Heritage Assessment: Infrastructure Associated with the San Kraal, Phezukomoya and Hartebeesthoek East and West Wind Energy Facilities, Noupoort, Northern Cape

(Assessment conducted under Section 38 (8) of the National Heritage Resources Act as part of a Basic Assessment)

Report prepared for Arcus Consultancy Services SA (Pty) Ltd

On behalf of EDF Renewables (South Africa) (Pty) Ltd

15 August 2019

Version 2.2 - Final

Prepared by

John Gribble (MA)

Gail Euston-Brown (BA)

ACO Associates CC
8 Jacobs Ladder
St James
7945
Phone 021 7064104
<table>
<thead>
<tr>
<th>Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6</th>
<th>Section of Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;</td>
<td>Pages 4-10</td>
</tr>
<tr>
<td>(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;</td>
<td>Page 11</td>
</tr>
<tr>
<td>(c) an indication of the scope of, and the purpose for which, the report was prepared;</td>
<td>Section 1</td>
</tr>
<tr>
<td>(cA) an indication of the quality and age of base data used for the specialist report;</td>
<td>Section 3</td>
</tr>
<tr>
<td>(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;</td>
<td>Section 2.1, Section 7, Section 10</td>
</tr>
<tr>
<td>(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;</td>
<td>Section 3</td>
</tr>
<tr>
<td>(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;</td>
<td>Section 3</td>
</tr>
<tr>
<td>(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;</td>
<td>Sections 7 &amp; 8, Figures 1</td>
</tr>
<tr>
<td>(g) an identification of any areas to be avoided, including buffers;</td>
<td>Section 7</td>
</tr>
<tr>
<td>(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;</td>
<td>Figures 6 &amp; 8</td>
</tr>
<tr>
<td>(i) a description of any assumptions made and any uncertainties or gaps in knowledge;</td>
<td>Section 3.4</td>
</tr>
<tr>
<td>(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;</td>
<td>Section 7</td>
</tr>
<tr>
<td>(k) any mitigation measures for inclusion in the EMPr;</td>
<td>Section 11</td>
</tr>
<tr>
<td>(l) any conditions for inclusion in the environmental authorisation;</td>
<td>N/A</td>
</tr>
<tr>
<td>(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;</td>
<td>N/A</td>
</tr>
<tr>
<td>(n) a reasoned opinion—</td>
<td>Section 12</td>
</tr>
<tr>
<td>i. as to whether the proposed activity, activities or portions thereof should be authorised;</td>
<td></td>
</tr>
<tr>
<td>iA. Regarding the acceptability of the proposed activity or activities; and</td>
<td></td>
</tr>
<tr>
<td>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;</td>
<td></td>
</tr>
<tr>
<td>(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and</td>
<td>N/A</td>
</tr>
<tr>
<td>(p) any other information requested by the competent authority</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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.
Details of the Heritage Practitioner

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.

Unit D17, Prime Park, Mocke Road, Diep River, Cape Town, 7800

Email: john.gribble@aco-associates.com
Phone: 021 706 4104
Fax: 086 6037195
Curriculum Vitae

Name: John Gribble

Profession: Archaeologist

Date of Birth: 15 November 1965

Parent Firm: ACO Associates cc

Position in Firm: Senior Archaeologist

Years with Firm: 22 months

Years of experience: 28

Nationality: South African

HDI Status: n/a

Education:

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:

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

Professional Qualifications and Accreditation:

- Member: Association of Southern African Professional Archaeologists (No. 043)
- Principal Investigator: Maritime and Colonial Archaeology, ASAPA CRM Section
- Field Director: Stone Age Archaeology, ASAPA CRM Section
Experience:

I have nearly 30 years of combined archaeological and heritage management experience. After completing my postgraduate studies, which were focussed on the vernacular architecture of the West Coast, 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. As the Heritage Officer: the Boland I was involved in day to day historical building control and heritage resources management across the region. In 1996 I become the NMC’s first full-time maritime archaeologist in which 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 based in Southampton to set up their maritime archaeological section. I then spent a year at TUV SUD PMSS, an international renewable energy consultancy based in Romsey, where I again provided maritime archaeological consultancy services to principally the offshore renewable and marine aggregate industries.

In August 2012 I set up Sea Change Heritage Consultants Limited, a maritime archaeological consultancy. Sea Change provides archaeological services to a range of UK maritime sectors, including marine aggregates and offshore renewable energy. It also actively pursues opportunities to raise public awareness and understanding of underwater cultural heritage through educational and research projects and programmes, including some projects being developed in South Africa.

Projects include specialist archaeological consultancy for more than 15 offshore renewable energy projects and more than a dozen offshore aggregate extraction licence areas.

In addition to managing numerous UK development-driven archaeological projects, I have also been involved in important strategic work which developed guidance and best practice for the offshore industry with respect to the marine historic environment. This has included the principal authorship of two historic environment guidance documents for COWRIE and the UK renewable energy sector, and the development of the archaeological elements of the first Regional Environmental Assessments for the UK marine aggregates industry. In 2013-14 I was lead author and project co-ordinator on the Impact Review for the United Kingdom of the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage. 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 also appointed 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.
I have been a member of the ICOMOS International Committee for Underwater Cultural Heritage since 2000 and have served as a member of its Bureau since 2009. I am currently the secretary of the Committee.

I have been a member of the Association of Southern African Professional Archaeologists for more than twenty years and am accredited by ASAPA’s CRM section. I was a member of the UK’s Chartered Institute for Archaeologist’s (CIfA) between 2005 and 2018, and served on the committee of its Maritime Affairs Group between 2008 and 2010. Since 2010 I have been a member of the UK’s Joint Nautical Archaeology Policy Committee.

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

Books and Publications:


DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

(For official use only)

File Reference Number: 
NEAS Reference Number: 
Date Received: 

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE
San Kraal and Phezukomoya WEFs: Basic Assessment Application

Kindly note the following:
1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details
Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

Details of Specialist, Declaration and Undertaking Under Oath
1. SPECIALIST INFORMATION

<table>
<thead>
<tr>
<th>Specialist Company Name: ACO Associates</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-BBEE:</td>
</tr>
<tr>
<td>Contribution level (indicate</td>
</tr>
<tr>
<td>1 to 8 or non-compliant)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Specialist name: John Gribble</td>
</tr>
<tr>
<td>Specialist Qualifications: MA Archaeology</td>
</tr>
<tr>
<td>Professional affiliation/registration: Member ASAPA (#043)</td>
</tr>
<tr>
<td>Physical address: Unit D17, Prime Park, 21 Mocke Road, Diep River</td>
</tr>
<tr>
<td>Postal address: As above</td>
</tr>
<tr>
<td>Postal code: 7800 Cell: Not available</td>
</tr>
<tr>
<td>Telephone: 021 706 4104 Fax: 078 616 2961</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:john.gribble@aco-associates.com">john.gribble@aco-associates.com</a></td>
</tr>
</tbody>
</table>

2. DECLARATION BY THE SPECIALIST

I, John Gribble, declare that –

- 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

ACO Associates cc

Name of Company:

13 August 2013

Date

Details of Specialist, Declaration and Undertaking Under Oath
3. **UNDERTAKING UNDER OATH/ AFFIRMATION**

I, _John Gribble_, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

[Signature]

Signature of the Specialist

ACO Associates cc

Name of Company

13 August 2019

Date

[Signature]

Signature of the Commissioner of Oaths

214-08-14

Date

**SUID-AFRIKAANSE POLISIEDIEN**

DIST.3

STASIEBEVELVOERDER

14 AUG 2019

STATION COMMANDER

DIEPrukK. PIC.P

SOUTH AFRICAN POLICE SERVICE
Executive Summary

The San Kraal and Phezukomoya Wind Energy Facilities (WEFs) located outside the town of Noupooort in the Northern Cape Province received Environmental Authorisation from the Department of Environmental Affairs in June 2018.

EDF Renewables (South Africa) (Pty) Ltd are proposing to amend the approved San Kraal and Phezukomoya WEFs by splitting each facility into two, smaller WEFs (Hartebeeshoek East and West respectively), and changing the layout and turbine specifications of each of the resultant four WEFs.

The proposal to divide the San Kraal and Phezukomoya WEFs into the four smaller entities (San Kraal, Phezukomoya, Hartebeeshoek West and Hartebeeshoek East), requires an application by EDF Renewables for the development of additional infrastructure related to the grid connections for the four WEFs.

This includes a collector substation within the approved preferred grid corridor, an expansion to the approved San Kraal 132 kV substation, 400 kV turn in Options A and/ or B at the Eskom Hydra D substation, a 132 kV overhead line HBH Corridor to transfer electricity from the San Kraal substation to the collector substation or the Eskom Hydra D substation, two additional access points to the WEFs off of the N9 and a future access point on both sides of the N10 specifically for grid access when the line is built. A number of new step up and switching substations and overhead lines are also proposed on the four WEFs.

These project components are the subject of this Basic Assessment, which is based on a combination of information from published archaeological reports, unpublished archaeological, heritage and palaeontological impact assessments for the general area and from data collected in the field by ACO Associates in 2017 and 2019.

Although the inaccessibility of some areas and time constraints meant that the proposed project elements could not be fully surveyed, the surveys did cover much of the area that will be occupied by the four proposed WEFs and their associated infrastructure and provided a good baseline understanding of the archaeological potential of the affected area. This is generally very low with sparse and limited occurrences of archaeological sites and material recorded in the area.

Palaeontological assessments for the San Kraal and Phezukomoya WEFs were conducted by Dr John Almond as part of the 2017 EIA process and provided a comprehensive assessment of the palaeontological potential of the area covered by the WEFs and their grid connection infrastructure. A new palaeontological assessment was not commissioned for this Basic Assessment as the scope and findings of the 2017 assessment remain valid for this study.

When the information gathered is viewed in combination with the results of the previous archaeological work in the area, the confidence in the findings set out later in this report is high.

Findings:

The archaeological fieldwork for this project identified a small number of archaeological and historical occurrences and sites: some surface scatters of patinated hornfels stone artefacts
of MSA origin, found in or associated with eroded, deflated, non-vegetated areas in contexts very similar to those reported for other projects in the area, and colonial period packed stone kraals and other structures. The pre-colonial lithic scatters are considered to be in secondary, deflated context, and seems to be indicative of a type of low level, widespread occurrence of pre-colonial lithics that covers the entire landscape. No stratified sites were located, and no cultural material other than stone was found during this assessment.

The palaeontological assessments identified three areas of paleontological sensitivity, none of which will be impacted by the activities covered by this report. Any excavations into the bedrock the high rocky plateau areas of the Kikvorsberge, however, have the potential to affect fossiliferous sediments of the Katberg Formation (Upper Beaufort Group / Tarkastad Subgroup, Karoo Supergroup) of earliest Triassic age. Similarly, Latest Permian sediments of the underlying Balfour Formation crop out along the foot of the escarpment, at elevations similar to that of the proposed collector substation, Phezukomoya temporary batching plant 2 and the additional access points and may be impacted by bedrock excavations there. These latter sediments are, however, generally mantled by a thick apron of colluvium and alluvium.

None of the heritage sites or occurrences identified in this assessment will be directly affected by the construction and installation of various collector, step up and switching substations or by the overhead lines and no site-specific mitigation is thus proposed.

Any impacts on currently unidentified heritage resources arising from the activities covered in this report will be limited to the footprint of any disturbance and thus localised in extent. The likelihood of new sites or material being found during earthworks is considered to be extremely low.

In respect of cumulative impacts, the comparative assessment of several wind and solar energy projects in the area indicates that the cumulative impacts on archaeological resources will be of low consequence for WEFs and tolerable for solar energy facilities with their more intensive impacts on the land within their footprints. The significance of cumulative impacts on palaeontological resources, given the comparatively small combined footprint of the alternative energy projects considered and the very extensive outcrop areas of the Balfour and Katberg Formations, is assessed to be low.

Provided that the general mitigation measures recommended for both archaeological and palaeontological resources in this report are implemented, the overall impact of construction and installation of the proposed infrastructure on archaeological and colonial period heritage resources is tolerable and generally of low significance. Similarly, it is likely that any potentially negative impacts of the proposed developments on local fossil resources will be substantially reduced. Furthermore, these impacts will be partially offset by the positive impact represented by our increased understanding of the palaeontological heritage of the Great Karoo region.

From a heritage perspective, therefore, the proposals are considered acceptable, and the application can be authorised.
Table of Contents

Curriculum Vitae .............................................................................................................. 5
Specialist Declaration of Interest ....................................................................................... 10
Executive Summary .......................................................................................................... 12
  Findings: ......................................................................................................................... 12
Glossary ............................................................................................................................. 17
Abbreviations .................................................................................................................... 17
1  Introduction .................................................................................................................. 18
   Terms of Reference ....................................................................................................... 18
2  Legislation ..................................................................................................................... 19
3  Site Location .................................................................................................................. 20
4  Method .......................................................................................................................... 23
   Desk-Based Assessment ............................................................................................... 23
   Archaeological Field Survey ........................................................................................ 23
   Palaeontological Assessment ....................................................................................... 25
   Restrictions and Assumptions ...................................................................................... 25
5  Palaeontological Background to the Study Area .......................................................... 25
6  Archaeological Background to the Study Area ............................................................. 27
   Previous Archaeological Assessments in the Area ....................................................... 30
7  The Landscape of Colonial Settlement ......................................................................... 31
8  Heritage Sensitivities .................................................................................................... 32
    Palaeontology ............................................................................................................... 32
    Archaeology and Colonial Period Heritage Sites ....................................................... 33
9  Potential Impacts Relating to the Proposed WEF Grid Infrastructure ......................... 38
   Nature of Impacts on Heritage Resources .................................................................... 38
   Extent of impacts on Heritage Resources .................................................................... 39
   Significance of Impacts on Heritage Resources ........................................................... 39
9.1  Impact Assessment ..................................................................................................... 40
    Impacts of the Collector, Step Up and Switching Substations ................................... 40
      9.1.1 Impacts on Palaeontology ................................................................................. 40
      9.1.2 Impacts on Archaeology and Colonial Period Heritage Sites ....................... 41
    Impacts of the Grid Connection Route and Additional Access Points ..................... 42
      9.1.3 Impacts on Palaeontology ................................................................................. 42
      9.1.4 Impacts on Archaeology and Colonial Period Heritage Sites ....................... 43
<table>
<thead>
<tr>
<th>10</th>
<th>Cumulative Impacts</th>
<th>44</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Mitigation</td>
<td>46</td>
</tr>
<tr>
<td>12</td>
<td>Conclusions and Recommendations</td>
<td>47</td>
</tr>
<tr>
<td>13</td>
<td>References</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Appendix A: Grading Categories</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Appendix B: Details of Recorded Archaeological Sites and Occurrences</td>
<td>52</td>
</tr>
</tbody>
</table>

**Figure 1:** The extents of the proposed Phezukomoya (orange), San Kraal (green), Hartebeesthoek East (dark blue) and Hartebeesthoek West (purple) WEFs with the amended 2019 WTG layouts, road/cable alignments (black), and approved (yellow) and proposed (light blue) infrastructure and grid connection routes (Source: Google Earth) ...... 21

**Figure 2:** Combined 2017 (yellow) and 2019 (blue) track plots for ACO surveys of the Phezukomoya (orange), San Kraal (green), Hartebeesthoek East (blue) and Hartebeesthoek West (purple) WEFs and associated infrastructure. Archaeological findspots are also shown (Source: Google Earth) ........................................................................................................... 24

**Figure 3:** Location of the area surveyed for the Zeekoei Valley Archaeological Project (hatched green) shown in relation to the San Kraal, Phezukomoya, Hartebeesthoek West and Hartebeesthoek East WEFs and their infrastructure (after Sampson 1985) .................. 28

**Figure 4:** Palaeontologically sensitive area (red polygon) containing fossil burrows of prehistoric vertebrates along a stream bed located within the preferred grid connector corridor ........................................................................................................... 33

**Figure 5:** Palingkloof Member buffer zones (yellow hatched areas) proposed by Almond (2017a & b) in relation to project elements assessed in this report. The red hatched area (bottom left) is the vertebrate burrow buffer ........................................................................................................... 35

**Figure 6:** Location of sites JG041-045 and GEB010-011 found in deflated areas north of collector substation (light blue polygon) and grid connector route (light blue dotted line). The future access points are shown as the light blue star and the approved grid connector route is the yellow line ................................................................. 36

**Figure 7:** Location of the ruined historical farm complex (JR003-004, JR006-007) on San Kraal in relation to the proposed 33/132 kV step up substation .......................................................... 38

**Plate 1:** View of landscape typical of the Kikvorsberge. The Mainstream Noupoort WEF is visible in the mountain top at the centre of the image .................................................................................. 22

**Plate 2:** View of high plateau landscape of undulating grassland and exposed rocky platforms typical of that at the location of the proposed 33/132kV Hartebeesthoek substation ......................................................... 22

**Plate 3:** View across valley bottom towards the proposed location of the collector substation (position marked by arrow) and N10 access points. The approximate alignment of the grid connection route is indicated with the yellow arrow .................................................................................. 23

**Plate 4:** Sampson’s climate model. Note that the shaded areas to the right of the cold/warm divide are those during which human occupation of the Zeekoei Valley (and environs) is predicted (Source: Sampson 1985) .................................................................................. 29
Plate 5: Example of deflated area with MSA lithics at sites JG041-045 and GEB010-011. The converter substation is located below the hills in the distance.

Plate 6: Example of the heavily patinated lithics recorded on sites JG041-045 and GEB010-011.
Glossary

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

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 20 000 years ago.

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

Hornfels: Contact metamorphic rock that has been baked and hardened by the heat of intrusive igneous rock.

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

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

Pan: A shallow depression in the landscape that accumulates water from time to time.

Smithfield: South African Later Stone Age lithic industry found mainly in the interior and characterised by tools made principally on hornfels.

Abbreviations

ECPHRA Eastern Cape Provincial Heritage Resources Authority
ESA Early Stone Age
GPS Global Positioning System
HIA Heritage Impact Assessment
LSA Later Stone Age
MSA Middle Stone Age
NHRA National Heritage Resources Act
SAHRA South African Heritage Resources Agency
WEF Wind Energy Facility
WTG Wind Turbine Generator
1 Introduction

The San Kraal and Phezukomoya Wind Energy Facilities (WEFs) located outside Noupoort in the Northern Cape received Environmental Authorisation from the Department of Environmental Affairs in June 2018.

EDF Renewables (South Africa) (Pty) Ltd (EDF Renewables) wishes to amend the approved San Kraal and Phezukomoya WEFs by splitting each facility into two smaller WEFs (Hartebeeshoek East and West respectively) and changing the layout and turbine specifications of each of the resultant four WEFs. The proposed changes to the approved San Kraal and Phezukomoya WEFs are the subject of a current EA amendment application.

The Environmental Authorisation for the San Kraal and Phezukomoya WEFs included the following infrastructure associated with the grid connection:

- On-site switching stations;
- On-site substations and OMS areas;
- Overhead powerlines between the on-site switching stations and substations;
- Batching plant, temporary laydown and construction compound areas;
- A 132 kV high voltage overhead power line from the on-site substations to the proposed 400 kV Umsobombvu substation; and
- Turn-in options at the Eskom MTS substation (see Figure 1).

The proposal to divide the San Kraal and Phezukomoya WEFs into the four smaller entities (San Kraal, Phezukomoya, Hartebeeshoek West and Hartebeeshoek East), requires an application by EDF Renewables for the development of additional infrastructure related to the grid connections for the four WEFs. This infrastructure is the subject of this Basic Assessment and is described in the following section.

Terms of Reference

ACO Associates was appointed by Arcus Consultancy Services SA (Pty) Ltd (Arcus) in 2019 to produce an archaeological and palaeontological Basic Assessment report for the following additional infrastructure for the proposed San Kraal, Phezukomoya, Hartebeeshoek West and Hartebeeshoek East WEFs:

- A collector substation located 5 km from the Hydra D substation on farm RE/118 and within the previously approved 132 kV OHL corridor. If approved, for Option A of the four WEFs (see below), all approved grid corridors will converge on this collector substation from where electricity will be transferred via a 132 kV line to the Hydra D substation;
- A proposed expansion to the approved San Kraal substation;
- 400 kV turn in Options A and/ or B at the Eskom Hydra D substation;
- A 132 kV OHL HBH Corridor to transfer electricity from the San Kraal substation to the collector substation or the Eskom Hydra D substation; and
- Two additional access points to the WEFs off of the N9 and a future access point on both sides of the N10 specifically for grid access when the line is built (see Figure 1).

The following infrastructure for approval specific to each WEF is also considered in this report (see Figure 1):
San Kraal:
- A 132 kV step up substation located approximately 2 km north-east of the approved San Kraal substation;
- A 132 kV OHL within the approved site which will transfer electricity from the 132 kV step up substation to the approved San Kraal substation; and
- A 132 kV OHL within the approved site which will transfer electricity from the San Kraal substation to the approved Phezukomoya substation.

Phezukomoya:
- A temporary Phezukomoya batching plant;
- An additional Phezukomoya substation located to the east of the approved Phezukomoya substation;
- A 132 kV OHL within the approved site which will transfer electricity from the proposed additional Phezukomoya substation to the approved Phezukomoya substation; and
- A 132 kV OHL within the approved site which will transfer electricity from the approved Phezukomoya substation to the San Kraal substation.

Hartebeesthoek West:
- The relocation of the Hartebeesthoek West switching station from the location approved as part of the original EA for Phezukomoya WEF to a position approximately 2.5 km south-west of the San Kraal substation;
- A 132 kV OHL within the approved site which will transfer electricity from the proposed Hartebeesthoek West switching substation to the San Kraal substation; and
- A 132 kV OHL within the approved site which will transfer electricity from the San Kraal substation to the approved Phezukomoya substation.

Hartebeesthoek East:
- Hartebeesthoek East on-site substation located approximately 2.3 km south-east of the San Kraal substation expansion;
- A 132 kV OHL within the approved site which will transfer electricity from the proposed Hartebeesthoek East on-site substation to the San Kraal substation; and
- A 132 kV OHL within the approved site which will transfer electricity from the proposed Hartebeesthoek East on-site substation to the approved Phezukomoya substation.

This Basic Assessment forms part of the EIA process, as determined by the National Environmental Management Act (No. 107 of 1998), as amended and the Environmental Impact Assessment (EIA) Regulations of 2014, as amended. It is required to identify potential heritage resources which may be impacted during the construction, operation and decommissioning phases of the project, to assess their significance and to provide recommendations for mitigation.

2 Legislation
The basis for all heritage impact assessment is the National Heritage Resources Act (No. 25 of 1999) (NHRA). The Act defines certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa, the law is directed towards
the protection of human-made heritage, although places and objects of scientific importance are also covered by the Act. The NHRA also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage which must be considered in any heritage assessment includes:

- Buildings and structures (greater than 60 years of age);
- Archaeological sites (greater than 100 years of age);
- Palaeontological sites and specimens;
- Shipwrecks and aircraft wrecks (greater than 60 years of age);
- Graves and graveyards; and
- Cultural landscapes.

Section 38 of the NHRA requires Heritage Impact Assessments (HIA’s) for the following kinds of development which are relevant to this proposal:

- The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length; and
- Any development or other activity which will change the character of a site exceeding 5000 m² in extent.

Site Location
The proposed substations, grid connection and access points that are the subject of this assessment are located on and around the mountains of a sandstone escarpment known locally as the Kikvorsberge, between approximately 11 km and 18 km south of Noupoort (Figure 1 and Plate 1). The project elements straddle the Northern Cape/ Eastern Cape provincial boundary.

The San Kraal substation extension and switching station, Phezukomoya and Hartebeespoort West substations, Hartebeespoort East switching station and 400 kV turn in Options A and B are situated on a high plateau of undulating grassland lying more than 1700 m above sea level (Plate 2), while the collector substation, Phezukomoya batching plant and additional access points are located in a valley bottom below the surrounding mountains (Plate 3). The proposed OHL routes traverse both types of terrain.

The area is sparsely populated and rural: sheep and cattle farming being the primary occupation of local farmers. Aside from the Mainstream Noupoort WEF and the railway infrastructure at Noupoort, there is little non-agricultural development in the area. In the winter months, the Kikvorsberge can be exceptionally cold but are windy and exposed year-round.
Figure 1: The extents of the proposed Phezukomoya (orange), San Kraal (green), Hartebeesthoek East (dark blue) and Hartebeesthoek West (purple) WEFs with the amended 2019 WTG layouts, road/cable alignments (black), and approved (yellow) and proposed (light blue) infrastructure and grid connection routes (Source: Google Earth)
Plate 1: View of landscape typical of the Kikvorsberge. The Mainstream Noupoort WEF is visible in the mountain top at the centre of the image.

Plate 2: View of high plateau landscape of undulating grassland and exposed rocky platforms typical of that at the location of the proposed 33/132kV Hartbeesthoek substation.
Plate 3: View across valley bottom towards the proposed location of the collector substation (position marked by arrow) and N10 access points. The approximate alignment of the grid connection route is indicated with the yellow arrow.

3 Method
This Basic Assessment draws on a combination of information from published archaeological reports, unpublished archaeological, heritage and palaeontological impact assessments for the general area, and from data collected in the field by ACO Associates in 2017 and 2019.

Desk-Based Assessment
The desk-based element of this assessment reviewed the archaeological information collected by the Zeekoei Valley Archaeological Project (see Section 5 below), and the results of the excavation of the Blydefontein rock shelter which lie immediately to the west and north of the area being assessed here respectively. In addition, the results of several heritage assessments that have been carried out for proposed development projects in the vicinity of Noupoort were also reviewed. These projects are:

- The Noupoort WEF, directly adjacent to the northern boundary of the study area (Van Schalkwyk, 2012; Orton, 2014);
- The proposed Umsobomvu WEF, between Noupoort and Middelburg (Anderson, 2014); and
- Archaeological assessments for the proposed Allemans, Carolus Poort, Inkukuleko, Toitdale, Kleinfontein and Noupoort solar energy facilities (Booth 2011a, 2011b; Booth & Sanker 2012a, 2012b, 2012c).

Archaeological Field Survey
ACO Associates conducted archaeological survey work in the area between 16-21 September 2017 as part of the San Kraal and Phezukomoya WEF EIA process, and between 8-11 April 2019 as part of the San Kraal, Phezukomoya, and Hartebeesthoek West and Hartebeesthoek East WEF amendment application.

The archaeological surveys visited as many WTG and infrastructure locations as possible, either by vehicle or on foot, and where practicable cable/road alignments were also covered. The team was unable to reach some locations due to their inaccessibility and time constraints.
Figure 2: Combined 2017 (yellow) and 2019 (blue) track plots for ACO surveys of the Phezukomoya (orange), San Kraal (green), Hartebeesthoek East (blue) and Hartebeesthoek West (purple) WEFs and associated infrastructure. Archaeological findspots are also shown (Source: Google Earth)
Each member of the survey team carried a Garmin GPS unit which recorded survey tracks and any archaeological sites or materials located were recorded as waypoints on the GPS.

The combined tracklogs and findspots for the 2017 and 2019 surveys for the San Kraal WEF are shown in Figure 2 above.

In addition to recording the position of any heritage site that was located, sites were photographed, described and graded according to the SAHRA grading system (see Appendix A). No trial holes were dug, and no archaeological material was collected during the survey. All observations are based on material visible on the surface.

Together the surveys covered much of the area that will be occupied by the four proposed WEFs and their associated infrastructure, including the grid connections, and provided a good baseline understanding of the archaeological potential of the affected area, which is generally very low with sparse and limited occurrences of archaeological sites and material recorded in the area.

**Palaeontological Assessment**

Palaeontological assessments for the San Kraal and Phezukomoya WEFs were conducted by Dr John Almond (Almond, 2017a & b) as part of the 2017 EIA process and provided a comprehensive assessment of the palaeontological potential of the area covered by the WEFs and their grid connection routes and infrastructure.

A new palaeontological assessment was not commissioned for this Basic Assessment as the scope and findings of the 2017 assessment remain valid for this study.

**Restrictions and Assumptions**

Time constraints and difficulties in accessing some areas meant that it was not possible to survey all project components as part of the fieldwork associated with this assessment.

However, the combined overall coverage of the 2017 and 2019 surveys was good and substantial portions of the footprints of the Phezukomoya, San Kraal, Hartebeesthoek East and Hartebeesthoek West WEFs and their associated infrastructure, including the grid connections have been archaeologically surveyed. It is assumed that those areas which could be surveyed (Figure 2) provide an accurate sample of the types of heritage resources which might be anticipated in areas which were not accessed.

When the information gathered is viewed in combination with the results of the previous archaeological work in the area, the confidence in the findings set out later in this report is high.

**4 Palaeontological Background to the Study Area**

The Karoo is a vast palaeontological landscape consisting of multiple layers of sediments that contain a vast array of fossils ranging from fish and early vertebrates to plant remains and trace fossils. It is considered to be one of the most complete fossil records on the planet.

Generally, the Karoo fossils predate the age of the life forms popularly known as dinosaurs by some scores of millions of years. The vertebrates of these times are known as early
mammal-like reptiles which were ancestral to dinosaurs; hence, the Karoo palaeontological sequence has contributed on a world scale to understanding the development of life forms on the planet.

According to Almond (2017a & b), most of the study area is underlain by continental sediments of the Katberg Formation (Upper Beaufort Group/Tarkastad Subgroup, Karoo Supergroup) of earliest Triassic age. Latest Permian sediments of the underlying Balfour Formation crop out along the foot of the Katberg escarpment but are generally mantled by a thick apron of colluvium (sandy and gravelly scree, hillwash) and alluvium.

The geology and palaeontology of the Karoo have been a subject of research since the early 20th century, and several Karoo vertebrate fossil sites are reported from the Katberg Formation and underlying rocks in the Middelburg–Noupoort region. The following extract is taken from the palaeontological assessments for the San Kraal and Phezukomoya WEFs (Almond, 2017a & b):

“Kitching (1977) reports recording as many as five different species of Lystrosaurus from good mountain slope exposures as well as road and railway cuttings in the Carlton Heights area near Noupoort. Abundant lystrosaurids, including three species of the genus, were found at Edenvale and on Noupoort Commonage. [Almond indicates that] this suggests the possible presence of Latest Permian beds referable to the Dicynodon Assemblage Zone in this area, and this is supported by a recent search for fossil records from the Noupoort area in the Karoo fossil database at the Bernard Price Institute (Wits University) undertaken by Mr Mike Day (Almond, 2017a & b).

Sites on the farms Naauwpoort 1, Bergendal 179, New Jakkalsfontein 172 and Carolus Poort 167 have yielded abundant material of Lystrosaurus together with Procolophon, Tetracynodon and a few specimens of Dicynodon. An unusually diverse LAZ assemblage has recently been recorded from Barendskraal near Middelburg by Damiani et al. (2003a). The poorly preserved fossil flora recorded by Gastaldo et al. (2005) from the basal Katberg at Carlton Heights near Noupoort is of special interest because plant fossils are so rare in this stratigraphic interval. Scrappy compressions of reedy plants within Katberg sandstones were illustrated by Almond (2015) from the Umsobomvu WEF project area south-west of Noupoort.

Sparse, highly weathered postcranial remains, as well as poorly preserved Lystrosaurus skull material, was reported just to the SW of Noupoort by Butler (2014). Gess (2012b) recorded locally abundant vertebrate body fossils, including Lystrosaurus and a small cynodont, plant stems, vertebrate burrows and Katbergia (“roots”) on Portion 1 of Naauw Poort Farm 1 located c. 11 km south of Noupoort. On farm Blydefontein 168, situated just to the north of the [study area], Almond (2012) recorded fragmentary reworked skeletal remains, including disarticulated skulls, postcrania and teeth (especially dicynodont tusks) within greyish calcareous conglomerates. Some of the fossils were clearly encased in ferruginous pedogenic calcareous before they were exhumed and reworked. Overlying massive grey-green siltstones contain rare “bone-bed” concentrations
(e.g. Lystrosaurus skull and postcrania) and horizons of large ferruginous calcrite nodules representing palaeosols. A small number of, mostly fragmentary, vertebrate fossils were reported from Katberg overbank mudrocks and calcrite breccia beds in the San Kraal WEF study area (Almond 2017b) and also the Umsobomvu WEF study area (Almond, 2015); they did include one well-articulated lystrosaurid skeleton with associated skull, however.

Low-diversity trace fossil assemblages recorded from Katberg rocks in the Noupoort area – for example south of the Oologspoort road - include locally abundant vertical cylindrical structures attributed to Skolithos in the literature (e.g. Almond, 2012) but more plausibly interpreted as plant stem casts, as well as small meniscate back-filled burrows (“Taenidium”). Numerous examples of the cm-wide subcylindrical invertebrate burrow Katbergia were observed by Almond (2012) in fresh road cuttings through the Katberg Formation along the N9 at Carlton Heights and localities further to the SW (Gess, 2012; Almond, 2015). These distinctive burrows penetrate down through grey-green mudrocks at an oblique angle and show surface scratch markings; they have been tentatively attributed to decapod crustaceans (Gastaldo & Rolerson, 2008; Bordy et al., 2010). Several much larger, straight, gently-sloping vertebrate burrow casts cutting down through thin-bedded overbank mudrocks within the lower Katberg Formation are recorded from road cuttings on farm Naauw Poort 1 (Almond, 2015), while Almond (2017) illustrated an equivocal mudrock-infilled large burrow cast from the lower Katberg Formation in Oorlogsspoort”.

5 Archaeological Background to the Study Area

The central Karoo has been a focus of archaeological research since the 1960s when Garth Sampson began studying the Stone Age archaeology of the region. Of particular relevance to this report is the detailed archaeological survey of the 5 000 square kilometre catchment of the Zeekoei River (from the Sneeuberg Mountains to the Gariep River Valley) which lies immediately west of the project area, undertaken by a team led by Sampson in and late 1970s and early 1980s (Figure 3 below).

The Zeekoei Valley Archaeological Project recorded some 10 000 archaeological sites representing a history of human occupation covering at least 250 000 years. Sampson identified seven industries or phases of human history within his study area, each of which is legible on the landscape today, and each of which represents a pre-colonial layer of the human history of the Karoo (Sampson, 1985).

Sampson (1985:13) developed a model for the last 250 000 years, based on palaeoclimatic data (Plate 4 below), which predicted that the human occupation of the Zeekoei Valley “was restricted to the warm-wet stages and that [it] was abandoned at the peak of the cold-dry stages”, with variations in climate and the degrees of aridity and temperature dictating the viability of the landscape as a place suitable for people to live.

Each pre-colonial phase of human occupation has left its archaeological signature on the landscape which is identifiable by the kinds of (mainly stone) artefacts that have been left behind. The three main pre-colonial temporal archaeological phases are termed the Early,
Middle and Later Stone Ages. Artefacts of both the Early and Middle Stone Age are ubiquitous and widespread in the Karoo, and can be described as an ancient litter that occurs at a low frequency across the landscape. Where definable scatters of Early and Middle Stone Age material does occur, however, they are considered to be significant heritage sites.

Figure 3: Location of the area surveyed for the Zeekoei Valley Archaeological Project (hatched green) shown in relation to the San Kraal, Phezukomoya, Hartebeesthoek West and Hartebeesthoek East WEFs and their infrastructure (after Sampson, 1985).

The proximity of the WEF infrastructure elements being considered in this report to the Zeekoei Valley suggests that the same pulses of human occupation, and thus types of archaeological sites and materials can be expected in the area they will occupy.

The latest, and possibly more intensive occupation of the Karoo started around 13 000 years ago with the onset of the current, Holocene climatic warm phase during the Later Stone Age. This important archaeological layer on the landscape represents the heritage of the San (popularly known as Bushman) hunter-gatherers and Khoekhoen (historically known as
“Hottentot” by early writers) herders, whose descendants make up a significant portion of South Africa’s population today.

A number of Later Stone Age rock shelters have been excavated in the region (see Sampson, 1985; Hart, 1989) including the Blydefontein Shelter, also located in the Kikvorsberge, approximately 14 km north of the 33/132kV substation (see Bousman 1991 and 2005; Bousman et al, 2016). The earliest occupation level at Blydefontein is dated to 13600 years before the present (BP), which reinforces Sampson’s (1985) statement that rock shelters in the area do not appear to contain archaeological deposits older than the start of the Holocene.

Plate 4: Sampson’s climate model. Note that the shaded areas to the right of the cold/warm divide are those during which human occupation of the Zeekoei Valley (and environs) is predicted (Source: Sampson 1985).

The spatial distribution of Late Stone archaeological sites in the Karoo reflects peoples’ need to be close to water with rivers, pans, springs and other sources of water playing an important role in influencing where they lived. At the same time, the scarcity of natural caves and shelters in the Karoo landscape means that most archaeological sites are open occurrences of stone artefacts, ostrich eggshell fragments and, on more recent sites, pottery. Bone is rarely preserved in open contexts.

The climate of the Karoo also played a key role in where people chose to live in the past. The winters are cold with temperatures dropping well below zero. The summers, by contrast, are hot and rainfall is often unreliable. Sampson (1985) observed that almost all Late Stone Age sites are situated at the bottom of the breaks of dolerite dykes, in sheltered areas on the
crests of dolerite dykes, or in dolerite mazes and outcrops. So too, are the stone kraal circles by Khoekhoen groups after 1000 AD which are almost always built on the edges of low ridges and dykes. LSA sites tend to be rare on exposed hilltops and very high ridges, and according to Orton (2014), pre-colonial archaeological material, in general, is rare in the open grasslands that characterise the upland areas.

The results of this report suggest that the same may be true further back in time, as relatively little archaeology was recorded on the mountain top where the 33/132kV substation is proposed and which will be crossed by the grid connection route.

The most recent archaeological layer in the Karoo landscape relates to the historical occupation of the area by stock farmers of European descent from the late 18th century. Indications are that the formal granting of title deeds to land only started in the early 19th century, but judging by the kinds of artefacts and structures found on the landscape, many of the farms are likely to have been used before land was formally granted or loaned (Sampson and Sampson, 1994).

**Previous Archaeological Assessments in the Area**

In addition to the archaeological work in the area outlined above, several heritage assessments have been carried out for proposed development projects in the vicinity of Noupoort.

The existing Mainstream Noupoort WEF, directly adjacent to the northern boundary of the study area, was subject to archaeological assessment (see Van Schalkwyk, 2012; Orton, 2014). These assessments identified some pre-colonial sites and a few historical sites, including a number of graves and several rock painting sites, but found that Stone Age artefact scatters were uncommon in the high mountain plateau context of the area surveyed.

Anderson (2014) carried out a heritage impact assessment for the Umsobombvu WEF, which was proposed in an area approximately 21 km south-west of Noupoort and 18 km north-west of Middelburg. He recorded the presence of a number of historical farms complexes, stone-walled kraals (historical and potentially pre-colonial), graves and graveyards, several rock art sites and numerous open scatters of pre-colonial lithics; mainly MSA, but with LSA and some ESA artefacts also present in places.

Archaeological assessments have also carried out for several proposed solar energy facilities in the vicinity of Noupoort. Most situated just to the north of the town, but one – the Tollie solar energy facility – is situated between the authorised, preferred grid connection route, and the grid connection route being assessed in this report.

The solar energy facilities are all located below the Kikvorsberge, on wide valley floors which characterise the landscape between the mountains and hills in the area. Their situation is very similar to that of the proposed collector substation, access points and of much of the area traversed by the grid connection route. The impact assessment reports for these facilities (see Booth 2011a, 2011b; Booth & Sanker 2012a, 2012b, 2012c) all note a consistent, low-level occurrence across the landscape of thin scatters of heavily patinated and worn MSA lithics made on hornfels. These MSA scatters were often associated with exposed, deflated non-vegetated areas within the landscape. Some LSA
lithics were noted in a few cases, but no other cultural material was reported at any of the sites recorded. More dense occurrences of MSA (and some LSA) lithics, possibly associated with knapping and tool production, were noted on the Alleman and Carolus solar energy facility sites. These denser lithic occurrences were always found in the lee of or near rocky outcrops or ridgelines. Overall, the heritage significance of material reported by these assessments was assessed to be low (IIIC), some of the denser lithic occurrences were rated IIIB.

6 The Landscape of Colonial Settlement

The indigenous people of the Karoo waged a bitter war against colonial expansion as they gradually lost control of their traditional land to European stock farmers or trekboere. Penn (2005) notes the most determined indigenous resistance to trekboer expansion occurred when they entered the harsh environment of the escarpment of the interior plateau (the Hantam, Roggeveld and Nieuweveld Mountains).

Similarly, trekboer settlers found their progress onto the upper escarpment halted at the Sneeuberg close to the project area as the San launched an almost successful campaign to drive them out. Place names throughout the Karoo such as Oorlogspoort and Oorlogskloof are testimony to the skirmishes of the late 18th century.

The situation became so desperate that the colonists fought back by establishing the “Kommando” system and the “hunting” of San was officially sanctioned in 1777 (Dooling 2007). The Drostdy of Graaff Reinet, the northernmost regional colonial centre of the Cape colony at the time, played a significant role in this long and bitter war which eventually saw the almost complete destruction of the Karoo San.

The early occupation of the Great Karoo by European settlers is one which is largely undocumented. These European pastoralists were highly mobile, trekking between winter and summer grazing on and off the escarpment. Land ownership was informal, and only became regulated after the implementation of the quitrent system of the 19th century used by the Government to control the lives and activities of the farmers.

Indications are that most of the farms in the study area started as loan farms in the late 18th century. A loan farm was given out after a person petitioned the government for permission to use a piece of land. They paid tithes to the government for the use, but it was not generally recorded in title deeds with surveyor’s diagrams.

Many of these loan farms were circular in shape because of a custom that allowed the farmer to take a measurement from a central spot, such as a homestead, spring or rock formation. The walking-off distance was regarded as about 750 roods (2.8 km), amounting to an area of around 3000 morgen (2570 hectares). Weak springs are at the centres of most of the loan farms and indicate the importance of even the most meagre water resources on this landscape.

The formal granting of title deeds only took place in the early 19th century, but judging by the kinds of artefacts and structures found on the landscape, many of the farms were being used long before the land was formally granted or loaned.
7 Heritage Sensitivities

Archaeological and other heritage sites and materials are fragile, finite, non-renewable and highly context-sensitive. Any and all impacts which affect these resources are thus potentially negative, although this can be ameliorated by the level of significance of affected sites, and the application of mitigation measures.

Palaeontology

Any form of bedrock excavations on the high rocky plateau areas of the Kikvorsberge resulting from activities associated with the construction of the various substations and with the installation of the OHLs that are the subject of this assessment, have the potential to affect sediments of the Katberg Formation (Upper Beaufort Group/Tarkastad Subgroup, Karoo Supergroup) of earliest Triassic age.

Latest Permian sediments of the underlying Balfour Formation crop out along the foot of the escarpment, at elevations similar to that of the proposed collector substation, Phezukomoya temporary batching plant 2 and the additional access points, but these sediments are generally mantled by a thick apron of colluvium (sandy and gravelly scree, hillwash) and alluvium.

The uppermost Balfour and Katberg Formations preserve an important record of biological and palaeoenvironmental events on land during the catastrophic Permo-Triassic extinction of 252 million years ago and subsequent biotic recovery and elsewhere in the Main Karoo Basin have yielded locally abundant vertebrate fossils, large vertebrate burrows, a small range of invertebrate burrows and rare plant remains.

As described above, several vertebrate fossil localities in the Noupoort area are noted in the scientific literature, but only a few fossil remains were recorded during the field assessment for San Kraal and Phezukomoya WEFs and associated powerline (Almond, 2017). These include fragmentary bones and teeth within calcrete breccias as well as several large vertebrate burrows, one with associated disarticulated bones.

Almond (2017a & b) suggests that the paucity of recorded fossil sites here is probably due to 1) the very low exposure levels seen here of overbank mudrocks where most fossils are preserved, and 2) the predominance of amalgamated channel sandstone facies in the upper part of the Katberg Formation building the plateau areas.

However, scientifically important fossil remains in the subsurface may be compromised anywhere that there are voluminous bedrock excavations undertaken for the elements of WEF infrastructure being assessed in this report (Almond, 2017a & b).

Almond (2017) identified no palaeontological no-go areas or highly sensitive fossil sites within the San Kraal or Phezukomoya WEF footprint or along the connector grid route options assessed in 2017. Those fossil occurrences that he did report were assigned a low significance rating (IIIC) and do not warrant mitigation.

A 50 m-radius protective buffer zone was proposed for several vertebrate burrow sites along a stream bed on farm Winterhoek 118 (significance rating IIIB) which lay at the convergence of the powerline route options and very close to the Alternative 1 132 kV powerline route (Figure 4). Almond (2017a & b) recommended that if Alternative 1 was the chosen route, it
should be realigned slightly to the south-east in this sector to lie outside the proposed buffer zone. The preferred route, which was authorised in 2018, was sufficiently distant from Almond’s proposed buffer not to require mitigation. Neither the proposed grid connection, SK-PH collector substation or N10 access points assessed in this report are located near to the buffer.

Figure 4: Palaeontologically sensitive area (red polygon) containing fossil burrows of prehistoric vertebrates along a stream bed located within the preferred grid connector corridor.

Almond (2017a & b) also noted excellent exposures of mudrocks of the Palingkloof Member (upper Balfour Formation), which are of geoheritage as well as palaeontological significance because of their proximity to the Permo-Triassic boundary, and recommended buffer zones despite these occurrences being outside any area of likely impact from the proposed WEF development. One exposure which lies along the railway line at Carlton Heights (Farms RE/1/1 and 18/1), has featured in several scientific publications while the other, close to Hartebeesthoek homestead on Farm RE/182, is currently unstudied (Figure 5). It is anticipated that neither of these two geosites will be directly impacted by the activities being assessed in this report.

Archaeology and Colonial Period Heritage Sites
The pre-colonial archaeological sensitivities of the areas assessed for this report are typical of those reported in the vicinity by the assessments previously carried out and discussed earlier.
Experience throughout the Karoo and locally (see Orton, 2012 and Anderson, 2014, for example) has shown that high ridges and mountain tops seldom attracted prehistoric human occupation. These areas tend to be dry, windswept and very cold in winter and unless there was a suitable rock shelter, source of water or raw material, do not seem to have been heavily used and are unlikely to be archaeologically sensitive. The 33/132kV substations, switching stations and upland portions of the grid connection route which are situated on high ground are thus likely to be relatively archaeologically insensitive.

Valley bottoms and the plains surrounding the mountains were more favoured by pre-colonial people for occupancy. Here there are normally sources of water, shelter from the winds as well as the potential for grazing small stock on or close to the sandy riverbeds. Also important were low ridges on or adjacent to flat plains, with Khoikhoi kraals almost always built adjacent to or against low ridges and cliffs. Anywhere where there is a cluster of rock that provided shelter from the wind or a shallow cave inevitably has archaeological material associated with it. Anderson (2014) and Orton (2014) recorded some rock paintings within the Umsobomvu and Noupoort WEFs, but none were noted during the surveys for this assessment.
The fieldwork for this project identified a small number of archaeological and historical occurrences and sites, the majority of which are surface scatters of patinated hornfels stone artefacts of MSA origin. Appendix B contains details of all archaeological observations associated with the WEF infrastructure elements being assessed in this report, together with co-ordinates and an image of each site or its artefactual material.

These sites and material were found in or associated with eroded, deflated, non-vegetated areas in contexts very similar to those reported for other projects in the area. JG041-045 and GEB010-011 (Figure 6, Plate 5 and Plate 6) were located in the north of the N10, in the general vicinity of the collector substation and N10 access points. The lithics were scattered across deflated hollows in an area subject to flooding after rain. They were heavily patinated and most showed signs of being waterworn. As in the case of the finds at the various solar energy facilities referred to earlier, this material is considered to be in secondary, deflated
context, and seems to be indicative of a type of low level, widespread occurrence of pre-colonial lithics that covers the entire landscape.

No stratified sites were located, and no cultural material other than stone was found during this assessment.

Figure 6: Location of sites JG041-045 and GEB010-011 found in deflated areas north of collector substation (light blue polygon) and grid connector route (light blue dotted line). The future access points are shown as the light blue star and the approved grid connector route is the yellow line.
Colonial period sites, which included farm complexes and other structures like kraals were recorded at various points within the area assessed by ACO in 2017 and 2019 (see Hart et al., 2017a & b; Gribble & Euston-Brown, 2019 a-d).

The ruined farm complex within the San Kraal WEF reported in 2017 (Hart et al, 2017b) (JR003-004, JR006-007) is less than 160 m from the proposed San Kraal 33/132 kV step-up substation and may be affected by its construction (Figure 7).
GEB009, a stone cairn which probably served as a historical farm boundary marker and JG008, a semi-circular kraal marked with spaced upright rocks were recorded approximately 280 m and 900 m from the alignment of the OHL between the Hartebeesthoek West switching station and the approved San Kraal substation. Neither will be affected by the installation of the OHL.

Figure 7: Location of the ruined historical farm complex (JR003-004, JR006-007) on San Kraal in relation to the proposed 33/132 kV step-up substation.

8 Potential Impacts Relating to the Proposed WEF Grid Infrastructure

Nature of Impacts on Heritage Resources

Wind energy facilities are major developments which can produce a wide range of impacts that have the potential to affect heritage resources. The main cause of impacts to such sites is a physical disturbance of the material itself and its context.

With regards to the construction and installation of the proposed infrastructure that is the subject of this assessment, the main source of impact will be the construction of or
upgrading of access roads, the levelling of the substation sites, and the digging of foundation for substation infrastructure and cable route pylons.

In respect of palaeontological resources, Almond (2017: 16) states that “excavations and other construction work undertaken into bedrock in order to install ... [WEF] infrastructure could expose, disturb, destroy or seal-in valuable fossil heritage”.

There are not likely to be impacts on heritage resources during the operation and decommissioning of this infrastructure, except where further or new disturbance or intrusive groundworks take place.

The best method for managing impacts on heritage resources is avoidance. In the case of the infrastructure being assessed here, this could require the realignment of the route or the micro-siting of pylon positions or the substation footprints. Where avoidance is not possible, then some degree of mitigation can be achieved by systematically removing the affected heritage sites or material from the landscape. This is generally considered a second-best option as the process can be time-consuming and expensive, and the in situ preservation of heritage resources is always preferred.

**Extent of impacts on Heritage Resources**

It is expected that impacts on heritage resources arising from construction and installation of the proposed infrastructure will be limited to the footprint of any disturbance and thus localised in extent. Furthermore, most of the area affected by the proposed construction activities has very limited archaeological and colonial period heritage potential, due to the less than favourable conditions for human occupation on the Kikvorsberge and a lack of occupation foci on the plains below the mountains.

In terms of buried archaeological material, it is never possible to be entirely sure of what lies below the ground surface. However, the fieldwork undertaken for this project and the findings of other heritage assessments in the area suggest that substantial buried archaeological sites are unlikely to be present in the area. Impacts on buried archaeological resources arising from ground disturbance associated with the construction and installation of the proposed infrastructure are thus likely to be negligible.

With regard to palaeontology, Almond (2017) states that “most of the sedimentary formations represented within the study area contain fossils of some sort. The pervasive mantle of alluvium, scree and soil covering the vast majority of the potentially fossiliferous overbank mudrocks within the study area is almost certainly largely responsible for the paucity of significant fossil finds here during the present field study. Fossils may be expected in the subsurface, and negative impacts at some level on fossil heritage are therefore considered certain”. Such impacts will be limited to the development footprint, and although they can often be mitigated, they cannot be fully rectified or reversed.

**Significance of Impacts on Heritage Resources**

In terms of the information that has been collected, indications are that the significance of impacts arising from the construction and installation of the proposed infrastructure on archaeological and colonial period heritage sites and palaeontological resources will be low, although it must be borne in mind that the fossils likely to be impacted can be of “importance to national as well as international research projects” (Almond, 2017: 16).
9 Impact Assessment

The impact assessment below uses the method developed by Hacking (no date) and considers the potential impacts of the construction/operation/decommissioning of a) the collector, step up and switching substations and b) the grid connection OHLs and access points on palaeontological and archaeological heritage receptors.

The following principal activities associated with the construction and installation of the proposed infrastructure have been identified as having the potential for significant impacts on heritage resources:

- Site preparation and levelling (substations); and
- Excavation of foundations (substations and grid connection OHLs).

Impacts on heritage resources are assessed against these activities below.

Impacts of the Collector, Step Up and Switching Substations

9.1.1 Impacts on Palaeontology

9.1.1.1 Nature of Impacts

Any earth-moving activities or excavations that disturb bedrock have the potential to impact palaeontological material. According to Almond’s (2017a & b) assessments for the San Kraal and Phezukomoya WEFs, most of the potentially-fossiliferous bedrock in the area is mantled by alluvium, scree and soil, which may reduce the potential for impacts, particularly on the site of the SK-PH collector substation where such covering will be thicker than on the upland site of the most of the other substations.

9.1.1.2 Extent of Impacts

Impacts will be localised and limited to the footprint of bedrock disturbance within excavations or caused by site preparation.

9.1.1.3 Significance of Impacts

In terms of the information that has been collected for this assessment, indications are that impacts to palaeontology from the construction of the collector, step up and switching substations will be of medium, negative significance.

If the mitigation measures proposed below are implemented and applied, the significance of residual impacts are assessed to be low.

Table 1: Summary of impacts on palaeontological heritage resources: Collector, step up and switching substations

<table>
<thead>
<tr>
<th>Impact Phase: Construction/Operation/Decommissioning</th>
<th>Potential impact description: Displacement or destruction of palaeontological heritage resources by earthmoving or excavation activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Mitigation</td>
<td>Severity: Medium</td>
</tr>
<tr>
<td>With Mitigation</td>
<td>Severity: Low</td>
</tr>
</tbody>
</table>
Can the impact be reversed? NO - The finite and non-renewable nature of palaeontological resources means that impacts cannot be fully rectified or reversed.

Will impact cause irreplaceable loss or resources? YES - The finite nature of palaeontological resources means that any material lost cannot be replaced.

Can impact be avoided, managed or mitigated? YES - The impact can be avoided if the bedrock is not disturbed by project activities. If disturbance is unavoidable, impacts can be mitigated by implementing the measures set out below.

Mitigation measures to reduce residual risk or enhance opportunities:
- A fossil chance finds procedure must be implemented and applied during earthworks to ensure that any substantial fossil remains (such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil burrow assemblages) are reported.
- Any fossil finds must be safeguarded by the responsible Environmental Control Officer, preferably in situ, and the responsible heritage management authority (SAHRA for the Northern Cape or ECPRHA for the Eastern Cape) notified of the find immediately so that appropriate mitigation action can be taken by a professional palaeontologist.
- These mitigation recommendations must be incorporated into the Construction Environmental Management Plan (EMP).

Residual impact YES - but acceptable as of low negative significance provided the mitigation measures proposed have been properly and fully implemented.

9.1.2 Impacts on Archaeology and Colonial Period Heritage Sites

9.1.2.1 Nature of Impacts
Site preparation, excavations for foundations or any other activities that disturb the soil have the potential to impact archaeological sites and material and colonial period heritage sites within or on the land comprising the footprints of the collector, step up and switching substations.

9.1.2.2 Extent of Impacts
Impacts will be localised and limited to the footprint of any excavations or ground disturbance.

9.1.2.3 Significance of Impacts
Indications are that impacts to archaeological sites and colonial period heritage sites from the construction of collector, step up and switching substations will be of medium, negative significance.

If the mitigation measures proposed below are implemented and applied, the significance of residual impacts are assessed to be low.

Table 2: Summary of impacts on archaeological and colonial period heritage resources: Collector, step up and switching substations

<table>
<thead>
<tr>
<th>Impact Phase: Construction/Operation/Decommissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential impact description: Displacement or destruction of archaeological and colonial period heritage resources by earthmoving or excavation activities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Severity</th>
<th>Extent</th>
<th>Duration</th>
<th>Status</th>
<th>Probability</th>
<th>Significance</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Mitigation</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
<td>Negative</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Neutral</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>---------</td>
<td>-----</td>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td>Can the impact be reversed?</td>
<td>NO – Archaeological and colonial period heritage resources are finite and non-renewable which means that impacts cannot be fully rectified or reversed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will impact cause irreplaceable loss or resources?</td>
<td>YES - The finite nature of palaeontological resources means that heritage resources destroyed or damaged cannot be replaced.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can impact be avoided, managed or mitigated?</td>
<td>YES – It is unlikely that impacts can be totally avoided, given the nature of the archaeological sites recorded in the area, but they can be mitigated by implementing the measures set out below.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mitigation measures to reduce residual risk or enhance opportunities:

- Any substantial archaeological sites (i.e. dense artefact clusters or stratified deposits) encountered must be reported to the responsible Environmental Control Officer, who must ensure that finds are safeguarded in situ.
- The responsible heritage management authority (SAHRA for the Northern Cape or ECPRHA for the Eastern Cape) must be notified of any finds immediately so that appropriate mitigation action can be taken by a professional archaeologist.
- Historical farmyards and buildings, particularly the cluster of buildings represented by JR003-004 and JR006-007, must be avoided and any old stone kraals or ruins must not be disturbed. This includes not removing stone from walls, or artefacts from the earth or earth surface.
- Any chance discoveries of human remains must be reported to the appropriate heritage authority and project archaeologist.
- These mitigation recommendations must be incorporated into the Construction Environmental Management Plan (EMP).

Residual impact | YES - but acceptable as of low negative significance provided the mitigation measures proposed have been properly and fully implemented.

**Impacts of the Grid Connection Route and Additional Access Points**

The potential impacts of the grid connection OHLs and the additional access points are of a lower intensity than those associated with the collector, step up and switching substations. The footings for the grid connection pylons are small and relatively shallow, and the service road required for installation and maintenance is normally simply a track. It is possible that archaeological sites or material will be disturbed by the pylon foundations, but the depth of foundation excavations required suggest that impacts on the palaeontological resources are less likely.

**9.1.3 Impacts on Palaeontology**

**9.1.3.1 Nature of Impacts**

Excavations for pylon foundations or any other activities that disturb the bedrock have the potential to impact palaeontological material.

**9.1.3.2 Extent of Impacts**

Impacts will be localised and limited to the footprint of bedrock disturbance within any excavations.
9.1.3.3 **Significance of Impacts**

In terms of the information that has been collected for this assessment, indications are that impacts to palaeontology from the installation of the grid connection OHLs and the creation of the additional access points will be of medium, negative significance.

If the mitigation measures proposed below are implemented and applied, the significance of residual impacts are assessed to be low.

**Table 3:** Summary of impacts on palaeontological heritage resources: Grid connection OHLs and additional access points

<table>
<thead>
<tr>
<th>Impact Phase: Construction/Operation/Decommissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential impact description: Displacement or destruction of palaeontological heritage resources by earthmoving or excavation activities</td>
</tr>
<tr>
<td>Severity</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Without Mitigation</td>
</tr>
<tr>
<td>With Mitigation</td>
</tr>
</tbody>
</table>

Can the impact be reversed? NO - The finite and non-renewable nature of palaeontological resources means that impacts cannot be fully rectified or reversed.

Will impact cause irrereplaceable loss or resources? YES - The finite nature of palaeontological resources means that any material lost cannot be replaced.

Can impact be avoided, managed or mitigated? YES - The impact can be avoided if the bedrock is not disturbed by project activities. If disturbance is unavoidable, impacts can be mitigated by implementing the measures set out below.

Mitigation measures to reduce residual risk or enhance opportunities:

- A fossil chance finds procedure must be implemented and applied during earthworks to ensure that any substantial fossil remains (such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil burrow assemblages) are reported.
- Any fossil finds must be safeguarded by the responsible Environmental Control Officer, preferably in situ, and the responsible heritage management authority (SAHRA for the Northern Cape or ECPRHA for the Eastern Cape) notified of the find immediately so that appropriate mitigation action can be taken by a professional palaeontologist.
- These mitigation recommendations must be incorporated into the Construction Environmental Management Plan (EMP).

Residual impact YES - but acceptable as of low negative significance provided the mitigation measures proposed have been properly and fully implemented.

9.1.4 **Impacts on Archaeology and Colonial Period Heritage Sites**

9.1.4.1 **Nature of Impacts**

Excavations for pylon foundations or any other activities that disturb the soil, such as the creation of the access road, have the potential to impact archaeological sites and material and colonial period heritage sites within or on the affected piece of land.

9.1.4.2 **Extent of Impacts**

Impacts will be localised and limited to the footprint of any excavations or ground disturbance.
9.1.4.3 Significance of Impacts

Indications are that impacts to archaeological sites and colonial period heritage sites from the installation of the grid connection OHLs the creation of additional access points will be of medium, negative significance.

If the mitigation measures proposed below are implemented and applied, the significance of residual impacts are assessed to be low.

Table 4: Summary of impacts on archaeological and colonial period heritage resources: Grid connection OHLs and additional access points

<table>
<thead>
<tr>
<th>Impact Phase: Construction/Operation/Decommissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential impact description: Displacement or destruction of archaeological and colonial period heritage resources by earthmoving or excavation activities</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Without Mitigation</td>
</tr>
<tr>
<td>With Mitigation</td>
</tr>
</tbody>
</table>

- Can the impact be reversed? NO – Archaeological and colonial period heritage resources are finite and non-renewable which means that impacts cannot be fully rectified or reversed.
- Will impact cause irreplaceable loss or resources? YES - The finite nature of palaeontological resources means that heritage resources destroyed or damaged cannot be replaced.
- Can impact be avoided, managed or mitigated? YES – It is unlikely that impacts can be totally avoided, given the nature of the archaeological sites recorded in the area, but they can be mitigated by implementing the measures set out below.

Mitigation measures to reduce residual risk or enhance opportunities:

- Any substantial archaeological sites (i.e. dense artefact clusters or stratified deposits) encountered must be reported to the responsible Environmental Control Officer, who must ensure that finds are safeguarded in situ.
- The responsible heritage management authority (SAHRA for the Northern Cape or ECPRHA for the Eastern Cape) must be notified of any finds immediately so that appropriate mitigation action can be taken by a professional archaeologist.
- Historical farmyards and buildings must be avoided and any old stone kraals or ruins must not be disturbed. This includes not removing stone from walls, or artefacts from the earth or earth surface.
- Any chance discoveries of human remains must be reported to the appropriate heritage authority and project archaeologist.
- These mitigation recommendations must be incorporated into the Construction Environmental Management Plan (EMP).

Residual impact YES - but acceptable as of low negative significance provided the mitigation measures proposed have been properly and fully implemented.

10 Cumulative Impacts

The assessment of the cumulative impacts on heritage resources of this project and the other similar projects being planned in the same area is difficult due to the variability of available impact assessment reports.

Furthermore, the true cumulative impacts of multiple projects can only be established on the basis of audits of successful mitigation carried out as projects are built. With the exception of 44
the Noupoort WEF, none of the other projects described in Section 5.1 above have reached the construction phase, and the implementation of mitigation measures has thus not yet taken place. As far as we are aware, no mitigation report is available for the operational Noupoort WEF.

The assessment of cumulative impacts below is based, therefore, on the impact assessment reports conducted for the nearby projects and is presented with a medium degree of confidence.

In respect of archaeological sites and materials, an examination of the Noupoort, Umsobomvu, San Kraal and Phezukomoya WEFs reveals that all the sites have similar archaeology, dominated by open scatters of mainly MSA lithics, the majority of which are ungraded or have Grade 3 significance ratings. WEF developments also typically affect less than one percent of the project area, and the actual instances of physical impacts on archaeological resources are very low. Indications are that the cumulative impacts of WEFs in the Noupoort area will be of low consequence.

The solar energy facilities being considered in the area are potentially more destructive to archaeological resources affected because of the site preparation and clearance of the array area they require. The land parcels involved tend to be smaller than those associated with WEFs, but this makes the avoidance of heritage resources more difficult. Mitigation measures have been proposed for the more significant sites identified at several of the solar facilities assessed, and although some loss of Grade 3 heritage resources is expected, the cumulative impact on archaeological resources is tolerable.

Based on the comparative assessment of these various projects, the cumulative impacts of projects in the area will be of low consequence for WEFs and tolerable for solar energy facilities with their more intensive impacts on the land within their footprints.

In respect of the cumulative impacts on palaeontological resources of the proposed developments in the area, Almond's (2017a & b) comparison of impact assessments indicates the following:

- Palaeontological impact significances inferred for these projects that range from low (Noupoort and Umsobomvu WEFs) to medium (San Kraal and Phezukomoya WEFs, Naaupoort 1 solar project) to unassessed, reflect different assessment approaches rather than contrasting palaeontological sensitivities and impact levels;
- Meaningful cumulative impact assessments require comprehensive data on all major developments within a region, not just those involving alternative energy, as well as an understanding of the extent to which recommended mitigation measures are followed through; and
- Trying to assess cumulative impacts on fossil assemblages from different stratigraphic units (in this case, Late Permian fossils from the Adelaide Subgroup and Early Triassic assemblages from the Tarkastad Subgroup) has limited value.

Given the comparatively small combined footprint of the alternative energy projects under consideration, compared with the very extensive outcrop areas of the Balfour and Katberg Formations, the significance of cumulative impacts on palaeontological resources is assessed as low.
11 Mitigation

As is clear from the assessment above, it is **not expected** that the construction and installation of the infrastructure being assessed here will have significant impacts on heritage resources. There will be no direct impact on identified heritage resources, and the likelihood of sites or material being found during earthworks is low.

It is recommended that the following general archaeological mitigation measures are implemented during the construction phase of the project:

- Any substantial archaeological sites (i.e. dense artefact clusters or stratified deposits) encountered during construction work must be reported by staff, and contractors to the responsible Environmental Control Officer, who must ensure that finds are safeguarded in situ. The responsible heritage management authority (SAHRA for the Northern Cape or the Eastern Cape Provincial Heritage Resources Authority (ECPHRA) for the Eastern Cape) must be notified of any finds immediately so that appropriate mitigation action can be taken by a professional archaeologist;
- Historical farm complexes and buildings must be avoided, and old stone kraals or ruins must not be disturbed. This includes not removing stone from walls, or artefacts from the earth or earth surface;
- Human remains can occur at any place on the landscape but are particularly likely to be found on or close to archaeological sites. They are regularly exposed during construction activities. Such remains are protected by a number of pieces of legislation including the Human Tissues Act (No 65 of 1983), the Exhumation Ordinance of 1980 and the National Heritage Resources Act (No 25 of 1999). In the event of human remains being found on during construction activities, work in the vicinity of the remains must cease immediately, SAHRA or the ECPHRA must be informed of the discovery, and the remains must be removed by an archaeologist under a permit from SAHRA or the ECPHRA. This process will incur some expense as removal of human remains is at the cost of the developer. Time delays may result while the application is made to SAHRA/ ECPHRA and an archaeologist is appointed to do the work; and
- These mitigation recommendations must be incorporated into the Construction Environmental Management Plan (EMP).

In respect of palaeontological resources, it is recommended that:

- A fossil chance finds procedure is implemented and applied should substantial fossil remains such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil burrow assemblages be exposed by excavation or discovered within the development footprint. When material is found, the responsible Environmental Control Officer should safeguard the fossils, preferably in situ, and alert SAHRA so that appropriate action can be taken by a professional palaeontologist, at the project owner’s expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a professional palaeontologist; and
• Palaeontological mitigation recommendations should be incorporated into the Construction Environmental Management Plan (EMP) for the project.

12 Conclusions and Recommendations
Provided that the mitigation measures recommended in this report are implemented, the overall impact of the construction and installation of grid connection infrastructure for the San Kraal, Phezukomoya, Hartebeesthoek West and Hartebeesthoek East WEFs on archaeological and colonial period heritage resources is tolerable and generally of low significance.

Similarly, provided that the recommended palaeontological mitigation measures are carried through, it is likely that any potentially negative impacts of the proposed developments on local fossil resources will be substantially reduced. Furthermore, they will be partially offset by the positive impact represented by our increased understanding of the palaeontological heritage of the Great Karoo region.

From a heritage perspective, therefore, the proposals are considered acceptable, and the application can be authorised.
13 References


Booth, C. and Sanker, S. 2012c. A Phase 1 archaeological impact assessment for the proposed establishment of the Inkululeko Solar Energy Facility on Portion 2 of the farm
**Carolus Poort 167, near Noupoort, Northern Cape Province.** Unpublished report prepared for Savannah Environmental (Pty) Ltd. Albany Museum.


Hacking, T. No Date. An innovative approach to structuring environmental impact assessment reports.


# Appendix A: Grading Categories

<table>
<thead>
<tr>
<th>Grading</th>
<th>Description of Resource</th>
<th>Examples of Possible Management Strategies</th>
<th>Heritage Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Heritage resources with qualities so exceptional that they are of special national significance.</td>
<td>May be declared as a National Heritage Site managed by SAHRA.</td>
<td>Highest Significance</td>
</tr>
<tr>
<td>II</td>
<td>Heritage resources with special qualities which make them significant in the context of a province or region, but do not fulfil the criteria for Grade I status.</td>
<td>May be declared as a Provincial Heritage Site managed by the appropriate Provincial Heritage Resources Authority (PHRA).</td>
<td>Exceptionally High Significance</td>
</tr>
<tr>
<td>III</td>
<td>Such a resource contributes to the environmental quality or cultural significance of a larger area and fulfils one of the criteria set out in section 3(3) of the Act but that does not fulfil the criteria for Grade II status. Grade III sites may be formally protected by placement on the Heritage Register. These resources are managed by local authorities who have been found competent by the relevant PHRA and have been granted delegated authority.</td>
<td>This grading is applied to buildings and sites that have sufficient intrinsic significance to be regarded as local heritage resources; and are significant enough to warrant that any alteration, both internal and external, is regulated. Such buildings and sites may be representative, being excellent examples of their kind, or may be rare. In either case, they should receive maximum protection at local level.</td>
<td>High Significance</td>
</tr>
<tr>
<td>IIIA</td>
<td>Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.</td>
<td>Like Grade IIIA buildings and sites, such buildings and sites may be representative, being excellent examples of their kind, or may be rare, but less so than Grade IIIA examples. They would receive less stringent protection than Grade IIIA buildings and sites at local level.</td>
<td>Medium Significance</td>
</tr>
<tr>
<td>IIIB</td>
<td>Such a resource might have similar significances to those of a Grade IIIA resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement or community.</td>
<td>This grading is applied to buildings and/or sites whose significance is contextual, i.e. in large part due to its contribution to the character or significance of the environs. These buildings and sites should, as a consequence, only be regulated if the significance of the environs is sufficient to warrant protective measures, regardless of whether the site falls within a Conservation or Heritage Area. Internal alterations should not necessarily be regulated.</td>
<td>Low Significance</td>
</tr>
<tr>
<td>IIIC</td>
<td>Such a resource is of contributing significance to the environs. These are heritage resources which are significant in the context of a streetscape or direct neighbourhood.</td>
<td>A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.</td>
<td>No research potential or other cultural significance</td>
</tr>
<tr>
<td>NCW</td>
<td>No further actions under the NHRA are required. This must be motivated by the applicant and approved by the authority. Section 34 can even be lifted by the PHRA for structures in this category if they are older than 60 years.</td>
<td>No further actions under the NHRA are required. This must be motivated by the applicant and approved by the authority. Section 34 can even be lifted by the PHRA for structures in this category if they are older than 60 years.</td>
<td>No research potential or other cultural significance</td>
</tr>
</tbody>
</table>
## Appendix B: Details of Recorded Archaeological Sites and Occurrences

<table>
<thead>
<tr>
<th>Archaeological Occurrence</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Associated WEF feature</th>
<th>Description</th>
<th>Grading</th>
<th>Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>JG008</td>
<td>-31.245541°</td>
<td>25.006315°</td>
<td>2017 - Falls within San Kraal 132kV OHL Option 2.</td>
<td><strong>Description</strong>: Kraal marked with spaced upright rocks, semi-circular in the lee of a rock shelf.</td>
<td>IIIIC</td>
<td><img src="image.jpg" alt="Photo" /></td>
</tr>
<tr>
<td>Archaeological Occurrence</td>
<td>Latitude</td>
<td>Longitude</td>
<td>Associated WEF feature</td>
<td>Description</td>
<td>Grading</td>
<td>Photo</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------</td>
<td>------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>JG009</td>
<td>-31.245952°</td>
<td>25.007948°</td>
<td><strong>2017</strong> – Approx. 550 m from cable alignment to WTG59</td>
<td>Modern borehole capping</td>
<td>NCW</td>
<td><img src="image1.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>2019</strong> – Approx. 770 m the alignment of the OHL between the Hartebeeshoek West switching station and the San Kraal substation. Will not be affected by WEF.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JR003</td>
<td>-31.237027°</td>
<td>25.045103°</td>
<td><strong>2017</strong> – Approx. 300 m from network cable between WTG53 and WTG52.</td>
<td>Historical homestead complex, rock wall building.</td>
<td>IIIC</td>
<td><img src="image2.jpg" alt="Photo" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>2019</strong> – Approx. 330 m from proposed San Kraal 33/132 kV step-up substation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Archaeological Occurrence</td>
<td>Latitude</td>
<td>Longitude</td>
<td>Associated WEF feature</td>
<td>Description</td>
<td>Grading</td>
<td>Photo</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>JR004</td>
<td>-31.237077°</td>
<td>25.044362°</td>
<td>2017 – Approx. 300m from network cable between WTG53 and WTG52.</td>
<td>Ruin of a house, two rooms, rock walls.</td>
<td>IIIC</td>
<td></td>
</tr>
<tr>
<td>JR006</td>
<td>-31.237321°</td>
<td>25.043682°</td>
<td>2017 – Approx. 300m from network cable between WTG53 and WTG52.</td>
<td>Large kraal rock wall behind (west) of JR003 and JR004. No stone artefacts present.</td>
<td>IIIC</td>
<td></td>
</tr>
<tr>
<td>Archaeological Occurrence</td>
<td>Latitude</td>
<td>Longitude</td>
<td>Associated WEF feature</td>
<td>Description</td>
<td>Grading</td>
<td>Photo</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------</td>
<td>-------------</td>
<td>-------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>JR007</td>
<td>-31.237388°</td>
<td>25.044846°</td>
<td>2017 - Approximately 300m from network cable between WTG53 and WTG52.</td>
<td>Stone wall and ruin house directly west of JR003 and east of JR004. No stone artefacts observed.</td>
<td>IIIC</td>
<td><img src="image1.jpg" alt="Photo" /></td>
</tr>
<tr>
<td>JR008</td>
<td>-31.265264°</td>
<td>25.044311°</td>
<td>2017 – Approx. 200 m from WTG43</td>
<td>Large kraal about 100m² with track running through it. Crosses into Hartebeeshoek farm. Includes a spring.</td>
<td>IIIC</td>
<td><img src="image2.jpg" alt="Photo" /></td>
</tr>
<tr>
<td>Archaeological Occurrence</td>
<td>Latitude</td>
<td>Longitude</td>
<td>Associated WEF feature</td>
<td>Description</td>
<td>Grading</td>
<td>Photo</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------</td>
<td>-----------</td>
<td>------------------------</td>
<td>-------------</td>
<td>---------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| JR009                     | -31.265125° | 25.044786° | 2017 – Approx. 200 m from WTG43  
2019 – More than 1050 m from the location of the proposed Hartebeeshoek East substation. Will not be affected by WEF. | Smaller rock kraal adjacent to JR008. | IIIC | ![Photo](image1.jpg) |
| JR010                     | -31.265135° | 25.044889° | 2017 – Approx. 200 m from WTG43  
2019 – Approx. 1080 m from the location of the proposed Hartebeeshoek East substation. Will not be affected by WEF. | Kraal butted up against rock shelter used as natural kraal. | IIIC | ![Photo](image2.jpg) |
| JR011                     | -31.265184° | 25.045084° | 2017 – Approx. 200 m from WTG43  
2019 – More than 1090 m from the location of the | Smaller kraal adjacent to JR008. | IIIC | No image available |
<table>
<thead>
<tr>
<th>Archaeological Occurrence</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Associated WEF feature</th>
<th>Description</th>
<th>Grading</th>
<th>Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>proposed Hartebeesthoek East substation. Will not be affected by WEF.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JR012</td>
<td>-31.265457°</td>
<td>25.046036°</td>
<td>2017 – Approx. 200 m from WTG43 2019 – More than 1200 m from the location of the proposed Hartebeesthoek East substation. Will not be affected by WEF.</td>
<td>Small rock shelter kraal SE of other kraals. Kraals seem to face erosion gully downstream from spring. Nice sense of place. No stone artefacts observed.</td>
<td>IIIC</td>
<td></td>
</tr>
<tr>
<td>JG013</td>
<td>-31.265672°</td>
<td>25.044031°</td>
<td>2017 – Approx. 200 m from WTG43 2019 – More than 980 m from the location of the proposed Hartebeesthoek East substation. Will not be affected by WEF.</td>
<td>Spring at historical kraal complex.</td>
<td>No grading</td>
<td></td>
</tr>
<tr>
<td>Archaeological Occurrence</td>
<td>Latitude</td>
<td>Longitude</td>
<td>Associated WEF feature</td>
<td>Description</td>
<td>Grading</td>
<td>Photo</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>JG014</td>
<td>-31.265915°</td>
<td>25.044392°</td>
<td>2017 – Approx. 350 m from WTG40</td>
<td>2019 – More than 1020 m from the location of the proposed Hartebeeshoek East substation. Will not be affected by WEF.</td>
<td>IIIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Historical stone kraal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEB009</td>
<td>-31.250115°</td>
<td>25.008290°</td>
<td>2019 – Approx. 280 m the alignment of the OHL between the Hartebeeshoek West switching station and the San Kraal substation. Will not be affected by WEF.</td>
<td>Packed stone cairn approx. 1 m³. Close to farm boundary. Possibly boundary marker.</td>
<td>IIIC</td>
<td></td>
</tr>
</tbody>
</table>

2019
<table>
<thead>
<tr>
<th>Archaeological Occurrence</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Associated WEF feature</th>
<th>Description</th>
<th>Grading</th>
<th>Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEB010 / GEB011 / JG041 / JG042 / JG043 / JG044 / JG045</td>
<td>-31.293217 / -31.29685</td>
<td>24.87975 / 24.8757</td>
<td>Approx. 1100 m from collector station and N10 access points. Will not be affected by WEF.</td>
<td>Series of MSA lithic scatters in deflated/washed out areas on flat valley bottom with stream. Lithic material appears to be visible wherever sandy topsoil is absent.</td>
<td>IIIc</td>
<td><img src="image1" alt="Photo" /> <img src="image2" alt="Photo" /> <img src="image3" alt="Photo" /></td>
</tr>
<tr>
<td>Archaeological Occurrence</td>
<td>Latitude</td>
<td>Longitude</td>
<td>Associated WEF feature</td>
<td>Description</td>
<td>Grading</td>
<td>Photo</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------</td>
<td>-----------</td>
<td>------------------------</td>
<td>-------------</td>
<td>---------</td>
<td>-------</td>
</tr>
</tbody>
</table>

![Photo](image-url)