



SiVEST SA (PTY) LTD

PROPOSED CONSTRUCTION OF THE HEUWELTJIES WIND ENERGY FACILITY, NEAR BEAUFORT WEST, WESTERN CAPE PROVINCE, SOUTH AFRICA

Heritage Impact Assessment

DFFE Reference: TBA
Report Prepared by: PGS Heritage Pty Ltd
Issue Date: 14 December 2022
Version No.: 0.2

Declaration of Independence

- I, Nikki Mann, declare that –
- General declaration:
- I act as the independent heritage practitioner 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 heritage impact assessments, 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 will take into account, to the extent possible, the matters listed in section 38 of the NHRA when preparing the application and any report relating to the application;
- 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;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from a heritage practitioner in terms of the Act and the constitutions of my affiliated professional bodies; and
- I realise that a false declaration is an offence in terms of regulation 71 of the Regulations and is punishable in terms of section 24F of the NEMA.

Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

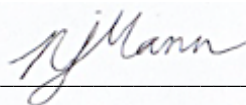
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CONTACT PERSON: Nikki Mann - Archaeologist

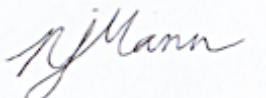

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PGS confirms that this HIA report is done in accordance with the QMS implemented by PGS Heritage. The report structure and format followed is that of SiVEST Environmental as per the appointment scope and deliverable of SiVEST. The authors did implement the PGS HIA SOP and requirements

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PROPOSED CONSTRUCTION OF THE HEUWELTJIES WIND ENERGY FACILITY, NEAR BEAUFORT WEST, WESTERN CAPE PROVINCE, SOUTH AFRICA

HERITAGE IMPACT ASSESSMENT

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd (PGS) has been appointed by SiVest (PTY) Ltd (SiVEST), on behalf of South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as "Mainstream"), to undertake the assessment of the proposed construction of the 240MW Heuweltjies Wind Energy Facility (WEF) located near Beaufort West in the Western Cape Province of South Africa.

1. SITE NAME

The Heuweltjies WEF and associated infrastructure.

2. LOCATION

The proposed WEF is located approximately 70km south of Beaufort West in the Western Cape Province. It is within the Prince Albert Local Municipality, in the Central Karoo District Municipality (**Figure 1**).

The WEF application site is approximately 4017.6 hectares (ha) in extent and incorporates the following farm portions:

- Remainder of the Farm Witpoortje No 16
- Portion 8 Of The Farm Klipgat No 114

A smaller buildable area (1673 ha) has however been identified as a result of a preliminary suitability assessment undertaken by Mainstream and this area is likely to be further refined with the exclusion of

sensitive areas determined through various specialist studies being conducted as part of the EIA process.

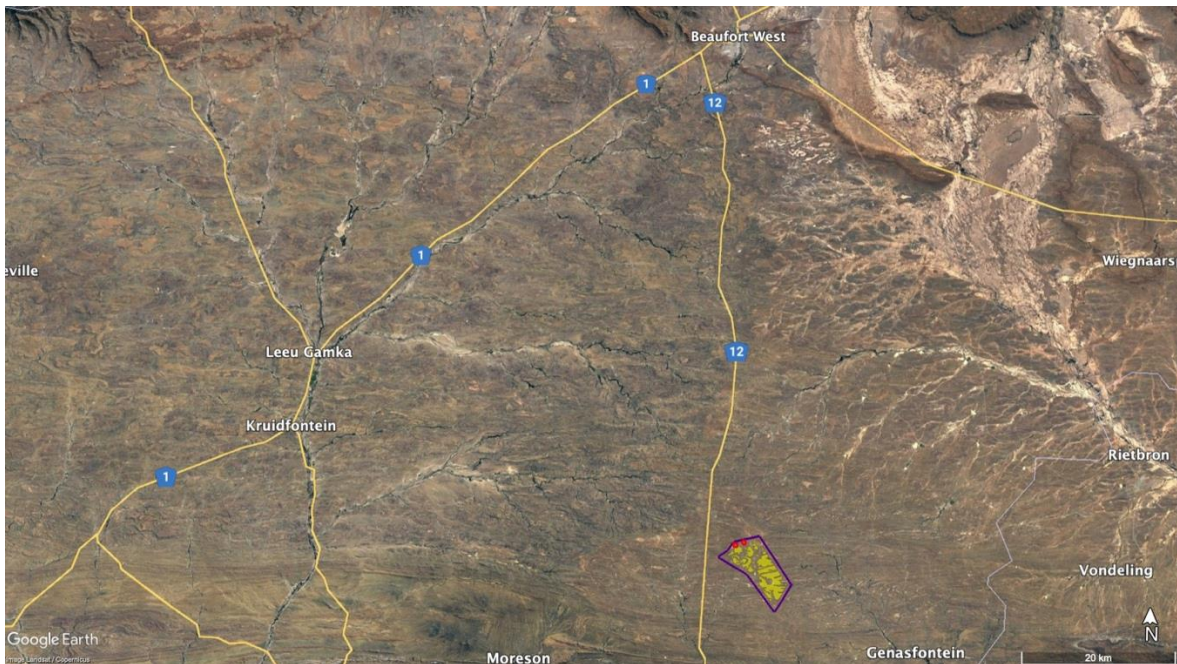


Figure 1: Locality of Heuweltjies study area.

3. DESCRIPTION OF THE PROPOSED DEVELOPMENT

It is anticipated that the proposed Heuweltjies WEF will comprise of up to sixty (60) wind turbines with a maximum total energy generation capacity of up to approximately 240MW (**Figure 2**). The electricity generated by the proposed WEF development will be fed into the national grid via a 132kV overhead power line. The 132kV overhead power line will however require a separate EA and will be subject to a separate Basic Assessment (BA) process, which will be undertaken in parallel to the EIA process as far as possible. A BESS will be located next to the onsite 33/132kV substation.

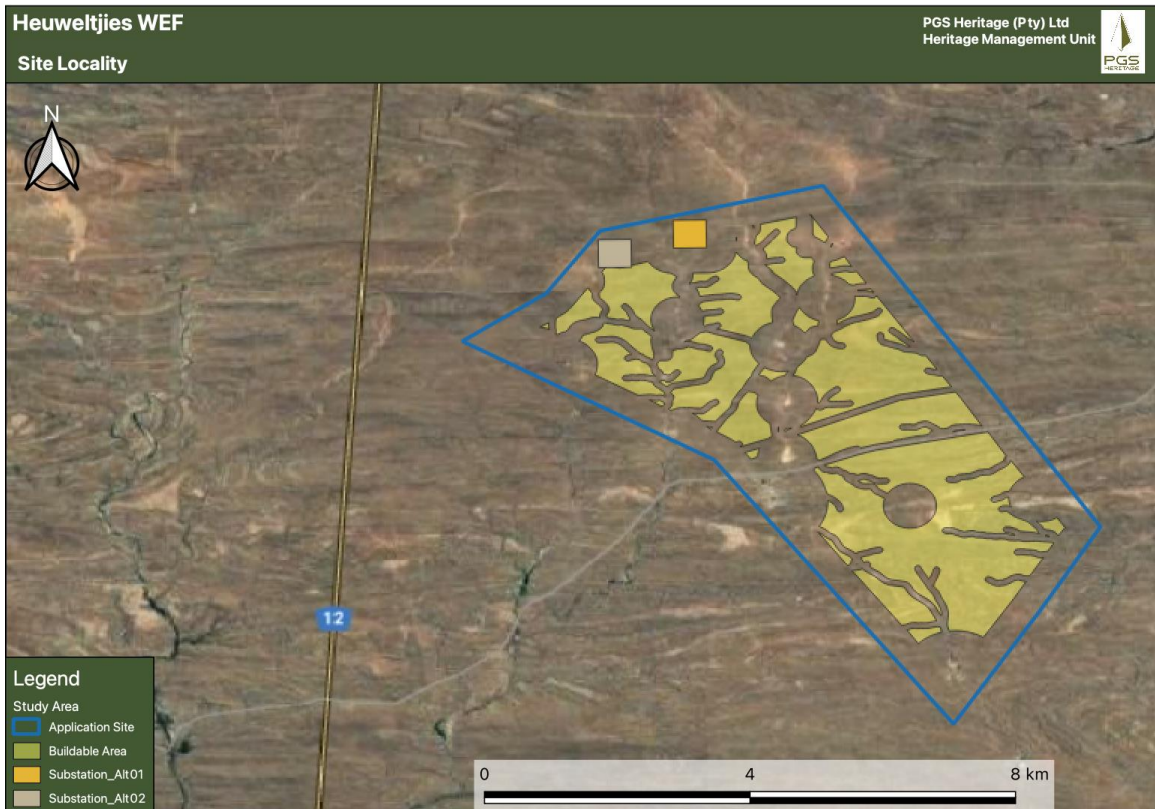


Figure 2: Proposed layout and development area for Heuweltjies WEF and associated infrastructure.

4. HERITAGE RESOURCES IDENTIFIED

The fieldwork component of the study was aimed at identifying tangible remains of archaeological, historical and heritage significance. A selective survey of the study area was conducted in February 2021. Due to the nature of cultural remains, a systematic controlled-exclusive surface survey was conducted on foot, by two archaeologists from PGS (Ruan van der Merwe and Wynand van Zyl). The cultural landscape elements field survey was conducted by a cultural landscapes specialist (archaeologist / anthropologist / heritage specialist) over 4 days from 25-28 November 2021 (summer). The palaeontological field work was conducted in early November 2020.

4.1 Archaeology, built environment and burial grounds and graves

The fieldwork conducted for the evaluation of the possible impact of the new Heuweltjies WEF has revealed the presence of twenty-seven (27) heritage resources.

Burial Grounds and graves

Two (2) burial grounds (**H006, H016**) were rated as having high heritage significance.

Historical structures

Five (5) structures (**H001, H002, H008, H014, H014/1**) were rated as having medium heritage significance and three (3) structures (**H007, H015, H017**) were rated as having low heritage significance.

Archaeological features

Three (3) Stone Age sites (**H013, H013/1, H013/3**) were rated as having medium heritage significance.

Fourteen (14) find spots (**H003-5, H009-12, H018-24**) comprise a number of low-density Stone Age surface artefact scatters and were rated as having low heritage significance. These are primarily from the Middle Stone Age (MSA), although both Later Stone Age (LSA) and earlier Early Stone Age (ESA) material was identified. All of these artefact assemblages occur in heavily deflated and eroded areas, so their scientific potential and heritage significance is somewhat lowered. Based on findings from a range of other heritage reports in the area, these types of sites are to be expected in this region.

4.2 Palaeontology

The Palaeontological Impact assessment (PIA) determined that the Heuweltjies WEF project areas are underlain by continental (fluvial / lacustrine) sediments of the Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) which are of Middle Permian age. These bedrocks contain sparse, unpredictable to locally concentrated vertebrate fossils as well as rare trace fossils (e.g., tetrapod trackways and burrows) and plant material of scientific and conservation value. Very few new fossil vertebrate sites - most notably a partial, articulated pareiasaur reptile skeleton - have been recorded within the WEF project area during the short (2 day) site visit, while several more sites have previously been mapped in the vicinity during recent palaeontological surveys of adjoining WEF project areas. All the recorded fossil sites lie *outside* the WEF project footprints.

No Very High Sensitivity or No-Go palaeontological sites or areas have been identified within the WEF project areas. The single known pareiasaur reptile skeleton site lies along a stream bank and is therefore already protected within the standard ecological buffer zone. Since all known fossil sites can be readily mitigated – if necessary - through professional recording and collection of fossil material in the pre-construction phase, no recommendations for micro-siting of infrastructure such as wind turbine, pylon positions or access roads are therefore made here. There are no preferences on palaeontological heritage grounds for specific site options for the WEF on-site substation and construction laydown area, given their similar geological and palaeontological context.

4.3 Cultural Landscape

The Koup region is a significant cultural landscape that reflects the relationship between man and nature over a period of time. This relationship has generally been sustainable, where biodiversity and ecological systems have been maintained in the utilisation of the landscape expressed in specific land use patterns. The surrounding land use indicates a social appreciation of the natural environment with low impact stock and game farming with limited farmstead crop cultivation. The vastness and relative homogenous nature of the cultural landscape is, however, often undervalued. If careful contextual planning is not followed, it will rapidly result in a cluttered wasteland. This does not mean that development is discouraged, but rather that the implementation of wind and solar energy farms should be planned holistically.

The findings of this report, coupled with the proposed layout for development of wind turbines, which considers appropriate placement in terms of wind energy capacity, concludes that the development can be permitted within the site if the report's recommendations are followed. The mitigating recommendations in this report consider the ecological, aesthetic, historic and socio-economic value lines that underpin the layers of significance that combine to create the character of the place and the cultural landscape of the Koup. These recommendations include road and farmstead complex buffers which incorporate cultivated areas and graves, steep slope and ridgeline no-go areas as well as consideration of the unique land form of the site, CBA and ESA no-go areas, as well as mechanisms to support any non-landowner residents that live on the site in being able to continue their indigenous land use patterns, knowledge and social systems, although none were identified during this fieldwork.

5. ANTICIPATED IMPACTS ON HERITAGE RESOURCES

The pre-construction and construction phase of the proposed WEF will entail extensive surface clearance as well as excavations into the superficial sediment cover and underlying bedrock (e.g. for widened or new access roads, wind turbine foundations, hardstanding areas, on-site substation, underground cables, construction laydown area, O&M building and BESS).

Construction of the facility may adversely affect potential archaeological and fossil heritage within the development footprint by damaging, destroying, disturbing or permanently sealing-in fossils preserved at or beneath the surface of the ground that are then no longer available for scientific research or other public good. The possible pre-construction impacts calculated on the tangible cultural heritage resources vary between **HIGH to MODERATE NEGATIVE** rating but with the implementation of the recommended buffers and management guidelines will be reduced to a **LOW NEGATIVE** impact.

The impact on the cultural landscape includes:

- Critical Biodiversity Areas (BDA) and Ecological Support Areas (ESA), largely associated with the riverine environment of the study area supports biodiversity conservation. These areas recognise the ongoing relationship between man and the environment in the way they are managed to maintain a natural state, which in turn, has a benefit for human habitation. Landscape elements are reflected in the names of the local farmsteads, indicating a close relationship between inhabitants on the landscape and these rivers as well as the significant dependence on these resources;
- The impact on the sense of place as the vast open landscape with low shrubby vegetation, characteristic of the Koup Karoo and determining to a large extent its evolution in history, creates a sense of place and landscape character intimately associated with this cultural landscape;
- The impact on the historicity of the landscape specifically on such features as, the national N12 road, a historic route linking Beaufort West with the towns of De Rust and Outshoorn via scenic Meiringspoort Pass and the coastal town of George further south; history of the landscape and its intimate association with stock farming and waves of settlement throughout history stretching back to the Stone Age.
- The impact on the continued land use pattern and relationship to the land and its possible decline of the socio-economic position of the inhabitants, as they may not be able to maintain some level of subsistence with these resources. The ability for these residents to provide for themselves in this way must not be negatively impacted upon by the WEF development and must be supported, including financially, by the development. Their existence on the landscape, as the historic inhabitants of the area, previously disenfranchised and disempowered, is a fundamental element to the cultural landscape.

The impact on the cultural landscape through the development of the Heuweltjies WEF is calculated to have a **VERY HIGH** negative impact and specifically on the aesthetic and historical components of the cultural landscape. This impact is further projected as **VERY HIGH** when incorporating the cumulative impacts projected with the other eight (8) projects within 35k m of Heuweltjies. By implementing the recommended mitigation measures and design indicators this negative impact can potentially reduce to **MODERATE**.

6. RECOMMENDATIONS

The calculated impact as summarised in **Section 8** of this report confirms the impact of the new Heuweltjies WEF will be reduced with the implementation of the mitigation measures (**Section 10**) for the cultural heritage resources. This finding in addition to the implementation of a chance finds procedure, as part of the EMP, will mitigate possible impacts on unidentified heritage resources.

An assessment of the final footprint of the new Heuweltjies WEF must be conducted with the final walkdown of the area during the finalization of the Layout and EMPr.

The following mitigation measures will be required:

In terms of the **AIA**:

- An archaeological walk down of the final approved layout will be required before construction commences;
- 50m buffer zones around grave sites (**H006, H016**)
- 30m buffer zone around farmsteads (**H001, H002, H008, H014 (H014/1)**)
- 30m buffer zone around historical structures (**H007, H015, H017**)
- 30m buffer zones around Stone Age sites with a medium heritage significance (**H013, H013/1, H013/3**)
- If significant Stone Age sites (medium heritage significance or higher) can't be avoided, then sites must be sampled by a qualified specialist under a permit issued by SAHRA
- A heritage management plan for the heritage resources and a grave management plan needs to be compiled and approved for implementation during construction and operations of the project.
- A chance finds protocol must be developed that includes the process of work stoppage, site protection, evaluation and informing HWC of such finds and a final process of mitigation implementation.

In terms of the **Cultural Landscape Assessment (CLA)**:

- A 1000m buffer to either side of the N12 for turbine and infrastructure placement (800m no-go turbine buffer and 200m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout);
- 300m buffer to either side of identified significant historic regional road for turbine placement, substation and laydown area (200m no-go turbine buffer and 100m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout);
- 800m buffer around Trakaskuilen and Lammerkraal farmsteads and 300m buffer around Klipgat and Witpoortjie ruin cultural landscape features for turbine placements (single turbines at the edges of some of these buffers are acceptable); and
- existing roads to be used with minimal upgrade as far as possible;
- provisional no-go areas on koppie and steep slopes (over 10%) for all infrastructure (no-go areas to be refined to specialist approval in EIA phase once finer detailed information is available);
- riverine corridors 100m buffer.

Further, the following changes to the current proposed layout is recommended:

- Substation options 1 and 2 are equally acceptable in their proposed placement.

Further heritage indicators and recommendations for construction/ decommissioning and operational phases unsuitable for mapping have been made in the CLA (Section 12) and are necessary for the identified negative impacts to be reduced from very high to medium negative impact of the proposed Heuweltjies WEF and associated infrastructure on the cultural landscape.

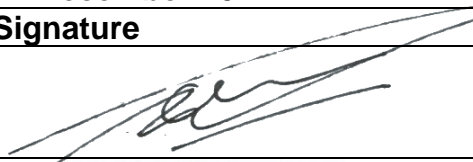


More detailed development mitigation could be considered through micro-site assessment, by a suitably qualified cultural landscape specialist, on final layout of the proposed WEF and gridline development.

In terms of the Palaeontological Impact Assessment (PIA):

Recommended mitigation for WEF project comprises:

- Cross-checking of final, authorized footprints against the available fossil database by a palaeontological specialist;
- If necessary, a specialist palaeontological walk-down of selected, unsurveyed, potentially sensitive sectors of the final WEF project areas in the pre-construction phase and
- Implementation of a Chance Fossil Finds Protocol by the ECO / ESO during the construction phase. The qualified palaeontologist responsible for the mitigation work will need to submit a Work Plan for approval by Heritage Western Cape (HWC) and a Mitigation Report must be submitted to HWC for consideration.

7. AUTHOR/S AND DATE

Date:	14 December 2022	
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NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page ii of Report- Contact details and company Section 1.2 and Appendix A
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page ii
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1.3, 5 and 6
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7, 8 and 9
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.3 and 5
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.3
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;	Section 6 and 7
g) an identification of any areas to be avoided, including buffers;	Section 7 and 11
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;	Section 7
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
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;	Executive summary and section 8, 9, 10, and 11
k) any mitigation measures for inclusion in the EMPr;	Section 10
l) any conditions for inclusion in the environmental authorisation;	Section 10 and 11
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Executive Summary; Section 11
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
q) any other information requested by the competent authority.	
2) Where a government notice <i>gazetted</i> 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.	NEMA Appendix 6 and GN648

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PROPOSED CONSTRUCTION OF THE HEUWELTJIES WIND ENERGY FACILITY, NEAR BEAUFORT WEST, WESTERN CAPE PROVINCE, SOUTH AFRICA

HERITAGE IMPACT ASSESSMENT

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Glossary of Terms

Archaeological resources

This includes:

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

rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;

wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;

features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

construction, alteration, demolition, removal or change in use of a place or a structure at a place;

carrying out any works on or over or under a place;

subdivision or consolidation of land comprising a place, including the structures or airspace of a place;

constructing or putting up for display signs or boards;

any change to the natural or existing condition or topography of land; and

any removal or destruction of trees, or removal of vegetation or topsoil

Early Stone Age

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

Fossil

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

Heritage

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

Heritage resources

This means any place or object of cultural significance and can include (but not limited to) as stated under Section 3 of the NHRA,

- places, buildings, structures and equipment of cultural significance;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features of cultural significance;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds, and
- sites of significance relating to the history of slavery in South Africa;

Holocene

The most recent geological time period which commenced 20 000 years ago.

Late Stone Age

The archaeology of the last 30 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Stone Age

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

Heritage Site

Site in this context refers to an area place where a heritage resource is located and not a proclaimed heritage site as contemplated under s27 of the NHRA.

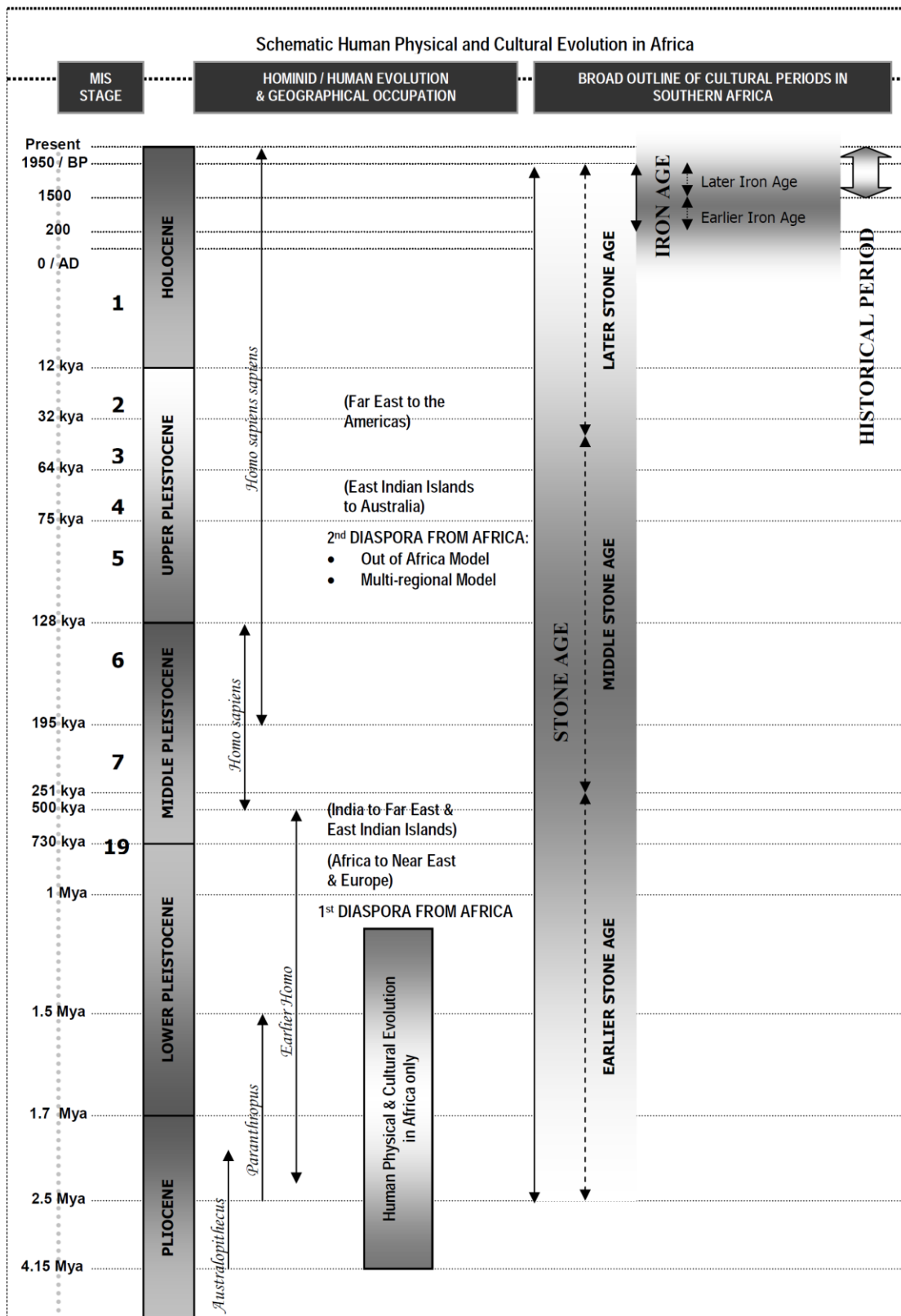


Figure 3: Human and Cultural Timeline in Africa (Morris, 2008)

List of Abbreviations

Abbreviations	Description
AIA	Archaeological Impact Assessment
APHP	Association of Professional Heritage Practitioners
ASAPA	Association of South African Professional Archaeologists
BESS	Battery Energy Storage System
CBD	Critical Biodiversity Areas
CRM	Cultural Resource Management
DFFE	Department of Forestry, Fisheries and Environment
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
ESAs	Ecological Support Areas
GN	Government Notice
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
Mainstream	South Africa Mainstream Renewable Power Developments (Pty) Ltd
MSA	Middle Stone Age
MIA	Middle Iron Age
NCA	National Competent Authority
NCW	Not Conservation Worthy
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
O&M	Operation and Maintenance
OES	Ostrich eggshell
PGS	PGS Heritage (Pty) Ltd
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
SIVEST	SiVEST (PTY) Ltd
WEF	Wind Energy Facility

SiVEST SA (PTY) LTD

PROPOSED CONSTRUCTION OF THE HEUWELTJIES WIND ENERGY FACILITY, NEAR BEAUFORT WEST, WESTERN CAPE PROVINCE, SOUTH AFRICA

HERITAGE IMPACT ASSESSMENT

1. INTRODUCTION

PGS Heritage (Pty) Ltd (PGS) has been appointed by SiVest (PTY) Ltd (SiVEST), on behalf of South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as “Mainstream”), to undertake the assessment of the proposed construction of the Heuweltjies Wind Energy Facility (WEF) near Beaufort West in the Western Cape Province.

The overall objective of the development is to generate electricity by means of renewable energy technology capturing wind energy to feed into the National Grid.

It is anticipated that the proposed Heuweltjies WEF will comprise of up to sixty (60) wind turbines with a maximum total energy generation capacity of up to approximately 240MW. The electricity generated by the proposed WEF development will be fed into the national grid via a 132kV overhead power line (this will form part of a separate Basic Assessment application, and as such is not included in this report).

1.1 Terms of Reference

The aim of the study is to identify possible archaeological heritage sites and finds that may occur in the proposed development area. The HIA aims to inform the Environmental Impact Assessment (EIA) in the development of a comprehensive Environmental Management programme (EMPr) to assist the project applicant in responsibly managing the identified heritage resources in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act (Act 25 of 1999) (NHRA).

1.2 Specialist Credentials

This study was compiled by PGS and its appointed specialists and is detailed below:

The staff at PGS has a combined experience of nearly 90 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes. PGS will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Wouter Fourie, the Project Coordinator, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Principal Investigator; he is further an Accredited Professional Heritage Practitioner with the Association of Professional Heritage Practitioners (APHP).

Nikki Mann, author of the Archaeological Impact Assessment (AIA) and Heritage Impact Assessment (HIA) report, graduated with her Master's degree (MSc) in Archaeology and is registered as a Professional Archaeologist with the ASAPA.

Dr John Almond, author of the Palaeontological Impact Assessment (PIA), has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa.

Emmylou Rabe Bailey, author of the Cultural Landscape Assessment (CLA), director of Hearth Heritage consultancy, has over 10 years of experience in the heritage field, in the public and private sectors. Emmylou holds an MA in Archaeology and Heritage Conservation from the University of Leicester, UK (2008), specialising in the assessment, conservation and representation of archaeological resources and cultural landscapes. Her BA(Hons) in Environmental Science and Archaeology was interdisciplinary research that focused on heritage assessment, conservation and management of the Luyolo Cultural Landscape in Simonstown, Cape Town (UCT, 2002). Emmylou's PhD in Environmental Anthropology (Rhodes University) around conservation and care ethics in cultural landscapes is currently on hold. Emmylou is an Accredited Professional Heritage Practitioner with the APHP and registered with the ASAPA as a Professional Archaeologist. She also sits on Heritage Western Cape Council and the HWC Archaeology, Palaeontology and Meteorites Permitting Committee.

1.3 Assessment Methodology

This HIA report was compiled by PGS for the proposed development of the Heuweltjies WEF. The applicable maps, tables and figures, are included as stipulated in the NHRA (no 25 of 1999), the NEMA (no 107 of 1998). The HIA process consisted of three steps:

Step I – Literature Review: A detailed archaeological and historical overview of the study area and surroundings were undertaken. This work was augmented by an assessment of reports and data contained on the South African Heritage Resources Information System (SAHRIS). Additionally, an assessment was made of the available historic topographic maps. All these desktop study components were undertaken to support the fieldwork.

Step II – Physical Survey: The fieldwork was conducted over several days. It aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

The fieldwork for the AIA was conducted by archaeologists from PGS (Ruan van der Merwe and Wynand van Zyl) over four days in February 2021.

The fieldwork for the PIA was completed by a palaeontologist, John Almond over a 2-day site-specific field survey during the period 3 to 4 November 2020 (as described in the PIA), while the component for the Cultural Landscape Assessment by a cultural landscape specialist (archaeologist/anthropologist/heritage specialist), Emmylou Rabe Bailey, over 4 days from 25-28 November 2021 (as described in the CLA), which aimed at locating and documenting sites falling within the proposed development footprint.

Step III – The final step involved the recording and documentation of relevant archaeological resources, the assessment of resources in terms of the HIA criteria and report writing, as well as mapping and constructive recommendations.

1.3.1 Archaeological specific methodology

Additional to the preceding methodological description the archaeological methodology included fulfilling the requirements of the NHRA (section 35 and 36) that protects the following features in the landscape:

- Material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
- Rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency, and which is older than 100 years, including any area within 10m of such representation;

- Graves and burial grounds, including ancestral graves, royal graves, graves of traditional leaders, graves of victims of conflict, historical graves and cemeteries, and other human remains not covered by the Human Tissue Act (1983) (Act No 65 of 1983).

1.3.2 *Palaeontological specific methodologies*

In summary, the approach to PIA was as follows. Fossil bearing rock units occurring within the broader study area is determined from geological maps and relevant geological sheet explanations as well as satellite images. Known fossil heritage in each rock unit is inventoried from scientific literature, previous assessments of the broader study region, and the author's field experience and palaeontological database. Based on this data as well as field examination of representative exposures of all major sedimentary rock units present, the palaeosensitivity of the development area and impact significance of the proposed development is assessed together with recommendations for any further specialist palaeontological studies or mitigation. This PIA was undertaken in line with the HWC 2021 Minimum Standards for the palaeontological component of heritage impact assessment.

1.3.3 *Cultural Landscape Assessment specific methodologies*

1.3.3.1 *Desktop analysis and literature review.*

- Review of Desktop Beaufort West Heritage Survey and Beaufort West Municipal SDF;
- Review of Central Karoo District Spatial Development Framework.
- Review of relevant Archaeological Impact Assessment (AIA), Heritage Impact Assessment (HIA), Visual Impact Assessment (VIA) and Socio-economic Impact Assessment reports (SEIA) on the proposed Koup 1 and adjacent Koup 2 proposed WEFs as well as other relevant assessment reports from the surrounding area;
- Review of relevant academic literature and articles on cultural landscape assessment;
- Review of relevant academic literature and articles on the cultural heritage of the regional study area;
- Review of relevant policies and legislation on cultural landscapes assessment, scenic drives and route assessment and heritage assessment in EIA process;
- Review of historic and current maps of the study area and surrounds;
- Review of REDZs Strategic Environmental Assessment (SEA) reports (DEA, 2015); and
- Review of relevant international cultural landscapes best practice.

1.3.3.2 *Preliminary field survey*

The field survey of cultural landscape elements was conducted by a cultural landscapes specialist (archaeologist/anthropologist/heritage specialist) over 4 days from 25 – 28 November 2021 (summer).

The survey was conducted in a vehicle on existing farm access roads and on foot where no vehicle access was possible. Cultural heritage resources and cultural landscape elements falling within and adjacent to the proposed development footprint were identified, mapped and photographed where appropriate. The season for fieldwork did not impact the research for this study.

1.3.3.3 *Recording*

Recording and documentation of relevant cultural heritage and cultural landscape elements, the assessment of resources in terms of the specialist requirements for CLA criteria, report writing, mapping and recommendations.

The significance of the cultural landscape is based on the examination of the

- processes (spatial pattern, land uses, response to natural features and cultural traditions);
- components (circulation, boundaries, vegetation, structural types, cluster arrangements, archaeological types, small-scale elements); and
- perceptual qualities (views and aesthetics), which are then utilized to identify and assess the relationships between the patterns of human use, the natural environment and cultural beliefs and attitudes.

Evaluation of provisionally identified heritage elements' significance according to World Heritage Convention Operational Guidelines (2017) and NHRA (Act 25 of 1999) as is required as part of the BA process.

1.3.3.4 *Grading*

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

HWC (2016), uses a system in which resources of local significance are divided into Grade IIIA – high significance, Grade IIIB – medium significance and Grade IIIC - low local or contextual significance, with a Not Conservation Worthy (NCW) grading for sites of very low or no significance and generally not requiring mitigation or other interventions).

It should be noted that without further research and investigation of the intangible and living heritage found at the Heuweltjies study site or surrounding area, a valuable and true assessment of the significance of the heritage resources and elements is not possible, and any grading assigned is subject to further work to confirm the proposed gradings. Notwithstanding, this report has drawn from other

research to inform gradings and is confident that the proposed gradings herein have considered the most common significance assignments.

1.3.3.5 Sensitivity mapping for cultural landscapes (SEA, 2015)

Landscape sensitivity was determined as part of this study through the identification of natural, scenic and cultural resources which have aesthetic, social and economic value to the local community, the region, and society as a whole. The resources considered include features of topographic, geological or cultural interest, together with landscape grain or complexity. Protected landscapes, such as national parks, nature reserves, game parks or game farms, as well as heritage sites, add to the cultural value of an area and were thus considered as essential criteria in the determination of landscape sensitivities. Landscape sensitivity was further determined by taking into account existing receptors in the area including settlements, national roads, arterial roads, scenic routes, and tourist destinations such as guest farms and resorts.

1.3.3.6 Community engagement

Limited interviews with tenants and labourers on the properties proposed for development and land owners around the proposed development were done as part of the cultural landscape assessment to identify any values associated with identified heritage resources and to ascertain whether any meaningful intangible heritage resources are associated with any of the built structures or natural features. Further research/ other studies beyond the brief of this BA would be required to determine the significance of the intangible or living heritage of the Koups cultural landscape. The findings of this report must be shared with identified interested and affected parties in the EIA public participation process in order to further ascertain any intangible cultural resources that may exist on the landscape that have not been identified. Notably it is critical that the non-landowner residents on and surrounding the properties proposed for development also be included as I&APs in the process.

1.4 Site Significance Classification Standards

The various specialist heritage reports utilise the classification system as developed by HWC (2016) (Table 1 and Table 2).

Table 1 : Rating system for archaeological resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Langebaanweg (West Coast Fossil Park), Cradle of Humankind	May be declared as a National Heritage Site managed by SAHRA. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Highest Significance
II	Heritage resources with special qualities which make them significant, but do not fulfil the criteria for Grade I status. Current examples: Blombos, Paternoster Midden.	May be declared as a Provincial Heritage Site managed by HWC. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	Exceptionally High Significance
III	Heritage resources that contribute 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.		
IIIA	Such a resource must be an excellent example of its kind or must be sufficiently rare. Current examples: Varschedrift; Peers Cave; Brobartia Road Midden at Bettys Bay	Resource must be retained. Specific mitigation and scientific investigation can be permitted in certain circumstances with sufficient motivation.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree.	Resource must be retained where possible where not possible it must be fully investigated and/or mitigated.	Medium Significance
IIIC	Such a resource is of contributing significance.	Resource must be satisfactorily studied before impact. If the recording already done (such as in an HIA or permit application) is not sufficient, further recording or even mitigation may be required.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	No further actions under the NHRA are required. This must be motivated by the applicant or the consultant and approved by the authority.	No research potential or other cultural significance

Table 2: Rating system for built environment resources

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
I	Heritage resources with qualities so exceptional that they are of special national significance. Current examples: Robben Island	May be declared as a National Heritage Site managed by SAHRA.	Highest Significance
II	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.	May be declared as a Provincial Heritage Site managed by HWC.	Exceptionally High Significance

Grading	Description of Resource	Examples of Possible Management Strategies	Heritage Significance
	Current examples: St George's Cathedral, Community House		
II	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.		
IIIA	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.	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.	High Significance
IIIB	Such a resource might have similar significances to those of a Grade III A resource, but to a lesser degree. These are heritage resources which are significant in the context of a townscape, neighbourhood, settlement or community.	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.	Medium Significance
IIIC	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.	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.	Low Significance
NCW	A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.	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 HWC for structures in this category if they are older than 60 years.	No research potential or other cultural significance

2. ASSUMPTIONS AND LIMITATIONS

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites, the layered histories associated with the area, specifically in terms of intangible and living heritage resources associated to the cultural landscape and the current dense vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out in **Section 4**.

The following identified assumptions should be noted:

- That the reports and information provided to Hearth Heritage by the client and EAP are true and correct at the time of submission.
- That the development infrastructure will be removed, and rehabilitation of the landscape completed as per the EMPr for these developments in the decommissioning phase and not recommissioned.
- That the status quo of the landscape was 'as usual' during the fieldwork period and that residents or labourers, stock or other relevant cultural elements were not altered for the survey period.

The following identified limitations should be noted:

- Only 2 previous specialist cultural landscapes research for the immediate area was available for proposed adjacent Koup 1 and 2 WEFs, however HIA studies in the area have been done and were consulted for information. Similarities to landscape character and elements in the region to other areas where CLA studies have been done, allowed for use of these studies in analysis and recommendations for development in this report (Jansen and Franklin, 2020).
- No stakeholder participation was conducted to determine intangible or living heritage resources for the purposes of the cultural landscape assessment.
- Due to the historical layering of the landscape and associated history and memory of conflict, dispossession and disempowerment, the values attributed to the landscape and heritage resources are varied and do not necessarily align to give a definitive single significance to the site. Perceptions of sense of place vary over time and place and from one individual to the next depending on their relationship to the landscape and the proposed development. Without a detailed and extensive consultation process with all potential stakeholders, including non-landowners (labourers, tourists, youth), the full significance of the cultural landscape and impact of the proposed development on it, cannot be accurately determined. The depth and complexity of values assigned to heritage resources in this landscape is beyond the scope of this report for the BAR, but should be further developed in the EIA process through stakeholder engagement by qualified heritage specialists to determine the full impact of the proposed development on the cultural landscape and inform mitigation accordingly.
- At the time of undertaking the visual study no information was available regarding the type and intensity of lighting that will be required for the proposed WEF and therefore the potential impact of lighting at night was not assessed at a detailed level. However, lighting requirements are

relatively similar for all WEFs and as such, general measures to mitigate the impact of additional light sources on the ambiance of the nightscape were provided in the VIA (Schwartz, 2021).

- Inadequate database for fossil heritage for much of the RSA, given the large size of the country and the small number of professional palaeontologists carrying out fieldwork here. Most development study areas have never been surveyed by a palaeontologist.
- Variable accuracy of geological maps which underpin these desktop studies. For large areas of terrain these maps are largely based on aerial photographs alone, without ground-truthing. The maps generally depict only significant (“mappable”) bedrock units as well as major areas of superficial “drift” deposits (alluvium, colluvium) but for most regions give little or no idea of the level of bedrock outcrop, depth of superficial cover (soil etc), degree of bedrock weathering or levels of small-scale tectonic deformation, such as cleavage. All of these factors may have a major influence on the impact significance of a given development on fossil heritage and can only be reliably assessed in the field.
- Inadequate sheet explanations for geological maps, with little or no attention paid to palaeontological issues in many cases, including poor locality information.
- The extensive relevant palaeontological “grey literature” - in the form of unpublished university theses, impact studies and other reports (e.g. of commercial mining companies) - that is not readily available for desktop studies.
- Absence of a comprehensive computerised database of fossil collections in major RSA institutions which can be consulted for impact studies. A Karoo fossil vertebrate database is now accessible for impact study work.

In the case of palaeontological desktop studies without supporting Phase 1 field assessments these limitations may variously lead to either:

- a) *underestimation* of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- b) *overestimation* of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by tectonism or weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium etc).

Since most areas of the RSA have not been studied palaeontologically, a palaeontological desktop study usually entails *inferring* the presence of buried fossil heritage within the study area from relevant fossil data collected from similar or the same rock units elsewhere, sometimes at localities far away. Where substantial exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a palaeontological impact assessment may be significantly enhanced through field assessment by a professional palaeontologist, as in the case of the present study.

In the case of the present study area in the southern Great Karoo region due south of Beaufort West (Western Cape) exposure of potentially fossiliferous bedrocks is very limited, due to extensive cover by superficial sediments and karroid *bossieveld* vegetation. However, sufficient exposures were examined to allow a realistic assessment of the palaeontological sensitivity of the key rock units (See **Figure 43**), while a substantial amount of relevant geological and palaeontological data is available from previous PIAs in the region (See, for example, References under Almond). Confidence levels for this assessment are accordingly rated as Medium. Comparatively few academic palaeontological studies have been carried out in the region so any new data from impact studies here are of scientific interest (*cf* an ongoing research project on late Middle Permian fossil assemblages in the Main Karoo Basin by Professor Bruce Rubidge at Wits University and colleagues).

3. TECHNICAL DESCRIPTION

3.1 Project Location

The proposed WEF and associated infrastructure is located approximately 70km south of Beaufort West in the Western Cape Province and is within the Prince Albert Local Municipality, in the Central Karoo District Municipality (**Figure 4**).

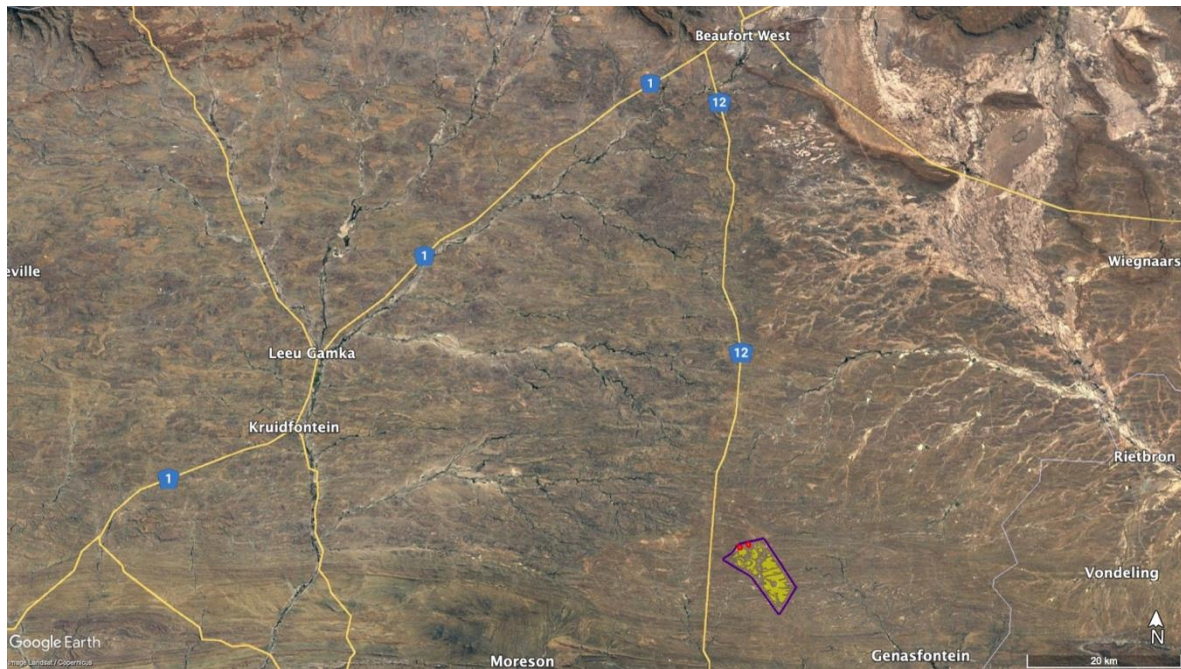


Figure 4: Regional Context Map.

3.1.1 WEF

The WEF application site as shown on the locality map below (**Figure 5**) is approximately 4017.6 hectares (ha) in extent and incorporates the following farm portions:

- Remainder of the Farm Witpoortje No 16
- Portion 8 of the Farm Klipgat No 114

A smaller buildable area (1673 ha) has however been identified as a result of a preliminary suitability assessment undertaken by Mainstream and this area is likely to be further refined with the exclusion of sensitive areas determined through various specialist studies being conducted as part of the EIA process.

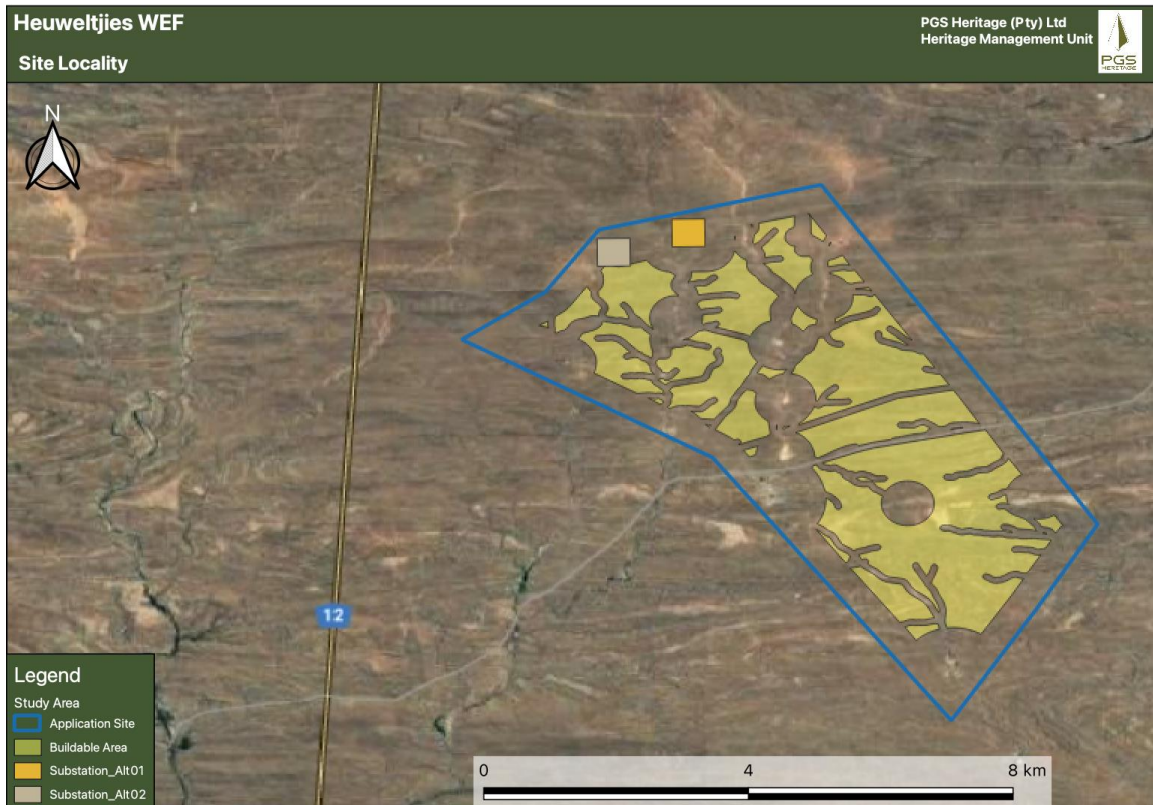


Figure 5: Heuweltjies WEF Site Locality.

3.2 Project Description

It is anticipated that the proposed Heuweltjies WEF will comprise of maximum of up to sixty (60) wind turbines with a maximum total energy generation capacity of up to approximately 240MW. The electricity generated by the proposed WEF development will be fed into the national grid via a 132kV overhead power line. The 132kV overhead power line will however require a separate EA and is subject to a separate BA process, which is currently being undertaken in parallel to this EIA process.

3.2.1 Wind Farm Components

- Up to sixty (60) wind turbines, with a maximum export capacity of approximately 240MW. This will be subject to allowable limits in terms of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The final number of turbines and layout of the WEF will, however, be dependent on the outcome of the Specialist Studies conducted during the EIA process;
- Each wind turbine will have a hub height of between 120m and 200m and rotor diameter of up to approximately 200m;
- Permanent compacted hard standing areas / platforms (also known as crane pads) of approximately 90m x 50m (total footprint of approx. 4 500m²) per turbine during construction and for on-going maintenance purposes for the lifetime of the proposed development;
- Each wind turbine will consist of a foundation of up to approximately 15m x 15m in diameter. In addition, the foundations will be up to approximately 3m in depth;

- Electrical transformers (690V/33kV) adjacent to each wind turbine (typical footprint of up to approximately 2m x 2m) to step up the voltage to 33kV;
- Associated infrastructure of approximately 25ha which includes;
 - One (1) new 11kV - 33/132kV on-site substation consisting of independent Power Producer (IPP) portion (33kv portion to form part of this environmental authorisation application form) and an Eskom portion (132kV portion of the shared 33kV/132kV portion) including associated equipment and infrastructure, occupying a total area of approximately 25ha (i.e. 250 000m²). The Eskom portion, which will be applied for under a separate environmental authorisation application, will be ceded over to Eskom once the IPP has constructed the Eskom switchyard. The necessary Transfer of Rights will be lodged with DFFE when required at a later stage.
 - A Battery Energy Storage System (BESS) will be located next to the IPP portion / yard of the shared onsite 33/132kV substation and will be included as part of the 25ha. The storage capacity and type of technology would be determined at a later stage during the development phase, but most likely will comprise an array of containers, outdoor cabinets and/or storage tanks;
 - One (1) construction laydown / staging area of up to approximately 3ha to be located on the site identified for the substation. It should be noted that no construction camps will be required in order to house workers overnight as all workers will be accommodated in the nearby town;
 - Operation and Maintenance (O&M) buildings, including offices, a guard house, operational control centre, O&M area / warehouse / workshop and ablution facilities to be located on the site identified for the substation. This will be included in the 33kV portion/yard of the on-site substation area 25 ha of the IPP portion of the onsite substation.
- The wind turbines will be connected to the proposed substation via medium voltage (11-33kV) underground cabling and overhead power lines. A 20m underground cable or overhead line servitude will be required;
- Internal roads with a width of up to approximately 5m wide will provide access to each wind turbine with a road servitude of 8m. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary. Turns will have a radius of up to 50m for abnormal loads (especially turbine blades) to access the various wind turbine positions. It should be noted that the proposed application site will be accessed via the N12 National Route;
- A wind measuring lattice (approximately 140m in height) mast has already been strategically placed within the wind farm application site in order to collect data on wind conditions;
- No new fencing is envisaged at this stage. Current fencing is standard farm fence approximately 1-1.5m in height. Fencing might be upgraded (if required) to be up to approximately 2m in height; and
- Water will either be sourced from existing boreholes located within the application site or will be trucked in, should the boreholes located within the application site be limited.

3.3 Alternatives

3.3.1 Wind Energy Facility

No other activity or site alternatives are being considered. Renewable Energy development in South Africa is highly desirable from a social, environmental and development point of view and a wind energy facility is considered suitable for this site due to the high wind resource in this area.

The choice of technology selected for the Heuweltjies WEF is based on environmental constraints and technical and economic considerations. No other technology alternatives are being considered as wind energy facilities are more suitable for the site than other forms of renewable energy due to the high wind resource.

The size of the wind turbines will depend on the development area and the total generation capacity that can be produced as a result. The choice of turbine to be used will ultimately be determined by technological and economic factors at a later stage.

Design and layout alternatives will be considered and assessed as part of the EIA. These include alternatives for the Substation locations and also for the construction / laydown area. The proposed preliminary layout is shown in **Figure 6** below.

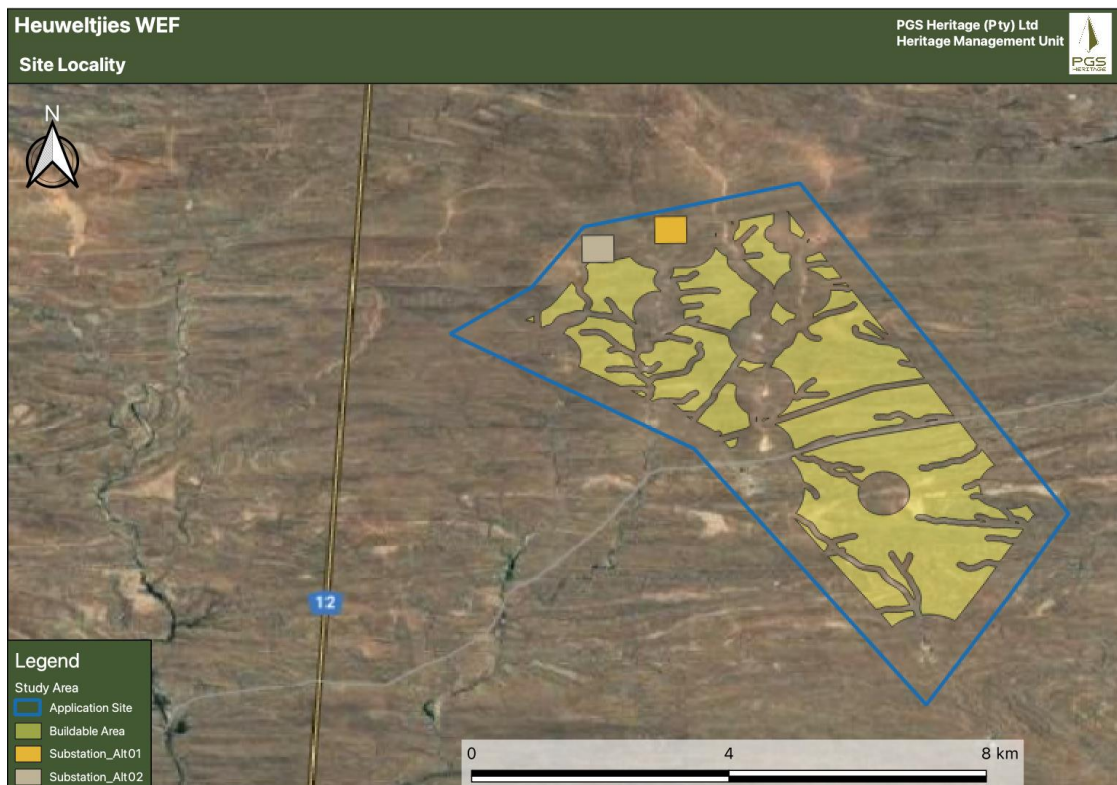


Figure 6: Preliminary layout and development area.

3.3.2 *No-go Alternative*

The 'no-go' alternative is the option of not undertaking the proposed WEF and associated infrastructure projects. Hence, if the 'no-go' option is implemented, there would be no development, and thus no associated environmental impacts on the site or the surrounding area. It provides the baseline against which other alternatives are compared and will be considered throughout the report.

4. LEGAL REQUIREMENT AND GUIDELINES

4.1 Statutory Framework: The National Heritage Resources (Act 25 of 1999)

The NHRA has applicability, as the study forms part of an overall HIA in terms of the provisions of Section 34, 35, 36 and 38 of the NHRA and forms part of a heritage scoping study that serves to identify key heritage resources, informants, and issues relating to the palaeontological, archaeological, built environment and cultural landscape, as well as the need to address such issues during the impact assessment phase of the HIA process.

4.1.1 Section 35 – Archaeology, Palaeontology and Meteorites

According to Section 35 (Archaeology, Palaeontology and Meteorites) and Section 38 (Heritage Resources Management) of the NHRA, PIAs and AIAs are required by law in the case of developments in areas underlain by potentially fossiliferous (fossil-bearing) rocks, especially where substantial bedrock excavations are envisaged, and where human settlement is known to have occurred during prehistory and the historic period.

4.1.2 Section 36 – Burial Grounds & Graves

A section 36 permit application is made to the Heritage Western Cape (HWC) or the competent provincial heritage authority which protects burial grounds and graves that are older than 60 years and must conserve and generally care for burial grounds and graves protected in terms of this section, and it may make such arrangements for their conservation as it sees fit. HWC must also identify and record the graves of victims of conflict and any other graves which it deems to be of cultural significance and may erect memorials associated with these graves and must maintain such memorials. A permit is required under the following conditions:

Permitting requirements for burial grounds and graves older than 60 years (prehistoric) and historic burials to the HWC:

- a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves.
- b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or

- c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.
- d) SAHRA or a provincial heritage resources authority may not issue a permit for the destruction or damage of any burial ground or grave referred to in subsection (3)(a) unless it is satisfied that the applicant has made satisfactory arrangements for the exhumation and re-interment of the contents of such graves, at the cost of the applicant.

4.1.3 Section 38 HIA as a Specialist Study within the EIA in Terms of Section 38(8)

A NHRA Section 38 (Heritage Impact Assessments) application to HWC is required when the proposed development triggers one or more of the following activities:

Permitting requirements for demolition of built environment features:

- a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- b) the construction of a bridge or similar structure exceeding 50 m in length;
- c) any development or other activity which will change the character of a site,
 - i. exceeding 5 000 m² in extent; or
 - ii. Involving three or more existing erven or subdivisions thereof; or
 - iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or
 - iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- d) the re-zoning of a site exceeding 10 000 m² in extent; or
- e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority

In this instance, the heritage assessment for the property is to be undertaken as a component of the EIA for the project. Provision is made for this in terms of Section 38(8) of the NHRA, which states that:

This is an HIA submitted to the relevant authority (DEA) in terms of Section 38(8) of the National Heritage Resources Act. The commenting authority is HWC.

An HIA report is required to identify, and assess archaeological resources as defined by the Act, assess the impact of the proposal on the said archaeological resources, review alternatives and recommend mitigation (see methodology above).

Section 38 (3) Impact Assessments are required, in terms of the statutory framework to conform to basic requirements as laid out in Section 38(3) of the NHRA. These are:

SiVEST Environmental Prepared by: **PGS Heritage Pty Ltd for SiVEST**
 Project Description: **Proposed Construction of the Heuweltjies Wind Energy Facility - HIA**
 Version No. 0.2

- The identification and mapping of heritage resources in the area affected.
- The assessment of the significance of such resources.
- The assessment of the impact of the development on the heritage resources.
- An evaluation of the impact on the heritage resources relative to sustainable socio/economic benefits.
- Consideration of alternatives if heritage resources are adversely impacted by the proposed development.
- Consideration of alternatives.
- Plans for mitigation in the future.

The identification and evaluation of cultural landscapes for this EIA has been conducted according to the NHRA. While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list “historical settlements and townscapes” and “landscapes and natural features of cultural significance” as part of the National Estate. Furthermore, some of the points in Section 3(3) speak directly to cultural landscapes.

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

4.1.4 NHRA definitions of terms applicable to assessment of cultural landscape:

Heritage resources are protected under the NHRA. As part of this assessment, resources were, as far as possible, assigned sensitivity ratings according to Section 3(3) of this act, which provides a guideline for evaluating the cultural significance of heritage resources according to the following criteria:

- a) its importance in the community or pattern of South Africa’s history;
- b) its possession of uncommon, rare or endangered aspects of South Africa’s natural or cultural heritage;
- c) its potential to yield information that will contribute to an understanding of South Africa’s natural or cultural heritage;
- d) its importance in demonstrating the principal characteristics of a particular class of South Africa’s natural or cultural places or objects;
- e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;

- f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- g) its strong or special association with a particular community or cultural group for social cultural or spiritual reasons;
- h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- i) sites of significance relating to the history of slavery in South Africa.

Cultural heritage values (significance) as outlined in the NHRA, refers to qualities and attributes possessed by places or objects: these values can be aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance; for the past, present and future generations. These values may manifest themselves in places and physical features but can also be associated with intangible qualities such as people's associations with or feelings for a place or item or other elements such as cultural practices, knowledge, songs, legends and stories.

4.1.5 *Cultural Heritage Survey Guidelines and Assessment Tools for Protected Areas in South Africa, May 2017 (Gazetted Dec 2017)*

This guide is meant for those who work in Protected Areas and manage cultural heritage resources. The guide should be used together with the National Heritage Resource Act, 1999 (Act No 25 of 1999) (NHRA), the National Environmental Management Act: Protected Areas Act, 2003 (Act No. 57 of 2003), the South African Heritage Resources Agency (SAHRA) and Provincial Heritage Resources Agency (PHRA) Guidelines on Norms and Standards. In lieu of minimum standards guidelines for cultural landscapes assessment specifically in South African legislation, the CHG offers cultural heritage survey guidelines and assessment tools that can be used for the purposes of CLA's in the EIA process.

Tools for inventories of different categories of cultural heritage resources:

- Intangible Cultural Heritage Types:
 - Elements of folklore and traditional crafts
 - Elements of oral tradition
- Cultural Landscapes Characteristics:
 - a) processes – spatial pattern, land uses, response to natural features and cultural traditions
 - b) components – circulation, boundaries, vegetation, structural types, cluster arrangements, archaeological types, small-scale elements
 - c) perceptual qualities – views and aesthetics

4.1.6 *Spatial Development Frameworks and Heritage Surveys*

The Western Cape Provincial Government: Heritage and Scenic resources: Inventory and Policy Framework for the Western Cape, September 2014 Version 5 by Winter & Oberholzer, identifies and

grades the scenic resources within the Western Cape. The aim of the framework study was so that cultural and scenic resources of significance could be identified and rated so that they could be included in all Spatial Development Frameworks (SDF's) to avoid inappropriate planning applications. The Winter & Oberholzer (2014) study focuses on the regional level.

4.1.7 *Scenic Routes*

A scenic route is usually a public street designated as a scenic drive by a governing body in recognition of the high visual amenity alongside that public street, including background vistas of a mountain, open country, a coastline or a town; usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail. Although not directly stipulated in the NHRA, "scenic routes" are considered as a category of heritage resource in the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) Guidelines for involving heritage specialists in the EIA process, and Baumann and Winter (2005) comment that the visual intrusion of development on a scenic route should be considered a heritage issue.

4.1.8 *World Heritage Convention*

The United Nations Educational, Scientific and Cultural Organization (UNESCO) Operational Guidelines for the World Heritage Convention (2017) define Cultural Landscapes as:

Cultural properties that represent the "combined works of nature and of man". They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal. Cultural landscapes should be selected based on their representation in terms of a clearly defined geo-cultural region and also for their capacity to illustrate the essential and distinct elements of such regions. Cultural landscapes often reflect the specific techniques of sustainable land use, considering the characteristics and limits of the natural environment they are established in, and a specific spiritual relation to nature.

Cultural landscapes fall into three main categories, namely:

- (i) The most easily identifiable is the clearly defined landscape designed and created intentionally by man. This embraces garden and parkland landscapes constructed for aesthetic reasons which are often (but not always) associated with religious or other monumental buildings and ensembles.
- (ii) The second category is the organically evolved landscape. This results from an initial social, economic, administrative, and/or religious imperative and has developed its present form by association with and in response to its natural environment. Such landscapes reflect that process of evolution in their form and component features. They fall into two sub-categories:

- ☞ a relict (or fossil) landscape is one in which an evolutionary process came to an end at some time in the past, either abruptly or over a period. Its significant distinguishing features are, however, still visible in material form.
 - ☞ a continuing landscape is one which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time, it exhibits significant material evidence of its evolution over time.
- (iii) The final category is the associative cultural landscape. The inscription of such landscapes on the World Heritage List is justifiable by the powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent.

4.1.9 Notice 648 of the Government Gazette 45421

Although minimum standards for archaeological (2007) and paleontological (2012) assessments¹ were published by SAHRA and Heritage Western Cape²³, GN.648 requires sensitivity verification for a site selected on the national web based environmental screening tool for which no specific assessment protocol related to any theme has been identified. The requirements for this Government Notice (GN) are listed in **Table 3** and the applicable section in this report noted. The screening tool indicated a **low** archaeological and cultural heritage significance (**Figure 7**) and a **very high** palaeontological significance (**Figure 8**).

Table 3: Reporting requirements for GN648

GN 648	Relevant section in report	Where not applicable in this report
2.2 (a) a desktop analysis, using satellite imagery;	Section 6	
2.2 (b) a preliminary on-site inspection to identify if there are any discrepancies with the current use of land and environmental status quo versus the environmental sensitivity as identified on the national web-based environmental screening tool, such as new developments, infrastructure, indigenous/pristine vegetation, etc.	Section 5	-
2.3(a) confirms or disputes the current use of the land and environmental sensitivity as identified by the national web-based environmental screening tool;	Section 5	-
2.3(b) contains motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity;	Section 6 provides a description of the current use and confirms/doesn't confirm the status in the screening report.	-

Separate screening reports are included in the AIA and PIA appendices for the project.

¹ South African Heritage Resources Agency. 2007. *Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment Reports*. May 2007.

² Heritage Western Cape. 2016. *Guide for Minimum Standards for Archaeology and Palaeontology Reports Submitted to Heritage Western Cape*. June 2016.

³ Heritage Western Cape 2016. *Guidelines for Heritage Impact Assessments required in terms of Section 38 of the National Heritage Resources Act (Act 25 of 1999)*.

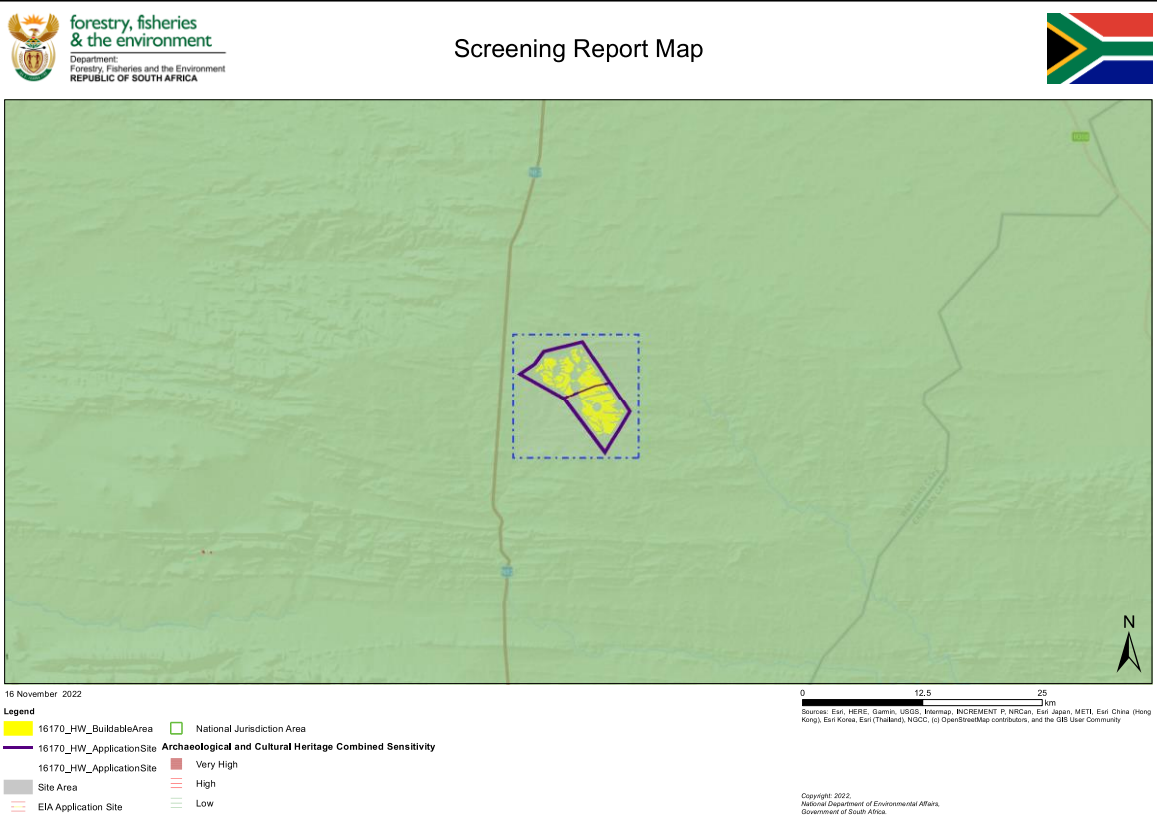


Figure 7: Archaeological sensitivity map for the Heuweltjies WEF project area abstracted from the DFFE Screening tool.

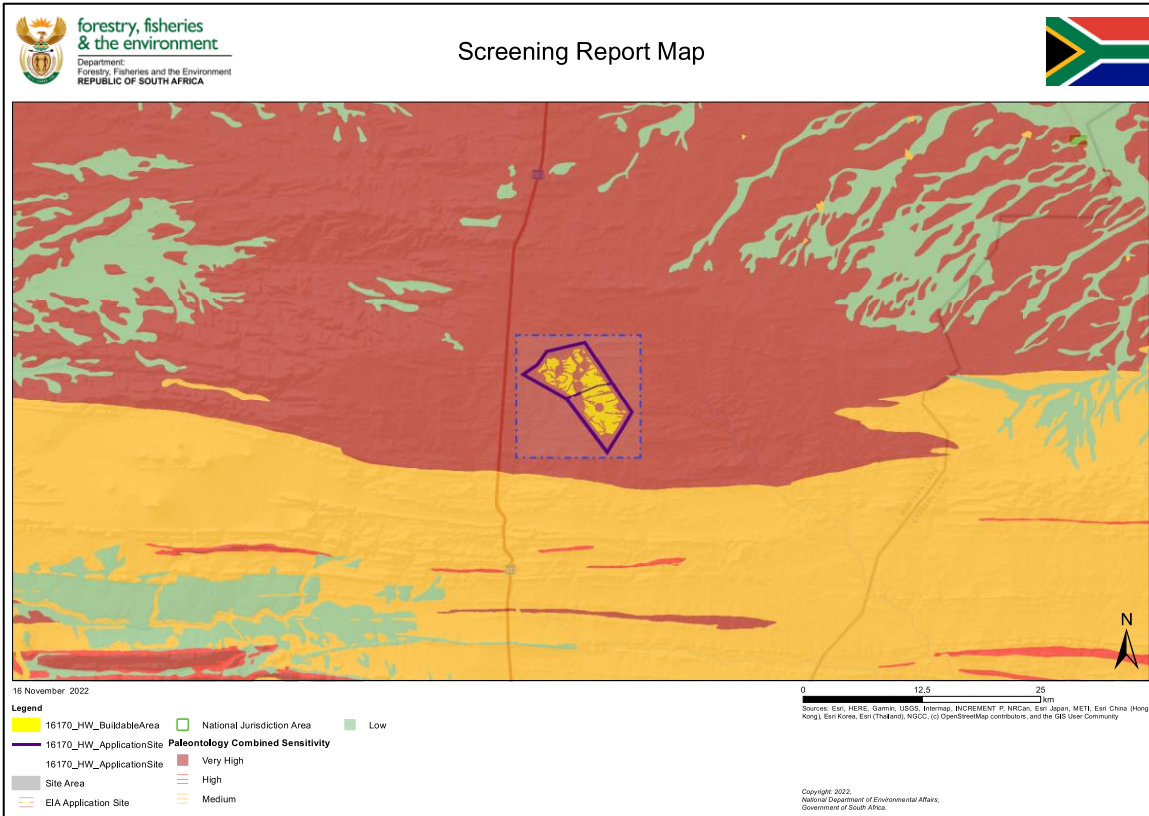


Figure 8: Palaeontological sensitivity map for the Heuweltjies WEF project area abstracted from the DFFE Screening tool.

4.1.10 NEMA – Appendix 6 requirements

The HIA report has been compiled considering the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) Appendix 6 requirements for specialist reports as indicated in the table on page vi and vii of this report.

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

A site visit was conducted by two archaeologists from PGS in February 2021. The general vicinity of the proposed development area was assessed.

The proposed development area is located approximately 70km south of the town of Beaufort West in the Western Cape Province. The study area is located within an arid and sparsely vegetated region of the Karoo which is currently experiencing a drought. This has resulted in farms in the area being restricted to farming small numbers of livestock which include Dorper sheep, cattle and game which include kudu, gemsbok and small buck.

The study area is underlain by Karoo Supergroup sedimentary rocks. Rock types encountered include hornfels, CCS (chert), mudstones, siltstone, carbonates and fine-grained sandstones, some of which have been silicified and metamorphosed. In terms of the topography, the study area comprises relatively flat portions of land which have undergone extensive erosion with the development of occasional scree slopes. There are also remnants of rocky ridges. The flat sandy plains (often bioturbated) with areas of sheet wash are frequently cut by ephemeral streams. The soils were predominately sandy with gravel and large rock fragments.

The vegetation of the study area is typical of the Nama-Karoo biome and comprises grasses, stunted shrubs and thorn trees which are established along stream courses (Palmer & Hoffman, 1997). Therefore, the archaeological visibility of the area was ideal for surveying.

The study area is serviced by the formal N12, graded gravel roads and farm tracks. Photographs of the general study area are provided below.



Figure 9: General view of the topography of the study area.



Figure 10: General view of bioturbated rocky sands.



Figure 11: View of sparse vegetation within a deflation zone in the study area.



Figure 12: View of a typical rocky ridge observed in the study area.



Figure 13: General view of outwash plain.

6. BACKGROUND RESEARCH

The previous section provided a topographical description of the proposed development area. This section seeks to describe the historical origins of the receiving environment.

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore, an internet literature search was conducted, and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

6.1 Archival/Historical Maps

Historical topographic maps (1:50 000) for various years (1965, 1987, 2005) were available for utilisation in the background study. These maps were assessed to observe the development of the area, as well as the location of possible historical structures and burial grounds. The study area was overlain on the map sheets to identify structures or graves situated within or immediately adjacent to the study area that could possibly be older than 60 years and thus protected under Section 34 and 36 of the NHRA.

6.1.1 1: 50 000 Topographical Map 3222DC and 3322BA - First Edition 1965

A section of the First Edition of the 3222DC (AMANDELHOOGTE) and 3322BA (SEEKOEKAT) Topographical Sheet is depicted in **Figure 14** and **Figure 15**. This map sheet was based on aerial photography undertaken in 1962, was surveyed in 1965 and was printed by the Trigonometrical Survey Office in 1966.

Several sites containing structures (incl. farmstead) and a ruin are depicted in the vicinity of the study area. All these identified sites are likely to be at least 56 years old.

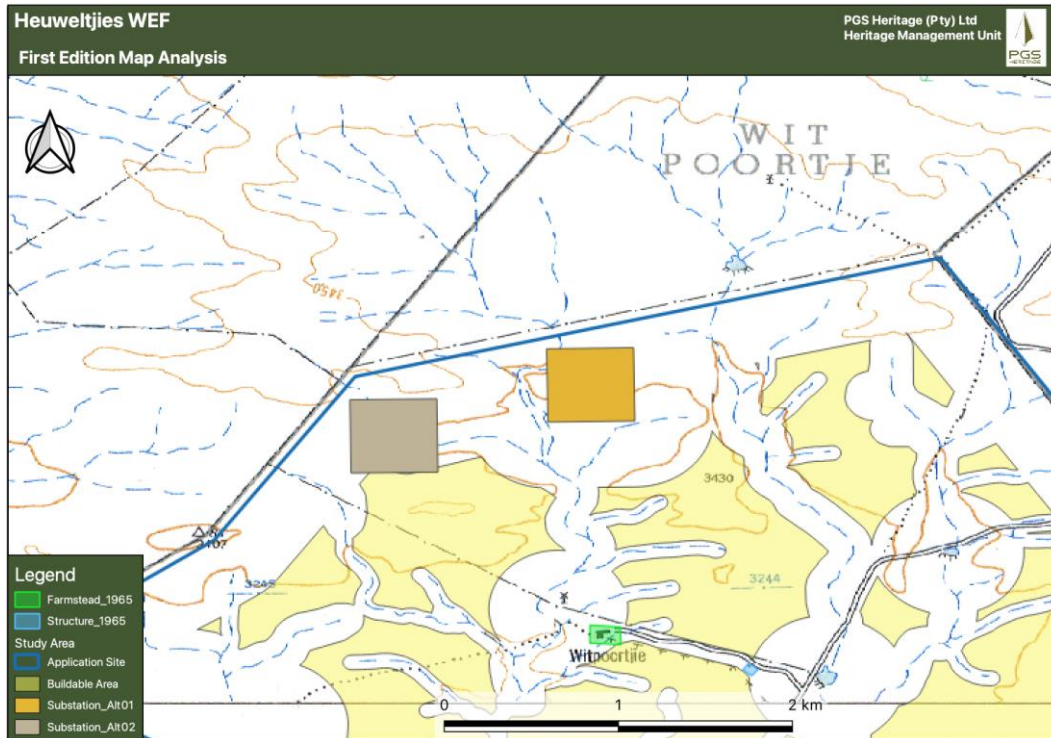


Figure 14: First Edition of 3222DC Topographic Map 1: 50 000 dating to 1965, showing the proposed Heuweltjies WEF, with two possible heritage features (Farmstead: green polygon; Structure: blue polygon) located within the project area.

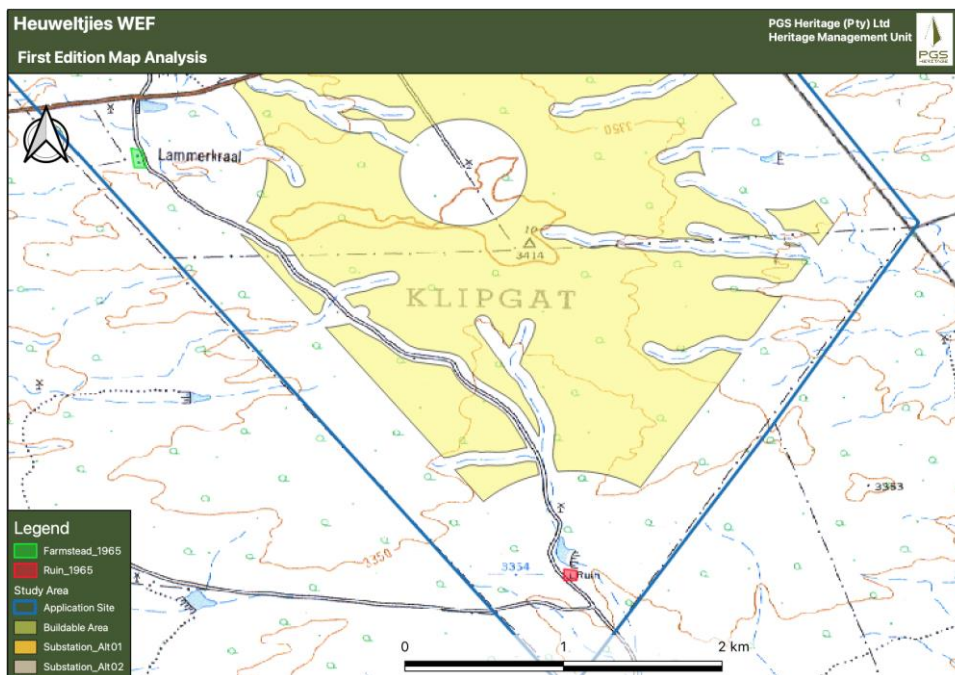


Figure 15: First Edition of 3322BA Topographic Map 1: 50 000 dating to 1965, showing the proposed Heuweltjies WEF, with two possible heritage features (Farmstead: green polygon; ruin: red polygon) located within the proposed project area.

6.2 Historical Overview of the Study Area

Table 4: Summary of archival data found on the general area.

DATE	DESCRIPTION
<p>Early Stone Age (2.5 million to 250 000 years ago)</p>	<p>The Earlier Stone Age (ESA) is the first phase identified in South Africa’s archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates to approximately 1.5 million years ago.</p> <p>Isolated ESA lithics, including occasional hand axes have been reported from the area surrounding Beaufort West, but they are generally quite ephemeral. Kinahan (2008) identified 7 ESA sites during an assessment of Ryst Kuil. He recorded isolated quartzite artefacts and commented that “none of the ESA material was considered to be in primary context and therefore of little research value”.</p> <p>No Early Stone Age sites are known within the immediate vicinity of the study area. However, this is probably due more to a lack of research on the surroundings of the study area rather than a lack of sites.</p>
<p>Middle Stone Age (250 000 to 40 000 years ago)</p>	<p>The Middle Stone Age (MSA) is the second oldest phase identified in South Africa’s archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called ‘prepared core’ technique.</p> <p>Within the region around Beaufort West, heritage reports have shown that MSA artefacts are widespread and occur in isolated as well as relatively dense concentrations over large areas. According to Kinahan (2008), the MSA sites in his assessment (Ryst Kuil) “probably formed part of a continuous surface scatter almost without focal points”. He noted that the MSA artefacts were mainly made from quartzite and hornfels.</p> <p>No Middle Stone Age sites are known within the immediate vicinity of the study area. However, this is probably due more to a lack of research on the surroundings of the study area rather than a lack of sites.</p>
<p>Later Stone Age (40 000 years ago to the historic past)</p>	<p>The Later Stone Age (LSA) is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths.</p> <p>According to heritage reports conducted in the region, LSA artefacts are not as common as ESA and MSA stone artefacts in the area. Artefacts are generally made from hornfels and in some cases chert which was most likely sourced from a chert horizon that caps some of the low hills in the area. LSA artefacts are generally located close to dry river courses (Kinahan, 2008; Halkett, 2009). There have also been hut circles and stone kraals identified which have been interpreted as representing pre-colonial pastoralist groups.</p> <p>No Later Stone Age sites are known in the vicinity of the study area. However, this is likely rather due to a lack of research focus on the surroundings of the study area than a lack of sites.</p>
<p>17th – 19th Century</p>	<p>Beaufort West historically was an important centre for sheep farming, trade and transport. This was also an area of interaction between various cultural groups.</p>

During the eighteenth and early nineteenth century the Koup was one of the last refuges of the San. A shortage of surface water meant that populations of San hunter-gatherers, and later Khoekhoe pastoralists were confined to areas with springs. During the second half of the 18th century, farmers started moving northward into the Karoo, settling in areas known as the Nuweveld and the Koup (**Figure 16, Figure 17**).

The movement of small groups of Xhosa into the Karoo during the 18th century resulted from a century of frontier wars in the Eastern Cape. The movement of Xhosa into the Karoo accelerated after the great cattle killing of 1856 and 1857. Many Xhosa migrated into the Karoo in search of work to survive. Many of these migrants fleeing starvation in the devastated lands east of the Kei River helped build some of the beautiful stone kraals that have become a feature of the Karoo.

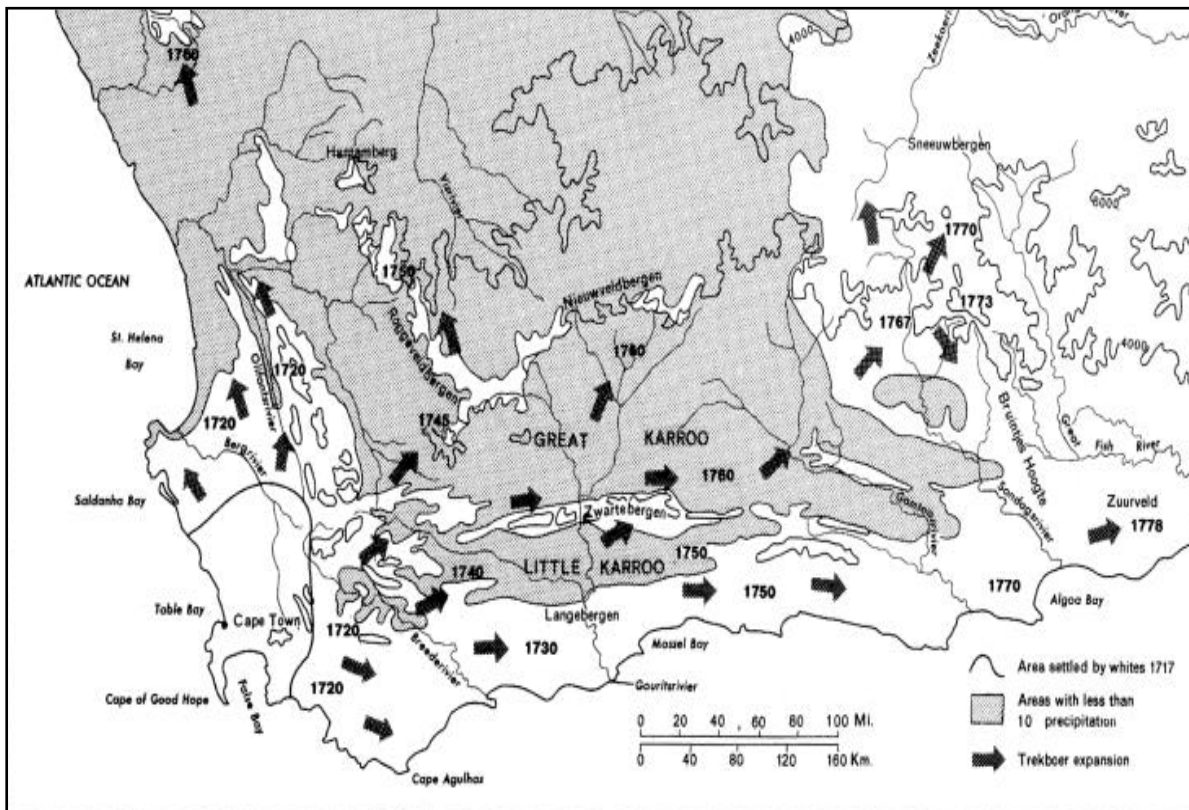
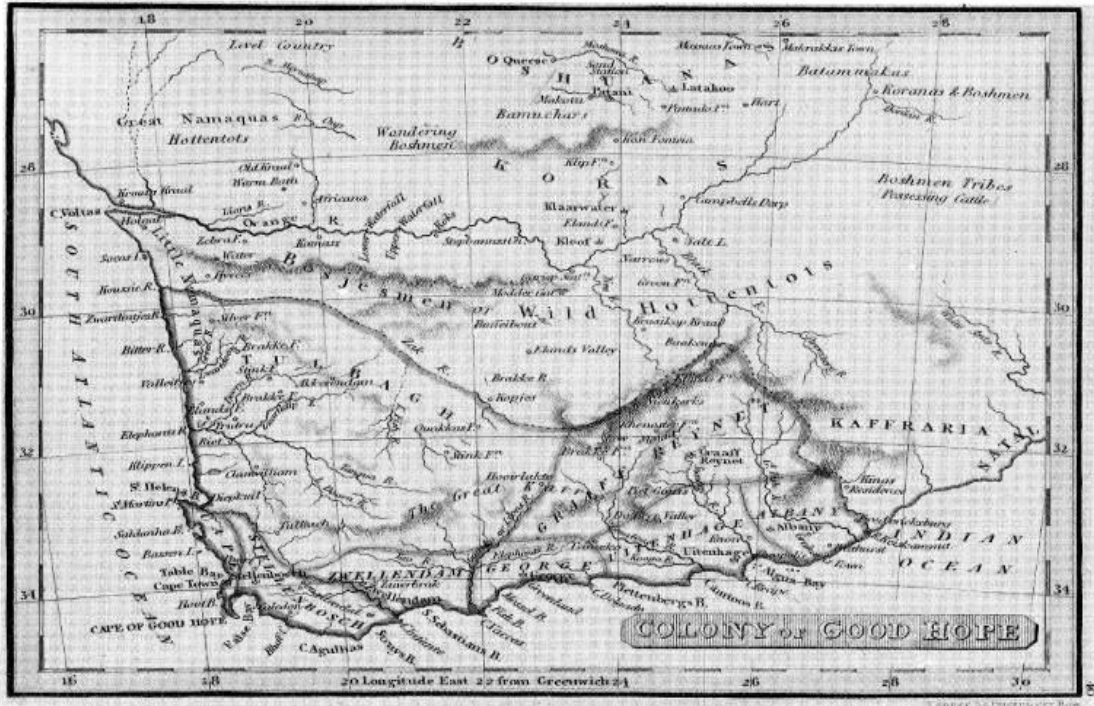


Figure 16: Trekboer and colonial expansion by 1717-1788 in the study region (Reference: Guelke & Shell 1992: 818).



The Cape Colony, 1820

Figure 17: Early map of the Cape illustrates the expansion of farmers towards the east and northeast Karoo (Reference: Watson, R.L. 1990).

6.3 Previous Heritage Studies in the area

It is well known that the Karoo contains a long and rich archaeological record dating from the ESA to the historic period. However, vast areas of the region have yet to be subjected to systematic analytical research.

Scatters of ESA through to LSA artefacts have been widely reported in the general vicinity of Beaufort West. This is a result of the erosional nature of the environment, which tends to leave artefacts exposed on the surface rather than buried beneath layers of sediment. To date, heritage studies in the area have shown that these artefacts have occurred in secondary contexts, often associated with gravel deposits, having been subjected to erosion of the soils in which they were once deposited (Dreyer 2005; Halkett 2009; Kaplan 2006, 2007; Orton 2010; Webley & Hart 2010a, 2010b; Webley & Lanham 2011). Although context is generally poor, the Karoo is still regarded as a region that is very rich in archaeological and historical heritage.

Historical resources, such as farmsteads, kraals and graves, are also observed within the Beaufort West region (Halkett 2009; Webley & Hart 2010b). To the northeast of Beaufort West, rock engravings have been identified on dolerite boulders that are characteristic of parts of the Karoo (Orton, 2010; Parkington *et al.*, 2008). The lack of caves and rock shelters in the Karoo region, results in the majority

of archaeological sites in the area being classified as open-air sites. As such, the artefacts are generally not *in-situ* and organic remains are rarely preserved.

6.3.1 South African Heritage Resources Information System (SAHRIS)

A review of SAHRIS has revealed that a number of other archaeological studies have been performed within the wider vicinity of the study area. The following studies were conducted around the study area of this report:

- **Cape Archaeological Survey (CAS) cc and Associates. 2016. Heritage Impact Assessment: Proposed Construction of Two Power Lines & Three Substations for the Mainstream Wind Energy Facility. Land Parcel Beaufort West, Remainder of Farm Trakaskuilen No 15, Portion 1 Trakaskuilen No 15, Portion 1 of Witpoortje No 16.** CAS was appointed by SiVest Environmental Division on behalf of their client Mainstream Renewable Power South Africa (Pty) Ltd to conduct an AIA report. The study area was situated on the N12 between Beaufort West and Klaarstroom. Several MSA open sites, positioned on the summit areas of low rides and koppies, were identified. There was also a general background presence of MSA with occasional flakes or cores observed in the open. There was little evidence of LSA activity in the area. Most of the raw material used was a fine-grained chert with a reddish outer patina (grey when flaked). In terms of colonial period archaeology, there were several farm complexes with buildings, historic dumps and derelict structures. The area hadn't been systematically studied or researched, so the archaeological sensitivity of the proposed wind farm on archaeological features was seen as high.
- **Dreyer, C. 2005. Archaeological and historical investigation of the proposed residential developments at the farms Grootfontein 180 & Bushmanskop 302, Beaufort West, south-western Cape.** The study area is located approximately 20km west of Beaufort West. Scattered and isolated lithics were found in the area. A trihedra, Acheulian or Victoria West I handaxe, a bifacial worked Oldowan chopper with minimal retouch, a number of isolated flakes and core flakes and several small assemblages of LSA scrapers were identified. On the flood plain near the Sand River, fragments of ostrich eggshell and one single ostrich eggshell bead were also identified.
- **Fourie, W. 2018. AIA: Proposed Construction of a Linking Station, two (2) Power Lines and two (2) On-site Substations for the Beaufort West and Trakas Wind Farms, near Beaufort West in the Western Cape Province.** PGS Heritage (Pty) Ltd (PGS) was appointed by SiVEST to undertake an Archaeological Impact Assessment (AIA). The study area was located approximately 50km south of Beaufort West. Two archaeological sites and seven findspots were identified. The archaeological resources identified during the fieldwork comprised a large number of Stone Age surface artefact scatters. These were primarily from the MSA, although both LSA and earlier ESA material was identified. All of these artefact

assemblages occurred in heavily deflated and eroded areas, so their scientific potential and heritage significance is somewhat lowered.

- **Halkett, D. 2009. An archaeological assessment of uranium prospecting on portions 1, 3 and 4 of the farm Eerste Water 349, and remainder of the farm Ryst Kuil 351, Beaufort West.** ACO Associates was appointed by Ferret Mining and Environmental Services (Pty) Ltd to undertake a scoping survey. Heritage sites were quite sparse in the area. Pre-colonial stone age sites (ESA, MSA and LSA) and colonial sites related to farming and settlement (incl. cemeteries, small ruined dwellings, stone kraal, fragments of annular ware and transfer printed refined earthenware ceramics) were identified. There were patinated and polished ESA/MSA artefacts made of hornfels and siltstone. LSA material is rarer but one scatter of LSA material was identified in close proximity to a dry river course.
- **Kinahan, J. 2008. Archaeological Baseline Survey of the Proposed Ryst Kuil Uranium Project.** Kinahan was appointed by Turgis Consulting (Pty) Ltd on behalf of UraMin-Mago-Lukisa JV Company (Pty) Ltd to conduct an archaeological baseline survey. The study area was located approximately 45km southeast of Beaufort West. In general, the study area was characterised by a low density of surface material, with much displacement by sheet erosion. None of the ESA material (isolated quartzite artefacts) were in-situ as all showed evidence of fluvial transport. Isolated MSA finds were observed. These finds probably formed part of a continuous surface scatter but lateral disturbance may have greatly exaggerated the distribution and number of these sites. The lack of focal points in the landscape means that there were no major MSA site concentrations. MSA artefacts were dominated by quartzite and hornfels. There was also some evidence of Levallois core production and a few Howieson's Poort segments found at a number of sites. Isolated and local scatters of LSA materials were also apparent. A number of these sites were associated with lithic raw material sources (chert and hornfels outcrops). Late pre-colonial sites included a number of suspected hut circles and short lengths of stone walling, as well as possible burial cairns. Historic stone structures (dry-stone construction and mud-brick construction) along with imported items (crochery and rifle cartridges) were also noted.
- **Nilssen, P. 2011. Archaeological Impact Assessment. Proposed Beaufort West Photovoltaic (Solar) Park: southern portion of properties; 2/158 Lemoenkloof, RE 9/161 Kuilspoor, RE 162 Suid-lemoensfontein and RE 1/163 Bulskop, Beaufort West, Western Province.** The study area was approximately 8km south east of Beaufort West. The finds included numerous isolated and very low-density scatters of Stone Age artefacts ranging in age from the ESA to the LSA. Due to their temporally mixed nature and the absence of other faunal/cultural remains, these finds were considered to be of low heritage significance. There were also several archaeological occurrences that represented isolated events that were recorded as medium to high heritage significance.
- **Orton, J. 2011. Heritage Impact Assessment for a proposed Photo-Voltaic Facility on Steenrots Fontein 168/1, Beaufort West Magisterial District, Western Cape. University of Cape Town: Archaeology Contracts Office.** The UCT Archaeological Contracts Office was

appointed by the Council for Scientific and Industrial Research (CSIR) to conduct a HIA. Most of the archaeological material was likely MSA (background scatters) and the artefacts were generally weathered. Historical material included fragments of a bottle and fragments of an annular ware bowl. All of the finds were recorded as low significance.

- **Webley, L. & Halkett, D. 2015. Archaeological Impact Assessment: Proposed Uranium Mining and Associated Infrastructure on Portions of the Farms Quaggasfontein and Rystkuil* near Beaufort West in the Western Cape and De Pannen near Aberdeen in the Eastern Cape.** Webley and Halkett were appointed by Ferret Mining & Environmental Services (Pty) Ltd, on behalf of a client, to conduct an AIA report. Archaeological material comprised small numbers of ESA artefacts, scatters of MSA and occasional LSA. The majority were manufactured on indurated shales (hornfels) and some artefacts were manufactured from a chert band. Artefact numbers were very low and of low significance. One LSA site, Site D009, was located on the banks of a little stream. Amongst the identified lithics, was a characteristic LSA drill and thumbnail scraper.
- **Webley, L. & Lanham, J. 2011. Heritage Assessment of the Proposed upgrade to the stormwater retention facilities at Beaufort West, Western Cape.** Archaeology Contracts Office (ACO) were appointed by Kayad Knight Piesold (Pty) Ltd to conduct a heritage impact assessment. No heritage resources were identified.
- **Vidamemoria Heritage Consultants. 2015. Heritage Impact Assessment: DR 2403 Central Karoo, Beaufort West – Central Karoo District Municipality, Western Cape.** Vidamemoria was appointed by Aurecon South Africa (Pty) Ltd to conduct a HIA for a proposed borrow pit. The study area was located approximately 44.5km southeast of Murraysburg. No heritage resources were identified.
- **Vidamemoria Heritage Consultants. 2012. Heritage Impact Assessment: DR 2308 Central Karoo, Beaufort West – Central Karoo District Municipality, Western Cape.** Vidamemoria was appointed by Aurecon South Africa (Pty) Ltd to conduct a HIA for a proposed borrow pit. The study area was located approximately 40km southwest of Beaufort West. Low density scatters of mixed MSA and LSA artefacts were observed in a secondary context and were of low archaeological heritage significance.

6.4 Palaeontological context

The geology of the Heuweltjies WEF project area is covered by 1: 250 000 geology sheets 3222 Beaufort West and 3322 Oudtshoorn (Council for Geoscience, Pretoria; Johnson & Keyser 1979, Toerien 1979) (**Figure 18**). The WEF project area is underlain at depth by Middle Permian continental (fluvial / lacustrine) sediments of the **Abrahamskraal Formation** (Lower Beaufort Group / Adelaide Subgroup, Karoo Supergroup) (Pa, pale green in **Figure 18**) (Johnson & Keyser 1979, Johnson *et al.* 2006). It is likely that the majority of the bedrocks here can be largely or entirely assigned to the sandstone package of the **Moordenaars Member** and the following mudrock-dominated **Karelskraal Member** towards the top of the very thick Abrahamskraal Formation succession (see stratigraphic

column in **Figure 19**). Stratigraphically lower members of the Abrahamskraal succession, but not the underlying Ecca Group, may well be represented in the far south, however (*cf* Day & Rubidge 2014). According to the published geological map, the **Poortjie Member**, which spans the Middle to Late Permian boundary (*cf* Day *et al.* 2015b) and defines the base of the **Teekloof Formation** (Lower Beaufort Group / Adelaide Subgroup) (Pt, dark green), is *not* represented within the project area. However, this sandstone-dominated, tuffite-containing unit *might* underlie the WSW-ESE ridges traversing the northern margins of the area (this is unconfirmed). The sedimentology of the Abrahamskraal Formation has been reviewed recently by Wilson *et al.* (2014) while the Abrahamskraal – Teekloof transition has been addressed by Paiva (2015).

Early Jurassic intrusions of the Karoo Dolerite Suite are not mapped within the project area but do occur closer to Beaufort West. The project area lies within the northern margins of the Cape Fold Belt where levels of tectonic deformation vary from low to moderately high. As is clearly apparent from the striking colour-striped patterns seen on satellite images (**Figure 43**) as well as in the field, the Palaeozoic bedrocks here have been deformed by moderately intense, north-directed crustal compression during the Permo-Triassic Orogeny, resulting in a series of tight, large-scale folds with broadly W-E axes as well as several low-angle thrust faults with a similar strike orientation in the region, the latter often associated with quartz veining (These structures are well seen in road cuttings along the N12). Bedding dips are up to 40° and both mudrock as well as sandstone facies may be affected by a pervasive cleavage or closely-spaced fracture sets with a west-east orientation.

The Palaeozoic bedrocks in the study area are, for the most part, poorly exposed away from the more important drainage lines and occasional steeper hillslopes. Topographic relief is generally low so that on gentler hillslopes, beneath the extensive gravelly to sandy *vlaktes*, as well as along many water courses the bedrocks are mantled by a spectrum of **Late Caenozoic superficial sediments**. For the most part these comprise downwasted (eluvial) surface gravels (notably of wacke / vein quartz and tuffite), rubbly colluvium, silty, sandy and gravelly alluvium and skeletal soils with local development of spring deposits such as calcrete.

Most of the superficial deposits are unconsolidated and probably of Late Pleistocene to Holocene age (*i.e.*, *deposited* within the last 2.5 million years) but some alluvium is well-calcretised and might be somewhat older. High Level gravel terraces are not well-developed in the region, implying low levels of stream incision, and there are no extensive areas of alluvium within the WEF Infrastructure project areas on the geological map (these are better represented on the 1: 50 000 topographic sheets).

An interesting surface feature of the region are well-developed *heuweltjies* or mima mounds – slightly raised areas up to 10 or so meters in diameter that are characterised by pale, calcretised sandy soils, tall woody shrubs or small trees, and intensive vertebrate burrowing as well as frequently by Later Stone Age artefacts. These relictual to currently active features show up as well-dispersed, pale, round spots

on aerial photos and satellite images and have been variously attributed to a combination of termite activity, mammalian burrowing and bush clumps.

The main geological features of this region of the Great Karoo margins have already been covered in some detail in the previous accounts of the adjoining Trakas and Beaufort West WEFs by Almond (2018, 2022d) and will therefore not be repeated at length here.

The sedimentary rock units mapped within the WEF project area are listed in the legend to map **Figure 18** and shown in the stratigraphic column in **Figure 19**.

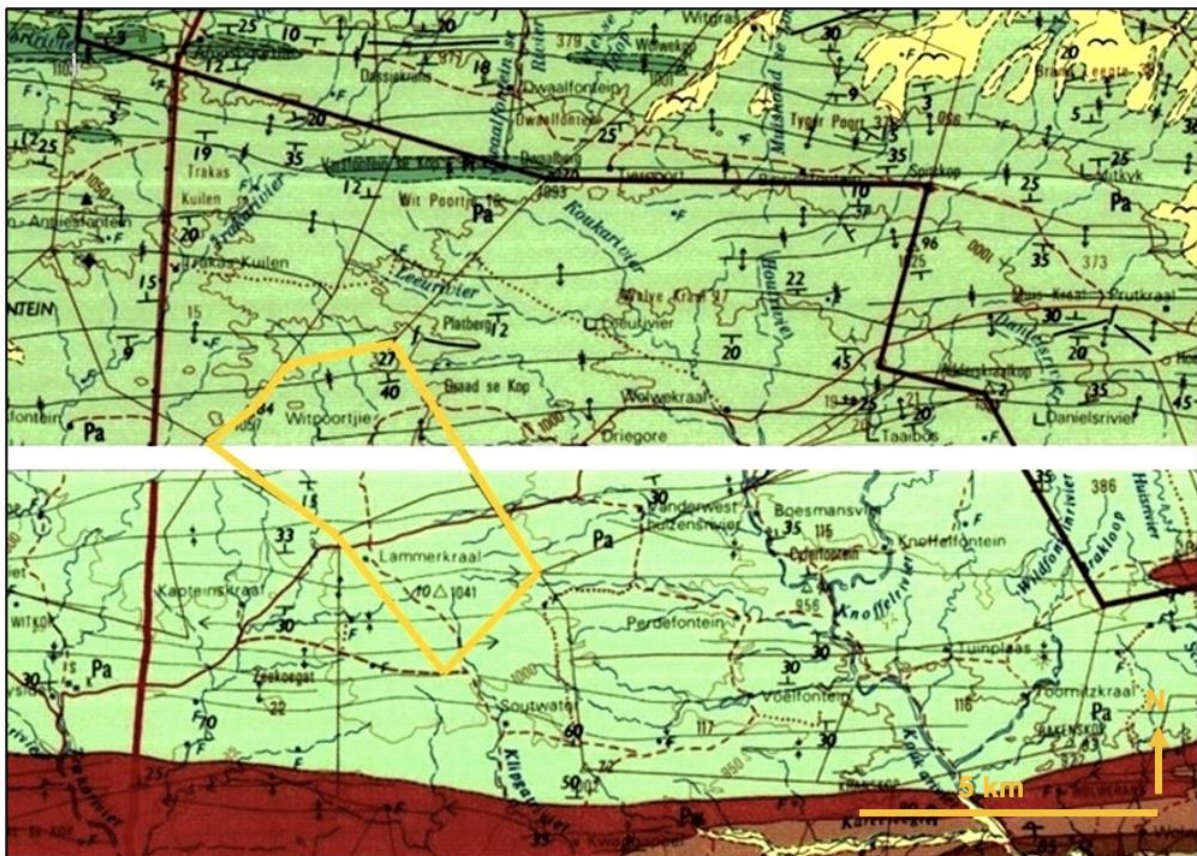


Figure 18: Extract from adjoining 1: 250 000 geology sheets 3222 Beaufort West (above) and 3322 Oudtshoorn (below) showing the boundaries of the Heuweltjies WEF project area to the south of Beaufort West (yellow polygon). Note numerous W-E trending fold axes occur in the region which falls within the northern margins of the Cape Fold Belt. Pa (pale green) = Abrahamskraal Formation (Adelaide Subgroup, Lower Beaufort Group). Pt (dark green) = Poortjie Member of the Teekloof Formation (Adelaide Subgroup, Lower Beaufort Group). Yellow = Late Cenozoic / Quaternary superficial sediments, including alluvium, sheet wash, colluvium, soils, locally cemented by pedocretes such as calcrete. To the west of the N12 and outside the WEF project area diamond symbols indicate fossil localities within the Tapinocephalus Assemblage Zone. Triangles indicate fossils within the Pristerognathus Assemblage Zone (N.B. This fossil biozone data is now outdated and the fossils concerned have probably been collected).

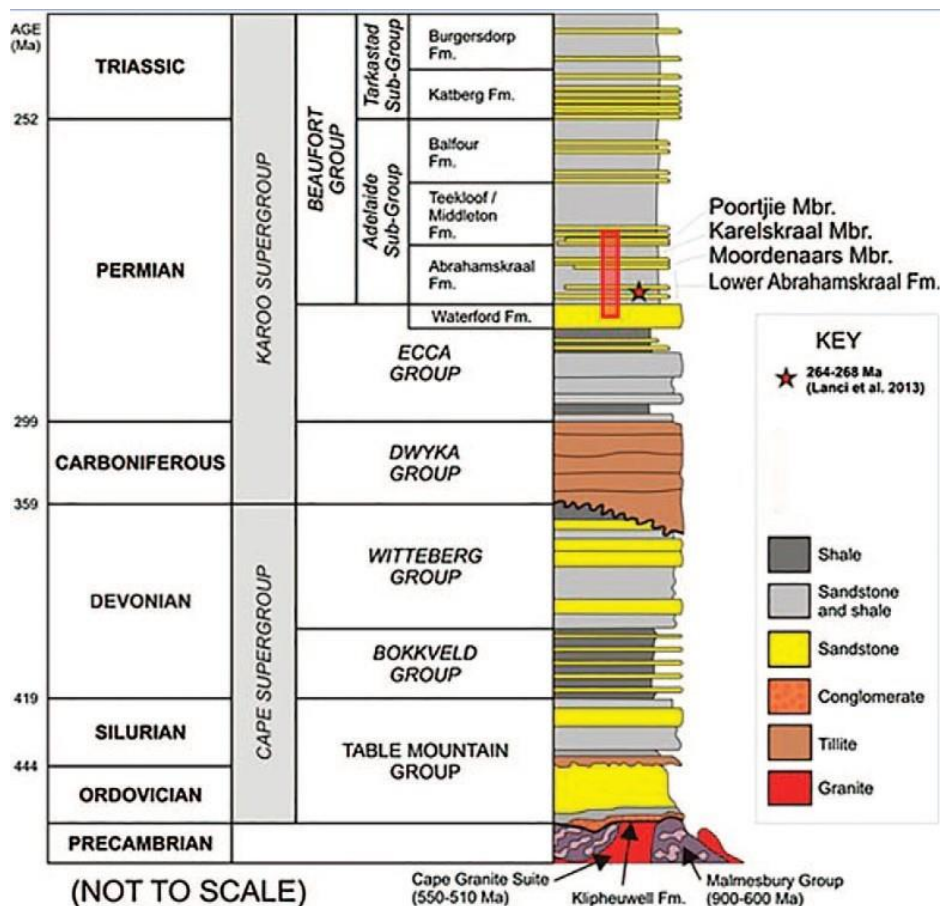


Figure 19: Palaeozoic stratigraphic column for the Western Cape showing the position of the Abrahamskraal and Teekloof Formations of the Lower Beaufort Group within the Karoo Supergroup (red rectangle). A Middle Permian (Wordian) zircon age has been obtained for the lower part of the Abrahamskraal Formation (red star) (Figure modified from Wilson et al. 2014). The base of the Poortjie Member has recently been dated to 260 Ma (end-Capitanian = end Middle Permian) on the basis of a white tuff unit 3.5 m above the basal sandstone (Day et al. 2015b). As currently mapped, only the Abrahamskraal Formation is represented within the Heuweltjies WEF project area but this may be revised with further detailed mapping.

6.5 Findings of the historical desktop study

The findings can be compiled as follows and have been combined to produce a heritage sensitivity map for the project based on the desktop assessment (Figure 20).

6.5.1 Possible Heritage Finds

The evaluation of satellite imagery and the analysis of the studies previously undertaken in the area has indicated that certain areas may be sensitive from a heritage perspective. Archaeological surveys and studies in the area have shown rocky outcrops, dry river beds, riverbanks and confluence to be prime localities for archaeological finds and specifically Stone Age sites (Kinahan, 2008; Halkett, 2009; Webley & Halkett, 2015).

The analysis of the studies conducted in the area assisted in the development of the following landform to heritage find matrix in Table 5.

Table 5: Landform type to heritage find matrix

LAND FORM TYPE	HERITAGE TYPE
Crest and foot hill	MSA scatters
Pans/ dry river courses	LSA/MSA scatters
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material

Dry river courses have been referenced as having possible heritage sensitivity within the study area. It must be noted that the proposed development layout for the most part has excluded river courses from the footprint.

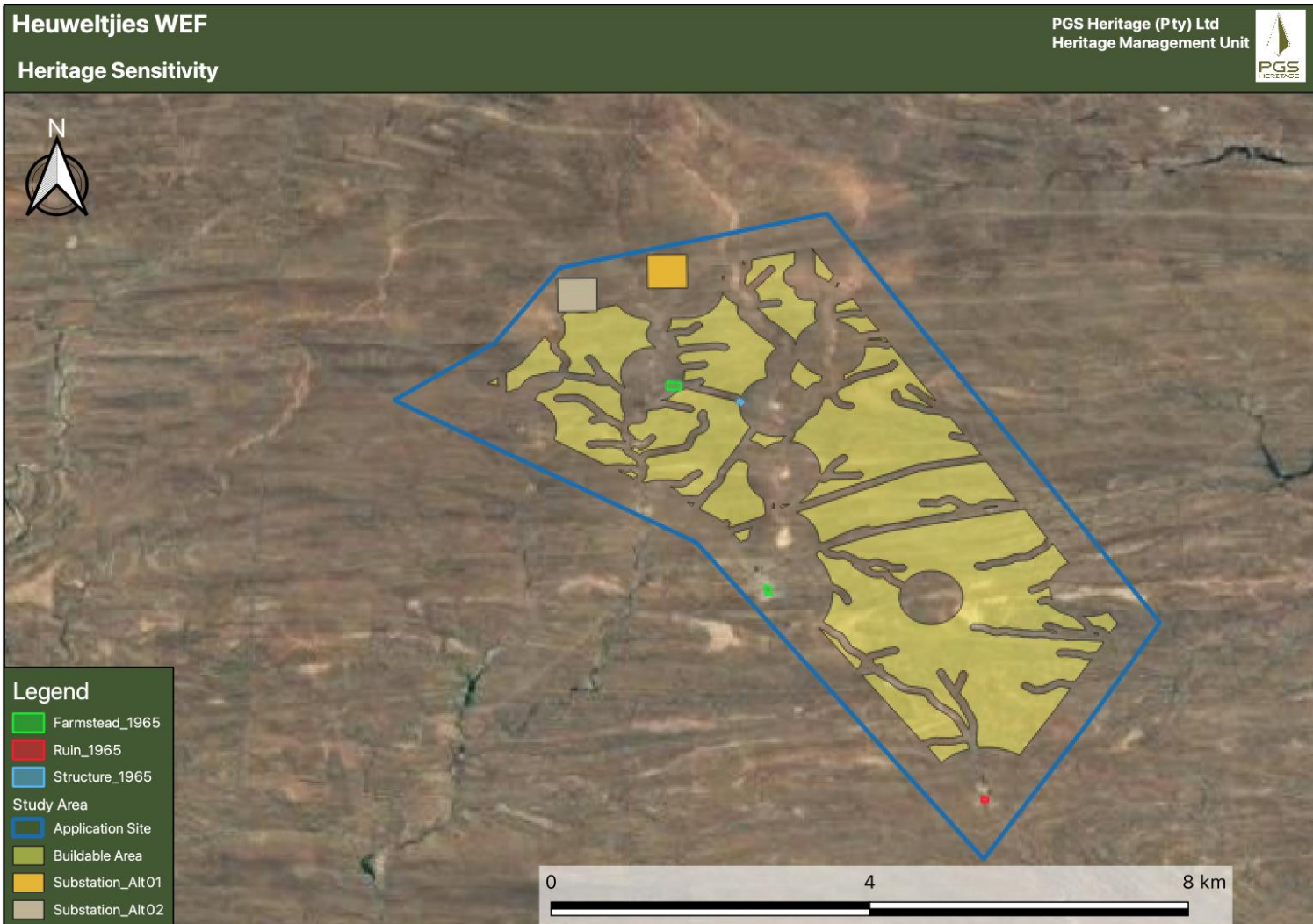


Figure 20: Possible heritage sensitivity areas; Structures (blue polygon), farmsteads (green polygons) and ruin (red polygon) within the Heuweltjies WEF study area.

7. HERITAGE RESOURCE – STATUS QUO

A selective survey of the study area was conducted between November 2020 and November 2021.

7.1 Archaeology and built environment

The archaeological fieldwork conducted for the evaluation of the possible impact of the new Heuweltjies WEF, and associated infrastructure has revealed the presence of twenty-seven (27) tangible cultural heritage resources.

The heritage resources identified during the fieldwork extends temporarily from the MSA through to the early mid 21st century.

7.1.1 Archaeological features

Three (3) Stone Age sites (**H013, H013/1, H013/3**) were rated as having medium heritage significance.

Fourteen (14) find spots (**H003-5, H009-12, H018-24**) comprise a number of low-density Stone Age surface artefact scatters and were rated as having low heritage significance. These are primarily from the Middle Stone Age (MSA), although both Later Stone Age (LSA) and earlier Early Stone Age (ESA) material was identified. All of these artefact assemblages occur in heavily deflated and eroded areas, so their scientific potential and heritage significance is somewhat lowered. Based on findings from a range of other heritage reports in the area, these types of sites are to be expected in this region.



Figure 21: Stone tools found at H013.

The scale is in 1cm increments.

7.1.2 Historical Structures

Four homesteads or the remains of homesteads (Klipgat, Witpoortjie, Trakaskuillen and Lammerkraal) were identified within or adjacent to the proposed WEF footprint area. These constitutes the extent of

physical remains of current and historical adaptations to the challenging landscape. The farmsteads within or close to the WEF footprint are Klipgat (H014, H014/1: **Figure 22**), Witpoortjie (H001, H002, H007, H008: **Figure 23**, **Figure 24**), Trakaskuilen (outside study area; **Figure 25**, **Figure 26**) and Lammerkraal (outside of proposed buildable area; **Figure 27**). Most of the farmsteads are located close to areas where historically water could be sources and, in most cases, these are dry riverbeds with cultivatable floodplains. One burial ground is associated with the Witpoortjie homestead (H006: **Figure 28**) and another burial ground is associated with the Klipgat homestead (H016: **Figure 29**).



Figure 22: 19th century Klipgat homestead ruin



Figure 23: Witpoortje Homestead.



Figure 24: Stone packed farmhouse on Witpoortje.



Figure 25: Trakaskuilen homestead.



Figure 26: Cottages and kraal associated with Trakaskuilen farmstead.



Figure 27: View of Lammerkraal farmstead from the regional road.

Five (5) structures (**H001, H002, H008, H014, H014/1**) were rated as having medium heritage significance and three (3) structures (**H007, H015, H017**) were rated as having low heritage significance.

Although the various heritage elements in each of these farmsteads do not all constitute having a high or medium significance. The combination of the build environment, burial grounds and graves, as well as the utilisation of the landscape create an associated landscape and all three cases a medium to high cultural significance.

7.1.3 Burial Grounds and Graves

Two (2) burial grounds (**H006, H016**) were rated as having high heritage significance.

One of the burial grounds, a small cemetery, associated with Witpoortjie homestead, (**H006; Figure 28**), has three graves with white marble/granite covers and headstones.

The other burial ground (**H016; Figure 29**), associated with the Klipgat homestead, contains both formal (white granite/marble) and informal graves (packed stone).



Figure 28: View of the mid 20th century graves identified at H006.



Figure 29: Views of graves at H016.

7.2 Palaeontological heritage

Approximately 50 bedrock exposures were examined during the course of the two-day site visit by three experienced heritage professionals, with fossils recorded at only 5 sites. It is concluded that, although scientifically important fossil material is present within the Palaeozoic bedrocks Heuweltjies WEF project area, they are very sparse indeed here. Apart from these fossil sites (most of which remain unrecorded), the palaeosensitivity of the WEF project area is LOW overall.

Continental (terrestrial / fluvial /lacustrine) fossil biotas within the Abrahamskraal Formation bedrocks of the WEF project area are assigned to the ***Tapinocephalus Assemblage Zone*** of late Middle Permian (Capitanian) age (c. 265 – 260 Ma) according to the latest biozonation map of Day and Rubidge (2020). The fossil biota of the the *Tapinocephalus* Assemblage Zone is characterised by a range of vertebrate fossil groups, notably large dinocephalian therapsids, primitive pareiasaur reptiles and small-bodied dicynodonts *plus* a variety of carnivorous therocephalians (**Figure 30, Figure 31**).

Fossil finds of any sort are very sparse occurrence within the Abrahamskraal Formation bedrocks within the Heuweltjies WEF project area, with only 5 recorded fossil sites from c. 50 exposures examined (See satellite site map in **Figure 43**). In part, this is due to (1) the low levels of bedrock exposure in the region as well as, perhaps, (2) the moderately high levels of tectonic deformation locally and (3) weathering of bedrocks related to the ancient African palaeosurface. Due to the high levels of deformation (folding, faulting), the precise stratigraphic position of new fossil finds is hard to determine while vertebrate fossils (e.g., many skulls within nodules) often cannot be identified until they are prepared in the lab. For this reason, it is not feasible at present to assign the fossil material to specific stratigraphic members within the Abrahamskraal Formation (As noted below, the pareiasaur skeleton recorded within the WEF project area supports an upper Abrahamskraal Formation succession here).

The only new vertebrate fossil records documented here include:

(1) occasional weathered “rolled bone” fragments reworked into surface gravels and;
(2) the postcranial remains of a large-bodied pareiasaur reptile (**Figure 31, Figure 32, Figure 33 to Figure 36**). The left limbs and vertebrae of this last specimen – preserved within grey-green mudrocks on Portion 8 of The Farm Klipgat No 114 - are exposed in a stream bank while much of the rest of the skeleton (quite likely including the skull) are probably still buried within the matrix. Based on detailed features of the limb bones, and possibly also on bony scutes adhering to the vertebrae, the specimen has been provisionally assigned to the genus *Nochelesaurus* by Dr Marc van den Brandt (pers. comm., March 2021). This genus is restricted to the *upper* part of the Abrahamskraal Formation, largely within the *Diictodon – Styraococephalus* Subzone (cf Van den Brandt *et al.* 2021a, 2021b).

The only trace fossils identified within the WEF project area include narrow, small-scale invertebrate burrows associated with wrinkled sandstone palaeosurfaces which may have been generated by small microbial mat miners such as insects or worms (**Figure 39**). No convincing tetrapod burrows were seen,

although possible but *equivocal* candidates are occasionally seen (*cf* **Figure 38**), while no petrified wood or other plant fossil were recorded within the WEF project area.

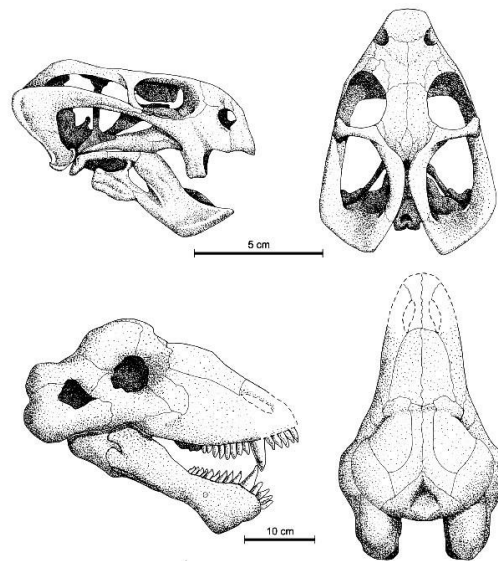


Figure 30: Skulls of two key vertebrate herbivores of the recently recognised Diictodon – Stracocephalus Subzone (upper portion of the Tapinocephalus Assemblage Zone) which extends across the end – Middle Permian (Capitanian) Extinction Event of 260 Ma (million years ago). Diictodon (above) was a small-bodied, burrowing dicynodont therapsid (“mammal-like reptile”) while Styracocephalus (below) was one of the longest-surviving members of the dinocephalians, a major group of large-bodied herbivorous therapsids (From Day & Rubidge 2020).

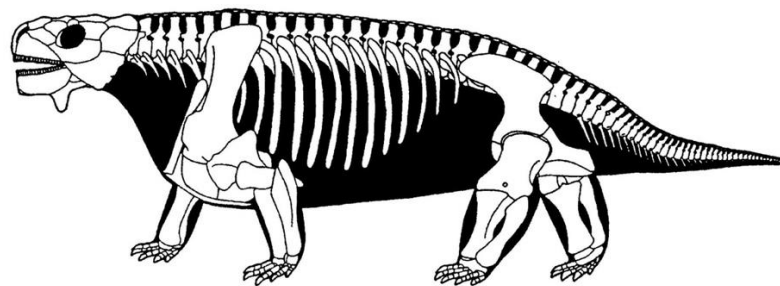


Figure 31: Skeleton of a large-bodied (rhino-sized), herbivorous pareiasaur reptile (Bradysaurus) from the Middle Permian Karoo Basin of the RSA.

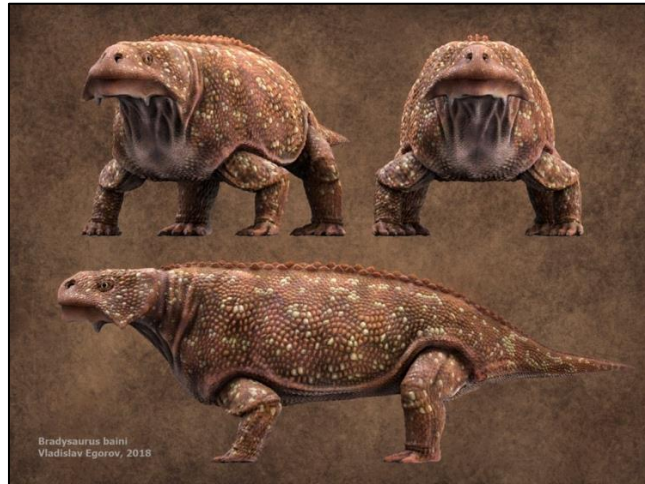


Figure 32: Graphic reconstruction of a typical large-bodied, herbivorous pareiasaur reptile from the Middle Permian Period.



Figure 33: Sedimentological setting of the large-bodied pareiasaur reptile skeleton illustrated in the following three images (Loc. 048). The postcranial remains are associated with a rusty-brown ferruginous calcrete palaeosol horizon (arrowed) within grey-green silty overbank mudrocks. Below this are seen a small lenticular channel sandstone and a package of riverbank / levée sediments.



Figure 34: Postcranial skeletal remains, including left forelimb and vertebrate column, of a large-bodied pareiasaur reptile weathering out of grey-green overbank siltstones beneath the brownish concretionary lens in a riverbank at Loc. 048 (See following two figures for scale).



Figure 35: Close-up of a string of articulated sacral vertebrae and ribs of the specimen shown above (Scale is c. 15 cm long). The bones are encrusted by a film of pedogenic carbonate. Further articulated vertebrae and possible portions of a limb girdle were found in float nearby.



Figure 36: Articulated left forelimb bones of the pareiasaur skeleton shown in Figure 43 (scale is 15 cm long).



Figure 37: Subcylindrical fossil structure (c. 1.5 cm wide) preserved within a medium-grained sandstone – possibly a plant root / stem cast or invertebrate burrow (Loc. 053).

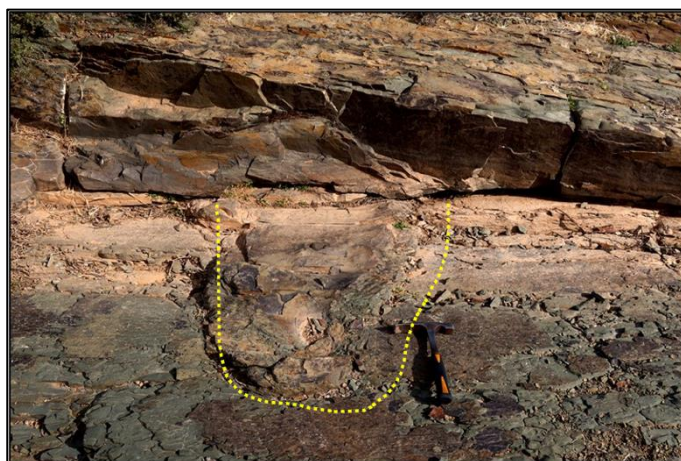


Figure 38: Sizeable gutter-shaped sedimentary structure with convex-downward internal lamination within interbedded sandstones and siltstones exposed in a dam overflow (Loc. 024) (Hammer = 30 cm). This feature broadly resembles a tetrapod burrow but is probably sedimentary in origin (e.g. load or basal scour structure).

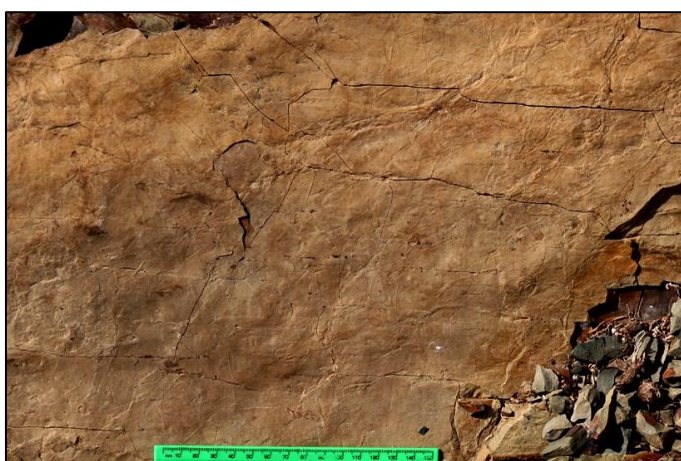


Figure 39: Wrinkled sandstone palaeosurface with sparse, barely visible, narrow horizontal burrows, probably of small-bodied microbial mat miners – perhaps worms or small insects (Scale in cm and mm) (Loc. 024).

7.3 Cultural landscape

The Heuweltjies site can be divided into landscape character units (**Figure 45**) with cultural heritage resource types. These units were determined by taking the larger landscape context into consideration to understand the character and cultural heritage values that underpin the proposed development site.

7.3.1 *Poorts and koppies*

The vast terrain of the Koup lends significance to the low ridges and associated visually prominent koppies that create intermittent relief from the monotonous largely flat topography of the region. The small local poorts and koppies create a sense of place and orientation in this landscape and are associated to points of continuous access and thoroughfare by humans and animals over time. The poort that exits into the Koup landscape from Meiringspoort Pass is 11kms away from the Heuweltjies WEF. At this distance the WEF will be clearly visible from this viewpoint and will have a medium negative impact on the heritage resource.

7.3.2 *Riverine corridors – Bio-cultural heritage resources*

The dry riverine corridors that spread over the Koup landscape create points of contact and cultivation in an otherwise dry and barren environment. Largely non-perennial, these watercourses are also known for flooding after heavy rains, spreading much needed water over the surrounding land and, in so doing, supporting ecological and agricultural systems. Historic farmsteads and their associated structures and areas of crop cultivation are found in this landscape unit.

7.3.3 *Historic farmsteads and associated crop gardens – Grade IIIA – IIIC cultural heritage resources*

The farmsteads in this study are all located adjacent or near to riverine corridors. Areas of crop cultivation are found adjacent to the farmsteads, often along the dry riverbeds. The continued existence of these farmsteads in this historically and environmentally hostile environment lends significance to their place on the landscape and the determination of the people they represent.

7.3.4 *Conservation areas – Bio-cultural heritage resources*

Critical Biodiversity Areas and Ecological Support Areas, largely associated with the riverine environment of the study area supports biodiversity conservation. These areas recognise the ongoing relationship between man and the environment in the way they are managed to maintain a natural state, which in turn, has a benefit for human habitation.

7.3.5 *Historic routes and gateways – Grade IIIA – II cultural heritage resources*

The site is accessed via the national N12 road, a historic route linking Beaufort West with the towns of De Rust and Outdshoorn via scenic Meiringspoort Pass, and the coastal town of George further south. The north-south orientated N12 intersects the characteristic east west ridges with shallow poorts, often the location of historic farmsteads, such as Amospoortjie, Trakaskuilen and Amandelhoogte, culminating in the Meiringspoort Pass that winds through the Groot Swartberg mountain range located within the Swartberg Nature Reserve. This road has carried inhabitants and travellers between historic towns, farmsteads and further regional destinations since at least the late C18th. The N12 has been recognised as a scenic route in the district and municipal SDFs for the area.

7.3.6 *Viewsheds of significant mountain ranges*

Views and vistas of the distant mountains and destinations give significance to the experience of the vast open landscape. The flat open expanses of the Koup Karoo are a central element to the experience and sense of place of the landscape; the mountain ranges of the Nuiweveld to the north and Swartberg to the south, give scale and containment to this vastness. Buffers for development mitigate the impact of the development on places from which significant viewsheds are experienced.

7.3.7 *Slopes and ridges*

The vast terrain of the Koup lends significance to the low undulating ridges and associated visually prominent koppies that create intermittent relief from the monotonous largely flat topography of the region. Within this relatively flat expanse the steep slopes and ridges contained in the Heuweltjies landscape are significant in their visual and environmental capacities.

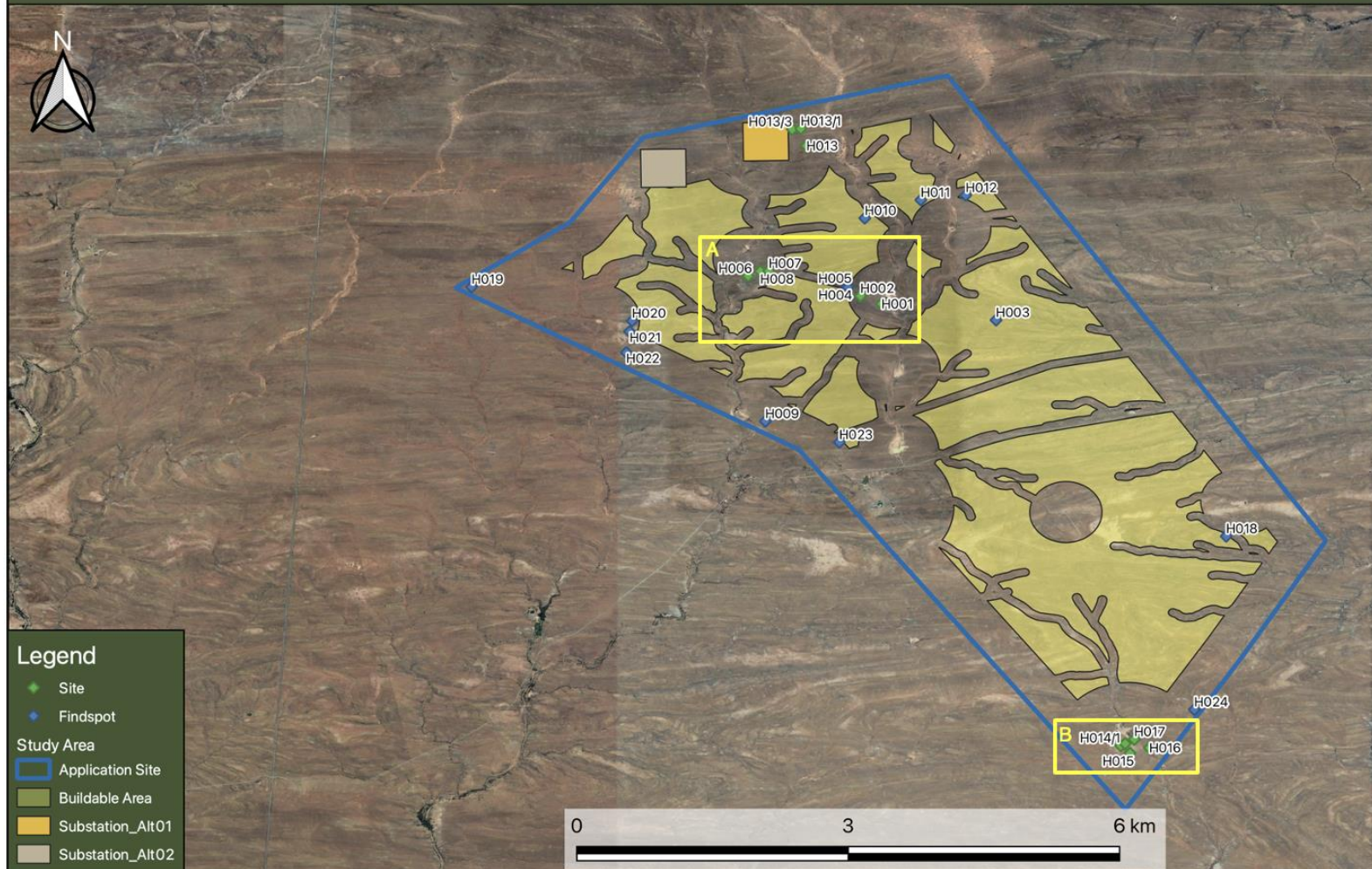


Figure 40: Locality of the heritage resources identified within the WEF study area. See insets A and B below.



Figure 41: Inset A.



Figure 42: Inset B.

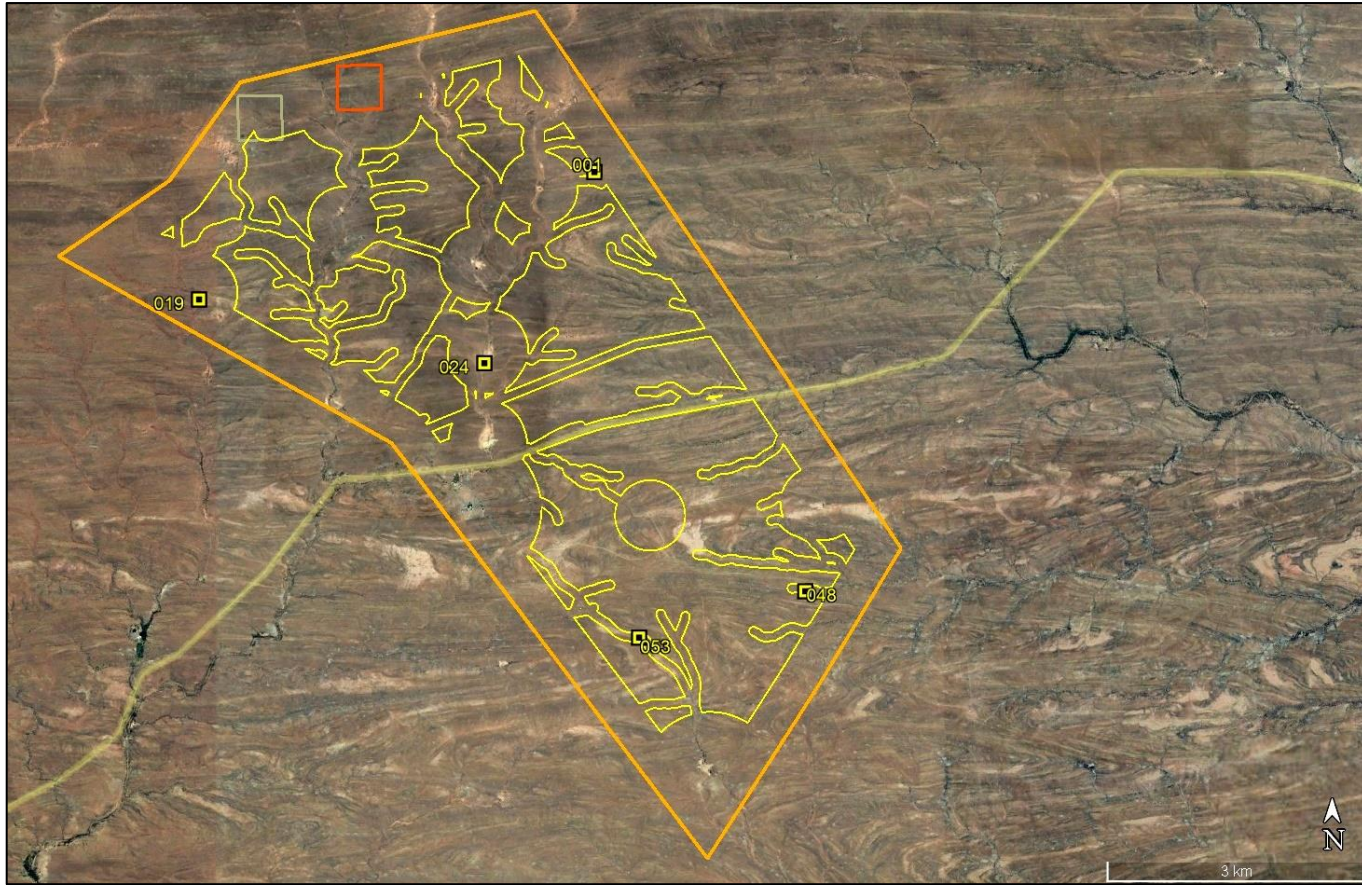


Figure 43: Google Earth© satellite image of the Heuweltjies WEF and associated Infrastructure project area (orange polygon) showing numbered fossil sites recorded here (numbered yellow squares). See table above for GPS data and brief description for the new Heuweltjies WEF fossil sites. Many of the recorded fossil sites are protected within standard environmental buffer zones along drainage lines and none of them lie within the proposed buildable area (yellow polygons). No palaeontological heritage High Sensitivity or No-Go areas have been defined within the WEF project area since well-preserved, scientifically important fossils are very sparse here and, in all cases, known or chance fossil finds can normally be effectively mitigated through professional recording and collection during the pre-construction phase, if necessary.

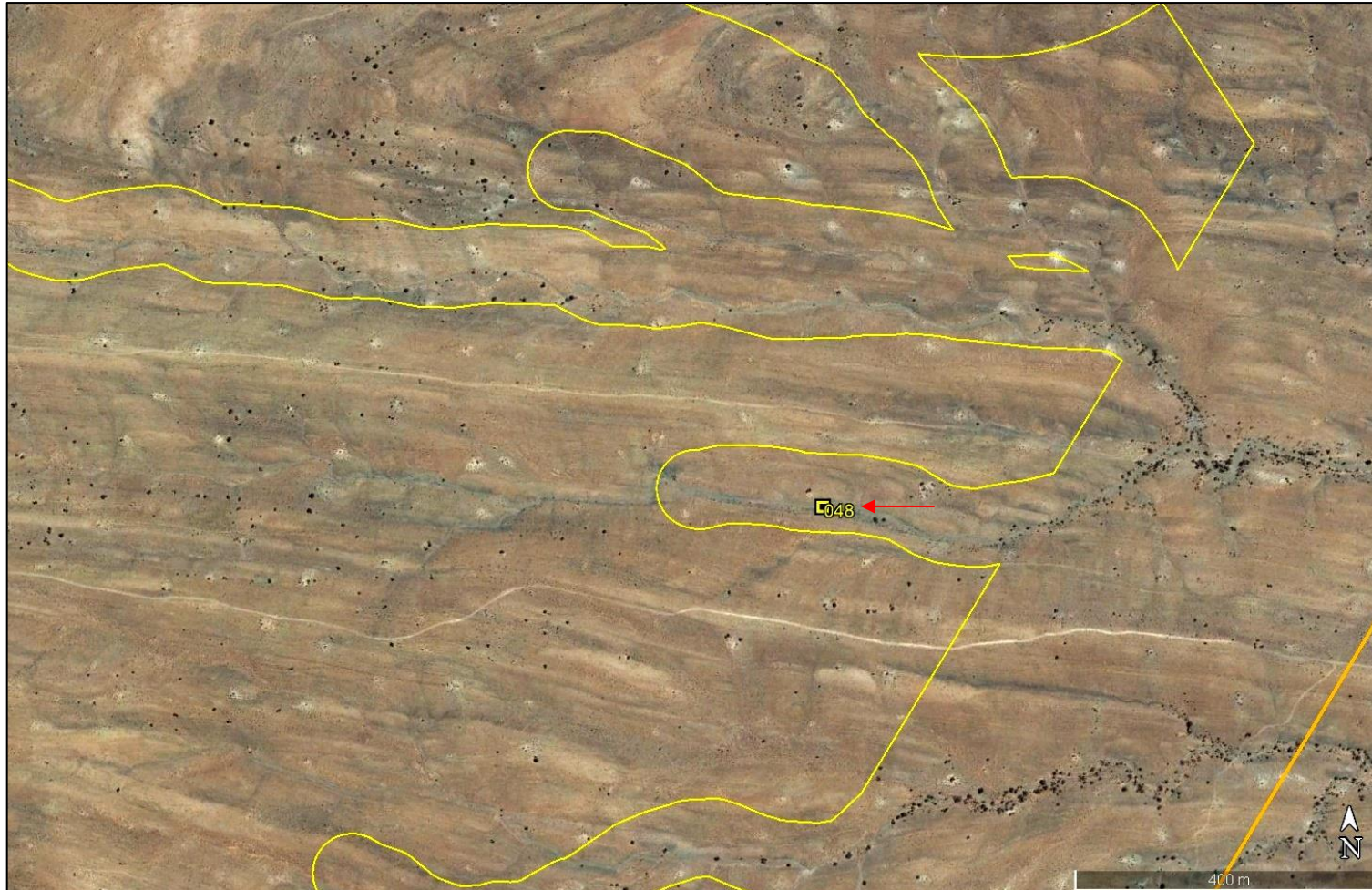


Figure 44: Satellite map showing new fossil sites within the south-eastern sector of the Heuweltjies WEF project area (yellow polygon). The pareiasaur reptile skeleton in a stream bank at Loc. 048 (arrow) lies outside the proposed WEF buildable area (yellow polygons) and will be protected within the ecological buffer zone along drainage lines.

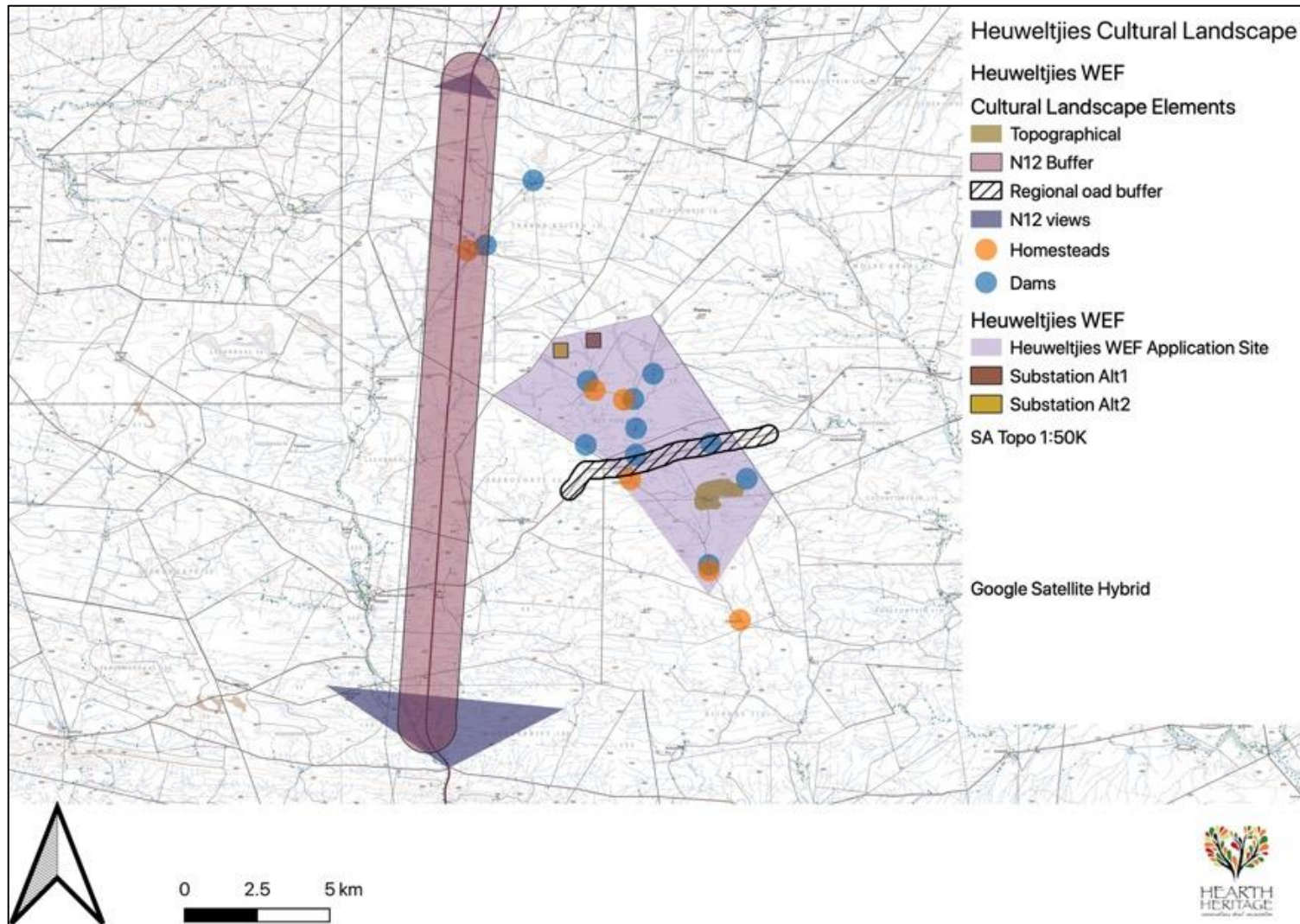


Figure 45: Heuweltjies Cultural landscape features map with proposed WEF infrastructure overlay. (Slope classes and riverine corridors/ ESAs have not been included here but have been mitigated for in the recommendations).

8. IDENTIFICATION AND ASSESSMENT OF IMPACTS

The various heritage specialists that worked on the identification of heritage resources and assessed their significance based their findings on a set of guidelines developed by the HWC (2021) in line with the NHRA and international best practice. The CLA further expanded its assessment through the core values as developed by Roos (2007), which include ecologic, aesthetic, historic, social and economic.

Tangible heritage resources are often preserved due to unusual circumstances and are non-renewable resources. When a development is proposed, and specialist studies are undertaken as part of the wider evaluation of heritage resources, it provides an opportunity into a depository that would not otherwise exist. In this sense the impact is POSITIVE for some heritage resources provided that efforts are made to preserve or mitigate heritage resources in the study footprint, prior to and during the construction phase of the development.

The general nature of impacts from the proposed development will be visual with regard to the cultural landscape and built heritage, and physical with regard to archaeological and palaeontological heritage resources. Mitigation measures for heritage resources will be recommended to mitigate impacts.

8.1 General Observations

In this section, an assessment will be made of the impact of the proposed development on the identified heritage sites. An overlay of all the heritage sites identified during the fieldwork over the proposed development footprint areas was made to assess the impact of the proposed development on these identified heritage sites. This overlay resulted in the following observations:

Heritage sites assessed to have a low heritage significance are not included in these impact risk assessment calculations. The reason for this is that sites of low significance will not require mitigation. These sites are 14 findspots (**H003-5, H009-12, H018-24**) and 3 structures (**H007, H015, H017**).

Two grave and burial grounds (**H006 and H016**) of high heritage significance were located more than 100m away from proposed development areas (incl. existing farm tracks). As a result, an impact is not expected from the proposed development on these sites.

Five structures (**H001, H002, H008, H014, H014/1**) of medium heritage significance were located less than 100m away from existing farm tracks. If the farm tracks were to be expanded, it is possible that there will be an impact from the proposed development on these sites

Although the sites mentioned and described above are listed as points on a map, these resources are part of a larger cultural landscape (farmstead, vistas etc) and as such the impact on the cultural

landscape extends outside of the boundaries of these specific heritage resource. These impacts are multi-faceted and cannot always be seen as only a direct impact on tangible heritage resources.

It is also necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the size of the study area and the subterranean nature of some heritage sites. The impact assessment conducted for heritage sites assumes the possibility of finding heritage resources during the project life and has been conducted as such.

Three project phases have been identified by SiVEST namely the Pre-Construction Phase, Construction Phase and Operational Phase. As site clearing activities of all the development footprint areas are grouped under the Pre-Construction Phase, the highest level of impact on the identified heritage sites is expected during this phase. No impacts are expected during the Operational Phase. All the identified heritage sites are expected to be destroyed in terms of the pre-mitigation impact assessments undertaken below, whereas only those sites not mitigated by amendments to the proposed development footprints will also be destroyed in terms of the post-mitigation impact assessment calculations undertaken below.

The following impact rating tables are based on the proposed WEF development layout within the region.

8.2 Identification of impacts

The pre-construction and construction phase of the proposed WEF will entail extensive surface clearance as well as excavations into the superficial sediment cover and underlying bedrock (e.g. for widened or new access roads, wind turbine foundations, hardstanding areas, on-site substation, underground cables, construction laydown area, O&M building and BESS). Construction of the facility may adversely affect potential archaeological and fossil heritage within the development footprint by damaging, destroying, disturbing or permanently sealing-in fossils preserved at or beneath the surface of the ground that are then no longer available for scientific research or other public good. The possible pre-construction impacts calculated on the tangible cultural heritage resources is overall MODERATE NEGATIVE rating but with the implementation of the recommend buffers and management guidelines will be reduced to a LOW NEGATIVE impact.

The impact on the cultural landscape includes:

- Critical Biodiversity Areas (BDA) and Ecological Support Areas (ESA), largely associated with the riverine environment of the study area supports biodiversity conservation. These areas recognise the ongoing relationship between man and the environment in the way they are

managed to maintain a natural state, which in turn, has a benefit for human habitation, reflect the names of the local farmsteads, indicating a close relationship between inhabitants on the landscape and these rivers as well as the significant dependence on these resources;

- The impact on the sense of place as the vast open landscape with low shrubby vegetation, characteristic of the Koup Karoo and determining to a large extent its evolution in history, creates a sense of place and landscape character intimately associated with this cultural landscape;
- The impact on the historicity of the landscape specifically on such features as, the national N12 road, a historic route linking Beaufort West with the towns of De Rust and Outdshoorn via scenic Meiringspoort Pass and the coastal town of George further south; history of the landscape and its intimate association with stock farming and waves of settlement throughout history stretching back to the Stone Age.
- The impact on the continued land use pattern and relationship to the land and its possible decline of the socio-economic position of the inhabitants, as they may not be able to maintain some level of subsistence with these resources. The ability for these residents to provide for themselves in this way must not be negatively impacted upon by the WEF development and must be supported, including financially, by the development. Their existence on the landscape, as the historic inhabitants of the area, previously disenfranchised and disempowered, is a fundamental element to the cultural landscape.

The impact on the cultural landscape through the development of the Heuweltjies WEF is calculated to have a VERY HIGH negative impact and specifically on the aesthetic and historical components of the cultural landscape. This impact is further projected as VERY HIGH when incorporating the cumulative impacts projected with the other eight (8) projects within 35k m of Heuweltjies. By implementing the recommended mitigation measures and design indicators this negative impact can potentially reduce to MODERATE.

The impact assessment rating is based on the rating scale as contained in **Appendix B**.

8.3 Impact Assessment ratings

Table 6: Assessment of the Impact of Proposed WEF on Heritage Resources – Pre-Construction Phase

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Pre- Construction Phase																				
Damage to historical structures (H001, H002, H008, H014, H014/1)	Construction activities (i.e., expansion of existing farm roads) close to these identified structures can damage and cause irreparable damage or destroy the resource	2	2	4	4	4	2	32	-	Medium	<ol style="list-style-type: none"> 1. A no-go-buffer-zone of at least 30m should be kept to the closest WEF infrastructure (incl. roads). 2. If development occurs within 30m of the site, the structure will need to be satisfactorily studied and recorded before impact occurs. 3. Recording of the structure i.e. (a) map indicating the position and footprint of the 	2	1	4	4	4	1	15	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION												
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S				
												<p>structure (b) photographic recording of the structure (c) measured drawings of the floor plans of the structure.</p> <p>4. A baseline report must be compiled for the site within which the recorded drawings from the previous item as well as all existing information on the structure can be included. This baseline report will then be</p>												

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION								RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)		S	E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)
											utilised as a part of the HMP to determine any future unforeseen impacts on the heritage resources. 5. The baseline report must be submitted to the relevant heritage authorities with a permit application in the event that the site will be impacted.								

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Unidentified heritage resources (Chance finds)	Destruction or damage to previously unidentified archaeological or historical resources	1	3	4	2	4	2	28	-	Medium	1. A management plan for the heritage resources needs then to be compiled and approved for implementation during construction and operations.	1	2	3	3	4	2	26	-	Low
Fossil Heritage Resources	Disturbance, damage or destruction of fossils at or beneath the ground surface due to surface clearance and bedrock excavations	1	3	4	2	4	2	28	-	Medium	Cross-checking of final approved footprint by palaeontological specialist. If necessary, pre-construction walkdown (with fossil recording/collection) of final footprint by specialist palaeontologist. Chance Fossil Finds Procedure during construction phase.	1	2	4	2	4	1	13	-	Low
Cultural Landscape - Ecological	Inappropriate infrastructure layout planning degrades ecological elements of the cultural landscape.	2	4	3	3	3	4	60	-	High	Please refer to Table 14	2	2	2	1	3	2	20	-	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cultural Landscape - Aesthetic	Inappropriate infrastructure layout planning negates aesthetic and sense of place requirements of the cultural landscape.	2	4	4	4	3	4	68	-	Very High	Please refer to Table 14	2	3	2	3	3	39	-	Medium	
Cultural Landscape - Historic	Inappropriate infrastructure layout planning degrades historic elements of the cultural landscape.	2	4	3	4	4	4	68	-	Very High	Please refer to Table 14	2	2	2	1	3	20	-	Low	
Cultural Landscape – Socio-economic	Non-landowner residents' lack of representation in planning and public participation process leads to loss of local knowledge, socio-economic empowerment and character of the cultural landscape.	2	4	4	3	4	4	68	-	Very High	Please refer to Table 14	2	2	1	2	4	22	-	Positive Low	

Table 7: Ratings of impacts for the Construction/Decommissioning Phase

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction/ Decommissioning Phase																				
Cultural Landscape - Ecological	Fragmentation and destruction of the landscape degrading the environment and thus continuous relationship between man and environment.	2	4	3	3	4	3	48	-	High	Please refer to Table 14	2	2	2	1	4	2	22	-	Low
Cultural Landscape - Aesthetic	WEF infrastructure construction and decommissioning activity degrades the character of the cultural landscape and the sense of place.	2	4	3	3	3	4	60	-	High	Please refer to Table 14	2	4	2	2	2	2	24	-	Medium
Cultural Landscape - Historic	Integrity if farmsteads and farm roads degraded by insensitive construction or decommissioning activities.	2	4	4	3	4	4	68	-	Very High	Please refer to Table 14	2	2	3	2	2	2	22	-	Low
Cultural Landscape – Socio-economic	Integrity of local residents to continue their patterns of land use is degraded by the construction and decommissioning activities.	2	3	4	4	4	4	68	-	Very High	Please refer to Table 14	1	3	3	1	3	2	22	-	Low

Table 8: Ratings of impacts for the Operational Phase

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Operational Phase																				
Cultural Landscape - Ecological	Inappropriate operational activities degrade the significant ecological elements of the cultural landscape.	1	2	2	2	3	4	56	-	High	Please refer to Table 14	1	1	4	2	3	2	22	-	Low
Cultural Landscape - Aesthetic	Inappropriate operational activities degrade the significant aesthetic elements of the cultural landscape altering the character and sense of place.	2	4	3	3	4	3	48	-	High	Please refer to Table 14	2	4	3	3	4	2	32	-	Medium
Cultural Landscape - Historic	Inappropriate operational activities degrade the significant historic elements of the cultural landscape altering the character and sense of place.	2	4	4	4	4	4	72	-	Very High	Please refer to Table 14	2	2	4	2	4	2	28	-	Medium
Cultural Landscape – Socio-economic	Inappropriate operational activities degrade the significant socio-economic opportunities of the cultural landscape.	2	4	3	4	4	4	68	-	Very High	Please refer to Table 14	2	3	2	2	3	2	24	+	Medium

8.4 Cumulative Impacts

This section evaluates the possible cumulative impacts (CI) on heritage resources with the addition of the Heuveltjies WEF. The CI on heritage resources evaluated a 35-kilometer radius (**Figure 46**). It must further be noted that the evaluation is based on available heritage studies. Although there are at least 8 WEF applications approved, currently only one has been built and as a result the full impact of the development cannot be fully assessed.

The following must be considered in the analysis of the cumulative effect of development on heritage resources:

- **Fixed datum or dataset:** There is no comprehensive heritage data set for the Beaufort West region and thus we cannot quantify how much of a specific cultural heritage element is present in the region. The region has never been covered by a heritage resources study that can account for all heritage resources. Further to this none of the heritage studies conducted can with certainty state that all heritage resources within the study area has been identified and evaluated;
- **Defined thresholds:** The value judgement on the significance of a heritage site will vary from individual to individual and between interest groups. Thus, implicating that heritage resources' significance can and does change over time. And so, will the tipping threshold for impacts on a certain type of heritage resource;
- **Threshold crossing:** In the absence of a comprehensive dataset or heritage inventory of the entire region we will never be able to quantify or set a threshold to determine at what stage the impact from developments on heritage resources has reached or is reaching the danger level or excludes the new development on this basis. (Godwin, 2011)

With regards to the historical resources, in most cases given a low-medium heritage significance on a local scale and in the majority of the cases were recommended as being easily mitigated or avoidable.

While the graves sites in all cases given a high heritage significance on a local scale and in the majority of the cases were recommended as being no-go areas or extensive mitigation required.

Hearth Heritage (2022) notes that without a regional database of this information, it is impossible to offer a true cumulative impact of the proposed development. Cumulative impact assessment on cultural landscapes for the area is therefore based on minimal information and assumptions drawn from the general information of the area and the limited local cultural landscapes assessments that have been done for other proposed WEF facilities in the Karoo region where the cultural landscape is most similar.

A few specialist HIA and VIA reports in the area did consider cultural landscapes in their consideration of the developments being assessed for and they have been summarised here. It must be noted that these were not necessarily all assessed for WEFs and therefore the consideration of impacts would differ from this cultural landscapes report. Notwithstanding, the findings of these reports in terms of the

significance of the landscape and potential mitigation **are in line with those of this cultural landscapes assessment report for Heuweltjies WEF.**

It must be noted that the focus of heritage studies in the area has been on the material and tangible aspects of the landscape as identified in the NHRA. Cultural landscape assessments would ideally include consideration of intangible heritage associated to the tangible resources identified and a public participation process dealing with issues regarding inter alia intangible heritage, indigenous knowledge systems, oral histories, language and lifeways of the people who inhabit and use the landscape.

The Heuweltjies WEF site is not located within a SEA identified REDZ zone or in one of the SEA strategic transmission corridors. Currently there are no operational renewable energy projects in the Koup region, however there are applications for both wind and solar energy developments within a 35km radius from the Heuweltjies WEF application site. Various electric grid connections and transmission lines are currently in operation along the N1 and the N12. Although their height surpasses any natural or cultural elements, the linear orientation of these lines, in most part adjacent to the road, do not cross the viewshed as one travels along the N12. Together with their light form and static nature, this reduces their visual impact. The associated infrastructure, such as substations, is more intrusive as the height, scale and angular form is more in conflict with the natural undulating horizontal lines of the surrounding landscape. These elements are currently relatively low scale and do not overwhelm the sense of place but should be considered as part of the cumulative impact of the new renewable energy developments in the region.

The numerous applications and proposed establishment of several wind energy facilities between Beaufort West and the Swartberg mountain range, as well as the adjacent regions in the Karoo have sparked a concern with regards to cumulative impacts that these projects may have on the heritage resources and the cultural landscape. The approval of an increased number of RE projects in the region may lead to the mass industrialisation of the landscape that changes the character of the landscape and hence impacts on the sense of place and aesthetic value negatively.

The Koup region has been considered as a wilderness landscape with a significant footprint of human habitation, cultural contact and conflict, whereby the cumulative impact of increased WEFs will involve significant sterilisation of the aesthetic qualities of the landscape. The cumulative impacts on tangible heritage resources can be considered **low in general** due to the thin density in the area, except when considering the cultural landscape which is negatively impacted by the construction of renewable energy, wind turbines and associated electrical infrastructure on the 'sense of place', land use patterns and its scenic beauty. The cumulative impact on the cultural landscape is thus **unavoidably high without mitigation**, with losses to perceptual qualities and historic land use. Similarly, cumulative impacts to living heritage sites will be unavoidably **high without mitigation**, with losses including the physical expressions of cultural heritage as well as to sense of place and cultural landscapes. While mitigation in the form of avoidance and protection of these sites can go some way to reducing cumulative impacts, these are likely to remain **moderate**.

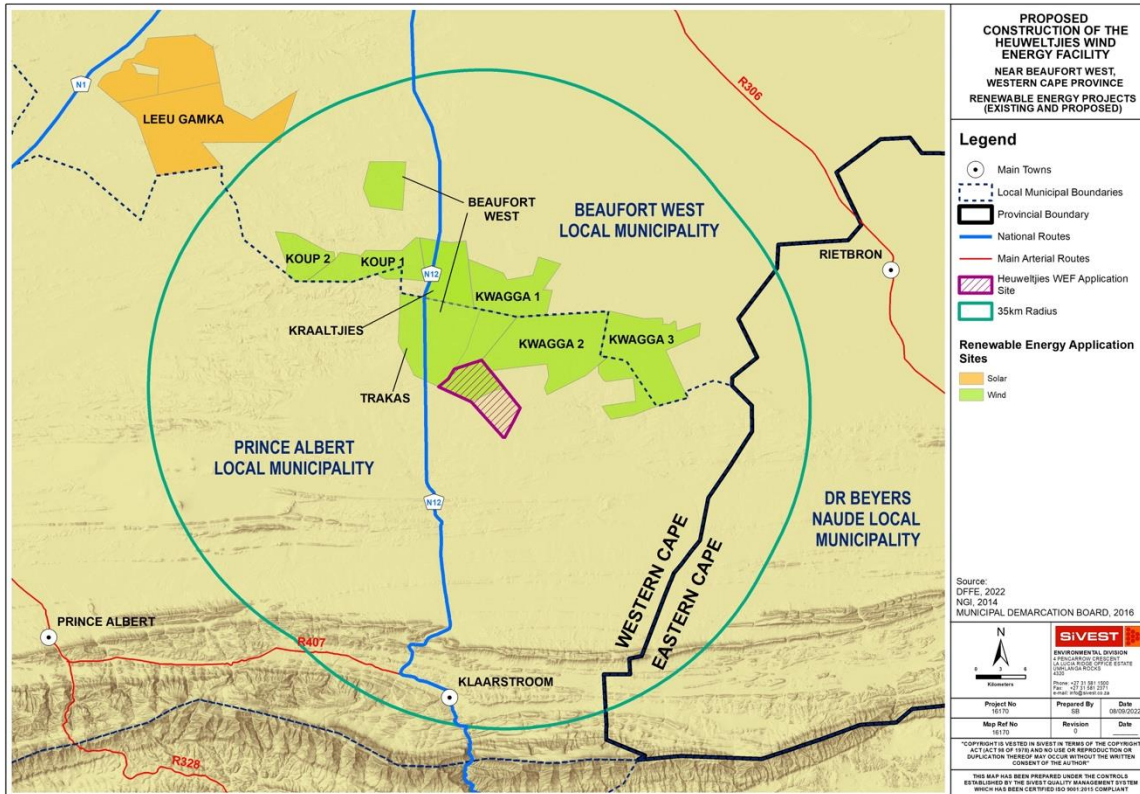


Figure 46: Renewable energy facilities proposed within a 35km radius of the proposed development (provided by SiVEST).

Table 9: Existing and Proposed Renewable Energy Projects within 35km of Site

Project	DEA Reference No	Technology	Capacity	Status of Application / Development
Proposed Beaufort West Wind Farm	12/12/20/1784/1	Wind	140MW	Approved
Proposed Trakas Wind Farm	12/12/20/1784/2	Wind	140MW	Approved
Proposed Wind and Solar Facility on the Farm Lombardskraal 330	14/12/16/3/3/2/406	Solar	20MW	EIA in Process
Proposed Kraaltjies WEF	TBA	Wind	140MW	EIA in Process
Kwagga WEF 1	Pending	Wind	279 MW	EIA in Process
Kwagga WEF 2	Pending	Wind	341 MW	EIA in Process
Kwagga WEF 3	Pending	Wind	204.6 MW	EIA in Process
Koup 1 WEF	TBA	Wind	140 MW	EIA in Process
Koup 2 WEF	TBA	Wind	140 MW	EIA in Process

Table 10 provides an analysis of the projected cumulative impact this project will add to impact on heritage resources.

The numerous applications and proposed establishment of several wind energy facilities between Beaufort West and the Swartberg mountain range, as well as the adjacent regions in the Karoo have sparked a concern with regards to cumulative impacts that these projects may have on the heritage resources and the cultural landscape. The approval of an increased number of RE projects in the region may lead to the mass industrialisation of the landscape that changes the character of the landscape and hence impacts on the sense of place and aesthetic value negatively. The Koups region has been considered as a wilderness landscape with a significant footprint of human habitation, cultural contact and conflict, whereby the cumulative impact of increased WEFs will involve significant sterilisation of the aesthetic qualities of the landscape. The cumulative impacts on tangible heritage resources can be considered low in general due to the thin density in the area, except when considering the cultural landscape which is negatively impacted by the construction of renewable energy, wind turbines and associated electrical infrastructure on the 'sense of place', land use patterns and its scenic beauty. The cumulative impact on the cultural landscape is thus unavoidably high without mitigation, with losses to perceptual qualities and historic land use. Similarly, cumulative impacts to living heritage sites will be unavoidably high without mitigation, with losses including the physical expressions of cultural heritage as well as to sense of place and cultural landscapes. While mitigation in the form of avoidance and protection of these sites can go some way to reducing cumulative impacts, these are likely to remain moderate.

By placing turbines away from the high and prominent ridgelines as well as below rather than on top of steep and high slopes, the height of the turbines should be somewhat reduced so that they can be more gently incorporated visually into the skyline of the landscape. The infrastructure associated with the WEF, such as laydown areas, substations and gridlines, should be less conspicuous located between the ridgelines, at low lying elevations.

The main negative impacts by WEF development and associated infrastructure to the cultural landscape are on the aesthetic and historic value of the area, including the local residents'⁴ opportunity to continue their historic patterns of land use and relationship to the landscape. The historic inhabitants of the area are an essential element to the historic and cultural significance of the cultural landscape and their continued existence in this place with the opportunity to practice traditional land use patterns and knowledge systems are critical in the conservation of the Koups region's intangible heritage.

The cumulative visual impact of the Heuweltjies WEF on the region has been considered by Schwartz (VIA, 2022) and is supported by the findings of this cultural landscapes impact assessment in terms of aesthetic heritage significance. The recommendations for cumulative visual impact according to the VIA impact rating table is supported by this cultural landscape impact assessment.

⁴ 'Local residents' refers to, and must include, the people currently living on site and utilizing the natural resources there (e.g. site managers or rentee's) and not necessarily landowners. These residents often represent the historic occupants of this landscape, who have been historically disenfranchised and disempowered by the lack of land ownership opportunity.

“Although it is important to assess the visual impacts of the proposed Heuweltjies WEF and grid connection infrastructure specifically, it is equally important to assess the cumulative visual impact that could materialise if other renewable energy facilities (both wind and solar facilities) and associated infrastructure projects are developed in the broader area. Cumulative impacts occur where existing or planned developments, in conjunction with the proposed development, result in significant incremental changes in the broader study area. In this instance, such developments would include renewable energy facilities and associated infrastructure development.

Renewable energy facilities have the potential to cause large scale visual impacts and the location of several such developments in close proximity to each other could significantly alter the sense of place and visual character in the broader region. Although power lines and substations are relatively small developments when compared to renewable energy facilities, they will introduce a more industrial character into the landscape, thus altering the sense of place.

Eight renewable energy project applications were identified as ‘approved’ or ‘in process’ within a 35 km radius of the proposed Heuweltjies WEF and grid connection infrastructure. It is assumed that all of these renewable energy developments include grid connection infrastructure. The eight (8) WEFs, namely Beaufort West WEF, Trakas WEF, Kwagga WEFs 1, 2 and 3 and Koup 1 & 2 WEFs and Kraaltjies WEF are all located in relatively close proximity to Heuweltjies WEF. These proposed WEFs, in conjunction with the associated grid connection infrastructure, will inevitably introduce an increasingly industrial character into a largely natural, pastoral landscape, thus giving rise to significant cumulative impacts. The number of renewable energy facilities within the surrounding area and their potential for large scale visual impacts will significantly alter the sense of place and visual character in the broader region, as well as exacerbate the visual impacts on surrounding visual receptors, once constructed.

From a visual perspective, the further concentration of renewable energy facilities as proposed will inevitably change the visual character of the area and alter the inherent sense of place, introducing an increasingly industrial character into the broader area, and resulting in significant cumulative impacts.”

Significant negative cumulative impacts will occur due to the night lighting associated with WEFs. As identified and supported by the VIA (Schwartz, 2022) the negative impact of this WEF element on the cultural landscape will alter the sense of place for the duration of the operation of the facility.

“Much of the study area is characterised by natural areas with pastoral elements and low densities of human settlement. As a result, relatively few light sources are present in the broader area surrounding the proposed development site. The closest built-up area is the town of Beaufort West which is situated approximately 55km north of the application site and is thus too far away to have significant impacts on the night scene. At night, the general study area is therefore characterised by a picturesque dark starry sky and the visual character of the night environment across the broader area is largely ‘unpolluted’ and pristine. Sources of light in the area are limited to isolated lighting from surrounding farmsteads and

transient light from the passing cars travelling along the N12 national route. Given the scale of the proposed WEF, the operational and security lighting required for the proposed project is likely to intrude on the nightscape and create glare, which will contrast with the extremely dark backdrop of the surrounding area. In addition, red hazard lights placed on top of the turbines may be particularly noticeable as their colour will differ from the few lights typically found within the environment and the flashing will draw attention to them.”

However, with the proposed recommendations of this CLA the cumulative negative impact of the proposed WEFs on the cultural landscape can be reduced.

Table 10: Impact rating - Cumulative

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ or -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ or -)	S
Cumulative Phase																				
Tangible Heritage Resources	The extent that the addition of this project will have on the overall impact of developments in the region on heritage resources.	4	2	4	4	4	2	36	-	Medium	It can clearly be noted that the area in general is abundant with Stone Age and historical remains. However, until a regional detailed study is commissioned by HWC or SAHRA. No further mitigations measures can be proposed other than those already recommended for the site-specific mitigation of sites in this report.	4	1	4	4	4	1	17	-	Low
Fossil heritage resources	Disturbance, damage or destruction of fossils at or beneath the ground surface due to surface clearance and bedrock excavations	1	4	4	3	4	2	32	-	Medium	Pre-construction walkdown of final footprint by specialist palaeontologist; Application of Chance Fossil Finds Procedure during construction phase	1	2	4	2	4	1	13	-	Low
Ecological	Inappropriate cumulative development	3	4	4	3	4	4	72	-	Very high	Please refer to Table 14 for mitigation recommendations for	3	2	4	2	3	2	28	-	Medium

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION										
		E	P	R	L	D	I / M	TOTAL	STATUS (+ or -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ or -)	S		
Cumulative Phase																						
	degrade the significant ecological elements of the cultural landscape												specifically cumulative impacts.									
Aesthetic	Inappropriate cumulative development degrades the significant aesthetic elements of the cultural landscape altering the character and sense of place	3	4	3	3	3	4	64	-	Very high			NOTE: If the recommendations in this CLA are applied to the majority of the surrounding RE developments, impacts can be reduced to ratings given in this table.	3	4	2	2	3	2	28	-	Medium
Historic	Inappropriate cumulative development degrades the significant historic elements of the cultural landscape altering the character and sense of place	3	4	4	4	4	4	76	-	Very high			With no specialist CLA reports done on the surrounding applications, cumulative impact on the cultural landscape of the region has not been considered and cannot be included in this rating.	3	2	3	2	3	2	26	-	Medium
Socio-economic	Inappropriate cumulative development degrade the significant socio-economic opportunities of the cultural landscape	3	4	3	4	4	4	72	-	Very high				3	3	1	1	4	2	24	+	Medium

9. COMPARATIVE ASSESSMENT OF ALTERNATIVES

Two alternatives were provided for the substation sites.

An assessment of the options for the substation shows that there will possibly be an impact on heritage resources if the Option 1 substation is chosen. Therefore, there is a preference for substation Option 2.

In terms of the CLA, there is no preference for the location of the substation site.

There are no preferences on palaeontological heritage grounds for any particular layout among the substation site options under consideration.

Key

PREFERRED	The alternative will result in a low impact/reduce the impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact/increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Alternative	Preference	Reasons
SUBSTATION		
Substation site Option 1 within WEF	Not Preferred	A site of medium heritage significance occurs less than 50m east of this location.
Substation site Option 2 within WEF	Preferred	No heritage resources have been identified in the general area of the substation footprint.

9.1 The No-Go Alternative

Environmental and heritage legislation requires the consideration of the no-go option. This option would result in no development impact on the Heuweltjies cultural landscape, and it should continue to operate in the similar way maintaining the current significance.

If the Heuweltjies site is not developed, the WEF and associated infrastructure will not be built and the aesthetic and visual impact of new RE developments will be contained to their existing scale and massing.

The potential for socio-economic opportunities related to the construction and operation of the RE facility for local residents in the area would be lost. The potential for increased RE energy capacity nationally would be lost in this instance but certainly gained elsewhere.

10. GENERAL RECOMMENDATIONS AND MITIGATION MEASURES

10.1 Construction phase

The project will encompass a range of activities during the construction phase, including vegetation clearance, excavations and infrastructure development associated with the project.

It is possible that cultural material will be exposed during construction and may be recoverable, keeping in mind delays can be costly during construction and as such must be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance, however foundation holes do offer a window into the past, and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project, and these must be catered for. Temporary infrastructure developments are often changed or added to the project as required. In general, these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction phase, it is important to recognize any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following chance find procedure should be implemented as part of the Environmental Management Programme (EMPr).

10.2 Chance finds procedure

- A heritage practitioner / archaeologist should be appointed to develop a heritage induction program and conduct training for the ECO as well as team leaders in the identification of heritage resources and artefacts. The ECO (following this training) can be permitted to provide similar induction and awareness training to contractors that will undertake construction of the project.
- An appropriately qualified heritage practitioner / archaeologist /palaeontologist must be identified to be called upon if any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities halted using the appropriate protocol.
- The qualified heritage practitioner / archaeologist /palaeontologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- The contractor therefore should have some sort of a contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.
- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner / archaeologist.

10.3 Possible finds during construction

The study area occurs within a greater historical and archaeological site as identified during the desktop and fieldwork phase. Soil clearance for infrastructure as well as the proposed development activities, could uncover the following:

- High density concentrations of stone artefact; and
- Unmarked graves.

10.4 Timeframes

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead times must be worked into the construction time frames. **Table 11** gives guidelines for lead times on permitting.

Table 11: Lead times for permitting and mobilisation

Action	Responsibility	Timeframe
Preparation for field monitoring and finalisation of contracts	The contractor and service provider	Approximately 1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and HWC	Approximately 3 months
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	Approximately 3 months
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and HWC	Approximately 2 weeks
Relocation of burial grounds or graves in the way of construction	Service provider – Archaeologist, HWC, local government and provincial government	Approximately 6 months

10.5 Heritage Management Plan for EMPr implementation

Table 12: Heritage Management Plan for EMPr implementation – Archaeological, BGG and Built Environment structures

Aspect	Mitigation measures	Phase	Target
General project area	<ul style="list-style-type: none"> Implement chance find procedures in case where possible heritage finds are uncovered. 	Construction and operation	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 34-36 and 38 of NHRA
Graves and Burial grounds (H006, H016)	<ul style="list-style-type: none"> The sites should be demarcated with a 50-meter no-go-buffer-zone and the graves should be avoided and left in situ. A Grave Management Plan should be developed for the graves, to be implemented during the construction and operation phases (which needs approval by HWC prior to construction). If the site is going to be impacted directly and the graves need to be removed a grave relocation process for these sites is recommended as a mitigation and management measure. This will involve the necessary social consultation and public participation process before grave relocation permits can be applied for with the HWC under the NHRA and National Health Act regulations. 	Construction	Ensure compliance with relevant legislation and recommendations from HWC under Section 36 and 38 of NHRA
Archaeological sites that were rated as medium (H013, H013/1, H013/3)	<ul style="list-style-type: none"> A no-go-buffer-zone of 30m should be demarcated. If the site can't be avoided, then it must be sampled by a qualified specialist under a permit issued by SAHRA A management plan, after a walkdown of the final layout, for the heritage resources needs then to be compiled and approved for implementation during construction and operations. 	Pre-construction	Ensure compliance with relevant legislation and recommendations from HWC under Section 35 and 38 of NHRA
Historical Structures that were rated as low (H007, H015, H017) but don't fall within	<ul style="list-style-type: none"> No mitigation is required. The documentation of the site in this HIA report is sufficient and the site can be destroyed without a permit, only with the approval of this report as provided here. 	Pre-construction	Ensure compliance with relevant legislation and recommendations from HWC under Section 34/35 and 38 of NHRA

Aspect	Mitigation measures	Phase	Target
proposed development area.			
Historical Structures that were rated as medium heritage significance (H001, H002, H008, H014, H014/1).	<ul style="list-style-type: none"> As the sites are located less than 100m adjacent to an existing farm road, it is possible that the sites will be impacted upon if the road is expanded. If there are plans to expand the current farm road, it is recommended that a no-go-buffer-zone of at least 30m is kept to the closest WEF infrastructure (including turbines, substation facilities and roads). If development occurs within 30m of the site, the structure will need to be satisfactorily studied and recorded before impact occurs. Recording of the buildings i.e. (a) map indicating the position and footprint of all the buildings and structures (b) photographic recording of all the buildings and structures (c) measured drawings of the floor plans of the principal buildings. A baseline report must be compiled for the site within which the recorded drawings from the previous item as well as all existing information on the structure can be included. This baseline report will then be utilised as a part of the HMP to determine any future unforeseen impacts on the heritage resources. The baseline report must be submitted to the relevant heritage authorities with a permit application in the event that the site will be impacted. 	Pre-construction	Ensure compliance with relevant legislation and recommendations from HWC under Section 34/35 and 38 of NHRA

Table 13: Heritage Management Plan for EMPr implementation – Palaeontology

Aspect	Mitigation measures	Phase	Target
General project area	<ul style="list-style-type: none"> The final, authorized layout of the WEF should be cross-checked by a qualified palaeontological specialist to what level of additional palaeontological surveying, monitoring or mitigation is necessary for these projects, if any. 	Pre-Construction Construction	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 35 of NHRA

Aspect	Mitigation measures	Phase	Target
	<ul style="list-style-type: none"> • Should a palaeontological “walkdown” of selected, potentially sensitive and previously unsurveyed sectors of the authorized footprint be recommended, this should involve the recording and judicious collection of valuable fossil material as well as relevant geological data (e.g., on stratigraphic context, preservation style / taphonomy) within or close to (within ~10 m) the project footprint. • During the construction phase the Chance Fossil Finds Protocol (refer to PIA) should be fully implemented. • The Environmental Control Officer (ECO) should be made aware of the possibility of important fossil remains (i.e. vertebrate bones, teeth, petrified wood, plant-rich horizons etc.) being found or unearthed during the construction phase of the development. • Monitoring for fossil material of all major surface clearance and deeper (>1m) excavations by the Environmental Site Officer on an on-going basis during the construction phase is therefore recommended. Significant fossil finds should be safeguarded and reported at the earliest opportunity to Heritage Western Cape for recording and sampling by a professional palaeontologist (Contact details: Heritage Western Cape. 3rd Floor Protea Assurance Building, 142 Longmarket Street, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 021 483 5959 Email: ceoheritage@westerncape.gov.za). • The qualified palaeontologist responsible for the mitigation work will need to submit a Work Plan for approval by Heritage Western Cape (HWC) and a Mitigation Report must be submitted to HWC for consideration. All fieldwork and reporting should meet the standards of international best practice as well as those developed for PIA reports by SAHRA (2013) and Heritage Western Cape (2021). Fossil material collected must be safeguarded and curated within an approved palaeontological repository (e.g. museum or university collection) with full collection data. 		

Table 14: Heritage Management Plan for EMPr implementation – Cultural landscape

Aspect	Mitigation measures	Phase	Target
Ecological	<ul style="list-style-type: none"> • Critical Biodiversity Areas, and Ecological Support Areas (along drainage lines), should be protected from development of the wind turbines or any associated development during all phases. • No wind turbines should be placed within the 1:100-year flood line or the no-go areas specified by the wetland specialist (where advised) of the watercourses. In the context of the sensitivity to soil erosion in the area, as well as potential archaeological resources, it would be a risk to include any structures close to these drainage lines and specialist recommendations must be taken into account in this regard, as advised. • Identified medicinal plants used for healing or ritual purposes should be conserved during all phases if threatened for use and continued access to these resources must be maintained. • Careful planning should incorporate areas for stormwater runoff where the base of the structure disturbed the natural soil. Local rocks found on the site could be used to slow stormwater (instead of concrete, or standard edge treatments), and prevent erosion that would be an unfortunate consequence that would alter the character of the site. By using rocks from site it helps to sensitively keep to the character. 	Planning/ pre-construction	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 38 of NHRA
	<ul style="list-style-type: none"> • Critical Biodiversity Areas, and Ecological Support Areas (along drainage lines), should be protected from development of the wind turbines or any associated development during all phases. • No wind turbines should be placed within the 1:100-year flood line of the watercourses. In the context of the sensitivity to soil erosion in the area, as well as potential archaeological resources, it would be a risk to include any structures close to these drainage lines. This recommendation can be waived if the archaeological or hydrological/ riverine specialist reports recommend different buffers. • Remaining areas of endemic and endangered natural vegetation should be conserved in line with relevant specialist buffers. 	Construction/ decommissioning	

Aspect	Mitigation measures	Phase	Target
	<ul style="list-style-type: none"> • Critical Biodiversity Areas, and Ecological Support Areas (along drainage lines), should be protected from development of the wind turbines or any associated development during all phases in line with relevant ecological and aquatic specialist recommended buffers. • Areas of critical biodiversity should be protected from any damage during all phases; where indigenous and endemic vegetation should be preserved at all cost. • Areas of habitat are found among the rocky outcrops and contribute to the character, as well as biodiversity of the area. Care should be taken that habitats are not needlessly destroyed. • Identified medicinal plants used for healing or ritual purposes should be conserved during all phases if threatened for use. • Careful planning should incorporate areas for stormwater runoff where the base of the structure disturbed the natural soil. Local rocks found on the site could be used to slow stormwater (instead of concrete, or standard edge treatments), and prevent erosion that would be an unfortunate consequence that would alter the character of the site. By using rocks from site it helps to sensitively keep to the character. 		
	<ul style="list-style-type: none"> • Areas of endemic and endangered natural vegetation should be conserved. • Critical Biodiversity Areas, and Ecological Support Areas (along drainage lines), including manmade wetlands and dams, should be protected as far possible. • Areas of habitat are found among the rocky outcrops and contribute to the character, as well as biodiversity of the area. Care should be taken that habitats are not needlessly destroyed. • Identified medicinal plants used for healing or ritual purposes should be conserved during all phases if threatened for use. Access to these resources should be made available to those who have had historic access to them. 	Operational	
Aesthetic	<ul style="list-style-type: none"> • Where additional infrastructure (i.e. roads) is needed, the upgrade of existing roads to accommodate the 	Planning/ pre-construction	Ensure compliance with relevant

Aspect	Mitigation measures	Phase	Target
	<p>development should be the first consideration.</p> <ul style="list-style-type: none"> • Avoid development of infrastructure (such as buildings, wind turbines and power lines), on crests or ridgelines due to the impact on the visual sensitivity of skylines. The visual impact of turbines can be reduced by distancing them from viewpoints such as roads and farmsteads and placing them in lower lying plains to reduce their impact on the surrounding sensitive cultural landscape. • Significant and place-making viewsheds of surrounding ridgelines and distant mountain should be maintained by limiting the placement of turbines or associated infrastructure on opposing sides of any of the regional roads, so that at any time a turbine-free view can be found when travelling through the landscape or at the historic farmsteads. • Retain view-lines and vistas focused on prominent natural features such as mountain peaks or hills, as these are important place making and orientating elements for experiencing the cultural landscape. • Prevent the construction of new buildings/structures/ new roads on visually sensitive, steep, elevated or exposed slopes, ridgelines and hillcrests. • Turbine and new road placement to avoid slopes steeper than 10% with existing farm roads to be used for access to turbines as far possible. The low gradient is relative to the context of the landscape, which is flat and expansive. • Due to the scenic and historic significance of the regional road, a buffer of 1000m to either side of the N12 should be maintained for no development associated with the WEF other than sensitive road upgrades, which must not impact on the views from the road. • Two relevant poorts on the N12 offer views of the vast flat Koup landscape and the Heuweltjies WEF site. <ul style="list-style-type: none"> 1) A smaller poort alongside the Amospoortjie farmstead as one travels south on the N12 (recommended grading III C) which runs through one of the east west ridges of the Koup landscape. 2) On travelling north through the Meiringspoort Pass (Grade II), this portion of the N12 that travels through the Swartberg range, culminates in a poort through the last ridge of the mountain range, which opens up with dramatic 		<p>legislation and recommendations from SAHRA under Section 38 of NHRA</p>

Aspect	Mitigation measures	Phase	Target
	<p>views of the vast flat landscape of the Koup Karoo. This poort is located 11kms from the nearest proposed Heuweltjies turbine and is of medium sensitivity at this distance.</p> <ul style="list-style-type: none"> • To support the continued occupation of the homesteads on the landscape, the turbines should be placed at a suitable distance from any occupied homestead. Trakaskuilen and Lammerkraal both dated to pre-1965 can be graded IIIB and a 800m buffer would be minimum. Trakaskuilen and Lammerkraal are currently not negatively impacted by the proposed development as the proposed gridline is over 1km away. Any associated gravesites are graded IIIA. • Due to the historic and local experience of the landscape from the regional farm road running across the north of Klipgat portion, which links the historically significant farmsteads across the region, a buffer of 300m from the regional road still in use should be maintained for no development associated with the WEF other than sensitive road upgrades which must not impact on the views from the road. (200m no-go turbine buffer and 100m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout); • There is no preference for WEF substations as the two options offer similar impacts. • The impact of WEF turbine night lighting on the wilderness landscape is intrusive and overwhelms the rural character of the landscape, giving it an industrial sense of place after dark. Reduce the impact of turbine night lighting by minimizing the number of turbines with lighting to only those necessary for aviation safety such as a few identified turbines on the outer periphery, or use aircraft triggered night lighting. Due to the reduced receptors on the roads at night, the impact of the lighting at night is reserved mainly for farmsteads and other places of overnight habitation such as the surrounding tourist facilities, which would be heavily impacted by the light pollution on a long term and ongoing basis. 		
Aesthetic	<ul style="list-style-type: none"> • Encourage mitigation measures (for instance use of vegetation) to 'embed' or disguise the proposed structures within the surrounding tourism and agricultural landscape at ground level, road edges etc; • The continuation of the traditional use of material could be enhanced with the use of the rocks on the site 	Construction/ decommissioning	Ensure compliance with relevant legislation and recommendations

Aspect	Mitigation measures	Phase	Target
	<p>as building material. This would also help to embed structures into the landscape and should not consist of shipping containers or highly reflective untreated corrugated sheeting that clutters the landscape and is exacerbates the foreign intrusion on the natural matte landscape.</p> <ul style="list-style-type: none"> • Using material found on the site adds to the sense of place and reduces transportation costs of bringing materials to site. • The local material such as the rocks found within the area could be applied to address storm water runoff from the road to prevent erosion. • Duration and magnitude of construction/ decommissioning activity must be minimized as far possible to reduce the impact of heavy vehicles on the roads as well as the associated dust from the activity. Lightest vehicles possible should be used to reduce degradation to the farm roads and the need to upgrade roads to scale and extent that negatively impacts on the integrity of the historic farm roads. Construction/ decommissioning traffic must operate at speeds that reduce dust and noise as far possible. 		<p>from SAHRA under Section 38 of NHRA</p>
Aesthetic	<ul style="list-style-type: none"> • Infrastructure improvement or maintenance work, including new roads and upgrades to the road network, should be appropriate to the rural context (scale, material etc.) and avoid steep slopes over 10% as well as ridges. • Prevent the construction of new buildings/structures on visually sensitive, steep (over 10%), elevated or exposed slopes, ridgelines and hillcrests or within farmstead and N12 buffers and 300m of the regional farm roads. • Avoid visual clutter in the landscape by intrusive signage, and the intrusion of commercial, corporate development along roads. • Duration and magnitude of operational activity must be minimized as far possible to reduce the impact of heavy vehicles on the roads as well as the associated dust from the activity. Lightest vehicles possible should be used to reduce degradation to the farm roads and the need to upgrade roads to scale and extent that negatively impacts on the integrity of the historic farm roads. Operational traffic must operate 	Operational	<p>Ensure compliance with relevant legislation and recommendations from SAHRA under Section 38 of NHRA</p>

Aspect	Mitigation measures	Phase	Target
	<p>at speeds that reduce dust and noise as far possible.</p> <ul style="list-style-type: none"> The impact of WEF turbine night lighting on the wilderness landscape is intrusive and overwhelms the rural character of the landscape, giving it an industrial sense of place after dark. Reduce the impact of turbine night lighting by minimizing the number of turbines with lighting to only those necessary for aviation safety, such as a few identified turbines on the outer periphery, or use aircraft triggered night lighting. Due to the reduced receptors on the roads at night, the impact of the lighting at night is reserved mainly for farmsteads and other places of overnight habitation such as the surrounding tourist facilities, which would be heavily impacted by the light pollution on a long term and ongoing basis. 		
Historic	<ul style="list-style-type: none"> Due to the scenic and historic significance of the regional road, a buffer of 1000m (800m no-go turbine buffer and 200m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout) to either side of the N12 should be maintained for no development associated with the WEF other than sensitive road upgrades, which must not impact on the views from the road. The visual impact of the turbines will be 50% less at 1000m distance and therefore this distance will greatly reduce the negative visual impact of the turbines on the experience of the historic road and the values that give it significance. The integrity of the historic farmsteads and their associated cultivated areas and relationship to the riverine corridors and other natural elements, such as Tooverberg, should be maintained and protected. Location of proposed turbines should be limited to a 1000m buffer around the farmsteads as far possible to limit impact to the farmsteads. Any development that impacts the inherent character of the werf component should be discouraged and a development buffer of 250m around any graded heritage structure, must be maintained, including the associated cultivated areas, cemeteries and unmarked graves, for all new infrastructure. Klipgat and Witpoortjie ruin complexes, provisionally graded IIIB, should be regarded as distinct cultural landscape features and buffers of 250m around each complex, including homesteads, graves, dams, stone kraals and other water management features are recommended. 	Planning/ pre-construction	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 38 of NHRA

Aspect	Mitigation measures	Phase	Target
	<ul style="list-style-type: none"> • Due to the historic and local experience of the landscape from the farm roads, which link the historically significant farmsteads across the region, a buffer of 300m (200m no-go turbine buffer and 100m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout) from the farm roads should be maintained for no development associated with the WEF other than sensitive road upgrades which must not impact on the views from the road. • The existing names of places, routes, watercourses and natural features in the landscape that are related to its use, history and natural character should be retained and used as heritage resources related to intangible heritage. • Burial grounds and places of worship are automatically regarded as Grade IIIa or higher. Any development that threatens the inherent character of family burial grounds must be assessed and should be discouraged. No development closer than 50m from the boundary of any burial grounds or unmarked graves. No turbines have been proposed for placement near known unmarked burials or family cemeteries. A preconstruction micro-survey of each turbine footprint and any new access roads should be conducted to ensure no further unmarked graves are threatened. These recommendations should be considered together with the AIA report and the AIA recommendations should take preference for burial grounds or graves where they are not associated with other heritage features or cultural landscape elements. • Respect existing patterns, typologies and traditions of settlement-making by promoting the continuity of heritage features. These include: (a) indigenous; (b) colonial; and (c) current living heritage in the form of tangible and intangible associations to place. • Alterations and additions to conservation-worthy structures should be sympathetic to their architectural character and period detailing. 		
Historic	<ul style="list-style-type: none"> • Historic farmsteads must be protected from the impacts of heavy construction vehicles and increased numbers of people. No construction traffic should pass through or closer than 50m to any outlying graded heritage structure, which includes the associated historically cultivated lands, cemeteries, unmarked burials. The most appropriate use of existing farm roads must be found to avoid farm werfs as far as possible and reduce construction impact on these heritage features. 	Construction/ decommissioning	Ensure compliance with relevant legislation and recommendations from SAHRA

Aspect	Mitigation measures	Phase	Target
	<ul style="list-style-type: none"> • Duration and magnitude of construction/ decommissioning activity must be minimized as far possible to reduce the impact of heavy vehicles on the roads as well as the associated dust from the activity. Lightest vehicles possible should be used to reduce degradation to the farm roads and the need to upgrade roads to scale and extent that negatively impacts on the integrity of the historic farm roads. Construction decommissioning traffic must operate at speeds that reduce dust and noise as far possible. • Accommodation of construction staff must not negatively impact on existing farm residents or degrade the integrity of the farmstead complexes and should, without negative impact to ecological or aesthetic resources, be located outside of the farmstead complexes or site. Farm residents should be consulted on the preferable location for construction staff accommodation. • Traditional planting patterns should be protected by ensuring that existing trees are not needlessly destroyed, as these signify traces of cultural intervention in a harsh environment. These planting patterns include the trees planted around the werfs and along travel routes. Interpretation of these landscape features as historic remnants should occur. A buffer of 50m around such planting patterns should be maintained and will be identified by specialist during the Final Layout walk down. • Burial grounds and places of worship are automatically regarded as Grade IIIa or higher. Any development that threatens the inherent character of family burial grounds must be assessed and should be discouraged. No turbines have been proposed for placement near known unmarked burials or family cemeteries. A preconstruction micro-survey of each turbine footprint and any new access roads should be conducted to ensure no further unmarked graves are threatened. These recommendations should be considered together with the AIA report and the AIA recommendations should take preference for burial grounds or graves where they are not associated with other heritage features or cultural landscape elements. • Mountain slopes have been used for traditional practices for many years, and care should be taken that any significant cultural sites, such as burials and veldkos/medicinal plant resources, are not disturbed. • Farms in the area followed a system of stone markers to demarcate the farm boundaries in the area. Where these structures are found on the site, care should be taken that they are not needlessly destroyed, as they add to the layering of the area. • Roads running through the area have historic stone way markers. Where these are found care should be taken that they are left in tact and in place. Road upgrades must not move or threaten their position and they should be visible from the road they are related to by passing travellers. Final buffers for stone markers will be for specialist identification at Final Layout walk down. 		under Section 38 of NHRA

Aspect	Mitigation measures	Phase	Target
	<ul style="list-style-type: none"> Where the historic function of a building/site is still intact, the function has heritage value and should be protected. Surviving examples (wagon routes, outspans, and commonage), where they are owned in some public or communal way (or by a body responsible for acting in the public interest) and where they are found to be actively operating in a communal way, will have cultural and heritage value and should be enhanced and retained. The historic route running through Heuweltjies should be maintained and integrity as a communal road for farm residents must be retained 		
Historic	<ul style="list-style-type: none"> Historic farmsteads must be protected from the impacts of operational facility vehicles and increased numbers of people. No WEF operations traffic should pass within 50m from graded structures, which includes the associated historically cultivated lands, cemeteries, unmarked burials. The most appropriate use of existing farm roads must be found to avoid farm werfs as far as possible and reduce construction impact on these heritage features. The AIA buffer recommendations should take preference for identified archaeological heritage resources. Traditional planting patterns should be protected by ensuring that existing trees are not needlessly destroyed, as these signify traces of cultural intervention in a harsh environment. These planting patterns include the trees planted around the werfs and along travel routes. Interpretation of these landscape features as historic remnants should occur. Burial grounds and places of worship are automatically regarded as Grade IIIa or higher. Any development that threatens the inherent character of family burial grounds must be assessed and should be discouraged and a buffer of 50m around all burial ground or unmarked graves should be in place. No turbines have been proposed for placement near known unmarked burials or family cemeteries. A preconstruction micro-survey of each turbine footprint and any new access roads should be conducted to ensure no further unmarked graves are threatened. Mountain slopes have been used for traditional practices for many years, and care should be taken that any significant cultural sites, such as burials and veldkos/medicinal plant resources, are not disturbed. Farms in the area followed a system of stone markers to demarcate the farm boundaries in the area. Where these structures are found on the site, care should be taken that they are not needlessly destroyed, as they add to the layering of the area. Roads running through the area may have historic stone way markers. Where these are found care should be taken that they are left in tact and in place. Road upgrades must not move or threaten their position and they should be visible from the road they are related to by passing travellers. 	Operational	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 38 of NHRA

Aspect	Mitigation measures	Phase	Target
	<ul style="list-style-type: none"> • Where the historic function of a building/site is still intact, the function has heritage value and should be protected. • Surviving examples (wagon routes, outspans, and commonage), where they are owned in some public or communal way (or by a body responsible for acting in the public interest) and where they are found to be actively operating in a communal way, will have cultural and heritage value and should be enhanced and retained. The historic route running through Heuweltjies should be maintained and integrity as a communal road for farm residents must be retained. • Accommodation of WEF staff must not negatively impact on existing farm residents or degrade the integrity of the farmstead complexes and should, without negative impact to ecological or aesthetic resources, be located outside of the farmstead complexes or site. Farm residents should be consulted on the preferable location for construction staff accommodation. • Lightest vehicles possible should be used to reduce degradation to the farm roads and the need to upgrade roads to scale and extent that negatively impacts on the integrity of the historic farm roads. Operational traffic must operate at speeds that reduce dust and noise as far possible. 		
Socio-economic	<ul style="list-style-type: none"> • The findings of this report must be shared with identified interested and affected parties, including non-landowner residents on the development properties, in the EIA public participation process in order to further ascertain any intangible cultural resources that may exist on the landscape that have not been identified. A specialist qualified in recognising and discussing significance of intangible heritage resources should be present during the public meetings. The findings should inform the recommendations for appropriate mitigation for impacts to the cultural landscape. • The continued use of the landscape for human habitation and cultivation by historic residents of the area, should be retained and encouraged as far possible to sustain the continual use pattern and human-environment relationship which is the ultimate significance of this cultural landscape element. The WEF development must allow and support this, including financially, and not degrade this continued relationship. • The local community on and around the development should benefit from job opportunities created by the proposed development and the development should not cause reduction in economic viability of surrounding properties in excess of those offered by the development. Short-term job opportunities at the expense of long term economic benefit and local employment opportunities must be prevented. • Local residents must be offered employment on the construction/ decommissioning and operational phases before 'importing' staff from elsewhere. 	Planning/ pre-construction	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 38 of NHRA

Aspect	Mitigation measures	Phase	Target
	<ul style="list-style-type: none"> Local residents must be offered employment training opportunities associated with WEF developments at all phases. 		
Socio-economic	<ul style="list-style-type: none"> An updated cultural landscapes impact assessment report must be completed should the WEF continue to be used after the term granted in this application. This report should include a detailed assessment of the socio-economic impacts to the cultural landscape and its outcomes and recommendations need to be considered in the decision for recommissioning and be implemented if recommissioning is approved. The continued use of the landscape for human habitation and cultivation by historic residents of the area, should be retained and encouraged as far possible to sustain the continual use pattern and human-environment relationship which is the ultimate significance of this cultural landscape element. The WEF development must allow and support this, including financially, and not degrade this continued relationship. The local community on and around the development should benefit from job opportunities created by the proposed development and the development should not cause reduction in economic viability of surrounding properties in excess of those offered by the development. Short-term job opportunities at the expense of long term economic benefit and local employment opportunities must be prevented. Local residents must be offered employment on the construction/ decommissioning and operational phases before 'importing' staff from elsewhere. Local residents must be offered employment training opportunities associated with WEF developments at all phases. Sheep, cattle or game farming should be allowed to continue below the wind turbines, or be rehabilitated to increase biodiversity in the area. 	Construction/ decommissioning	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 38 of NHRA
Socio-economic	<ul style="list-style-type: none"> The local community on and around the development should benefit from job opportunities created by the proposed development and the development should not cause reduction in economic viability of surrounding properties in excess of those offered by the development. Short-term job opportunities at the expense of long term economic benefit and local employment opportunities must be prevented. The continued use of the landscape for human habitation and cultivation by historic residents of the area, should be retained and encouraged as far possible to sustain the continual use pattern and human-environment relationship which is the ultimate significance of this cultural landscape element. The WEF development must allow and support this, including financially, and not degrade this continued relationship. 	Operational	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 38 of NHRA

Aspect	Mitigation measures	Phase	Target
	<ul style="list-style-type: none"> • Local residents must be offered employment on the construction/ decommissioning and operational phases before 'importing' staff from elsewhere. • Local residents must be offered employment training opportunities associated with WEF developments at all phases. • Crop cultivation, sheep, cattle or game farming should be allowed to continue below the wind turbines, or be rehabilitated to increase biodiversity in the area. 		

The implementation of the recommendations contained in the preceding tables are illustrated in (**Figure 47**). It must be noted that the smaller buffers and distances recommended for tangible heritage features will be contained within the larger 1000-meter buffer that indicates a no-go for turbine development turbines.

The following summary of design indicators informed the mapping and recommendations on infrastructure placement:

- A 1000m buffer to either side of the N12 for turbine and infrastructure placement (800m no-go turbine buffer and 200m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout);
- 300m buffer to either side of identified significant historic regional road for turbine placement, substation and laydown area (200m no-go turbine buffer and 100m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout);
- 800m buffer around Trakaskuilen and Lammerkraal farmsteads and 300m buffer around Klipgat and Witpoortjie ruin cultural landscape features for turbine placements (single turbines at the edges of some of these buffers are acceptable); and
- existing roads to be used with minimal upgrade as far as possible;
- provisional no-go areas on koppie and steep slopes (over 10%) for all infrastructure (no-go areas to be refined to specialist approval in EIA phase once finer detailed information is available);
- riverine corridors 100m buffer.

Further, the following changes to the current proposed layout is recommended:

- Substation options 1 and 2 are equally acceptable in their proposed placement.

Further heritage indicators and recommendations for construction/ decommissioning and operational phases unsuitable for mapping have been made in the CLA (Section 12) and are necessary for the identified negative impacts to be reduced from very high to medium negative impact of the proposed Heuweltjies WEF and associated infrastructure on the cultural landscape.

More detailed development mitigation could be considered through micro-site assessment, by a suitably qualified cultural landscape specialist, on final layout of the proposed WEF and gridline development.

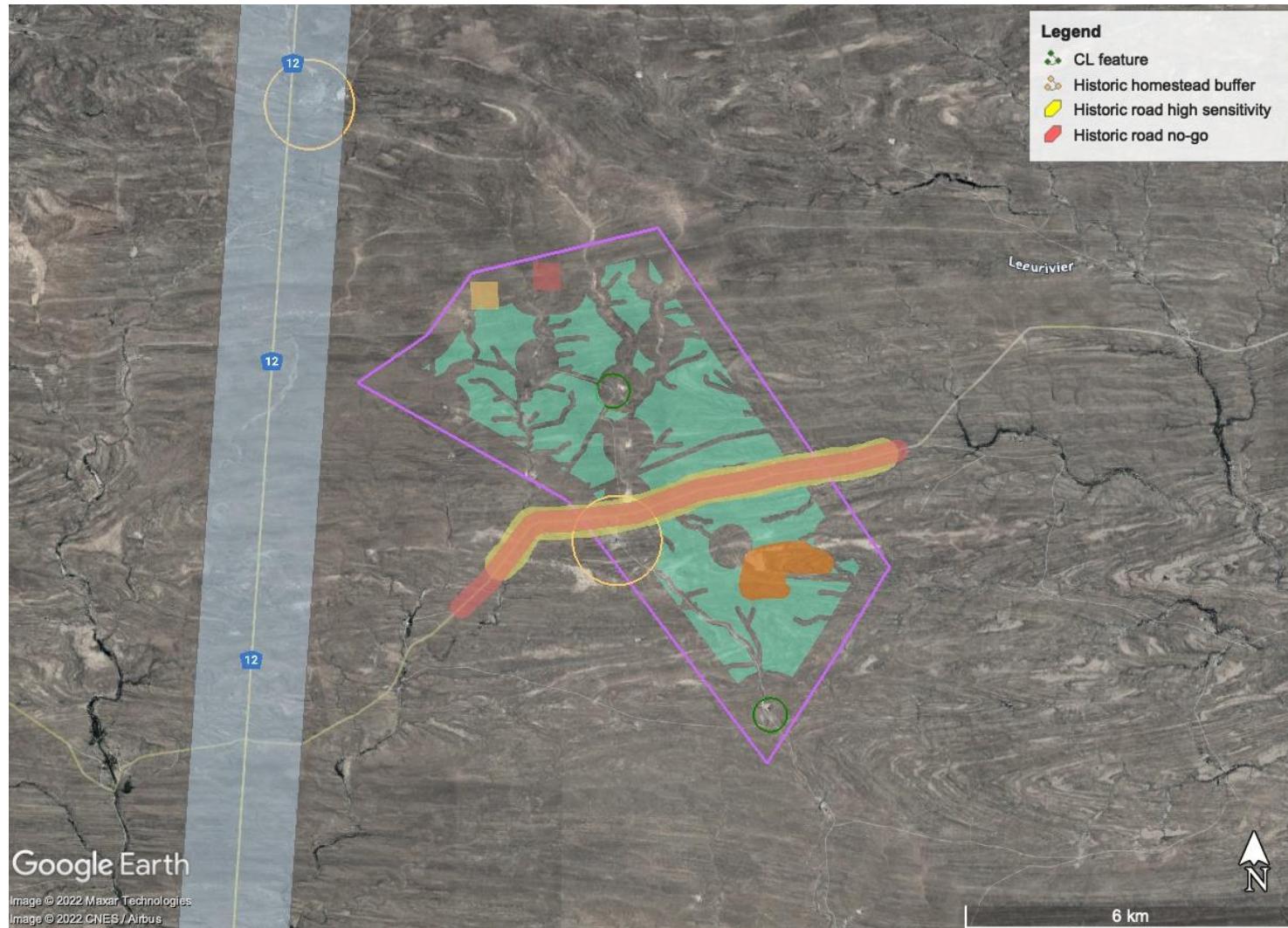


Figure 47: Cultural Landscapes Assessment heritage indicators and buffers map for proposed Heuweltjies WEF project (Note: 100m/ flood line riverine corridor buffers not indicated).

11. CONCLUSION AND RECOMMENDATIONS

PGS has been appointed by SiVEST on behalf of Mainstream, to undertake the assessment of the proposed construction of the Heuweltjies WEF near Beaufort West in the Western Cape Province.

Heritage resources are unique and non-renewable and as such any impact on such resources must be seen as significant. The studies comprising the full HIA identified various tangible cultural heritage resources while a significant cultural landscape component attributed as an intangible cultural heritage resource was described.

11.1 Archaeology, built environment and burial grounds and graves

The fieldwork conducted for the evaluation of the possible impact of the new Heuweltjies WEF has revealed the presence of twenty-seven (27) tangible cultural heritage resources.

11.1.1 *Burial Grounds and graves*

Two (2) burial grounds (**H006, H016**) were rated as having high heritage significance.

11.1.2 *Historical Structures*

Five (5) structures (**H001, H002, H008, H014, H014/1**) were rated as having medium heritage significance and three (3) structures (**H007, H015, H017**) were rated as having low heritage significance.

11.1.3 *Archaeological features*

Three (3) Stone Age sites (**H013, H013/1, H013/3**) were rated as having medium heritage significance.

Fourteen (14) find spots (**H003-5, H009-12, H018-24**) comprise a number of low-density Stone Age surface artefact scatters and were rated as having low heritage significance. These are primarily from the Middle Stone Age (MSA), although both Later Stone Age (LSA) and earlier Early Stone Age (ESA) material was identified. All of these artefact assemblages occur in heavily deflated and eroded areas, so their scientific potential and heritage significance is somewhat lowered. Based on findings from a range of other heritage reports in the area, these types of sites are to be expected in this region.

11.2 Palaeontology

The PIA determined that the Heuweltjies WEF project areas are underlain by continental (fluvial / lacustrine) sediments of the Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) which are of Middle Permian age. These bedrocks contain sparse, unpredictable to locally concentrated vertebrate fossils as well as rare trace fossils (e.g., tetrapod trackways and burrows) and plant material of scientific and conservation value. Very few new fossil vertebrate sites - most notably a partial, articulated pareiasaur reptile skeleton - have been recorded during within the WEF project area during the short (2 day) site visit, while several more sites have previously been mapped in the vicinity during recent palaeontological surveys of adjoining WEF project areas. All the recorded fossil sites lie *outside* the WEF project footprints.

No Very High Sensitivity or No-Go palaeontological sites or areas have been identified within the WEF project areas. The single known pareiasaur reptile skeleton site lies along a stream bank and is therefore already protected within the standard ecological buffer zone. Since all known fossil sites can be readily mitigated – if necessary - through professional recording and collection of fossil material in the pre-construction phase, no recommendations for micro-siting of infrastructure such as wind turbine, pylon positions or access roads are therefore made here. There are no preferences on palaeontological heritage grounds for specific site options for the WEF on-site substation, given their similar geological and palaeontological context.

11.3 Cultural Landscape

The Koup region is a significant cultural landscape that reflects the relationship between man and nature over a period of time. This relationship has generally been sustainable, where biodiversity and ecological systems have been maintained in the utilisation of the landscape expressed in specific land use patterns. The surrounding land use indicates a social appreciation of the natural environment with low impact stock and game farming with limited farmstead crop cultivation. The vastness and relative homogenous nature of the cultural landscape is, however, often undervalued. If careful contextual planning is not followed, it will rapidly result in a cluttered wasteland. This does not mean that development is discouraged, but rather that the implementation of wind and solar energy farms should be planned holistically.

The findings of this report, coupled with the proposed layout for development of wind turbines, which considers appropriate placement in terms of wind energy capacity, concludes that the development can be permitted within the site if the report's recommendations are followed. The mitigating recommendations in this report consider the ecological, aesthetic, historic and socio-economic value lines that underpin the layers of significance that combine to create the character of the place and the cultural landscape of the Koup. These recommendations include road and farmstead complex buffers

which incorporate cultivated areas and graves, steep slope and ridgeline no-go areas as well as consideration of the unique land form of the site, CBA and ESA no-go areas, as well as mechanisms to support any non-landowner residents that live on the site in being able to continue their indigenous land use patterns, knowledge and social systems, although none were identified during this fieldwork.

11.4 Impact statement

The pre-construction and construction phase of the proposed WEF will entail extensive surface clearance as well as excavations into the superficial sediment cover and underlying bedrock (e.g. for widened or new access roads, wind turbine foundations, hardstanding areas, on-site substation, underground cables, construction laydown area, O&M building and BESS).

Construction of the facility may adversely affect potential archaeological and fossil heritage within the development footprint by damaging, destroying, disturbing or permanently sealing-in fossils preserved at or beneath the surface of the ground that are then no longer available for scientific research or other public good. The possible pre-construction impacts calculated on the tangible cultural heritage resources vary between **HIGH** to **MODERATE NEGATIVE** rating but with the implementation of the recommended buffers and management guidelines will be reduced to a **LOW NEGATIVE** impact.

The impact on the cultural landscape includes:

- Critical Biodiversity Areas (BDA) and Ecological Support Areas (ESA), largely associated with the riverine environment of the study area supports biodiversity conservation. These areas recognise the ongoing relationship between man and the environment in the way they are managed to maintain a natural state, which in turn, has a benefit for human habitation. Landscape elements are reflected in the names of the local farmsteads, indicating a close relationship between inhabitants on the landscape and these rivers as well as the significant dependence on these resources;
- The impact on the sense of place as the vast open landscape with low shrubby vegetation, characteristic of the Koup Karoo and determining to a large extent its evolution in history, creates a sense of place and landscape character intimately associated with this cultural landscape;
- The impact on the historicity of the landscape specifically on such features as, the national N12 road, a historic route linking Beaufort West with the towns of De Rust and Outdshoorn via scenic Meiringspoort Pass and the coastal town of Geroge further south; history of the landscape and its intimate association with stock farming and waves of settlement throughout history stretching back to the Stone Age.
- The impact on the continued land use pattern and relationship to the land and its possible decline of the socio-economic position of the inhabitants, as they may not be able to maintain some level of subsistence with these resources. The ability for these residents to provide for themselves in this way must not be negatively impacted upon by the WEF development and

must be supported, including financially, by the development. Their existence on the landscape, as the historic inhabitants of the area, previously disenfranchised and disempowered, is a fundamental element to the cultural landscape.

The impact on the cultural landscape through the development of the Heuweltjies WEF is calculated to have a **VERY HIGH** negative impact and specifically on the aesthetic and historical components of the cultural landscape. This impact is further projected as **VERY HIGH** when incorporating the cumulative impacts projected with the other eight (8) projects within 35k m of Heuweltjies. By implementing the recommended mitigation measures and design indicators this negative impact can potentially reduce to **MODERATE**.

11.5 Conclusion

The calculated impact as summarised in **Section 8** of this report confirms the impact of the new Heuweltjies WEF will be reduced with the implementation of the mitigation measures (**Section 10**) for the cultural heritage resources. This finding in addition to the implementation of a chance finds procedure, as part of the EMP, will mitigate possible impacts on unidentified heritage resources.

The following mitigation measures will be required:

In terms of the **AIA**:

- An archaeological walk down of the final approved layout will be required before construction commences;
- 50m buffer zones around grave sites (**H006, H016**)
- 30m buffer zone around farmsteads (**H001, H002, H008, H014 (H014/1)**)
- 30m buffer zone around historical structures (**H007, H015, H017**)
- 30m buffer zones around Stone Age sites with a medium heritage significance (**H013, H013/1, H013/3**)
- If significant Stone Age sites (medium heritage significance or higher) can't be avoided, then sites must be sampled by a qualified specialist under a permit issued by SAHRA
- A heritage management plan for the heritage resources and a grave management plan needs to be compiled and approved for implementation during construction and operations of the project.
- A chance finds protocol must be developed that includes the process of work stoppage, site protection, evaluation and informing HWC of such finds and a final process of mitigation implementation.

In terms of the **Cultural Landscape Assessment (CLA)**:

- A 1000m buffer to either side of the N12 for turbine and infrastructure placement (800m no-go turbine buffer and 200m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout);

- 300m buffer to either side of identified significant historic regional road for turbine placement, substation and laydown area (200m no-go turbine buffer and 100m high sensitivity buffer where turbine placement is subject to specialist approval in the Final Layout);
- 800m buffer around Trakaskuilen and Lammerkraal farmsteads and 300m buffer around Klipgat and Witpoortjie ruin cultural landscape features for turbine placements (single turbines at the edges of some of these buffers are acceptable); and
- existing roads to be used with minimal upgrade as far as possible;
- provisional no-go areas on koppie and steep slopes (over 10%) for all infrastructure (no-go areas to be refined to specialist approval in EIA phase once finer detailed information is available);
- riverine corridors 100m buffer.

Further, the following changes to the current proposed layout is recommended:

- Substation options 1 and 2 are equally acceptable in their proposed placement.

Further heritage indicators and recommendations for construction/ decommissioning and operational phases unsuitable for mapping have been made in the CLA (Section 12) and are necessary for the identified negative impacts to be reduced from very high to medium negative impact of the proposed Heuweltjies WEF and associated infrastructure on the cultural landscape.

More detailed development mitigation could be considered through micro-site assessment, by a suitably qualified cultural landscape specialist, on final layout of the proposed WEF and gridline development.

In terms of the **Palaeontological Impact Assessment (PIA)**:

Recommended mitigation for WEF project comprises:

- Cross-checking of final, authorized footprints against the available fossil database by a palaeontological specialist;
- If necessary, a specialist palaeontological walk-down of selected, unsurveyed, potentially sensitive sectors of the final WEF project areas in the pre-construction phase and
- Implementation of a Chance Fossil Finds Protocol by the ECO / ESO during the construction phase. The qualified palaeontologist responsible for the mitigation work will need to submit a Work Plan for approval by Heritage Western Cape (HWC) and a Mitigation Report must be submitted to HWC for consideration.

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APPENDIX A – CV

WOUTER FOURIE

Professional Heritage Specialist and Professional Archaeologist and Director PGS Heritage

SUMMARY OF EXPERIENCE

Specialised expertise in Archaeological Mitigation and excavations, Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia* -

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave “rescue” excavations in the various provinces of South Africa

Involvement with various Heritage Impact Assessments, within South Africa, including -

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects
- Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
- Involvement with various Heritage Impact Assessments, outside South Africa, including -
- Archaeological Studies in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation project in DRC

KEY QUALIFICATIONS

BA [Hons] (Cum laude) - Archaeology and Geography - 1997

BA - Archaeology, Geography and Anthropology - 1996

Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member

Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)

CRM Accreditation (ASAPA) -

Principal Investigator - Grave Relocations

Field Director – Iron Age

Field Supervisor – Colonial Period and Stone Age

Accredited with Amafa KZN

KEY WORK EXPERIENCE

2003- current - Director – Professional Grave Solutions (Pty) Ltd

2007 – 2008 - Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand

2005-2007 - Director – Matakoma Heritage Consultants (Pty) Ltd

2000-2004 - CEO– Matakoma Consultants

1998-2000 - Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng

1997-1998 - Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

Worked on various heritage projects in the SADC region including, Botswana, Mozambique, Malawi, Mauritius and the Democratic Republic of the Congo

PROFESSIONAL CURRICULUM VITAE FOR NIKKI MANN
Professional Archaeologist for PGS Heritage

Name: Nikki Mann
Profession: Archaeologist
Date of birth: 1992-10-13
Parent Firm: PGS Heritage (Pty) Ltd
Position at Firm: Archaeologist
Years with firm: 2
Years of experience: 7
Nationality: South African
HDI Status: White

EDUCATION:

Name of University or Institution : University of Cape Town
Degree obtained : BSc
Major subjects : Archaeology, Environmental and
Geographical Sciences
Year : 2013

Name of University or Institution : University of Cape Town
Degree obtained : BSc [Hons]
Major subjects : Archaeology
Year : 2014

Name of University or Institution : University of Cape Town
Certificate obtained : MSc – Archaeology (phytolith analysis)
Year : 2017

Professional Qualifications:

Professional Archaeologist - Association of Southern African Professional Archaeologists -
Professional Member – No 472

Languages:

English
French

KEY QUALIFICATIONS

SiVEST Environmental

Prepared by: PGS Heritage Pty Ltd for SiVEST

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- 3 years of work in the heritage consulting field;
- 7 years working experience in archaeological excavations;
- Proven experience in report writing and report deliverables;

HERITAGE IMPACT ASSESSMENTS

South African

Kathu Tyre Management Plant HIA. Kathu. EXM. **Position:** Heritage Specialist.

Kathu Borrow Pit Screening. Kathu. EXM. **Position:** Heritage Specialist.

Kolomela Mine Expansion. Postmasburg. EXM. **Position:** Heritage Specialist.

Kudumane HIA update. Hotazel. SRK. **Position:** Heritage Specialist.

Victoria West Pipeline project. Victoria West. iXEng. **Position:** Heritage Specialist.

10MW Chelsea Solar PV. Gqeberha, Eastern Cape. SLR. **Position:** Heritage Specialist.

Koup 1 and Koup 2 WEF. Beaufort West, Western Cape. SiVEST. **Position:** Heritage Specialist.

Victoria West Pipelines. Victoria West, Northern Cape. iXEng. – **Position:** Heritage Specialist.

East Orchards Poultry Farm Project. Delmas, Mpumalanga. EcoSphere. – **Position:** Heritage Specialist.

Gunstfontein WEF and OHL. Sutherland, Northern Cape. Savannah– **Position:** Heritage Specialist.

Overhead power line for Oya PV Facility. Sutherland, Northern Cape. SiVEST– **Position:** Heritage Specialist.

Infrastructure for Kudusberg WEF. Sutherland, Northern Cape. SiVEST– **Position:** Heritage Specialist.

Proposed SKA fibre optic cable, between Beaufort West and Carnarvon, Northern and Western Cape. **Position:** Heritage Specialist.

Proposed SANSA Space Operations. Matjiesfontein, Western Cape. **Position:** Heritage Specialist

Pienaarspoort WEF 1 and 2. North-west of Matjiesfontein, Western Cape. Savannah- **Position:** Heritage Specialist.

Swellendam WEF. Swellendam, Western Cape. – **Position:** Heritage Specialist.

Matjiesfontein Road Extension Project. Matjiesfontein, Western Cape. **Position:** Heritage Specialist.

MITIGATION WORK

2020 – Coega Zone 10, Coega IDZ, Eastern Cape Province. Colonial Period Phase 2 Mitigation Archaeological Excavation. **Archaeologist.**

2019 – 2020 - **Lesotho Highland Development Authority – Polihali Dam Project - Heritage Management Plan development and Implementation.** Mokhotlong, Kingdom of Lesotho. **Archaeologist.**

2018- Proposed development of boreholes and associated pipelines for the Langebaan Aquifer within the Hopefield Private Nature Reserve, Hopefield, Western Cape. **Archaeologist.**

POSITIONS HELD

SiVEST Environmental

Prepared by: PGS Heritage Pty Ltd for SiVEST

Project Description: **Proposed Construction of the Heuweltjies Wind Energy Facility– HIA**

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2021 – current: Archaeologist - PGS (Pty) Ltd
2019 – 2020: Archaeologist - PGS (Pty) Ltd Lesotho
2018 – 2020: Contract Archaeologist – CTS Heritage

REFERENCES

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PGS Heritage	George Washington	CTS Heritage
Tel: +27 12 332 5305	University	Tel: +27 (0)87 073 5739
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APPENDIX B – IMPACT ASSESSMENT METHODOLOGY

1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).

1.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Rating of impacts criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		

1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:		
Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.		

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.