

**HERITAGE IMPACT ASSESSMENT: PROPOSED EXPANSION OF THE
SAND MINE ON PORTION 4 OF THE FARM ZANDBERGFONTEIN,
ROBERTSON, WESTERN CAPE**

(Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of an Environmental Impact Assessment)

Prepared for

Greenmined Environmental

On behalf of

Zandberg Sandput (Pty) Ltd

April 2020

Version 1.1



ACO Associates cc
Archaeology and Heritage Specialists

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CONTENTS OF THE SPECIALIST REPORT – CHECKLIST

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a <i>curriculum vitae</i> ;	Preface pages and Appendix D
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 4
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 3: Terms of Reference
(cA) an indication of the quality and age of base data used for the specialist report;	Section 5: Methodology
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 11: Impacts and Risks
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5.3: Archaeological Field Assessment
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5: Methodology
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Sections 7-10: Heritage Assessments
(g) an identification of any areas to be avoided, including buffers;	Section 11: Impacts and Risks
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 8
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5.4: Restrictions and Assumptions
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment, or activities;	Sections 7, 8 and 11

(k) any mitigation measures for inclusion in the EMPr;	Section 11: Impacts and Risks
(l) any conditions for inclusion in the environmental authorisation;	Section 11: Impacts and Risks
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	Section 12: Conclusion
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(p) any other information requested by the competent authority	N/A
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

DETAILS OF THE SPECIALIST

This study has been undertaken by John Gribble BA Hons, MA (ASAPA) and Gail Euston-Brown BA of ACO Associates CC, archaeologists and heritage consultants.

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CONSULTANT DECLARATION OF INDEPENDENCE

I, John Gribble, declare that – general declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:



Name of company (if applicable): ACO Associates CC

Date: 17 April 2020

EXECUTIVE SUMMARY

ACO Associates CC was appointed by Greenmined Environmental, on behalf of Zandberg Sandput (Pty) Ltd, to carry out a heritage impact assessment for the expansion of a sand mine on Portion 4 of the farm Zandbergfontein (Farm 97) outside Robertson in the Western Cape.

The assessment comprised a walkover survey of the mine expansion area by ACO Associates on 25 March 2020, desktop archaeological and palaeontological impact assessments, and the production of this integrated heritage impact assessment which addresses the impacts of the proposed sand mining on heritage resources. The area surveyed and assessed for this report is undeveloped agricultural land.

Findings: The palaeontological impact assessment indicates that the bedrock of the mine expansion area is Wupperthal Formation sandstone and siltstone which have some potential for containing marine fossils. This is overlain across the bulk of the mine expansion area by a thick mantle of Quaternary aeolian dune sand, which is the target resource of the mine. The PIA suggests that while fossils are possible in the Wupperthal Formation, their survival and presence in the Quaternary sand itself is not likely.

Although the Wupperthal Formation is considered to be of high palaeontological sensitivity, there is a very low likelihood that bedrock and the fossils it may contain will be impacted by the expansion of the sand mine. The potential impact of the proposed expansion of the Zandberg sand mine on palaeontological material is thus assessed to be low.

Given the wide geographical distribution of the Wupperthal Formation, the cumulative impacts of projects such as this one on palaeontological resources are assessed to be low.

The PIA recommends the inclusion of a Fossil Chance Find Protocol in the EMPr to ensure that in the unlikely event of fossils being encountered during mining, they will be rescued, palaeontologically assessed and a sample collected and retained.

No archaeological sites and materials, historical buildings or structures, graves and cemeteries or any other category of heritage resource were identified in the mine expansion area by this assessment, and no impacts are expected.

Should any human remains be encountered at any stage during the construction or earthworks associated with the project, mining in the vicinity must cease immediately, the remains must be left *in situ* but made secure, and the project archaeologist and HWC must be notified immediately.

Conclusion: This assessment has found that the area identified for expansion of the Zandberg sand mine is not a sensitive heritage environment and that with the possible exception of palaeontological material, impacts on heritage resources arising from expanded mining operations are unlikely.

It is our considered opinion that provided the mitigation measures set out above are implemented, the overall impact of the proposed expansion of the Zandberg sand mine will be of low heritage significance and the proposed activity is acceptable.

GLOSSARY

Aeolian: Relating to or arising from the action of the wind.

Apedal: A sediment in which none of the material occurs in the form of peds, or individual, natural soil aggregates. Such a sediment is without apparent structure.

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

Cultural landscape: The combined works of people and natural processes as manifested in the form of a landscape

Early Stone Age: The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

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

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

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

Hominins: The group consisting of modern humans, extinct human species and all our immediate ancestors (including members of the genera *Homo*, *Australopithecus*, *Paranthropus* and *Ardipithecus*) but excluding all Great Apes and their ancestors.

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

Lithology: The description of the physical characteristics of a rock unit, visible at outcrop, in hand or in core samples.

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

National Estate: The collective heritage assets of the Nation.

Optically Stimulated Luminescence: a method for measuring doses from ionizing radiation which can be used to date geological sediments typically in a range from approximately 100,000 to 350,000 years before the present.

Palaeontology: Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Pleistocene: A geological time period (of 3 million – 10 000 years ago).

Quaternary: The geologic time period that encompasses the most recent 2.6 million years. It comprises the Pleistocene (2.6 Ma – 10,000 years ago) and the Holocene (10,000 years ago to the present) and is characterised by a series of global glacial cycles.

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

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

Tertiary: Term for the geologic period from 66 million to 2.6 million years ago.

ACRONYMS

DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
Ka	Thousand years ago
LSA	Late Stone Age
MSA	Middle Stone Age
Mya	Million years ago
NHRA	National Heritage Resources Act
NID	Notice of Intent to Develop
OSL	Optically Stimulated Luminescence
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

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1 INTRODUCTION

ACO Associates cc (ACO) was appointed by Greenmined Environmental, on behalf of Zandberg Sandput (Pty) Ltd), to carry out a heritage impact assessment (HIA) for the expansion of a sand mine on Portion 4 of the farm Zandbergfontein (Farm 97) outside Robertson in the Western Cape (Figure 1 and Figure 2).

2 DEVELOPMENT PROPOSAL

Sand mining commenced in the 1980's on Portion 4 of the farm Zandberg fontein No 97, Robertson, with the mining right holder mining the area from 1994. The mining right is valid until 2047 and has an approved footprint of ±17.68 ha (Figure 2).

The Zandberg Sandput intends submitting an application for consent of the relevant minister to expand the existing mining right footprint of the Zandberg sand mine by ±108.4 ha, in terms of Section 102 of the Minerals and Petroleum Resources Development Act (No. 28 of 2002).

The proposed expansion area will be developed in an area currently used for agricultural purposes and mining will progress into the expansion area as the current mining footprint is mined-out.

The small scale strip mining currently practised, where the sand is recovered by a single front-end-loader and loaded directly onto the trucks of clients which transports it from site, will continue unchanged in the mine expansion area and no new infrastructure will be established in the extension area .

3 TERMS OF REFERENCE

ACO Associates was commissioned to produce a HIA as part of the Environmental Impact Assessment (EIA) process for this project, as required by the National Environmental Management Act (No. 107 of 1998), as amended.

The HIA was requested by Heritage Western Cape (HWC), the competent heritage authority in the Western Cape in its response, dated 17 February 2020, to a Notice of Intent to Develop (Case No. 20013103AS0210E) submitted to it by Greenmined Environmental (Appendix A).

HWC stated that “since there is reason to believe that the proposed development will impact on heritage resources ... a Heritage Impact Assessment (HIA) that satisfies the provisions of section 38(3) of the [National Heritage Resources Act] be submitted”. HWC stipulated that the HIA must specifically address potential impacts on archaeological and palaeontological heritage resources.

The aim of the HIA is to identify heritage resources which may be impacted by the proposed expansion of mining on Zandbergfontein, assess their significance and provide recommendations for mitigation.

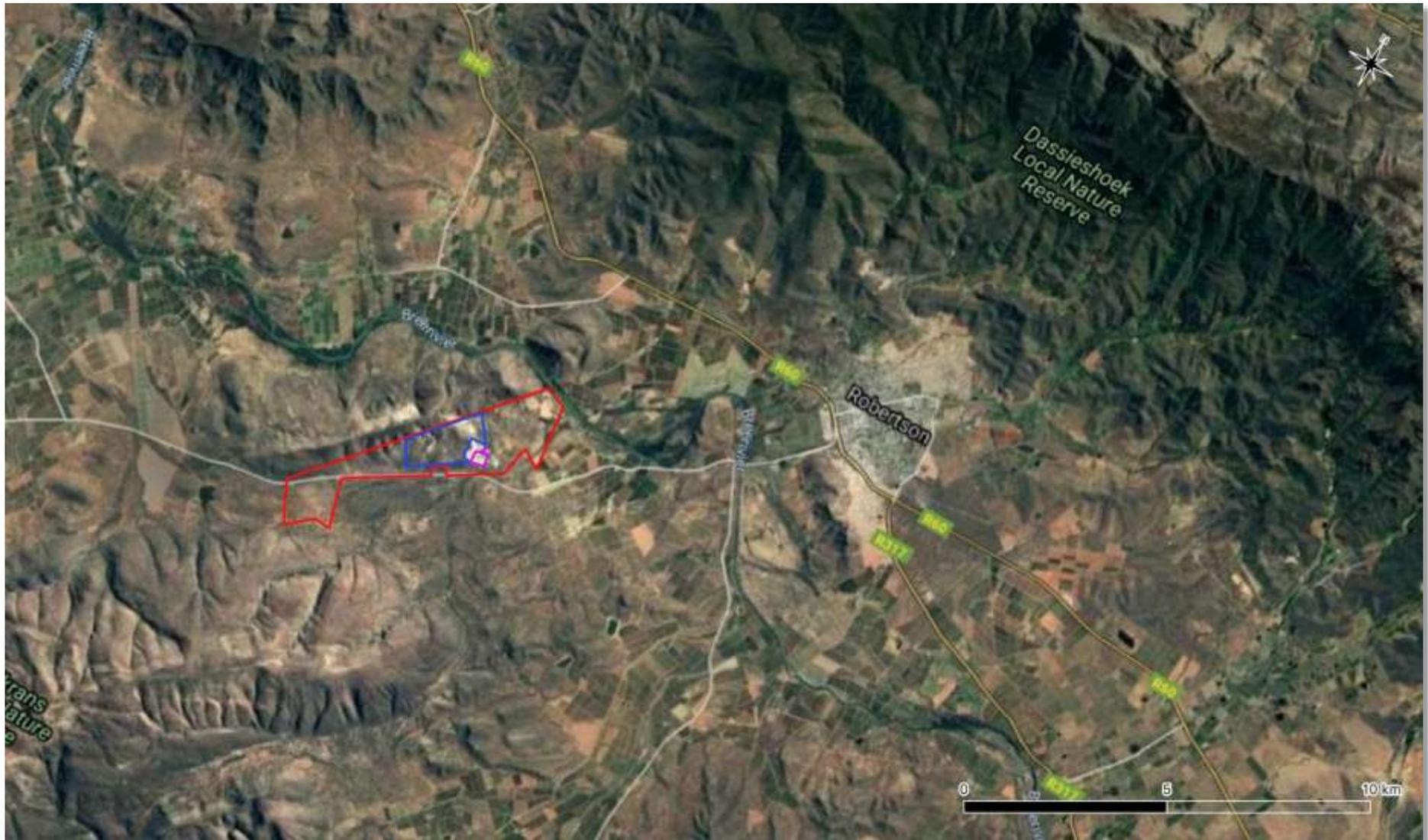


Figure 1: General location of the proposed sand mine extension (blue polygon) in relation to the existing mine (purple) and the boundary of the farm Zandbergfontein (red). Robertson is located approximately 7 km east of the mine expansion area (Source: GoogleEarth).

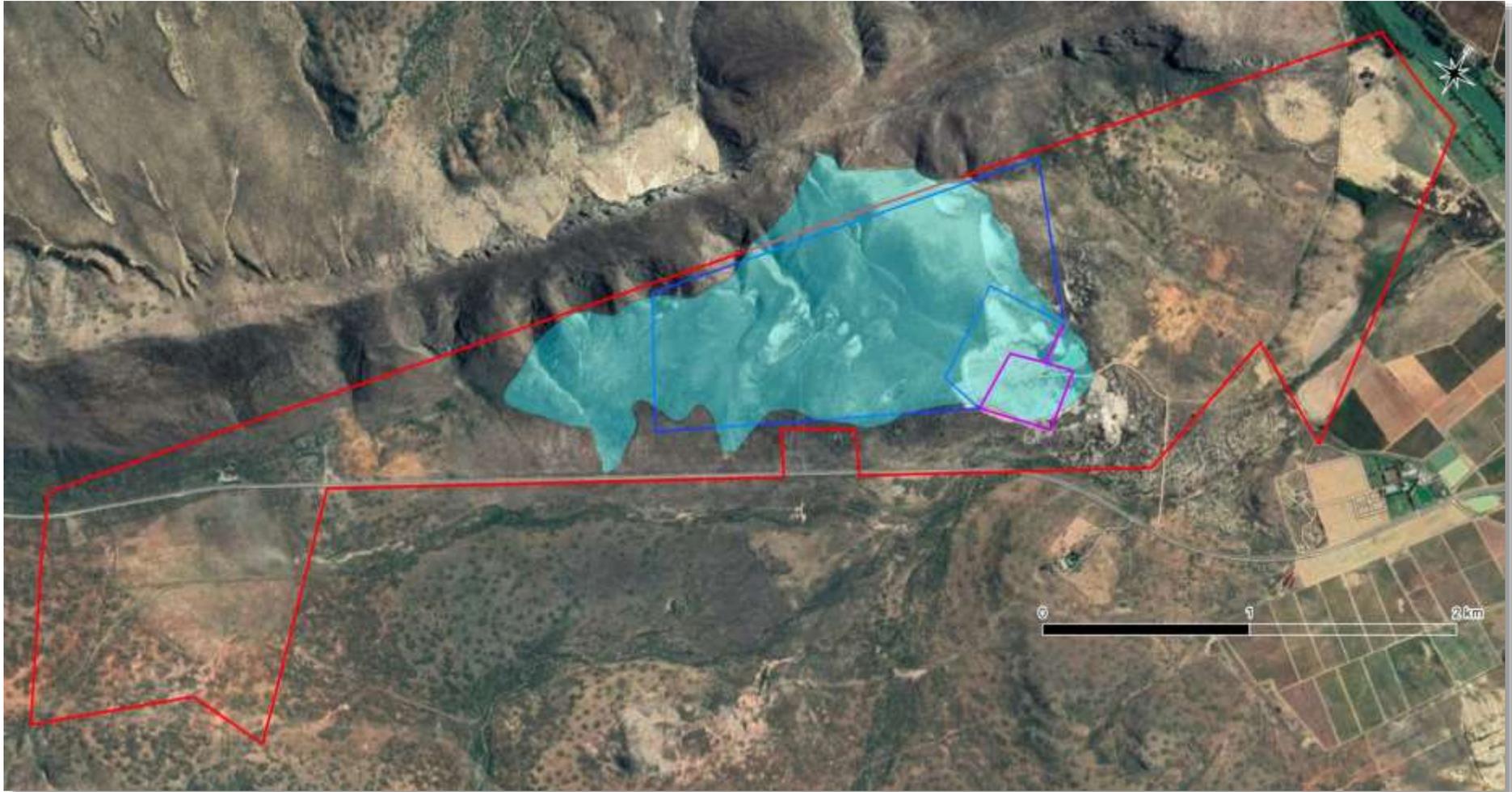


Figure 2: Detail of the existing mining area (purple) and proposed mine expansion area (blue) on the farm Zanbergfontein (red). The approximate extent of the dune that forms the target resource of the mine is shaded blue (Source: Google Earth).

This document includes the following:

- A desk-top literature review to assess the potential for archaeological, cultural and historic sites in the proposed mine expansion area;
- A desk-top palaeontological review to assess the potential for the occurrence of fossil material in the proposed mine expansion area;
- A heritage field assessment to identify and document (collect GPS coordinates and photograph) heritage resources that may be affected by the project.

The results of these studies are integrated in this HIA report along with an assessment of the sensitivity and significance of any identified heritage resources, an evaluation of the potential impacts on these resources of the expansion of mining, and recommendations for measures to mitigate any negative impacts of the project on them.

This HIA will form part of the EIA and must be submitted for comment to HWC as part of the EIA process.

4 RELEVANT LEGISLATION

4.1 *National Heritage Resources Act (No 25 of 1999)*

The National Heritage Resources Act (NHRA) came into force in 2000 with the establishment of the SAHRA, replacing the National Monuments Act (No. 28 of 1969 as amended) and the National Monuments Council as the national agency responsible for the management of South Africa's cultural heritage resources.

The NHRA reflects the tripartite (national/provincial/local) nature of public administration under the South African Constitution and makes provision for the devolution of cultural heritage management to the appropriate, competent level of government. In the Western Cape this is Heritage Western Cape.

The NHRA gives legal definition to the range and extent of what are considered to be South Africa's heritage resources. According to Section 2(xvi) of the Act a heritage resource is "any place or object of cultural significance". This means that the object or place has aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

In terms of the definitions provided in Section 2 of the NHRA, heritage resources potentially relevant to this assessment are:

- Material remains of human activity which are in a state of disuse and are in or on land [which includes land under water] and which are older than 100 years, including artefacts, human and hominid remains and artificial features;
- 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;
- 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;

- Any movable property of cultural significance which may be protected in terms of any provisions of the NHRA, including any archaeological artefact or palaeontological specimen; and
- Intangible heritage such as traditional activities, oral histories and places where significant events happened.

As per the definitions provided above, these cultural heritage resources are protected by the NHRA and a permit from HWC is required to destroy, damage, excavate, alter, deface or otherwise disturb any such site or material.

It is also important to be aware that in terms of Section 35(2) of the NHRA, all archaeological objects and palaeontological material is the property of the State and must, where recovered from a site, be lodged with an appropriate museum or other public institution.

Section 38 of the NHRA requires a HIA for certain kinds of development. In relation to this project, the relevant activity is a development which will change the character of a site exceeding 5000 m² in extent (Section 38(1)(c)(i)).

4.1.1 Grading of Heritage Resources

The South African heritage resources management system is based on grading, which provides for assigning the appropriate level of management responsibility to a heritage resource.

Grading, according to Winter & Oberholzer (2014) is “generally based on the intactness, rarity and representivity of the resource, as well as its role in the larger landscape or cultural context”.

Heritage resources are graded according to criteria specified in Section 3 of the NHRA which suggests the following criteria for assigning heritage significance:

- Importance in the community or pattern in South Africa’s history;
- Possession of uncommon, rare or endangered aspects of South Africa’s natural or cultural heritage;
- Potential to yield information that will contribute to an understanding of South Africa’s natural or cultural heritage;
- Importance in demonstrating the principal characteristics of a particular class of South Africa’s natural or cultural places or objects;
- Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- Importance in demonstrating a high degree of creative or technical achievement during a particular period;
- Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- Strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- Significance in relating to the history of slavery in South Africa.

The generally accepted heritage resource grades are shown in Table 1 below.

Table 1: Grading of heritage resources (Source: Baumann & Winter 2005: Box 5).

Grade	Level of significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources.

4.2 National Environmental Management Act (No 107 of 1998)

The National Environmental Management Act (NEMA) provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals that are likely to have a negative effect on the environment.

Regulations governing the environmental authorisation process have been promulgated in terms of NEMA and include the EIA Regulations, 2014 as amended (GNR R326/2017) and Listing Notices 1 – 3 (GNR 324, 325 and 327/2017). These regulations were amended in April 2017 by Government Notices 324, 325, 326 and 327.

The proposed Zandberg mine expansion triggers a number of activities in the Listing Notices and, in terms of GNR 325 therefore, the project will be subject to an Environmental Impact Assessment process and Zandberg Sandput will be required to obtain a positive Environmental Authorisation from the Department of Environmental Affairs prior to commencement of the proposed activities.

5 METHODOLOGY

This study was commissioned as a heritage impact assessment and attempts to assess the impacts of the proposed mine expansion on heritage resources in the area.

5.1 Palaeontological Desktop Review

Dr Marion Bamford of the University of the Witwatersrand undertook a desktop review to assess the palaeontological potential of the mine expansion area.

This comprised consultation of relevant geological maps and a review of available literature, palaeontological databases, and published and unpublished records to determine the likelihood of fossils occurring in the mine expansion area.

Sources used include records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases.

5.2 Archaeological Desktop Review

The Robertson area has not formed part of any focussed archaeological research projects. There is thus no published literature on its archaeology.

A number of previous archaeological, heritage and palaeontological impact assessments have been conducted for projects in the vicinity of the mine expansion area (see Figure 8 below), however, and the following reports, available on the SAHRIS online platform (<https://sahris.sahra.org.za/>) or in ACO's project archive, were reviewed and their findings have contributed to this assessment (see Section 8.1 below):

- Deacon, H.J. 2007. *Archaeological Impact Assessment: Keurkloof Quarry, Robertson.*
- Gribble, J. 2019. *Heritage Impact Assessment: Rooilandia Farm Dam, Pipeline and New Irrigation Areas.*
- Halkett, D. 2017. *Heritage Impact Assessment of the Proposed Habata Agricultural Expansion Project Near Robertson, Western Cape.*
- Kaplan, J. 2001. *Heritage impact assessment of proposed development Silverstrand Golf and Country Estate, Robertson.*
- Kaplan, J. 2006. *Archaeological impact assessment of proposed development of Erf 3, Robertson.*
- Kaplan, J. 2008. *Phase 1 Archaeological Impact Assessment: Proposed sand mine on the farm Modder Rivier 499 (Remainder of Portion 8) Worcester.*
- Lanham, J. 2006. *Heritage Impact Assessment: The proposed establishment of a landfill and associated facilities in the Breede River Winelands Municipality.*
- Orton, J. 2004. *Initial Heritage Impact Assessment for the proposed upgrade of the Bacchus Substation near Worcester.*
- Orton, J. 2009. *Archaeological Impact Assessment for the proposed new Uitspan Substation, Erf 2 Robertson, Robertson Magisterial District, Western Cape.*
- Webley, L. & Orton, J. 2010. *Archaeological impact assessment: Proposed expansion of the Skurwekop Caravan Park on Vinefera Farm, Robertson District, Western Cape.*

5.3 Archaeological Field Assessment

A physical survey of the area of the proposed mine expansion was undertaken by John Gribble and Gail Euston-Brown of ACO Associates on 25 March 2020.

Both members of the field team carried hand-held GPS receivers (using the WGS84 datum), pre-loaded with the footprint of the mine expansion area and other data such as the farm boundaries, and these were used to log the survey tracks (Figure 3) and record the position of any identified heritage resources.

The field team was suitably qualified and experienced to roughly date and characterise any heritage resources encountered during the survey.

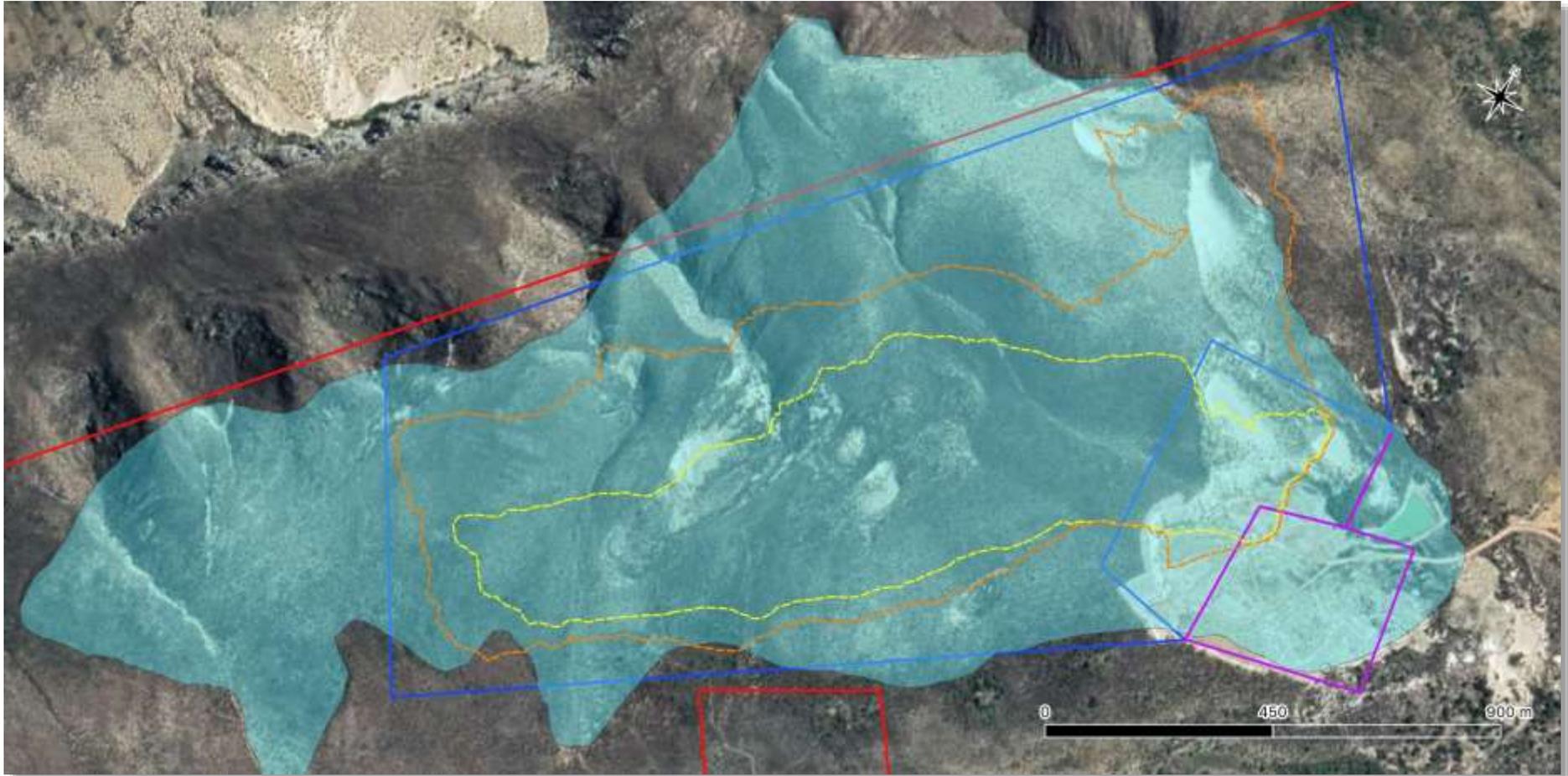


Figure 3: ACO survey track plots (dotted yellow and orange lines). The existing mine is shown in purple and the farm boundary in red. The approximate extent of the dune within the mine expansion area is shaded blue (Source: Google Earth).

No trial holes were dug and all observations were based on visible surface material. No material was removed from the project area.

5.4 Restrictions and Assumptions

The proposed mine expansion area was readily accessible and although covered in thick indigenous vegetation, surface visibility was generally good enough for the purposes of the field survey.

Although we believe that most of the relevant archaeological assessments and HIAs from the area have been located and reviewed, it is acknowledged that, particularly, recent heritage reports from the Western Cape do not always appear on the SAHRIS database and that may mean that some recent reports may not have been identified for review.

6 RECEIVING ENVIRONMENT

The mine expansion area is situated on the southern slope of the Sandberg and approximately 1.8 km from the Breede River to the east. In the east the slope gradient is relatively shallow, but this increases across the area towards its western boundary where the upper slopes of the expansion area are steep (Plate 1).



Plate 1: View of the Sandberg mine and mine expansion area from the road. Note the large deflation hollows across the upper slopes of the dune (Photo: J Gribble).

The expansion area is dominated by a large sand dune which covers almost its entire extent and areas of the mountain beyond, especially in the west (Figure 4 and Figure 5).

Tyson (1999:3) defines a sand dune as a hill or ridge of sand that has been piled up by the wind. Of the various types of aeolian dunes, the development of one variety is related to topographical barriers such as hills or mountains. These dunes develop where wind-driven migrating sand is obstructed by and accumulates against the windward side of the topographic barrier and can be either sand ramps or climbing (and falling) dunes.

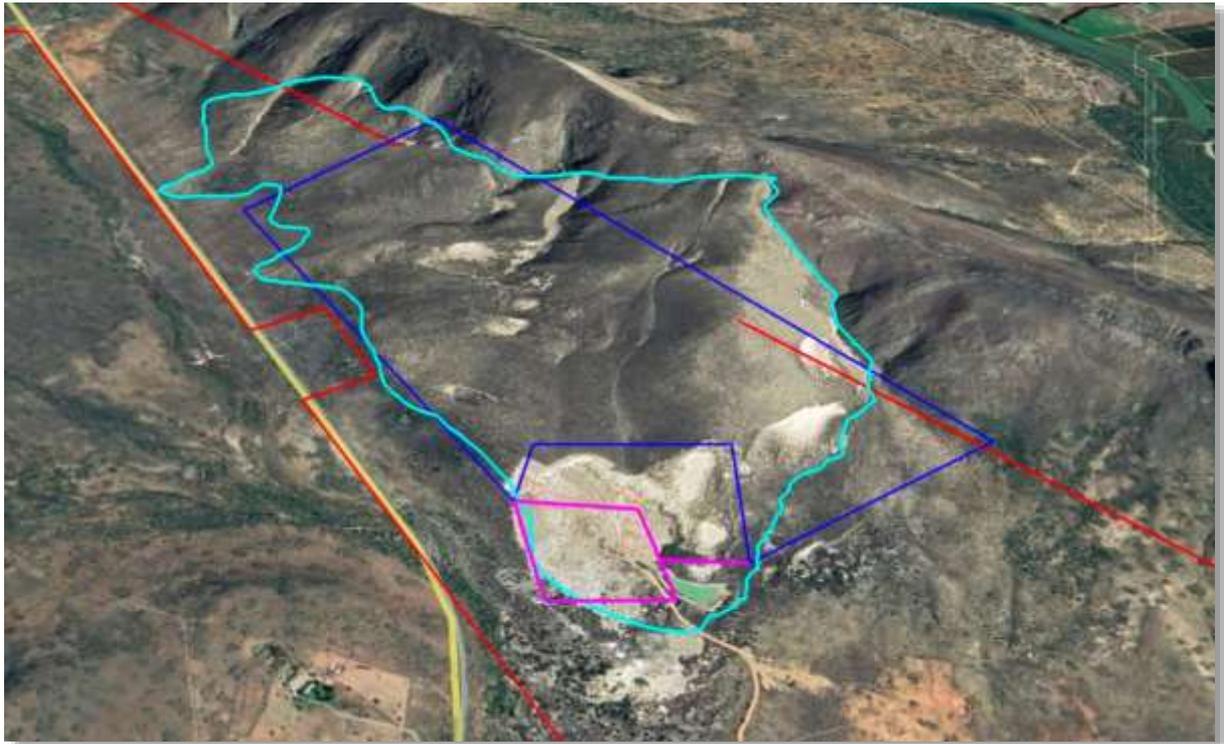


Figure 4: Oblique view of the Sandberg showing the mine expansion area and existing mine on its southern slope. The approximate extent of the dune is outlined in pale blue (Source: Google Earth).



Figure 5: Oblique view of the Sandberg looking east and showing dunes on its northern slope. The mine expansion area, existing mine and dune are visible on the southern slope (Source: Google Earth).

Tyson's (1990) study of the dunes on both the northern and southern slopes of the Sandberg concludes that they can be best described as climbing dunes. These develop on steeper inclines than sand ramps and are more mobile than the latter, allowing the migration of sand across the topographical barrier - if the prevailing wind and sand source are sufficient - to form falling dunes on the far side. Based on the topography of the Sandberg and the prevalence of south-easterly winds in the area, the dune in the mine expansion area is probably a climbing dune, and those on the opposite side of the mountain are falling dunes that have developed from sand migrating over the ridge (Figure 4 and Figure 5).

Climbing dunes tend to be largely homogenous in their composition, and this is the case with the Sandberg dune. At the time Tyson (1999) carried out her research, the Sandberg mine was already operating and she was able to access a cross section of the dune, which she measured as having accumulated to a depth of 9.3 m above the underlying bedrock. With minor exceptions the sands of this dune are apedal, containing virtually no discernible structure, another characteristic of a climbing dune rather than a sand ramp (Tyson 1999) (Plate 2 and Plate 3).



Plate 2: View of the current mined face of the dune showing the depth of the sand deposit (Photo: J Gribble).



Plate 3: View along the mined face of the dune showing the uniformity and homogeneity of sand (Photo: J Gribble).

Tyson (1999:72) obtained three Optically Stimulated Luminescence (OSL) age determinations from the top, middle and base of the Sandberg dune. These indicate that it was actively accumulating at the start of the Holocene (9.9 ± 0.7 thousand years (ka)) and during the period approaching the last glacial maximum (28.8 ± 5.3 ka). The basal date for the dune of 762.7 ± 104.5 ka is well beyond the accepted limit of OSL and is, at best, a maximum age. It indicates, however, that this dune was accumulating at least 350,000 years ago at a time when the area was occupied by Early Stone Age hominins.

With the exception of a handful of large deflation hollows visible in Figure 3 and Figure 4 (see also Plate 1 and Plate 4), the Sandberg dune is currently heavily vegetated and largely immobile (Plate 5).



Plate 4: Example of one of the large deflation hollows within the mine expansion area. Note the dense vegetation on the surrounding slope (Photo: J Gribble).



Plate 5: View westward across the mine expansion area showing the type and density of the vegetation cover. With the exception of the rocky ridge on the skyline, the remainder of the slope in this image is dune sand (Photo: J Gribble).

7 PALAEOLOGICAL ASSESSMENT

According to the desktop palaeontological assessment conducted by Dr Bamford (see Appendix B) the bedrock in this area is part of the Cape Supergroup, composed of siliciclastic sediments deposited in a passive margin basin with strata that are up to 10 km deep and spanning about 170 million years of earth history between the Early Ordovician circa 500 million years ago (Ma) and the Early Carboniferous circa 330 Ma. Although the subsequent Cape Orogeny has deformed these strata, there is lateral continuity in the Western Cape of over 1000 km of the three subdivisions of this group of sediments (Thamm and Johnson, 2006).

The lowest and oldest group is the Table Mountain Group, with sediments dating from the Ordovician, Silurian and Devonian periods. The middle, Devonian, Bokkeveld Group is divided into two subgroups: the lower Ceres Subgroup and the upper Bidouw Subgroup. The youngest Cape Supergroup sediments are the Witteberg Group, with two subgroups in the Western Cape: the Weltevrede and Lake Mentz Subgroups (Thamm and Johnson, 2006).

The Table Mountain Group is a typical cratonic sheet sandstone and is represented in the wider project area by only the uppermost Rietvlei Formation that is a shallow marine sandstone. The Bokkeveld Group is represented here by three formations in the Ceres Subgroup and two from the Bidouw Subgroup, particularly the Wupperthal Formation, indicating a cyclic alternation of fine-grained sandstone (delta front) and mudrock (offshore shelf) units (Thamm and Johnson, 2006) (Figure 6, Table 2).



Figure 6: Geological map of the area around the farm Zandbergfontein and the proposed mining area expansion (white rectangle). Abbreviations of the rock types are explained in Table 2 (Source: enlarged from the Geological Survey 1: 250 000 map 3319 Worcester).

Table 2: Explanation of symbols for the geological map in Figure 6 and their approximate ages (Roberts et al., 2006; Thamm and Johnson, 2006). The grey shaded formations may be impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Qg	Quaternary	Alluvium, sand,	Quaternary, ca 2.5 Ma to present
T-Qt	Tertiary-Quaternary	Scree and gritty sand	Tertiary to Quaternary
Dwu	Wuppertal Formation, Bidouw Subgroup, Bokkeveld Group, Cape Supergroup	Micaceous sandstone and siltstone	Late Devonian
Dw	Waboomberg Formation, Bidouw Subgroup, Bokkeveld Group, Cape Supergroup	Siltstone, shale, mudstone, sandstone	Late Devonian
Db	Boplaas Formation, Ceres Subgroup, Bokkeveld Group, Cape Supergroup	Light-grey feldspathic and micaceous sandstone	Middle Devonian
Dt	Tra-Tra Formation, Ceres Subgroup, Bokkeveld Group, Cape Supergroup	Micaceous sandy shale and mudstone	Middle Devonian
Dv	Voorstehoek Formation, Ceres Subgroup, Bokkeveld Group, Cape Supergroup	Fossiliferous shale, mudstone, siltstone, sandstone	Middle Devonian
Dr	Rietvlei Formation, Nardouw Subgroup, Table Mountain Group, Cape Supergroup	Quartzitic or feldspathic sandstone	Early Devonian

Unconformably overlying the Cape Supergroup rocks are the much younger, mainly Quaternary aeolian sands and dunes that characterise the mine expansion area and which were described above.

The SAHRIS palaeo-sensitivity map (see Figure 7 below) indicates that the bulk of the mine expansion area is of low palaeontological sensitivity (blue) and this applies to the Tertiary-Quaternary aeolian sands, grit and scree. There is a small chance that marine fossils might have been entrapped in these aeolian sands that were derived from older sandstones but because of the transported and abrasive nature of the sands, any fossils will have been highly fragmented and no longer recognisable (Roberts et al., 2006). From photographs taken during the site survey the sands are very uniform in colour and texture, with no indication of inclusions of different material, so it is very unlikely that they have preserved fossils.

Along the north-western margin of the mine expansion area, on the upper slopes of the Sandberg, the palaeo-sensitivity map indicates the presence of a narrow band of high sensitivity (brown). According to the palaeontological assessment this is an outcrop of Bokkeveld Group Wupperthal Formation which is composed of micaceous sandstones and siltstones and could contain marine or near shore fossils such as brachiopods, bivalves and other marine shells (Penn-Clarke et al., 2018).

Where this rock is exposed on the surface there will be no impact from mining operations due to the absence of the target resource. Where it is covered by the dune, mining will cease at the sand/bedrock interface and any potential impacts will be minimal.

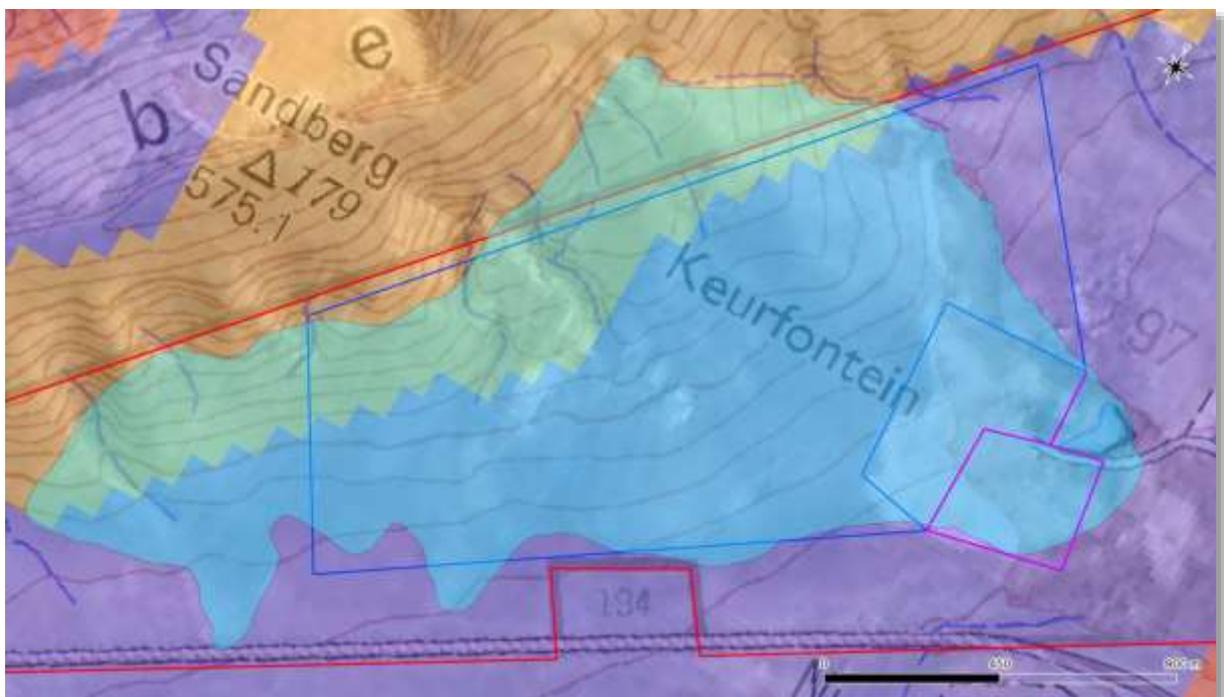


Figure 7: Overlay of mine expansion area (blue polygon) on the SAHRIS palaeo-sensitivity map of the site. The background colours indicate the following degrees of sensitivity: brown = high and blue = low and the approximate extent of the sand dune on the site is shaded blue (Source: <https://sahris.sahra.org.za/map/palaeo>).

8 ARCHAEOLOGICAL ASSESSMENT

8.1 *Details of Available Base Data*

As indicated above, the Robertson area has not been part of any focussed archaeological research projects and there is thus no published literature on its archaeology. The closest well studied archaeological site to the mine expansion area is Montagu Cave, approximately 48 km to the east. The cave is one of only a handful of South African archaeological sites which preserves a stratified sequence of Earlier Stone Age (ESA) deposits, overlain by Middle Stone Age (MSA) occupation levels (Archer *et al* 2015).

A number of previous archaeological, heritage and palaeontological impact assessments have been conducted for projects in the vicinity of the mine expansion area, however, and those survey reports that have been consulted confirm the widespread presence of ESA and MSA implements made on local quartzites in the area (Kaplan 2001, 2006 & 2008; Orton 2004 & 2009, Lanham 2006; Deacon 2007; Webley and Orton 2010; Halkett 2017; Gribble 2019) (Figure 8).

Although Later Stone Age (LSA) sites and materials are to be expected in the Breede River valley, none of these reports note the presence of such archaeological material. Similarly, although historical records confirm that the Breede River valley was visited by Khoekhoen pastoralist groups during the 18th century, their settlements have not been traced.

Deacon (2007:2) notes that the gravels of the Breede River are associated with ESA artefacts, with reports of these artefacts being widely encountered in the plough zones of vineyards in the area.

A HIA for proposed development at the Silwerstrand Golf and Country Estate, about 2 km west of Robertson and approximately 5 km north-east of Zandbergfontein identified only three ESA artefacts on the site and concluded that the receiving environment was not archaeologically or historically sensitive (Kaplan 2001).

Orton's (2004) survey for a HIA of a portion of land adjoining the existing Bacchus substation near the R43, some 36 km west of Zandbergfontein found only two stone artefacts made on quartzite and probably ascribable to the ESA. In the same area, Kaplan (2008) found a small number of ESA and MSA lithics in secondary context on a new gravel road at the proposed Moddergat sand mine on the farm Modder Rivier.

An investigation by Lanham (2006) of three possible landfill sites, one of which (the Bullida Gronde site) is located 2.5 km south east of Robertson and approximately 10 km south-east of Zandbergfontein revealed only a small quantity of archaeological material in the form of two radial cores, one biface and a number of smaller flakes. These finds were assessed to be of low archaeological significance.

An archaeological impact assessment for the proposed development of Erf 3, Robertson by Kaplan (2006) identified a single ESA quartzite flake and a possible core, as well as several other quartzite chunks. These were considered to be of low heritage significance.

Deacon (2007) examined a site for the expansion of the Keurkloof (Prima Klipbrekers) Quarry, some 2.5 km north-west of Robertson but observed no prehistoric archaeological artefacts at the site.

In 2009, Orton found four small Early, or possibly Middle Stone Age flakes on the site of a proposed sub-station, immediately south of Robertson. Due to context they were deemed to be of very low significance

Webley and Orton (2010) undertook an archaeological impact assessment of a proposed expansion of the Skurwekop Caravan Park on Vinefera Farm, south west of Robertson and approximately 4.5 km north-east of Zandbergfontein. The site was disturbed but they did examine some rocky outcrops on the side of Sandberg to determine if any archaeological material was present. No material was found at the rock outcrops or on the sides of the hill. Only a single, possibly ESA item was found at the caravan park site.

A HIA conducted for a proposed agricultural expansion project on the farm Rooilandia, approximately 17 km north-west of Zandbergfontein identified a wide spread of ESA and MSA archaeological occurrences. For the most part, this material comprised isolated occurrences of single lithic artefacts, much of it exposed in areas where erosion and sheetwash has occurred. Only four of the occurrences could be described as possible archaeological sites. These were graded IIIC, while the remainder of the material was not assessed to be conservation worthy (Gribble 2019).

Field inspections for two recent Notifications of Intent to Develop (NID) carried out by ACO for projects on the farms Klipboslaagte (off the R60 east of Robertson) and Gorees Hoogte (off the R60 west of Robertson) recorded the same type of unstratified surface finds of ESA and MSA lithics, broadcast widely over the areas surveyed, as were recorded at many of the sites described above. These artefacts were assessed to be in secondary context and of very low significance.

Lastly, a HIA by Halkett (2017) for the Habata agricultural expansion project, which is located directly adjacent to and west of Zandbergfontein found widespread Earlier and Middle Stone Age stone artefactual material across the site, the nature and context of which were very similar to that recorded at Rooilandia and elsewhere in the area. This material was assessed to have a low scientific value. No LSA material was identified at Habata.

8.2 Survey Results

The walkover survey of the mine expansion area found no evidence of archaeological sites or material on the surface of the dune. Deflation hollows often contain archaeological material – the result both of people in the past making use of the shelter these hollows provide and the exposure of previously buried archaeological material as the hollow develops. A number of the deflation hollows within the mine expansion area were visited but even in instances where they had deflated to the level of the gravel underlying the dune sand (Plate 6), no archaeological material was noted in any of them.

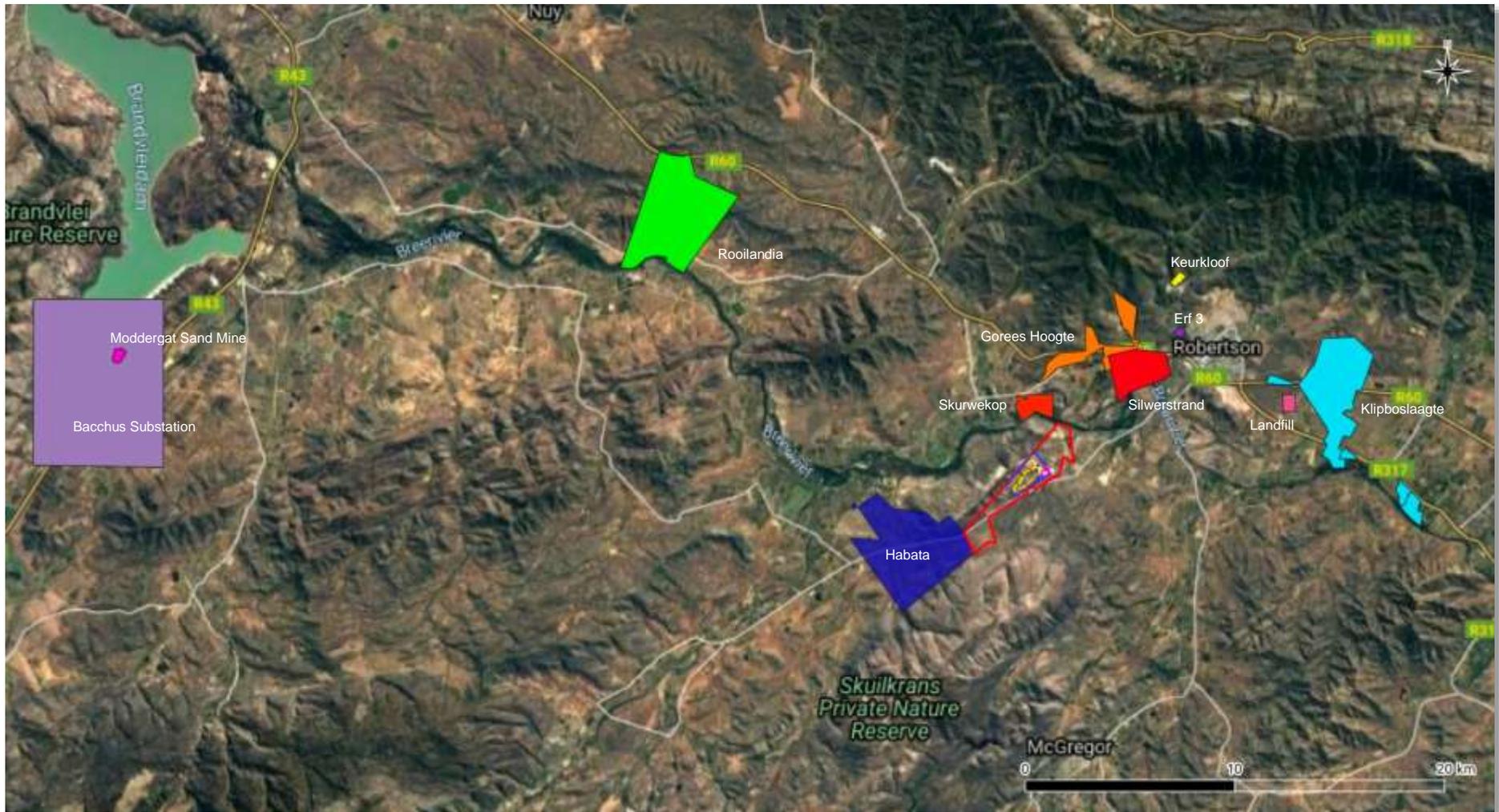


Figure 8: Zandbergfontein (red polygon) and locations of the other archaeological assessments in the area referred to in this report. Erf 2, south of Robertson (Orton 2009) is not shown (Source: Google Earth).

Dune sand was absent in places along the southern boundary of the mine expansion area, and gravel scree and bedrock were exposed (Plate 7). Here too, no archaeological material was identified.

Given the documented and widespread occurrence of ESA and MSA artefacts in the region, it is possible that archaeological material is present on or in earlier soils under the dune sand in the mine expansion area on Zandbergfontein. The apparent age of the dune – in excess of 200,000 years according to the OSL age determinations obtained by Tyson (1999) – suggests that if such material is present on the underlying slope, it is likely to consist of ESA lithics, as the dune would already have been present and developing during most or all of the MSA.



Plate 6: Interior of large deflation hollow on the northern boundary of the mine expansion area. Note the gravel lag exposed below the sand, which often contains archaeological material. No archaeological material was noted in this case (Photo: J Gribble).



Plate 7: Rock and scree exposed on lower slopes of mine expansion area (Photo: J Gribble).

9 BUILT ENVIRONMENT

No historic buildings or structures were found in the mine expansion area during the ACO survey.

10 CEMETERIES AND GRAVES

No cemeteries or graves were found in the mine expansion area during the ACO survey.

11 IMPACTS AND RISKS

11.1 *Palaeontology*

The PIA suggests that fossils are possible in the Wupperthal Formation sandstones and siltstones that underlie the sand resource in the mine expansion area, but that their survival and presence in the Quaternary sand itself is highly unlikely. Potential impacts on this heritage resource arising from the operation of the mine are assessed as follows:

Table 3 Assessment of impacts on palaeontological resources

	Preferred Alternative	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	Low	Low
Duration	Long term	Long term

Significance	Low	Low
Probability	Unlikely	Unlikely
Confidence	High	High
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources	Low	Low
Cumulative Impact	Low	Low

Although the Wupperthal Formation is considered to be of high palaeontological sensitivity, there is a very low likelihood that this bedrock and the fossils it may contain will be impacted by the expansion of the sand mine. The potential impact of the proposed expansion of the Zandberg sand mine on palaeontological material is thus assessed to be low.

Given the wide geographical distribution of the Wupperthal Formation, the cumulative impacts of projects such as this one on palaeontological resources are assessed to be low.

11.1.1 Mitigation Measures

In respect of mitigation measures, the PIA recommends the inclusion of a Fossil Chance Find Protocol in the EMP. This will ensure that in the unlikely event of fossils being encountered during mining, they will be rescued and a palaeontologist called to assess and collect a representative sample. A Fossil Chance Find Protocol is attached as Appendix B.

11.2 Other Heritage Resources

There are no constraints in the mine expansion area with respect to archaeological sites and materials, the historical built environment, graves and cemeteries or to any other category of heritage resource and no impacts are expected.

11.2.1 Mitigation Measures

Should any human remains be encountered at any stage during the construction or earthworks associated with the project, mining in the vicinity must cease immediately, the remains must be left *in situ* but made secure and the project archaeologist and HWC must be notified immediately.

11.3 The No-Go Alternative

Not implementing the proposal will result in no impacts to heritage resources.

12 CONCLUSION

This assessment has found that the area identified for expansion of the Zandbergfontein sand mine is not a sensitive heritage environment and that with the possible exception of palaeontological material, impacts on heritage resources arising from expanded mining operations are unlikely.

It is our considered opinion that provided the mitigation measures set out above are implemented, the overall impact of the proposed expansion of the Zandbergfontein sand mine will be of low heritage significance and the proposed activity is acceptable.

13 REFERENCES

Archer, W., Presnyakova, D., Sumner, A., Aldeias, V., Gur Arie, S., Hernandez, M., Shaw, M. Porraz, G., Hutten, L., Poggenpoel, C. & Keller C.M. 2015. Montagu Cave in Prehistory: current excavation and analyses of the Acheulean sequence. Paper presented at the *Annual Meeting of the European Society for the study of Human Evolution*, London, UK 09/2015.

Deacon, H.J. 2007. *Archaeological Impact Assessment: Keurkloof Quarry, Robertson*. Unpublished client report. Unpublished report prepared for SitePlan Consulting on behalf of Prima Quarries (Pty) Ltd.

Gribble, J. 2019. *Heritage Impact Assessment: Rooilandia Farm Dam, Pipeline and New Irrigation Areas*. Unpublished report for Cornerstone Environmental Consultants. ACO Associates.

Halkett, D. 2017. *Heritage Impact Assessment of the Proposed Habata Agricultural Expansion Project Near Robertson, Western Cape*. Unpublished report for Holland and Associates Environmental Consultants. ACO Associates.

Kaplan, J. 2001. *Heritage impact assessment of proposed development Silwerstrand Golf and Country Estate, Robertson*. Unpublished report prepared for ECOSENSE. Agency for Cultural Resource Management.

Kaplan, J. 2006. *Archaeological impact assessment of proposed development of Erf 3, Robertson*. Unpublished report prepared for Boland Enviro. Agency for Cultural Resource Management.

Kaplan, J. 2008. *Phase 1 Archaeological Impact Assessment: Proposed sand mine on the farm Modder Rivier 499 (Remainder of Portion 8) Worcester*. Unpublished report prepared for Site Plan Consulting. Agency for Cultural Resource Management.

Lanham, J. 2006. *Heritage Impact Assessment: The proposed establishment of a landfill and associated facilities in the Breede River Winelands Municipality*.

Orton, J. 2004. *Initial Heritage Impact Assessment for the proposed upgrade of the Bacchus Substation near Worcester*. Unpublished report prepared for Eyethu Engineers. Archaeology Contracts Office, UCT.

Orton, J. 2009. *Archaeological Impact Assessment for the proposed new Uitspan Substation, Erf 2 Robertson, Robertson Magisterial District, Western Cape*. Unpublished report prepared for SHE Cape Environmental. Archaeology Contracts Office, UCT.

Penn-Clarke, C.R., Rubidge, B.S., Jinnah, Z.A., 2018. Two hundred years of palaeontological discovery: Review of research on the Early to Middle Devonian Bokkeveld Group (Cape Supergroup) of South Africa. *Journal of African Earth Sciences* 137, 157-178.

Roberts, D.L., Botha, G.A., Maud, R.R., Pether, J., 2006. Coastal Cenozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). *The Geology of South Africa*. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 605-628.

Tyson, S.J. 1999. *Sand Ramps or Climbing Dune? Identification and Palaeoenvironmental Significance of Aeolian Deposits in the Southern Kalahari and Breede River Valley, South Africa*. Unpublished MSc Dissertation. University of Cape Town.

Webley, L. & Orton, J. 2010. *Archaeological impact assessment: Proposed expansion of the Skurwekop Caravan Park on Vinefera Farm, Roberston District, Western Cape*. Unpublished report prepared for TPS Land Use Planners. Archaeology Contracts Office, UCT.

13.1 Online Resources

South African Heritage Resources Information System (Accessed online on 10 April 2020).
<http://www.sahra.org.za/sahris>.

SAHRA Palaeo-sensitivity Map (Accessed online on 10 April 2020)
<https://sahris.sahra.org.za/map/palaeo>.

APPENDIX A: HERITAGE WESTERN CAPE NID RESPONSE

REGISTERED MAIL

Our Ref: HM/CAPE WINELANDS/ROBERTSON/
REM AND PTN 4 OF FARM ZANDBERGFONTEIN 97
Case No.: 20013103AS0210E
Enquiries: Andrew September
E-mail: andrew.september@westerncape.gov.za
Tel: 021 483 9543
Date: 19 February 2020

Christine Fouche
Postnet Suite 62
Private bage X15
Somerset West
7129



RESPONSE TO NOTIFICATION OF INTENT TO DEVELOP: HIA 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 EXPANSION OF SAND MINE ON THE REMAINDER AND PORTION 4 OF FARM ZANDBERGFONTEIN 97, ROBERTSON, SUBMITTED IN TERMS OF SECTION 38(8) OF THE NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

CASE NUMBER: 20013103AS0210E

The matter above has reference. Heritage Western Cape is in receipt of your application for the above matter received on 10 February 2020. This matter was discussed at the Heritage Officials Meeting held on 17 February 2020.

You are hereby notified that, since there is reason to believe that the proposed development 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. This HIA must have specific reference to the following:

- Archaeological Impact Assessment;
- Palaeontological Impact Assessment;

The required HIA must have an integrated set of recommendations. The comments of relevant registered conservation bodies and the relevant Municipality must be requested and included in the HIA where provided. Proof of these requests must be supplied.

Please note, should you require the HIA to be submitted as a Phased HIA, a written request must be submitted to HWC prior to submission. HWC reserves the right to determine whether a phased HIA is acceptable on a case by case basis.

This decision is subject to an appeal period of 14 working days. The appeal period shall be taken from the date above. It should be noted that for an appeal to be deemed valid it must refer to the decision, it must be submitted by the due date and it must set out the grounds of the appeal. Appeals must be addressed to the official named above and it is the responsibility of the appellant to confirm that the appeal has been received within the appeal period.

Applicants are strongly advised to review and adhere to the time limits contained the Standard Operational Procedure (SOP) between DEADP and HWC. The SOP can be found using the following link <http://www.hwc.org.za/node/293>

HWC reserves the right to request additional information as required.

Should you have any further queries, please contact the official above and quote the case number.

Yours faithfully,


.....
Dr Axolisi Dlamuka
Chief Executive Officer, Heritage Western Cape
www.westerncape.gov.za/cas

Street Address: Protea Assurance Building, Green Market Square, Cape Town, 8001 • Postal Address: P.O. Box 965, Cape Town, 8000
• Tel: +27 (0)21 483 5959 • E-mail: cas@heritage.westerncape.gov.za

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Idilesi yendawo: Kumpqapho 3, Iwintshixo qoxisa Assurance, Greenmarket Square, eKapa, 8000 • Idilesi yeposi: Inombuso yeNtshona Koloni, 965, eKapa, 8000

APPENDIX B: PALAEOONTOLOGICAL IMPACT ASSESSMENT

Palaeontological Impact Assessment for the proposed Mining Rights Application on Zandbergfontein 97, southwest of Robertson, Western Cape Province

Desktop Study (Phase 1)

For

ACO Associates (Pty) Ltd

12 April 2020

Prof Marion Bamford

Palaeobotanist

P Bag 652, WITS 2050

Johannesburg, South Africa

Marion.bamford@wits.ac.za

Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, ASSAf
Experience: 31 years research; 23 years PIA studies

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by ACO Associates (Pty) Ltd, Diep River, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature:

A handwritten signature in blue ink, appearing to read 'MKBamford', with a horizontal line underneath it.

Executive Summary

A palaeontological Impact Assessment was requested for the Mining Rights Application by Zandberg Sand Mine to extend their mining operation to Portion 4 of Farm Zandbergfontein 97, southwest of Robertson, Western Cape Province. Heritage Western Cape has requested a Palaeontological Impact Assessment (Case Number: 20013103AS0210E). To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed MRA.

The proposed site lies mostly on the aeolian sands, alluvium, scree and grit of the Tertiary-Quaternary sands, but there is a small section to the northwest that lies on the sandstones and siltstones of the Wuppertal Formation (Bidouw Subgroup, Bokkeveld Group, Cape Supergroup) that might contain fossil marine shells in the consolidated sandstone. It is the loose sands that will be mined, however. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no palaeontological site visit is required but the geologist/engineer on site should look out for fossil shells, put them aside and send photographs to a palaeontologist to determine their scientific importance.

1. BACKGROUND

Sand mining commenced in the 1980's on Portion 4 of the farm Zandberg fontein No 97, Robertson, with the Viljoen family mining the area from 1994. In 2018, the mining right was ceded from WJ Viljoen to Zandberg Sandput (Pty) Ltd that is the current mining right holder (hereinafter referred to as the "MR Holder"). The mining right is valid until 2047, with an approved footprint of 17.6826 ha. The Zandberg mining method entails strip mining that is representative of the small scale mining industry where the sand is loaded with one front-end-loader (FEL) directly onto the trucks of clients that transports it from site. Little to no stockpiling is required and no washing of sand is needed. The MR Holder removes the topsoil of a strip of ± 1 ha within which the sand is mined in blocks of approximately 50 x 50 m. Topsoil is replaced over every mined-out strip prior to the opening of the consecutive strip.

The MR Holder intends submitting an application for consent of the minister to expand the existing mining right footprint of the Zandberg sand mine with 108.3851 ha, in terms of Section 102 of the MPRDA, 2002. The proposed expansion area will be developed over an area currently used for agricultural purposes. Should the S102 application be approved mining will progress into the expansion area as the current mining footprint is mined-out. The mining method will remain the same as the method currently implemented by the MR holder. No infrastructure will be established in the extension area.

2. SITE DESCRIPTION

The Zandberg sand mine is located ± 7 km south-west of the Robertson town. The extent of the proposed extension area is ± 108.39 ha, (Figures 1, 2) with the GPS coordinates of the area within Figure 2.

A Palaeontological Impact Assessment was requested for the MRA (Heritage Western Cape Case number: 20013103AS0210E. To comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development and is presented here.

Table 1: Specialist report requirements in terms of Appendix 6 of the EIA Regulations (amended 2017)

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	Relevant section in report
ai	Details of the specialist who prepared the report	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 38
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeo-sensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 3
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 4
k	Any mitigation measures for inclusion in the EMPr	Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	N/A

nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	N/A
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies if any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A



Figure 1: Google Earth map of the proposed extension to the sand mining operation by Zandberg sand mine on farm Zandbergfontein 97 within the blue outline. The purple outline represents the existing mining operation and the red outline is the farm boundary. Map supplied by ACO Associates.

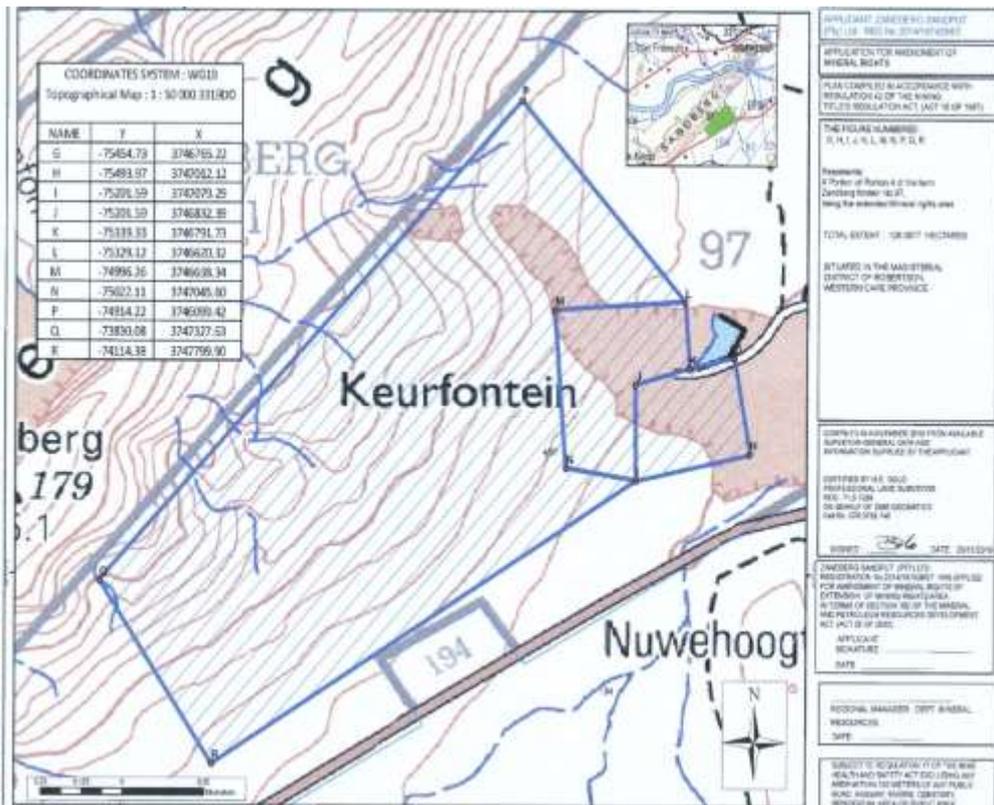


Figure 2: Detailed topographic map showing the project outlines

3. METHODS AND TERMS OF REFERENCE

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.

The methods employed to address the ToR included:

- Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
- Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
- Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
- Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

4. GEOLOGY AND PALAEOLOGY

Project Location and Geological Context

The rocks in this part of the Cape belong to the Cape Supergroup. They are composed of siliciclastic sediments that were deposited in a passive margin basin with strata that are up

to 10km deep. About 170 million years of earth history are represented by the Cape Supergroup (Early Ordovician ca 500 Ma to Early Carboniferous ca 330 Ma). The subsequent Cape Orogeny has deformed these strata but lateral continuity of over 1000km of the three subdivisions of this group of sediments can be observed in the Western Cape (Thamm and Johnson, 2006).

The lower group is the Table Mountain Group, with sediments dating from the Ordovician, Silurian and Devonian periods. The middle, Devonian Bokkeveld Group is divided into two subgroups: the lower Ceres Subgroup and the upper Bidouw Subgroup. The youngest Cape Supergroup sediments are the Witteberg Group, with two subgroups in the Western Cape: the Weltevrede and Lake Mentz Subgroups (Thamm and Johnson, 2006).

The Table Mountain Group is a typical cratonic sheet sandstone (ibid) and is resented in the project area by only the uppermost Rietvlei Formation that is a shallow marine sandstone (Figure 3, Table 2). The Bokkeveld Group is represented here by three formations in the Ceres Subgroup Group and two from the Bidouw Subgroup, indicating a cyclic alternation of fine-grained sandstone (delta front) and mudrock (offshore shelf) units.



Figure 3: Geological map of the area around the Farm Zandberg fontein 97 and the proposed mining area expansion. The location of the proposed project is indicated within the yellow rectangle. Abbreviations of the rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 3319 Worcester.

Table 2: Explanation of symbols for the geological map and approximate ages (Roberts et al., 2006; Thamm and Johnson, 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Qg	Quaternary	Alluvium, sand,	Quaternary, ca 2.5 Ma to present
T-Qt	Tertiary-Quaternary	Scree and gritty sand	Tertiary to Quaternary
Dwu	Wuppertal Fm, Bidouw Subgroup, Bokkeveld Group, Cape SG	Micaceous sandstone and siltstone	Late Devonian
Dw	Waboomberg Fm, Bidouw Subgroup, Bokkeveld Group, Cape SG	Siltstone, shale, mudstone, sandstone	Late Devonian
Db	Boplaas Fm, Ceres Subgroup, Bokkeveld Group, Cape SG	Light-grey feldspathic and micaceous sandstone	Middle Devonian
Dt	Tra-Tra Fm, Ceres Subgroup, Bokkeveld Group, Cape SG	Micaceous sandy shale and mudstone	Middle Devonian
Dv	Voorstehoek Fm, Ceres Subgroup, Bokkeveld Group, Cape SG	Fossiliferous shale, mudstone, siltstone, sandstone	Middle Devonian
Dr	Rietvlei Fm, Nardouw Subgroup, Table Mountain Group, Cape SG	Quartzitic or feldspathic sandstone	Early Devonian

Unconformably overlying the Cape Supergroup rocks are the much younger Tertiary to quaternary aeolian sands and sand dunes. The sands were probably derived from the weathering of the Cape Supergroup sandstones.

Palaeontological Context

The palaeontological sensitivity of the area under consideration is presented in Figure 4.

From the SAHRIS map below the area is indicated as mostly of low palaeontological sensitivity (blue) and this applies to the Tertiary-Quaternary aeolian sands, grit and scree, with a narrow band of very sensitive (orange/brown) Wupperthal Formation along the north western margin. The Wupperthal Formation is composed of micaceous sandstones and siltstones and could contain marine or near shore fossils such as brachiopods, bivalves and other marine shells (Penn-Clarke et al., 2018).

There is a small chance that marine fossils might have been entrapped in the Tertiary-Quaternary aeolian sands, alluvium. Scree and grit that were derived from older sandstones but because of the transported and abrasive nature of the sands, any fossils will have been highly fragmented and no longer recognisable (Roberts et al., 2006). From photographs taken by the archaeologists doing the walkthrough (Figures 5, 6), the sands are very uniform in colour and texture, with no indication of different material (fossils), so it is very unlikely that they have preserved fossils.

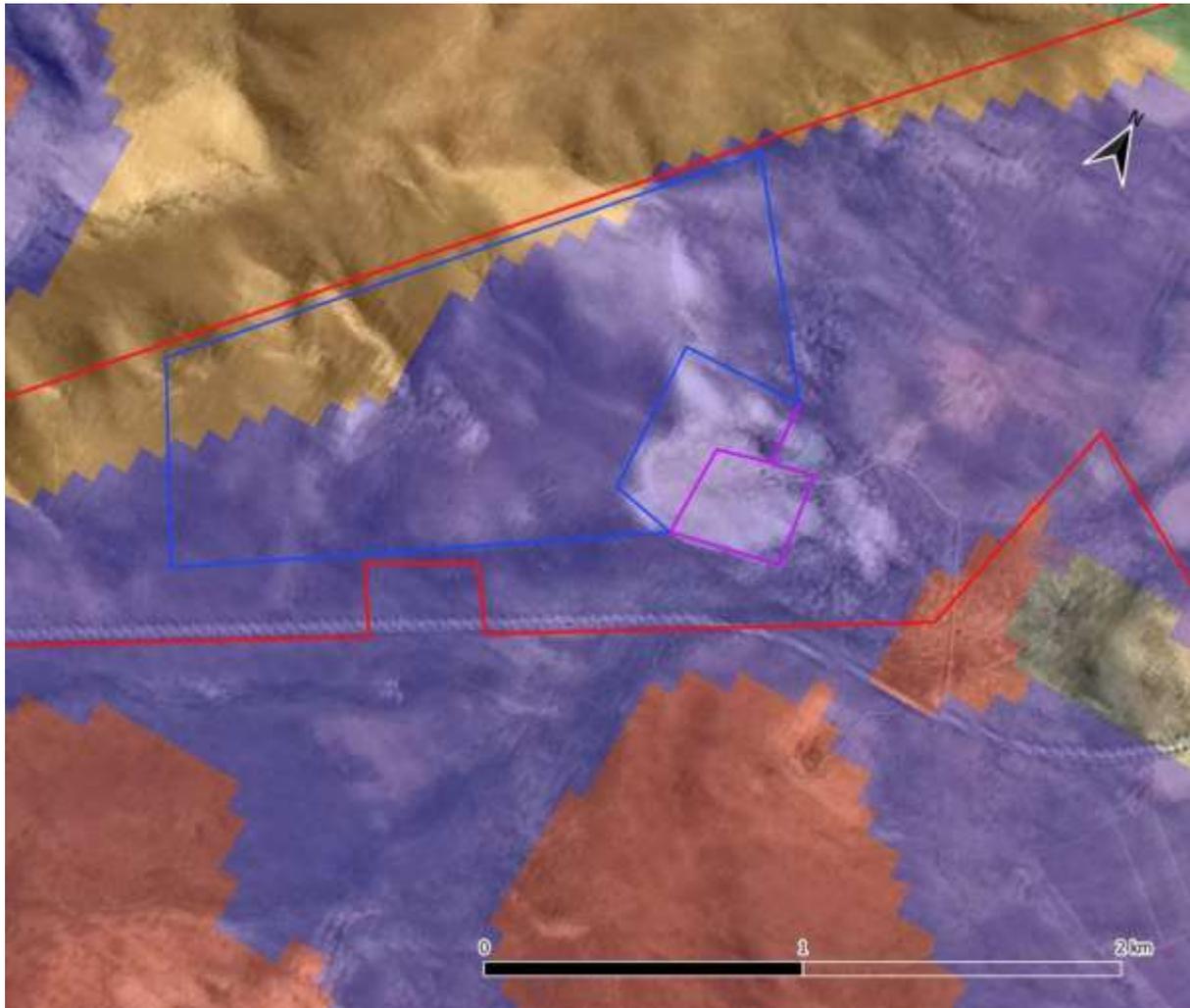


Figure 4: SAHRIS palaeo-sensitivity map for the site for the proposed sand mining expansion by Zandberg Sand mine, shown within the blue outline. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/brown = high; green = moderate; blue = low; grey = insignificant/zero.



Figure 5: View of the sand dune to be mined. Photograph courtesy of J Gribble.



Figure 6: View of existing sand mining operation showing uniform, fine-grained sand. Photograph courtesy of J Gribble.

4. IMPACT ASSESSMENT

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

Table 3a: Criteria for assessing impacts

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	H	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	L	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	L	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	H	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

Table 3b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	H	-
	M	-
	L	Aeolian sands do not preserve fossils; so far there are no records from the Quaternary sands in this region so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
	L+	-
	M+	-
	H+	-
DURATION	L	-
	M	-
	H	Where manifest, the impact will be permanent.
SPATIAL SCALE	L	Since only the possible fossils within the area would be transported fragments of marine fossils from the Quaternary aeolian sands, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	H	-
	M	-
	L	It is extremely unlikely that any fossils would be found in the loose sand that will be mined, nonetheless a Fossil Chance Find protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are deep and shallow water sands and sandstones that might contain fossils. However the sands to be mined are aeolian (wind transported) sands so are unlikely to preserve fossils that would be recognisable, only small fragments. Since there is an extremely small chance that fossils might occur in the sands, a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

5. ASSUMPTIONS AND UNCERTAINTIES

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the mudstones, sandstones, shales and sands are typical for the country and do contain marine invertebrate material. It is unlikely that the Quaternary aeolian sands would preserve fossils.

6. RECOMMENDATION

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the aeolian sands of the Quaternary. There is a very small chance that marine fossils (shells) may have been preserved in the Wupperthal Formation sandstones but not in the loose sand that will be mined, so a Fossil Chance Find Protocol should be added to the EMP: if fossils are found once mining has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.

7. REFERENCES

Roberts, D.L., Botha, G.A., Maud, R.R., Pether, J., 2006. Coastal Cenozoic deposits. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 605-628.

Plumstead, E.P., 1969. Three thousand million years of plant life in Africa. Geological Society of southern Africa, Annexure to Volume LXXII. 72pp + 25 plates.

Penn-Clarke, C.R., Rubidge, B.S., Jinnah, Z.A., 2018. Two hundred years of palaeontological discovery: Review of research on the Early to Middle Devonian Bokkeveld Group (Cape Supergroup) of South Africa. Journal of African Earth Sciences 137, 157-178.

Thamm, A.G., Johnson, M.R., 2006. The Cape Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 443 – 460.

8. CHANCE FIND PROTOCOL

See Appendix C below

APPENDIX A – EXAMPLES OF FOSSILS FROM THE BOKKEVELD GROUP.

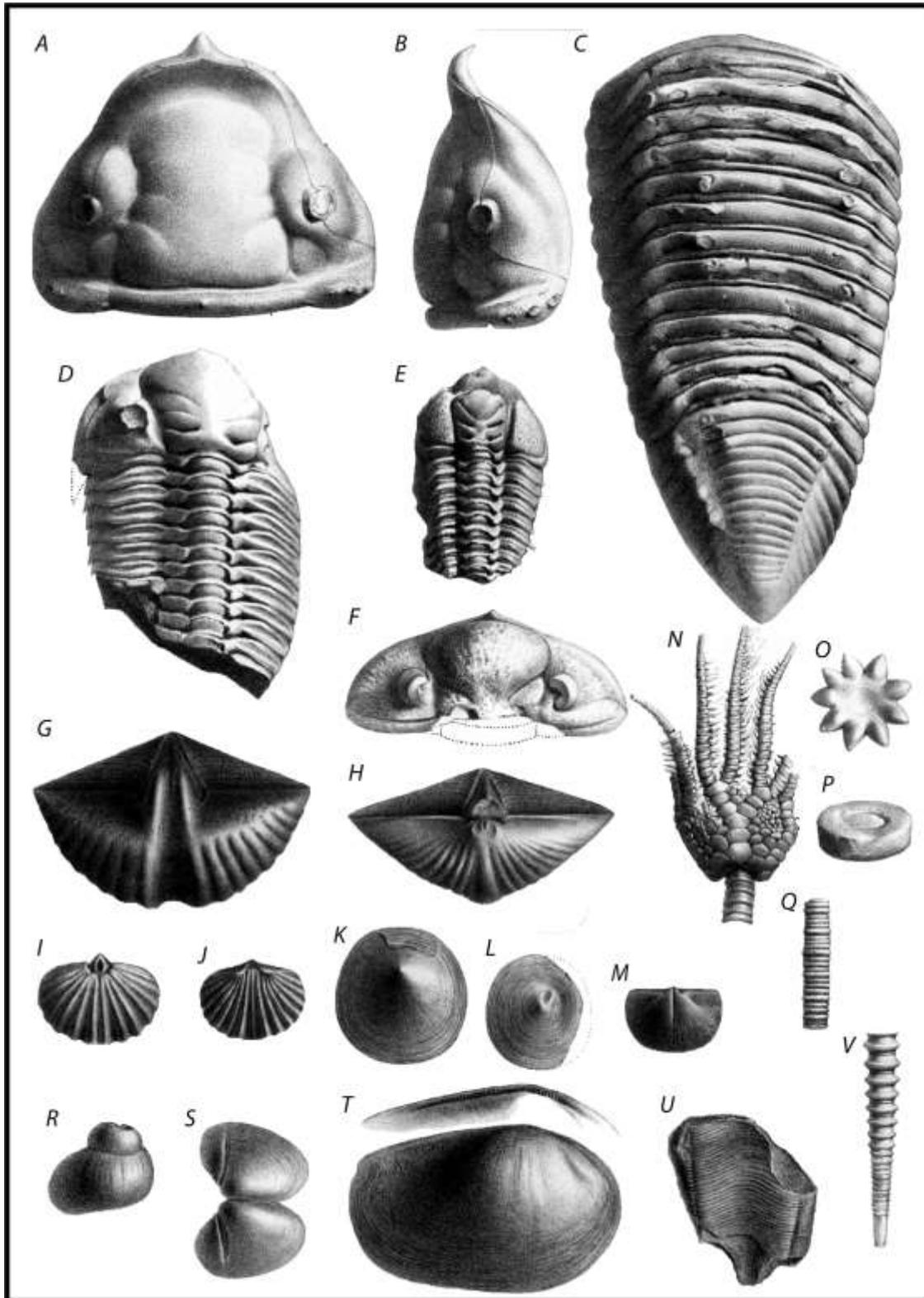


Figure 7: Line drawings of Bokkeveld marine fossils, from Penn-Clarke et al., 2018 (their fig 4, and reproduced from old texts by Sharpe (1856), Salter (1856); Sharpe and Salter (1856).

APPENDIX B – DETAILS OF SPECIALIST

Curriculum vitae (short) - Marion Bamford PhD January 2020

I) Personal details

Surname : **Bamford**
First names : **Marion Kathleen**
Present employment : Professor; Director of the Evolutionary Studies Institute.
Member Management Committee of the NRF/DST Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa-
Telephone : +27 11 717 6690
Fax : +27 11 717 6694
Cell : 082 555 6937
E-mail : marion.bamford@wits.ac.za ;
marionbamford12@gmail.com

ii) Academic qualifications

Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) Professional qualifications

Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) Membership of professional bodies/associations

Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) – 1997+
PAGES - 2008 –onwards: South African representative

ROCEEH / WAVE – 2008+
INQUA – PALCOMM – 2011+onwards

vii) Supervision of Higher Degrees

All at Wits University

Degree	Graduated/completed	Current
Honours	7	0
Masters	10	4
PhD	12	5
Postdoctoral fellows	10	3

viii) Undergraduate teaching

Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 25 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene
Palaeoecology; Micropalaeontology – average 2-8 students per year.

ix) Editing and reviewing

Editor: *Palaeontologia africana*: 2003 to 2013; 2014 – Assistant editor
Guest Editor: *Quaternary International*: 2005 volume
Member of Board of Review: *Review of Palaeobotany and Palynology*: 2010 –
Cretaceous Research: 2014 –
Journal of African Earth Sciences: 2020 -

Review of manuscripts for ISI-listed journals: 25 local and international journals

x) Palaeontological Impact Assessments

Selected – list not complete:

- Thukela Biosphere Conservancy 1996; 2002 for DWAF
- Vioolsdrift 2007 for Xibula Exploration
- Rietfontein 2009 for Zitholele Consulting
- Bloeddrift-Baken 2010 for TransHex
- New Kleinfontein Gold Mine 2012 for Prime Resources (Pty) Ltd.
- Thabazimbi Iron Cave 2012 for Professional Grave Solutions (Pty) Ltd
- Delmas 2013 for Jones and Wagener
- Klipfontein 2013 for Jones and Wagener
- Platinum mine 2013 for Lonmin
- Syferfontein 2014 for Digby Wells
- Canyon Springs 2014 for Prime Resources
- Kimberley Eskom 2014 for Landscape Dynamics
- Yzermyne 2014 for Digby Wells
- Matimba 2015 for Royal HaskoningDV
- Commissiekraal 2015 for SLR
- Harmony PV 2015 for Savannah Environmental
- Glencore-Tweefontein 2015 for Digby Wells
- Umkomazi 2015 for JLB Consulting

- Ixia coal 2016 for Digby Wells
- Lambda Eskom for Digby Wells
- Alexander Scoping for SLR
- Perseus-Kronos-Aries Eskom 2016 for NGT
- Mala Mala 2017 for Henwood
- Modimolle 2017 for Green Vision
- Klippoortjie and Finaalspan 2017 for Delta BEC
- Ledjadja borrow pits 2018 for Digby Wells
- Lungile poultry farm 2018 for CTS
- Olienhout Dam 2018 for JP Celliers
- Isondlo and Kwasobabili 2018 for GCS
- Kanakies Gypsum 2018 for Cabanga
- Nababeep Copper mine 2018
- Glencore-Mbali pipeline 2018 for Digby Wells
- Remhoogte PR 2019 for A&HAS
- Bospoort Agriculture 2019 for Kudzala
- Overlooked Quarry 2019 for Cabanga
- Richards Bay Powerline 2019 for NGT
- Eilandia dam 2019 for ACO
- Eastlands Residential 2019 for HCAC
- Fairview MR 2019 for Cabanga
- Graspan project 2019 for HCAC
- Lielifontein N&D 2019 for Enviropro

xi) Research Output

Publications by M K Bamford up to December 2019 peer-reviewed journals or scholarly books: over 140 articles published; 5 submitted/in press; 8 book chapters.

Scopus h-index = 27; Google scholar h-index = 32; -i10-index = 80

Conferences: numerous presentations at local and international conferences.

xii) NRF Rating

NRF Rating: B-2 (2016-2020)

NRF Rating: B-3 (2010-2015)

NRF Rating: B-3 (2005-2009)

NRF Rating: C-2 (1999-2004)

APPENDIX C: FOSSIL CHANCE FIND PROTOCOL

Monitoring Programme for Palaeontology – to commence once the excavations or mining activities begin.

The following procedure is only required if fossils are seen on the surface and when excavations/mining commence:

- Photographs of fossil material likely to occur on the site must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones. This information will be built into the EMP's training and awareness plan and procedures.
- When excavations begin the sands must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material should be put aside in a suitably protected place. This way the project activities will not be interrupted.
- Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
- If there is any possible fossil material found by the developer/environmental officer/miners then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check any material dumps where feasible.
 - Fossils that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
 - If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
 - If no fossils are found and the excavations have finished then no further monitoring is required.

APPENDIX D: CURRICULUM VITAE: JOHN GRIBBLE

Name: John Gribble
Profession: Archaeologist (Maritime)
Date of Birth: 15 November 1965
Parent Firm: ACO Associates cc
Position in Firm: Senior Archaeologist
Years with Firm: 2.5
Years of experience: 29
Nationality: South African
HDI Status: n/a

Education:

1979-1983 Wynberg Boys' High School
1986 BA (Archaeology), University of Cape Town
1987 BA (Hons) (Archaeology), University of Cape Town
1990 Master of Arts, (Archaeology) University of Cape Town

Employment:

- September 2017 – present: ACO Associates, Senior Archaeologist and Consultant
- 2014-2017: South African Heritage Resources Agency, Manager: Maritime and Underwater Cultural Heritage Unit
- 2012-2018: Sea Change Heritage Consultants Limited, Director
- 2011-2012: TUV SUD PMSS (Romsey, United Kingdom), Principal Consultant: Maritime Archaeology
- 2009-2011: EMU Limited (Southampton, United Kingdom), Principal Consultant: Maritime Archaeology
- 2005-2009: Wessex Archaeology (Salisbury, United Kingdom), Project Manager: Coastal and Marine
- 1996-2005: National Monuments Council / South African Heritage Resources Agency, Maritime Archaeologist
- 1994-1996: National Monuments Council, Professional Officer: Boland and West Coast, Western Cape Office

Professional Qualifications and Accreditation:

- Member: Association of Southern African Professional Archaeologists (ASAPA) (No. 043)
- Principal Investigator: Maritime and Colonial Archaeology, ASAPA CRM Section
- Field Director: Stone Age Archaeology, ASAPA CRM Section
- Class III Diver (Surface Supply), Department of Labour (South Africa) / UK (HSE III)

Experience:

I have more than 30 years of professional archaeological and heritage management experience. After completing my postgraduate studies and a period of freelance archaeological work in South Africa and aboard, I joined the National Monuments Council (NMC) (now the South African Heritage Resources Agency (SAHRA)) in 1994. In 1996 I became the NMC's first full-time maritime archaeologist and in this regulatory role was responsible for the management and protection of underwater cultural heritage in South Africa under the National Monuments Act, and subsequently under the National Heritage Resources Act.

In 2005 I moved to the UK to join Wessex Archaeology, one of the UK's biggest archaeological consultancies, as a project manager in its Coastal and Marine Section. In 2009 I joined Fugro EMU Limited, a marine geosurvey company to set up their maritime archaeological section. I then spent a year at TUV SUD PMSS, an international renewable energy consultancy, where I again provided maritime archaeological consultancy services to principally the offshore renewable and marine aggregate industries.

In August 2012 I established Sea Change Heritage Consultants Limited, a maritime archaeological consultancy. Sea Change traded until 2018, providing archaeological services to a range of UK maritime sectors, including marine aggregates and offshore renewable energy. Relevant experience includes specialist archaeological consultancy for more than two dozen offshore renewable energy projects and aggregate extraction licence areas in UK waters including:

- Lynn and Inner Dowsing OWF;
- Humber Gateway OWF;
- Sheringham Shoal OWF;
- Race Bank OWF;
- Docking Shoal OWF;
- Triton Knoll OWF;
- Neart na Gaoithe OWF;
- Dogger Bank OWF;
- Hornsea OWF;
- Navitus Bay OWF;
- Aggregate Area 392/393, Hilbre Swash;
- Area 478, East English Channel;
- Area 372/1, North Nab;
- Areas 401 & 2;
- Area 466, North West Rough; and

- Area 447, Cutline.

In the UK I was also involved in strategic projects which developed guidance and best practice for the UK offshore industry with respect to the marine historic environment. This included the principal authorship of two historic environment guidance documents for COWRIE and the UK renewable energy sector (*Historical Environment Guidance for the Offshore Renewable Energy Sector* (2007) and *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector* (2010)). I was also manager and lead author in the development of the archaeological elements of the first Regional Environmental Assessments for the UK marine aggregates industry, and in the 2009 *UK Continental Shelf Offshore Oil and Gas and Wind Energy Strategic Environmental Assessment* for Department of Energy and Climate Change. More recently I undertook a review of the potential impacts of marine mining on South Africa's palaeontological and archaeological heritage resources for the Council for Geoscience, on behalf of the Department of Mineral Resources. In 2013-14 I was lead author and project co-ordinator on *The UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001: An Impact Review for the United Kingdom* and in 2016 I was co-author of a Historic England / Crown Estate / British Marine Aggregate Producers Association funded review of marine historic environment best practice guidance for the UK offshore aggregate industry.

I returned to South African in mid-2014 where I was re-appointed to my earlier post at SAHRA: Manager of the Maritime and Underwater Cultural Heritage Unit. In July 2016 I was appointed as Acting Manager of SAHRA's Archaeology, Palaeontology and Meteorites Unit.

I left SAHRA in September 2017 to join ACO Associates as Senior Archaeologist and Consultant. Since being at ACO I have carried out a number of offshore impact assessments (see list of recent projects below) and authored a review of the potential impacts of marine mining on South Africa's palaeontological and archaeological heritage for the Council for Geoscience, on behalf of the Department of Mineral Resources.

I have been a member of the Association of Southern African Professional Archaeologists (No. 043) for more than twenty years and am accredited by ASAPA's Cultural Resource Management section.

I have been a member of the ICOMOS International Committee for Underwater Cultural Heritage since 2000 and served as a member of its Bureau between 2009 and 2018.

Since 2010 I have been a member of the UK's Joint Nautical Archaeology Policy Committee.

I am a member of the Advisory Board of the George Washington University / Iziko Museums of South Africa / South African Heritage Resources Agency / Smithsonian Institution 'Southern African Slave Wrecks Project' and serve on the Heritage Western Cape Archaeology, Palaeontology and Meteorites Committee.

Selected Project Reports:

Gribble, J. 2017. *Archaeological Assessment of Farm No 8/851, Drakenstein*. Unpublished report prepared for Balwin Properties Pty Ltd. ACO Associates.

- Gribble, J. 2017. *Archaeological Assessment of Bosjes Phase 2, Farm 218 Witzenberg*. Unpublished report prepared for Farmprops 53 (Pty) Ltd. ACO Associates.
- Gribble, J. 2017. *Canal Precinct, V&A Waterfront: Heritage Impact Assessment*. Unpublished report prepared for Nicolas Baumann Urban Conservation and Planning. ACO Associates.
- Gribble, J. 2017. *Archaeological Assessment of the proposed dam on the farm Constantia Uitsig, Erven 13029 and 13030, Cape Town*. Unpublished report prepared for SLR Consulting (South Africa) (Pty) Ltd. ACO Associates.
- Gribble, J. 2017. *Archaeological Assessment of Erf 4722 Blouvillei, Wellington*. Unpublished report prepared for Urban Dynamics Western Cape (Pty) Ltd. ACO Associates.
- Hart, T.G., Gribble, J. & Robinson, J. 2017 *Heritage Impact Assessment for the Proposed Phezukomoya Wind Energy Facility to be Situated in the Northern Cape*. Unpublished report prepared for Arcus Consulting. ACO Associates.
- Hart, T.G., Gribble, J. & Robinson, J. 2017 *Heritage Impact Assessment for the Proposed San Kraal Wind Energy Facility to be Situated in the Northern Cape*. Unpublished report prepared for Arcus Consulting. ACO Associates.
- Gribble, J. 2018. *Integrated Heritage Impact Assessment of the Peter Falke Winery on Farm 1558 Groenvlei, Stellenbosch*. Unpublished report prepared for Werner Nel Environmental Consulting Services. ACO Associates.
- Gribble, J. & Halkett, D. 2018. *Heritage Impact Assessment for a Proposed Extension of the Kaolin Mine on Portion 1 of the Farm Rondawel 638, Namaqualand District, Northern Cape*. Unpublished report prepared for Rondawel Kaolien (Pty) Ltd. ACO Associates.
- Gribble, J. 2019. *Archaeological Impact Assessment for Proposed Sand Mining on Portion 2 of Farm Kleinfontein 312, Klawer District, Western Cape*. Unpublished report prepared for Green Direction Sustainability Consulting (Pty) Ltd. ACO Associates.
- Halkett, D. & Gribble, J. 2018. *Archaeological/Heritage Report for the Expansion of the Current Granite Mining at Oeranoep and Ghaams, Northern Cape Province*. Unpublished report prepared for Klaas Van Zyl. ACO Associates.
- Gribble, J. 2018. *Potential Impacts of Marine Mining on South Africa's Palaeontological and Archaeological Heritage*. Report prepared for Council for Geoscience. ACO Associates.
- Gribble, J. 2018. *Maritime Heritage Impact Assessment: Block ER236, Proposed Exploration Well Drilling*. Unpublished report prepared for ERM Southern Africa (Pty) Ltd. ACO Associates.
- Gribble, J. 2018. *Maritime Heritage Impact Assessment: IOX Cable Route*. Unpublished report prepared for ERM Southern Africa. ACO Associates.
- Gribble, J. 2018. *Archaeological Assessment of the Terrestrial Portion of the IOX Cable Route*. Unpublished report prepared for ERM Southern Africa. ACO Associates.

- Gribble, J. 2018. *Archaeological Assessment: Erven 11122, 11123, 11124, 11125, 11126, 11127 and Re 11128, Corner Frere Street and Albert Road, Woodstock, Cape Town.* Unpublished report prepared for Johan Cornelius. ACO Associates.
- Gribble, J. 2018. *Maritime Heritage Impact Assessment: Expansion of Diamond Coast Aquaculture Farm on Farm 654, Portion 1, Kleinzee, Northern Cape.* Unpublished report prepared for ACRM. ACO Associates.
- Gribble, J. 2018. *Heritage Impact Assessment: Ship Repair Facility, Port of Mossel Bay.* Unpublished report prepared for Nema Consulting. ACO Associates.
- Gribble, J. 2018. *Archaeological Assessment: Sites B and C, Portswood Ridge Precinct, V&A Waterfront.* Unpublished report prepared for Urban Conservation. ACO Associates.
- Gribble, J. 2018. *Heritage Impact Assessment: Zandrug, Farm Re 9/122, Cederberg.* Unpublished report prepared for Cederberg Environmental Assessment Practice. ACO Associates.
- Gribble, J. and Hart, T.G. 2018. *Initial Assessment Report and Motivation for Exploratory Permit, Erf 4995, corner of Waterfall and Palace Hill Roads, Simonstown.* Unpublished report prepared for Regent Blue Sayers' Lane (Pty) Ltd. ACO Associates.
- Gribble, J. and Hart, T.G. 2018. *Initial investigation report with respect to human remains found at Erf 4995, corner of Waterfall and Palace Hill Roads, Simonstown.* Unpublished permit report prepared for Regent Blue Sayers' Lane (Pty) Ltd. ACO Associates.
- Gribble, J. 2019. *Maritime Heritage Impact Assessment: ASN Africa METISS Subsea Fibre Optic Cable System.* Unpublished report prepared for ERM Southern Africa. ACO Associates.
- Gribble, J. 2019. *Maritime Archaeological Impact Assessment of Proposed Aquaculture Areas 1, 6 And 7, Algoa Bay, Eastern Cape Province.* Unpublished report prepared for Anchor Research & Monitoring (Pty) Ltd. ACO Associates.
- Gribble, J. 2019. *Heritage Impact Assessment: Rooilandia Farm Dam, Pipeline and New Irrigation Areas.* Unpublished report prepared for Cornerstone Environmental Consultants. ACO Associates.
- Gribble, J. 2019. *Maritime Archaeological Impact Assessment of Proposed Equiano Cable System, landing at Melkbosstrand, Western Cape Province.* Unpublished report prepared for Acer (Africa) Environmental Consultants. ACO Associates.
- Gribble, J. 2019. *Heritage Baseline for Prospecting Right Applications: Sea Concession Areas 14b, 15b and 17b, West Coast, Western Cape Province.* Unpublished report prepared for SLR Consulting. ACO Associates.
- Gribble, J. & Euston-Brown, G.L. 2019. *Archaeological Amendment Report: San Kraal Wind Energy Facility, Noupoort, Northern Cape.* Unpublished report prepared for Arcus Consulting. ACO Associates.

- Gribble, J. & Euston-Brown, G.L. 2019. *Archaeological Amendment Report: Phezukomoya Wind Energy Facility, Noupoot, Northern Cape*. Unpublished report prepared for Arcus Consulting. ACO Associates.
- Gribble, J. & Euston-Brown, G.L. 2019. *Archaeological Amendment Report: Hartebeeshoek West Wind Energy Facility, Noupoot, Northern Cape*. Unpublished report prepared for Arcus Consulting. ACO Associates.
- Gribble, J. & Euston-Brown, G.L. 2019. *Archaeological Amendment Report: Hartebeeshoek East Wind Energy Facility, Noupoot, Northern Cape*. Unpublished report prepared for Arcus Consulting. ACO Associates.
- Gribble, J. & Euston-Brown, G.L. 2019. *Heritage Assessment: Infrastructure Associated with the San Kraal, Phezukomoya and Hartebeeshoek East and West Wind Energy Facilities, Noupoot, Northern Cape*. Unpublished report prepared for Arcus Consulting. ACO Associates.

Publications:

- Gribble, J. and Scott, G., 2017, *We Die Like Brothers: The sinking of the SS Mendi*, Historic England, Swindon.
- Sharfman, J., Boshoff, J. and Gribble, J. 2017. Benefits, Burdens, and Opportunities in South Africa: The Implications of Ratifying the 2001 UNESCO Convention on the Protection of Underwater Cultural Heritage, in L. Harris (ed) *Sea Ports and Sea Power: African Maritime Cultural Landscapes*, Springer International Publishing, Switzerland, pp 101-110.
- Lloyd Jones, D., Langman, R., Reach, I., Gribble, J., and Griffiths, N., 2016, Using Multibeam and Sidescan Sonar to Monitor Aggregate Dredging, in C.W. Finkl and C. Makowski (eds) *Seafloor Mapping along Continental Shelves: Research and Techniques for Visualizing Benthic Environments*, Coastal Research Library 13, Springer International Publishing, Switzerland, pp 245-259.
- Athiros, G. and Gribble, J., 2015, *Wrecked at the Cape Part 2*, The Cape Odyssey 105, Historical Media, Cape Town.
- Gribble, J. and Sharfman, J., 2015, The wreck of SS Mendi (1917) as an example of the potential trans-national significance of World War I underwater cultural heritage, *Proceedings of the UNESCO Scientific Conference on the Underwater Cultural Heritage from World War I*, Bruges, 26-28 June 2014.
- Gribble, J., 2015, Underwater Cultural Heritage and International Law. Cambridge by Sarah Dromgoole, in *South African Archaeological Bulletin*, 70, 202, pp 226-227.
- Athiros, G. and Gribble, J., 2014, *Wrecked at the Cape Part 1*, The Cape Odyssey 104, Historical Media, Cape Town.
- Gribble, J., 2014, Learning the Hard Way: Two South African Examples of Issues Related to Port Construction and Archaeology, in *Dredging and Port Construction: Interactions*

with Features of Archaeological or Heritage Interest, *PIANC Guidance Document 124*, pp 97-107.

UK UNESCO 2001 Convention Review Group, 2014, *The UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001: An Impact Review for the United Kingdom*, ISBN 978-0-904608-03-8.

Sadr, K., Gribble, J. and Euston-Brown, G, 2013, Archaeological survey on the Vredenburg Peninsula, in Jerardino et al. (eds), *The Archaeology of the West Coast of South Africa*, BAR International Series 2526, pp 50-67.

Gribble, J. and Sharfman, J, 2013, Maritime Legal Management in South Africa, *Online Encyclopaedia of Global Archaeology*, pp 6802-6810.

Gribble, J., 2011, The UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001, *Journal of Maritime Archaeology* 6:1 77-86.

Gribble, J., 2011, The SS Mendi, the Foreign Labour Corps and the trans-national significance of shipwrecks, in J. Henderson (ed.): *Beyond Boundaries, Proceedings of IKUWA 3, The 3rd International Congress on Underwater Archaeology*, Römisch-Germanische Kommission (RGK), Frankfurt.

Gribble, J., 2011, Competence and Qualifications, in Guèrin, U., Egger, B. and Maarleveld, T. (eds) *UNESCO Manual for Activities directed at Underwater Cultural Heritage*, UNESCO - Secretariat of the 2001 Convention, Paris.

Gribble, J. and Leather, S. for EMU Ltd., 2010, *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector*. Commissioned by COWRIE Ltd (Project reference GEOARCH-09).

Sadr, K and Gribble, J., 2010, The stone artefacts from the Vredenburg Peninsula archaeological survey, west coast of South Africa, *Southern African Humanities* 22: 19–88.

Gribble, J., 2009, HMS Birkenhead and the British warship wrecks in South African waters in *Proceedings of the Shared Heritage Seminar*, University of Wolverhampton, 8 July 2008.

Gribble, J., Parham, D. and Scott-Ireton, D., 2009, Historic Wrecks: Risks or Resources? In *Conservation and Management of Archaeological Sites*, Vol. 11 No. 1, March, 2009, 16–28.

Gribble, J. and Athiros, G., 2008, *Tales of Shipwrecks at the Cape of Storms*, Historical Media, Cape Town.

Gribble, J., 2008, The shocking story of the ss Mendi, in *British Archaeology*, March/April 2008.

Gribble, J., 2007, The Protection of the Underwater Cultural Heritage: National Perspectives in light of the UNESCO Convention 2001 by Sarah Dromgoole, in *The International Journal of Nautical Archaeology*, 36, 1, pp 195-6.

- Gribble, J., 2006, The Sad Case of the ss Maori, in Grenier, R., D. Nutley and I. Cochran (eds) *Underwater Cultural Heritage at Risk: Managing Natural and Human Impacts*, pp 41-43, ICOMOS, Paris.
- Gribble, J., 2006, Pre-Colonial Fish Traps on the South Western Cape Coast, South Africa, in Grenier, R., D. Nutley and I. Cochran (eds) *Underwater Cultural Heritage at Risk: Managing Natural and Human Impacts*, pp 29-31, ICOMOS, Paris.
- Forrest, C.S.J., and Gribble, J., 2006, The illicit movement of underwater cultural heritage: The case of the Dodington coins, in *Art and Cultural Heritage: Law, Policy and Practice*, (ed B.T. Hoffman), New York, Cambridge University Press.
- Forrest, C.S.J., and Gribble, J., 2006, Perspectives from the Southern Hemisphere: Australia and South Africa, in *The UNESCO Convention for the Protection of the Underwater Heritage: Proceedings of the Burlington House Seminar*, October 2005, JNAPC / NAS.
- Gribble, J., 2003, "Building with Mud" – Developing historical building skills in the Karoo, in ICOMOS South Africa, in *The Proceedings of Symposium on Understanding and using urban heritage in the Karoo*, Victoria West, South Africa, 3-5 March 2002.
- Forrest, C.S.J., and Gribble, J., 2002, The illicit movement of underwater cultural heritage: The case of the Dodington coins, *International Journal of Cultural Property*, Vol II (2002) No 2, pp 267-293.
- Gribble, J. 2002, The Past, Present and Future of Maritime Archaeology in South Africa, *International Handbook of Underwater Archaeology* (eds Ruppe and Barstad), New York, Plenum Press.
- Thackeray, F. and Gribble, J., 2001, Historical Note on an Attempt to Salvage Iron from a Shipwreck, *Looking Back*, Vol 40, November 2001, pp 5-7.
- Gribble, J., 1998, Keeping Our Heads Above Water – the development of shipwreck management strategies in South Africa, *AIMA Bulletin*, Vol 22, pp 119-124.
- Gribble, J. 1996, Conservation Practice for Historical Shipwrecks, Monuments and Sites of South Africa, Colombo, Sri Lanka, ICOMOS 11th General Assembly.
- Gribble, J. 1996, National Databases on Monuments and Sites, Monuments and Sites of South Africa, Colombo, Sri Lanka, ICOMOS 11th General Assembly.
- Sadr, K, Gribble, J, & Euston-Brown, G L, 1992 The Vredenburg Peninsula survey, 1991/1992 season, *Guide to Archaeological Sites in the South-western Cape, Papers compiled for the South African Association of Archaeologists Conference*, July 1992, by A.B. Smith & B. Mutti, pp 41-42.
- Smith, AB, Sadr, K, Gribble, J, & Yates, R., 1992 Witklip and Posberg Reserve, *Guide to Archaeological Sites in the South-western Cape, Papers compiled for the South African Association of Archaeologists Conference*, July 1992, by A.B. Smith & B. Mutti, pp 31-40.

Smith, AB, Sadr, K, Gribble, J & Yates, R., 1991, Excavations in the south-western Cape, South Africa, and the archaeological identity of prehistoric hunter-gatherers within the last 2000 years, *The South African Archaeological Bulletin* 46: 71-91.