastline to the north. The areas located further inland, however, have seldom been considered. This means that baseline data for these areas is very sparse. However, some previous surveys have occurred in the study area. The first was by Orton and Webley in 2011 but the project was terminated with no reporting carried out. The others were by Halkett (2017a, 2020) who included some of the Webley and Orton findings and reported that archaeological materials were rare. Aside from isolated artefacts which are of no consequence and are not considered further here, he only reported a few scatters of stone artefacts in deflating areas. The artefacts were mostly of quartz, but some silcrete was also present. A few historical artefacts (glass and ceramic fragments) were also noted.

Further afield, Kaplan (2005a) worked to the northwest of the present study area. He located a deflation hollow with many Later Stone Age (LSA) artefacts. Further to the northwest, Kaplan (2005b) saw similar, but isolated, artefacts spread over the landscape. In one area, however, he found a scatter of black mussel shells that likely reflects a small LSA campsite. Nearby, Lavin (2023a) reports only isolated stone artefacts with no sites found. To the west of the present site, Kaplan (2007) recorded many LSA artefacts in an area just north of the Berg River. Historical glass and ceramic fragments were also reported. Some 13 km southwest of the study area Kaplan (2005c) recorded a small scatter of LSA artefacts that included fragments of glass and ceramics that he noted to have been reworked.

Other areas with sandy substrates have also produced archaeological materials. Just north of the Aurora MTS, and also on a similar sandy substrate, Kaplan (2021) found one silcrete flake and one potsherd. Between there and the Berg River, Lavin (2023b) reports a few isolated artefacts. Just to the west, near Langebaanweg, he found scattered isolated artefacts (Kaplan 2009), while nearby Orton (2017) found an LSA shell and stone scatter that merited sampling but, sadly, was mined before the required mitigation occurred (Orton 2019). Very close by Kaplan (2007) recorded a light scatter of LSA materials in a sandy hollow. Close to these sites is the hill Anyskop which has a deflation hollow with many LSA artefacts, burnt calcrete fragments indicative of people having made fireplaces and occasional Middle Stone Age (MSA) and Early Stone Age (ESA) (Dietl *et al.* 2005; Kandel & Conard 2012). Intriguingly, Roberts *et al.* (2011) utilised radiometric dating techniques to determine that the Anyskop blowout had formed during the late Holocene. Their optically stimulated luminescence date yielded a result of 300 ± 600 years ago for its formation. However, it is quite clear from the historical aerial photography that the blowout was not present in 1938 and was newly formed in 1960 (Orton 2017). This hints at the possibility of a far wider scatter being present across the rest of the hill. Some 31 km southeast of the study area, Orton (2012) found a deflation in an old field that had many LSA artefacts in it. This site was rehabilitated and a road made through it without mitigation taking place.

Although it is 31 km south of the study area, Elandsfontein is also worth noting for the significant ESA remains recovered there (Braun *et al.* 2013a, 2013b; Singer & Wymer 1968). Also found there was a hominid skull cap (Drennan 1953).

Documentary evidence is also relevant for relatively recent archaeology. The late 18th century map presented in Figure 23 shows a Khoekhoe kraal on the southern bank of the Berg River. The precise location today is hard to tell but, judging from the position of the tributary stream marked (assumed to be the Soutrivier), it may be slightly upstream of the study area. It nonetheless confirms the presence of precolonial societies along the Berg River until relatively recently. Historical occupation

in the wider area goes back to the earliest days of the colony when an outpost was established at Oudepost on the Churchhaven Peninsula (Schrire 1987). Several early colonial farms date back to the late 1700s and Fransen (2004) does document some historical farmsteads in the wider area. However, none of these occur within close enough proximity to the study area to be relevant. Historical materials can be expected to occur in very low densities as "litter" in the landscape around historical farmsteads and a kitchen midden/dump is usually present within perhaps 100 m of the house.

Figure 23: *1795 map showing a Cochoqua Kraal on the south bank of the Berg River. Source:* https://www.davidrumsey.com/luna/servlet/detail/RUMSEY~8~1~24855~970009:Cape-of-Good-Hope-;JSESSIONID=52699d63-98f2-41b4-8647-8d8c17333708?title=Search+Results%3A+List_No+equal+to+%272104.051%27&thumbnailViewUrlKey=link.view.search.url&fullTextSearchChecked=&annotSearchChecked=&dateRangeSearchChecked=&showShareIIIFLink=true&helpUrl=https%3A%2F%2Fdocumentation.lunaimaging.com%2Fdisplay%2FV75D%2FLUNA%2BViewer%23LUNAViewer-LUNAViewer&showTip=false&showTipAdvancedSearch=false&advancedSearchUrl=https%3A%2F%2Fdocumentation.lunaimaging.com%2Fdisplay%2FV75D%2FSearching%23Searching-Searching

5.2.2. Site visit

In contrast to Halkett's (2017a, 2020) surveys, the current work revealed a good number of LSA sites, although many of them were quite ephemeral. These sites were all located within previously ploughed lands and have no doubt been revealed by deflation after ploughing has disturbed the surface and removed the roots that bind the sand. Interestingly, one site recorded during May/June 2023 was revisited in January 2024 with far fewer finds made. Table 2 lists the finds. In addition, there are few more sites recorded by Halkett (2017a, 2020; note that his isolated artefacts were not included) that are also listed in Appendix 2.

The artefacts on these sites were largely of quartz, but silcrete artefacts were also fairly commonly seen. Some scatters included grindstones (or fragments thereof) and hammerstones (Figure 24), but, with one exception, pottery and ostrich eggshell were not seen on any sites. The exception was a site on the northern floodplain of the Berg River. It was a pottery scatter which no doubt originated

from a single pot that must have once been buried in a dune there and which has become exposed and subsequently broken up. Three rim sherds with the same decoration were seen (Figure 25). The sites within the study area are generally of low significance but, being in an area from which no samples have ever been taken, they are still seen as important. A key element of these sites is their presence in ploughed lands. Such sites no doubt exist elsewhere too but cannot be found as the surface is not deflated. When ploughed fields lie fallow those artefacts that find themselves close to the surface will become exposed. Many more artefacts will be present beneath the surface. Ploughing will then rebury the artefacts until another fallow season allows some to be exposed. For this reason, sites can be present during one survey and 'gone' during another. As a result of this phenomenon, it is likely that many sites would be destroyed by development in areas that have avoided the visible archaeology and makes sampling of some scatters even more important.

Figure 24: *Stone artefacts from waypoint 434. Scale in 1 cm and 5 cm intervals.*

Figure 25: *Decorated pottery from waypoint 483. Scale in cm.*

Rare, isolated historical artefacts were found in the wider area, but a low density scatter was noted on the western side of the Doornfontein farmhouse. Although LSA materials were also present in this latter area, no historical artefacts were obviously associated with any LSA materials.

Older material was found in only one place and this was on the edge of the Berg River floodplain very close to the pottery noted above. At this point some stone artefacts were associated with an exposure of fossil shell. While most of the artefacts were adiagnostic, one was a mid-section of a bifacial point of the sort commonly ascribed to the Still Bay period of the MSA. The fragment appears to have come from an unifinished artefacts, perhaps discarded when it broke during manufacture.

Figure 26: *Opposite faces of the fragment of Still Bay bifacial point. Scales in cm.*

5.3. Graves

No isolated graves were found but the Melck family graveyard was recorded on the western side of the farmhouse (waypoint 479). The graveyard has a stone wall and contains nine graves with dates of death extending from 1918 to 2018 (Figure 27). According to a farm labourer, there is a workers' graveyard on the eastern side of the farmstead. It was not located during the surveys but is far from the development study area. From aerial photography a graveyard was also identified on Kruispad, but far away from the development area (Waypoint A1).

It should be noted that unmarked precolonial graves can occur almost anywhere on the landscape but that they are far less likely in ploughed lands because, if present there originally, they would long since have been revealed.

Figure 27: *Melck family graveyard at waypoint 479.*

5.4. Historical aspects and the Built environment

5.4.1. Desktop study

The history of St Helena Bay goes back to before the beginnings of the Cape Colony when, on 8th November 1497, Vasco da Gama sailed his small fleet into the bay and named it St Helena Bay (Turner 2009). However, it is the fishing industry that really put St Helena Bay on the map. St Helena Bay has a long history of fishing activity dating back to the days of the Dutch East India Company (VOC). According to Ellis (2008) the Berg River mouth was first used as a harbour in the late 17th century, and farming and grazing were encouraged from the early 18th century onwards. In general, the arid plains of the area attracted little interest from the VOC and there were few settlers.

Fransen (2004, 2006) does not list Velddrif in his work, and neither does he indicate the houses on Doornfontein. However, Halkett (2017b) has provided an extensive historical background on the immediate surroundings of the proposed project. Importantly, he includes a late 19th century map which indicates the farm Doornfontein (Halkett 2017b: fig. 3). He notes that a 1788 estate inventory of Martinus Melck lists Doornfontein as a milk post/dairy. He also owned Kersefontein which had a house and that was no doubt where he lived. The older house on Doornfontein may thus not have been present at that stage. An 1839 survey diagram labels “Doorn Fountain” and shows two dots, almost certainly suggesting a house to have been present (Figure 28). Also labelled along the northern edge of the western part (which is now Kruispad) is ‘Kleine Hermanus Kraal’. Two wagon roads are marked. One extends from the western edge of Kruispad in a south-easterly direction towards the salt pan on Doornfontein. The other runs eastwards towards the Doornfontein farmstead but seemingly stops west of the farmstead. Both of these roads are marked in the late 19th century Southern Districts map (Figure 29). There is no sign of the latter road today, but the southern one still survives. Curiously, the late 19th century map shows a drift referred to as ‘Poes Kop Drift’ in the south-western corner of modern Kruispad but no roads linking to it.

The earliest aerial photography dates to 1938. Figure 30 shows the Doornfontein farmstead pretty much in its current configuration, although the small cottage southeast of the main house does not appear to have been present (according to the owner it was built in the 1950s) and the large sheds to the north of the farmstead were clearly absent. It also seems that all the labourers’ cottages spread out towards the southeast were already present, but one has evidently been demolished in recent years.

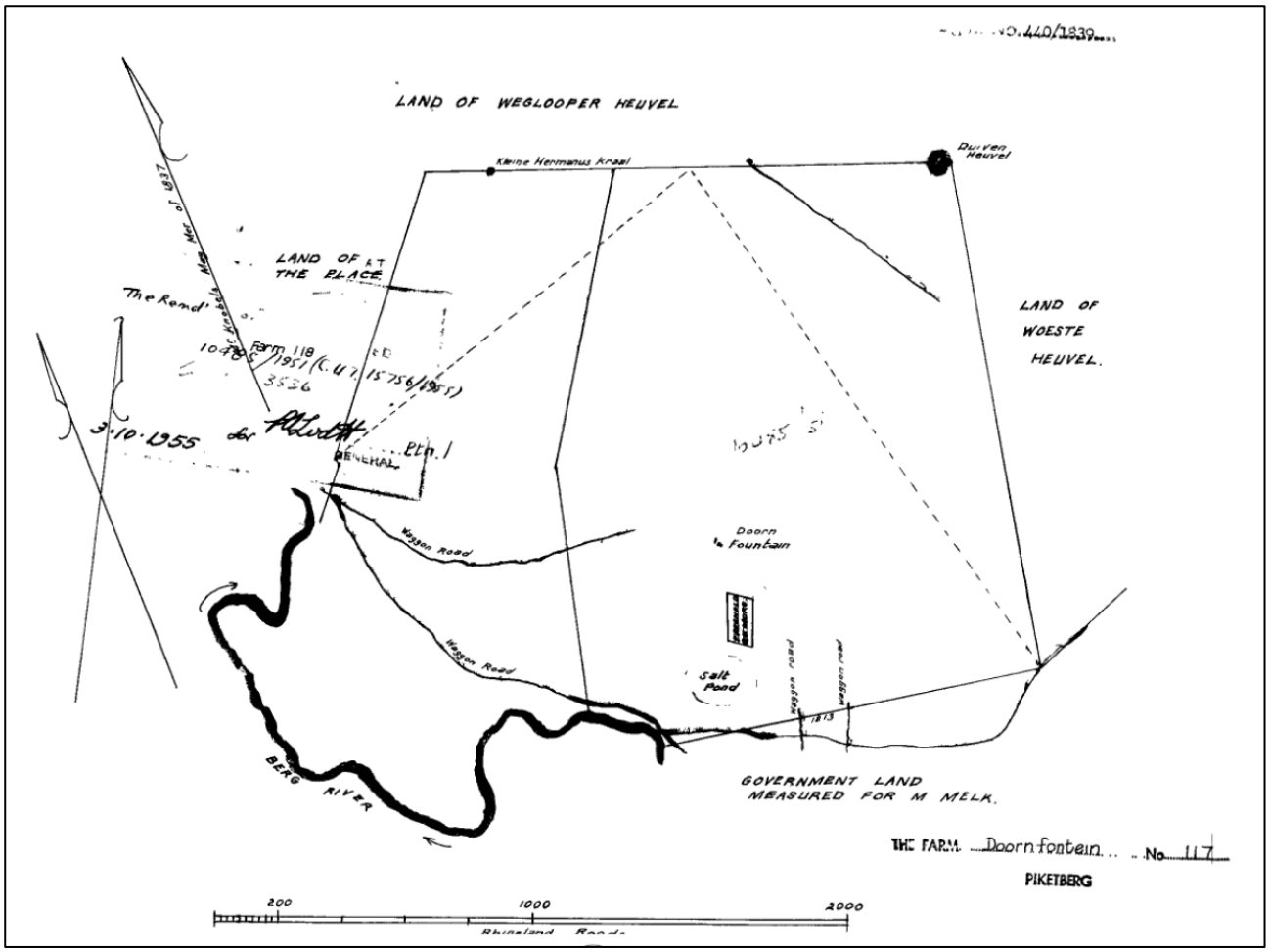

Figure 28: *1839 Surveyor General diagram 440/1839.*

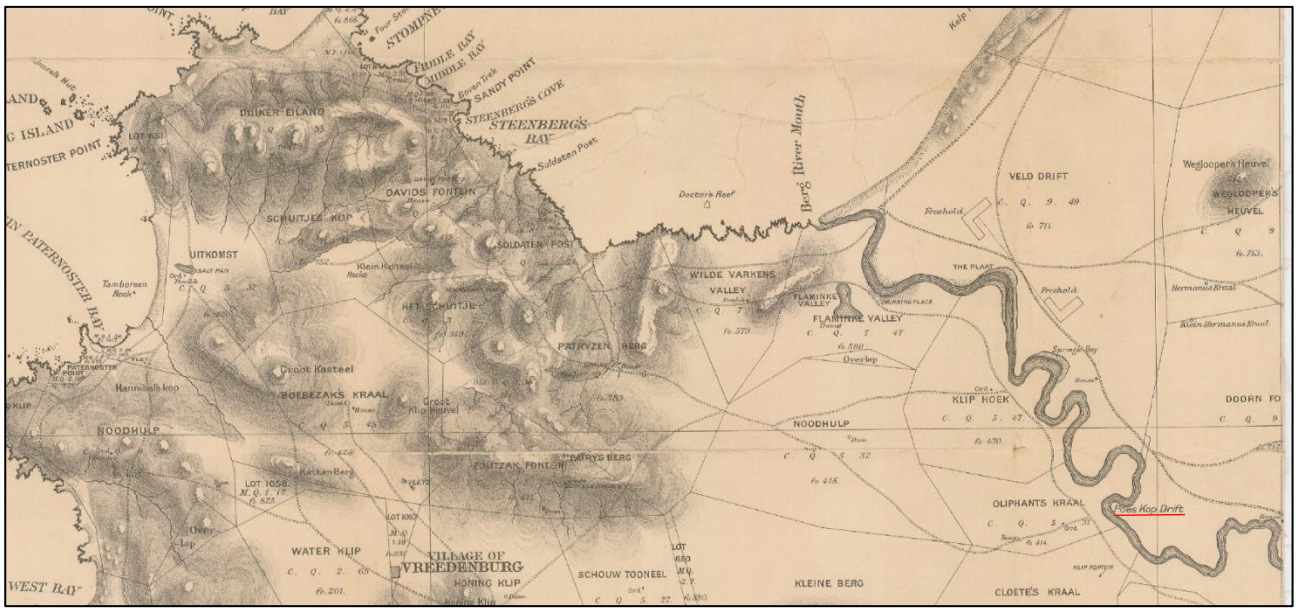

Figure 29: *Extract from 1880-1900 Southern Districts Map indicating a drift in the southern part of what is now Kruispad called Poes Kop Drift. However, no road is marked across the river there.*

Figure 30: *1938 aerial photograph (126_009_50278) showing the Doornfontein farmstead. Dark green = graveyard (waypoint 479), blue = shed (waypoint 441), red = original farmhouse (waypoint 440), yellow = old barn (waypoint 436), orange = another outbuilding, light green = old barn (waypoint 437), white = current main house (waypoint 439).*

Figure 31 shows the 1938 aerial view of the Kruispad farmstead. It is clear that the farmstead was very much undeveloped at that stage but at least one house (which still exists today) was present. A graveyard is visible on modern aerial photography 220 m east of the house but does not appear to have been present in 1938. It is clearly evident that, unlike Doornfontein, the Kruispad farmstead has largely developed since 1938. The 1960 aerial photograph, in fact, also shows relatively few structures. At both farmsteads it seems that the majority of the trees also postdate 1938.

Figure 31: *1938 aerial photograph (126_009_50280) showing the Kruispad farmstead. The red arrow marks a house still present today.*

Another useful source is the 1960 topographic mapping. Close examination shows some changes to the landscape that are less easily seen on aerial photography (Figure 32). The location referred to as "Kleine Hermanus Kraal" in the north of Kruispad in 1839 (Figure 30) is marked as two buildings on the 1960 map but they are no longer present today. The field survey only got to within about 200 m of the site though so the presence of archaeological remnants has not been ascertained. Similarly, a small farmstead named "Boskop" is shown in the north-eastern part of Kruispad but is absent today (there are some gum trees there forming a windbreak on the southern side of where the structures were). In this case the survey visited the location twice with no archaeological traces of the structures found, in fact, the site has subsequently been ploughed over. A track ran directly between Doornfontein and Boskop, speaking to a direct relationship between the two. This track survives today, albeit with a slight change in the north.

The Langrietvlei farmhouse, located 7.4 km south of the study area, is a declared Provincial Heritage Site (PHS). The Kersefontein farmhouse and an outbuilding, located 10.7 km southeast of the study areas are both PHSs.

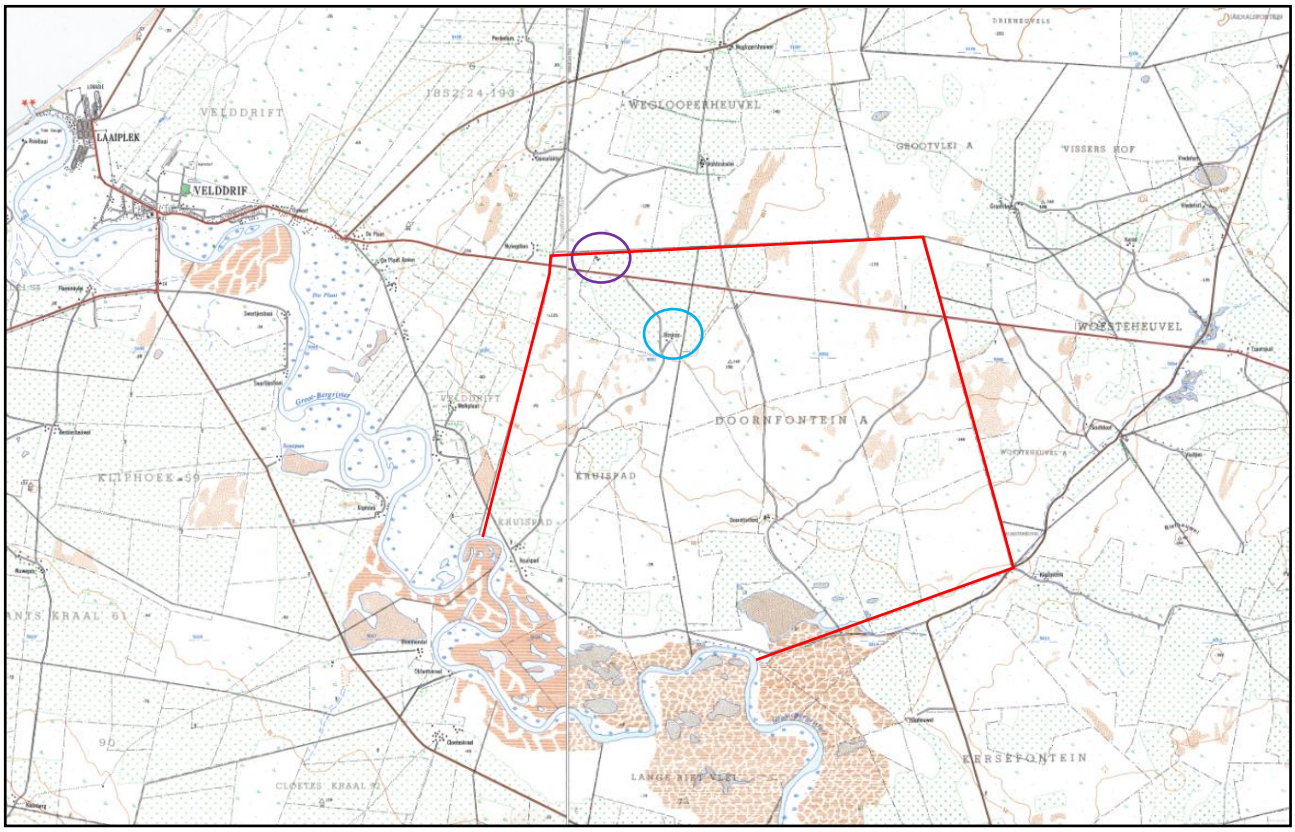

Figure 32: *1965 topographic maps of the study area. Kleine Hermanus Kraal is ringed in purple, Boskop in blue.*

5.4.2. Site visit

The site visit showed that historical sites are absent from the study area. All historical features noted in the desktop study are located well away from the development footprint. The Doornfontein farmstead was visited and recorded (waypoint 439) and is the most significant heritage resources in the study area. It has man historical structures, with the main farmhouse having been restored and renovated (Figure 33). It is unknown how much of the current appearance is modern, but the house seems to predate the Victorian period and was likely 'Victorianised' in the past with the recent renovations seeking to preserve that character. It faces south (downslope) towards the Berg River and a spring occurs in the garden on that side of the house. Just behind that house (i.e. to the north) is the older farmhouse (waypoint 440). This was once a T-shaped Cape Dutch house, but its gable collapsed and the repair followed the simplest route of removing the gable entirely (Figure 34). Additions and renovations have also been made to this house in recent years, especially on the north and west sides of the tail.

Figure 33: *View of the north-eastern corner of the current main farmhouse on Doornfontein (waypoint 439).*

Figure 34: *South-eastern corner of the older house on its large stone plinth (waypoint 440).*

5.5. Cultural landscapes and scenic routes

Cultural landscapes are the product of the interactions between humans and nature in a particular area. Sauer (1925) defined them thus: "The cultural landscape is fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result". Cultural landscapes are thus areas containing multiple 'sites' and which have been shaped by the interaction of natural processes and anthropogenic activities such as construction and agriculture. Scenic routes are well-travelled roads that pass through natural or cultural landscapes with aesthetic value and that often have iconic or visually attractive views.

The site falls within an area known locally as the 'Sandveld'. This term refers to the flat, sandy plain between the coast and the mountains, although in places further north there are a few sandstone hills and small mountains within the Sandveld. The study area, however, is sandy almost as far as the eye can see. It is bisected to the south by the Berg River which is an aesthetically significant landscape feature considered by Winter and Oberholzer (2013) as a locally significant feature. The granite hills of the Vredenburg Peninsula occur some 17 km and more to the west and, aside from the coastline, are the next nearest landscape feature of note.

Locally, the site is a mosaic of indigenous vegetation and agricultural lands. This pattern has remained fairly consistent over the last 60 years (Figure 35). In amongst this mosaic is a network of tracks, some of which are quite old. Also present as markers in the landscape are gum trees. These were frequently planted as windbreaks, as at the no longer extant Boskop. There are also prominent clusters of trees at both the Doornfontein and Kruispad farmsteads.

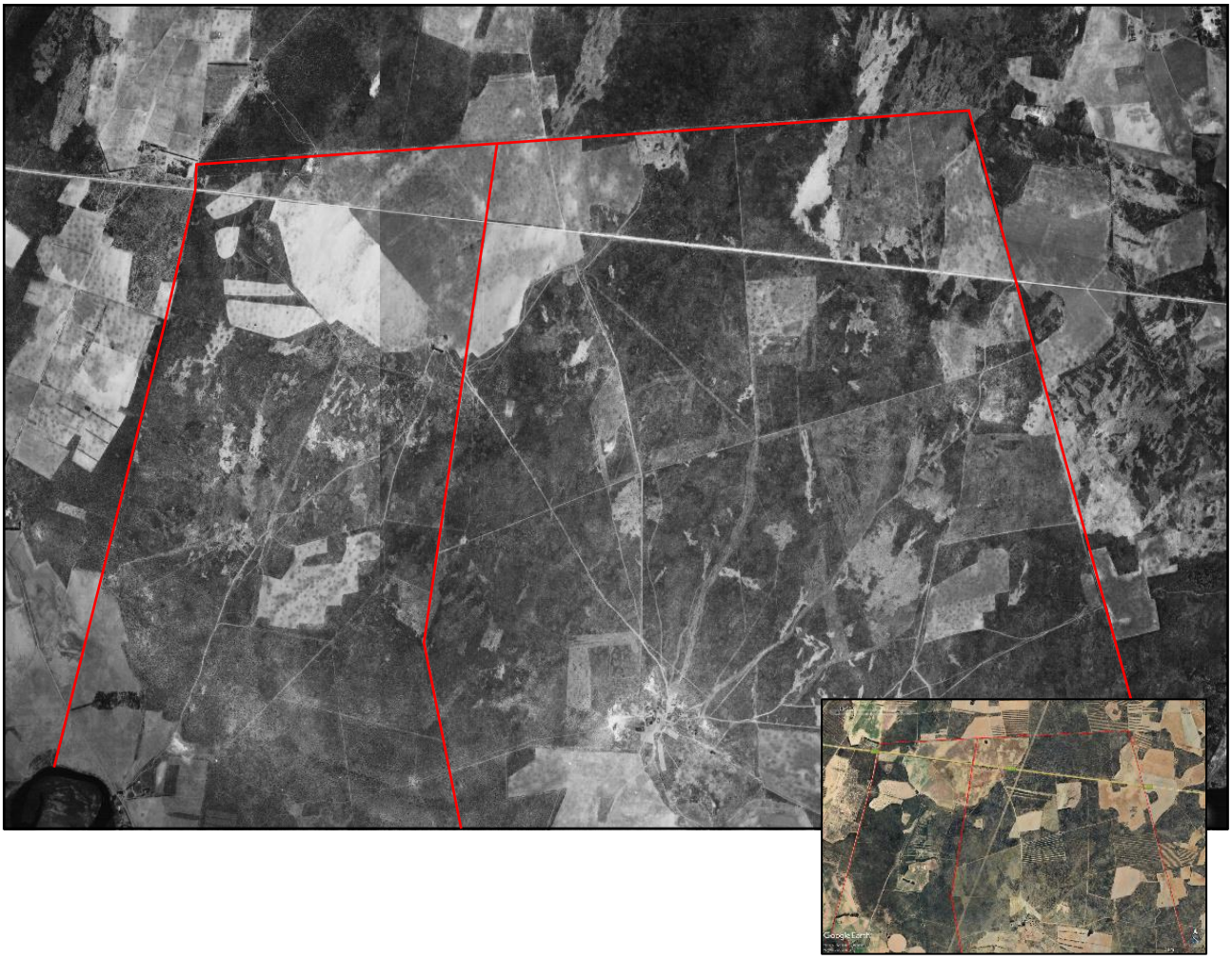

Figure 35: *1960 aerial photography showing that the historical landscape is much the same as today (inset) but that more lands have been tilled since 1960.*

A final consideration related to the cultural landscape is the night time landscape which, in this area, will be generally dark with just small points of light at the scattered farmhouses of the area.

The West Coast is generally regarded as a scenic environment and, as such, the main roads of the area can be seen as scenic routes. Winter and Oberholzer (2013) indicate that the R399 running

through the northern part of the site and the R29 to the west are both important linking routes. Importantly from the point of view of this project, visibility of the Berg River is very limited from the R399 due to topography and local screening vegetation, while visibility of the site from the R27 is minimal due to distance (closest approximately 7.5 km).

5.6. Visual impact assessment

Stead (2024) notes the key elements of the landscape to be:

- The Berg River;
- The R399 tourist corridor;
- The agrarian cultural landscape; and
- The coastal town of Velddrif.

Visual absorption capacity is noted to be medium. Factors influencing this are the natural vegetation being up to 2 m high, the presence of windrows and alien trees in places, the lack of screening vegetation in agricultural lands, and the lack of farm buildings close to the project footprint. The topography I generally fairly flat but with gentle slopes downhill towards the Berg River. Ridges and steep slopes are absent from the area. It is noted that skyline impacts of low intensity could occur from the Berg River valley in the area to the west of the study area.

A viewshed for the project has been constructed based on a project height of 5 m. It is noted than the solar panels are proposed to be 3 m high, but that some taller elements will also be present (e.g. substations). It must be stressed that this is a theoretical viewshed which assumes no screening is present (i.e. it is a worst case scenario).

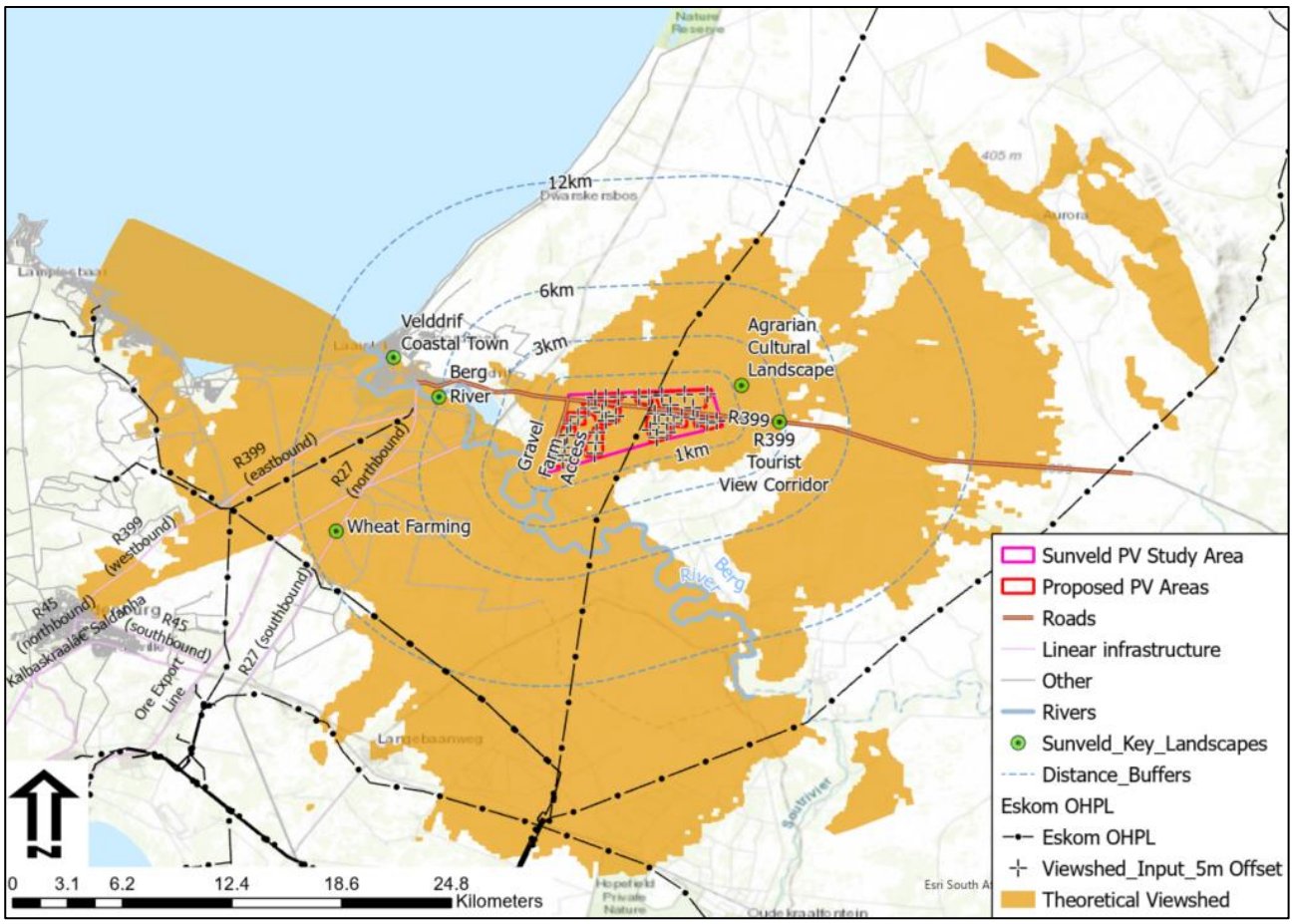

Figure 36: *Viewshed map for the proposed facility (Stead 2024: fig. 14).*

The kinds of impacts identified include, amongst other things, loss of landscape character, a massing effect in the landscape owing to a large-scale landscape modification and a cumulative impact related to setting a precedent for similar facilities to occur in the area. A number of mitigation measures have been proposed and will be further discussed below.

5.7. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. The reasons that a place may have cultural significance are outlined in Section 3(3) of the NHRA (see Section 2 above).

The archaeological resources are deemed to have low cultural significance at the local level for their scientific value and can be variably graded IIIC or NCW.

Graves are deemed to have high cultural significance at the local level for their social value. They are allocated a grade of IIIA.

Built heritage on the farms is greatly variable in cultural significance but a few structures on Doornfontein are worthy of IIIB and IIIA grading. Although the Kruispad farmstead was not visited, most structures are modern but a grade of IIIB is still applied to the farmstead for precautionary reasons.

The cultural landscape is largely a natural landscape with aesthetic value. It has two main components: (1) the Berg River and associated floodplain (loosely considered in this report as being all areas within 1 km of visible seasonal wetlands and pans) and (2) the surrounding Sandveld. While the Berg River is seen as having high local cultural significance, the Sandveld areas are rated as having medium local significance. These two components are graded IIIA and IIIB respectively. It then follows that the R399 through the northern part of the study area should also be allocated a grade of IIIB.

Figure 37 shows a grade map for the study area and surrounds.

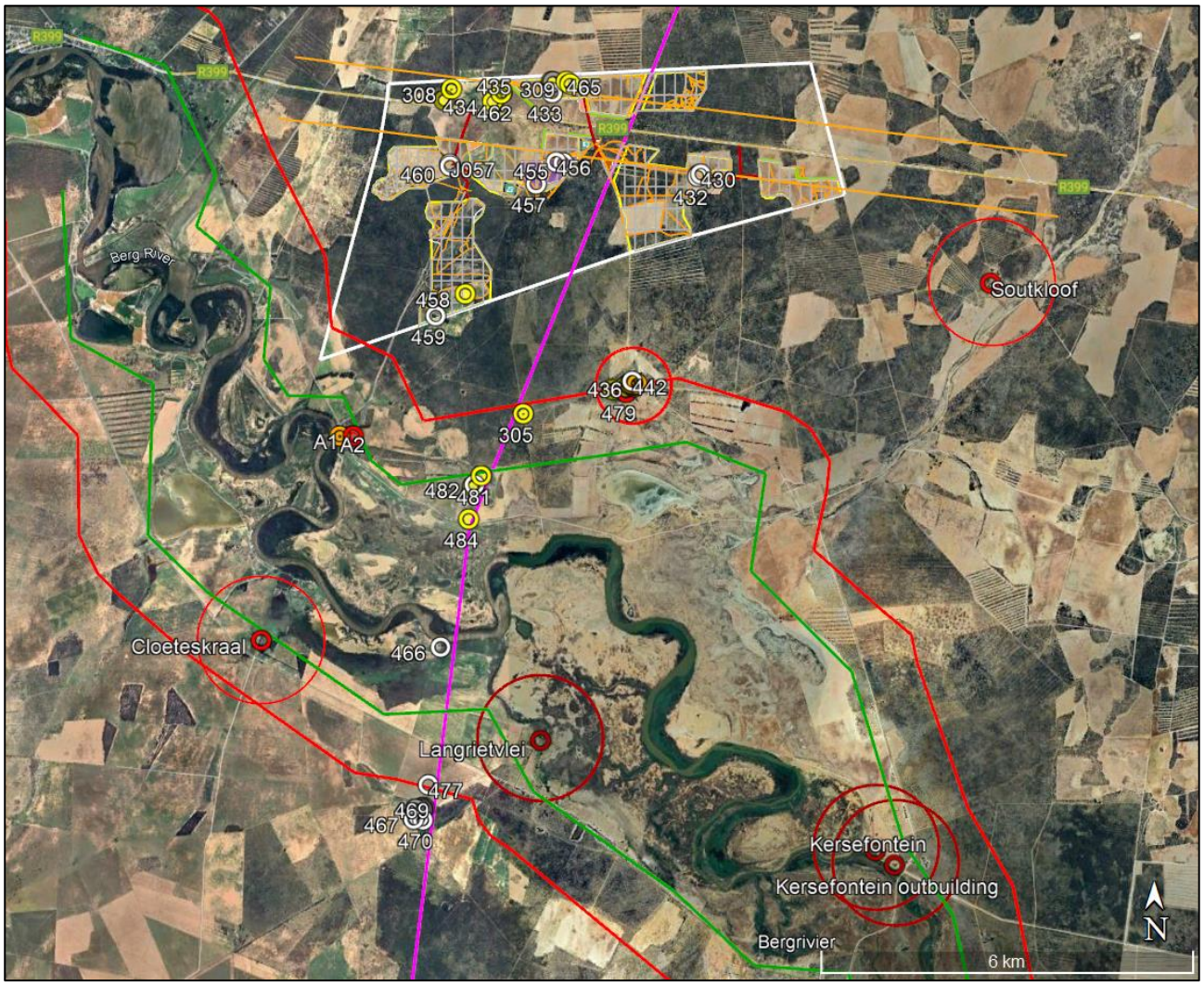

Figure 37: *Grade map for the study area. Dark red circles = grade I & II, red circles = grade IIIA, orange circles = grade IIIB, yellow circles = grade IIIc, white circles = NCW. Archaeological sites have been allocated 50 m buffers, farmsteads 500 m, the R399 500 m, PHS 1 km and the Berg River 1 km. The green line encloses the wetland environments of the Berg River floodplain, the red lines are the 1 km buffer. The orange lines are 500 m buffers from the R399.*

5.8. Summary of heritage indicators

- Uncontrolled damage to fossils should be minimised as far as possible.
- Archaeological sites should be protected with a buffer of at least 30 m. Reusing of existing roads through the buffers is allowed but any widening must take place away from the site.
- Direct damage to archaeological sites should be avoided as far as possible and, where some damage to significant sites is unavoidable, scientific data should be rescued.
- Built heritage resources should be protected with a buffer of at least 30 m as far as possible.
- Highly significant historical structures should be avoided by at least 500 m, but roads and/or powerlines may pass closer.
- The facility should not dominate views from multiple publicly accessible locations.
- Views of the Berg River should not be compromised.
- Significant views should not be compromised.
- The riverine corridor should be avoided by at least 1 km.

6. ASSESSMENT OF IMPACTS

The impacts identified for this project are:

- *Construction phase:*
  - Impacts to palaeontology
  - Impacts to archaeology
  - Impacts to graves
  - Impacts to the cultural landscape
- *Operation phase:*
  - Impacts to the cultural landscape
- *Decommissioning phase:*
  - Impacts to the cultural landscape

While palaeontological heritage is assessed in the separate specialist study, all the other impacts are considered here. Impacts to the built environment were also considered but will not occur due to the large distance between the development footprint and all known heritage structures. No structure of any sort occurs within 1 km of the proposed footprint. No further assessment is required.

6.1. Construction Phase

6.1.1. Impacts to archaeological resources

Direct impacts to archaeological resources would occur during the construction phase when grubbing and excavation begin. Although the sites are not of high cultural significance, the rarity of archaeological sites in the open Sandveld means that the impact magnitude can be rated as medium. If construction goes ahead using the layout proposed then impacts will definitely occur and an impact significance of **medium negative** can be expected (Table 3). Mitigation will be very easy to effect and will result in a reduction of significance to **low negative**.

There are no fatal flaws in terms of construction phase impacts to archaeology.

Table 3: *Assessment of construction phase archaeological impacts.*

Nature: Construction Phase Archaeological Impacts associated with: • Damage to or destruction of archaeological sites.		
	Without Mitigation	**With Mitigation**
Extent / Spatial Scope	Local	Local
Duration	Permanent	Permanent
Magnitude / Severity	Medium	Low

Probability	Definite	Definite
Significance	**Medium**	**Low**
Status	Negative	Negative
Irreplaceable loss of resources / Sensitivity of receiving environment	Yes – archaeological resources cannot be replaced or recreated	None – archaeological data will have been rescued and preserved for further study
Can impact be mitigated	Yes	
Mitigation:	A pre-construction survey of the PV footprint should be caried out to check for newly exposed archaeological sites. Graded archaeological sites within the development footprint should be excavated if they cannot be avoided. Ungraded archaeological sites in the development footprint should be tested to determine artefact density with excavations expanded as needed to capture good samples	

6.1.2. Impacts to graves

Direct impacts to graves would occur during the construction phase when grubbing and excavation begin. Although graves are of high cultural significance (magnitude = high), the rarity of graves and very low probability of impacting them means that the significance is rated **low negative** (Table 4). Mitigation will be very easy to effect and will result in a reduction of significance to **low negative**.

There are no fatal flaws in terms of construction phase impacts to graves.

Table 4: *Assessment of construction phase impacts to graves.*

Nature: Construction Phase Impacts to graves associated with: • Damage to or destruction of graves.		
	Without Mitigation	**With Mitigation**
Extent / Spatial Scope	Local	Local
Duration	Permanent	Permanent
Magnitude / Severity	High	Low
Probability	Improbable	Improbable
Significance	**Low**	**Low**
Status	Negative	Negative

Irreplaceable loss of resources / Sensitivity of receiving environment	Yes – graves cannot be replaced or recreated	No – graves will have been rescued and protected or relocated
Can impact be mitigated	Yes	
Mitigation:	If found during development, graves must be protected in situ and reported to an archaeologist and/or HWC for further assessment.	

6.1.3. Impacts to the cultural landscape

Direct impacts to the cultural landscape would occur throughout the construction phase as a result of the clearing of land and activity occurring on the site. This activity is out of place in a rural area. The impacts would be limited to the local area but could be quite disruptive. As a result of the short duration, an impact significance of **medium negative** can be expected (Table 5). Mitigation will not make much difference but may slightly reduce the magnitude. Impacts after mitigation are, however, still expected to be **medium negative**.

There are no fatal flaws in terms of construction phase impacts to the cultural landscape.

Table 5: *Assessment of construction phase impacts to the cultural landscape.*

Nature: Construction Phase Impacts to the cultural landscape associated with: • Visual intrusion into the cultural landscape. • Extensive activity on site in a rural area. • Increased light pollution at night.		
	Without Mitigation	**With Mitigation**
Extent / Spatial Scope	Local	Local
Duration	Short term	Short term
Magnitude / Severity	High	Medium
Probability	Definite	Definite
Significance	**Medium**	**Medium**
Status	Negative	Negative
Irreplaceable loss of resources / Sensitivity of receiving environment	No – the site can be rehabilitated.	No – the site can be rehabilitated.
Can impact be mitigated	Yes, but only slightly	

Mitigation:	Minimise construction duration. Ensure rehabilitation of all areas not required during operation. Make use of visual mitigation measures to reduce nighttime impacts (e.g. downlighters, motion detectors).

6.2. Operation Phase

6.2.1. Impacts to the cultural landscape

Direct impacts to the cultural landscape would occur throughout the operation phase as a result of the presence of the facility on the site. However, it is expected that with time the development would "settle in" to the landscape and become less of an obvious intrusion. The impacts would be limited to the local area and are considered of medium magnitude. As a result of the long duration, an impact significance of **medium negative** can be expected (Table 6). Mitigation will make a negligible difference and impacts after mitigation are expected to remain **medium negative**.

There are no fatal flaws in terms of construction phase impacts to the cultural landscape.

Table 6: *Assessment of operation phase impacts to the cultural landscape.*

Nature: Operation Phase Impacts to the cultural landscape associated with: • Visual intrusion into the cultural landscape. • Increased light pollution at night.		
	Without Mitigation	**With Mitigation**
Extent / Spatial Scope	Local	Local
Duration	Long term	Long term
Magnitude / Severity	Medium	Medium
Probability	Definite	Definite
Significance	**Medium**	**Medium**
Status	Negative	Negative
Irreplaceable loss of resources / Sensitivity of receiving environment	No – the site can be rehabilitated.	No – the site can be rehabilitated.
Can impact be mitigated	Yes, but only slightly	

Mitigation:	Ensure all maintenance and operation vehicles and activities remain in designated areas. Paint structures in earthy tones where technically feasible to minimise contrast. Make use of visual mitigation measures to reduce nighttime impacts (e.g. downlighters, motion detectors).

6.3. Decommissioning Phase

6.3.1. Impacts to the cultural landscape

Similarly to the construction phase, direct impacts to the cultural landscape would occur throughout the decommissioning phase as a result of the activity on site. Although the magnitude would again be high, the short duration results in an impact significance of **medium negative** (Table 7). Mitigation will make a negligible difference and impacts after mitigation are expected to remain **medium negative**. It is noted, however, that after mitigation the impact would eventually cease.

There are no fatal flaws in terms of decommissioning phase impacts to the cultural landscape.

Table 7: *Assessment of decommissioning phase impacts to the cultural landscape.*

Nature: Decommissioning Phase Impacts to the cultural landscape associated with: • Visual intrusion into the cultural landscape. • Extensive activity on site in a rural area. • Increased light pollution at night.		
	Without Mitigation	**With Mitigation**
Extent / Spatial Scope	Local	Local
Duration	Short term	Short term
Magnitude / Severity	High	Medium
Probability	Definite	Definite
Significance	**Medium**	**Medium**
Status	Negative	Negative
Irreplaceable loss of resources / Sensitivity of receiving environment	No – the site can be rehabilitated.	No – the site can be rehabilitated.
Can impact be mitigated	Yes, but only slightly	

Mitigation:	Minimise decommissioning duration. Ensure rehabilitation of all areas after the removal of infrastructure. Make use of visual mitigation measures to reduce nighttime impacts (e.g. downlighters, motion detectors).

6.4. Existing impacts to heritage resources

The main current impact to heritage is the ploughing of the lands which results in archaeological materials being buried and revealed on a cyclical basis. A significant concern here is that sites that are visible now are only so because they are in ploughed lands lying fallow. This means that there are likely many more sites that have either not been identified or have been undergraded and would get destroyed by development. Conversely, sites identified and avoided now may be ploughed over and become largely invisible and hence vulnerable to future development. Trampling from grazing animals and/or farm/other vehicles could also occur. These impacts could be of **medium negative** significance. There are currently no obvious threats to the cultural landscape, although it is noted that an existing HV line runs through the site. Being visually permeable, such powerlines result in only minimal alteration of the rural landscape. This impact is **negligible**.

6.5. Cumulative impacts

In relation to an activity, cumulative impact "means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities" (NEMA EIA Reg GN R982 of 2014).

Developments close to the Berg River are likely to have the greatest impacts on archaeology. The renewable energy application to the southwest of the site (Figure 37) has the greatest relevance in this regard, although no archaeological sites were reported by Lavin [2023b]. Mining projects such as that at Elandsfontein well to the south of the river can also affect archaeology quite significantly. Considering that the extent of archaeological material in the development footprint is unknown but likely quite widespread, and that the same problem likely pertains for all other surveys in the area, it is impossible to gauge the extent of the cumulative impacts. Given the nature of the archaeological materials expected to occur from the limited record made, it is anticipated that cumulative impact significance would be **medium negative**. Mitigation would be as per the individual impacts and would result in a reduction of the expected cumulative impact significance to **low negative**.

Cumulative impacts to graves are not a concern since graves are very rarely encountered, especially in areas away from the coastline. Cumulative impact significance is thus **low negative**. Mitigation would be as per the individual impacts and does not affect the **low negative** rating.

Sources of cumulative impacts to the cultural landscape relate to any activities that are incongruent with the rural landscape. In this area these include mainly other renewable energy facilities and mining. As is evident from Figure 38, a large number of renewable energy projects and applications

exist in the area. The most important landscape feature is the Berg River corridor. Key to the assessment of cumulative impacts is the positioning of other development on the landscape relative to this corridor. The proposed development across the river to the southwest of the study area is obviously important, and, although no footprint is shown in its HIA, the EIA reporting (Savannah 2024) indicates that some of its footprint falls within the area suggested for no development in the present report. The present project is set further back from the river corridor and, being fragmented, is likely to only result in a cumulative impact significance of **low negative**. Mitigation would be as per the individual impacts and does not affect the **low negative** rating.

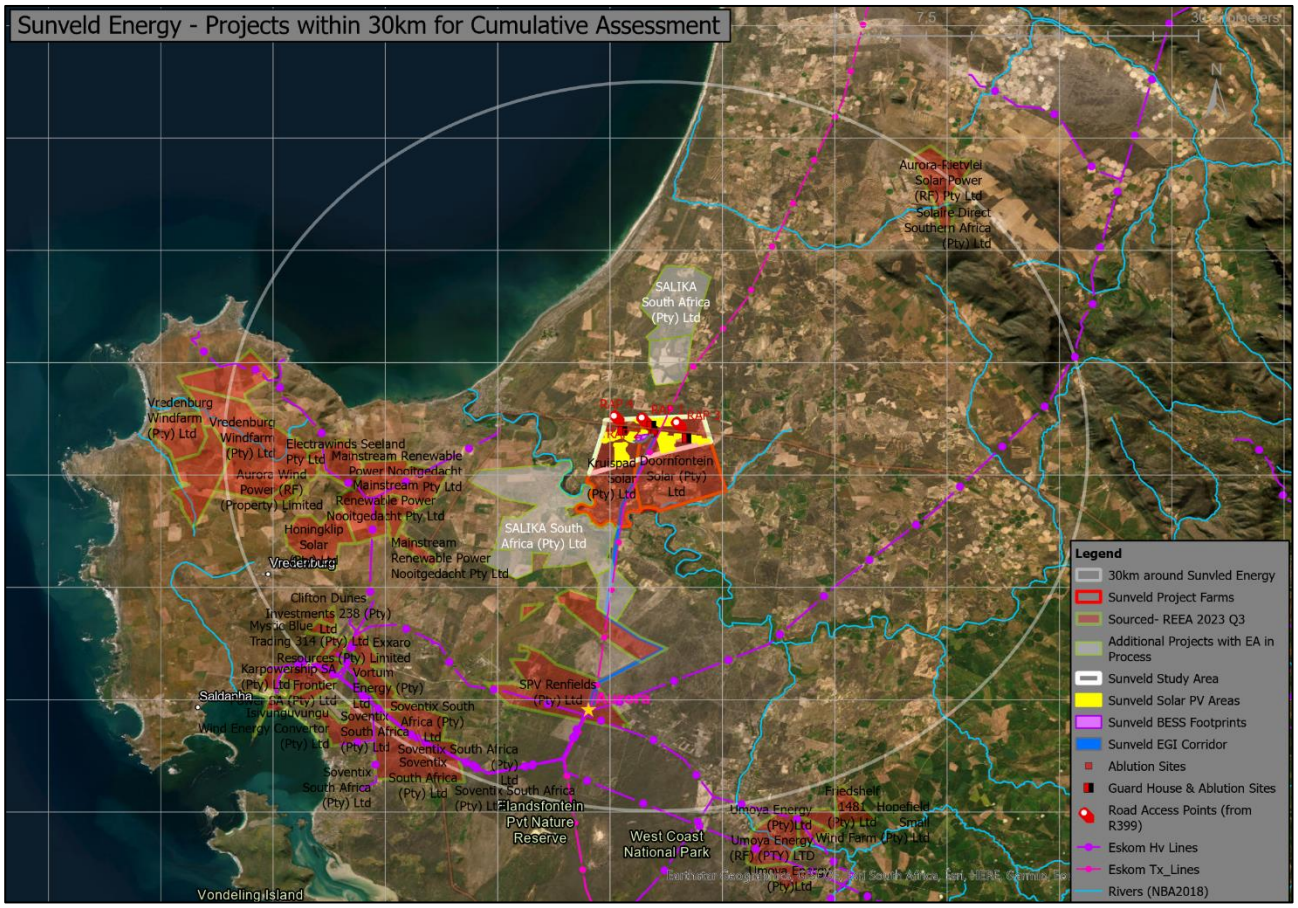

Figure 38: *Map showing other renewable energy applications in the surrounding area.*

6.6. Evaluation of impacts relative to sustainable social and economic benefits

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

The project will result in new electricity generation which is very much needed in South Africa due to the ongoing social and economic impacts of load shedding. The project will also provide jobs, both during all phases of development. These are clear economic and social benefits and, if mitigation is applied as suggested above, then the socio-economic benefits outweigh the residual impacts.

6.7. The No-Go alternative

If the project were not implemented then the site would stay as it currently is (impact significance of **neutral**). Although the heritage impacts with implementation would be greater than the existing impacts, the loss of socio-economic benefits is more significant and suggests that the No-Go option is slightly less desirable in heritage terms.

6.8. Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Whether the impacts that might occur on this site are acceptable is difficult to tell because of the limited surface visibility and high likelihood that other significant sites lie undiscovered in freshly ploughed or unploughed lands. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many publicly accessible vantage points is undesirable. Because of the height of the majority of the proposed development, such an impact to the landscape is not envisaged. Visibility from the south side of the Berg River is likely to be too low to be a concern.

7. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The actions recorded in Table 8 should be included in the environmental management programme (EMPr) for the project.

Table 8: *Heritage considerations for inclusion in the EMPr.*

Impact	Mitigation / management objectives & outcomes	Mitigation / management actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
Impacts to archaeology and graves					
Damage or destruction of archaeological sites or graves	Avoid impacts (preferred) or sample sites before disturbance	Planning Phase: Archaeological mitigation to be implemented. This must include at minimum test excavations at all sites within the footprint with full mitigation where warranted.	Appoint archaeologist to conduct mitigation well before construction (preferably 6 months)	Once-off	Project developer
Damage or destruction of archaeological sites or graves	Locate significant sites before damage occurs.	Planning Phase: Archaeological pre-construction survey to be conducted to check for further exposures of artefacts.	Appoint archaeologist to conduct survey well before construction (preferably 6 months)	Once-off	Project developer
Damage or destruction of archaeological sites or graves	Rescue information, artefacts or burials before extensive damage occurs	Construction Phase: Reporting chance finds as early as possible to HWC or an archaeologist, protect in situ and stop work in immediate area.	Inform staff to be vigilant and carry out inspections of new excavations	Ongoing basis	Construction Manager or Contractor
				Whenever on site (at least weekly during construction period only)	ECO
Impacts to the cultural landscape					
Visible landscape scarring	Minimise landscape scarring	Construction Phase: Ensure disturbance is kept to a minimum and does not exceed project requirements. Rehabilitate areas not needed during operation.	Monitoring of surface clearance relative to approved layout	Ongoing basis	Construction Manager or Contractor
				As required	ECO
Intrusion into cultural landscape	Minimise visual intrusion	Construction Phase: Ensure that a landscape architect is engaged to design and implement the visual mitigation.	Check that landscape plan is complete prior to construction	Once-off	Project developer
Intrusion into cultural landscape	Minimise visual intrusion	Operation Phase: Ensure that all maintenance vehicles and operational activities stay within designated areas.	Undertake visual inspections and report non-compliance	As required	Environmental Manager
Intrusion into cultural landscape	Minimise contrast and light pollution	Operation Phase: Paint buildings in earthy colours (mid-grey/brown) to reduce contrast. Make use of motion detectors and downlighting to reduce night-time light pollution.	Monitor that this has been considered in the design and operation of the facility	Once off	Project Developer

Visible landscape scarring	Minimise landscape scarring	Decommissioning Phase: Ensure all areas are rehabilitated following specialist rehabilitation plan.	Monitor compliance and success of rehabilitation	As required	ECO

8. CONSULTATION WITH HERITAGE CONSERVATION BODIES

As required by HWC in their response to the NID, the report was sent to the municipality and registered (with HWC) conservation bodies for comment as part of the PPP conducted under NEMA. Any heritage-related responses will be communicated to HWC.

9. CONCLUSIONS

There are three primary concerns for this project.

Palaeontological impacts have been assessed by Avery (2024). He found that fossils could be present anywhere in the footprint area, but, if encountered, are likely to be sparse. There is a very small possibility, however, that more numerous fossils could occur in Springfontyn sediments. There is no way to predict such finds and the opportunity to inspect subsurface excavations could prove to be a benefit if fossils are found, recorded in context and rescued.

Archaeological resources occur in and around the study area and tend to have been revealed by ploughing. An important consideration here is that sites "come and go" depending on the visibility of artefacts which, in turn depends on how recently an area has been ploughed. The observations from this study suggest that archaeological materials are likely to be quite widespread in the study area but that only some have been located. The implication is that significant sites may be lost where they are as yet unknown and currently undiscoverable. Monitoring for stone artefacts in this sedimentary context is pointless. As such, it is suggested that even sites appearing unimportant on the surface (graded NCW in this report) should be tested for density over several square meters and then have excavations expanded if there is the potential to recover a meaningful assemblage. It must also be noted that recently recorded significant sites (graded IIIC in this report) may not be visible in future years. Such locations MUST still be included in the testing program. A pre-construction survey will be required to locate any newly revealed archaeological sites and any such sites will need to be added to the list of locations for further work.

The third aspect is the cultural landscape. In and around the study area there is a mix of arable land and natural vegetation. A significant concern for this project is its proximity to the R399 which runs from Piketberg to Velddrif and is regarded as a scenic route. For various reasons parts of the project need to be closer to this road than is desirable from a strictly visual perspective and, as such, the visual specialist has proposed mitigation measures that will reduce the visual impacts to the landscape as seen from this road. The Berg River corridor is a highly significant landscape feature but, being located at a lower elevation that the proposed PV project, its context will only be minimally affected.

Table 9: *Heritage indicators and project responses.*

Indicator	Project Response
Uncontrolled damage to fossils should be minimised as far as possible.	No fossils are known, but mitigation measures have been suggested to deal with chance finds.

Archaeological sites should be protected with a buffer of at least 30 m. Reusing of existing roads through the buffers is allowed but any widening must take place away from the site.	Some sites are in the footprint and cannot be avoided and will require mitigation. Those outside it are well more than 30 m away.
Direct damage to archaeological sites should be avoided as far as possible and, where some damage to significant sites is unavoidable, scientific data should be rescued.	Pre-construction survey, test excavations and mitigation work have been recommended to deal with all sites that cannot be avoided.
Built heritage resources should be protected with a buffer of at least 30 m as far as possible.	This has been achieved.
Highly significant historical structures should be avoided by at least 500 m, but roads and/or powerlines may pass closer.	This has been achieved. No project component will be within 2 km of a significant structure.
The facility should not dominate views from multiple publicly accessible locations.	Visual mitigation has been proposed for views from the R399, but other views will be from too far away to be of concern.
Views of the Berg River should not be compromised	Visual mitigation along the R399 has been suggested. This will reduce the overall view towards the south but only within the project area. The river tends not to be openly visible from the R399 and other views of the river will not be affected. This is acceptable.
Significant views should not be compromised.	Views along the R399 are relevant and visual mitigation measures have been suggested to mitigate impacts. This is acceptable.
The riverine corridor should be avoided by at least 1 km.	This has been achieved.

9.1. Reasoned opinion of the specialist

Although many archaeological sites are likely to be present, none is likely of high significance and mitigation can be easily achieved. Visual impacts will be suitably controlled through mitigation measures. Since there are no outstanding concerns, it is the opinion of the heritage specialist that the project may be authorised in full.

10. RECOMMENDATIONS

It is recommended that the proposed Solar PV facility be authorised, but subject to the following recommendations which should be included as conditions of authorisation:

- Palaeontological monitoring will be required. This should be done with an approved Workplan so that any fossils found can be immediately studied and removed without delay to the project;
- A Fossil Chance Finds Procedure must be included in the project EMPr;
- Training in the identification of fossils should be given to workers at the start of construction;

- A pre-construction archaeological survey of the site must be carried out to determine whether any further archaeological sites have become visible;
- Test excavations and/or mitigation as required must be carried out at all recorded sites where the potential for obtaining a meaningful assemblage is likely regardless of their visibility at the time of construction;
- Fencing should be placed around the various development footprints and not enclose larger areas of landscape;
- Lighting mitigation such as downlighters and motion-detectors must be employed throughout the project;
- Where technically feasible, structures are to be painted in a mid-grey/brown colour;
- Screening trees to be planted per visual consultant specifications;
- Low berms (2.5 m) to be constructed and vegetated with local Strandveld vegetation;
- A landscape architect must be engaged to design and oversee implementation of the visual mitigation measures;
- If any fossils, archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

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APPENDIX 1 – Curriculum Vitae

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 40 Brassie Street, Lakeside, 7945
Telephone: (021) 788 1025
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code EB
Marital Status: Married to Carol Orton
Languages spoken: English, Afrikaans, basic French

Education:

SA College High School	Matric	1994
University of Cape Town	B.A. (Archaeology, Environmental & Geographical Science)	1997
University of Cape Town	B.A. (Honours) (Archaeology) [First Class]	1998
University of Cape Town	M.A. (Archaeology)	2004
University of Oxford	D.Phil. (Archaeology)	2013

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004

UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

- Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
- ASAPA CRM Section member with the following accreditation:
  - Principal Investigator: Coastal shell middens (awarded 2007)
    Stone Age archaeology (awarded 2007)
    Grave relocation (awarded 2014)
  - Field Director: Rock art (awarded 2007)
    Colonial period archaeology (awarded 2007)
- Association of Professional Heritage Practitioners (APHP) membership number: 43
  - Accredited Professional Heritage Practitioner

Memberships and affiliations:

South African Archaeological Society Council member	2004 – 2016
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
UCT Department of Archaeology Research Associate	2013 – 2017
Heritage Western Cape APM Committee member	2013 – 2023
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –
Kalk Bay Historical Association	2016 –
Association of Professional Heritage Practitioners member (CRM Section)	2016 –
Southern African Field Archaeology section editor	2021 –

Fieldwork and project experience:

I have extensive experience as Field Director and Principal Investigator throughout Western and Northern Cape, and the western Free State and Eastern Cape. I also work in the eastern part of South Africa through partnership with an Iron Age accredited colleague.

<u>Feasibility studies:</u>
Heritage feasibility studies examining all aspects of heritage from the desktop

Phase 1 surveys and impact assessments:

- Project types
  - Notification of Intent to Develop applications
  - Heritage Impact Assessments
    - Self-standing assessments under Section 38(1) of the NHRA
    - Assessments under NEMA and Section 38(8) of the NHRA
  - Archaeological specialist studies
  - Strategic assessments
  - Phase 1 archaeological test excavations in historical and prehistoric sites
    - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Agricultural developments
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind, solar and hydro-electric)

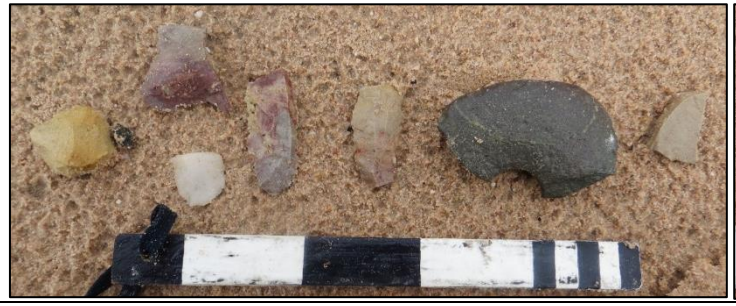
Phase 2 mitigation and research excavations:

➢ ESA open sites	o Duinefontein, Gouda, Namaqualand
➢ MSA rock shelters	o Fish Hoek, Yzerfontein, Cederberg, Namaqualand
➢ MSA open sites	o Swartland, Bushmanland, Namaqualand
➢ LSA rock shelters	o Cederberg, Namaqualand, Knersvlakte, Bushmanland
➢ LSA open sites (inland)	o Swartland, Franschhoek, Namaqualand, Bushmanland, De Aar
➢ LSA coastal shell middens	o Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand coast, Knersvlakte
➢ LSA burials	o Melkbosstrand, Saldanha Bay, Namaqualand coast, Knysna
➢ Historical sites	o Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
➢ Historic burial grounds	o Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl, Beaufort West, Franschhoek (farmstead and well), Paarl, De Aar

➢ ***Awards:***

1998: Frank Schweitzer memorial book prize for an outstanding student.
2015/2016: Western Cape Government Cultural Affairs Awards: Best Heritage Project.

APPENDIX 2 – List of Finds

Waypoint	Location	Description	Grade
430	S32 48 20.9 E18 18 00.2	Medium density 2x3m BGS in deflated area. Cores and flakes of quartz and silcrete. On revisiting this site 7.5 months later an ephemeral scatter of quartz, silcrete and 'other' flakes was seen along with one hammerstone.  	NCW
431	S32 48 21.5 E18 17 58.8	Other side of deflated area of 430 with some silcrete flakes. On revisiting this site 7.5 months later just two silcrete flakes were seen.	NCW
432	S32 48 22.1 E18 17 58.4	1x2m dense scatter of silcrete flakes and blades and some quartz. A partial bored stone was also present. On revisiting this site 7.5 months later only an ephemeral scatter of quartz artefacts was noted.  	NCW

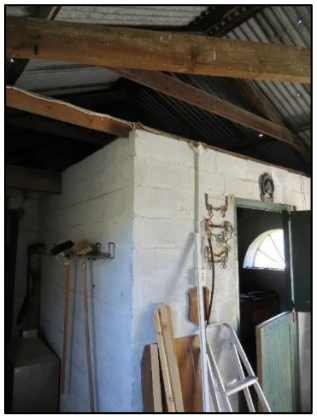
Waypoint	Location	Description	Grade
433	S32 47 38.6 E18 16 28.3	Low density ephemeral scatter with quartz flakes, one broken blade and 1 silcrete flake. 	NCW
434	S32 47 43.2 E18 15 51.6	Medium density site in deflated, fallow area between two recently ploughed fields. 2 manuports, 5 hammer stones, two upper grind stones one upper grindstone/hammerstone, numerous flakes of quartz with minimal silcrete. Hammer stones and upper grindstones were of quartzite and other grey (probably metamorphic) rock. The main scatter is in an area of about 8 m by 8 m but there is light scatter around this area that extends up to 10-15 m from the core area.  	IIIC

Waypoint	Location	Description	Grade
		 	
435	S32 47 39.0 E18 15 56.9	Medium density scatter of flakes, a hammer stone, and two cores. Largely quartz and grey meta volcanic rock, with some silcrete. Also in the same fallow area as 434.    	IIIC

Waypoint	Location	Description	Grade
			
436	S32 50 09.8 E18 17 21.0	Old farm building, part of the original farm. Walls are thick and made of stone, and have been plastered and in places repaired with cement. It is currently used as storage and as a chicken coop. Part of Doornfontein farm complex (436-442) with complex is considered IIIA as a whole. 	IIIB

Waypoint	Location	Description	Grade
		    	

Waypoint	Location	Description	Grade
		  	

437	S32 50 10.5 E18 17 19.9	Part of original farm buildings but fixed and repaired in subsequent years. Concrete cinderblocks inside. Part of Doornfontein farm complex (436-442) with complex is considered IIIA as a whole.     	IIIB

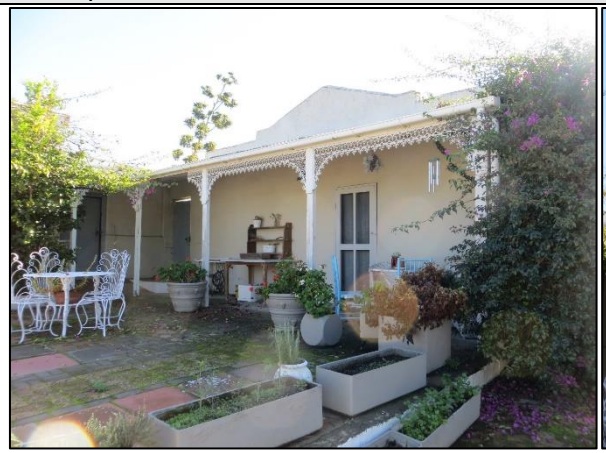
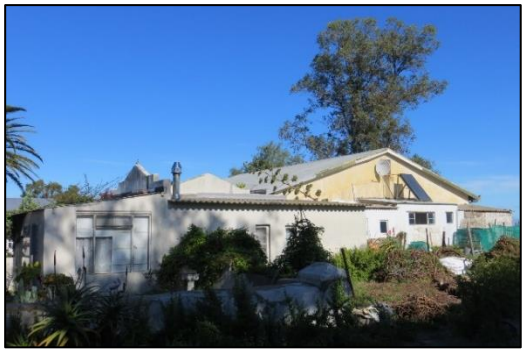
Waypoint	Location	Description	Grade
		 	

Waypoint	Location	Description	Grade
438	S32 50 11.3 E18 17 19.1	A small cottage built near the main house. Built in the 1950s (according to farm owner) and refurbished in 2011. 	NCW
439	S32 50 10.6 E18 17 18.0	Current main farmhouse said to have been built in 1870 and more recently restored (https://www.doornfonteinfarm.co.za/). It is evident that is has been Victorianised, but it is not clear when this occurred. It was not the original farmhouse but was built to replace the house located immediately to its north. Large refurbishments and extensions done between 2001 and 2011, including adding the stoeps (north and south) and swimming pool room (west). 	IIIA

Waypoint	Location	Description	Grade
		     	

Waypoint	Location	Description	Grade
		 South façade  West gable of addition	
440	S32 50 09.8 E18 17 18.0	The original farmhouse built in the 1800s (according to farmer). Thick stone walls built on stone platform. Originally had a south-facing Cape Dutch gable which collapsed some years back and was not replaced. Oldest is the east-west section with the tail having been added. A further addition to the tail with a lower floor level has been added between 2004 and 2010.  	IIIB

Waypoint	Location	Description	Grade
			
441	S32 50 09.8 E18 17 16.6	Another small cottage, built in the 1900s. Additions and repairs done over the years. It adjoins a large shed (visible on 1938 aerial photography) and other outbuildings.	IIIC

Waypoint	Location	Description	Grade
		     	

Waypoint	Location	Description	Grade
442	S32 50 08.4 E18 17 18.0	Modern farm storage sheds and garages made from concrete blocks and asbestos sheeting.      	NCW
455	S32 48 15.1 E18 16 35.2	An ephemeral quartz scatter with 21 artefacts seen in an area of about 15 m by 20 m. There could be more artefacts beneath the surface. 	NCW
456	S32 48 14.7 E18 16 30.7	An ephemeral quartz and silcrete scatter with 25 artefacts seen in an area of about 20 m by 20 m.	NCW
457	S32 48 26.0 E18 16 18.3	An ephemeral scatter with 16 quartz artefacts and one silcrete flake seen in an area of about 10 m by 20 m. There could be more artefacts beneath the surface.	NCW

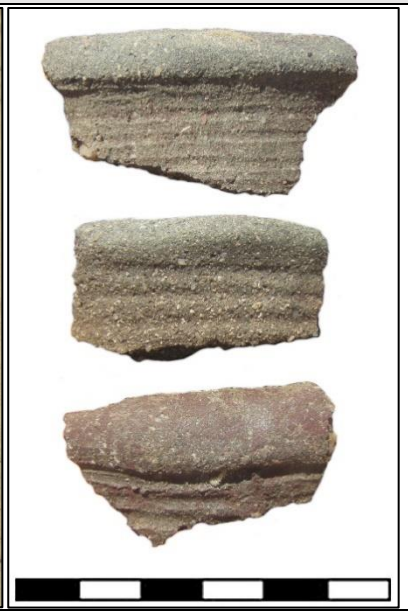
Waypoint	Location	Description	Grade
458	S32 49 23.1 E18 15 34.6	A moderate density artefacts scatter with quartz and silcrete. There were at least 50 artefacts in an area of about 10 m by 10 m and likely more below the surface.  	IIIC
459	S32 49 34.4 E18 15 16.3	A large windrow of gum trees 360 m long and up to 50 m wide. It forms part of the modern cultural landscape with such windrows being quite common in the area. However, as it is not present on the 1960 aerial photograph, it is not very old and thus considered NCW. 	NCW

Waypoint	Location	Description	Grade
460	S32 48 16.7 E18 15 25.1	Three quartz artefacts and a hammerstone were seen in a very disturbed and trampled area. Very likely further artefacts beneath the sand. 	NCW
462	S32 47 38.3 E18 15 57.1	Fairly dense scatter of quartz artefacts with at least 50 seen in an area of about 5m by 10 m. There may be more beneath the surface. Located 15 m north of 435 so the two may be one site.	IIIC
463	S32 47 32.8 E18 16 27.9	Moderate density scatter of quartz, silcrete and 'other' artefacts in an area just north of a small rise that looks like an old heuweltjie. 45 artefacts were seen in a area of about 8 m by 10 m. The area has been recently ploughed but has deflated. There may be more beneath the surface.	IIIC
464	S32 47 33.0 E18 16 28.9	A small scatter of 12 quartz artefacts in a recently ploughed area. There may be more beneath the surface.	NCW
465	S32 47 32.8 E18 16 37.0	A large scatter of quartz, silcrete and 'other' artefacts in an area of about 20 m by 30 m. The area has been recently ploughed but has deflated. There may be more beneath the surface. This is the site recorded by (Halkett 2017b) as waypoint 309. 	IIIC
478	S32 50 13.6 E18 17 14.5	In this area alongside the Doornfontein farmhouse there are a number of LSA artefacts in quartz and silcrete as well as some historical items. The latter are refined white	NCW

Waypoint	Location	Description	Grade
		earthenwares. No evidence of a historical dump (only very light scatter) and the area has been ploughed. This area is at the edge of the Berg River floodplain.	
479	S32 50 14.2 E18 17 14.3	Melck family graveyard. It is walled with a stone wall and east-facing metal pedestrian gate. There are nine graves with dates of death extending from 1918 to 2018. Gum trees were planted in each corner but the one in the southwest has since died. 	IIIA
480	S32 50 11.3 E18 17 13.7	This is in the same ploughed area as waypoint 478 but slightly further up the slope above the Berg River floodplain. The density of LSA materials is greater here. There are artefacts of quartz and silcrete as well as a broken manuport and a grindstone fragment. 	IIIC

Waypoint	Location	Description	Grade
481	S32 50 57.6 E18 15 44.6	A deflated area of a ploughed field on but very close to the edge of the Berg River floodplain showed about 20 LSA artefacts. Most were quartz but a few silcrete ones were also present along with one in quartz porphyry. There was also a broken hammerstone on a small quartzite cobble. There is a good chance that more artefacts are present beneath the surface.  	IIIC
482	S32 51 02.3 E18 15 40.3	At this location near the edge of the Berg River floodplain there was a scatter of fossil shell that included some extremely large wite mussels. Occasional MSA artefacts were also present including a medial fragment of what is almost certainly an unfinished Still Bay point. The origin of the material is unclear since the area is heavily deflated but the material is concentrated in one section only. 	NCW

Waypoint	Location	Description	Grade
		 	
483	S32 51 03.1 E18 15 39.3	This is another section of the heavily deflated area in which 482 was found. Here there was a dense scatter of perhaps 100 potsherds in a small area of about 3 m by 5 m. There were a few associated stone artefacts, and the entire site was only some 5 m by 10 m in extent. The pottery included three rim sherds with a 'thickened round' rim form and with horizontal incisions parallel to the lip. It seems likely that this was a whole pot in the recent past but that it has broken and degraded considerably since exposure by deflation. It may have been deposited in the sand dune which lies immediately north and which is eroding away under force of the southerly wind. 	IIIC

Waypoint	Location	Description	Grade
		 	
484	S32 51 20.1 E18 15 36.8	A scatter of about 20 quartz artefacts was found in a deflated part of a ploughed field on the Berg River floodplain. Included an upper grindstone fragment. There was also an upper grindstone fragment. There is a good chance that more artefacts are present beneath the surface.  	IIIC

Waypoint	Location	Description	Grade
304	S32 50 12.7 E18 17 05.5	From Halkett 2017b: *Deflation area containing Later Stone Age artefactual material in relatively low density. The artefacts are mostly on quartz consisting of chunks and flakes. One fragment of Cape coastal pottery was identified.*	IIIC
305	S32 50 25.4 E18 16 10.5	From Halkett 2017b: *Ephemeral scatter of quartz artefacts consisting of flakes and chunks in track.*	NCW
307	S32 47 42.5 E18 15 21.4	From Halkett 2017a: *Ephemeral scatter of quartz flakes in small deflation area.*	IIIC
308	S32 47 36.7 E18 15 26.0	From Halkett 2017a: *Artefact scatter concentrated in a sandy deflation hollow described by Orton and Webley in 2011. Predominantly LSA quartz flakes and chunks but some silcrete present. Also Ostrich eggshell and some green glass and 1 fragment of Transfer printed refined earthenware ceramic with willow pattern motif.*	IIIC
309	S32 47 34.1 E18 1 39.3	From Halkett 2017b: *Low density artefact scatter in and around an area that is probably the remains of an old pan or spring. The artefacts consist predominantly of quartz flakes, chips and chunks but some silcrete is present. Fragments of a quartzite upper and lower grindstone were recorded. One fragment of marine shell (black mussel) was observed. Most artefacts are in ploughed land to the west of the "pan", but are also found in the "pan" itself.* [This is the site recorded as waypoint 465 in the present study.]	NCW
A1	S32 50 36.8 E18 14 25.3	A farm graveyard on Kruispad, visible on modern aerial photography but not present in 1938. Not visited. Assumed older than 60 years for precautionary reasons.	IIIA
A2	S32 50 36.9 E18 14 16.8	A small house on Kruispad visible on 1938 aerial photography. Not visited. Allocated Grade IIIB for precautionary reasons.	IIIB

APPENDIX 3 – Palaeontological study

APPENDIX 4 – Palaeontological chance finds procedure

HWC PROCEDURE: CHANCE FINDS OF PALAEONTOLOGICAL MATERIAL

Introduction

This document is aimed to inform workmen and foremen working on a construction and/or mining site. It describes the procedure to follow in instances of accidental discovery of palaeontological material (please see attached poster with descriptions of palaeontological material) during construction/mining activities. This protocol does not apply to resources already identified under an assessment undertaken under s. 38 of the National Heritage Resources Act (no 25 of 1999).

Fossils are rare and irreplaceable. Fossils tell us about the environmental conditions that existed in a specific geographical area millions of years ago. As heritage resources that inform us of the history of a place, fossils are public property that the State is required to manage and conserve on behalf of all the citizens of South Africa. Fossils are therefore protected by the National Heritage Resources Act and are the property of the State. Ideally, a qualified person should be responsible for the recovery of fossils noticed during construction/mining to ensure that all relevant contextual information is recorded.

Heritage Authorities often rely on workmen and foremen to report finds, and thereby contribute to our knowledge of South Africa's past and contribute to its conservation for future generations.

Training

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO. It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

Actions to be taken

One person in the staff must be identified and appointed as responsible for the implementation of the attached protocol in instances of accidental fossil discovery and must report to the ECO or site agent. If the ECO or site agent is not present on site, then the responsible person on site should follow the protocol correctly in order to not jeopardize the conservation and well-being of the fossil material.

Once a workman notices possible fossil material, he/she should report this to the ECO or site agent.

Procedure to follow if it is likely that the material identified is a fossil:

i The ECO or site agent must ensure that all **work ceases** immediately in the vicinity of the area where the fossil or fossils have been found;

ii The ECO or site agent must **inform HWC of the find immediately.** This information must include photographs of the findings and GPS co-ordinates;

iii The ECO or site agent must compile a **Preliminary Report and fill in the *Fossil Discoveries: HWC Preliminary Record Form*** within 24 hours without removing the fossil from its original position. The **Preliminary Report** records basic information about the find including:

- The date
- A description of the discovery
- A description of the fossil and its context (e.g. position and depth of find) Where and how the find has been stored
- Photographs to accompany the preliminary report (the more the better):
  - A scale must be used
  - Photos of location from several angles Photos of vertical section should be provided
  - Digital images of hole showing vertical section (side);
  - Digital images of fossil or fossils.

iv Upon receipt of this **Preliminary Report**, HWC will inform the ECO or site agent whether or not a rescue excavation or rescue collection by a palaeontologist is necessary.

v **Exposed finds must be stabilized where they are unstable and the site capped, e.g. with a plastic sheet or sand bags.** This protection should allow for the later excavation of the finds with due scientific care and diligence. HWC can advise on the most appropriate method for stabilization.

vi If the find cannot be stabilized, **the fossil may be collect with extreme care** by the ECO or the site agent and put aside and protected until HWC advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

No work may continue in the vicinity of the find until HWC has indicated, in writing, that it is appropriate to proceed.

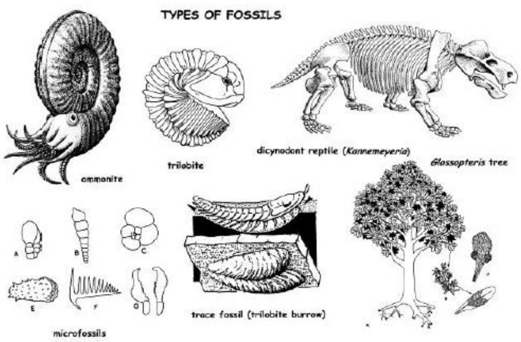
FOSSIL DISCOVERIES: HWC PRELIMINARY RECORDING FORM			
Name of project			
Name of fossil location			
Date of discovery			
Description of situation in which the fossil was found:			
Description of context in which the fossil was found:			
Description and condition of fossil identified:			
GPS coordinates:	Lat:	Long:	
If no co-ordinates available then please describe the location:			
Time of discovery:			
Depth of find in hole:			
Photographs (tick as appropriate and indicate number of the photograph)	Digital image of vertical section (side)		
	Fossil from different angles		
	Wider context of the find		
Temporary storage (where it is located and how it is conserved)			
Person identifying the fossil	Name: Contact:		
Recorder:	Name: Contact:		
Photographer	Name: Contact:		

Palaeontology: what is a fossil?

Fossils are the traces of ancient life (animal, plant or microbial) preserved within rocks and come in two forms:

• Body fossils preserve parts, casts or impressions of the original tissues of an organism (e.g. bones, teeth, wood, pollen grains); and

• Trace fossils such as trackways and burrows record ancient animal behaviour.



How to report chance fossil finds: What should I do if I find a fossil during construction/mining?

If you think you have identified a fossil:

Immediately inform the ECO or Site Agent. He/she will then contact HWC and write a report and if necessary operations will stop in that specific area until the fossil is recovered

Heritage Western Cape
ceoheritage@westerncape.gov.za
021 483 5959
www.hwc.org.za

Types of palaeontological finding - What does a fossil look like?

Fossils vary in size, from fossilised tree trunks and dinosaur bones down to very small o
Finds can be **individual fossils** (one isolated wood log or bone) or **clusters and beds**
teeth, animal or plant remains, trace fossils in close proximity or bones resembling par
bed of fossils is a layer with many fossil remains.

Below there is a list of few examples of fossils which may be identified during excavati
Cape.

Image	Description	Image	D
	Leaves		Sna c
	Fossil wood		Bon
	The remains of fish and marine life (e.g. teeth, scales, starfish)		La ma and
	Stromatolites		Trac burr (ants, be
	Animal footprints		

Images provided by Dr John Almond

Text by HWC's Archaeology, Palaeontology & Meteorites Committee June 2016

APPENDIX 5 – Visual study

APPENDIX 6 – Site Sensitivity Verification

As required in Part A of the Government Gazette 43110, GN 320, a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool. The details of the site sensitivity verification are noted below:

Date of Site Visit	29th May to 3rd June 2023 and 19th to 21st January 2024
Specialist Name	Dr Jayson Orton
Professional Registration Number	ASAPA: 233; APHP: 043
Specialist Affiliation / Company	ASHA Consulting (Pty) Ltd

Method of the Site Sensitivity Verification

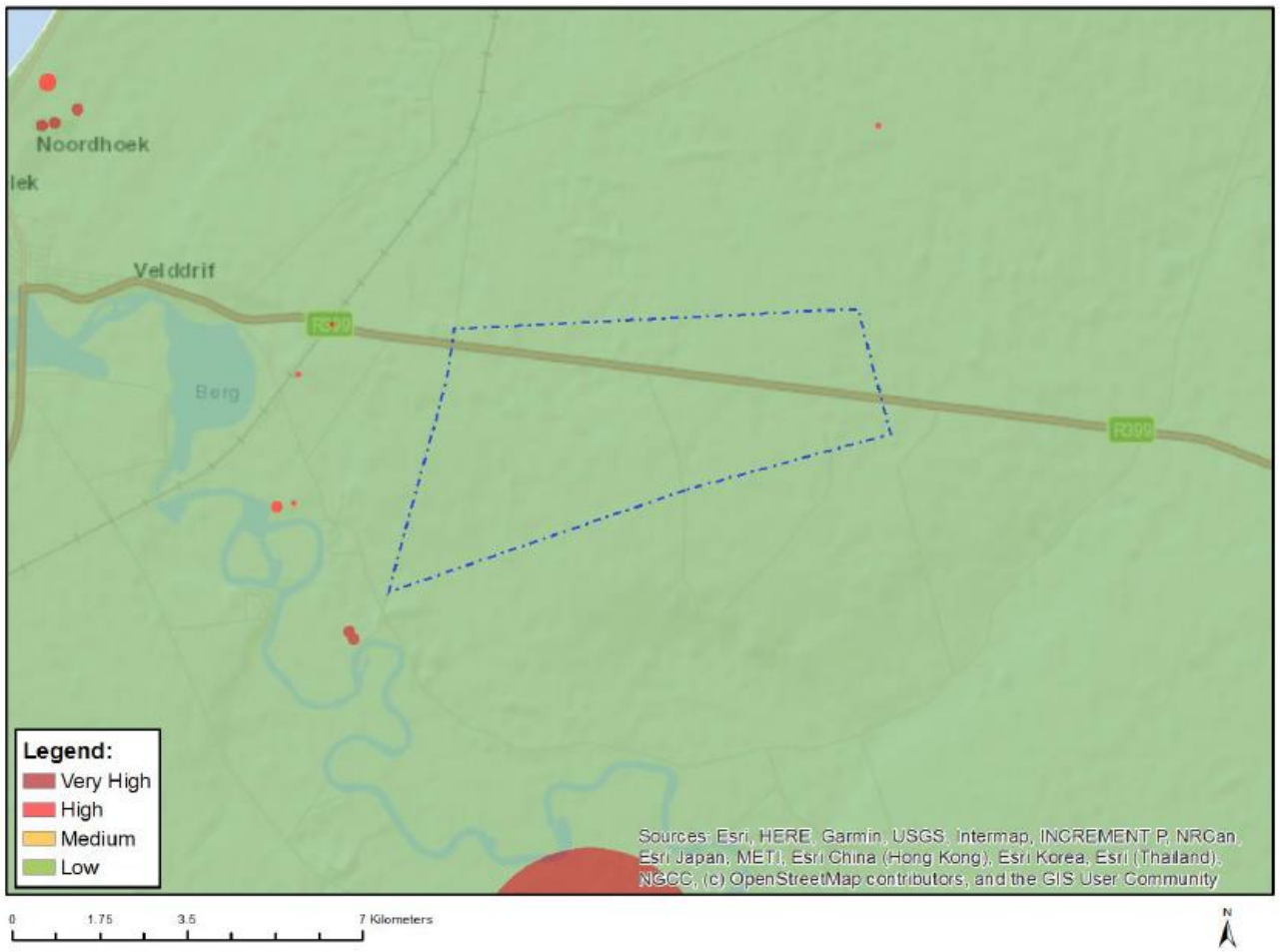
Initial work was carried out using satellite aerial photography in combination with the author's accumulated knowledge of the local landscape. A field survey was then carried out. Sensitivity data was provided to the developer so that a layout that minimised environmental impacts could be devised. Subsequent desktop research using maps, historical aerial photography, published literature and commercial reports was also conducted to inform on the heritage context of the area. This information is presented in the report (Sections 5.2.1 and 5.4.1). A final survey was then carried out after receipt of the development layout to check any areas that had not been adequately covered before.

Outcome

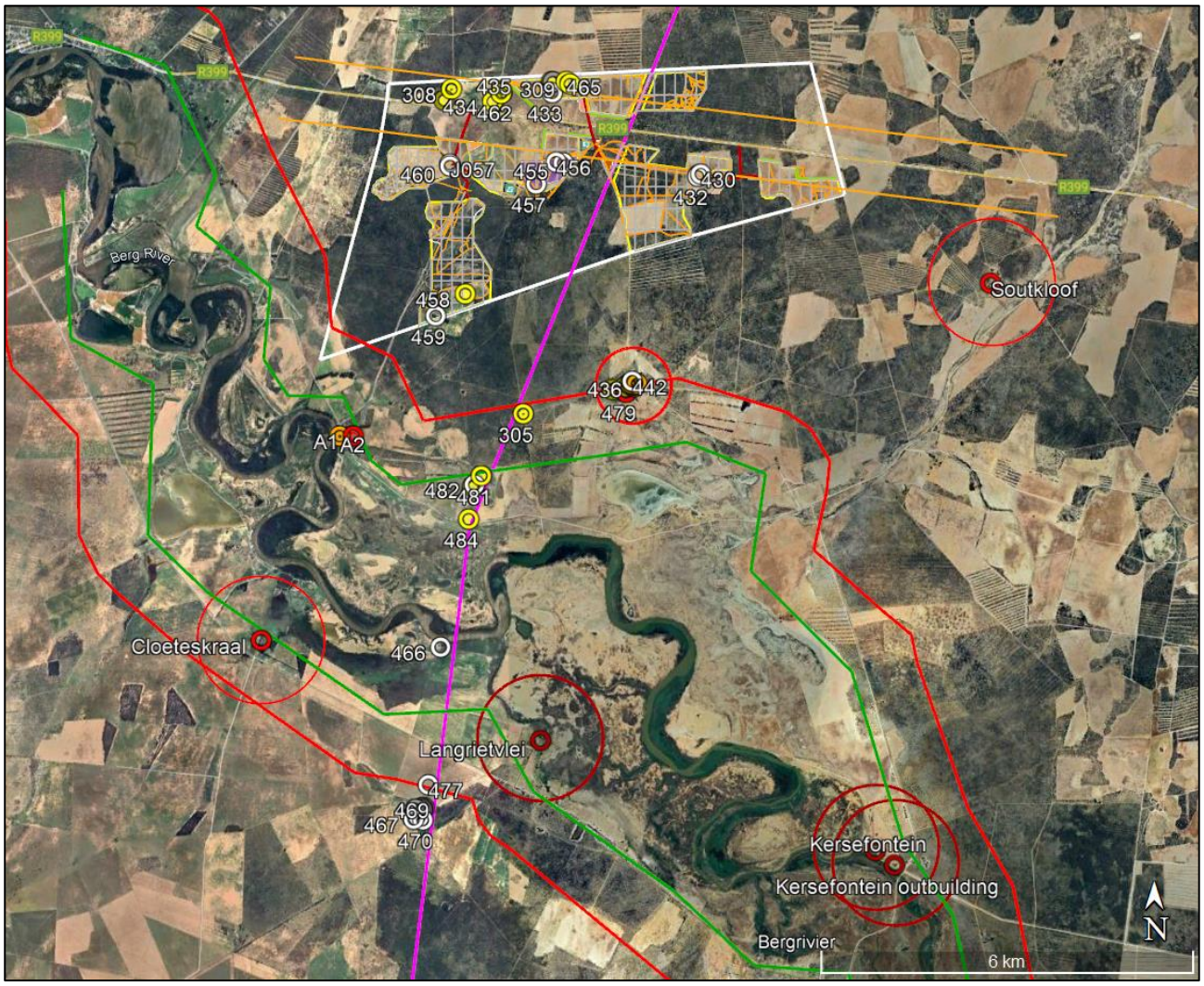
The first map below is extracted from the screening tool report and shows the archaeological and heritage sensitivity to be low throughout the study area and across much of the surrounding landscape. Specific heritage sites have been identified as of high sensitivity. The survey has shown that many more heritage sites occur in the landscape. The second map below shows the areas considered to be sensitive from a heritage point of view. Photographs of these sites are included in the impact assessment report. These include archaeological sites, structures, graves, the R399 scenic route and, importantly, the Berg River floodplain.

The heritage specialist therefore **disputes** the Screening Tool map.

Note: Sites of Grade IIIA (high cultural significance) and IIIB (medium cultural significance) should be regarded as of high sensitivity. IIIC sites (low cultural significance) can be seen as medium, while NCW (very low significance) are low sensitivity.



Screening tool map of the study area.



Heritage sensitivity map of the study area. Dark red circles = grade I & II, red circles = grade IIIA, orange circles = grade IIIB, yellow circles = grade IIIc, white circles = NCW. Archaeological sites have been allocated 50 m buffers, farmsteads 500 m, the R399 500 m, PHS 1 km and the Berg River 1 km. The green line encloses the wetland environments of the Berg River floodplain, the red lines are the 1 km buffer. The orange lines are 500 m buffers from the R399.

Palaeontological Assessment: Proposed 600 MW Solar PV Facility Including a Battery Energy Storage System (BESS) on farms Kruispad 120 and DoornfonteinA 118, Velddrif District

Prepared for
ASHA Consulting (Pty) Ltd

February 2024

Contents

Executive Summary

Dr Graham Avery (see Appendices 1, 2) was commissioned by Dr Jayson Orton, ASHA Consulting (Pty) Ltd, on behalf of their client Sunveld Energy (Pty) Ltd to provide a desktop assessment of the palaeontological potential of the proposed 600 MW Solar PV Facility Including a Battery Energy Storage System.

Proposed activity: Energy capture and storage plant.

Location: 1:50 000: 3218 CA CC VELDDRIF, 3218CD BERGRIVIER (rough central point: 32° 48.500'S; 18° 15.830'E).

The proposed 600 MW Solar PV Facility is located in a blue category (low palaeontological sensitivity) landscape (SAHRIS nd). However underlying deposits, the Langebaan and Springfontyn Formations, in particular, would be categorized as red (very high palaeontological sensitivity). The surface cover sands are mainly loose 'white' Holocene sand that does not normally include palaeontological material; this formation is, however, underlain by compact, greyish to pale orange Springfontyn Formation sand and Langebaan Formation aeolianites. In addition to common species like dune mole-rats and tortoises, rarer finds, like extinct antelope and remains of carnivores, elephants, rhinos and zebras, together with pollens and rare accumulations of multiple species accumulated by hyaenas and porcupines, provide insights into past biodiversity, records of species distributions and the habitats they lived in; e ach, if encountered, is of very high importance.

Excavations into sediments not normally accessible to palaeontologists should be seen as providing opportunities to recover important fossil material that would enable observations to be made about our past biodiversity and natural and cultural environments.

Palaeontological remains are rare, protected by the South African National Heritage Resources Act of 1999 and, if encountered, must be recorded by an appropriately qualified specialist. Approval from Heritage Western Cape would be required to deal with any palaeontological occurrence encountered. A Work Plan should be applied for from Heritage Western Cape and a protocol for managing palaeontological eventualities during the construction period should be in place before any construction excavation takes place. This must include monitoring of excavations, at least initially, by an appointed specialist who will determine the nature and timing of further monitoring.

Provided that the recommendations in this report are followed, there is no palaeontological reason why establishment of the proposed 600 MW Velddrif PV facility should not proceed, if appropriately managed/monitored.

Palaeontological Assessment: Proposed 600 MW Solar PV Facility Including a Battery Energy Storage System (BESS) facility on farms Kruispad 120 and DoornfonteinA 118, Velddrif District (Rough Centre Point S32° 48.500'; E18° 15.830')

Introduction

Dr Graham Avery (see Appendices 1, 2) was commissioned by Jayson Orton, ASHA Consultants (Pty) Ltd, on behalf of their client Sunveld Energy (Pty) Ltd to provide a desktop assessment on the palaeontological potential of the proposed 600 MW Solar PV Facility Including a Battery Energy Storage System facility on farms Kruispad 120 and DoornfonteinA 118, Velddrif District (Figures 1, 2).

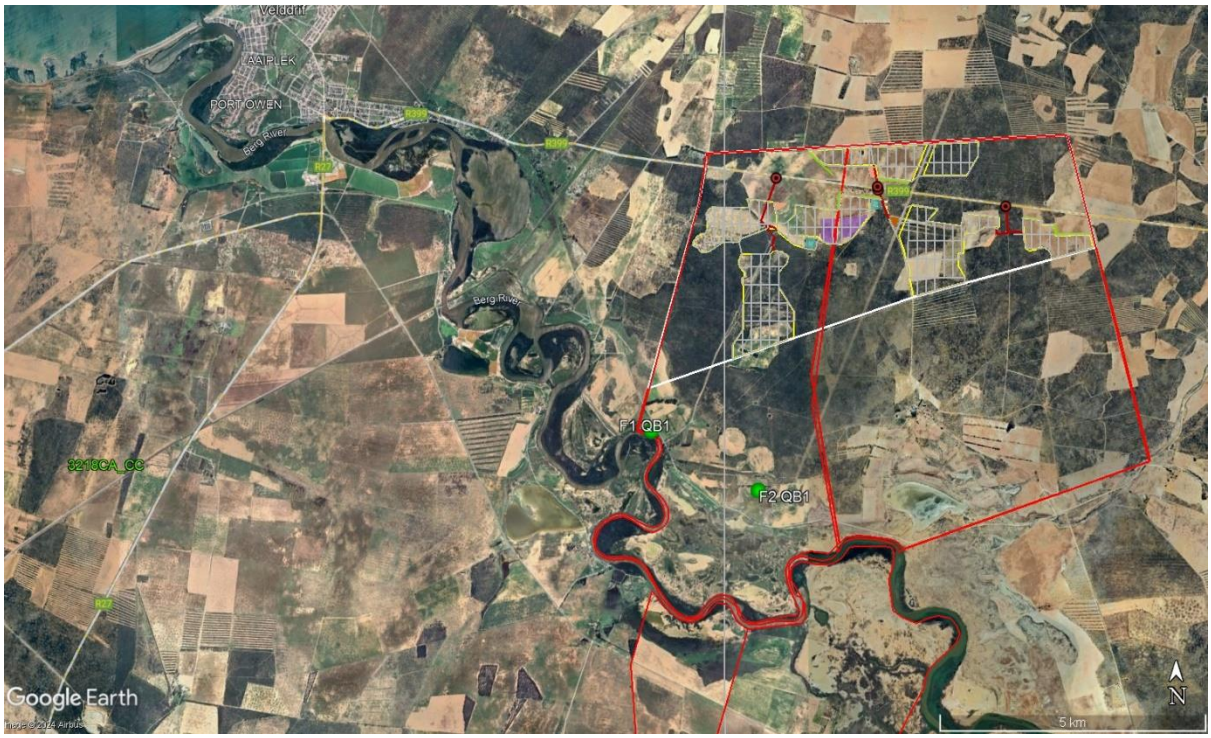


Figure 1. Google Earth view of 600MW facility (hatched areas).

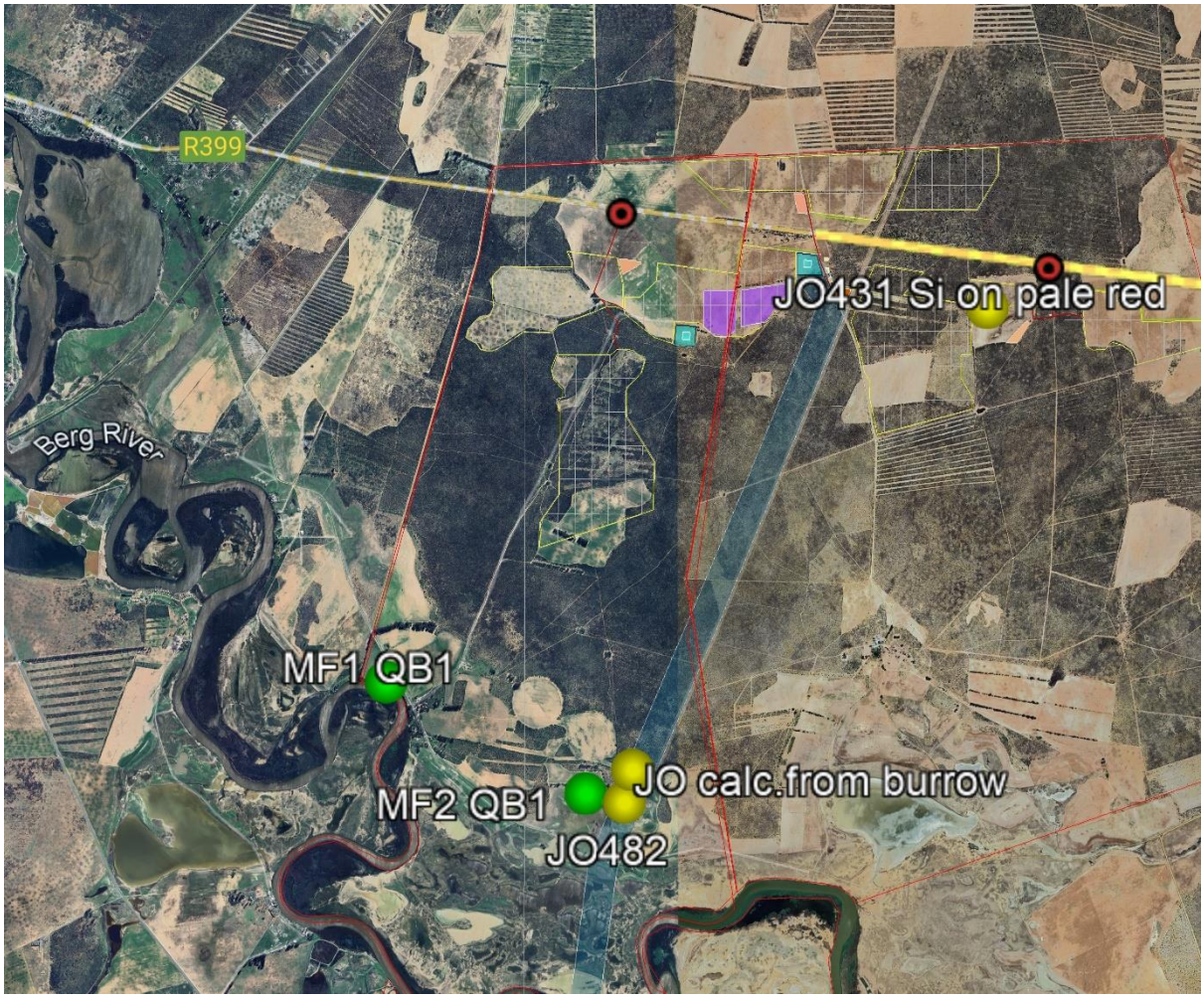


Figure 2. Google Earth view of the location of the proposed 600 MW Solar PV facility (hatched areas). JO locations were recorded by Jayson Orton during his archaeological survey (see below); MF locations were taken from (Visser and Schoch 1972). See Table 1 for site details. None fall on PV footprint.

Declaration

I have no financial or interest other than palaeontological or archaeological in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

Method

A background palaeontological impact desktop study of the proposed area was undertaken by Dr G. Avery, archaeozoologist. The 1: 125 000 geological series map was consulted for the regional surface geology and the then-known fossil occurrences it records (Visser and Schoch 1972). The 1:250 000 geological series map 3218 Clanwilliam was consulted for updated information on the surface geology of the area (Anon 1973) (Figure 3). Protocols in reports by (Pether 2012; Avery 2016, 2022), and the Heritage Western Cape Chance finds Procedure (2016), which will form the basis for a tailor-made protocol during the construction period; and other scientific publications were consulted (Roberts et al. 2011; Hendey 1978; Conard 2002). The project area was not visited, since the surface was to be covered by an archaeological survey and the areas of primary palaeontological concern, and

Pleistocene archaeology, are normally, but not invariably, sub-surface. Palaeo locations recorded by Jayson Orton during his surface archaeology survey are shown

Results of the Study

Geology and lithology

Figure 3 shows the general surface lithology of the area (Anon 1973). The location of the proposed solar energy facility is indicated. The sediments at the locality are shown as predominantly loose 'white' Holocene Witzand Formation (Cw, Cw/Cs) sand that is underlain by harder, light-grey to pale-orange, Springfontyn Formation (Cs) sand. Ridges of Langebaan Formation (Ll) aeolianite and calcrete outcrop. The Springfontyn and Langebaan formation sediments are known to include sparse fossils and Stone Age remains (Roberts, Bateman, et al. 2009; Roberts, Botha, et a(Roberts, Bateman, et al. 2009; Roberts, Botha, et al. 2009; Roberts, Cawthra, and Musekiwa 2013). Such finds can only be exposed by erosion or digging and, although likely to be sparse, would be categorized as very important.

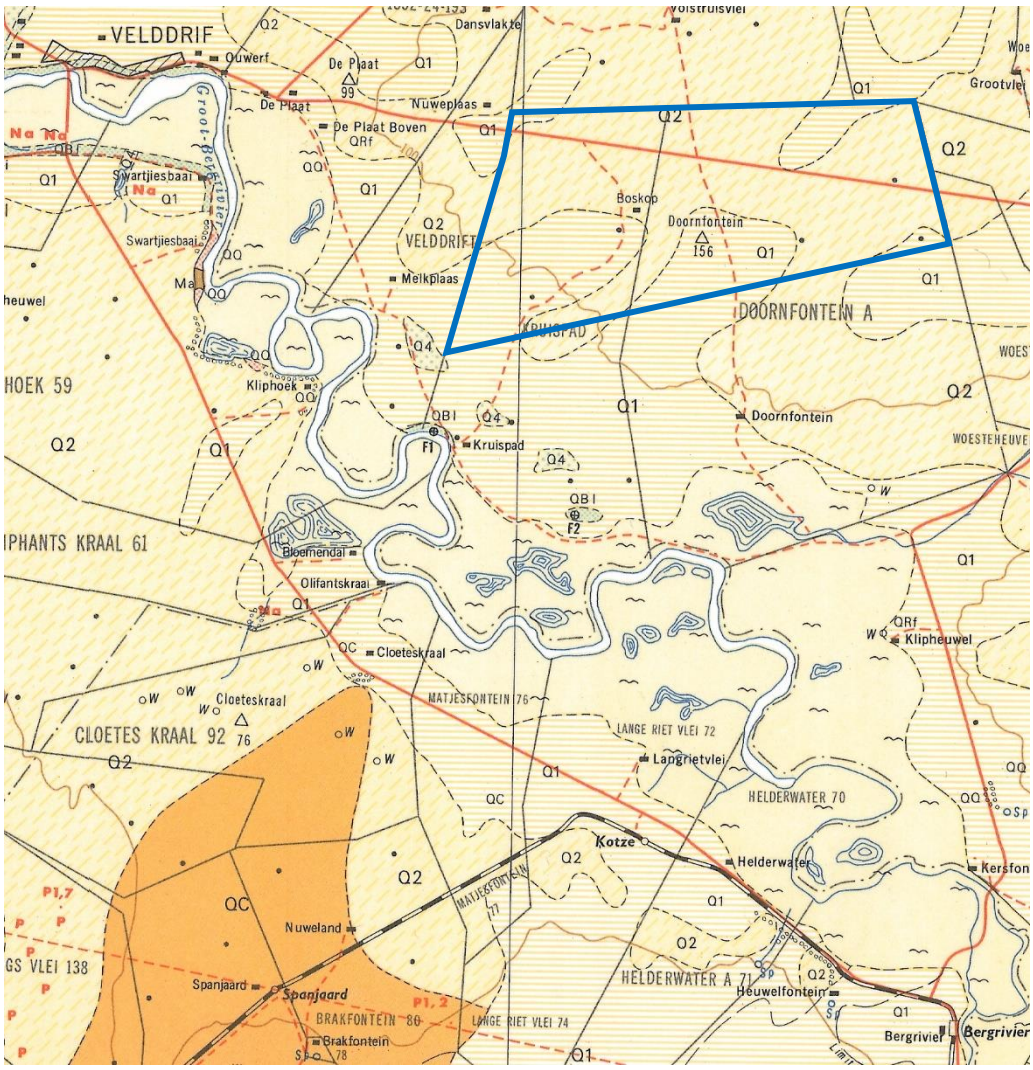


Figure 3. Surface geology in the study area (Visser and Schoch 1972). The position of the PV facility is indicated. The study area is covered by Q1 sediments (Langebaan Fm. white to light reddish soil) and Q2 sediments (Springfontyn Fm. pale grey and red soil and sandy loam of hillocky veld (heuweltjiesveld)) and QB1 (Velddrif Fm. marine shell

deposits). Other sediment types in the region include superficial patches of Q5 Holocene Witzand Fm. QW, Q4 (Brackish calcareous soil) and QC consolidated and unconsolidated limestone and lime-rich sand. Qrf (ferricrete) and QQ silcrete deposits also occur). The area is covered by a veneer of unconsolidated white Holocene sands, including dunes, which overlie light-grey to pale-orange Pleistocene sandy soil and white to buff aeolianite and calcrete, which can include fossils (See Figure 4) Figure 5 shows the Sandveld Formations that are likely to underlie the study area.

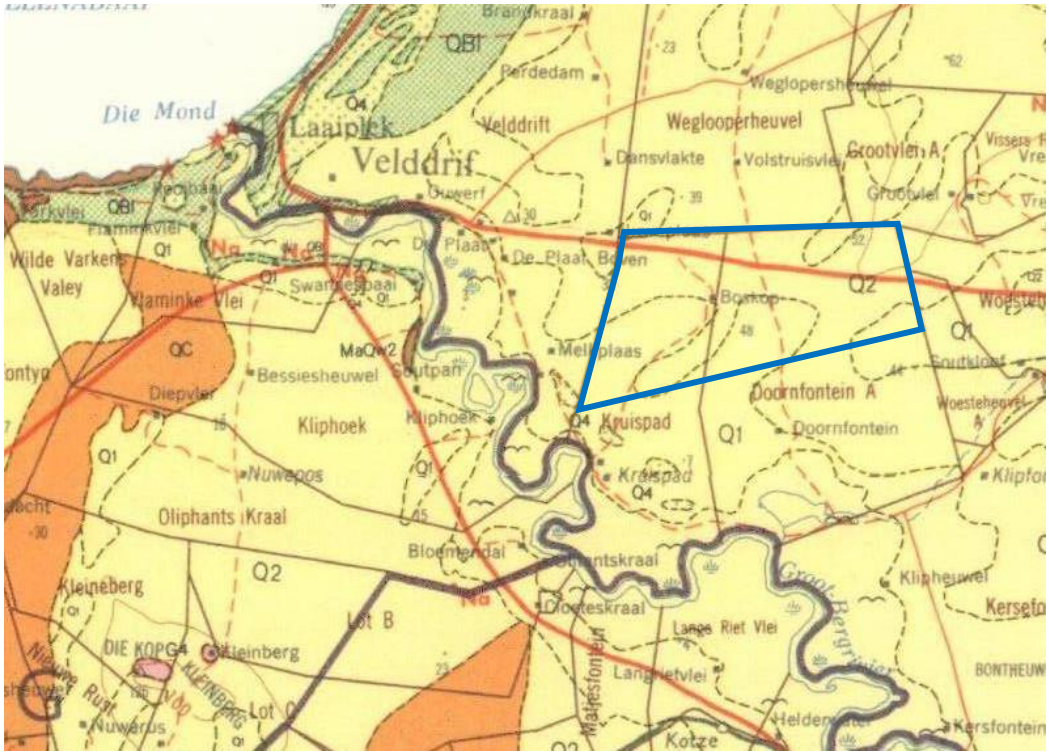
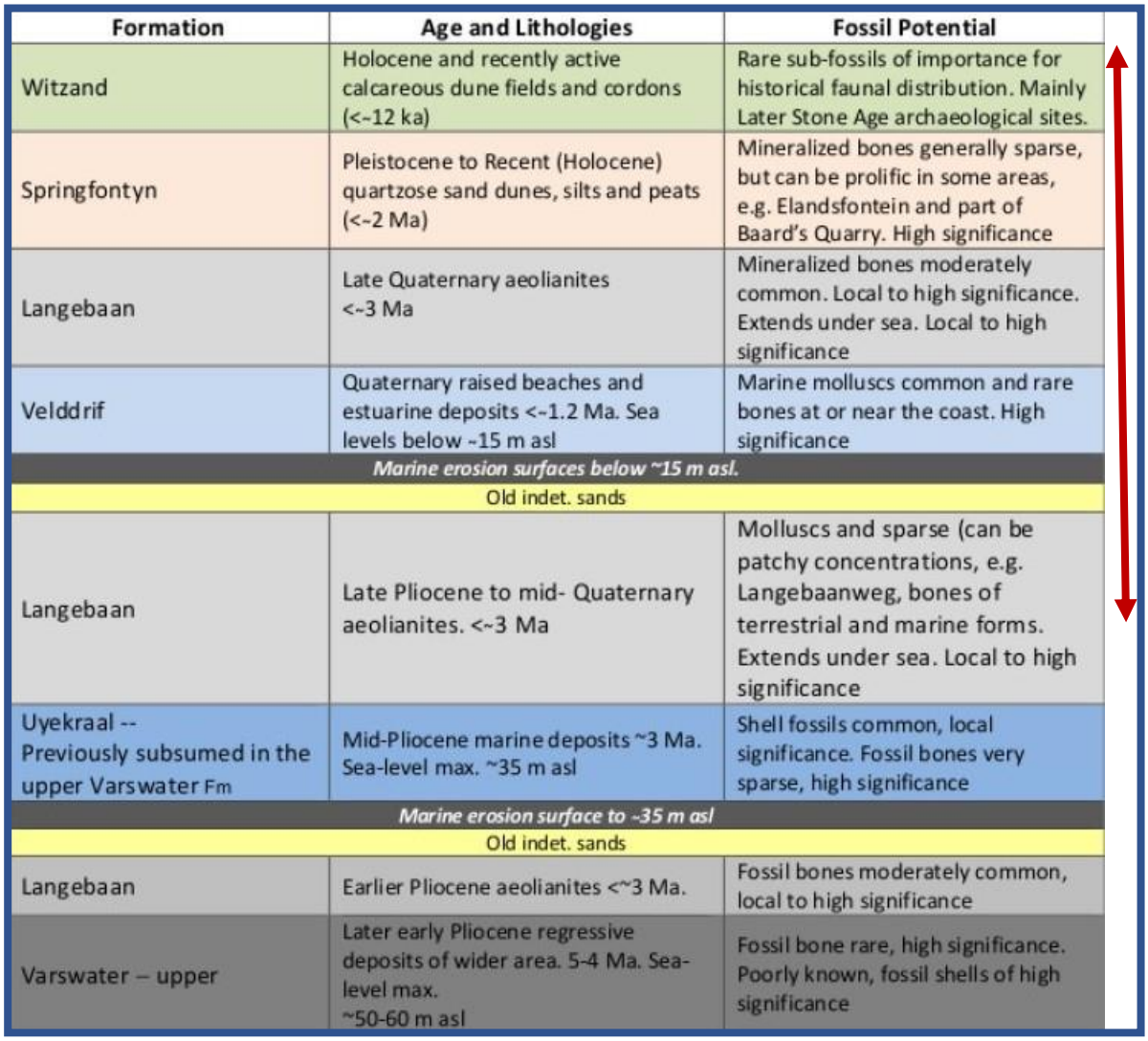


Figure 4. Location of the PV facility on 1: 250 000 geological series map (Anon 1973). Details as for Figure 3.



Formation	Age and Lithologies	Fossil Potential
Witzand	Holocene and recently active calcareous dune fields and cordons (<~12 ka)	Rare sub-fossils of importance for historical faunal distribution. Mainly Later Stone Age archaeological sites.
Springfontyn	Pleistocene to Recent (Holocene) quartzose sand dunes, silts and peats (<~2 Ma)	Mineralized bones generally sparse, but can be prolific in some areas, e.g. Elandsfontein and part of Baard's Quarry. High significance
Langebaan	Late Quaternary aeolianites <~3 Ma	Mineralized bones moderately common. Local to high significance. Extends under sea. Local to high significance
Velddrif	Quaternary raised beaches and estuarine deposits <~1.2 Ma. Sea levels below ~15 m asl	Marine molluscs common and rare bones at or near the coast. High significance
Marine erosion surfaces below ~15 m asl.		
Old indet. sands		
Langebaan	Late Pliocene to mid- Quaternary aeolianites. <~3 Ma	Molluscs and sparse (can be patchy concentrations, e.g. Langebaanweg, bones of terrestrial and marine forms. Extends under sea. Local to high significance
Uyekraal -- Previously subsumed in the upper Varswater Fm	Mid-Pliocene marine deposits ~3 Ma. Sea-level max. ~35 m asl	Shell fossils common, local significance. Fossil bones very sparse, high significance
Marine erosion surface to ~35 m asl		
Old indet. sands		
Langebaan	Earlier Pliocene aeolianites <~3 Ma.	Fossil bones moderately common, local to high significance
Varswater – upper	Later early Pliocene regressive deposits of wider area. 5-4 Ma. Sea-level max. ~50-60 m asl	Fossil bone rare, high significance. Poorly known, fossil shells of high significance

Figure 5. Summary of Sandveld Formations likely to occur in the PV facility area. Modified from (Pether 2013; Pether, Roberts, and Ward 2000; Pether 2014; Roberts, Bateman, et al. 2009; Roberts, Botha, et al. 2009) and G Avery (pers. observation). Ma = Million years ago; ka = thousand years ago. Note: The base of the Holocene has been formalized at 11.8 ka; and chronology for the base of the Lower Pleistocene Boundary has been formally re-defined to an earlier date of 2.58 Ma (Gibbard et al. 2010) – deposits of the latter age and older are assumed to be beyond the reach of the proposed construction; The period of likely interest regarding the PV facility is arrowed.

Palaeontological Potential

The 600 MW Solar PV Facility area is categorized blue (of low palaeontological sensitivity). It is bounded by red (very high palaeontological sensitivity) and green (of moderate palaeontological importance) areas and there are tiny patches of white (unknown and therefore of very high palaeontological sensitivity for precautionary reasons) (see Figures5 and 6).

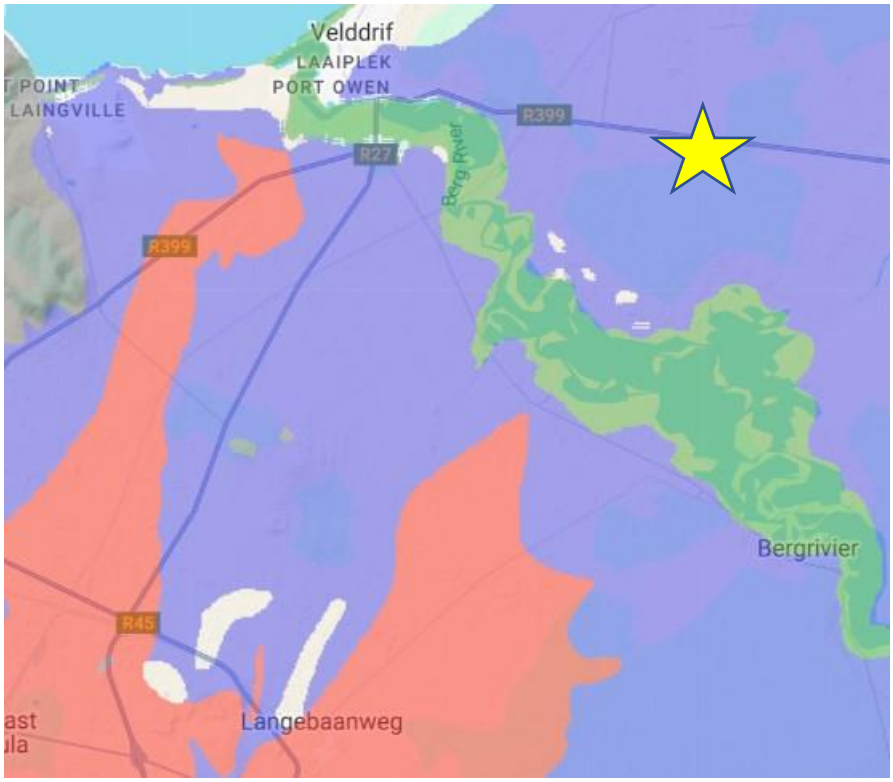


Figure 6. The 600 MW Solar PV Facility area (starred) falls within a blue Low palaeontologically sensitive area, although a portion of the listed farms fall within a green, moderately palaeontologically sensitive area (SAHRIS nd)). The small white areas (classified as very sensitive) appear to be marine shell deposits of unknown composition and age (Visser and Schoch 1972). Middle and Late Pleistocene Springfontyn and Langebaan Formation deposits underlie the Holocene cover sands. Springfontyn deposits are known to include very important palaeontological remains exposed by deflation, especially in the dune plumes that extend inland from the coast (Roberts, Bateman, et al. 2009), notably the Duynefontein (Cruz-Uribe et al. 2003) and the Geelbek plumes (Braun et al. 2013; Klein et al. 2007; Klein and Cruz-Uribe 1991; Klein 1978). The red areas to the south and south west indicate very high palaeontologically sensitive areas that here coincide with Langebaan and Springfontyn deposits. None are mapped within the project area. Nevertheless, it appears that Springfontyn and Langebaan Formation aeolianites exposed on eroded surface exposures noted by Orton and others exist under the cover sands. All are rare and of high palaeontological importance.

The Holocene (a.k.a. Witzand Fm.), dating from 11.8 ka to the present, aeolian cover sands, do not normally include palaeontological material, but they are underlain by elements of the Springfontyn and Langebaan Formations (Figure 5). Dates presented in Figure 5 (estimates for periods covered) indicate sediments ranging from the Middle to Late Pleistocene, which are known to include sparse fossiliferous sediments, palaeo land surfaces, with bones and ichnofossils (trace fossils, such as termite nests, burrows and tracks, and stone artefacts and peats). Notably, they can also include intrusive bone accumulations introduced later in crevices or old burrows in the Langebaan Formation calcretes when used by brown hyaenas as dens (Roberts, Bateman, et al. 2009; Klein 1975).

Thus, sparsely distributed occurrences of palaeontological material can be expected within each of the Pleistocene deposits, which would only be exposed during construction excavations, monitoring by an appropriately-qualified specialist will be required at that time.

Cover sands

Holocene <11.8 ka (ka = thousand years ago).

Palaeontological material is not normally found in these loose sediments. Erosion sometimes exposes underlying deposits of greater age, which can include Middle to Late Pleistocene fossils and Middle and Early Stone Age artefacts.
Nevertheless, sub-fossil bones and other remains in the cover sands may contribute to knowledge of the recent historical distribution records of species, including people, present during this period. Later Stone Age burials may be encountered. If so, established heritage protocols must be complied with.

Springfontyn Formation

Middle and Late Pleistocene ~700 ka to 11.8 ka.

Palaeontological material occurs within the Springfontyn Formation compact sand and intercalated calcrete, which is underlain by earlier Langebaan Formation hard and soft calcretes that formed at different times (Figure 5). Any such sites should be categorized as being of very high palaeontological sensitivity, but, being sub-surface, may not necessarily be reflected on the SAHRIS map (SAHRIS nd). While the calcretes, *per se*, have high palaeontological potential, occurrences are mostly very small in number and bone frequency. Rare large accumulations, such as brown hyaena den accumulations, which were intrusive into fissures or tunnels in the much older Langebaan Formation calcretes provide a remarkable insight into the local biosphere(s) in the past.

Further afield, Springfontyn Formation deposits with Late Acheulian (ESA) artefacts and fossil bones, dated to 330 ka and underlying a Langebaan Formation calcrete dated to 160 ka, occur around palaeo wetlands at Duinefontein (Koeberg Nature Reserve) (Cruz-Uribe et al. 2003; Klein et al. 1999; Sampson 2003) Springfontyn Formation sediments at Elandsfontein, near Hopefield, have yielded species-rich Middle Pleistocene bone accumulations, Late Acheulian (ESA) artifacts and an ancient hominid in a wetland context dated to between 700 ka and 400 ka.

Table 1. Summary of known fossil localities. See Figure 2. None fall on the footprint, but they indicate regional sediments in support of possible finds during construction.

Reporter	Designation	Details	Formation	Comment	SAHRIS	Estimated Age
(Visser and Schoch 1972)	FB	Undifferentiated Fossil Bones in deflated areas	Springfontyn	Terrestrial	Red	Mid-Pleistocene
Orton	JO	Undifferentiated Fossil Bones in deflated areas	Springfontyn	Terrestrial	Red	Mid-Pleistocene
Orton	JO	Undifferented fossil bone Undifferentiated Fossil Bones in deflated areas	Springfontyn	Terrestrial	Red	Mid-Pleistocene
Orton	JO	Subsurface pale red sediment exposures	Springfontyn	Terrestrial	Red	Mid-Pleistocene
Orton	JO	Subsurface pale red sediment exposure -- stone artefact	Springfontyn	Terrestrial	Red	Mid-Pleistocene
Orton	JO	Subsurface white calcareous sediment exposures	Langebaan & Velddrif	Terrestrial	White	Pleistocene
(Orton 2007)	JO various	Undifferented fossil bones & stone artefacts	Springfontyn, just north of Elandsfontein fossil site	Terrestrial	Red	Mid-Pleistocene
(Visser and Schoch 1972)	MF	Shells	Velddrif	Marine, unknown age	White	Pleistocene
(Visser and Schoch 1972)	MF	Shells	Velddrif	Unknown	White	Pleistocene
(Roberts et al. 2011)	LBW WC Fossil Park	Deep; Diverse terrestrial and marine fauna	Langebaan overlying Varswater	Likely too deep to be reached	Red	Pleistocene over Early Pliocene
(Hendey 1978)	Baards	Diverse, mainly terrestrial Fauna	Probable Springfontyn (or earlier)	Channel; likely too deep to be reached	Red	Pleistocene over Early Pliocene

			overlying Varswater			
(Conard 2002)	Anyskop	Early & Middle Stone Age	Springfontein Overlying Langebaan Fm.	Terrestrial	Red	Mid-Pleistocene

Langebaan Formation

Middle and Late Pleistocene; >700 000 to 11.8 ka.

Palaeosols, land surfaces. Calcrete fissures or tunnels in the Langebaan Formation may include intrusive (younger) Springfontyn Formation fossil hyaena den accumulations.

For the most part, however, fossils are rare in the Langebaan Formation and most occurrences are most likely to be sparsely distributed and numerically small. All would be of very high palaeontological significance, however, if encountered, due to their scarcity (Almond and Pether 2008).

Intrusions of Springfontyn fossil material into Langebaan Formation deposits

Small pockets of bone can occur, for instance, where bone accumulators like hyaenas, Jackals or porcupines used pre-existing fissures/burrows of other animals. Their potential would be to provide records of past animal distributions and contexts in the area.

Fluvial deposits

The PV facility does not appear to extend into an area where fluvial or wetland deposits may occur. Footings for the proposed powerline, may do so, however, as the line will cross the Berg River.

Marine deposits

Shell deposits that occur above modern sea level were deposited during past periods of higher sea level. Such deposits exist in the area, but known occurrences do not appear to affect the PV facility area.

Essentially, therefore, the palaeontological potential of the proposed PV project is moderate to very high, and can be realized provided that construction excavations are appropriately managed through monitoring by a suitably-qualified person.

The following figures were recorded by JO during his archaeological survey. None fall within the PV footprint.

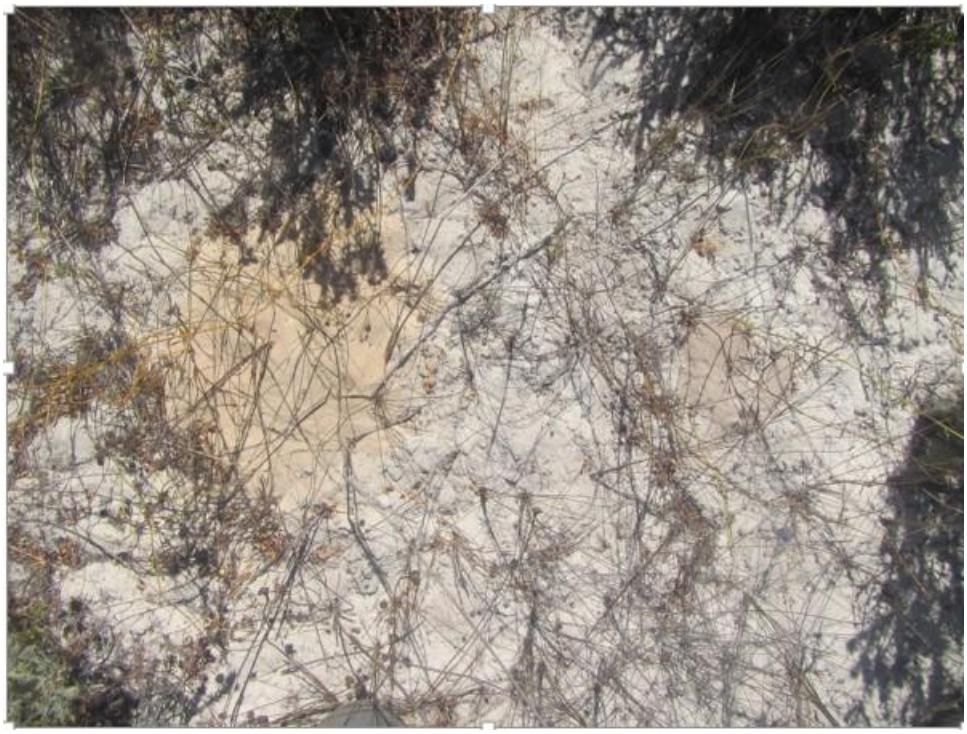


Figure 7. JO Pale red sand exposure Langebaan or Springfontyn Formations.

Figure 8. JO white Langebaan Fm. sediment exposed by burrowing mammal.

Figure 9. JO 431. White Langebaan Fm. encrustation on silcrete flake *in situ* on pale red and light grey sediment, likely to be Springfontyn Fm.

Figure 10. JO 482. Deflated area with fossil shells: probably Velddrif Fm.

Figure 11. JO 482. Large fossil shell: large bivalve probably Velddrif Fm.

Figure 12. JO482. Fossil shell fragments (2 bivalve species).

Figure 13. JO 482; Ichnofossil: possible termite nest capsule with some white encrustation suggesting Langebaan or Velddrif Fm., but possibly a quite recent intrusion.

Figure 14. JO482: Ichnofossil: possible termite nest capsule with some white encrustation suggesting Langebaan or Velddrif Fm., but possibly a quite recent intrusion.

Conclusions

1. The proposed 600MW PV facility appears to fall within the northern extension of the Geelbek dune plume, deposits of which have yielded very important Middle Pleistocene fossil occurrences. It is also clear that erosion of cover sands continues to expose a sparse continuity of bones and the presence of the underlying pale red Springfontyn Formation-type deposits in which they occur. This indicates the potential that excavations into the Springfontyn deposits may yield fossils.
2. Langebaan Formation sediments are also present and, while fossils in them are sparse, their very high palaeontological sensitivity, if encountered, must be considered.
3. Palaeontological remains in the Langebaan and Springfontyn Formations are often sparsely distributed and rare but, if encountered, provide very important additions to the paucity of information currently recorded for the periods represented.
4. Since it is shown above that there is a clear probability that important palaeontological material could be encountered in the deposits underlying the PV site, a tailored protocol for recovering any palaeontological material encountered must be developed by an appropriately-qualified palaeontological specialist, who will monitor construction excavations. The frequency of visits would be worked out with the contractor to minimize time spent on site. Training of construction workers would help to facilitate this.
5. Structural excavations will be around 0.5 m in depth and are not expected to exceed 2.0 m (D. Holder, personal communication). The many excavations for the footings of the PV structures will be very small and make minor disturbance at a very shallow depth.

6. Construction of the Velddrif PV facility can be managed so that it will not impact significantly on palaeontological remains; in the event of fossils being encountered, a management plan will be in place to recover material, which would be deposited in a recognized repository.

Table 1. Impact Assessment.

Project phase	**Construction**			
Impact	**Destruction of palaeontological resources**			
Description of impact	**Destruction of and damage to palaeontological materials during earthmoving activities**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**- Monitoring of construction excavations, and** **- Removal of any fossil materials discovered during construction.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Local	Extending across the site	Very limited	Limited to specific isolated parts of the site
Intensity	Extremely high	Natural and/ or social functions and/ or processes are severely altered	Very low	Natural and/ or social functions and/ or processes may slightly altered
Probability	Likely	The impact may occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	High	The resource is irreparably damaged and is not represented elsewhere
Significance	**Moderate - negative**		**Negligible - negative**	
Comment on significance	Fossils are known from the region but they can be very patchily distributed underground. Impacts are nonetheless probable. Individual fossils can have high cultural significance for their scientific value and the overall impact significance of moderate negative seems appropriate. Rescue of fossils will dramatically reduce the impact and negligible negative is again appropriate.			
Cumulative impacts	Cumulative impacts are expected to be of low significance.			

Provided that the recommendations herein are adhered to the proposed 600 MW Velddrif Photovoltaic Facility can be allowed to proceed from a palaeontological perspective, provided that an appropriate monitoring and management system is in place.

Recommendations

1. In terms of The South African National Heritage Resources Act 25 of 1999, amendments and regulations (www.sahra.org.za), all palaeontological remains are protected and may only be disturbed or removed by an appropriately-qualified person in possession of a relevant approved Workplan.
2. Monitoring of construction excavations must take place. A protocol to ensure recovery of any fossils, and possible further mitigation must be developed and included in the project Environmental Management Plan (EMP).
3. Application to Heritage Western Cape for a Workplan, before construction is initiated, is advisable, since this would enable removal of any palaeo-material to be made with minimal delay.
4. Any fossil material encountered during the course of construction must be retained and will be deposited in the Quaternary collection of Iziko South African Museum.
5. Palaeontological awareness training is a useful way to stimulate worker interest and facilitate their recognition and reporting of fossil material if encountered. This could be on site or in the form of an illustrated online (Zoom or other digital format) lecture showing examples of what the fossils might look like and explaining why they are important elements of our heritage.
6. Funds must be available to cover the costs of monitoring and any fieldwork arising from this.

Palaeontological Points for the EMP

Should anything of a palaeontological nature be encountered on site the Conservation/Supervising Officer must be notified. Established protocols would 'kick in' and this must be carefully explained to workers during the Environmental Education Programme. The author of this report can assist with training in the basic recognition and value of palaeontological material.

Heritage Permits Required

All fossils are protected by law. The primary heritage legislation that needs to be considered is The National Heritage Resources Act 25 of 1999, amendments and regulations (www.sahra.org.za). All heritage material, including human remains, is included.

Clearance in terms of the National Heritage Resources Act of 1999 will be required before the project can proceed.

A Work Plan approval for the disturbance and removal of any palaeontological material encountered will be required from Heritage Western Cape (HWC); potential delays could be minimized by submitting an application for a Work Plan before construction is initiated.

Dr Graham Avery MRSSAf
15 February 2024
Curator in Natural History Collections Department (retired)
Archaeozoologist
Emeritus Research Associate: Iziko Museums, Research and Exhibitions Department

Professional Member Association of Southern African Professional Archaeologists #008 – Principle Investigator: archaeozoology, coastal, shell middens, Stone Age.
Member: Palaeontological Society of South Africa.
25 San Bernardo, 18 De Lorentz Street, Gardens, Cape Town 8001.

Appendix 1 (Qualifications and Accreditation)

- MA (UCT, 1976) and PhD (UCT, 1990), each in archaeology/archaeozoology and have worked extensively in the Quaternary palaeontological field, focusing on the south-western coast of South Africa, in both research and commercial contexts. I have conducted research on a variety of Early, Middle and Later Stone Age and palaeontological sites and published the findings.
- I am accredited with the Association of Southern African Professional Archaeologists (ASAPA) Cultural Resource Management (CRM) section (Member #008, 1998) as Principal Investigator: Stone Age, Shell Middens, Middle Pleistocene studies and archaeozoology and a member of the Palaeontological Society of South Africa.

Appendix 2 Abbreviated Curriculum Vitae: Graham Avery

Contact Details

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Cape Town 8001

Business Details

Graham Avery (Sole Proprietor): Archaeozoology, Stone Age Archaeology and Quaternary Palaeontology.
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Cell: +27 83 441 0028
Email: drgavery97@gmail.com

Professional Qualifications

PhD (archaeology) 1990. Archaeological and palaeoenvironmental interpretation of avian remains from archaeological sites. University of Cape Town.
MA (archaeology) 1976. Systematic Investigation of Coastal Shell Middens in the South Western Cape. University of Cape Town.
BA (Archaeology, Social Anthropology, African History, History and Geography) 1969 University of Cape Town.

Current Positions

- Emeritus Research Associate, Research and Exhibitions Department, Cenozoic Palaeontology, Iziko South African Museum (July 2020–).

Positions Held

- Research Associate, Cenozoic Palaeontology, Iziko South African Museum (July 2012–2020).
- Retired 31 January 2012.
- Archaeozoologist, Curator of Quaternary Collections, Cenozoic Studies Section, Natural History Department, Iziko South African Museum (2002–January 2012). [Transferred to Natural History Collections Department when Iziko came into being].
- Head of Human Sciences Division, South African Museum (1993–2002).
- Head of Archaeology Department, South African Museum (1990–1993).
- Acting Head of Archaeology Department, South African Museum (1985–1990).
- Researcher, Archaeology Department, South African Museum (1980–2002).
- Manager: Archaeological Data Recording Centre, South African Museum (1974–1979).
- Environmental Archaeologist, South African Museum (1970–1973).
- Manager (temporary): Archaeological Data Recording Centre, South African Museum (1969).

Research Publications (they are not included here)

Cultural Resource Management Reports (CRM)

Avery, G. 2023. Report: Removal of Human Remains encountered on (Erf 5571) 32°42.39'S; 17°58.30'E (1: 50 000 3217 DD & DB Vredenburg). Case #: Case Number: 23052605SB0526 Issued in terms of Section 36(3) of the National Heritage Resources Act, 1999 (Act 25 of 1999) and Regulation 3(3) (a) of PN 298 (29 August 2003). For Heritage Western Cape and owner. 22 pp. Unpublished.

Avery, G. 2023. Report: Cleansing Ceremony and Removal of Human Remains encountered on the Port Captains Office Precinct, Small Crafts Harbour, Saldanha Bay on Erf 8209 (ptn of Erf 3460) 33° 1.715'S; 17° 57.706'E (1: 50 000 3318AA and 3317BB Saldanha Bay). Case #: Case Number: HWC230050404SB0616 Issued in terms of Section 36(3) of the National Heritage Resources Act, 1999 (Act 25 of 1999) and Regulation 3(3)(a) of PN 298 (29 August 2003). Prepared for Transnet SOC (per Tabo Langa). 19 pp. Unpublished.

Avery, G. 2022. Palaeontological Monitoring Report #2 (human remains # 2): Development of Erf 1897, Blue Downs, The Conifers (1:50 000 3318DC Bellville). Prepared for Doug Jeffery Environmental Consultants.14 pp. Unpublished.

Avery, G. 2022. Palaeontological Monitoring Report #1: Development of Erf 1897, Blue Downs (1:50 000 3318DC Bellville). Prepared for Doug Jeffery Environmental Consultants. 11 pp. Unpublished.
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