

HERITAGE IMPACT ASSESSMENT

**Basic Assessment for the Proposed Development of the
325MW Kudusberg Wind Energy Facility and associated
infrastructure, between Matjiesfontein and Sutherland in
the Western and Northern Cape Provinces: BA REPORT**

HWC Case Number: 18071105

DEA Number: To be confirmed

Report prepared for:
CSIR – Environmental Management Services
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EXECUTIVE SUMMARY

Site Name

The proposed development is the Kudusberg Wind Energy Facility.

Location

The development is proposed west of the R345 that runs between Sutherland and Matjiesfontein on the Western and Northern Cape Province boundary.

The project falls within the Witzenberg Local Municipality, Cape Winelands District within the Western Cape, and the Karoo Hoogland Local Municipality, Namakwa District in the Northern Cape.

The affected farm portions are:

Western Cape:

- Portion 1 of 156 Gats Rivier Farm;
- Portion 2 of 156 Gats Rivier Farm;
- Remainder of 156 Gats Rivier Farm;
- Portion 1 of 157 Riet Fontein Farm.
- Portion 1 of 158 Amandelboom Farm;
- Remainder of 158 Amandelboom Farm;
- Portion 1 of 159 Oliviers Berg Farm;
- Remainder of 159 Oliviers Berg Farm;
- Portion 2 of 157 Riet Fontein Farm;
- Remainder of 161 Muishond Rivier Farm; and
- Remainder of 395 Klipbanks Fontein Farm.

Northern Cape:

- Portion 4 of 193 Urias Gat Farm;
- Portion 6 of 193 Urias Gat Farm;
- Remainder of 193 Urias Gat Farm;

- Remainder of 194 Matjes Fontein Farm; and
- Remainder of 196 Karree Kloof Farm.

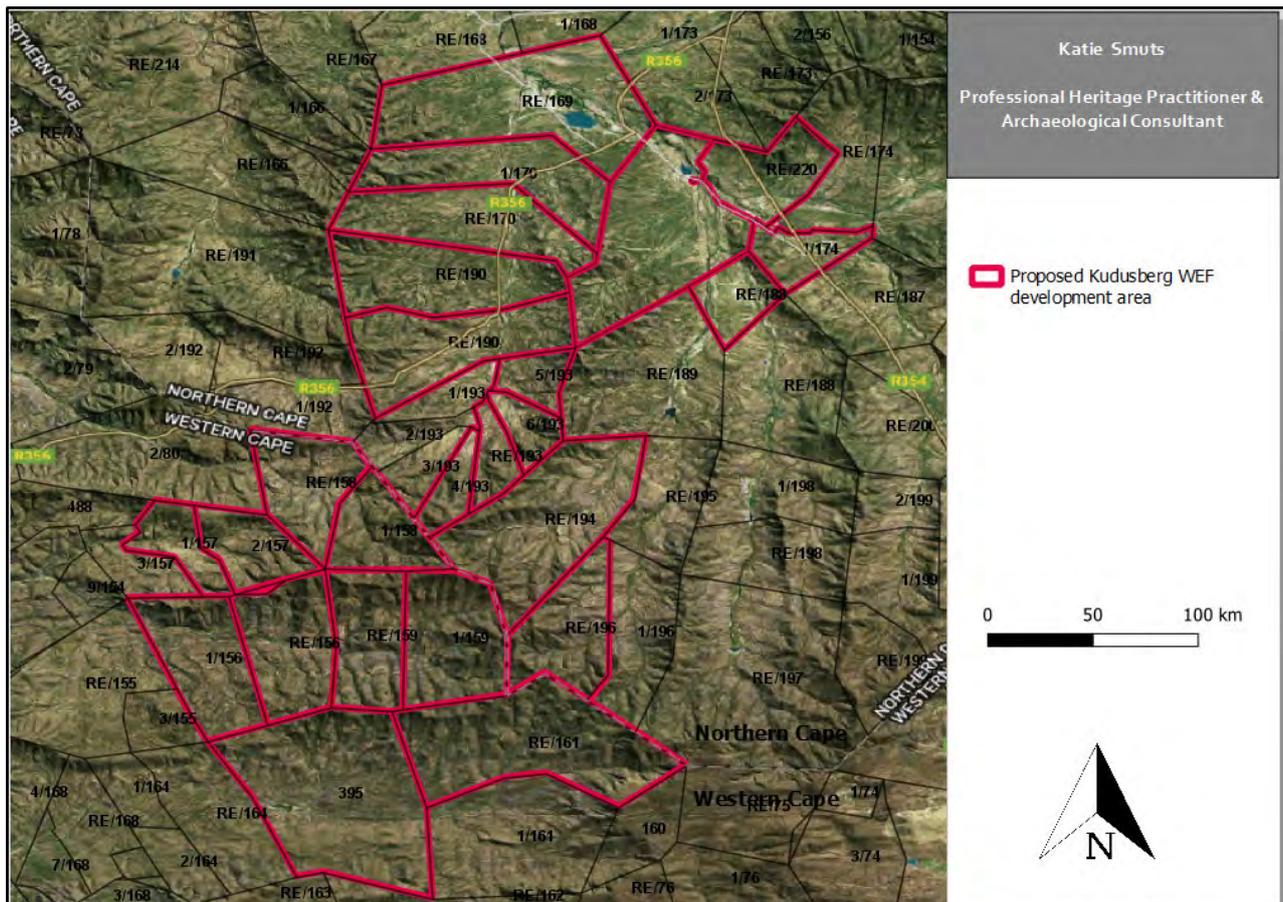
Properties affected by public access road:

- 169 Zeekoegat Farm;
- Portion 1 of 170 Roodeheuvel Farm;
- Remainder of 170 Roodeheuvel Farm;
- Remainder of 190 Wind Heuvel Farm;
- Portion 1 of 190 Wind Heuvel Farm;
- Portion 5 of 193 Urias Gat Farm;
- Remainder of 171 VinkeKuיל Farm;
- Alkant Re/220 Farm; and
- Portion 1 of 174 Lange Huis Farm.

The central GPS co-ordinates for the proposed development are:

-32.8769836382S; 20.3214413375E

Locality Plan



Locality Plan showing proposed Kudusberg WEF development area and affected farm portions (farm boundaries indicated in red).

Description of Proposed Development

The proposed Kudusberg WEF will have an energy generation capacity (at 132 kV point of utility connection) of up to 325 megawatt (MW), and will include the following:

- Up to 56 wind turbines, each between 3MW and 6.5MW in nameplate capacity with a foundation of up to 30m in diameter and up to 5m in depth.
- The hub height of each turbine will be up to 140m and its rotor diameter up to 180m.
- Permanent compacted hardstanding laydown/crane pad areas for each wind turbine of 90mx50m (total footprint for 56 turbines = 25.2ha) during construction and for ongoing maintenance purposes for the lifetime of the turbines.
- Electrical transformers (690V/33kV) adjacent to each turbine (2m x 2m, up to 10m x 10m) to step up the voltage to 33kV.

- Underground 33kV cabling between turbines buried along access roads, where feasible, with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the onsite 33/132kV substation.
- Internal access roads up to 12m wide, including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 82.44ha. Where possible, existing roads will be upgraded. Turns will have a radius of up to 50m for abnormal loads to access the various turbine positions.
- One 33/132kV onsite substation. The 33kV footprint will be assessed in this wind farm basic assessment. The current applicant will remain in control of the low voltage components of the 33/132kV substation, whereas the high voltage components of this substation will likely be ceded to Eskom shortly after the completion of construction. The total footprint of this onsite substation will be approximately 2.25 ha.
- Up to 4 x 140m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Temporary infrastructure including a construction camp (~12.6ha) including an on-site concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase.
- Fencing will be limited around the construction camp and batching plant. The entire facility would not be fenced off. The height of fences around the construction camp is anticipated to be up to 4m.
- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks. The necessary approvals from the DWS will be applied for separately.

The proposed development site is located entirely within the Renewable Energy Development Zone 2 (REDZ 2) known as Komsberg, published in terms of Section 24(3) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998)

in Government Notice (GN) R. 114 of 16 February 2018. Considering this, a Basic Assessment (BA) Process as contemplated in terms of regulation 19 and 20 of the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended), is required for the authorisation of this large scale WEF.

Heritage Resources Identified

The geology of the area comprises the Abrahamskraal Formations of the Lower Beaufort Group. The Abrahamskraal Formation is of very high fossil sensitivity, with local occurrences of significant tetrapod burrows and dispersed teeth and bones, as well as plant debris and trace fossils.

Heritage resources identified on site included archaeological and built environment features (Figures 5.1 and 5.2.1-5.2.5). Archaeological resources included scattered, isolated Middle and Later Stone Age artefacts, although these were very infrequent. A single cave with finger painted rock art, Later Stone Age artefactual material and a single sherd of indigenous pot was also identified. Several stone-built kraals, either rounded or rectilinear in shape, and dry stacked or mortared, were recorded and are likely of historic age, although some could be pre-colonial. Ruined dwellings and other disused farm buildings that are all likely over 100 years old were also recorded, usually in association with one or more kraals. Built environment features included farmsteads and associated outbuildings at several farms. A single, fenced grave with marble headstone was recorded (KDB057), as well as a likely child's grave (KDB064) and a further graveyard containing about 12 graves with hand carved sandstone headstones and stone covered graves (KDB081). Likely burials included an informal graveyard containing over ten stone cairns (KDB072 – KDB076, comprising site complex KDBc11). The cultural landscape of the region comprises the largely undeveloped ridges and slopes, as well as the cumulative evidence for hundreds of years of continuous patterns of transhumant pastoralism that has left, at most, ephemeral traces on the landscape.

Almost all features were found along valley bottoms or on open plains near watercourses, with no significant heritage resources of any kind identified at higher elevations.

Anticipated Impacts on Heritage Resources

Any excavations into bedrock of the Abrahamskraal Formation is, **highly likely** to impact any fossils present. Given that the prevalence of fossils in these deposits in this area is rare, however, impacts to significant palaeontological remains are expected to be **very low**.

With the ridges devoid of artefactual material of any kind, impacts are likely only to occur at sites at lower elevations, where most of the infrastructure is NOT proposed. These impacts will arise from the widening of existing roads, the creation of new access roads, and the development of construction camps and the onsite substation. Impacts could be direct or indirect and include damage, destruction and degradation of sites, as well as loss of sense of place resulting in diminished significance of heritage resources.

The anticipated direct impacts of the turbines themselves on heritage resources are expected to be **low**. The originally proposed alignment of Access Alternative 1 would have resulted in impacts to sites including one stone cairn (KDB058), a U-shaped stone-built structure, several kraal structures and a three-roomed stone-built structure (KDBc7), and further kraals and a stone and mudbrick-built structure (KDBc8). Similarly, Common Access Road 1 would have bisected Wind Heuvel farmstead (KDB059), and passed directly adjacent to the graveyard located there (KDB081). Impacts to these sites would have been **high to very high**. The applicant has subsequently amended these layouts, reducing likely impacts to **low or insignificant**. Construction Camp Alternative 3 is proposed for construction on the site of the informal graveyard (KDBc6), posing a **very high** threat of impact to those sites. A **moderate**, indirect threat is posed to the stone-built features in the landscape, and a **low** threat to the rock art cave (KDB045); this threat is derived from the increase of people in the landscape who could accidentally or intentionally damage or destroy features. Further indirect impacts are likely to the context of the region by the nature of the proposed development which will detract from the sense of place and degrade the cultural landscape. Impacts to the cultural landscape are expected to be **very high** and are generally impossible to mitigate without avoidance of sensitive areas by infrastructure. Sensitive placement of turbines and infrastructure, along with observation of appropriate buffers can, however, be

expected to reduce these impacts to cultural landscapes and sense of place from **high to moderate**.

Recommendations

In summary, recommendations are as follow:

- **Substation Alternative 1** is the **recommended** substation alternative, although Substation Alternatives 2 and 3 are not considered to be a no-go option;
- **Construction Camp 2** is the **recommended** construction camp alternative, although Construction Camp 1 is likely to be an acceptable alternative. **Construction Camp 3 should be considered a no-go option;**
- The realignment of **Access Road Alternative 1** renders it an **acceptable** choice, while Access Road Alternative 2 is likely to be an acceptable alternative. The proposed alignment for Access Road Alternative 2 should be subjected to a walkdown by an archaeologist prior to commencement of development to identify any areas or sites that require protection or mitigation, should it be selected;
- **Common Access Road 1** has been realigned to the east to avoid Wind Heuvel farmstead and is considered an **acceptable** route. The road should not be widened or altered at this point and a proper fence should be erected around the Stadler graveyard (KDB081);
- The following buffers should be observed around identified heritage resources:
 - Graves: no development should be permitted within 50m of identified graves and cemeteries; existing roads within this buffer should not be altered or widened;
 - Cave site (KDB045): construction staff should not be permitted within 200m of the site;
 - Farmsteads: no turbines should be located within 500m of farmsteads;
 - Kraals, stone walling and ruins > 100 years: construction staff should not be permitted within 100m of these sites and no development should occur within 15m of these sites; and
 - Archaeological finds: no buffers are recommended for the isolated artefacts identified in this survey.
- All site crew should be informed of the heritage significance of the resources in the study area, and those sites near development infrastructure, or easily reached (Table 2) should be inspected by the ECO during the construction

phase to ensure they are being respected;

- The alignment of the proposed road over the ridge saddle south of Pad se Hoek close to turbines 25 (-32.870067, 20.376674) and 26 (-32.868236, 20.381335) should be subject to an archaeological walkdown prior to construction;
- The R356 should be put forward for recognition as a scenic route to afford its scenic qualities and historic significance some measure of protection going forward;
- New construction work, construction camps, substations or access roads should not impact negatively or threaten any of the historic built form, which is part of the history and land use evolution of the cultural landscape by observing appropriate buffers around these features;
- If supported in consultation with local inhabitants (of permanent or seasonal habitation, owners or labourers), the negative impact of non-local inhabitants on cultural lifeways and language, employees associated with the new WEF should be reduced by housing the employees away from the CLAs;
- Impact of the proposed WEF on local inhabitants (of permanent and seasonal habitation, owners and labourers) should be monitored by the Holder of the Environmental Authorisation through a grievance mechanism described in the EMP. Such a grievance mechanism should take into account economic and social inequality and be made accessible and known to all inhabitants of the CLAs, not just the land owners. Such a grievance mechanism should be in place for the duration of the development process through to the end of the decommissioning phase;
- The Chance Fossil Finds Protocol (See Appendix 2.2) should be implemented in the event of the discovery of significant new fossils during the construction phase;
- Monitoring of all major surface clearance and deeper (> 1m) excavations for fossil material (bones, teeth, petrified wood, etc.) by the ECO on an on-going basis during the construction phase. Significant fossil finds to be reported to Heritage Western Cape (HWC) (Western Cape sites) or the South African Heritage Resources Agency (SAHRA) (Northern Cape sites) for recording and sampling by a professional palaeontologist;

- If any archaeological material or human burials are uncovered during the course of development, then work in the immediate area should be halted at once. The find should be reported to the heritage authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.

It is not anticipated that the proposed development will have significant impacts to heritage resources, beyond those to the cultural landscape, given that they are generally of low heritage significance. It is therefore recommended that the project be authorised, subject to implementation of the above recommendations. These recommendations should be included in the Environmental Management Programme (EMPr) and the Environmental Authorisation (EA).

Author/s and Date:

29/10/2018

Katie Smuts – Main author

Emmylou Rabe Bailey – Cultural landscapes content

John Almond – Palaeontological Impact Assessment

Madelon Tusenius – Content contributor

SPECIALIST EXPERTISE

Katie Smuts holds an MPhil from UCT in Archaeology (History and Archaeology of the Western Cape; 2012), having specialised in archaeological analysis of historic built fabric and forms. Prior to that, her BA (Hons), obtained from UCT with distinction in 1999, was focused on analysis of depictions of human figures in the rock art of the Western Cape.

Katie has worked both as a commercial archaeologist and as a Heritage Officer for the national Heritage Agency, SAHRA, and later Manager of the National Inventory there, where she was responsible for the maintenance of the country's online heritage management platform and heritage resource database, SAHRIS (the South African Heritage Resources Information System). Katie currently works as a freelance heritage practitioner and archaeological consultant, drafting Heritage Impact Assessments, Archaeological Impact Assessments, Heritage Inventories, heritage scoping reports and heritage components for Strategic Environmental Assessments, Environmental Management Frameworks and similar planning initiatives.

EMPLOYMENT HISTORY

Period	Position	Employer
October 2017-Present	Archaeological Consultant & Heritage Practitioner	Self Employed
February 2017-September 2017	Heritage Specialist	CTS Heritage
October 2013-December 2016	Manager of the National Inventory	SAHRA
May 2012-September 2013	Heritage Officer, APM Unit	SAHRA
March 2009-May 2012	Archaeological Consultant	Self Employed
August 2006-September 2006	Section Manager: Butrint World Heritage Site	Institute of World Archaeology
February 2006-February 2009	Part-time contract archaeologist	ACO
October 2004-January 2006	Contract archaeologist	Various, UK
June 2003-March 2004	Part-time contract archaeologist	ACO
January 2000-December 2000	Co-Director	Clanwilliam Living Landscapes Project
January 1999-May 2000	Tutor and lecturer	Archaeology Department, UCT

QUALIFICATIONS

2012:	MPhil (Archaeology), UCT
09/10-11/10:	Architecture & Urban Conservation II: Skills Development (UCT)
04/10-06/10:	Architectural & Urban Conservation I: Theory & Development (UCT)
1999:	B.A. Honours Distinction (Historical Studies of Western Cape), UCT
1998:	B.A. 1st Class (Archaeology, Classics), UCT

AFFILIATIONS

2018-present:	Chair of Stanford Heritage Committee (SHC)
2017-present:	Vice-chair of Overstrand Heritage and Aesthetics Committee (OHAC)
2017-present:	Co-chair of Association of Southern African Professional Archaeologists (ASAPA) Cultural Resource Management (CRM) Committee
2015-present:	Member of Association of Professional Heritage Practitioners (APHP)
2015-present:	Treasurer of Heritage Association of Southern Africa (HASA)
2013-present:	Member of the South African Museums Association (SAMA)
2008-present:	ASAPA CRM accreditation in Rock Art, Coastal Shell Middens, Stone Age Archaeology and Grave Relocation

RELEVANT PROJECT EXPERIENCE

- Compilation of Heritage Impact Assessments, Archaeological Impact Assessments and Heritage Scoping Reports for:
 - Renewable energy applications
 - Mixed use developments
 - Mining applications and borrow pits
 - Roadworks
 - Infrastructural developments
- Compilation of Notifications of Intent to Develop in terms of Section 38 applications in the Western Cape
- Compilation of permit applications in terms of Sections 27, 34 and 35
- Heritage components of Environmental Management Frameworks
- Heritage surveys for inventory purposes
- Archaeological and heritage research projects

SPECIALIST DECLARATION

I, Katie Smuts, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- 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 have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: _____  _____

Name of Specialist: Katie Smuts

Date: 27/08/2018

LIST OF ABBREVIATIONS

AIA	Archaeological Impact Assessment
BA	Basic Assessment
BAR	Basic Assessment Report
CFB	Cape Fold Belt
CLA	Cultural Landscape Area
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
IKS	Indigenous Knowledge Systems
LSA	Later Stone Age
Ma	Million Years Ago
M A.S.L.	Metres Above Sea Level
MSA	Middle Stone Age
MW	Mega Watts
NEMA	National Environmental Management Act
NCW	Not Conservation Worthy
NHRA	National Heritage Resources Act
OES	Ostrich Eggshell
PHRA	Provincial Heritage Resources Authority
PPP	Public Participation Process
REDZ	Renewable Energy Development Zone
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SEA	Strategic Environmental Assessment
VIA	Visual Impact Assessment
WEF	Wind Energy Facility

GLOSSARY

Definitions	
<i>Asbos</i>	Local bush which is dried and used to build <i>skerms</i>
<i>Early Stone Age</i>	Stone Age period approximately 1.5 million years ago - 250 000 years ago
<i>Kookskerm</i>	Shelter built from dried bushes to provide protection from the wind for cooking activities
<i>Kommando</i>	Boer militia units
<i>Kraal</i>	Livestock enclosure common throughout the area.
<i>Krans</i>	Cliff
<i>Later Stone Age</i>	Stone Age period approximately last 30 000 years
<i>Legplaats</i>	Stock post
<i>Matjieshuis</i>	Mat or reed house
<i>Middle Stone Age</i>	Stone Age period approximately 250 000 - 30 000 years
<i>Skerm</i>	Circular enclosures constructed out of dried bushes
<i>Trekboer</i>	Semi-nomadic subsistence farmers who moved out of the Cape Colony
<i>Werf</i>	Farmyard

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain-	Pp ix-x
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;	
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	P xi
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 3.1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 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 5
g) an identification of any areas to be avoided, including buffers;	Section 5.5
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 5.6
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3.2
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;	Section 5.4, 5.7,8.1, 8.2
k) any mitigation measures for inclusion in the EMPr;	Section 8.2
l) any conditions for inclusion in the environmental authorisation;	Section 8.2
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8.2
n) a reasoned opinion-	Section 8
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;	
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 3.1, 9
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 9
q) any other information requested by the competent authority.	Appendices 1-4
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.	N/A

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1 BACKGROUND TO DEVELOPMENT PROPOSAL

Kudusberg wind farm (Pty) Ltd (hereafter “Kudusberg”) is proposing to develop the 325 MW Kudusberg Wind Energy Facility (WEF) at Kudusberg between Sutherland and Matjiesfontein in the Northern Cape and Western Cape Provinces. Katie Smuts was appointed to undertake the Heritage Impact Assessment for the proposed Kudusberg WEF to inform the Basic Assessment (BA) undertaken on the proposed project (Figures 1.1-1.3, 2 and 3).

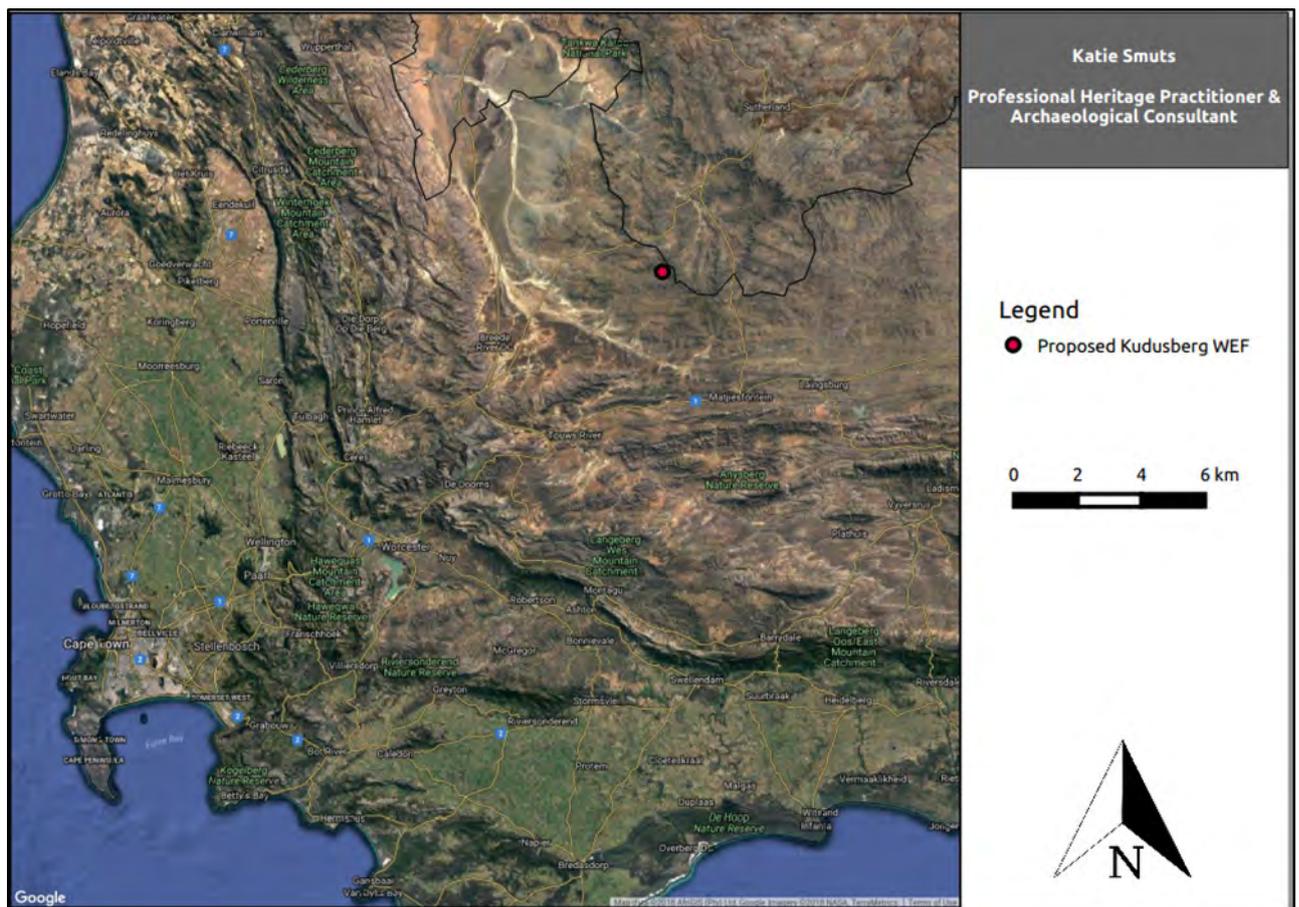


Figure 1.1 Locality map of the proposed Kudusberg WEF

The proposed Kudusberg WEF will have an energy generation capacity (at 132kV point of utility connection) of up to 325 megawatt (MW), and will include the following:

- Up to 56 wind turbines, each between 3MW and 6.5MW in nameplate capacity with a foundation of up to 30m in diameter and up to 5m in depth.
- Hub height of each turbine will be up to 140m and its rotor diameter up to 180m.
- Permanent compacted hardstanding laydown areas (also known as crane

pads) for each wind turbine of 90mx50m (total footprint for 56 turbines = 25.2ha) during construction and for ongoing maintenance purposes for the lifetime of the turbines.

- Electrical transformers (690V/33kV) adjacent to each turbine (typical footprint of 2m x 2m but can be up to 10m x 10m at certain locations) to step up the voltage to 33kV.
- Underground 33kV cabling between turbines buried along access roads, where feasible, with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the onsite 33/132kV substation.
- Internal access roads up to 12m wide, including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 82.44ha. Where possible, existing roads will be upgraded. Turns will have a radius of up to 50m for abnormal loads (especially turbine blades) to access the various turbine positions.
- One 33/132kV onsite substation. The 33kV footprint will need to be assessed in this wind farm basic assessment and the 132kV footprint in a separate basic assessment process as the current applicant will remain in control of the low voltage components of the 33/132kV substation, whereas the high voltage components of this substation will likely be ceded to Eskom shortly after the completion of construction. The total footprint of this onsite substation will be approximately 2.25 ha.
- Up to 4 x 140m tall (depending on the final hub height) wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Temporary infrastructure including a construction camp (~12.6ha) which includes an on-site concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase.
- Fencing will be limited around the construction camp, batching plant and substation. The entire facility would not be fenced off. The height of fences around the construction camp is anticipated to be up to 4m.
- Temporary infrastructure to obtain water from available local sources/ new or

existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks. The necessary approvals from the Department of Water and Sanitation (DWS) will be applied for separately.

The proposed facility is located entirely within the Komsberg Renewable Energy Development Zone (REDZ), one of the eight REDZ formally gazetted in South Africa for the purpose of development of solar and wind energy generation facilities (Figure 3). In line with the gazetted process for projects located within REDZ, the Kudusberg WEF is subject to a Basic Assessment (BA) process instead of a full Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) as amended, EIA Regulations 2014 (as amended in 2017).

2 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Kudusberg WEF is proposed for an area straddling the border of the Western and Northern Cape Provinces to the west of the R345 that runs between Sutherland and Matjiesfontein (Figures 1.1-1.3, and 2). The project falls within the Witzenburg Local Municipality, Cape Winelands District in the Western Cape, and the Karoo Hooglands Local Municipality, Namakwa District in the Northern Cape. The central GPS co-ordinates for the proposed development are: -32.8769836382S; 20.3214413375E.

The affected farm portions are:

Western Cape:

- Portion 1 of 156 Gats Rivier Farm;
- Portion 2 of 156 Gats Rivier Farm;
- Remainder of 156 Gats Rivier Farm;
- Portion 1 of 157 Riet Fontein Farm.
- Portion 1 of 158 Amandelboom Farm;

- Remainder of 158 Amandelboom Farm;
- Portion 1 of 159 Oliviers Berg Farm;
- Remainder of 159 Oliviers Berg Farm;
- Portion 2 of 157 Riet Fontein Farm;
- Remainder of 161 Muishond Rivier Farm; and
- Remainder of 395 Klipbanks Fontein Farm.

Northern Cape:

- Portion 4 of 193 Urias Gat Farm;
- Portion 6 of 193 Urias Gat Farm;
- Remainder of 193 Urias Gat Farm;
- Remainder of 194 Matjes Fontein Farm; and
- Remainder of 196 Karree Kloof Farm.

Properties affected by public access road:

- 169 Zeekoegat Farm;
- Portion 1 of 170 Roodeheuvel Farm;
- Remainder of 170 Roodeheuvel Farm;
- Remainder of 190 Wind Heuvel Farm;
- Portion 1 of 190 Wind Heuvel Farm;
- Portion 5 of 193 Urias Gat Farm;
- Remainder of 171 VinkeKuil Farm;
- Alkant Re/220 Farm; and
- Portion 1 of 174 Lange Huis Farm.

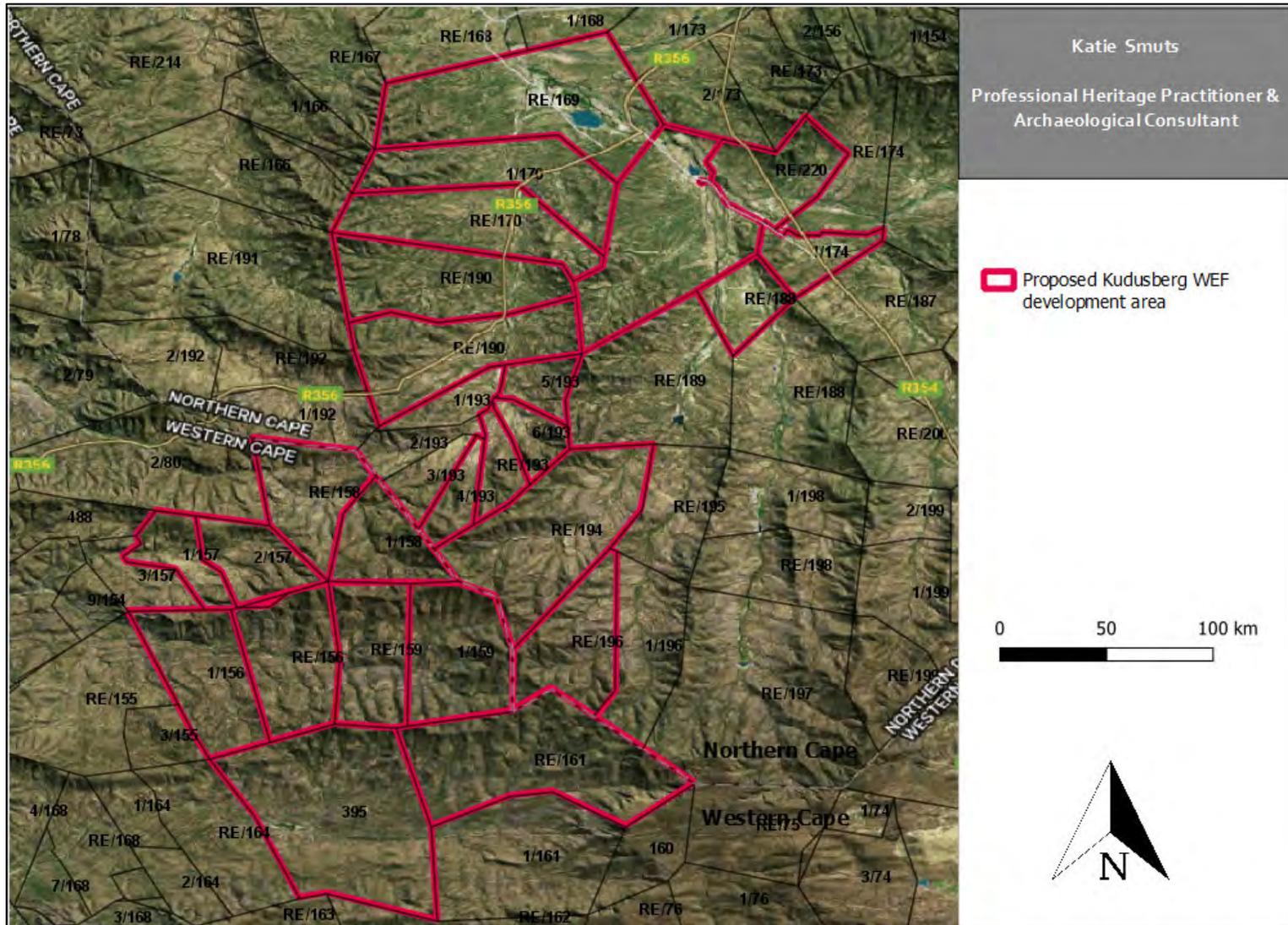


Figure 1.2. Proposed layout of Kudusberg WEF showing farm boundaries and Western and Northern Cape portions.

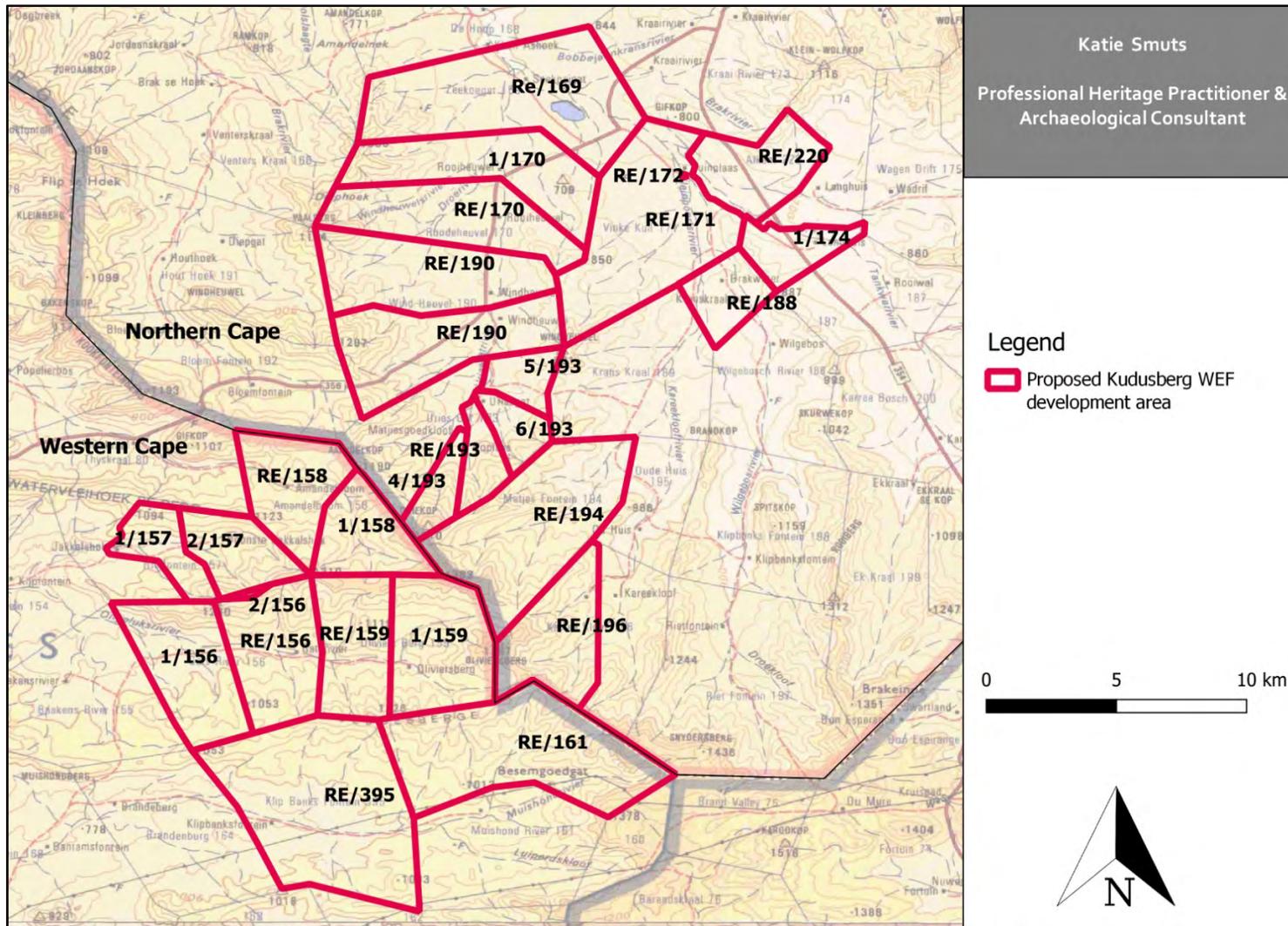


Figure 1.3. Topographical map showing proposed layout of Kudusberg WEF. (1:250k map 3220 Sutherland, courtesy of the Office of the Chief Surveyor General)

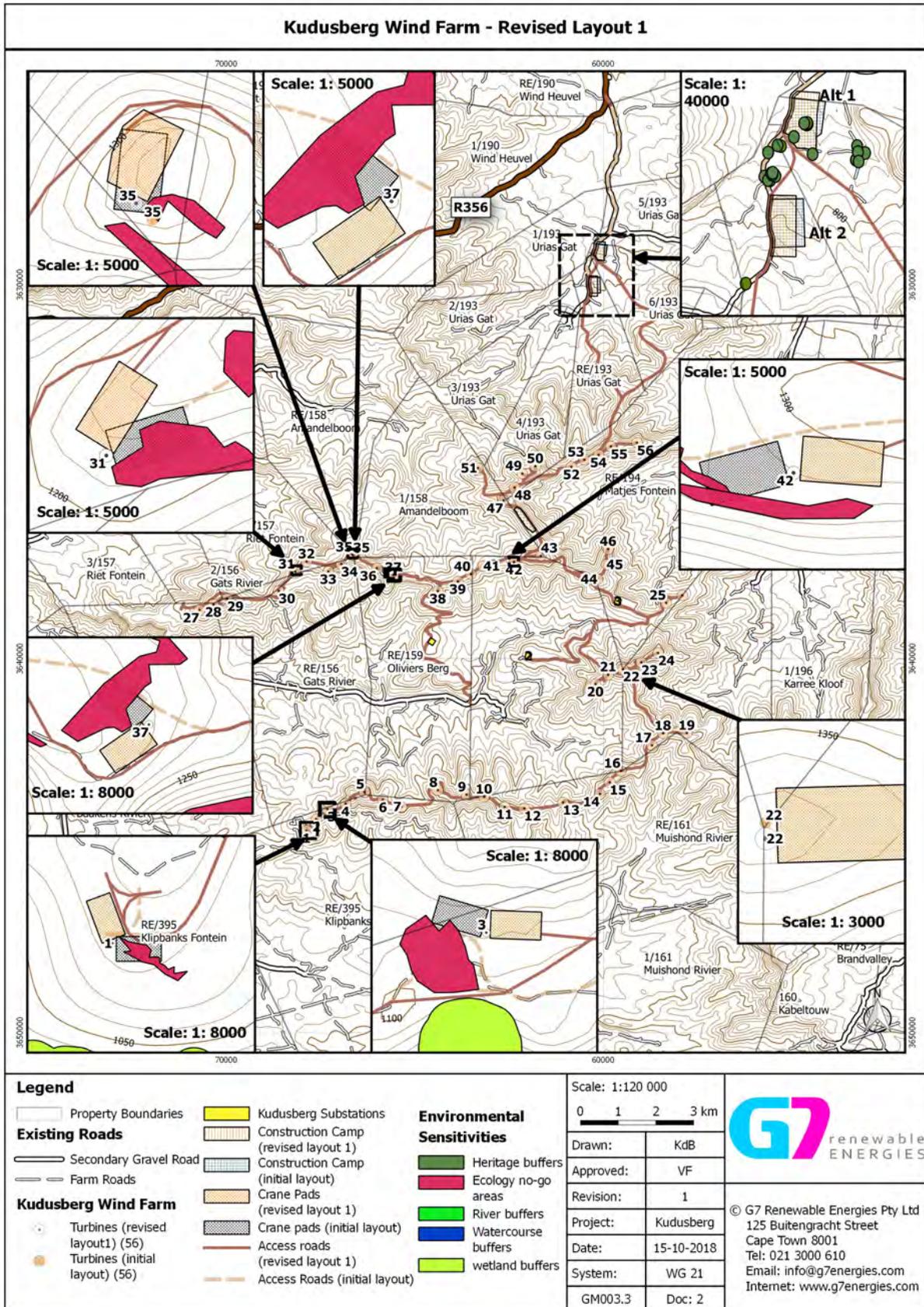


Figure 2. Overview of proposed infrastructure layout

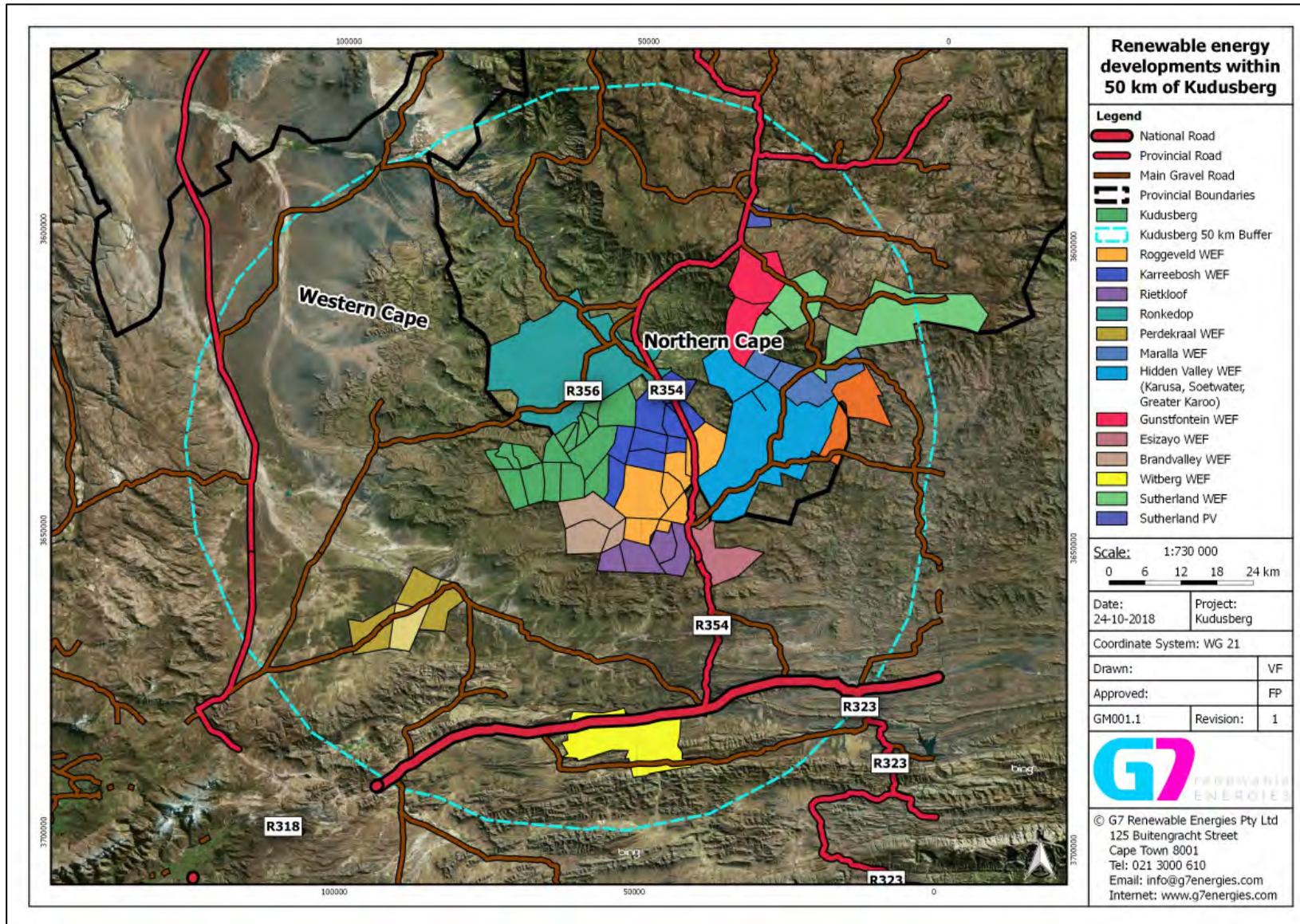


Figure 3. Cumulative WEFs proposed for the Komsberg REDZ relative to Kudusberg

The proposed development area is located towards the southwest of the main Karoo region, with the centre of the study area some 11km south of the R356 and 22km west of the R354, the Sutherland-Matjiesfontein road. The area is on the border of the summer and winter rainfall regions and receives some snow and precipitation in winter as well as summer thunderstorms, although precipitation is limited, and the region is semi-arid. The vegetation is characteristic of the Succulent Karoo biome in the low-lying areas and the Karoo Renosterveld Fynbos in the high-lying portions (Mucina and Rutherford 2006). The development area lies within the foothills of the Great Escarpment, and is characterised by valleys located between long ridges, and flat plains surrounded by hills and mountains. The ridges are largely undeveloped, while the valleys and plains contain several farmsteads comprising varying numbers of buildings. There are local roads and tracks servicing the area, some of which lead up to the hilltops, with recently created tracks servicing the wind masts scattered across peaks in the region. Together with farm infrastructure such as wire fenced stock camps and farm boundaries, wind pumps and reservoirs, these are the predominant features in an otherwise undeveloped, natural environment.

Several of the affected farms are no longer engaged in active agriculture, have changed ownership in recent times and are held by absentee landlords. Many of the farms are now relying solely on tourist accommodation for income, and high levels of wildlife predation is making sheep farming unsustainable.

3 DESCRIPTION OF METHODOLOGY

This study was commissioned as part of a Basic Assessment process as the development is located within the Komsberg REDZ. The site visit was conducted from 17-20 July 2018, with between 30- and 35-hours' survey conducted within this period; the palaeontologist and assistant returned to the field from 4-6 August 2018. The survey team consisted of two archaeologists, a palaeontologist and an assistant. Survey was conducted in a 4x4 vehicle as well as on foot, with existing roads and farm tracks utilised for vehicular access. Heritage resources identified in the field were recorded, mapped and photographed where appropriate. Tracks and waypoints were recorded on a handheld GPS device (Garmin Etrex) and photographs were taken with a digital camera. 1:50k and 1:250k maps were obtained from the

Directorate for Surveys and Mapping for use in the field. Maps and overlays were created for the report using Google Earth Imagery and QGIS Software.

The specialists employed a sampling strategy that aimed to characterise areas of proposed development, as it was not feasible to survey the entire development footprint. As a result, a sample of turbine footprints were assessed, all three substation alternatives, two of the three construction camp alternatives and some of the road alignments, representing a sample of ridges, slopes, valleys and plains. Vegetation was relatively sparse, making visibility good, although dense riparian vegetation dominated by thorn and karee trees along the river banks hampered visibility. The season did not affect visibility or the success of the survey.

A Palaeontological Desktop Report and Palaeontological Impact Assessment (PIA; Almond 2018; Appendix 2.1) were compiled in addition to the Archaeological Impact Assessment (AIA; Smuts 2018; Appendix 3). These together with a cultural landscape assessment study (Rabe Bailey 2018; Appendix 4) have been integrated into this HIA.

Background research for the AIA and cultural landscapes assessment was conducted by reviewing Heritage Impact Assessments conducted in the immediate surroundings. These reports are freely accessible on the South African Heritage Resources Information System (SAHRIS) and covered work done in the area between 2010 and 2017. This information is, therefore, recent and up to date. While some reports are more comprehensive than others, all were found to be of very high quality. These desktop-based assessments also included review of relevant academic articles and literature, historic and current maps, the REDZ Strategic Environmental Assessment (SEA) reports (DEA, 2015) and relevant international best practices.

The cultural landscapes assessment utilised a Landscape Character Assessment according to landuse, habitation and natural features to assist in an understanding of the various landscape areas and potential development impact (Swanwick, 2002).

The PIA was informed by the outcomes of the desktop-based assessment that preceded the field survey. The desktop-based report was informed by a review of existing PIAs and academic literature, as well as the relevant geological maps and satellite images. This review allows the palaeontologist to assess the likely fossil sensitivity of each rock unit within the development area. The likely impacts of the proposed development on local fossil heritage are then determined based on (1) the palaeontological sensitivity of the rock units concerned and (2) the nature and scale of the development itself, most significantly the extent of fresh bedrock excavation envisaged. The field assessment serves to identify any palaeontological hotspots and make specific recommendations for mitigation or monitoring required before or during construction.

Public consultation will be undertaken as part of the BA process, and in accordance with Heritage Western Cape's regulations pertaining to Public Participation Processes for heritage, and the results of that will be incorporated into the final Heritage Impact Assessment (HIA).

3.1 Scope of Work

This HIA considers the potential impacts of the proposed construction of a wind energy facility on several properties in the Komsberg REDZ located on the border of the Western and Northern Cape provinces.

The Terms of Reference for the HIA is the following:

General ToR:

- A key task for the specialists is to review the existing sensitivity mapping from the SEA for the project area and provide an updated sensitivity map for the Kudusberg WEF project site.
- Adhere to the requirements of specialist studies in terms of Appendix 6 of the NEMA EIA Regulations (2014), as amended.
- Identify and assess the potential impacts of the proposed Kudusberg WEF project and its associated infrastructure by assessing the impacts during the construction, operational and decommissioning phases.

- Identify and assess cumulative impacts from other Wind and Solar PV projects located within a 50 km radius from the Kudusberg WEF that already have received Environmental Authorisation (EA), are preferred bidders and/or may still be identified as having received a positive Environmental Authorisation at the start of this BA process.
- Propose mitigation measures to address possible negative effects and to enhance positive impacts to increase the benefits derived from the project.
- Use the Impact Assessment Methodology as provided by the CSIR.
- Assess the project alternatives and the no-go alternative.
- Provide a recommendation as to whether the project must receive Environmental Authorisation or not and identify any aspects which are conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation.

Specific ToR:

Heritage, Archaeology, Palaeontology and Cultural Landscape

- Describe and map the heritage features of the site and surrounding area. This is to be based on desk-top reviews, fieldwork, available databases, findings of the Wind and Solar SEA (CSIR, 2015) and findings from other heritage studies in the area, where relevant. Include reference to the grade of heritage feature and any heritage status the feature may have been awarded.
- Assess the impacts and provide mitigation measures to include in the environmental management plan
- Map heritage sensitivity for the site. Clearly show any “no-go” areas in terms of heritage (i.e. “very high” sensitivity), and provide recommended buffers or set-back distances.
- Identify and assess potential impacts from the project on the full scope of heritage features, including archaeology, palaeontology and the cultural-historical landscape, as required by heritage legislation. Liaise with the relevant authority in order to obtain a final comment in terms of section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), including Regulations issued

- Thereunder, as necessary. It is critical that the report follows the specific format required by the HWC.
- Load the relevant documents on the South African Heritage Resources Information System (SAHRIS).

3.2 Restrictions and limitations

- The vast area and hilly terrain, as well as the expansive layout of the proposed development meant that exhaustive survey was not possible.
- Areas between spot checks conducted from the vehicle were not surveyed and could contain heritage resources, however this risk is mitigated by the requirement to undertake a final site walkthrough prior to the finalisation of the layout before construction commences;
- Farm roads were in variable condition, which made progress across the study area slow and limited the time available for foot survey;
- The survey can only account for artefacts and archaeological features visible on the ground, and sub-surface heritage that could be present could not be verified;
- Limited previous research has been undertaken in the area in terms of cultural landscape assessment;
- No stakeholder participation was conducted to determine intangible heritage resources for the purposes of the cultural landscape assessment. Stakeholder engagement will be done as part of the BA process.
- Limitations specific to the PIA include:
 - The inadequate database for fossil heritage for SA;
 - Variable accuracy of geological maps used for desktop studies;
 - Inadequate sheet explanations for geological maps for palaeontological purposes;
 - Extensive relevant palaeontological “grey literature” that is not readily available for PIAs; and
 - Absence of a comprehensive database of fossil collections for comparative impact study.

3.3 Gradings

The grading of sites is stipulated in Section 7 of the National Heritage Resources Act (Act 25 of 1999) (NHRA) in order that the appropriate level of management can be accorded to sites. The South African Heritage Resources Agency (SAHRA) is the managing authority for all Grade I national sites, the Provincial Heritage Resources Agencies (PHRAs) are the managing authorities for all Grade II or provincial sites, while Grade III or local sites are intended for management by the local authorities.

Significant to this project, which straddles the Western and Northern Cape, is the different grading systems implemented by HWC (2016a) and SAHRA (2007). In order to regulate grading in the Western Cape, HWC has proposed a model that divides sites of local significance that is Grade III sites, into:

- Grades IIIa – high local significance;
- Grade IIIb – medium local significance;
- Grade IIIc – low local significance; and
- Not Conservation Worthy (NCW) – little to no significance and not requiring mitigation.

In the absence of a fully competent PHRA in the Northern Cape, SAHRA's grading system should be employed there; SAHRA the term field rating to describe gradings assigned as part of Section 38 processes, while grading is reserved for official significance as designated by authorities. This system grades locally important sites as follows:

- Field Rating/Grade IIIa - high local significance that should be preserved in their entirety;
- Field Rating/Grade IIIb – medium local significance that can be mitigated and preserved in part;
- Field Rating/Grade IIIc sites are recorded as:
 - Field Rating/Grade IVa – high or medium significance requiring mitigation;
 - Field Rating/Grade IVb – medium significance requiring recording; and
 - Field Rating/Grade IVc – low significance not requiring mitigation

For the purposes of this report, sites within the Western Cape have been graded in

terms of the HWC system, while those in the Northern Cape have been graded according to the SAHRA system. As the SAHRA system is only intended for application to archaeological heritage, not built environment, for the purposes of this report, the HWC system (Grades IIIa, IIIb and IIIc) have been retained for built environment (i.e. buildings, not including stone walling and structures – these terms are used to indicate archaeological built forms) in the Northern Cape.

3.4 Legislation and Cultural Landscapes

The identification and evaluation of cultural landscapes for this BAR has been conducted according to the NHRA. The relevant sections of the NHRA are included here to emphasise the detail and definitions on what qualifies as cultural landscapes, intangible heritage and living heritage. These resources and their investigation have not been adequately assessed in HIAs of the Komsberg area and surrounds as they require more time and research than is usually allocated in the EIA assessment process.

3.4.1 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. The identification of resources was undertaken in accordance with Section 3(2) of the act which specifies the following types of heritage resources included in the national estate:

- a) places, buildings, structures and equipment of cultural significance;
- b) places to which oral traditions are attached or which are associated with living heritage;
- c) historical settlements and townscapes;
- d) landscapes and natural features of cultural significance;
- e) geological sites of scientific or cultural importance;
- f) archaeological and palaeontological sites;
- g) graves and burial grounds, including:
 - i. ancestral graves;
 - ii. royal graves and graves of traditional leaders;

- iii. graves of victims of conflict;
 - iv. graves of individuals designated by the Minister by notice in the Government Gazette;
 - v. historical graves and cemeteries; and
 - vi. other human remains which are not covered in terms of the Human Tissue Act (No. 65 of 1983);
- h) sites of significance relating to the history of slavery in South Africa; and
- i) movable objects¹ (these resources are excluded from this study as by definition these objects are not spatially fixed).

3.4.2 Scenic Routes

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.

3.4.3 World Heritage Convention

The UNESCO Operational Guidelines for the World Heritage Convention (2017) define Cultural Landscapes as:

- Cultural properties and 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.

According to the above UNESCO Guidelines, Cultural Landscapes are considered a separate category from Historic Towns and Heritage Routes.

4 BACKGROUND TO AND CONTEXT OF HERITAGE COMPONENTS

The creation of the Komsberg REDZ, and the ensuing applications for WEFs in this area (Fourie et. al. 2015) has resulted in several HIAs having been compiled for the region since 2010. All these reports have addressed the region's archaeological and palaeontological heritage, and most have assessed the rural cultural landscape as well. Little research work, which is generally more thorough and comprehensive, has been done, however, so that while we have a broad understanding of the heritage character of the region, more specific conclusions cannot be derived.

4.1 Palaeontological Background

The geology of the Kudusberg WEF study area is outlined on the 1: 250 000 geology sheet 3220 Sutherland (Council for Geoscience, Pretoria; Theron 1983, Cole & Vorster 1999). Geologically, the study area lies on the gently folded northern margin of the Permo-Triassic Cape Fold Belt (CFB). The only major sedimentary rock unit represented within the study area on 1: 250 000 scale geological maps is the Abrahamskraal Formation, which forms the basal subunit of the Lower Beaufort Group (Karoo Supergroup) succession of the Main Karoo Basin of South Africa (Johnson et al. 2006). The continental (fluvial and lacustrine) mudrocks and sandstones forming the lowermost portion of the very thick Abrahamskraal Formation (Lower Beaufort Group) are of Middle Permian age, approximately 265-270 million years old (Ma). The Formation is of high fossil sensitivity. Underlying basinal, prodeltaic and deltaic sediments of the Tierberg, Kookfontein and Waterford and Formations (Ecca Group) only crop out outside and to the west and south of the present study area, while the Early Jurassic Karoo Dolerite Suite (c. 182; Duncan & Marsh 2006) is not mapped within the study area and was not encountered during the present field study.

The Palaeozoic bedrocks are very extensively overlain by a wide spectrum of Late Cenozoic superficial deposits. They include slope deposits (colluvium and hillwash), river and stream alluvium (including coarse pediment gravels), down-wasted surface gravels, calcretes and various soils. These geologically youthful sediments are generally of low palaeontological sensitivity.

The Abrahamskraal Formation, as a component of the Lower Beaufort Group, has yielded one of the richest fossil records of Permo-Triassic land-dwelling plants and animals anywhere in the world. The Formation can contain therapsids, including small dicynodonts and large-bodied herbivorous and carnivorous dinocephalians, representing some of the earliest and most primitive examples of certain subgroups in the world. Fish and amphibian remains, trace fossils and plant fossils are also noted.

4.2 Archaeological Background

Over 10 HIAs have been compiled in the vicinity of the study area, all with respect to windfarms and their associated infrastructure, and the findings of these reports are largely congruent. The reports identified surprisingly little pre-colonial or stone age archaeology, and distinct spatial patterning to the little that was found (Booth, 2012, 2015a and 2015b; Hart and Webley, 2013; Hart and Kendrick, 2014; Hart, 2015; van der Walt, 2016). Almost all archaeological material, predominantly in the form of scatters, has been identified on the flat floodplains up to the foothills of the mountains, and within river valleys along watercourses (Booth, 2016a and 2016b). The dry, fairly desolate ridges, which are subject to high winds and therefore the proposed locations for the turbines, are generally entirely devoid of Stone Age archaeological remains (Webley and Halkett, 2017). These findings were also supported by the Heritage Scoping Assessment Report (Fourie et. al. 2015) compiled as part of the Department of Environmental Affairs (DEA) Strategic Environmental Assessment (SEA) for wind and solar energy developments (DEA, 2015). A mitigation phase excavation (Evans et al. 1985) has been undertaken at two small rock shelters in the grounds of the South African Astronomical Observatory near Sutherland in the early 1980s. More recently, changing farming methods as represented by the distribution and variety of stone-built features (walls and kraals) was assessed as part of a Master's thesis (Regensberg, 2016).

The area is known to have been inhabited since the Early Stone Age (ESA) (Hart and Miller 2011) and throughout the Middle Stone Age (MSA) (Hart et al. 2010). Later Stone Age (LSA) scatters have also been documented throughout the region, although at remarkably low density (Booth 2012, 2016a and 2016b; Hart and Webley 2013; Hart and Kendrick 2014; Hart 2015; van der Walt 2015), although excavations at cave sites near Sutherland yielded significant LSA cultural material (Evan et. al. 1985). Most tools are made on hornfels, quartzite and chert, while quartz and Karoo shale were also utilised (Hart et. al. 2010). Within the last 2 000 years, pastoralists, the Khoekhoen, arrived in the area and, in this area, there is extensive evidence for the presence of these groups in the landscape. This evidence comes in the form of circular, stone-built enclosures constructed of piled stone up to half a metre high and from 3m to 4m to 9 m in diameter (Hart et. al. 2010). These enclosures represent

living spaces, which contained grass huts or Matjieshuise (mat covered houses) and kraals. The kraals are generally situated on the leeward slopes of low ridges and likely date to between 300 and 1 000 years ago (Hart et. al. 2010). The kraals sometimes form complexes of as many as 13 interlocking enclosures, often with adjoining 'lammerkraals' (lamb pens). These sites can be found with fine, red burnished pottery and OES fragments. Other evidence for herders in this area has been identified in the form of open camps situated along dry river beds in valley bottoms. These sites are large, measuring 80m x 80m, and are associated with fine, thin walled Cape Coastal pottery, frequent informal stone tools, stone features, grinding surfaces, ash middens, animal bone and several graves with broken grindstones atop them; colonial period artefacts have also been found in association with these sites (Ibid.).

Rock art, which can be attributed to the San hunter gatherers or the pastoralists, is known within the region, although it's not commonly identified, and more concentrated in the Cape Fold Mountains to the south of the project area (Booth, 2016a and 2016b; van der Walt, 2015). These paintings tend to be of the fine line tradition, attributed to hunter gatherers, or finger painting, which is attributed to the herders.

Early *Trekboere* entered the region in the late 1700s, moving their livestock down into the valleys and plains of the Karoo from the better watered escarpment to escape the harsh winters there. As a result of this pattern of seasonal movement of flocks the *Trekboere* usually had a loan farm on the plateau, and a stockpost (*legplaats*) in the Karoo. Conflict arose between the arriving *trekboere* and the indigenous San, which culminated in the massacre of San in the late 1770s by Boer *commandos* (Schoeman 1986; Hart and Webley 2011). These massacres are recorded archivally and in placenames in the area, such as the farm Oorlogskloof near Sutherland where more than 30 stone cairn burials are to be found. Further mass graves might be found on Gunstfontein Farm, while there is purportedly also a cave where the San made a last stand against the *kommandos* (Ibid.).

Increasingly, as exploitation of the area became better established, and particularly

after the Great Trek of the 1830s, their structures and imprint on the landscape became more permanent. The evidence for this early inhabitation of the region is to be found in historic farmhouses and associated buildings, stone cairns, stone walling, farm infrastructure such as reservoirs and, more recent wind pumps. Artefactual material from this period includes European ceramics, glass and iron fragments. The stone walling and kraals of this period are distinguished from the pre-colonial kraals as they are usually rectilinear and are faced on two sides with infill between the faces and are often mortared using locally derived clays.

The area was witness to a further period of military action during the South African War, with some skirmishes near Skietfontein in the Komsberg Mountains (Hart and Webley, 2011). The threat of Boer guerrilla activities also prompted the British to build several defensive structures in the region, including redoubts, gun platforms and blockhouses (van der Walt, 2015; Hart and Webley, 2011; Orton and Halkett, 2011).

Other renewable energy projects within a radius of 50 km from the proposed Kudusberg site have been considered in this HIA. Please see the list of projects provided in Table 1. (Figure 3; See AIA, Appendix 3). These sites have largely been identified through impact assessment surveys conducted in this vicinity. More sites occur in the area but have not, as yet, been mapped on SAHRIS.

Table 1: Cumulative projects within 50kms

DEA REFERENCE Number	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MW	STATUS
WIND PROJECTS							
14/12/16/3/3/2/967	Scoping and EIA	Biotherm Energy (Pty) Ltd	Proposed 140 MW Esizayo Wind Energy Facility and its associated infrastructure near Laingsburg within the Laingsburg Local Municipality in the Western Cape	WSP/ Parsons Brinckerhoff	Wind	140 MW	Approved
East -14/12/16/3/3/2/962 West- 14/12/16/3/3/2/693	Scoping and EIA	Biotherm Energy (Pty) Ltd	East: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the farm Welgemoed 268, the remainder of the farm Schalkwykskraal 204 and the remainder of the farm Drie Roode Heuvels 180 north of the town of Laingsburg within the Laingsburg and Karoo Hoodland Local Municipalities in the Western and Northern Cape Provinces	WSP/ Parsons Brinckerhoff	Wind	140 MW	Approved
			West: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the Farm Drie Roode Heuvels 180, the remainder of the farm Annex Drie Roode Heuvels 181, portion 1 of the farm Wolven Hoek 182 and portion 2 of the farm Wolven Hoek 182 north of the town of Laingsburg within the Karoo Hoodland Local Municipality in the Northern Cape Province				
12/12/20/1966/AM5	Amendment	Witberg Wind Power (Pty) Ltd	Proposed establishment of the WitbergWind Energy Facility, Laingsburg Local Municipality, Western Cape Province	Environmental Resource Management (Pty) Ltd / Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
12/12/20/1783/2/AM1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal West (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Environmental Resource Management (Pty) Ltd	Wind	110 MW	Under construction

Basic Assessment for the Proposed Development of the 325MW Kudusberg Wind Energy Facility and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces

DEA REFERENCE Number	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MW	STATUS
12/12/20/1783/1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal East (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Savannah Environmental Consultants (Pty) Ltd	Wind	150 MW	Approved
14/12/16/3/3/2/899	Scoping and EIA	Rietkloof Wind Farm (Pty) Ltd	Proposed Rietkloof Wind Energy (36 MW) Facility within the Laingsburg Local Municipality in the Western Cape Province	EOH Coastal & Environmental Services	Wind	36 MW	Approved
TBC	BA		Proposed Rietkloof Wind Energy Facility, Western Cape, South Africa	WSP	Wind	140 MW	In progress
14/12/16/3/3/2/826	Scoping and EIA	Gunstfontein Wind Farm (Pty) Ltd	Proposed 200 MW Gunstfontein Wind Energy Facility on the Remainder of Farm Gunstfontein 131 south of the town of Sutherland within the Karoo Hooglands Local Municipality in the Northern Cape Province, south of Sutherland.	Savannah Environmental Consultants (Pty) Ltd	Wind	200 W	Approved
12/12/20/1782/AM2	Scoping and EIA	Mainstream Power Sutherland	Proposed development of 140 MW Sutherland Wind Energy Facility, Sutherland, Northern and Western Cape Provinces	CSIR	Wind	140 MW	Approved
Karusa - 12/12/20/2370/1 Soetwater - 12/12/20/2370/2	Scoping and EIA	African Clean Energy Developments Renewables Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Karusa & Soetwater)	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Preferred bidders. Construction to commence in 2019
12/12/20/2370/3	Scoping and EIA	African Clean Energy Developments Renewables Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Greater Karoo))	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
West -14/12/16/3/3/2/856 East - 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farm (Pty) Ltd	Proposed 275 MW Komsberg West Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Approved
			Proposed 275 MW Komsberg East Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces				
12/12/20/1988/1/AM1	Amendment	Roggeveld Wind Power (Pty) Ltd	Proposed Construction of the 140 MW Roggeveld Wind Farm within the Karoo Hoogland Local	Savannah Environmental	Wind	140 MW	Preferred bidders.

DEA REFERENCE Number	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MW	STATUS
			Municipality and the Laingsburg Local Municipality in the Western and Northern Cape Provinces	Consultants (Pty) Ltd			Construction to commence in 2019.
14/12/16/3/3/2/807/AM1	Scoping and EIA Amendment	Karreebosch Wind Farm (Pty) Ltd	Proposed Karreebosch Wind Farm (Roggeveld Phase 2) and its associated infrastructure within the Karoo Hoogland and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
14/12/16/3/3/2/900	Scoping and EIA	Brandvalley Wind Farm (Pty) Ltd	Proposed 147 MW Brandvalley Wind Energy Facility North of the Town of Matjiesfontein within the Karoo Hoogland, Witzenberg and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	EOH Coastal & Environmental Services	Wind	140 MW	Approved
TBA	Scoping and EIA	Rondekop Wind Farm (Pty) Ltd	Proposed establishment of the Rondekop WEF, south-west of Sutherland in the Northern Cape	SiVEST SA (Pty) Ltd	Wind	325 MW	In process
West 14/12/16/3/3/2/856 East 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farms (Pty) Ltd	Komsberg East and West WEF	Arcus Consulting Services (pty) Ltd	Wind	140 MW each	
TBC	BA	ENERTRAG SA (Pty) Ltd	Proposed Development of the Tooverberg Wind Energy Facility and the associated grid connection near Touws River, Western Cape Province	SiVEST SA (Pty) Ltd	Wind	140 MW	In process
SOLAR PROJECTS							
12/12/20/2235	BA	Inca Sutherland Solar (Pty) Ltd	Proposed Photovoltaic (PV) Solar Energy Facility on A Site South Of Sutherland, Within The Karoo Hoogland Municipality Of The Namakwa District Municipality, Northern Cape Province	CSIR	Solar	10 MW	Approved

4.3 Cultural Landscapes and Living Heritage Background

Cultural landscapes are the interface of culture and nature, tangible and intangible heritage, and biological and cultural diversity. In contemporary society, particular landscapes can be understood by taking into consideration the way in which they have been settled and modified including overall spatial organisation, settlement patterns, land uses, circulation networks, field layout, fencing, buildings, topography, vegetation, and structures.

Research done in the last decade on the surrounding area, for input into HIAs required for other proposed WEFs, has highlighted archaeological, palaeontological and cultural landscape resources that are significant.

Other cultural landscape research for HIAs in the area have noted the possible impacts and made recommendations on cultural landscapes for each of their study areas. The visibility of proposed facilities from major transport routes and tertiary roads has been considered, particularly the R354, a scenic tourism route between Matjiesfontein and Sutherland (Hart and Webley 2011; Hart and Kendrick 2014). Predominantly, it is the negative impacts to the sense of wilderness that has been indicated as the greatest likely outcome of these developments (Hart and Webley 2011, 2013). The clustering of several proposed WEFs in the Sutherland area is considered to progressively and more negatively erode the cultural landscape (Hart and Webley 2013). Significant built environment features are variable across the landscape, and while some clusters of heritage buildings exist (Hart and Webley 2013), largely, there are few conservation-worthy buildings, and that places of celebrated heritage significance are limited (Hart and Webley 2011; Hart and Kendrick 2014). The remoteness of the area is noted, and the low visitor numbers also considered (Hart and Webley 2013; Booth 2016b). Where gradings have been proposed for the cultural landscape, these vary between Grade II and IIa (Hart and Kendrick 2014; Booth 2016b). The changes to the character of the landscape, and negative impacts on sense of place and aesthetic value which result from WEF developments – and compounded by cumulative impacts – are seen to be largely unmitigatable, with only the effective rehabilitation of the landscape after decommissioning serving as effective remedial action (Booth 2016a).

The SEA for wind and solar photovoltaic energy in South Africa (DEA 2015) does not consider intangible heritage resources, identifying only areas with material remains and previously identified natural and cultural heritage sites or protected areas, such as Karoopoort, Matjiesfontein and Touw Local Nature Reserve, as cultural landscapes in the Komsberg REDZ 2. There has not been any investigation into the living heritage of the area or intangible resources attached to the landscape, such as language or oral history. Although recognised as “Very High to High Sensitivity Zones”, “no buffer” has been suggested for the sensitivity mapping application. The proposed Kudusberg WEF is in an area that has been graded as “High” in the Combined Heritage Sensitivity Map for REDZ 2 (Figure 4.3). Mitigation recommended for the impact of development on cultural landscapes in the Komsberg area is also limited to adjusting buffers and consideration of view shed analysis, which considers only tangible heritage resources’ and visual impacts.

Due to the infrequent signature of physical remains in this area, researchers in material culture tend to describe the landscape as sparse or barren, attributing lower gradings of heritage significance as a result, except where scenic value is ascribed. This low ‘on the ground’ visibility is however the direct result of the liminal and seasonal occupation of the area which in and of itself is part of the value and significance of the landscape, and can be considered the tangible evidence of the historic character of the landscape, a character of movement and habitation in very challenging conditions. Furthermore, the suggestion that intangible resources can be “rehabilitated after decommissioning” is unfounded: oral history, language, indigenous knowledge systems are by nature dynamic, living resources which will be impacted upon permanently by any new introductions to the landscape. While introductions or change are not always a negative impact, the impacts of proposed development on intangible heritage should be investigated and considered at least as thoroughly as the tangible heritage resources.

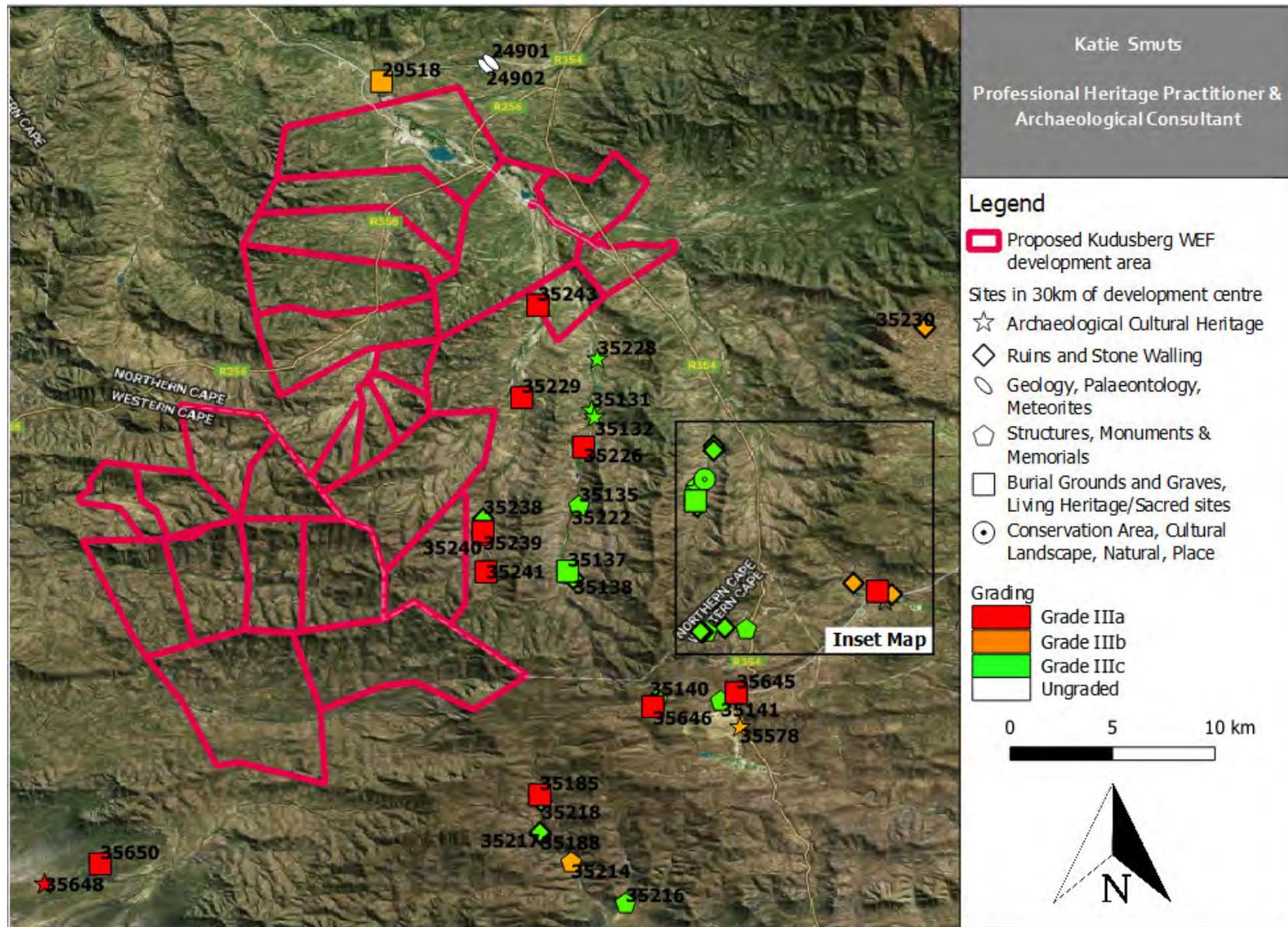


Figure 4.1. All known sites within 30kms of proposed development centre, as recorded on SAHRIS (Site IDs provided).

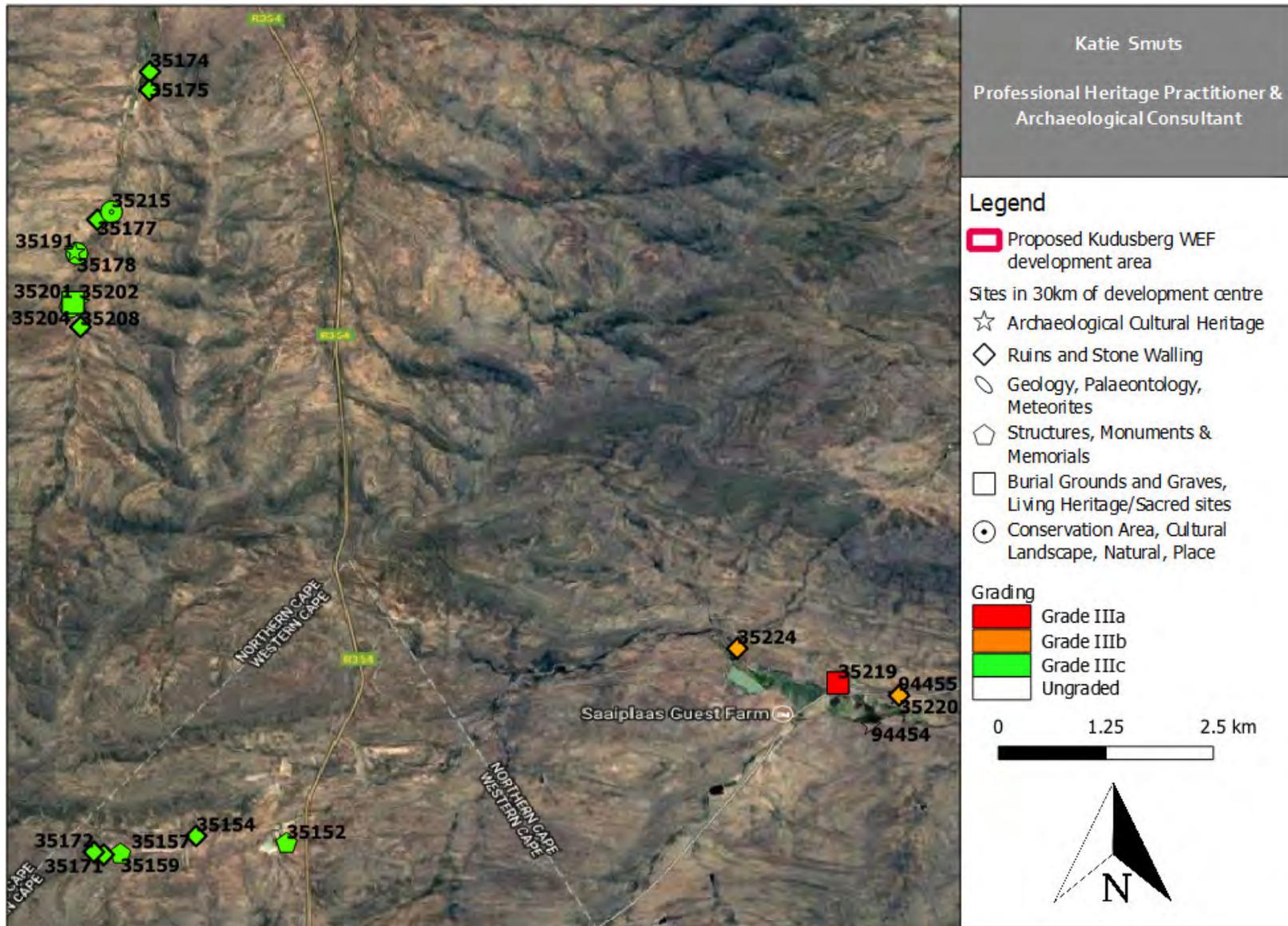


Figure 4.2. Inset Map

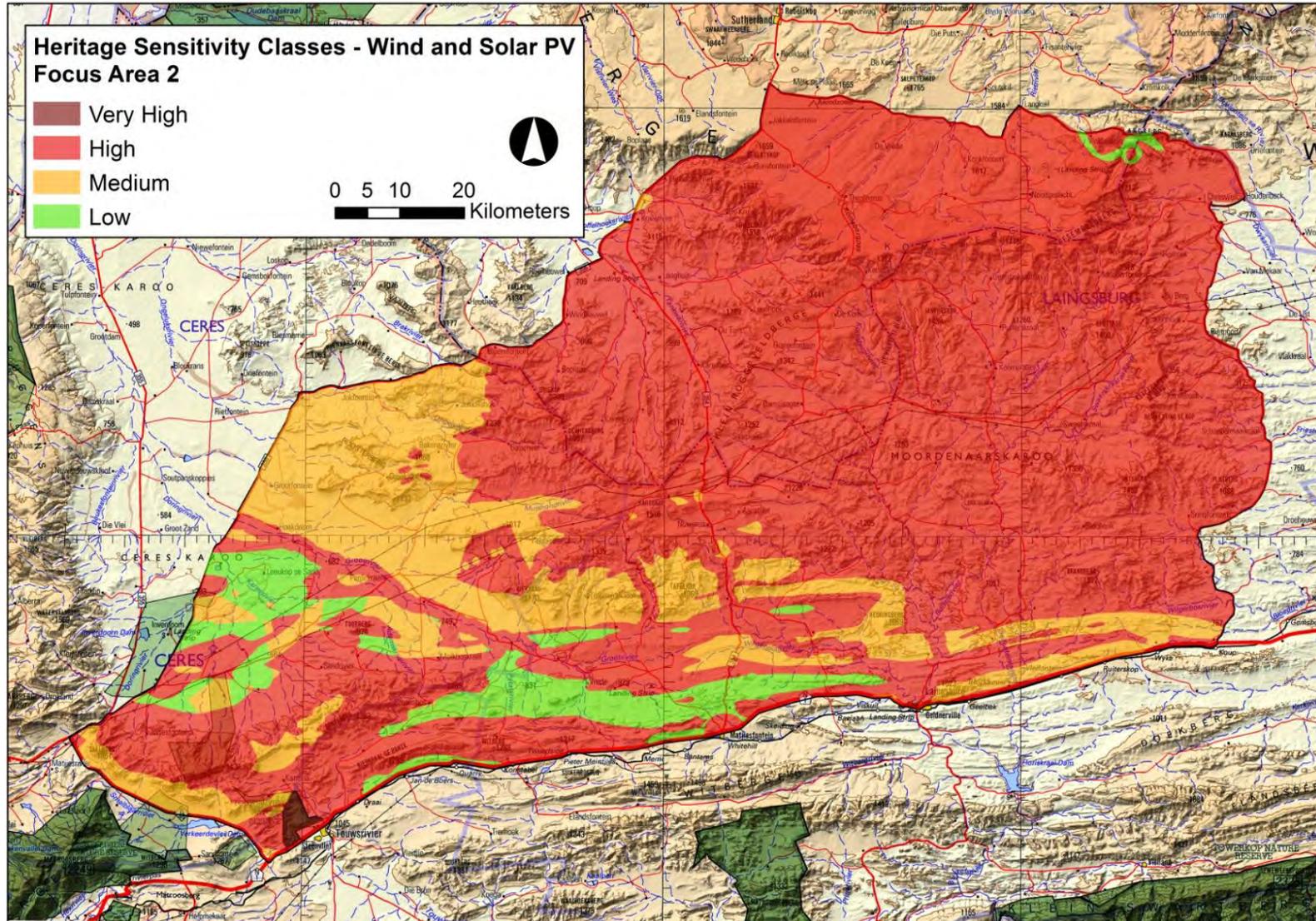


Figure 4.3. Heritage sensitivity map of Komsberg Focus Area 2 (Map from DEA 2015:58)..

5 DESCRIPTION OF HERITAGE RESOURCES / PROJECT RESULTS

The heritage surveys of the study area yielded heritage resources of various types, including palaeontologically sensitive deposits, Stone Age artefacts, rock art, stone-built ruins and walling as well as built environment and elements comprising the cultural landscape (See Appendices 2 and 3 for the PIA and AIA respectively)¹.

5.1 Palaeontological resources identified

The field assessment determined that fossils, as anticipated, are rare in this sector of the Great Karoo. The fossils observed mainly comprise horizons with reworked, fragmentary vascular plants as well as low-diversity trace fossil assemblages that are of low conservation and research interest. Scientifically-important lung fish burrow and fossil plant sites occur at several sites (recorded as Locations 039 (S32° 49' 47.6" E20° 24' 04.9"), 041 (S32° 49' 47.2" E20° 24' 05.0"), 135 (S32° 52' 00.7" E20° 16' 04.9") and 143 (S32° 53' 08.0" E20° 15' 38.4"); Plates 1 and 2, Figure 5.1). No fossil vertebrates were recorded, but a few occurrences of equivocal vertebrate burrows and poorly-preserved tetrapod tracks were found (Locations 29b (S32° 52' 35.9" E20° 20' 41.8"), 042 (S32° 49' 31.4" E20° 24' 16.5") and 043 (S32° 49' 32.6" E20° 24' 19.1"); Figure 5.1). None of the recorded fossil sites lies within the proposed WEF footprint and they should not be threatened by the proposed development. The Permian bedrocks are mostly mantled with Late Caenozoic colluvial and alluvial deposits as well as surface gravels and gravelly soils. This applies to the great majority of the ridge crests where the wind turbines will be situated as well as to the footprints of the access roads and various site options for the on-site substation and construction yards.

¹ Archaeological site types for the purposes of this survey: kraals have been recorded as structures, alignments of stone walling have been recorded as stone walling. Ruined dwellings have been recorded as ruins > 100 years. Their grading in the Northern Cape follows the SAHRA 2007 guidelines. Built structures > 60 years that are still in use have been recorded as buildings, and the SAHRA grading system has not been applied to them in the Northern Cape.



Plate 1. Lungfish burrow casts, indicated with arrows, within lacustrine mudrock at Loc. 135 (Almond 2018).



Plate 2. Longitudinally-striated leaves likely of *Schioneura gondwanensis* at Loc.039 (Almond 2018).

5.2 Archaeological resources identified

5.2.1 Stone Age archaeology

Very little Stone Age material was identified during the survey, and what was recorded comprised isolated stone artefacts. In general, these were made on predominantly locally derived stones, including Karoo sandstone and greywacke, as well as hornfels and chert. While some material appeared MSA in type, with so few artefacts identified, it was generally not possible to ascribe age to them (Plates 3-5).

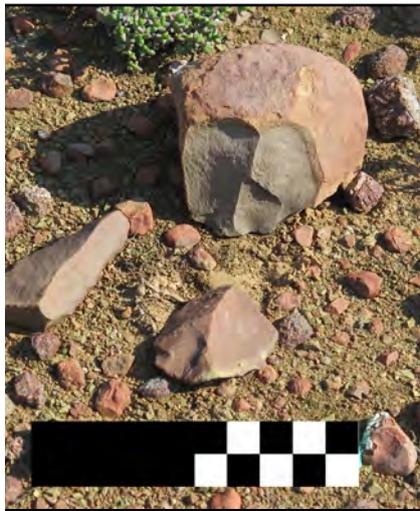


Plate 3. Stone tools KDB084



Plate 4. Stone tool KDB097



Plate 5. Stone tool KDB098

Most of the stone tools identified were found on the flat, open plain in the northern extent of the development footprint, while the three artefacts observed at KDB084 (Figure 5.2.2) represent the only artefacts identified on higher lying ground, at some 300m above the lower lying areas (Plate 3). None of the artefacts identified were considered significant, and no artefactual remains were found on the ridges.

The only significant archaeological site was identified some distance from any proposed infrastructure, but its presence in the study area is significant in terms of determining the heritage character of the area. KDB045 is a large south west facing rock shelter that was identified at the apex of a low lying kloof at approximately 1124m a.s.l. (Plate 6; Figure 5.2.2 and 5.2.3). This site contained rock art, stone artefacts, tortoise bone and ostrich eggshell as well as a single piece of thick walled, highly burnished ceramic with a glossy red exterior (Plates 7 and 8). Although the

cave floor was thickly covered with sheep dung, and fairly churned, it is likely that there is anthropogenic deposit at the site. The site also contained several panels with finger painted rock art in vibrant red ochre, with some apparent animal and human shapes (Plate 9) discernible as well as finger daubs. Faint traces of apparent eland-type shapes could indicate the presence of earlier fine line imagery at the site. This site is of high significance.



Plate 6. Rock shelter KDB045



Plate 7. Artefacts from KDB045, including a core, broken blade and backed piece.



Plate 8. Burnished ceramic at KDB045



Plate 9. Possible human figures

A ubiquitous feature in the landscape is the stone-built kraal. While determining relative age of such structures from a survey such as this, is not always feasible, it is useful to consider that prehistoric kraals tend to be built of piled cobbles and are

usually round, while historic kraals are often rectilinear and built from packed stone, sometimes dressed, faced and infilled with smaller stones or built with mortar. Very few of the many identified kraals and stone walls conformed to this pre-colonial building method, although several small, circular kraals were identified that were built of piled stone rather than packed stone that could represent pre-colonial herder activity in the region (Plate 10).

5.2.2 Historical archaeology

The most predominant type of archaeological material identified in the landscape was historical ruins. These ranged from packed stone walling, some with drystone walling, and some with mortar, to stone-built kraals displaying a variety of construction methods, ruined huts and rectilinear dwellings, one abandoned farmhouse (KDB056 at KDBc8) and one abandoned structure that was possibly an old school (KDB050 at KDBc7) (Plates 10-14; Figure 5.2.4; Table 2). These structures were concentrated along valley floors and on open plains in the north of the project area near watercourses. Individually, they are of little significance, but collectively serve as significant traces of long-term occupation of this landscape, and multiple expressions of the same economic activities, i.e. sheep farming.

An interesting feature of the stone structures is an apparent reuse of favoured areas for consecutive periods of use and occupation. This reuse is expressed in newer kraals built adjacent to, and even within the footprint of earlier kraals, where the phasing of these structures is evident in the changing styles of construction. Rounded kraals are often found in close association with well-built rectilinear structures that have been interpreted as dwellings (KDBc3, KDBc5, KDBc7, KDBc8; KDBc12 Figures 5.2.3 and 5.2.4). These clustered sites often, then, comprise one or two large kraals with either lammerhokke attached or freestanding small stone kraals, a rectangular dwelling of between one and three rooms, and a smaller rectangular or square hut.

The most significant complexes, comprising these clusters of stone walling, kraals, huts and ruins are on Boplaas *werf* on Urias Gat 4/193 (KDBc8; Figure 5.2.4), which is located along the proposed Access Alternative 1 from the north, and the Matjiesfontein farmstead (KDBc3; Figure 5.2.3) which is not at direct risk of impact from the development.



Plate 10. Small stone kraal (KDB042), possibly precolonial



Plate 11. Large kraal (KDB026) at Matjiesfontein Farm 194 (KDBc3)



Plate 12. Packed stone kraal wall (KDB055), with ruined cottage (KDB056) and repurposed reservoir currently occupied by migrant labourers to rear on 4/193 Urius Gat (KDBc8)



Plate 13. Oblong kraal cobble-built structure (KDB040) in foreground, with rectilinear faced stone dwelling (KDB041) to rear; both built with mortared stone (KDBc5)



Plate 14a. U-shaped structure (KDB050), view to northeast (KDBc7)



Plate 14b. U-shaped structure (KDB050), view to west

A single stone circle built with sub rectangular stones and filled with brush was identified on a relatively high altitude, KDB085 at 1220m a.s.l., and constitutes the highest lying feature encountered (Plate 15; Figure 5.2.2). It was not possible to determine the age of this structure which was identified as a possible shelter or shepherd's hut, and it is likely that it dates to the historic period. This site is considered to have low-medium significance and does not warrant further mitigation.



Plate 15. Possible shepherd's hut KDB085

One of the more enigmatic features was located along a low rocky outcrop in a wide bottomed valley on Matjiesfontein Farm 194 (KDBc2, comprising KDB14-17b; Figure 5.2.3). The feature consisted of at least 5 conical stone-built structures backing onto the krans, with two of those five collapsed, and possibly more (Plates 16-19). The stone work was neat and coursed, and the centre of each "tower" was filled with small irregular stone fragments (Plate 19). There was no other artefactual material, nor any other walling in the area or between the towers. The regularity of the feature, and the very orderly style of build suggests a defensive, military origin, but this could not be established. Due to the uniqueness of this structure and its fine method of construction, it is deemed to be of medium-high significance.



Plate 16. View of kran with conical stone features (KDBc2) built against it



Plate 17. Southernmost tower (KDB015)



Plate 18. Northernmost tower (KDB016)



Plate 19. Northernmost tower (KDB016) showing infill

5.2.3 Built Environment

Several historic farmhouses, workers' cottages and related built structures occur within the project area. Many of these structures are currently unoccupied, and several structures are falling to ruin, including at Urius Gat 4/193 (KDBc8; figure 5.2.4); Matjiesfontein 194 (KDBc3; Figure 5.2.3) and Urias Gat 193 (KDB065; Figure 5.2.4), all located in the Northern Cape. These structures include buildings sufficiently old to have been recorded as ruins > 100 years, and are dealt with above, while others have been recorded as structures in terms of Section 34 of the NHRA. As with most of the archaeological features, these structures are all located on valley floors and on the open plains close to watercourses. As many of the farms are no longer actively engaged in sheep farming anymore, some of these dwellings have been repurposed as guest accommodation, such as Gatsrivier 156. It was not always

possible to determine whether some of the more derelict cottages, for instance at Gatsrivier 1/156 and Re/156, Oliviersberg 1/159 and Re/159 and Urias Gat 4/193, were in use by labourers, either permanently or seasonally.

Of the farmsteads that are likely to be affected by the proposed WEF, the most likely to be impacted are Oliviersberg 1/159 (KDB091) and Gatsrivier 1/156 and Re/156 (KDB008-KDB008c) in the Western Cape, which lie between several ridges proposed for turbine placement (Figures 5.2.1 and 5.2.2). In the Northern Cape, Wind Heuvel Re/190 (KDB059 at KDBc11; Figure 5.2.5), which lies along the proposed access route from the north, will be impacted, while the turbines will be visible from Matjiesfontein 194 (KDB012). The three cottages at Gatsrivier Re/156 have been altered to accommodate tourists and are of little intrinsic heritage significance. The original dwelling at Oliviersberg 1/159 has been much altered by the owner, to the detriment of any heritage value, but retains some interesting architectural features (Plate 20). The Wind Heuvel farmhouse looks to be a 1930s or 1940s structure, although it likely has a much older core, and older elements exist in and around the *werf*, such as stone walling and kraals (KDB060). It is not clear whether the Matjiesfontein farmstead is still in use, and the *werf* appears unused in recent times. Again, although none of these structures is of high significance in and of themselves, where they constitute significant cultural landscapes and temporal layering of the area, they hold cultural significant that is of higher heritage value than the separate constituent elements.



Plate 20. Oliviersberg dwelling with double chimney and unsympathetic redevelopment

5.2.4 Burial grounds and graves

One single grave with two burials (KDB057 at KDBc8; Figure 5.2.3) and one burial ground were identified (KDB081 at KDBc11; Figure 5.2.5), and one likely child burial (KDB064; Figure 5.2.4). Several stone cairns were also noted as likely graves, including one isolated cairn (KDB058) and one group of more than 10 cairns (KDBc6) (Figure 5.2.4). All the graves identified were located within the Northern Cape.

The single grave (KDB057) was located on the Boplaaswerfon Urias Gat 4/193 (Plates 21 and 22), Portion 4 of Farm 193 Urius Gat. The inscribed marble headstone of this grave records the death of E.M. Fourie, mother (b. 1873 d. 1937) and J.O. Fourie, father (b. 1878 d. 1944). The grave is within a fenced area and is some 350m west of Access Alternative 1. The isolated stone cairn (KDB058) while not positively identifiable as a grave, should be considered a possible grave, and is located beyond 50m from Access Alternative 1. The likely child burial (KDB064) is located on Uria's Gat (KDB065) and is a small, low, rectangular metal railing edged with stone and cement that measures 650mm long by 500mm wide (Plate 23). It is located some 80m south west of Common Access 1, with a farm fence between the grave and the road.



Plate 21. Fourie grave (KDB057) with fenced camp



Plate 22. Fourie headstone



Plate 23. Likely child's grave (KDB064) at Urias Gat (KDB065)

The group of stone cairns (KDBc6) is located 300m northeast of the Urias Gat farmhouse on Re/193 (Plates 24 and 25). These cairns vary in size from just over 1m in length to approximately 1.8m. It is likely, given the uniformity of appearance and the grouping of these features that they do represent graves. These cairns lie approximately 165m east of Common Access Road 1 from the north, 190m northeast of the fork between Access Alternatives 1 and 2.



Plate 24. Large cairn at KDBc6 (KDB071)



Plate 25. Small cairn at KDBc6 (KDB072)

The other graves encountered (KDB081) were directly adjacent, 12m east, to Common Access Road 1 where it passes Wind Heuvel Farm (KDB059). This graveyard consists of some 10-12 graves (Plate 26), with hand inscribed sandstone headstones, and is the family graveyard of the historic – and present – owners of Wind Heuvel, the Stadlers, and most graves date to the late nineteenth and early twentieth centuries (Plate 27). Most of the graves are marked with stone cairns, while some have rectangular stone edging. The graveyard is not fenced, although its perimeter is demarcated by a small furrow that encloses the graves.



Plate 26. Stadler graveyard (KDB081) at Wind Heuvel farmstead (KDBc11)

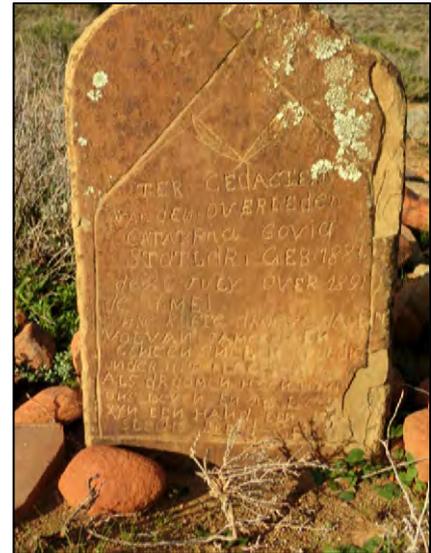


Plate 27. Stadler headstone at KDBc11

5.3 Cultural landscapes and Living heritage

Resources identified as part of the cultural landscape can be either tangible or intangible. Tangible resources include archaeological material culture and rock art, built environment features, pre-colonial and colonial period kraals and graves, as well as less obvious aspects like land use, views and vistas for monitoring herds and stock, technological advancement in the form of wind pumps etc., and roads. The characteristic “thin” signature of human presence in the landscape reflects a history of movement by people across the landscape rather than extended periods of habitation and reiterates the reality of a harsh and unforgiving environment with limited resources.

The following intangible resources were identified and described for the Kudusberg study site and surrounding landscape:

- Geographical place names

While many place names refer to natural features, game and climate, others, like Moordenaarskaroo, allude to the atrocities that have occurred over time in the landscape, a result of the struggle for and conflict over scarce resources. These names hold an intangible heritage value in their ability to describe the ways in which different people who moved through this space used it, lived in it, interacted with it,

and navigated it.

- Transhumant land use patterns and characteristics - Living heritage

The Karoo and surrounds, which includes the Kudusberg study area, was used for centuries by local indigenous pastoralists and hunter gatherer groups, and their movements over the landscape were organised to respond to the seasonal variations in grazing and water resources, for wild and domesticated animals (Penn, 2005). Even after the initial movement of *trekboers* into the area, “pastoral production was the major occupation of all the societies of the frontier zone with the exception of the hunter gatherer San, and it was principally through the dynamics of pastoralism that they transformed each other’s’ cultures while exploiting, serving or co-operating with each other” (Ibid: 15). As such, it is inaccurate to consider this area as only a “wilderness area” and, indeed, those areas of the Karoo that are still open and undeveloped, are still used as seasonal grazing by transhumant farmers, rare examples of South African history and heritage which are fast being lost to development and industrialisation. This landscape offers an opportunity to recognise and celebrate the work, lives and lifeways of those people who inhabited these ridges and plains and the ways in which they related to their landscape and each other under difficult and trying circumstances, throughout history into the present day.

- Indigenous Knowledge Systems

It is known that the early *trekboers* exploited the Indigenous Knowledge Systems (IKS) of the Khoekhoen regarding local conditions and maintaining herds in a semi-arid environment (Penn 2005). Other IKS regarding the uses of the natural resources of the area could also be present, considering especially the location of the Kudusberg site in an area of exceptionally rich botanical diversity (Clark et al. 2011: 116). Without further research into these possibilities, a valuable and true assessment of the impact of the development on the cultural landscape cannot be made.

- Frontier Zone History - ‘Khoisan’ Heritage

This area is relatively well known for being occupied by Khoekhoen and /Xam people before and during the early periods of colonial influence and then settlement. The

Great Karoo, including the Klein Roggeveld and Moordenaarskaroo in which the Kudusberg Study area is located, offers the potential to recognise the historic dispossession of indigenous groups of people of their lifeways, land use practices, language and culture. This history, and the memory thereof, embodied by Komsberg cultural landscape and surrounding Karoo area, is significant in the identity shaping of many present-day South Africans. It was not possible in the scope of this assessment to identify possible sites of *kommandomassacres* of San, nor were any San strongholds or mass burials identified.

Certain sites identified as heritage resources during fieldwork are worth noting as elements of the cultural landscape due to the material expression of longstanding, continuous traditions. Wind Heuvel farmstead (KDBc11), which is located near the revised access road from the north, comprises an historic structure that appears much altered from the exterior (KDB059), a large rectilinear kraal complex (KDB060), and a farm cemetery (KDB081) that lies directly adjacent to the existing farm road. In addition to these heritage resources, the farm displays examples of living heritage and continuity of traditional practices. While the seasonal farm labourers are housed in shipping containers – the workers travel down from the escarpment with the farmer in the winter – there are several *asboskookskerms* erected either freestanding or adjacent to the containers (KDB080; Plate 28). Adjacent to the main house there is a further large *asbos* enclosure that stands at least 6m high (Plate 29).



Plate 28. Kookskerm at Wind Heuvel



Plate 29. Freestanding asbos skerm

More broadly, the proposed Kudusberg WEF area can be divided into the following Cultural Landscape Areas (CLAs) (Figure 5.5):

5.3.1 Ridges

This area is characterised by a series of very high and long ridges with valleys between and offer some very dramatic vistas of the surrounding landscape (Plate 30). The ridge running east to west north of and parallel to the Gatsrivier was surveyed on foot, as was the proposed location of Substation 2. Views from here and the saddle just south of Pad se Hoek, on the dirt road between Oliviersberg farmstead and Matjiesfontein farmstead, take in the farmed valleys below, homesteads and stone kraals hugging the water courses that have been managed for centuries in this dry environment, and extend to the rise of the great escarpment and beyond. The ridges comprise a Grade IIIa CLA for their scenic qualities.



Plate 30. View south from Oliviersberg ridge showing (Rabe Bailey 2018).

5.3.2 Ridge slopes

Ridge slopes rise with variable inclines to the ridge tops from the valleys between, stepped with exposed weathered rock formations in the higher reaches (Plate 31). One of the overhangs located on the slope ridges adjacent to the Oliviersberg to Matjiesfontein farm track, which were surveyed on foot, had pre-colonial material remains and rock art, most likely used by the Khoekhoen groups who lived in these areas.



Plate 31. Sheep grazing on ridge slope in Matjiesfontein se Kloof CLA (Rabe Bailey 2018)

5.3.3 Ridge saddles

Here and there along the high ridges, there is a slight dip in the line, where the ridge slopes meet the ridge lines at a slightly gentler angle. These saddles act as funnels of movements across the landscape and may retain material evidence of this. Where identified historic tracks are still used, these are heritage elements of prior land use and one of the ways in which the landscape would have determined the movement and, therefore, settlement and interaction of people on the landscape. The Pad se Hoek ridge saddle (Plate 32) is a noted historic road evident on the Laingsberg Imperial Map of 1900-1919 as a Grand Trunk Road, and remnants of stone built retaining walls are evident along the route of this road.



Plate 32. Pad se Hoek ridge saddle above Matjiesfontein se Kloof CLA (Rabe Bailev 2018).

5.3.4 Valleys with river courses

The valleys between the high ridges can be narrow with steep ridge slopes either side, such as the Gatsrivier Valley (Plate 33), or with relatively wide valley floors such as the Uriasgatrivier valley. Each valley is fed by a network of non-perennial streams running down from the ridges over the ridge slopes. Where these tributaries meet each other or a larger stream or river, there is often the remains of historical human habitation. Where springs are also present, areas show signs of small-scale cultivation, most likely for supplemental stock feed. The landscape is largely undeveloped with indigenous vegetation, stone packed kraal and homestead structures and complexes making up the light scattering of built environment. The three (3) valley landscape character areas that were surveyed during field work for this assessment were the Gatsrivier valley (a Grade IIIb CLA), the Uriasgatrivier valley (a Grade IIIa CLA) and the Matjiesfontein se Kloof valley (a Grade IIIb CLA).

Historically the pastoralist farmsteads would have been located as close as possible to the best sources of clean, consistent water supply which would have been the springs and seeps along the tops of the watersheds. Later, with the introduction of windpumps in the late 18th century, farmers could move further down the valleys (Regensberg, 2016). This human settlement evolution is evident at Uriasgatrivier valley cultural landscape area in the north eastern part of the study site, where abandoned older structures and round kraals are found further up the water courses, with the more recent farmstead and associated labourers containers located further down the valley, closer to the public road and historic track which runs through Karoopoort towards Sutherland, now the R356.

Each of these valleys hold evidence of the continual use of the land for sheep farming and, more sparingly, cultivation, over centuries. The evolution of the landscape and the way in which its inhabitants related to it and used it, is reflected in the use and abandonment of structures, kraals and homesteads, showing the dynamic essence of the landscape and how mobility, adaptability and perseverance have been essential to survival on this landscape.



Plate 33. Gatsrivier Valley CLA showing temporal layers of built form (Rabe Bailey 2018)

5.3.5 Farm roads

The R356 runs to the west and north of the Kudusberg WEF study area, with the farm tracks of the Uriasgatrivier valley joining this road at the Wind Heuvel farmstead's gate (Plate 34). This historic route, which runs from Cape Town, through Karoopoort, and past the north of the Kudusberg study site on towards Sutherland, is evident in most historic maps and well described in historic travellers' accounts (Smuts and Alberts, 1988). The farm track that passes through the Gatsrivier valley, turning onto the Oliviersberg ridge slope at the Oliviersberg homestead, over the

saddle south of Pad se Hoek, and down into the Matjiesfontein se Kloof valley to the north and beyond to Sutherland, is a noted historic road visible on the Laingsburg Imperial Map dated 1900 - 1919 as a Grand Trunk Road. This route constitutes a Grade IIIb CLA. Interestingly the R356 is shown as a farm road on this map, which reflects the dynamic and changing relationships that people had with this landscape over time.



Plate 34. Historic R356 (at right) and farm road leading to Wind Heuvel Farm (at left) (Rabe Bailey 2018).

5.4 Impacts to heritage resources

The survey method employed – i.e. to sample as many landforms as possible to define the area’s heritage character given that accessing all footprint areas was not possible – resulted in resources identified outside of the project footprint. This means that not all resources identified in the field are likely to be impacted and, conversely, not all areas where impacts will likely result could be assessed.

The table below (Table 2) provides the details and co-ordinates of all heritage

resources that will be directly impacted, and those likely to experience high levels of indirect impact. Resources are listed by province and degree of significance.

Table 2. Table of sites liable to potential direct and/or indirect impacts from the proposed KudusbergWEF²

Site No.	Site Complex	Site Description	Site Type	Grading/ Field Rating	Coordinates
Western Cape					
KDB045		Cave with finger painted panels, flakes and cores	Rock art, artefacts, deposit	IIIa	-32°52'5.2"; 20°20'6.1"
KDB084		Stone tools, likely MSA	Artefacts	IIIc	-32°53'11.70"; 20°18'55.50"
KDB085		Circular cobble-built structure, piled stone, likely hut or shelter	Structure	IIIc	-32°51'50.60"; 20°18'31.60"
KDB091		Oliviersberg farmstead, stone-built farmstead, two cottages, dam	Building	IIIc	-32°53'44.53"; 20°19'48.43"
KDB093		Lime-rich cement brick in linear arrangement / drying stack	Artefacts	IIIc	-32°53'41.85"; 20°19'51.13'
KDB096		Large rectangular kraal, faced stone, mortar	Structure	IIIc	-32°53'12.51"; 20°19'32.78'
Northern Cape					
KDB057	KDBc8	Single gravestone in fenced cemetery; EM Fourie, mother (b. 1873 d. 1937) JO Fourie, father (b. 1878 d. 1944)	Burial Grounds & Graves	IIIa	-32°48'5.2"; 20°20'59"
KDB058		Stone cairn, possible grave	Burial Grounds & Graves	IIIa	-32°47'53.4"; 20°21'11"
KDB060	KDBc11	Wind Heuvel kraal complex	Structures	IIIb	-32°45'7.71"; 20°21'50.03"
KDB064		65cmx50cm metal enclosed feature, likely grave	Burial Grounds & Graves	IIIa	-32°47'14.1"; 20°21'23.1"
KDB071	KDBc6	Cairn 1, likely grave	Burial Grounds & Graves	IIIa	-32°47'8"; 20°21'31.8"
KDB072	KDBc6	Cairn 2, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.9"; 20°21'32.1"
KDB073	KDBc6	Cairn 3, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.8"; 20°21'32"
KDB074	KDBc6	Cairn 4, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.8"; 20°21'31.9"

² Where individual sites were clustered sufficiently to read as a single complex, they have been assigned site complex numbers in addition to their individual site numbers.

Site No.	Site Complex	Site Description	Site Type	Grading/ Field Rating	Coordinates
			Graves		
KDB075	KDBc6	Cairn 5, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.6"; 20°21'31.9"
KDB076	KDBc6	Cairn 6, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.5"; 20°21'32"
KDB081	KDBc11	Stadler cemetery. 10 graves with sandstone headstones at roadside. No fence	Burial Grounds & Graves	IIIa	-32°45'10"; 20°21'47"
KDB083		Church with grave	Building, living heritage, Burial Grounds & Graves	IIIa	-32°41'40.9"; 20°26'23.5"
KDB059	KDBc11	Wind Heuvel historic farmhouse and asbos skerm	Building, living heritage	IIIb	-32°45'9.7"; 20°21'46.4"
KDB080	KDBc11	Temporary accommodation and asboskookskerms on Wind Heuvel farmstead	Living heritage	IIIb	-32°45'26.2"; 20°21'50.9"
KDB082		Rooiheuvel farmstead with asbos skerm	Building	IIIb	-32°42'42.7"; 20°21'48.6"
KDB050	KDBc7	U-shaped structure. Stone built with three phases of construction, faced stone and mortar	Ruin > 100 years	IVa	-32°47'22.8" ; 20°21'17.5"
KDB052	KDBc8	Horseshoe shaped dry wall cobble-built kraal	Structure	IVa	-32°48'10.4" ; 20°21'2"
KDB053	KDBc8	4mx5m dwelling, dressed stone, mortar, gum pole roof structure	Ruin > 100 years	IVa	-32°48'9.5" ; 20°21'2.1"
KDB054	KDBc8	Lammerkraal, piled circular stone	Structure	IVa	-32°48'8.7" ; 20°21'2.2"
KDB055	KDBc8	Large rectilinear kraal with large faced stone blocks with infill	Structure	IVa	-32°48'7.8" ; 20°21'0.2"
KDB056	KDBc8	Stone dwelling, mud and grass plaster, rietdak with mud cap, mudbrick and breeze block extension	Ruin > 100 years	IVa	-32°48'9.3" ; 20°20'57.7"
KDB061	KDBc7	3-roomed structure 12mx5m; faced stone and mortar	Ruin > 100 years	IVa	-32°47'23.9" ; 20°21'19.4"
KDB063	KDBc7	Kraal with pen, drywall cobble built	Structure	IVa	-32°47'22.1" ; 20°21'20"
KDB066		Large rectangular kraal	Structure	IVa	-32°47'15.9" ; 20°21'18.8"
KDB099	KDBc7	Large rectangular kraal, northern end	Structure	IVa	-32°47'21.71" ; 20°21'20.28"
KDB100	KDBc7	Large rectangular kraal lammerkraal	Structure	IVa	-32°47'21.88" ; 20°21'19.78"
KDB101	KDBc7	Large rectangular kraal southern	Structure	IVa	-32°47'22.28" ; 20°21'20.13"

Site No.	Site Complex	Site Description	Site Type	Grading/ Field Rating	Coordinates
		end			
KDB102	KDBc7	Curved walling near large kraal, eastern extent	Structure	IVa	-32°47'22.67" ; 20°21'21.21"
KDB103	KDBc7	Large rectangular kraal eastern end	Structure	IVa	-32°47'22.15" ; 20°21'20.61"
KDB104	KDBc7	Curved walling near large kraal, western extent	Structure	IVa	-32°47'22.21" ; 20°21'20.85"
KDB105	KDBc7	Large rectangular kraal western end	Structure	IVa	-32°47'21.86" ; 20°21'19.99"
KDB107	KDBc12	Large, circular kraal structure (identified from Google Earth)	Structure	IVa	-32°47'18.18" ; 20°21'48.30"
KDB108	KDBc12	Small circular kraal structure (identified from Google Earth)	Structure	IVa	-32°47'14.19" ; 20°21'48.73"
KDB109	KDBc12	Large kraal with lammerhok (identified from Google Earth)	Structure	IVa	-32°47'16.22" ; 20°21'51.40"
KDB110	KDBc12	Multi-roomed structure (identified from Google Earth)	Ruin > 100 years	IVa	-32°47'15.94" ; 20°21'49.0"
KDB111	KDBc12	Two-roomed structure (identified from Google Earth)	Ruin > 100 years	IVa	-32°47'18.65" ; 20°21'49.20"
KDB062	KDBc7	Stone-built weir in dry river bed, mortared	Stone walling	IVb	-32°47'23.8" ; 20°21'18.7"
KDB069		Reservoir and leivoor	Structure	IVb	-32°47'11.5" ; 20°21'27.5"
KDB011		Stone-built embankment for old road	Transport infrastructure	IVc	-32°51'57.7" ; 20°22'29.9"
KDB011		Stone-built embankment for old road	Transport infrastructure	IVc	-32°51'57.7" ; 20°22'29.9"
KDB068		Core, likely LSA	Artefacts	IVc	-32°47'22.6" ; 20°21'23.5"
KDB077	KDBc6	Stone alignment	Stone walling	IVc	-32°47'7.6" ; 20°21'31"
KDB097		Flake	Artefacts	IVc	-32°46'17.8" ; 20°21'43.4"
KDB098		MSA point	Artefacts	IVc	-32°47'31.5" ; 20°21'19.2"
KDB065		1930s farmhouse in <i>werf</i>	Building	IIIc	-32°47'13.9" ; 20°21'22"
KDB051		Stone built 20 th Century farm store	Building	IIIc	-32°48'13.5" ; 20°21'0.4"
KDB106		Irregular kraal structure (identified from Google Earth)	Structure	IVc	-32°47'16.45" ; 20°21'33.74"

5.4.1 Direct Impacts

5.4.1.1 Construction Phase

Direct impacts to **palaeontological resources** are confined to the construction phase and impacts to these identified resources are not anticipated in the operational and decommissioning phases. The construction of any infrastructure that requires excavation into bedrock or is located at sites of surface exposures of bedrock will have **high** impacts to fossil resources. However, due to the lack of irreplaceable, unique or rare fossils within the development footprint, and the extensive superficial deposit overlying the sensitive deposits, the significance of the overall impact of the development is expected to be **very low following mitigation**.

Direct impacts to **archaeological resources**, burial grounds and graves, and built environment may result from construction vehicles in the study area, the building of roads, clearing of land, earthmoving, and similar activities related to construction. Stone Age archaeology is very sparse in this area, with only a very few, isolated artefacts found in the development footprint (KDB068, KDB084, KDB097, KDB098). As a result, the impact significance to Stone Age archaeology is likely to be **low** before mitigation. The preponderance of archaeological remains in the study area are the remains of built structures, likely of historic age, but some possibly pre-colonial. These structures are predominantly easy to identify and fairly robust, but several were located in very close proximity to access roads. These roads were subsequently realigned. The vulnerable sites included KDBc6 and KDBc7 and a kraal at KDB066 (Figure 5.3.1). The realignment of Access Road Alternative 1 to avoid these sites reduces the likely impacts to them from **high** to **low**, and, as such, no mitigation is required. Should Access Road Alternative 2 be chosen as the preferred option, the likelihood of impacts to these sites is also likely to be **low**. Farming infrastructure is located at KDB069 and a kraal at KDB106 (Figure 5.3.1), which are fairly close to Access Road Alternative 2, but the alignment is beyond the recommended buffers for these sites (Figure 5.4.2). As such, Access Road Alternative 2 remains an acceptable alternative choice.

Burial grounds and graves at risk during the construction phase are likely to be subject to **very high** direct impacts without mitigation. Revised Layout 1 has taken

this into account, and avoids Grave 057 and possible grave KDB058 as well as the graveyard at KDB081 (Figure 5.2.5) by adequate buffers (Figure 5.3.2). The group of stone cairns at KDBc6 is located on the proposed site for Construction Camp 3 (Figure 5.3.1) and is a **no-go option**; Construction Camp 2 is the preferred alternative. The design of Revised Layout 1 reduces the significance of impacts to these sites to **very low**.

The significance of the **built environment** is very low in this area, and it is likely that the significance of impacts to the built environment will be **low** without mitigation. Provided that structures are avoided sufficiently not to cause structural damage to them, mitigation will result in impacts of **very low** significance to built-environment structures.

Impacts to cultural landscapes are predominantly indirect in nature, given that the resource is largely intangible. These impacts are discussed below (see Section 5.4.2). An exception to this is the potential for significant remains at sites that arise from their importance as cultural landscapes. An example of this is the historic road over Pad se Hoek, where physical remains of the road endure as stone retaining walls, and other physical evidence for the historic passage of people through the area might also be prevalent.

Sites of moderately high cultural significance in the study area include the Wind Heuvel farmstead (KDBc11), with its evidence for **living heritage** in the form of *asboskookskerms* and other *skerm* structures (Figure 5.3.2). The originally proposed Common Access Road 1 from the north passed through the farmstead with likely impacts of **moderate** significance to this resource. This portion of the road has been moved west sufficiently that it doesn't intrude on the farmstead. It is, therefore, anticipated that the significance of impacts to the cultural significance of this site will be **low**. The other sites with living heritage aspects are unlikely to be affected, due in the case of Rooiheuvel (KDB082) to their distance from the road, and in the case of the Tuinplaas Church and Graveyard (KDB083) due to the unlikelihood of significant changes to the road at that point (Figure 5.2.5).

5.4.1.2 Operational Phase

Impacts to **archaeological resources, burial grounds and graves and built environment** are unlikely during the operational phase, as no new areas will be disturbed through operational activities. The significance of impacts without mitigation would, therefore be **very low**. Mitigation should only be to ensure that existing roads are used and no previously undisturbed areas subject to disturbance. With mitigation, impacts will remain of **very low significance**. The realignment proposed for Common Access Road 1 further ensures that the Stadler graveyard at KDB081 is avoided by an appropriate buffer. This realignment ensures that impacts from heavy vehicle traffic for maintenance of turbine locations and roads are unlikely to cause impacts to the graveyard, and the likelihood of significant impacts is **very low**.

Impacts to sites of **living heritage** will be continuous throughout the operational phase as a result of vehicles and personnel on site for maintenance, and the presence of roads, turbines and associated infrastructure in the landscape. Should the mitigation measures recommended below be implemented, the significance of these impacts will, however, remain **low**.

5.4.1.3 Decommissioning Phase

Impacts to **archaeological resources, burial grounds and graves and built environment** are unlikely during the decommissioning phase, as no new areas will be disturbed through decommissioning activities. The significance of impacts without mitigation would, therefore be **very low**. Mitigation should only be to ensure that existing roads are used, and no previously undisturbed areas should be subject to disturbance. With mitigation, impacts will remain **very low**.

Impacts to sites of **living heritage** will be continuous throughout the decommissioning phase as a result of vehicles and personnel on site for turbine dismantling and removal, and the remnants of access roads, and locations of turbines and associated infrastructure in the landscape. It should be noted, however, that any resulting impacts will be of a short duration. Should the mitigation measures recommended above be implemented, the significance of these impacts will, however, remain **low**.

5.4.2 Cumulative Impacts

There are currently multiple applications being made for the development of WEFs in the area surrounding the Kudusberg proposed WEF development site (within a radius of 50 km). Four of these have been approved to commence construction in early 2019 (see Table 1 for a list of these projects, and Figure 3 for the map of their distribution).

Cumulative impacts to the **palaeontological resources** of the region are likely, given the number of WEFs proposed within the Komsberg REDZ, which are all located on the lower Abrahamskraal Formation. In all the relevant field studies conducted for these WEFs, the palaeontological sensitivity and heritage impacts were considered low due to the unlikelihood of impacts on scientifically important, unique or rare fossils (Almond 2018). Provided that the proposed monitoring and mitigation recommendations for these various projects are implemented, their cumulative impact on palaeontological heritage resources - including impacts envisaged for the Kudusberg WEF project – is predicted to be **low**. Unlike with other forms of heritage resources, palaeontological resources can benefit from better research and improved understanding arising from appropriate professional mitigation for these projects, partially counterbalancing unavoidable residual negative impacts. This is regarded as a positive impact for Karoo palaeontological heritage.

Due to the likely **low** impacts to the sparse, low density Stone Age **archaeological heritage** anticipated in this region, the significance of cumulative impacts is similarly expected to be **low**. The significance of cumulative impacts to archaeological built heritage, in the form of stone walling, kraals and ruined stone-built structures, however, is anticipated to be **high** without mitigation. Mitigation, which should include protection and avoidance of these features, can be easily implemented across the wider REDZ and, should that occur, direct cumulative impacts to these features will likely be **very low**.

Burial grounds and graves can occur throughout this region, and are not always easily recognised as graves, making possible impacts to them from cumulative

developments **very high**. These features, both formal graves and stone cairns should be avoided where they are encountered in the landscape, such that the need for relocation does not arise. Should this mitigatory approach be adopted throughout the REDZ, the significance of cumulative impacts to graves will be **low**.

Where significant **built environment** features do occur, these should be avoided, with buffers implemented to protect them from encroachment and impact from roads, infrastructure and turbines which will result in **very high** impacts. No turbines should be placed within 500m of farmsteads. Despite these mitigatory measures, the significance of cumulative impacts to these structures, which are often the only structures in the landscape for many kilometres, will remain **moderate to high**.

Turbines and construction roads, particularly where they are prominently visible along the ridge slopes and ridges, have a cumulative visual impact of **high** negative significance on the highly significant **cultural landscape**. This effect is unavoidably exacerbated in REDZ and is essentially unmitigable. The existence of the REDZ does, however, serve to consolidate infrastructure, limiting impacts to one area, which is preferable to isolated, dispersed installations across the wider region. The vast landscape can potentially accommodate a limited number of wind turbines located in areas of minimal visual intrusion without much negative impact on the scenic value of the landscape. This factor is enhanced by the low numbers of people living in and travelling through the region and therefore experiencing the impacts, while the distances between and within installations reduces the amount of infrastructure visible at any given time. The Visual Impact Assessment (VIA) report indicates that the significance of the cumulative visual impacts on the landscape is of moderate significance

While much attention has been given in previous HIAs to the scenic qualities of the N1 and the R354, the cultural landscape assessment (Rabe Bailey 2018) suggests that the cultural significance of the R356 rivals that of those routes, and that cumulative impacts on the R356 should not be underestimated.

Similarly, cumulative impacts to **living heritage** sites will be unavoidably **high**

without mitigation, with losses including to 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, the significance of these impacts is likely to remain **moderate to high**. Again, here the creation of the REDZ serves to limit the extent of impacts to living heritage to smaller areas, thereby limiting the extent of the damage.

5.4.3 Indirect Impacts

Indirect impacts occur through contextual impacts arising from the intrusion of incompatible structures in the area that can lead to loss of sense of place and negative impacts to the rural cultural landscape and heritage resources within it. Indirect impacts pose the greatest threat to the significance and integrity of the cultural landscape, as it is those contextual impacts that affect the sense of place of the region. The quality of the visual aesthetics of the region is diminished and the integrity of the rural, undeveloped “wilderness” is eroded. In some instances, disruptions to these qualities and processes are temporary and can be undone through rehabilitation of the environment after decommissioning. This infrastructure can, however, leave permanent scarring on the landscape, as well as permanent changes in subjective experiences of the region. This changed perception can be particularly acute when the area is appreciated for its “wilderness” qualities and lack of development or infrastructure. Such impacts to the cultural landscape are difficult to quantify and impossible to mitigate except through avoidance of areas of high significance. Clustering of facilities in an area, as is an inevitable outcome of the establishment of REDZ results in large scale change to the affected landscape but does consolidate this change in a single, confined area, which can be preferable to isolated pockets of intrusion across a wider landscape.

The Kudusberg **cultural landscape** is at **high** risk of impacts during the construction phase, through the introduction of new, industrial, and disproportionately large elements into the largely uninhabited and only marginally transformed cultural landscape. The turbines themselves, as well as the laydown areas, crane pads, construction camps, substations and access roads all serve to erode the aesthetic and scenic qualities of the cultural landscape. These new intrusions also represent a

dramatically new way of using, interacting with and shaping the landscape in an area that has, until now, largely resisted or been impervious to, efforts to transform it. It must be recognised, however, that the site is located within a gazetted REDZ. Four wind farms are approved for construction in early 2019 in close proximity to the proposed Kudusberg facility, and these wind farms will greatly transform the cultural landscape in this region. Kudusberg will contribute to, and compound this change, but consolidation of wind farms in a single area can be viewed as preferable to spreading isolated facilities across the wider landscape. Further to this, viewer receptors in this area are fairly low, and the vast extent of the landscape offers some capacity to absorb and shield the viewer from some of the infrastructure.

Contextual impacts will be experienced during all phases but are most problematic during the operational phase, and will be ongoing for the operational lifetime of the facility, remaining of **high** significance throughout. Indeed, the ongoing visual intrusion created by the WEF infrastructure serves to erode connections to the sense of place and the aesthetic qualities of the landscape continually and increasingly. These indirect impacts to cultural landscapes and visual qualities can only be addressed and moderated through sensitive placement of turbines, roads and infrastructure that aim to minimise the visual intrusion of this infrastructure on the landscape. While the impacts are unavoidable, sensitive design and layout can reduce the significance of these impacts from very high to **high/moderate**.

The decommissioning of WEFs and the rehabilitation of the environment poses an opportunity to remove the impacts on the **cultural landscape** created during the construction and operational phases of these installations. However, the degree to which the “wilderness” aspects of the cultural landscape, as a perception rather than a quantifiable quality, can be reset is impossible to determine. Aspects of the infrastructure, particularly roads and large areas levelled for construction camps, will prove difficult to rehabilitate to their previous condition. Residual risks following decommissioning are therefore **moderate**.

The presence of people and vehicles in the landscape during any of these phases can also pose an indirect impact to resources through intentional and/or accidental

damage and disturbance. Rock art sites are highly vulnerable to damage through graffiti, the lighting of fires and similar activities, while stone-built features in the landscape can attract attention from people who are ignorant of their heritage significance. The rock art cave (KDB045) is sufficiently far from likely areas of high traffic and activity that the likelihood of impacts to it is **low**. The kraals and ruins in the development area are, however, at **moderate** risk of impacts. To prevent such indirect impacts, all site crew need to be informed of the heritage sensitivity of features in the landscape, and any vulnerable sites adjacent to road alignments or construction areas – camps, substations or turbine placements – should be cordoned off and indicated as no-go area. If these measures are implemented, the significance of these impacts can be reduced to **very low**. The influx of people into the area can also have negative indirect impacts on local knowledge (IKS), lifeways and languages, with the threat of impact greatest to less dominant groups. While continuous cultural practices are evident in this region, they appear to be resilient and fairly widely practiced among different echelons of the farming community (i.e, farmers and workers alike), it is **unlikely** that such impacts will arise, and they are likely to be of **low** significance should they be experienced.

Indirect impacts are possible to all tangible heritage resources identified in the study area but are most likely to occur to those either within easy reach of the development activity sites or at greatest risk through visual impacts (Table 2).

5.5 Buffers

The following buffers should be observed around identified heritage resources (Figures 5.4.1 to 5.4.4):

- Graves: no development should be permitted within 50m of graves and cemeteries; existing roads within this buffer should not be altered or widened;
- Cave site (KDB045): construction staff should not be permitted within 200m of the site;
- Farmsteads: no turbines should be located within 500m of farmsteads;
- Kraals, stone walling and ruins > 100 years: construction staff should not be permitted within 100m of these sites and no development should take place within 15m;
- Archaeological finds: no buffers are recommended for the isolated artefacts identified in this survey.

The revised layout 1 adheres to the recommended buffers.

5.6 Mapping of resources

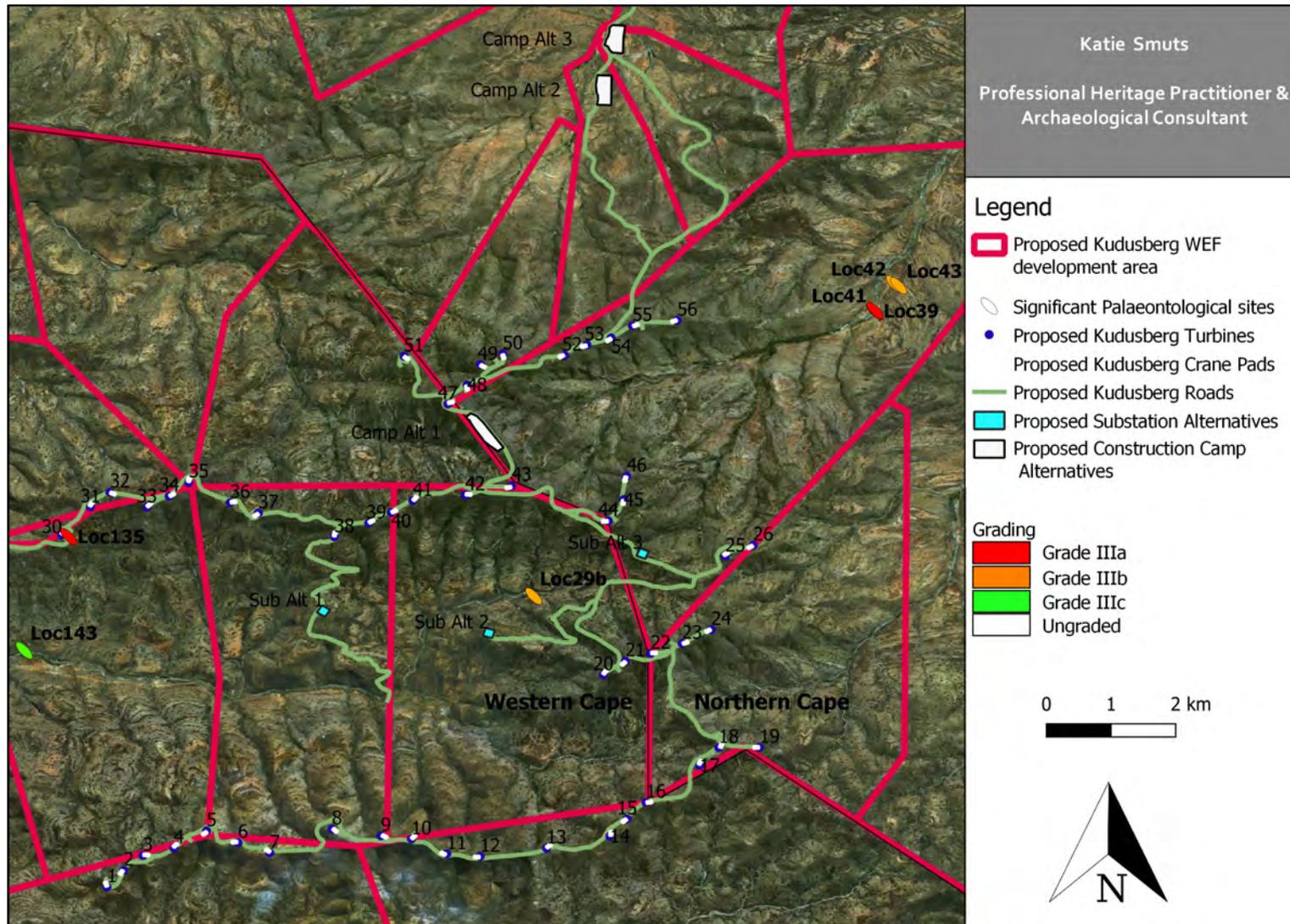


Figure 5.1. High sensitivity palaeontological sites relative to revised layout.

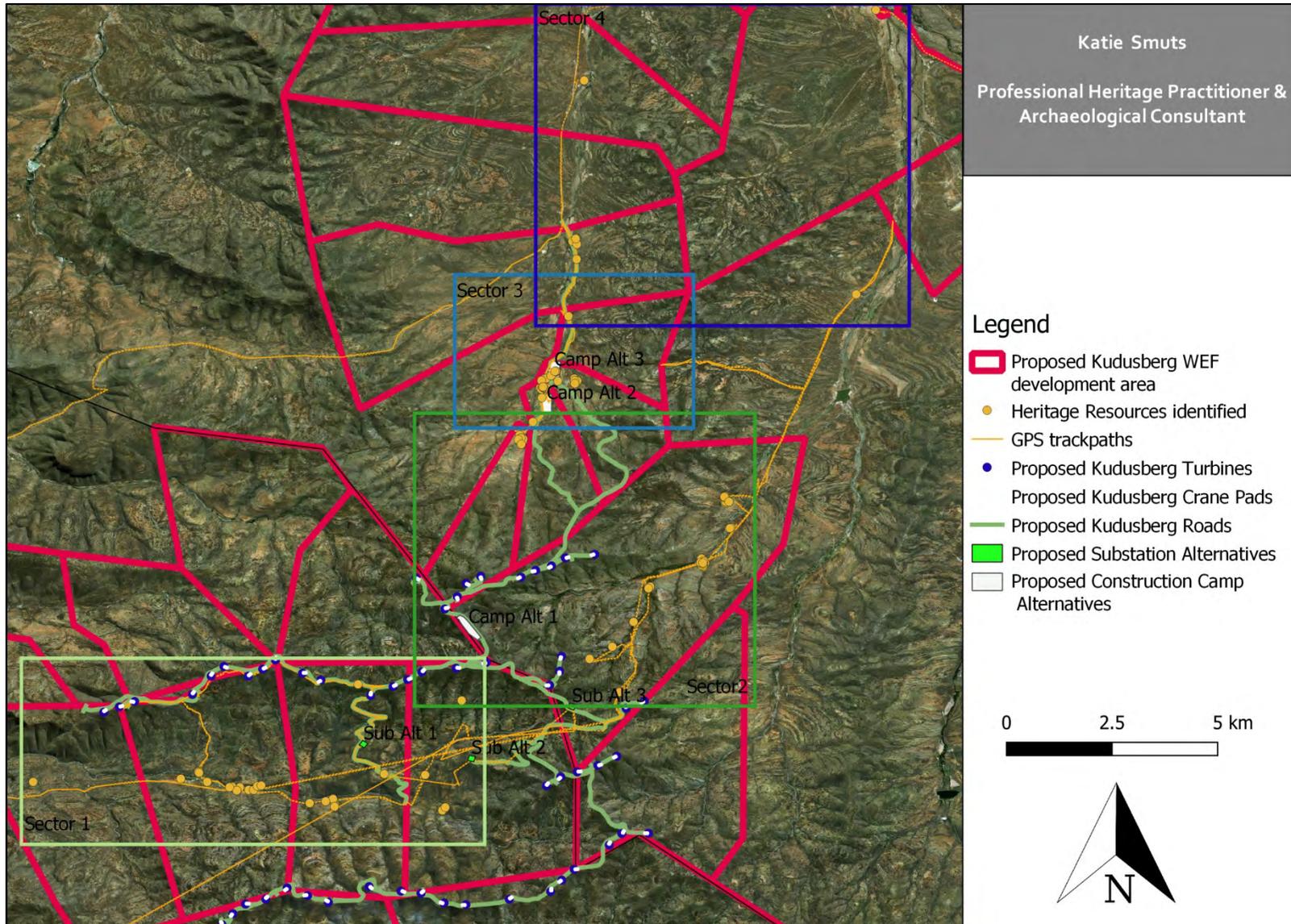


Figure 5.2.1. Trackpaths and identified heritage resources relative to revised infrastructure layout.

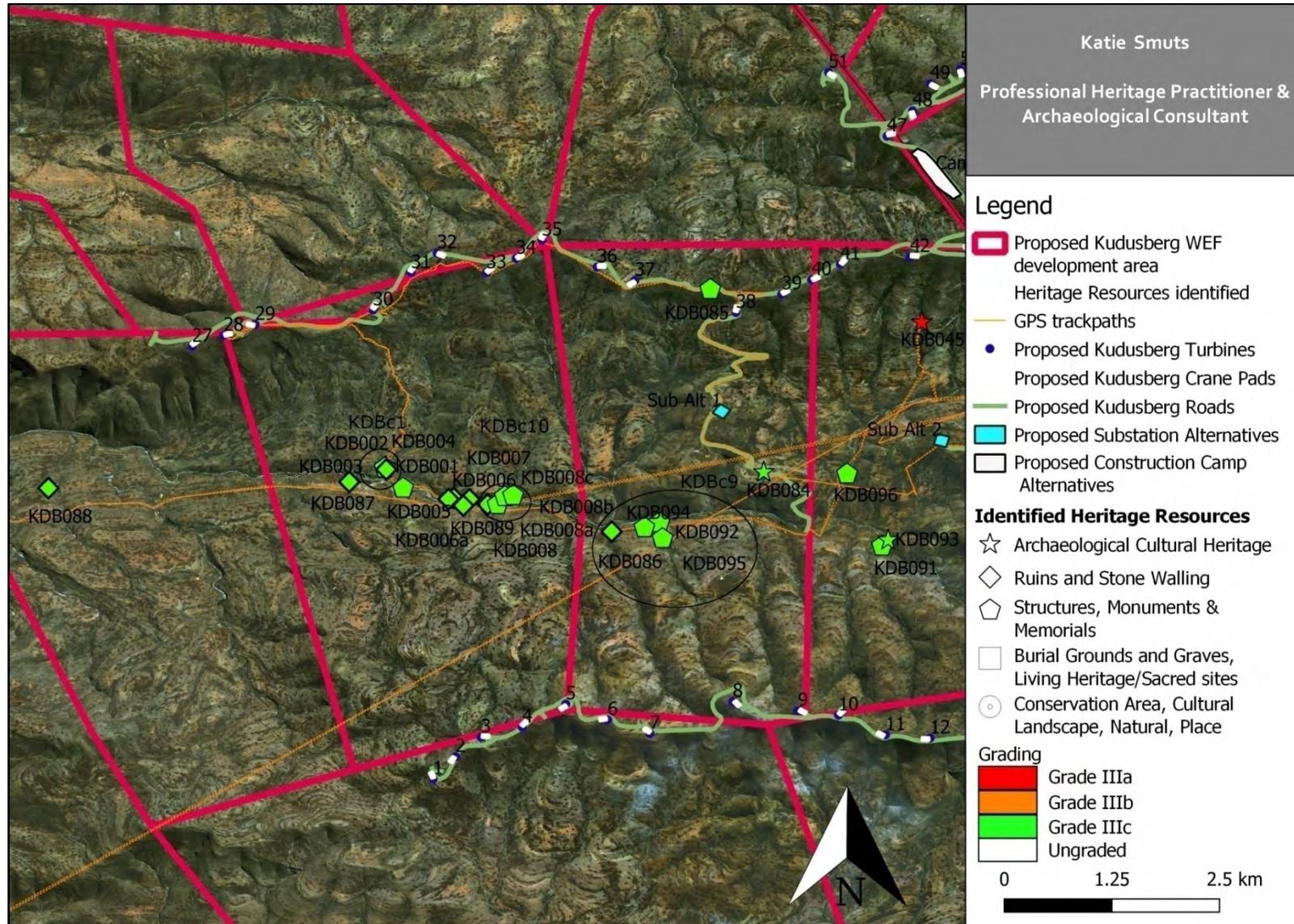


Figure 5.2.2. Heritage resources in Sector 1 Inset Map and relevant site complex numbers; all sites in Western Cape.

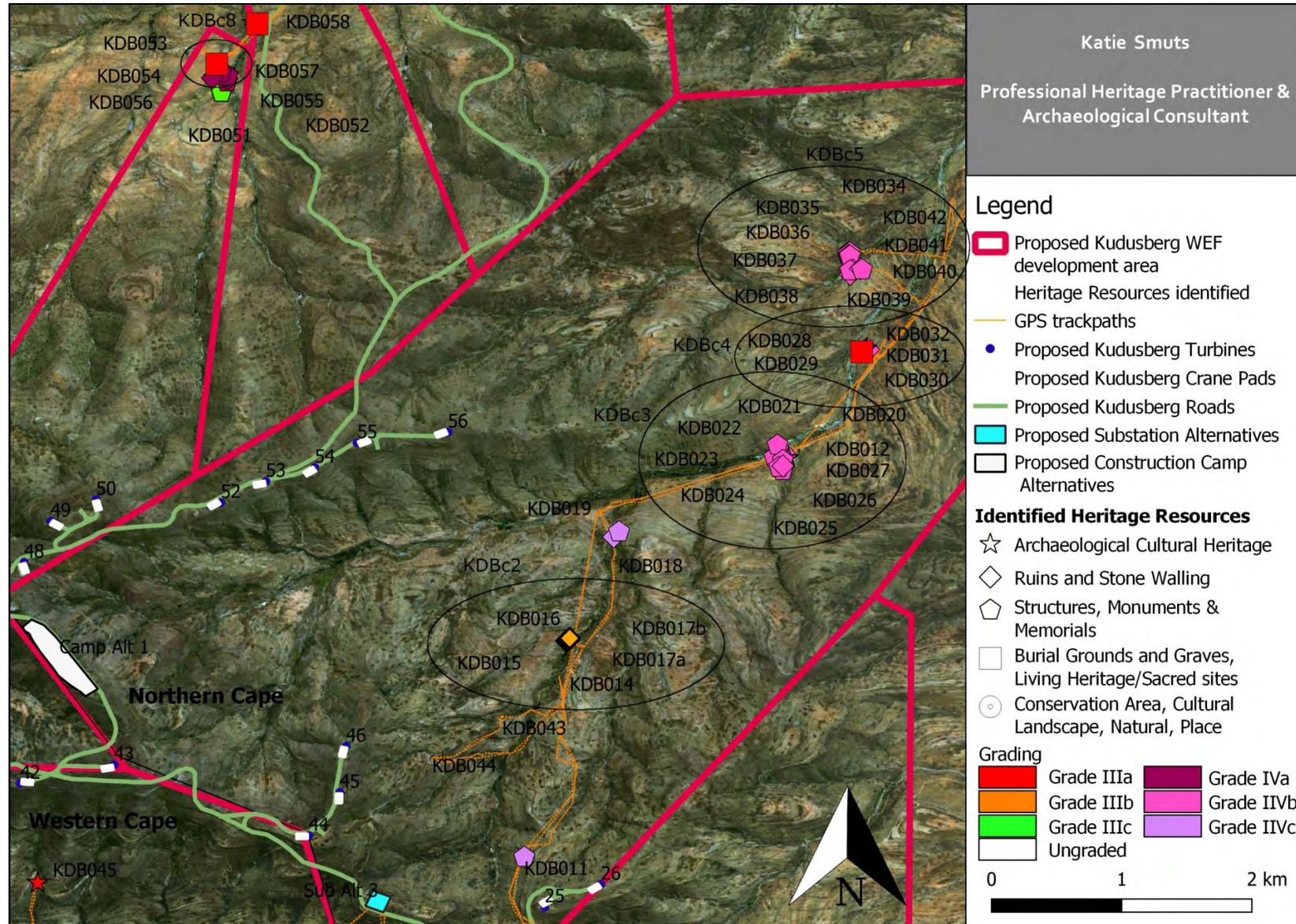


Figure 5.2.3. Heritage resources in Sector 2 Inset Map and relevant site complex numbers; all sites in Northern Cape except KDB045.

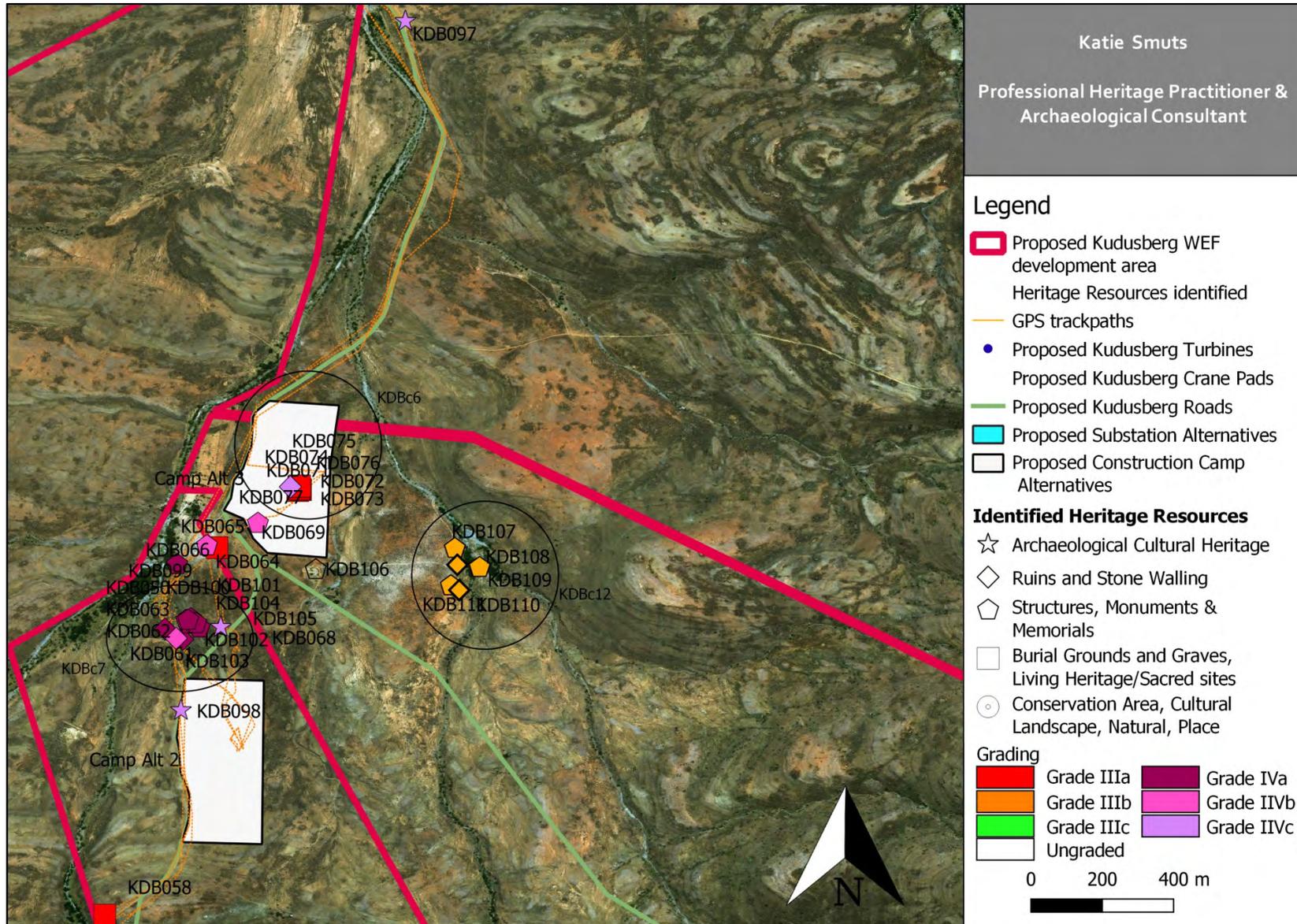


Figure 5.2.4. Heritage resources in Sector 3 Inset Map and relevant site complex numbers; all sites in Northern Cape.

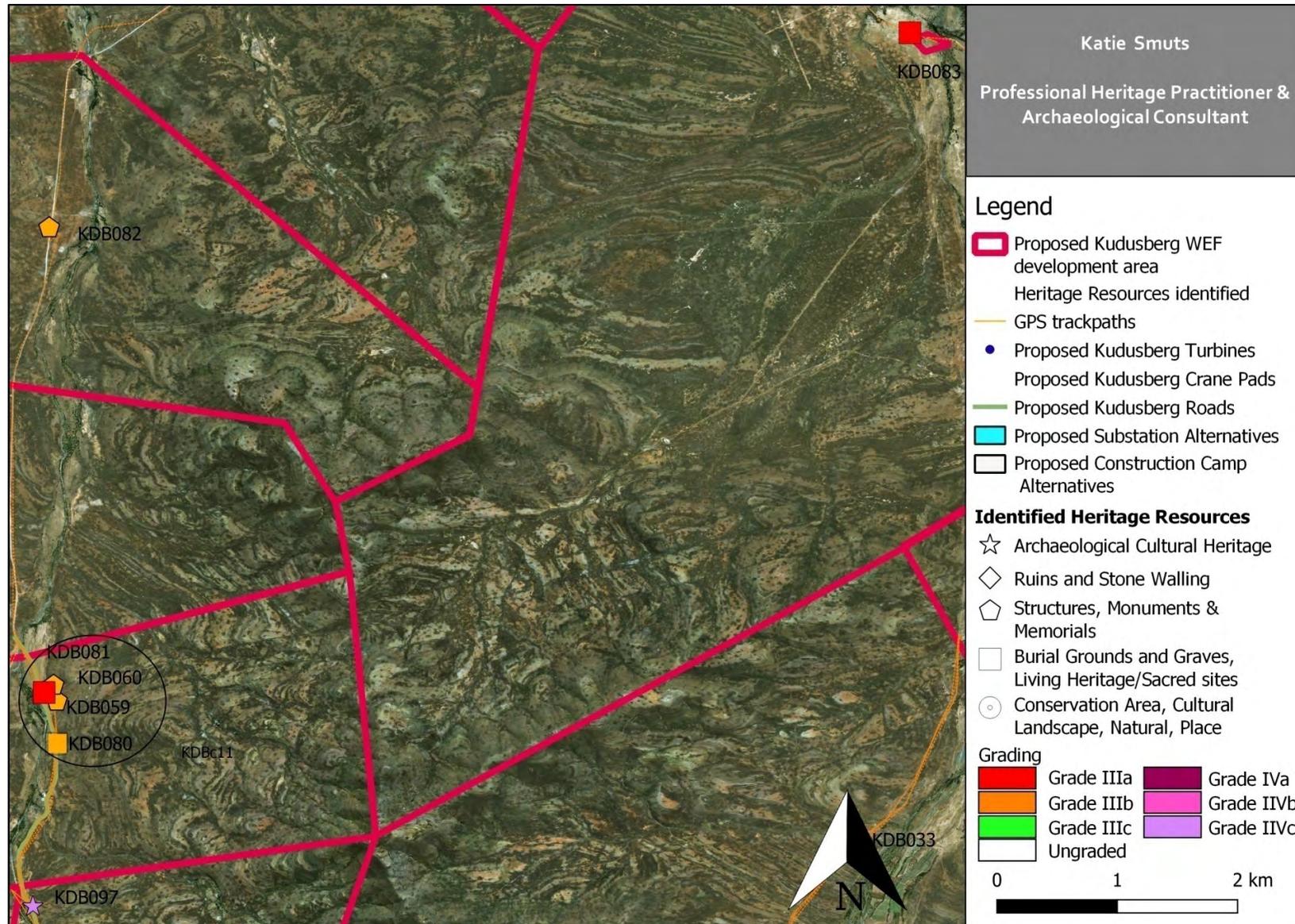


Figure 5.2.5. Heritage resources in Sector 4 Inset Map and relevant site complex numbers; all sites in Northern Cape.

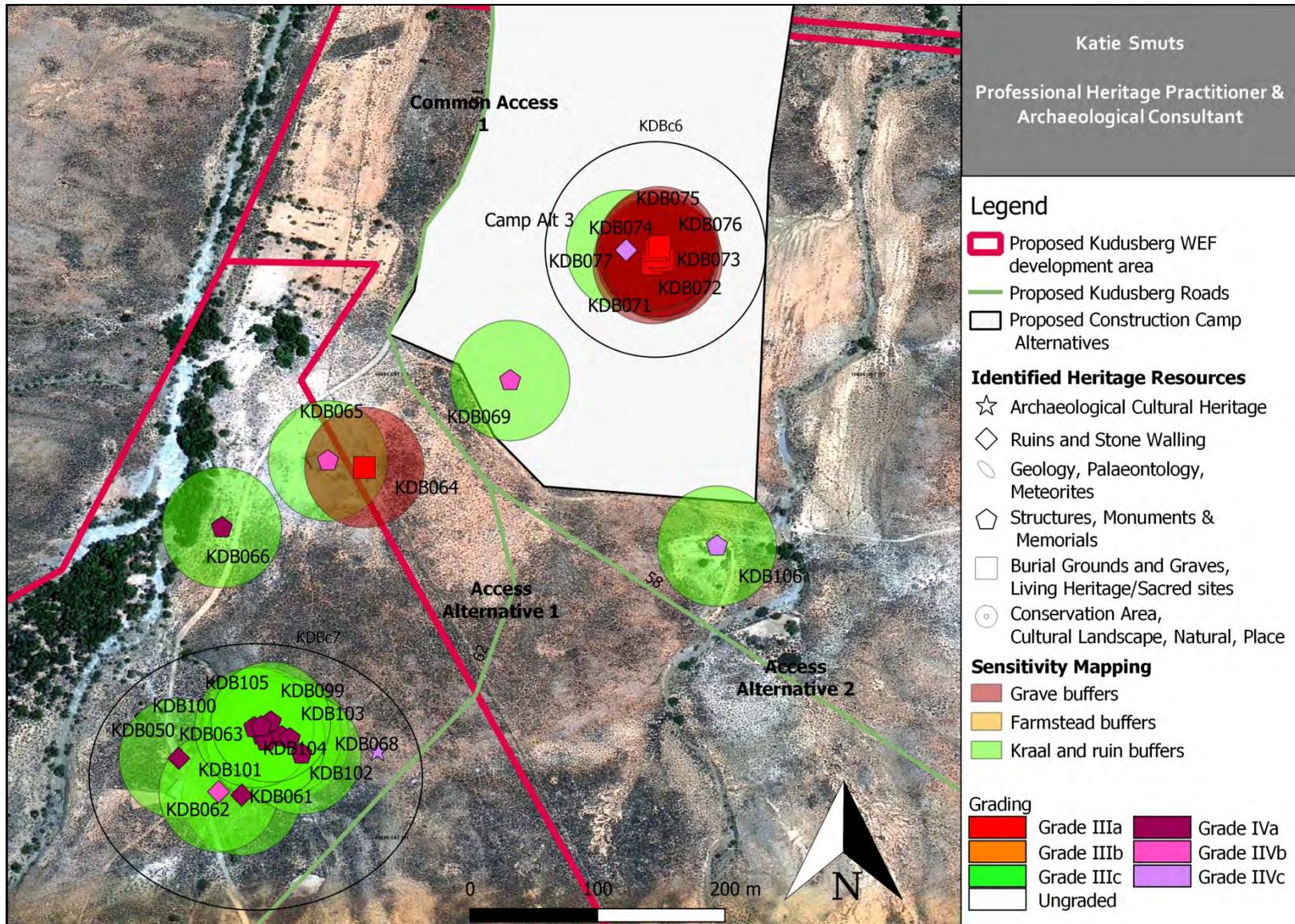


Figure 5.3.1. Proximity of affected heritage resources in Sector 3 (KDB6 and 7) to revised infrastructure layout.

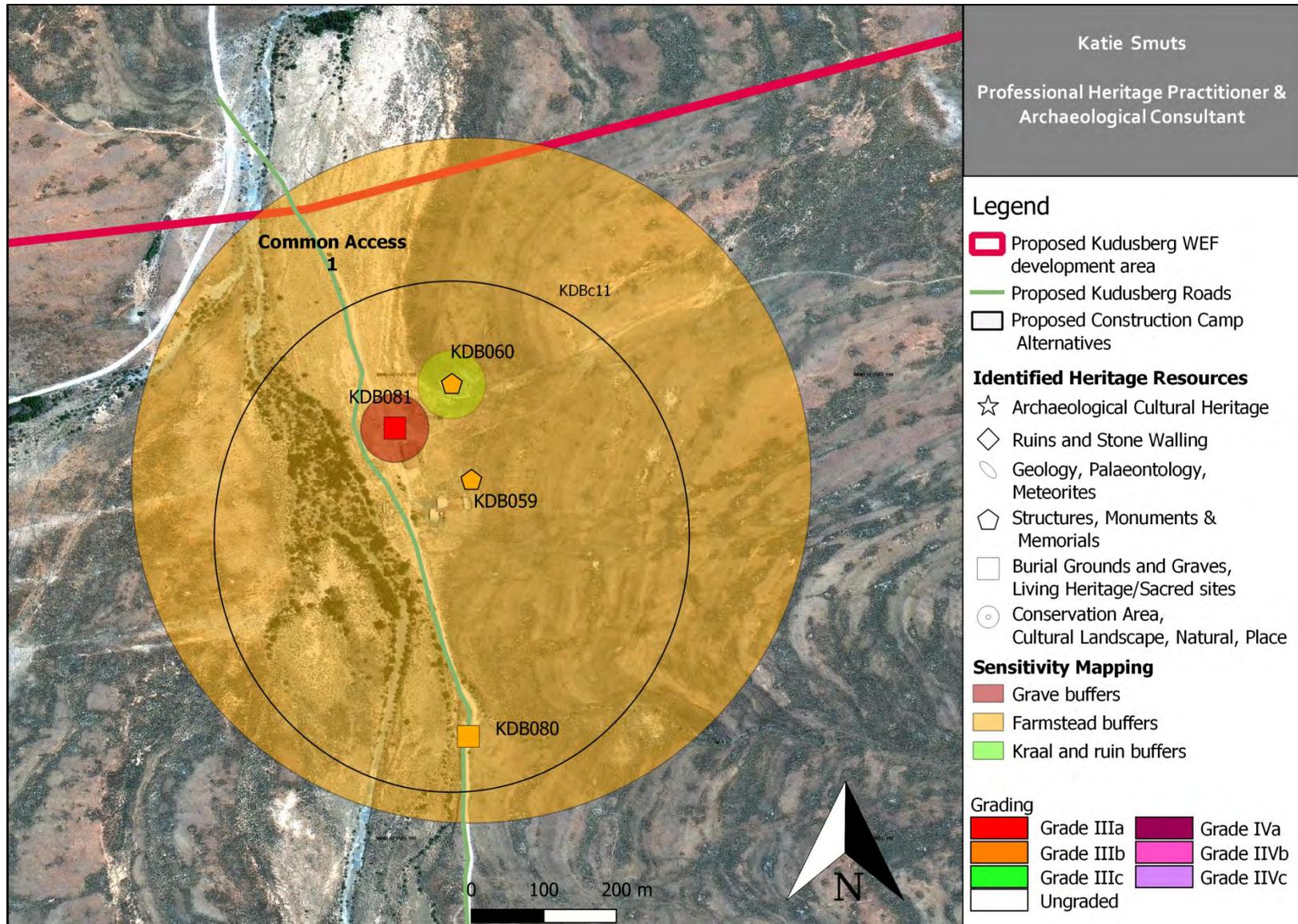


Figure 5.3.2. Map of proximity of affected heritage resources in Sector 4 (KDB11) to revised infrastructure layout.

5.7 Impact tables

Table 3. Impact assessment summary for the Construction Phase

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/risk	Confidence level
HERITAGE															
CONSTRUCTION PHASE															
Direct Impacts															
Construction of access roads, construction camp, substation and turbines	Destruction of palaeontological material, archaeological remains, graves and built environment features	Negative	Local	Permanent	Moderate	Very likely	Non-reversible	High	Low	No	Yes	<ul style="list-style-type: none"> • ECO to conduct checks of surface clearance and excavations >1m for fossil material and report finds to PHRA or SAHRA for recording by professional palaeontologist; • Revised Layout 1 makes Access Alternative 1 preferred choice and Common Access 1 acceptable 	Low	4	Medium

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/risk	Confidence level
												<ul style="list-style-type: none"> Use Construction Camp 2 			
Indirect Impacts															
<ul style="list-style-type: none"> Contextual impacts; Accidental / deliberate damage by people or vehicles 	<ul style="list-style-type: none"> Loss of significance through erosion of visual qualities and integrity of cultural landscape; Destruction of archaeological remains, graves and built environment 	Negative	Local	Permanent	Severe	Very likely	Non-reversible	High	High	No	Yes	<ul style="list-style-type: none"> Placement of turbines and associated infrastructure to observe buffers Inform site crew of heritage sensitivity of landscape Cordon off vulnerable sites as no-go areas 	Moderate	3	Medium

Table 4. Impact assessment summary for the Operational Phase

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/risk	Confidence level
HERITAGE															
OPERATIONAL PHASE															
Direct Impacts															
Operation of the proposed Kudusberg WEF	Destruction of archaeological remains, graves and built environment features	Negative	Local	Permanent	Slight	Unlikely	Non-reversible	High	Very low	Yes	Yes	<ul style="list-style-type: none"> • Use existing roads for maintenance purposes • Keep all disturbance within development footprint 	Very low	5	High
Indirect Impacts															
<ul style="list-style-type: none"> • Contextual impacts; • Accidental / deliberate damage by people or vehicles 	<ul style="list-style-type: none"> • Loss of significance through erosion of visual qualities and integrity of cultural landscape; • Destruction of archaeological remains, graves and built environment 	Negative	Local	Permanent	Severe	Very likely	Non-reversible	High	High	No	Yes	<ul style="list-style-type: none"> • Keep site crew informed of heritage sensitivity of landscape 	Moderate	3	High

Table 5. Impact assessment summary for the Decommissioning Phase

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/risk	Confidence level
HERITAGE															
DECOMMISSIONING PHASE															
Direct Impacts															
Decommissioning of construction camp, substation and turbines	Destruction of archaeological remains, graves and built environment features	Negative	Local	Permanent	Moderate	Unlikely	Non-reversible	High	Low	Yes	Yes	<ul style="list-style-type: none"> • Use existing roads • Keep all disturbance within development footprint 	Very low	5	High
Indirect Impacts															
<ul style="list-style-type: none"> • Contextual impacts; • Accidental / deliberate damage by people or vehicles 	<ul style="list-style-type: none"> • Loss of significance through erosion of visual qualities and integrity of cultural landscape; • Destruction of archaeological 	Negative	Local	Permanent	Moderate	Likely	Non-reversible	High	Low	No	Yes	<ul style="list-style-type: none"> • Keep site crew informed of heritage sensitivity of landscape • Keep vulnerable sites cordoned off as no-go areas 	Low	4	High

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/risk	Confidence level
	remains, graves and built environment														

Table 6. Cumulative impact assessment summary table

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/risk	Confidence level
HERITAGE															
CUMULATIVE IMPACTS															
<ul style="list-style-type: none"> • Construction of access roads, construction camp, substation and turbines • Contextual impacts; • Accidental / deliberate damage by people or vehicles 	<ul style="list-style-type: none"> • Destruction of palaeontological material within the Abrahamskraal Formation, archaeological remains, graves and built environment features (from direct and indirect impacts) • Loss of significance through erosion of visual qualities 	Negative	Local	Permanent	Severe	Very likely	Non-reversible	High	High	No	Yes	<ul style="list-style-type: none"> • ECO or Site Officer reporting to ECO to conduct checks during surface clearance and excavations >1m for fossil material and report finds to PHRA or SAHRA for recording by professional palaeontologist; • Protect and avoid archaeological sites wherever possible; • Avoid graves and graveyards; • Keep turbines 	Moderate	3	Medium

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/risk	Confidence level
	and integrity of cultural landscape											>500m from homesteads			

6 STATEMENT OF SIGNIFICANCE

Section 38(3)b of the NHRA (no. 25 of 1999) requires an assessment of the significance of heritage resources identified in surveys such as this. This task is mediated by the s. 2(vi) of the NHRA, as well as by HWC (2016a, 2016b) and SAHRA (2007) guidelines. Significance, or, more accurately, cultural significance in terms of s. 2(vi) of the NHRA should be assessed with regard to the “aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance” of a resource.

In this area of the SW Karoo the Abrahamskraal Formation fluvial bedrocks, elsewhere of high palaeontological sensitivity, are generally fossil-poor, apart from occasional horizons with plant debris or low-diversity trace fossils. A few examples of large tetrapod (i.e. terrestrial vertebrate) burrows as well as disarticulated skeletal remains (dispersed bones, teeth) recorded from these beds during recent field assessment are of considerable scientific interest but are very rare indeed. Because of the generally sparse occurrence of scientifically important, well-preserved, unique or rare fossil material within the bedrock formations concerned here the **palaeontological sensitivity** of the study area can be considered **low**. The region does not seem to contain either irreplaceable, unique or rare fossil remains, and bedrock deposits are, furthermore, deeply mantled by largely unfossiliferous superficial deposits.

While most of the heritage resources identified in this survey are of low intrinsic heritage significance, that is IIIc in terms of the HWC grading system, or IVb or IVc in terms of the SAHRA system, several sites are worthy of higher grading. All **burial sites** – and in this case, likely burials have been included in this category – have been graded IIIa for their very high cultural significance. Further to this, although it is not likely to be impacted by this development, the shelter with **rock art** and **artefacts** at KDB045 has been graded IIIa for its likely scientific importance as a possible research site.

Little of the **built environment** of this region survives in intact form, and most of the historic structures of interest are in ruins – i.e. archaeological resources, rather than

built environment ones. As such, the built environment significance of the study area is also low. Where these elements show evidence for continuing living heritage, as in the case of Wind HeuvelRe/190 (KDBc11) and Rooiheuvel 170 (KDB082) farmsteads with their *asboskookskerms* incorporated into the current farming traditions, these have been graded as Grade IIIb features. Grade IIIb grading has also been proposed for the stone-built towers at KDBc2. These are unusual features that exhibit a high degree of technological significance due to their careful, meticulous construction. This fact, together with their uncertain use and origins supports a grading that is sufficiently high to ensure their protection.

Cultural landscapes are a significant factor in the evaluation of the impact of proposed development on cultural heritage resources, tangible (eg. Historic settlements, landscapes, technological) and intangible (eg. language, indigenous knowledge systems, oral traditions). The area investigated for the proposed Kudusberg WEF, situated in the Karoo Hoogland Local Municipality and Witzenberg Local Municipality, is considered as having **moderate to high** cultural heritage significance as a cultural landscape, with elements proposed as Grade IIIb and IIIa. With four windfarms approved for development in early 2019, it is likely that this grading would need to be reviewed for those areas within close proximity to these facilities, and therefore experiencing high visual impacts from them. The scenic qualities and heritage significance of the R356, running from Karoopoort to Sutherland, should be considered for recognition as a scenic drive in order to afford it some protection going forward.

7 LEGISLATIVE AND PERMIT REQUIREMENTS

The portion of the study area that falls within the Northern Cape will receive their approval and mitigatory conditions from SAHRA. Should any archaeological or palaeontological mitigation need to be conducted, the qualified specialist appointed to do the work will need to obtain a permit to do so from SAHRA in terms of the relevant section of the NHRA.

The portion of the study area falling within the Western Cape will receive their approval and mitigatory conditions from HWC. Should any archaeological or

palaeontological mitigation need to be conducted, the qualified specialist appointed to do the work will need to submit a workplan for approval by HWC. Once the workplan has been approved, the mitigatory work can be undertaken as stipulated in the workplan.

In both instances, mitigation, whether archaeological or palaeontological is only to be undertaken by appropriately qualified specialists.

8 EVALUATION OF IMPACTS RELATIVE TO SOCIAL AND ECONOMIC BENEFITS

Section 38(3)(d) of the NHRA stipulates that the impacts on heritage resources posed by a given development should be considered relative to the sustainable social and economic benefits to be derived from the development.

This project will be of economic benefit to South Africans generally, through the enhancement of renewable energy sources to feed clean energy into the national grid. At the local level, it is likely that short-term employment opportunities will arise during the construction phase. The socio-economic impact was assessed separately to inform the BA process.

9 CONSULTATION WITH HERITAGE CONSERVATION BODIES

In addition to the Public Participation Process (PPP) that is required as part of the Basic Assessment Process, HWC requires that relevant stakeholders are given an opportunity to comment on the HIA specifically. As there are no Heritage Conservation Bodies with a registered interest in the study area in the Western Cape, the HIA will be submitted to the Witzenberg Local Municipality for comment.

In the Northern Cape, public consultation will be undertaken as part of the wider EIA process.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

This assessment has shown that while there are few significant heritage resources in the study area, the presence of clusters of related structures and features within the landscape holds relatively high significance in some instances.

Of the infrastructural elements surveyed, it is recommended that **Construction Camp Alternative 2 be selected**, as there are no significant heritage resources on that site, and impacts to the Uria's Gat River CLA have been ameliorated in Revised Layout 1. **Construction Camp Alternative 3** will have high impacts on an informal graveyard (KDBc6) and should be considered a **no-go option**. Construction Camp Alternative 1 is at elevation – approximately 1300m a.s.l. – and is therefore it is unlikely to pose an impact to significant heritage resources; this alternative was seen as the least preferred alternative in the Visual Assessment (Gibb 2018).

Of the three substation alternatives, none was found to contain any heritage resources. As no preferences were indicated in the Visual Assessment (Ibid.), no sites are deemed less appropriate from a cultural heritage perspective.

The realignment of Access Road Alternative 1 reduces the previously high impacts on several sites and site clusters, including KDBc6, KDBc7 and KDBc8. These sites are now avoided entirely, and the advised buffers have been adopted to inform the alignment of the proposed roads. As such, **Access Road Alternative 1** is the **preferred access** route. Access Road Alternative 2 is would appear to be devoid of any significant heritage resources, and this route could be used as a viable alternative.

The study area is largely devoid of heritage resources at elevation, and entirely devoid of significant heritage resources above 1200masl. As such, it is not anticipated that turbines located on ridges will negatively impact on heritage resources. This applies to other high lying infrastructure, such as Construction Camp Alternative 1, any of the substations, and access roads at altitudes above that height.

10.2 Recommendations

In summary, recommendations are as follow:

- **Substation Alternative 1** is the **recommended** substation alternative, although Substation Alternatives 2 and 3 are not considered to be a no-go option;
- **Construction Camp 2** is the **recommended** construction camp alternative, although Construction Camp 1 is likely to be an acceptable alternative. **Construction Camp 3 should be considered a no-go option;**
- The realignment of **Access Road Alternative 1** renders it an **acceptable** choice, while Access Road Alternative 2 is likely to be an acceptable alternative. The proposed alignment for Access Road Alternative 2 should be subjected to a walkdown by an archaeologist prior to commencement of development to identify any areas or sites that require protection or mitigation, should it be selected;
- **Common Access Road 1** has been realigned to the east to avoid Wind Heuvel farmstead and is considered an **acceptable** route. The road should not be widened or altered at this point and a proper fence should be erected around the Stadler graveyard (KDB081);
- The following buffers should be observed around identified heritage resources:
 - Graves: no development should be permitted within 50m of identified graves and cemeteries; existing roads within this buffer should not be altered or widened;
 - Cave site (KDB045): construction staff should not be permitted within 200m of the site;
 - Farmsteads: no turbines should be located within 500m of farmsteads;
 - Kraals, stone walling and ruins > 100 years: construction staff should not be permitted within 100m of these sites and no development should occur within 15m of these sites; and
 - Archaeological finds: no buffers are recommended for the isolated artefacts identified in this survey.
- All site crew should be informed of the heritage significance of the resources in the study area, and those sites near development infrastructure, or easily reached (Table 2) should be inspected by the ECO during the construction phase to ensure they are being respected;
- The alignment of the proposed road over the ridge saddle south of Pad se

Hoek close to turbines 25 (-32.870067, 20.376674) and 26 (-32.868236, 20.381335) should be subject to an archaeological walkdown prior to construction;

- The R356 should be put forward for recognition as a scenic route to afford its scenic qualities and historic significance some measure of protection going forward;
- New construction work, construction camps, substations or access roads should not impact negatively or threaten any of the historic built form, which is part of the history and land use evolution of the cultural landscape by observing appropriate buffers around these features;
- If supported in consultation with local inhabitants (of permanent or seasonal habitation, owners or labourers), the negative impact of non-local inhabitants on cultural lifeways and language, employees associated with the new WEF should be reduced by housing the employees away from the CLAs;
- Impact of the proposed WEF on local inhabitants (of permanent and seasonal habitation, owners and labourers) should be monitored by the Holder of the Environmental Authorisation through a grievance mechanism described in the EMP. Such a grievance mechanism should take into account economic and social inequality and be made accessible and known to all inhabitants of the CLAs, not just the land owners. Such a grievance mechanism should be in place for the duration of the development process through to the end of the decommissioning phase;
- The Chance Fossil Finds Protocol (See Appendix 2.2) should be implemented in the event of the discovery of significant new fossils during the construction phase;
- Monitoring of all major surface clearance and deeper (> 1m) excavations for fossil material (bones, teeth, petrified wood, etc.) by the ECO on an on-going basis during the construction phase. Significant fossil finds to be reported to Heritage Western Cape (HWC) (Western Cape sites) or the South African Heritage Resources Agency (SAHRA) (Northern Cape sites) for recording and sampling by a professional palaeontologist;
- If any archaeological material or human burials are uncovered during the course of development, then work in the immediate area should be halted at

once. The find should be reported to the heritage authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.

It is not anticipated that the proposed development will have significant impacts to heritage resources, beyond those to the cultural landscape, given that they are generally of low heritage significance. It is therefore recommended that the project be authorised, subject to implementation of the above recommendations. These recommendations should be included in the Environmental Management Programme (EMPr) and the Environmental Authorisation (EA).

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12 APPENDICES

12.1 Appendix 1: HWC Response to NID - 13 September 2018

Our Ref: HM/CENTRAL KAROO/LAINGSBURG/PORCION 1 OF 156 GATS RIVIER FARM, REMAINDER OF 156 GATS RIVIER FARM, REMAINDER OF 159 OLIVIERSBERG, PORTION 1 OF 159 OLIVIERSBERG, REMAINDER OF 161 MUIHONDRIVIER, ILifa leMveli leNtshona Koleni
REMAINDER OF 395 KLIPBANKS FONTEIN, PORTION 1 OF 158 AMANDELBOOM, Erfenis Wes-Kaap
REMAINDER OF 158 AMANDELBOOM, PORTION 2 OF 156 GATS RIVIER: AND Heritage Western Cape
PORCION 1 OF FARM 157 RIET FONTEIN

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

NOTIFICATION OF INTENT TO DEVELOP: PROPOSED KUDUSBERG WIND ENERGY FARM ON PORTION 1 OF 156 GATS RIVIER FARM, REMAINDER OF 156 GATS RIVIER FARM, REMAINDER OF 159 OLIVIERSBERG, PORTION 1 OF 159 OLIVIERSBERG, REMAINDER OF 161 MUIHONDRIVIER, REMAINDER OF 395 KLIPBANKS FONTEIN, PORTION 1 OF 158 AMANDELBOOM, REMAINDER OF 158 AMANDELBOOM, PORTION 2 OF 156 GATS RIVIER AND PORTION 1 OF FARM 157 RIET FONTEIN, LAINGSBURG, CENTRAL KAROO, SUBMITTED IN TERMS OF SECTION 38(8) OF THE NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

CASE NUMBER: 18071105AS0904E

The matter above has reference.

Heritage Western Cape is in receipt of your application for the above matter received on 04 September 2018. This matter was discussed at the Heritage Officers meeting held on 10 September 2018.

You are hereby notified that, since there is reason to believe that the proposed development will impact on heritage resources, HWC requires that a Heritage Impact Assessment (HIA) that satisfies the provisions of section 38(3) of the NHRA be submitted. This HIA must have specific reference to the following:

- Impacts to archaeological heritage resources
- Impacts to palaeontological heritage resources
- Visual impacts to the cultural landscape

The required HIA must have an integrated set of recommendations.

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

HWC reserves the right to request additional information as required.

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

Yours faithfully


.....
Dr. Mxolisi Dlamuka
Chief Executive Officer, Heritage Western Cape

www.westerncape.gov.za/ces

Street Address: 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 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1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033

12.2 Appendix 2.1: Palaeontological Impact Assessment

SEE ATTACHED DOCUMENT.

12.3 Appendix 2.2: Chance Fossil Finds Protocol

HWC PROCEDURE: CHANCE FINDS OF PALAEOLOGICAL MATERIAL

June 2016

Introduction

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

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

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

Training

Workmen and foremen need to be trained in the procedure to follow in instances of accidental discovery of fossil material, in a similar way to the Health and Safety protocol. A brief introduction to the process to follow in the event of possible accidental discovery of fossils should be conducted by the designated Environmental Control Officer (ECO) for the project, or the foreman or site agent in the absence of the ECO.

It is recommended that copies of the attached poster and procedure are printed out and displayed at the site office so that workmen may familiarise themselves with them and are thereby prepared in the event that accidental discovery of fossil material takes place.

Actions to be taken

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

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

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

- i. The ECO or site agent must ensure that all **work ceases** immediately in the vicinity of the area where the fossil or fossils have been found;
- ii. The ECO or site agent must **inform HWC of the find immediately**. This information must include photographs of the findings and GPS co-ordinates;
- iii. The ECO or site agent must compile a **Preliminary Report and fill in the Fossil Discoveries: HWC Preliminary Record Form** within 24 hours without removing the fossil from its original position. The **Preliminary Report** records basic information about the find including:
 - The date
 - A description of the discovery
 - A description of the fossil and its context (e.g. position and depth of find)
 - Where and how the find has been stored
 - Photographs to accompany the preliminary report (the more the better):
 - A scale must be used
 - Photos of location from several angles
 - Photos of vertical section should be provided
 - Digital images of hole showing vertical section (side);
 - Digital images of fossil or fossils.

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

- v. **Exposed finds must be stabilised where they are unstable and the site capped, e.g. with a plastic sheet or sand bags**. This protection should allow for the later excavation of the finds with due scientific care and diligence. HWC can advise on the most appropriate method for stabilisation.
- vi. If the find cannot be stabilised, **the fossil may be collect with extreme care** by the ECO or the site agent and put aside and protected until HWC advises on further action. Finds collected in this way must be safely and securely stored in tissue paper and an appropriate box. Care must be taken to remove the all fossil material and any breakage of fossil material must be avoided at all costs.

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

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

12.4 Appendix 3: Archaeological Impact Assessment

SEE ATTACHED DOCUMENT.

12.6 Appendix 4: Cultural Landscape Assessment

SEE ATTACHED DOCUMENT.

**PALAEONTOLOGICAL HERITAGE:
Basic Assessment for the Proposed Development
of the 325MW Kudusberg Wind Energy Facility and
associated infrastructure, between Matjiesfontein
and Sutherland in the Western and Northern Cape
Provinces: BA REPORT**

Report prepared for:

CSIR – Environmental Management Services
P O Box 320
Stellenbosch, 7599
South Africa

Report prepared by:

Dr John Almond - Natura Viva cc
P.O. Box 12410, Mill Street
Cape Town, 8010
South Africa

October 2018

SPECIALIST EXPERTISE

Dr John Almond 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. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape, Limpopo, Northwest, Gauteng, KwaZulu-Natal and the Free State under the aegis of his Cape Town-based company *Natura Viva* cc. He has served as a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

SPECIALIST DECLARATION

I, **Dr John Edward Almond**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- 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 have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realize that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

John E. Almond

Signature of the specialist:

Name of Specialist: **Dr John Edward Almond**

Date: **24 August 2018**

EXECUTIVE SUMMARY

Kudusberg Wind Farm (Pty) Ltd, is proposing to develop a wind energy facility (WEF) of up to 325 megawatt (MW) generation capacity on a site located between Matjiesfontein and Sutherland in the mountainous Klein Roggeveld region, Western and Northern Cape Provinces. The WEF project area is underlain by continental sediments of the Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) of Middle Permian age (c. 256-270 Ma) which are generally considered to be of high palaeontological sensitivity (SAHRA Palaeotechnical Report for the Northern Cape, SAHRIS website, Komsberg REDZ in SEA for Wind & Solar Photovoltaic Energy in South Africa, CSIR 2015). However, several previous palaeontological field assessments in the Klein Roggeveld region of the south-western Karoo as well as the recent 6-day palaeontological field survey of the Kudusberg WEF project area suggest that the Beaufort Group bedrocks here are generally fossil-poor, apart from fairly common horizons with plant debris or low-diversity invertebrate trace fossils. None of the fossil sites recorded during the field survey lie within the proposed development footprint. They include two plant fossil sites and one lungfish burrow site that are of scientific research interest as well as a few *equivocal* records of vertebrate burrows and tracks.

In terms of palaeontological heritage resources, the overall impact significance of the construction phase of the proposed wind energy facility is assessed as **VERY LOW (negative), before and after mitigation**. This assessment applies to the wind turbine locations, laydown areas, internal and external access roads, the on-site substation, construction yards, underground cables, 33 kV powerlines and associated WEF infrastructure within the study area.

Given the similar underlying geology, there are no preferences on palaeontological heritage grounds for any particular layout among the various options under consideration. These include different options for routing of access roads into the northern sector of the project area, turbine layouts and siting of construction yards and the on-site substation. No significant further impacts on fossil heritage are anticipated during the operational and decommissioning phases of the WEF. The no-go alternative (*i.e.* no WEF development) will have a neutral impact on palaeontological heritage.

There are no fatal flaws in the Kudusberg WEF development proposal as far as fossil heritage is concerned. *Provided that* the recommendations for palaeontological monitoring and mitigation outlined below are followed through, there are no objections on palaeontological heritage grounds to authorisation of the Kudusberg WEF project. Cumulative impacts on palaeontological heritage resources that are anticipated as a result of the numerous alternative energy developments currently proposed or authorised for the Klein-Roggeveld region (including additional impacts envisaged for the Kudusberg WEF project) are predicted to be very low (negative), *provided that* the proposed monitoring and mitigation recommendations made for these various projects are followed through. Unavoidable residual negative impacts (low significance) may be partially offset by the improved understanding of Karoo palaeontology resulting from appropriate professional mitigation. This is regarded as a significant *positive* impact for Karoo palaeontological heritage.

The great majority of the Kudusberg WEF project area is assessed as being of low palaeontological sensitivity due to the scarcity of significant fossil vertebrate, plant and other remains here. Sensitive no-go areas within the proposed development footprint itself have not been identified in this study. Scientifically-important fossil plant and lung fish burrow sites as well as the *equivocal* vertebrate burrows and tracks recorded here all lie well outside (> 50 m) the proposed development footprint (Appendix 1 and Figs. 51 & 52) and therefore no mitigation measures regarding them are recommended here. Pending the potential discovery of significant new fossil remains during the construction phase - in which event the Chance Fossil Finds Protocol appended to this report should

be applied (Appendix 2) – no specialist palaeontological mitigation or monitoring is recommended for the Kudusberg WEF project.

The Environmental Site Officer (ESO) responsible for the Kudusberg WEF development should be made aware of the potential occurrence of scientifically-important fossil remains (e.g. vertebrate bones, teeth, burrows and trackways, petrified wood, plant-rich beds) within the development footprint. During the construction phase all major clearance operations (e.g. for new access roads, turbine placements) and deeper (> 1 m) excavations should be monitored for fossil remains on an on-going basis by the Environmental Site Officer. Should substantial fossil remains be encountered at surface or exposed during construction, the Environmental Site Officer should safeguard these, preferably *in situ*. They should then alert the relevant provincial heritage management authority as soon as possible - i.e. Heritage Western Cape for the Western Cape (Contact details: Protea Assurance Building, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 086-142 142. Fax: 021-483 9842. Email: hwc@pgwc.gov.za) and SAHRA for the Northern Cape (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). This is to ensure that appropriate action (i.e. recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the developer's expense. A protocol for Chance Fossil Finds is appended to this report. These mitigation recommendations must be incorporated into the Environmental Management Programme (EMPr) for the Kudusberg WEF.

LIST OF ABBREVIATIONS

amsl	Above mean sea level
BA	Basic Assessment
DEA	Department of Environmental Affairs
EMPR	Environmental Management Programme
ESO	Environmental Site Officer
Ga	Billion years ago / old
HWC	Heritage Western Cape
Ma	Million years ago / old
PIA	Palaeontological impact assessment
REDZ	Renewable Energy Development Zone
SAHRA	South African Heritage Resources Agency
SEA	Strategic Environmental Assessment
WEF	Wind Energy Facility

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Addressed in the Specialist 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	P1
ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	P2
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 1.1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 1.3, 1.6
d) the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.1
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.1
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 1.3, 1.6
g) an identification of any areas to be avoided, including buffers;	Section 1.6
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;	Figs 11, 51
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.1
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;	Section 1.3, 1.6
k) any mitigation measures for inclusion in the EMPr;	Section 1.7
l) any conditions for inclusion in the environmental authorisation;	Section 1.6, 1.9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 1.6, 1.9
n) a reasoned opinion-	
i. as to whether the proposed activity, activities or portions thereof should be authorised;	
(iiA) regarding the acceptability of the proposed activity or activities; and	Section 1.9
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;	
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Any relevant comments received on the DBAR will be incorporated in the finalised report
q) any other information requested by the competent authority.	n/a
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.	

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1 PALAEOLOGICAL HERITAGE

1.1 INTRODUCTION AND METHODOLOGY

1.1.1 Scope and Objectives

The present report represents a Palaeontological Heritage Impact Assessment (PIA) undertaken as part of a Basic Assessment Process required for the proposed development of the 325 MW Kudusberg Wind Energy Facility near Sutherland in the Northern and Western Cape Provinces. This Basic Assessment Process is being co-ordinated by the CSIR, Stellenbosh (Contact details: Ms Minnelise Levendal. CSIR, Implementation Unit (Environmental Management Services) PO Box 320 Stellenbosch 7599. Tel: + 27-21 888-2495. Cell: 083 309 8159. Fax: 021-888 2693. E-mail: mlevendal@csir.co.za). The PIA forms a component of the multi-disciplinary Heritage Impact Assessment for the WEF development that is being co-ordinated by Ms Katie Smuts (Contact details: Caledon Street, Stanford Tel: 072 796 7754 Email: katie.smuts@gmail.com).

1.1.2 Terms of Reference

As defined by the CSIR, the Terms of Reference for the present PIA study, as a component of the overarching Heritage Impact Assessment of the Kudusberg WEF project, are as follows:

General ToR:

- A key task for the specialists is to review the existing sensitivity mapping from the SEA for the project area and provide an updated sensitivity map for the Kudusberg WEF project site.
- Adhere to the requirements of specialist studies in terms of Appendix 6 of the NEMA EIA Regulations (2014), as amended.
- Identify and assess the potential impacts of the proposed Kudusberg WEF project and its associated infrastructure by assessing the impacts during the construction, operational and decommissioning phases.
- Identify and assess cumulative impacts from other Wind and Solar PV projects located within a 50 km radius from the Kudusberg WEF that already have received Environmental Authorisation (EA), are preferred bidders and/or may still be identified as having received a positive Environmental Authorisation at the start of this BA process.
- Propose mitigation measures to address possible negative effects and to enhance positive impacts to increase the benefits derived from the project.
- Use the Impact Assessment Methodology as provided by the CSIR.
- Assess the project alternatives and the no-go alternative.
- Provide a recommendation as to whether the project must receive Environmental Authorisation of not and identify any aspects which are conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation.

Specific ToR:

- Describe and map the palaeontological heritage features of the site and surrounding area. This is to be based on desk-top reviews, fieldwork, available databases, findings of the Wind and Solar SEA (CSIR, 2015) and findings from other palaeontological heritage studies in the area, where relevant. Include reference to the grade of heritage feature and any heritage status the feature may have been awarded.
- Assess the impacts and provide mitigation measures to include in the environmental management plan.
- Map palaeontological heritage sensitivity for the site. Clearly show any “no-go” areas in terms of heritage (*i.e.* “very high” sensitivity) and provide recommended buffers or set-back distances.
- Identify and assess potential impacts from the project on palaeontology, as required by heritage legislation

1.1.3 Approach and Methodology

The PIA for the proposed Kudusberg WEF is based on geological and palaeontological data acquired (1) during a preliminary desktop analysis of the broader study region combined with (2) a 6-day field survey of key sectors of the project area by the palaeontologist (Dr Almond) and an experienced field assistant, focusing on potentially fossiliferous sites with informative bedrock exposure.

In preparing a palaeontological desktop study the potentially fossiliferous rock units (groups, formations, etc.) represented within the study area are determined from geological maps and satellite images. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience (consultation with professional colleagues as well as examination of institutional fossil collections may play a role here, or later following scoping during the compilation of the final report). This data is then used to assess the palaeontological sensitivity of each rock unit to development (provisional tabulations of palaeontological sensitivity of all formations in the Western and Northern Cape have already been compiled by J. Almond and colleagues; e.g. Almond & Pether 2008a, 2008b) and are shown on the palaeosensitivity map on the SAHRIS (South African Heritage Resources Information System) website. The likely impact of the proposed development on local fossil heritage is then determined based on (1) the palaeontological sensitivity of the rock units concerned and (2) the nature and scale of the development itself, most notably the extent of fresh bedrock excavation and ground clearance envisaged. When rock units of moderate to high palaeontological sensitivity are present within the development footprint – as in the present case - a field assessment study by a professional palaeontologist is usually warranted.

The focus of palaeontological field assessment is not simply to survey the development footprint or even the development area as a whole (e.g. farms or other parcels of land concerned in the development). Rather, the palaeontologist seeks to assess or predict the diversity, density and distribution of fossils within and beneath the study area, as well as their heritage or scientific interest. This is primarily achieved through a careful field examination of one or more representative exposures of all the sedimentary rock units present (*N.B.* Metamorphic and igneous rocks rarely contain fossils). The best rock exposures are generally those that are easily accessible, extensive, fresh (*i.e.* unweathered) and include a large fraction of the stratigraphic unit concerned (e.g. formation). These exposures may be natural or artificial and include, for example, rocky outcrops in stream or river banks, cliffs, quarries, dams, *dongas*, open building excavations or road and railway cuttings. Uncemented superficial deposits, such as alluvium, scree or wind-blown sands, may occasionally contain fossils and should also be included in the field study where they are well-represented in the study area. It is normal practice for impact palaeontologists to collect representative, well-localized (e.g. GPS and stratigraphic data) samples of fossil material during field assessment studies. To do so, a fossil collection permit from SAHRA is required and all fossil material collected must be properly curated within an approved repository (usually a museum or university collection).

Note that while fossil localities recorded during field work within the study area itself are obviously highly relevant, most fossil heritage here is embedded within rocks beneath the land surface or obscured by surface deposits (soil, alluvium, etc.) and by vegetation cover. In many cases where levels of fresh (*i.e.* unweathered) bedrock exposure are low, the hidden fossil resources must be inferred from palaeontological observations made from better exposures of the same formations elsewhere in the region but outside the immediate study area. Therefore, a palaeontologist might reasonably spend far more time examining road cuts and borrow pits close to, but outside, the study area than within the study area itself. Field data from localities even further afield (e.g. an adjacent province) may also be adduced to build up a realistic picture of the likely fossil heritage within the study area.

Based on the desktop and field studies, the likely impact of the proposed development on local fossil heritage and any need for specialist mitigation are then determined. Adverse palaeontological impacts normally occur during the construction rather than the operational or decommissioning phase. Mitigation by a professional palaeontologist – normally involving the recording and sampling of fossil material and associated geological information (e.g. sedimentological and taphonomic data) – is usually most effective during the preconstruction phase or, in some cases in the construction phase when fresh fossiliferous bedrock has already been exposed by excavations. To carry out mitigation, the palaeontologist involved will need to apply for a palaeontological collection permit from the relevant heritage management authority. In the present case the authorities concerned are Heritage Western Cape for the Western Cape

(Contact details: Protea Assurance Building, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 086-142 142. Fax: 021-483 9842. Email: hwc@pgwc.gov.za) and SAHRA for the Northern Cape (Contact details: South African Heritage Resources Agency. Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). It should be emphasized that, *provided that* appropriate mitigation is carried out, most developments involving bedrock excavation can make a positive contribution to our understanding of local palaeontological heritage.

1.1.4 Assumptions and Limitations

The accuracy and reliability of palaeontological specialist studies as components of heritage impact assessments are generally limited by the following constraints:

1. 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.
2. 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 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.
3. Inadequate sheet explanations for geological maps, with little or no attention paid to palaeontological issues in many cases, including poor locality information;
4. 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;
5. Absence of a comprehensive computerized 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. In the present case, site visits to the various loop and borrow pit study areas in some cases considerably modified our understanding of the rock units (and hence potential fossil heritage) represented there.

In the case of the present study area in the Klein Roggeveld region near Sutherland (Western and Northern 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 their palaeontological sensitivity (See Appendix 1), 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.

1.1.5 Source of Information

This combined desktop and field-based palaeontological assessment report is based on:

- (1) A short project outline and kmz data provided by the CSIR;
- (2) A review of the relevant scientific literature, including several previous palaeontological impact assessments in the broader Klein Roggeveld – Sutherland region (See References and discussion about cumulative impacts in Section 1.6);
- (3) Published topographical and geological maps (1: 250 000 Sheet 3320 Sutherland) and accompanying sheet explanations (Theron 1983, Cole & Vorster 1999) as well as Google Earth® satellite imagery;
- (4) A six-day field study of the Kudusberg WEF study area (17-20 July and 4 -6 August 2018);
- (5) The author's extensive field experience with the formations concerned and their palaeontological heritage (*cf* References under Almond).

1.2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO PALAEOLOGICAL HERITAGE IMPACTS

Kudusberg Wind Farm (Pty) Ltd is proposing to construct up to a 325 MW Wind Energy Facility (WEF) at a site to the west of the R354 between Sutherland and Matjiesfontein known as Kudusberg. The site is situated in the mountainous Klein Roggeveld region of the Great Karoo, RSA (Figs. 1 to 4) and site spans the boundary between the Western Cape and Northern Cape (Cape Winelands and Namakwa District Municipalities respectively). It comprises several adjoining land parcels, as shown in map Figure 4 below. The proposed WEF will be located within the Renewable Energy Development Zone 2 (REDZ 2), known as the Komsberg REDZ that was published in terms of Section 24(3) of the National Environmental Management Act, 1998 (NEMA) in GN R114 of 16 February 2018. The REDZs were identified through a Strategic Environmental Assessment (SEA) conducted by the Council for Scientific and Industrial Research (CSIR) with palaeontological sensitivity data contributed by the present author (Almond *in* Fourie *et al.* 2015).

A Basic Assessment (BA) Process, contemplated in terms of Regulation 19 and 20 of the Environmental Impact Assessment Regulations, 2014, is required to obtain Environmental Authorisation for this large-scale WEF, as required in terms of NEMA.

The various farms concerned with the Kudusberg WEF total c. 13 000 ha in area, of which the WEF will involve some 200 ha (Fig. 4). The main infrastructural components of the WEF of particular relevance to the present palaeontological heritage study (Figs. 2 & 3) include:

- Up to 56 wind turbines of 3 to 6.5 MW generation capacity that will be situated along ridges within turbine corridors. The footprint of each wind turbine, including foundations & hard standing areas, is c. 90 m x 50 m (total footprint for 56 turbines = 25.2 ha) during construction and for ongoing maintenance purposes for the lifetime of the turbines.
- Internal access roads (up to 12 m wide), including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 82.44 ha. Existing roads to be used will be upgraded / extended where needed.
- Electrical transformers (690 V/33 kV) adjacent to each turbine (2 m x 2 m, up to 10 m x 10 m) to step up the voltage to 33 kV.
- Underground 33 kV cabling between turbines to be buried along access roads, where feasible, with overhead 33 kV lines grouping turbines to cross valleys and ridges outside of the road footprints to reach the onsite 33/132 kV substation.
- On-site 33/132 kV substation (footprint c. 2.25 ha) (3 site options under consideration).
- Construction yard/s with an area of c. 12.6 ha which includes an on-site concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase (3 site options under consideration).
- Minor improvements (e.g. upgrading of water crossings, widening of intersections) to the access route to the project area from the R354 Matjiesfontein – Sutherland tar road in the east *via* the unpaved R356 road leading to the main WEF access road (MN04469/OG51) which branches off towards the south. Two 4-6 km long access road alternatives branching off the MN04469 are under consideration.

The assessments, conclusions and recommendations made in this PIA report apply to the *revised* layout of the Kudusberg WEF (October 2018) as shown in Figure 3. None of the small changes in proposed layout made since the originally proposed layout – largely involving the siting of several crane pads and turbines, the layout of construction camps and re-routing of common access road – affect the assessments, conclusions and recommendations made in the draft PIA report of August 2018.

It is noted that the connection of the proposed WEF to the National Grid via 132 kV transmission lines will be the subject of a separate BA process.

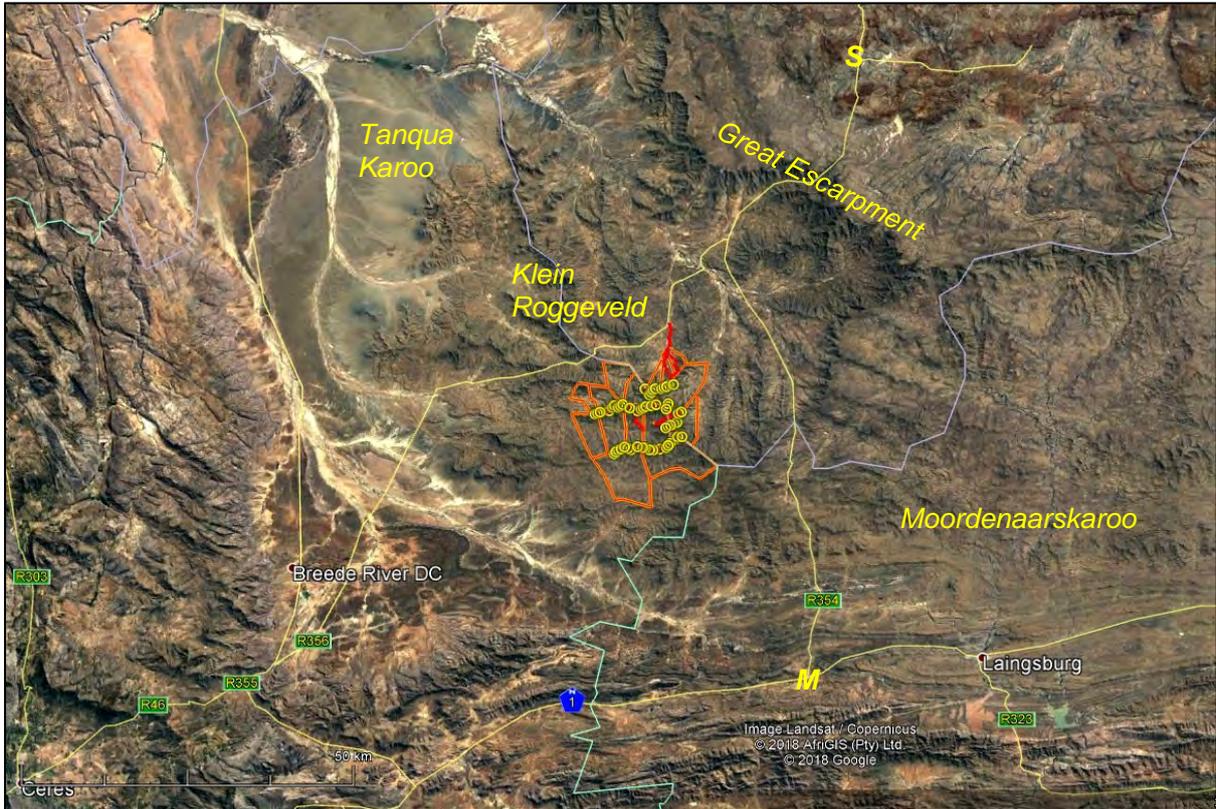


Figure 1. Google Earth© satellite image of the south-western Karoo showing the location of the proposed Kudusberg WEF (orange polygon) in the mountainous Klein Roggeveld region lying between the Cape Fold Belt and the Great Escarpment (Sutherland – S; Matjiesfontein - M). Note that the WEF project area spans the boundary between the Western and Northern Cape (dark blue line). N towards the top of the image.

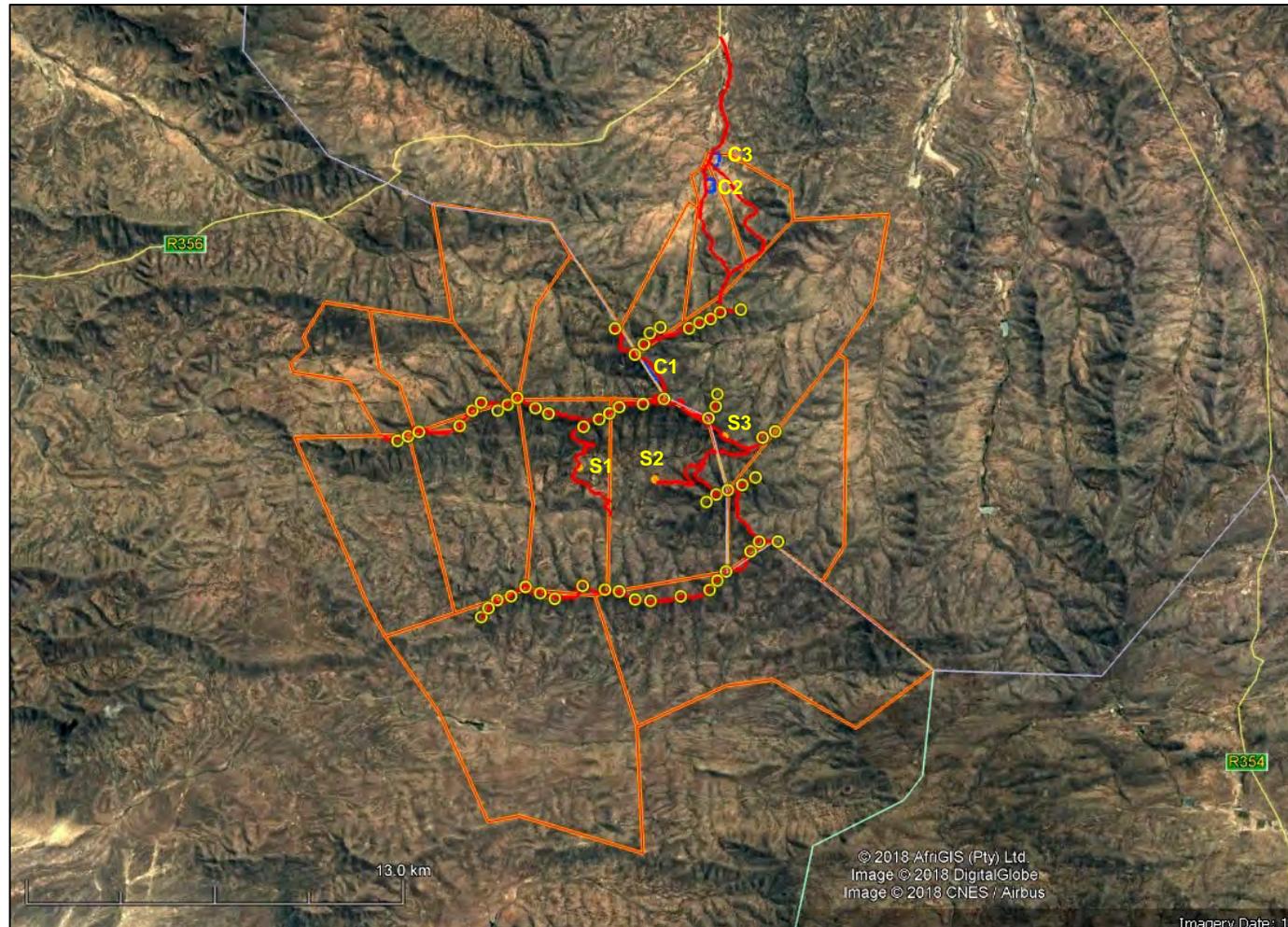


Figure 2. Google Earth© satellite image of the Kudusberg WEF project area (orange polygons outlining constituent land parcels) showing the highly-dissected, mountainous terrain here. Also shown is a provisional layout for the turbine positions (yellow circles) and internal and external access roads (red). Location options under consideration for the on-site substation (S1-3, orange) and construction camp (C1-3, blue) are also indicated. Details of the revised project layout (October 2018) are shown in Figure 3. N towards the top of the image.

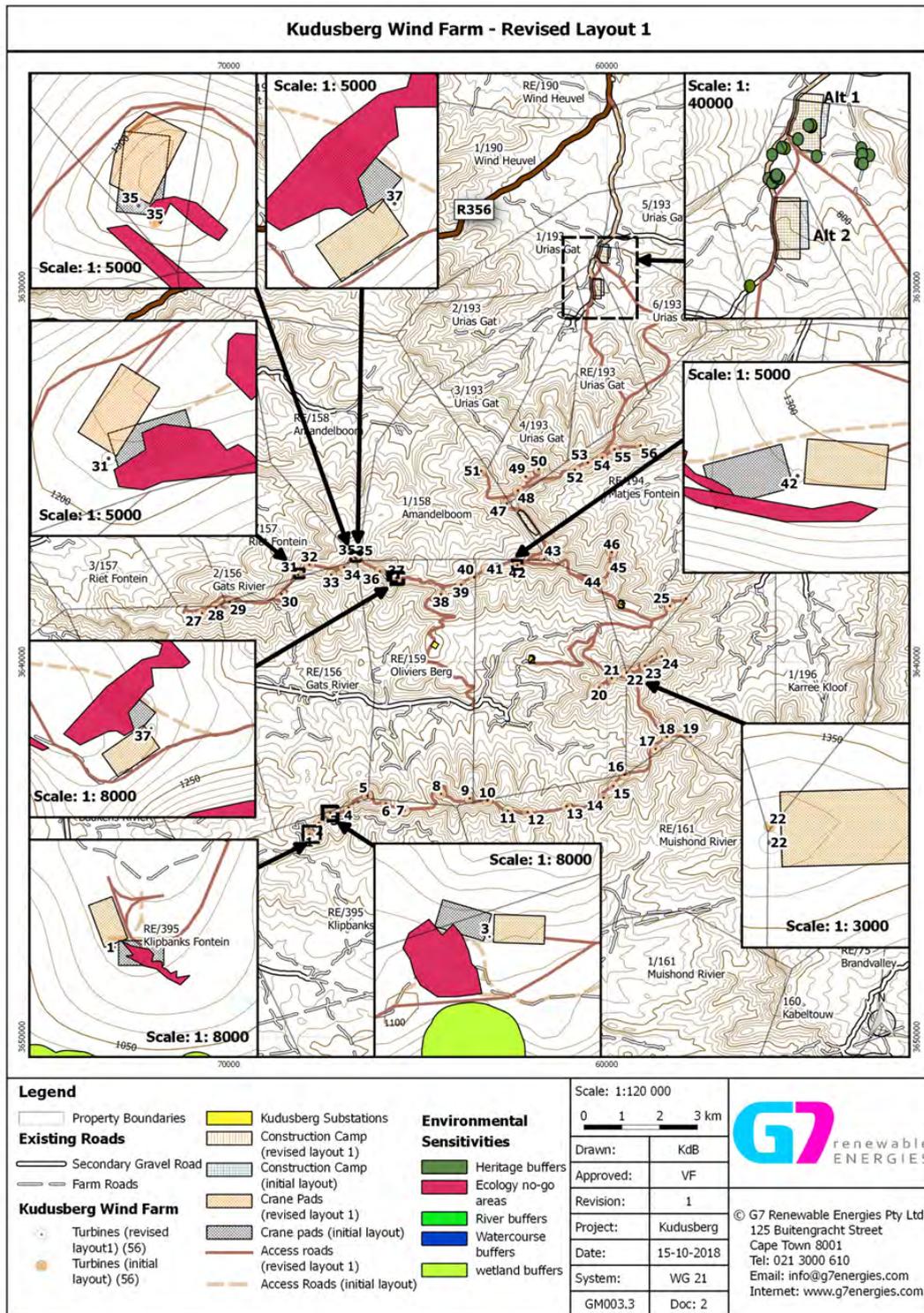


Figure 3. Topographic map of the Klein Roggeveld WEF project area showing the main infrastructural components of the proposed Kudusberg WEF. This figure details the revised layout for the WEF (October 2018) that is assessed in this report (Image prepared by G7 Renewable Energies (G7)).

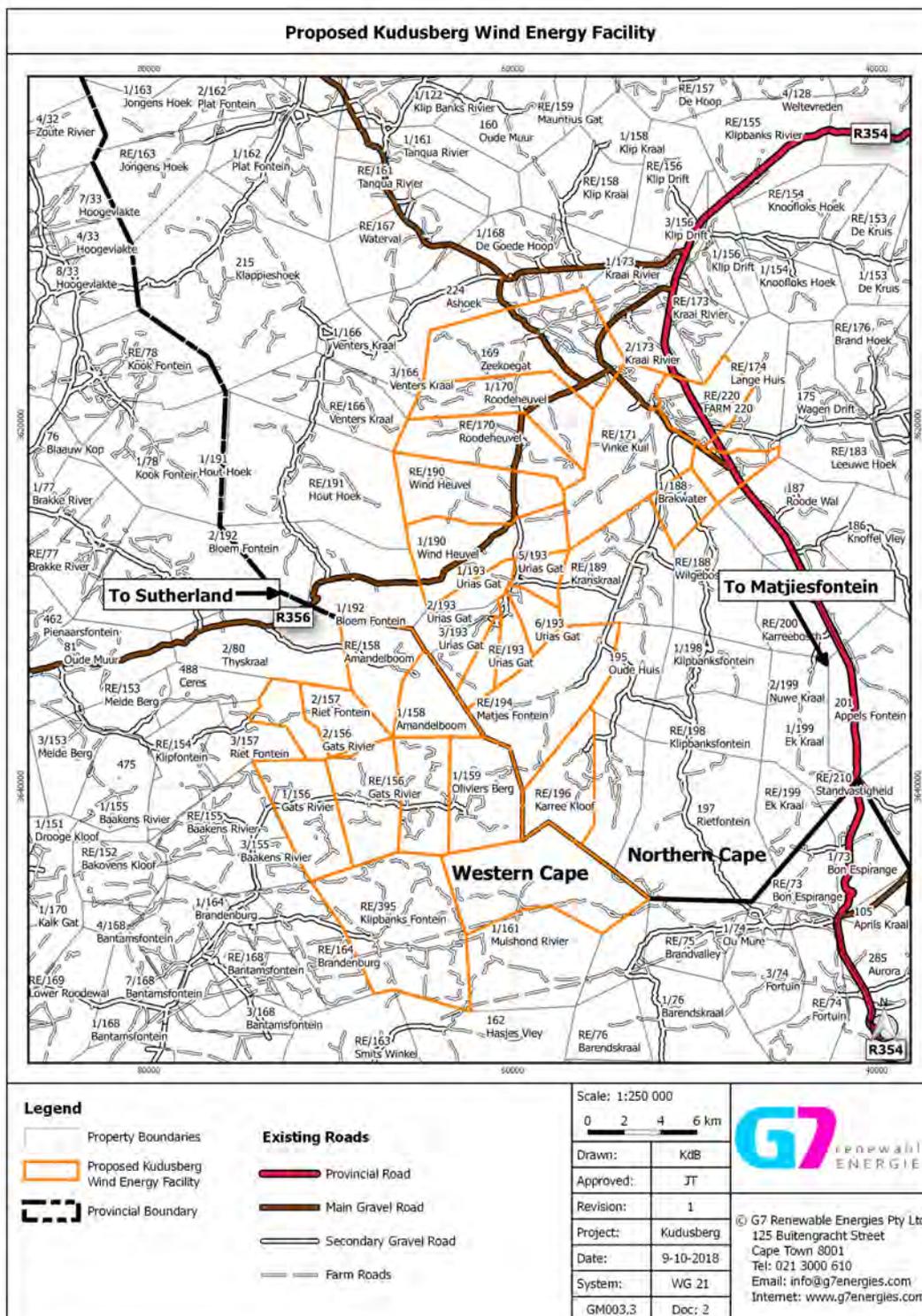


Figure 4. Map of the Klein Roggeveld region between Matjiesfontein and Sutherland showing the numbered land parcels concerned in the project area for the proposed Kudusberg WEF (orange polygon). Minor improvements to the access route to the project area from the R354 tar road in the east via the unpaved R356 road to the north of the main WEF project area may be required during the construction phase; the land parcels affected are also shown here (Image prepared by G7 Renewable Energies (G7)).

1.3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Kudusberg WEF study area is embedded within highly-dissected, hilly to mountainous terrain of the Klein-Roggeveld region, spanning the boundary between the Western and Northern Cape. This remote, semi-arid subregion of the Great Karoo of South Africa is situated between the rugged Cape Fold Mountains in the south, the arid *vlaetes* of the Ceres – Tanqua Karoo in the west and the steep Roggeveld Escarpment – part of the Great Escarpment - to the northeast (Figs. 1 to 4). The R354 tar road between Matjiesfontein and Sutherland runs well to the east of the area while the R356 gravel road skirts it on the northern side. The core project area where most of the WEF infrastructure will be situated is dominated by broadly west-east trending uplands with summit ridges and plateaux at elevations of around 1200-1360 m amsl (e.g. Oliviersberg 1367 m amsl). Mountain slopes are generally fairly gentle with prominent-weathering ridges or *kranzes* of Beaufort Group sandstones imparting a distinctive banded appearance that is very pronounced on satellite images (Figs. 5 to 8). The slopes are clothed in karroid *bossieveld* vegetation (the spotting on satellite images is due to *heuweltjies*) and incised by numerous small, intermittently flowing streams. The area is drained by westward- and northward-flowing tributaries of the Tanquarivier drainage system such as the Ongeluksrivier, Muishondrivier, Kareekloofrivier and Uriasgatrivier. Away from the numerous drainage lines, dry waterfalls and sandstone ridges (Figs. 9 & 10), levels of bedrock exposure in the study area - notably that of the recessive-weathering mudrock facies - are generally very low. This is largely due to extensive cover by alluvial and colluvial deposits, sandy to gravelly soils as well as karroid *bossieveld* vegetation (Central Mountain Shale Renosterveld, Koedoesberg – Moordenaars Karoo).



Figure 5. View south-eastwards from the crest of the central turbine ridge (Loc. 011) towards Oliviersberg homestead and the Oliviersberg range with higher ridges of the Klein Roggeveld in the background.



Figure 6. View eastwards along the western portion of the southern turbine ridge (Koedoesberge) showing flat-lying, poorly-exposed Abrahamskraal Formation along the ridge crest, coarse colluvial gravels in the foreground (Loc. 119).



Figure 7. View eastwards along the central turbine ridge from near Loc. 136 showing occasional prominent-weathering, tabular sandstones of the Abrahamskraal Formation.



Figure 8. View south-westwards towards the main northern turbine ridge showing flat to gently-dipping Abrahamskraal Formation with sheet-like sandstone units in the background and weathered grey-green mudrocks in the foreground (Loc. 056).



Figure 9. Seasonally dry stream valley on Oliviers Berg 159 that is deeply incised into mudrocks beneath a resistant channel sandstone capping that builds a dry waterfall further upstream (Loc. 003a).



Figure 10. Good vertical and panel sections through Abrahamskraal Formation mudrocks and channel sandstones along the stream valley due SE of Oliviersberg farmstead (Loc. 103).

1.3.1 Geological setting

The geology of the Klein Roggeveld region near Sutherland is outlined on the 1: 250 000 scale geology sheet 3220 Sutherland (Council for Geoscience, Pretoria; Theron 1983, Cole & Vorster 1999) (Fig. 11). The region lies on the gently folded northern margins of the Permo-Triassic Cape Fold Belt (CFB). The only major sedimentary bedrock unit mapped within the Kudusberg WEF project area on the 1: 250 000 scale geological map is the **Abrahamskraal Formation** (Pa, pale green in Fig. 11) which forms the basal subunit of the **Lower Beaufort Group (Karoo Supergroup)** in the western portion of the Main Karoo Basin of South Africa (Johnson *et al.* 2006). The continental (fluvial and lacustrine) mudrocks and sandstones or *wackes* (impure sandstones) of the very thick Abrahamskraal Formation are of Middle Permian age, with an estimated age of 265-270 Ma. Underlying basinal, prodeltaic and deltaic sediments of the Tierberg, Kookfontein and Waterford and Formations (Ecca Group) only crop out outside and to the west and south of the present study area (yellow, orange and brown areas in Fig. 11). The Early Jurassic Karoo Dolerite Suite (c. 182 Ma = million years old; Duncan & Marsh 2006) is not mapped within the study area and Karoo dolerite was not encountered during the present field study. It is represented by a few narrow dolerite dykes intruded into the Lower Beaufort Group country rocks along W-E to WNW-ESE fracture lines further to the east in the Klein Roggeveld region. The Palaeozoic bedrocks in the WEF study area are extensively mantled by a wide spectrum of Late Caenozoic superficial deposits. They include scree and other slope deposits (colluvium and hillwash), river and stream alluvium including coarse pediment gravels or “High Level Gravels”, down-wasted surface gravels, calcretes and various soils. These geologically youthful and, for the most part, unconsolidated sediments are generally of low palaeontological sensitivity and are also only briefly treated in this study. None of them are mapped at 1: 250 000 scale.

All these sedimentary rock units are potentially fossiliferous, although only the Abrahamskraal Formation is considered to be of high palaeontological sensitivity (*cf* Almond & Pether 2008a, 2008b, SAHRIS website, Komsberg REDZ heritage account in Fourie *et al.* 2015). The Abrahamskraal succession in the

Klein Roggeveld broadly youngs towards the northeast and levels of tectonic deformation are generally low on the fringes of the Cape Fold Belt. As shown on the geological map, the Abrahamskraal bedrocks are folded along broadly west-east trending axes and dips may range up to 50° (Fig. 13), with subhorizontal bedding characteristic of major ridge crests (Figs. 6, 8 & 14). However, steeper subvertical dips do occur – for example along the W-E zone north of the Oliviersberg on Oliviersberg 159.

A very short, illustrated account of the main sedimentary rock units encountered within the study area during fieldwork is presented in this section of the report. Fossil material recorded within the study area from these sediments is documented in the following section. GPS data and brief descriptions for all numbered geological and palaeontological localities mentioned in the text are provided in Appendix 1.

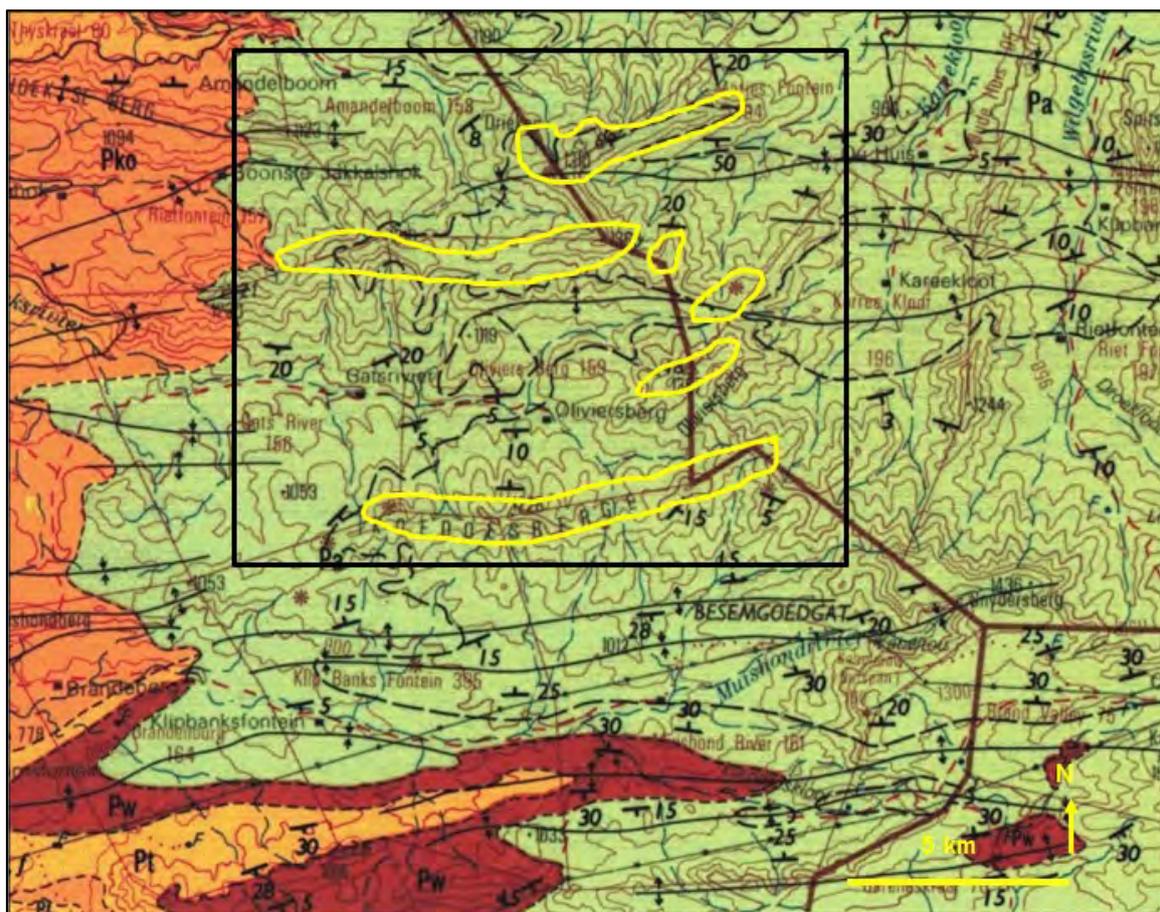


Figure 11. Extract from 1: 250 000 scale geology sheet 3220 Sutherland showing the *approximate* location of the core project area for the proposed Kudusberg WEF, located c. 60 km southwest of Sutherland, Western and Northern Cape Provinces (black rectangle) (Map published by Council for Geoscience, Pretoria). The main wind turbine corridors are indicated by the elongate yellow shapes (*cf* Figs. 2 & 3). The core development area – where most of the key WEF infrastructure (wind turbines, internal access roads, on-site substation *etc*) will be situated - overlies the outcrop area of Middle Permian continental sediments of the Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) (Pa, pale green). Thin black lines indicate broadly west-east trending fold axes within the Abrahamskraal Formation bedrocks, while the dashed line marks the incoming of reddish mudrocks within the Abrahamskraal succession. Basinal and deltaic sediments of the Ecca Group occur to the west and south of the WEF project area (yellow, orange and brown areas on the map). Karoo dolerite intrusions have not been mapped in this area. A wide spectrum of Late Caenozoic superficial deposits that *are* present here but are not mapped at 1: 250 000 scale include: alluvium (sandy to gravelly river deposits, including consolidated High-Level Gravels), colluvium (scree deposits, hillwash), pediment and downwasted surface gravels, pedocretes (calcretes) and soils.

1.3.1.1 Abrahamskraal Formation

The Abrahamskraal Formation is a very thick (c. 2.5 km) succession of fluvial deposits laid down in the Main Karoo Basin by meandering rivers on an extensive, low-relief floodplain during the Middle Permian Period, some 265-270 million years ago (Rossouw & De Villiers 1952, Johnson & Keyser 1979, Turner 1981, Theron 1983, Smith 1979, 1980, 1990, 1993a, 1993b, Smith & Keyser 1995a, Looock *et al.*, 1994, Cole & Vorster 1999, McCarthy & Rubidge 2005, Johnson *et al.*, 2006, Almond 2010a, Day 2013a, Day & Rubidge 2014, Wilson *et al.* 2014). These sediments include (a) lenticular to sheet-like channel sandstones, often associated with thin, impersistent intraformational breccio-conglomerates (larger clasts mainly of reworked mudflakes, calcrete nodules, *plus* sparse rolled bones, teeth, petrified wood), (b) well-bedded to laminated, grey-green, blue-grey to purple-brown floodplain mudrocks with sparse to common pedocrete horizons (calcrete nodules formed in ancient soils), (c) thin, sheet-like crevasse-splay sandstones, as well as more (d) localized playa lake deposits (e.g. wave-rippled sandstones, dark laminated mudrocks, limestones, evaporites). Several greenish- to reddish-weathering, silica-rich “chert” horizons are also found. Many of these appear to be secondarily silicified mudrocks or limestones but at least some contain subaerial or reworked volcanic ash (tuffs, tuffites). Thin, fine-grained tuffs with a pale greenish, cherty appearance also occur here and are of value for radiometric dating (*cf* Lanci *et al.* 2013 who obtained Middle Permian, Wordian ages for tuffs low down within the Abrahamskraal Formation in the western Karoo). A wide range of sedimentological and palaeontological observations point to deposition of the Abrahamskraal sediments under seasonally arid climates. These include, for example, the abundance of pedogenic calcretes and evaporites (silicified gypsum pseudomorphs or “desert roses”), reddened mudrocks, sun-cracked muds, “flashy” river systems, sun-baked fossil bones, well-developed seasonal growth rings in fossil wood, rarity of fauna, and little evidence for substantial bioturbation or vegetation cover (e.g. root casts) on floodplains away from the river banks.

There have since been several attempts, only partially successful, to subdivide the very thick Abrahamskraal Formation succession in both lithostratigraphic (rock layering) and biostratigraphic (fossil) terms (*cf* Looock *et al.* 1994, Day & Rubidge 2014). The precise stratigraphic range of the Lower Beaufort Group beds represented within the Kudusberg WEF study area has not been determined with any confidence. On the basis of proximity to the mapped Ecca – Beaufort boundary, the presence of a basal sandstone-rich package as well as another sandstone package higher up along the crests of the turbine ridges (e.g. Koedoesberge) *plus* the abundance of maroon mudrocks and the paucity of vertebrate fossil remains, it is concluded that most of the succession represented here belongs to the **Combrinkskraal Member** *sensu lato* of Looock *et al.* (1994). The two sandstone packages might then correspond to the **Combrinkskraal** and **Grooffontein Members** of Day and Rubidge (2014) (Fig. 12), one or both of which are recorded to the southwest of Sutherland (Ouberg Pass and Verlatenkloof). However, detailed field mapping is required to test this.

The Combrinkskraal Member *sensu lato* is not clearly differentiated by Looock *et al.* (1994), apart from to say that it comprises grey and maroon overbank mudrocks, with thin siltstone and sandstone interbeds and occasional calcareous concretions, while the channel sandstones are sheet-like. This description would apply to much of the lower Abrahamskraal Formation succession of the Klein-Roggeveld region. The sedimentology of the basal Abrahamskraal Formation (*Eodicynodon* Assemblage Zone) has been outlined by Rubidge (1995b; see also Rubidge *et al.* 2000, Smith *et al.* 2012). According to these authors, the depositional setting is interpreted as a subaerial delta plain featuring low-sinuosity perennial river channels with intervening floodplains and lakes. Upward-fining cycles are characteristic. Channel sandstones are fine-grained, single- to multi-storey with generally sharp, erosive bases, often associated with mudrock and calcrete intraclasts breccio-conglomerates. Mudrocks are thin-bedded or massive, predominantly grey to olive green in hue, and often feature small to sizeable reddish-brown carbonate concretions.

The Abrahamskraal Formation in the Klein-Roggeveld study region as a whole is a succession of continental fluvial rocks characterized by numerous lenticular to (most commonly) laterally-extensive, sheet-like sandstones with intervening, more recessive-weathering mudrocks (Stear 1980, Le Roux 1985, Looock *et al.* 1994, Cole & Vorster 1999, Wilson *et al.* 2014). The channel sandstone units are up to several (5 m or more) meters thick and vary in geometry from extensive, subtabular sheets to single-storey lenticles or multi-storey channel bodies. The prominent-weathering, laterally-persistent sandstone ledges generate a distinctive ridged, stepped or terraced topography on hill slopes in the area (Figs. 13 &

14). The sheet sandstones are generally pale-weathering (enhanced by epilithic lichens), fine- to medium-grained, well-sorted and variously massive or structured by horizontal lamination (flaggy, with primary current lineation) or, more rarely, tabular to trough cross-bedding. Greyish hues of some freshly broken sandstone surfaces suggest an “impure” clay-rich mineralogy (*i.e.* wackes). Current ripple cross-lamination and horizontal lamination is common towards the tops of the sandstone beds. These may also feature well-preserved palaeosurfaces with swales or pools, wave ripples (locally variable wave crest azimuths), falling water marks, adhesion warts, microbial mat textures, trace fossils and rills (Figs. 43 & 44). The lower contacts of the sandstones are often gradational or erosive on a small scale, especially lower down in the Abrahamskraal succession. Channel sandstones higher in the succession may be associated with lenticular to sheet-like basal breccias of reworked mudflake and calcrete intraclasts that may infill small-scale erosive gullies; such breccias were rarely observed within the present study area, however (Figs. 16 & 50).

Lower Beaufort Group bedrock exposure levels within the Kudusberg WEF study are generally very low, especially as far as the mudrock facies are concerned; surface exposure of these is mainly confined to limited stream and erosion gullies on steeper hillslopes as well as along major drainage lines such as the valleys of the Ongelukrivier and Kareekloofrivier (Figs. 9, 10, 19 to 22). Mudrock exposure along the ridge crests where most wind turbines will be located is very limited (Figs. 15 & 41). Most of the upland outcrop area – including the majority of the turbine ridges - is mantled with colluvium, soils and vegetation (Figs. 34 & 35), with the exception of prominent narrow ridges of sandstone that impart a striped appearance to the landscape (Figs. 5, 13 & 14). A moderately high but subordinate proportion of the Abrahamskraal overbank mudrocks within the study area are purple-brown to maroon, while non-reddish mudrocks may be more blue-green than greenish-grey, especially lower down in the succession. Horizons of small (pebble to cobble-sized) pedogenic calcrete concretions are moderately common at some horizons within the overbank mudrock packages (Fig. 25) but are on the whole sparse in the lowermost Abrahamskraal Formation. The sphaeroidal to irregular calcrete nodules are usually pale grey or ferruginised to rusty brown. They may show septarian cracking internally. Larger (several dm-scale) diagenetic concretions are usually ferruginous, rusty brown, and sphaeroidal, lenticular to irregular in form and may form laterally extensive, prominent-weathering beds (Fig. 24). A thin (< 10 cm) horizon of pale grey-green siliceous rock cropping out near the eastern wind mast on Koedoesberg is interpreted as a tuff (volcanic ash) (Figs. 30 & 35) (*cf* Lanci *et al.* 2013).

A spectrum of channel sandstone geometries is seen within the lower Abrahamskraal Formation in the study area (*cf* Wilson *et al.* 2014). Good examples of vertically-stacked, upwardly-expanding channel bodies are encountered at intervals, for example on Oliviers Berg 159 (Fig. 17). It is notable that most of the sandstone bodies within the study area show a markedly laterally-persistent, tabular geometry comparable to that of the underlying Waterford Formation. They are mostly fine- to very fine-grained with gradational rather than sharp, erosive bases and often cap small-scale (few m) upward-coarsening, upward-thickening sedimentary packages. These pass from massive mudrock through thin-bedded siltstone and fine-grained wacke into thicker-bedded wackes and cleaner-washed sandstones (Figs. 19 to 22). Diagenetic lenticles, beds and large concretions of rusty-hued ferruginous carbonate are more ubiquitous within the dominantly grey, blue- to grey-green mudrock facies than pale grey calcrete nodules, although both may occur within the same exposures. Features such as basal gullying, well-developed channel breccio-conglomerates containing reworked calcrete nodules, silicified gypsum pseudomorphs (Fig. 26) or sand-infilled mudcracks are not frequently found compared to higher members within the Abrahamskraal Formation. Extensive development of soft-sediment loading at the base of thicker sandstone units or entailing the complete break-up into balls-and-pillows of thinner beds, is commonly seen within the lowermost Abrahamskraal Formation beds, some of which may even involve maroon mudrocks (Fig. 23). These characteristics, which are shared in part with the deltaic Waterford Formation, contrast in several respects to the “typical” fluvial *Eodicynodon* AZ sediments described earlier. This, together with possible evidence for local channel collapse and large-scale slumping of the sediment prism, may suggest that the lowermost Abrahamskraal Formation in the study area was deposited in a more swampy, unstable delta plain setting with perennially high watertables. Horizons rich in stellate to sphaeroidal gypsum pseudomorphs and pedogenic calcrete nodules suggest contrasting periods of arid, evaporative conditions. Lacustrine (playa lake or perhaps interdistributary bay) packages characterised by very dark, laminated to thin-bedded mudrocks and heterolithic intervals, loading and dewatering features, desiccation cracks, plant debris and stem casts as well as low-diversity trace fossil assemblages represent wetter intervals on the floodplain / delta platform (Figs. 27 to 29, 43 to 48). Occasional

packages of distinctive, tabular-bedded, khaki- to yellowish-brown, crumbly (“biscuity”), medium-grained sandstones (Fig. 18) contrast with the typical very fine-grained, well-sorted grey-green wackes that predominate at this stratigraphic level. The former are locally associated with horizons of mudrock intraclast breccia and reworked plant material, giving them a more typical fluvial character reminiscent of the younger Koornplaats Member of the Abrahamskraal Formation (Figs. 49 & 50).

A transitional, highly variable depositional model for the lower Abrahamskraal Formation, oscillating between deltaic and fluvial settings, might also partially explain the paucity of vertebrate fossils (and perhaps also of woody remains) in these beds, due to palaeoecological as well as preservational (diagenetic) constraints. It is also possible that protracted intertonging of subaqueous and subaerial delta platform facies may have occurred along the diachronous Ecca – Beaufort boundary in the SW Karoo, especially in areas favoring local subsidence of a thick, river-dominated delta prism (This is also implied by Theron 1983, p. 8). Further detailed sedimentological studies and mapping that lie outside the scope of the present report are required to delineate and characterize the Ecca – Beaufort boundary in the study region.

		West of 24° E			East of 24° E
		Le Roux (1985)	This study		
PERMIAN	BEAUFORT GROUP	Teekloof Fm.	Steenkampsvlakte Member.		Balfour Fm.
			Oukloof Member		
			Hoedemaker Member		Middleton Fm.
			Poortjie Member		
			Abrahamskraal Fm.	Karelskraal M.	Karelskraal M.
	Moordenaars M.	Moordenaars M.			
	Wilgerbos M.	Swaerskraal M.			
	Koornplaats M.	Koornplaats M.			
	Leeuvlei M.	Leeuvlei M.			
	Combrinkskraal M.	Grootfontein M.			
		Combrinkskraal M.			
	ECCA	Waterford Formation			

Figure 12. Revised subdivision of the Abrahamskraal Formation (Day and Rubidge 2014). The red bar indicates stratigraphic members that are *probably* represented within the Kudusberg WEF study area, but this requires testing through detailed field mapping. Yellowish-brown, crumbly sandstones with associated reworked plant material, such as are typical for the Koornplaats Member, are also recorded in the study area.



Figure 13. Steeply south-dipping, closely-spaced sheet sandstones on the southern slopes of the central turbine ridge, Gats Rivier 156. They are probably referable to the Combrinskraal Member at the base of the Abrahamskraal Formation



Figure 14. Flat-lying Abrahamskraal Formation sheet sandstones building the crest of the central turbine ridge, Oliviers Berg 159 – possibly the Grootfontein Member package (Loc. 013).



Figure 15. Rare exposure of the thick, mudrock-dominated interval between the Combrinkskraal and Grootfontein Member sandstone packages, close to the crest of central turbine ridge near the wind mast on Gats Rivier 156 (Loc. 019).

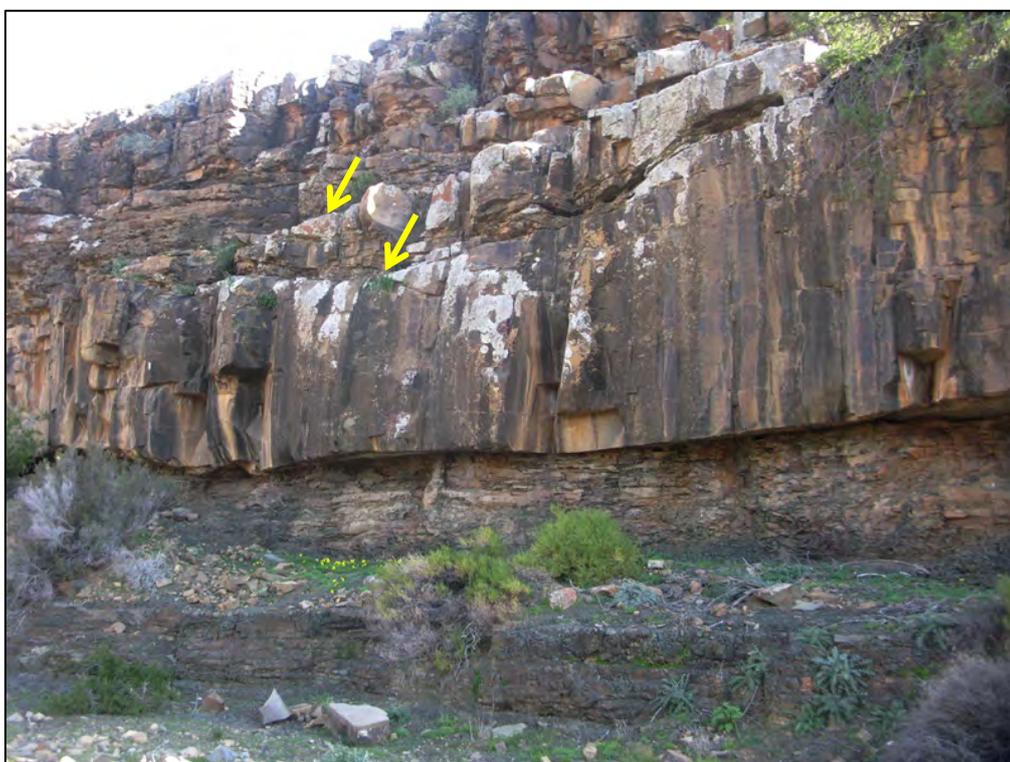


Figure 16. Sharp, erosive-based, multi-storey channel sandstone package containing lenses of mudflake intraclast breccia along internal erosion surfaces (arrows). The underlying finer-grained sediments show an upward-coarsening and –thickening trend (Loc. 021).



Figure 17. Vertical superposition of increasingly wide, lenticular channel sandstones (multistorey confined sand body) with convex-downward overbank succession at the base (Loc. 113).



Figure 18. Distinctive yellowish-brown, tabular, crumbly channel sandstone facies that occurs at intervals within the lower Abrahamskraal Formation and is often associated with transported plant remains (Loc. 142).



Figure 19. Upward-coarsening and - thickening mudrock to sandstone package typical of the Combrinskraal Member *sensu lato* (Loc. 110).



Figure 20. Thin upward-coarsening package within the lower Abrahamskraal Formation showing gradational lower contact of the upper wackes as well as the common occurrence of both purple-brown (oxidized) and grey-green (reduced) facies (Hammer = 30 cm) (Loc. 023)



Figure 21. Good vertical section through the lower Abrahamskraal Formation close to the Uitkyk Pass, Oliviers Berg 159. The lower mudrock-sandstone packages show an upward-coarsening trend with sharp tops, while the upper ones are typical fluvial sharp-based, upward-fining packages (Loc. 017).



Figure 22. Stacked thin, upward-coarsening packages with abundant reddish mudrocks, capped by an erosive-based channel sandstone, incised valley exposure of the Combrinkskraal Member (Loc. 029).



Figure 23. Local collapse and disruption of Abrahamskraal Formation wackes to form floating load “blobs” within a massive mudrock matrix (Hammer = 30 cm) (Loc. 025).



Figure 24. Horizon of lenticular ferruginous carbonate diagenetic concretions within fine-grained overbank mudrocks, suggesting high water tables on the floodplain. Note the general upward-coarsening trend within the sediment package (Loc. 116).

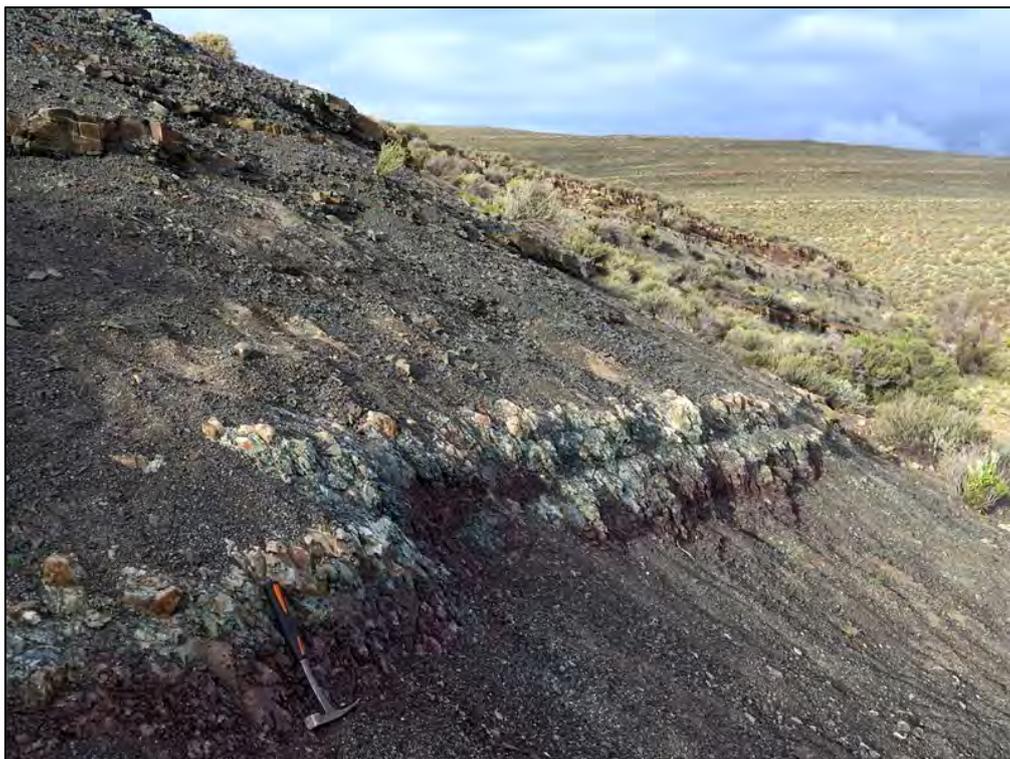


Figure 25. Horizon of pebble- to cobble-sized ferruginous palaeocalcrete concretions marking an ancient palaeosol within grey-green hackly mudrocks (Hammer = 30 cm). Such palaeosol horizons are a major focus in surveys for vertebrate fossil remains (Loc.110).



Figure 26. Weathered-out sphaeroidal clumps of radiating quartz crystals whose lenticular shape shows they are pseudomorphs after gypsum (*cf* desert roses). Horizons rich in evaporate minerals – often associated with lacustrine deposits and mudcracks - suggest periods of intense evaporation on the Middle Permian floodplain (Loc. 020).



Figure 27. Laminated to thin-bedded, dark grey siltstones of probable lacustrine origin overlain by fine-grained sandstone package showing small-scale channel features (Loc. 038).



Figure 28. Basally-loaded, fine-grained, ripple cross-laminated wacke with reworked plant debris and small-scale mudcracks on its upper surface (arrowed horizon) overlain by thin-bedded heterolithic facies showing evidence for dewatering (e.g. flame structures) (Loc. 040).



Figure 29. Curious vertical, tapering, subcylindrical structure penetrating upwards through and deforming interbedded wackes and mudrocks of the Abrahamskraal Formation (Hammer = 30 cm) (Loc. 131). This may be a dewatering feature.



Figure 30. Float blocks of yellowish-green fine-grained tuff (volcanic ash) within surface gravels close to the Koedoesberge east wind mast (Scale in cm). The source bed crops out in this area (Loc. 108). Tuff units such as this are of considerable value for accurately dating Beaufort Group succession.

1.3.1.2 Late Caenozoic Superficial Deposits

Late Caenozoic alluvial deposits in the Kudusberg WEF study area, as exposed in river or stream banks and erosion gully sections, reach thicknesses of up to few meters and are dominated by well-bedded to massive pale buff silts, sands and gravelly sands, with lenticles of fine to coarse, poorly-sorted gravel. They are well seen along the banks of the Ongeluksrivier, Kareekloofrivier and their various unnamed tributaries, for example (Figs. 31 & 32). The coarse, poorly-sorted basal gravels are dominantly composed of angular to subrounded wacke clasts, usually semi-indurated with partial to extensive calcrete cementation, and may show well-developed current imbrication. High Level Gravel terraces and abandoned bars of coarse bouldery to cobbly gravels perched up to several meters above modern stream level is encountered locally along major drainage lines and are probably of Pleistocene age.

Thick (up to several meters) mixed alluvial, colluvial and sheetwash deposits on hillslopes are exposed by gully or stream erosion where they are seen to consist of poorly-sorted sandy matrix as well as angular, blocky sandstone clasts (Fig. 36). The colluvium may form a semi-consolidated rubbly, clast-supported breccia bed locally. Elsewhere diamictites or matrix-supported breccias consisting of angular, dispersed sandstone blocks within a poorly-sorted sandy to silty matrix (locally calcretised) may be debrites emplaced by gravity flow on steeper slopes. Upland hillslopes and plateaux above the escarpment, where most of the key WEF infrastructure will be concentrated, are generally mantled by angular downwasted rock debris - predominantly Karoo sandstones or wackes (Figs. 34 & 35) - but in some areas the bedrocks are mantled in fine gravels and sandy soils (Fig. 8). Prominent-weathering sandstone *kranzes* along and above the escarpment are associated with scree aprons of angular to well-rounded blocks and corestones of Beaufort Group sandstone. Colluvial sandstone rubble, often dominated by well-rounded corestones of fine-grained wacke, overlies sandstone channel bodies of the Abrahamskraal Formations exposed along stream beds, hillslopes and hillcrests. On lower valley slopes close to drainage lines the colluvial gravels may be overlain by a well-developed calcrete hardpan.

Low-lying *vlaktes* on the northern and eastern margins of the study area (e.g. Uriasgatrivier and Matjiesfontein Kloof and Kareekloofrivier Valleys) are mantled in sandy to finely-gravelly alluvial soils that may reach a depth of a few meters and show calcrete development in the subsurface (Fig. 37). Close to drainage lines these finer-grained alluvial deposits are underlain by thick, coarse, semi-consolidated alluvial gravels at depth.



Figure 31. Coarse, crudely-imbricated High Level Gravels of probable Pleistocene age overlying a slightly elevated pediment surface, incised river valley on Oliviers Berg 159 (Loc. 027).



Figure 32. River bank section through semi-consolidated, poorly-sorted, coarse alluvial gravels interbedded with lenses of sandy alluvium, Oliviers Berg 159 (Loc. 022).



Figure 33. Erosion gully exposures of Quaternary sandy alluvium showing local development of pale creamy subsurface calcrete, Uriasgatrivier (Loc. 058) (Hammer = 30 cm) (Loc. 058).

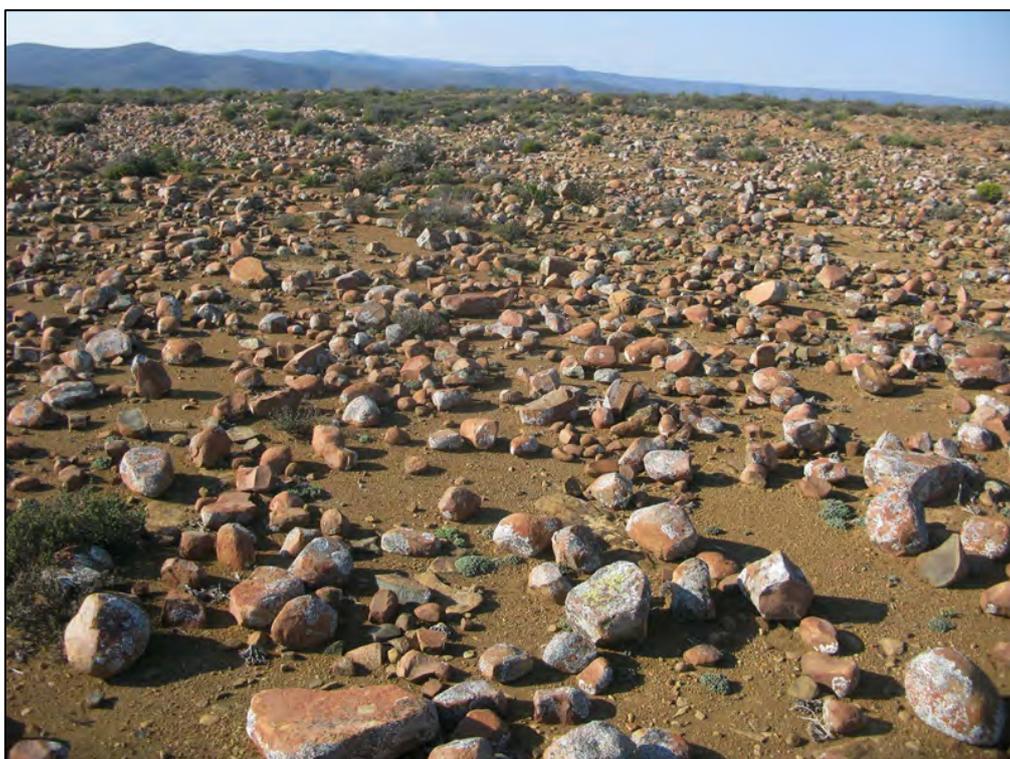


Figure 34. Subangular to well-rounded corestones of Abrahamskraal Formation wacke downwasted onto sandy soils along the crest of the central turbine ridge (Loc. 014).



Figure 35. Rubbly, angular surface gravels of wacke and volcanic tuff mantling flatter-lying areas along the southern turbine ridge near the wind mast (Loc. 108).



Figure 36. Thick, sandy colluvial debris with dispersed, angular wacke clasts exposed on lower valley slopes (Hammer = 30 cm). Some of these poorly-sorted deposits may have been emplaced by gravity-driven debris flows (Loc. 023).

1.3.2 Palaeontological heritage

In this section of the report fossil biotas recorded from the Abrahamskraal Formation and Late Caenozoic superficial sediments in the Klein Roggeveld region and elsewhere are outlined, together with new palaeontological data from the Kudusberg WEF project area itself.

Fossil biotas of the Lower Beaufort Group (Adelaide Subgroup)

Despite the scarcity of body fossil remains within the lowermost part of the succession, the overall palaeontological sensitivity of the Lower Beaufort Group sediments is generally rated as high to very high. This is due to the considerable scientific interest of fossils reflecting Middle Permian terrestrial ecosystems occurring here (*cf* Almond & Pether 2008b, SAHRIS palaeosensitivity map, Komsberg REDZ heritage assessment in Fourie *et al.* 2015).

A chronological series of mappable fossil biozones or assemblage zones (AZ), defined mainly by their characteristic tetrapod faunas, has been established for the Main Karoo Basin of South Africa (Rubidge 1995, 2005, Van der Walt *et al.* 2010, Smith *et al.* 2012). Maps showing the distribution of the Beaufort Group assemblage zones within the Main Karoo Basin have been provided by Keyser and Smith (1979) and Rubidge (1995, 2005). The latest Karoo fossil biozonation map (Van der Walt *et al.* 2010) assigns the lower Abrahamskraal Formation beds in the present study area, located on the south-western margins of the Lower Beaufort Group outcrop area, to the *Tapinocephalus* Assemblage Zone. However, recent magnetostratigraphic, radiometric and lithostratigraphic studies suggest that the Combrinkskraal Member *sensu lato* of the Abrahamskraal Formation belongs to the slightly older ***Eodicynodon* Assemblage Zone** of Middle Permian (Guadalupian / Wordian) age (*c.* 268-265 Ma) (Lanci *et al.* 2013, Day & Rubidge 2014, p. 233 and refs. therein).

Fossil biotas of the *Eodicynodon* Assemblage Zone have been summarized by Rubidge (1995) and more recently by Smith *et al.* (2012). This early Middle Permian biota is characterized by a limited variety of primitive therapsids, most notably the small dicynodont *Eodicynodon* (by far the commonest taxon), very rare large-bodied herbivorous and carnivorous dinocephalians such as *Tapinocaninus* and anteosaurids, as well as equally rare gorgonopsians and scylacosaurid therocephalians (Fig. 37) (See also Rubidge & Oelofsen 1981, Rubidge 1987, Rubidge 1991, Rubidge *et al.* 1994, Rubidge 1995, Rubidge *et al.* 2000, Rubidge 2005, Govender 2002, Jinnah & Rubidge 2007, Abdala *et al.* 2008, Nicolas and Rubidge 2010). The fauna is of considerable biogeographic significance in that it includes some of the earliest and most primitive examples of several therapsid subgroups recorded anywhere in the world. Associated fossils include disarticulated palaeoniscoid fish and amphibians (rhinesuchid temnospondyls), freshwater bivalves *plus* a small range of invertebrate ichnogenera such as the arthropod trackway *Umfolozia*. Records of glossopterid “seed ferns” and the widely occurring sphenophyte ferns *Equisetum* and *Schizoneura* (Anderson & Anderson 1985, Rubidge *et al.* 2000) have recently been supplemented by spectacularly rich plant-insect Lagerstätte discovered within lacustrine deposits near Sutherland (Moyo *et al.* 2018, Prevec & Matiwane 2018, Davids *et al.* 2018). Petrified wood is apparently – and perhaps surprisingly – absent in the lowermost Beaufort Group, in contrast to the underlying Waterford Formation; it is unclear why this is so. Vertebrate fossils – especially identifiable, articulated specimens – tend to be very rare indeed in this biozone, as indicated by the fossil chart of Loock *et al.* (1994) as well as the fossil site maps of Keyser & Smith (1977-78) and of Nicolas (2007) (Fig. 38). The fossils are also typically difficult to extract from their resistant rock matrix. They are mainly found within overbank, lake margin mudrocks in association with small pedogenic calcrete nodules or – in the case of the dinocephalians – within or at the base of channel sandstones (Smith *et al.* 2012). Several casts of large (*c.* 15 cm wide), subhorizontal to gently-inclined, straight tetrapod burrows, in one case associated with unidentified, scrappy postcranial and tooth material, are reported by Almond (2016c) from the *Eodicynodon* AZ in the Brandvalley WEF project area situated just south of

the present study area. The burrows reported there occur within the sandstone package along the crest of the Klein-Roggeveld Escarpment on Muishond Rivier 161 (possibly the Grootfontein Member of Day & Rubidge 2014). They may represent the oldest known tetrapod burrows reported from the Karoo Supergroup of South Africa (and even perhaps from Gondwana), although this claim remains to be confirmed.

No vertebrate body fossils (bones or teeth) were recorded from the Lower Abrahamskraal Formation in the Kudusberg WEF project area during the recent field survey, despite the availability here of several excellent bedrock exposures, some with well-developed pedogenic calcrete horizons. The marked scarcity of fossil tetrapods and woody plants combined with vertebrate burrowing might reflect environmentally-challenging conditions in the Karoo Basin in Middle Permian (Wordian) times. A few examples of sizeable (several dm diameter), subcylindrical sandstone bodies encased in mudrock that *might* represent vertebrate burrow casts were encountered here (Fig. 39). However, none of these show diagnostic burrow features (e.g. ventro-lateral scratch marks) and they are conservatively regarded as equivocal dubiofossils. A horizon of thin-bedded, dark grey mudstones of probable lacustrine origin exposed just below the crest of the central turbine ridge contains several dispersed to closely-spaced, subcylindrical burrow casts of lungfish (6-8 cm diameter; Fig. 40) (*cf* Hasiotis *et al.* 1993). Several occurrences of possible, but unconfirmed, sand-cast tetrapod burrows as well as probable lungfish burrows have recently been reported from the lower Abrahamskraal Formation - *i.e.* the Combrinskraal *sensu lato* and Leeuvlei Members - in the Klein-Roggeveld region (e.g. Almond 2010c, 2015c, 2015d, 2016b, Odendaal & Loock 2015). Well-preserved trackways and swimming trails attributed to temnospondyl amphibians (or perhaps another tetrapod group) are reported from the lower Abrahamskraal Formation above and below the Great Escarpment near Sutherland (Almond 2016i). A washed-out sandstone palaeosurface on Oliviers Berg 159 (Loc. 029b) bears *possible* tetrapod limb impressions, but these are admittedly rather vague and require closer analysis. Low diversity invertebrate trace fossil assemblages of the *Scoyenia* ichnofacies – for the most part poorly-preserved horizontal and oblique burrows - occur widely in association with damp substrates such as the margins of lakes and water courses within the Lower Beaufort Group. They are seen, for example, on wave rippled palaeosurfaces and within channel sandstone packages at several localities on Oliviers Berg 159 and Gats Rivier 156 (Figs. 42 to 44).

The commonest plant fossils recorded from the Lower Abrahamskraal Formation - including the present field study - comprise dispersed to concentrated, fragmentary impressions of sphenophytes (horsetail ferns and their relatives) preserved within overbank mudrocks and on sandstone bed tops (*cf* Anderson & Anderson 1985, Rubidge *et al.* 2000). They include segmented, striated stems of reedy horsetails (*Phyllothea*) as well as strap-shaped, longitudinally-ridged leaves referred to the genus *Schizoneura*. Two distinctive forms of *Schizoneura* – probably *S. africana* and *S. gondwanensis* – are recorded within probable lacustrine facies on Matjes Fontein 194 (Figs. 45 & 46). Whorled leaves of the former species surrounding a vertical stem are occasionally preserved *in situ*. The sphenophytes here, which also include an undescribed species of equisetalean (Dr R. Prevec, pers comm., 2018), occur in association with long-leaved lycopods (*cf* *Cyclodendron*) (Fig. 48) and other unidentified, reworked and probably partially-decomposed plant remains (Fig. 47). The plant fossils are preserved as secondarily mineralised compressions or low-relief moulds. Excavation of fresh material from this site may well yield better preserved plant specimens and perhaps an associated arthropod fauna (*cf* Moyo *et al.* 2018). Dense concentrations of small cylindrical, sandstone-infilled tubes commonly exposed in cross-section on bedding planes of flaggy sandstones probably represent stem casts of reedy swamp vegetation such as horsetails rather than *Skolithos* invertebrate dwelling burrows as commonly supposed.

The only fossil woody remains encountered in the Kudusberg WEF project area comprise poorly-preserved, ferruginised stem moulds up to a few cm in diameter that are associated with reworked, finely-striated sphenophytes and other unidentified plant debris. The fossil plant material is preserved within medium- to coarse-grained sandstones, on sandstone bedding planes, as well as associated with

mudrock intraclast breccias within a yellowish-weathering, tabular-bedded sandstone package reminiscent of the Koornplaats Member (Figs. 49 & 50). The apparent absence, or at least great scarcity, of petrified (silicified) wood within the lowermost Abrahamskraal Formation is puzzling in view of the abundant well-preserved material seen within the underlying Waterford Formation (*cf* Almond 2016b). However, sandstone palaeosurfaces in the earliest Beaufort Group beds not infrequently bear large linear tool marks that are plausibly attributed to current-entrained logs. A good example is recorded from just outside the Kudusberg WEF study area on Klip Banks Fontein 395 (Almond 2010a). Spectacularly rich Middle Permian plant-insect assemblages of inferred Guadalupian (Roadian) age, including glossopterids, have recently been reported from the Sutherland area (Moyo *et al.* 2018, Prevec & Matiwane 2018, Davids *et al.* 2018).

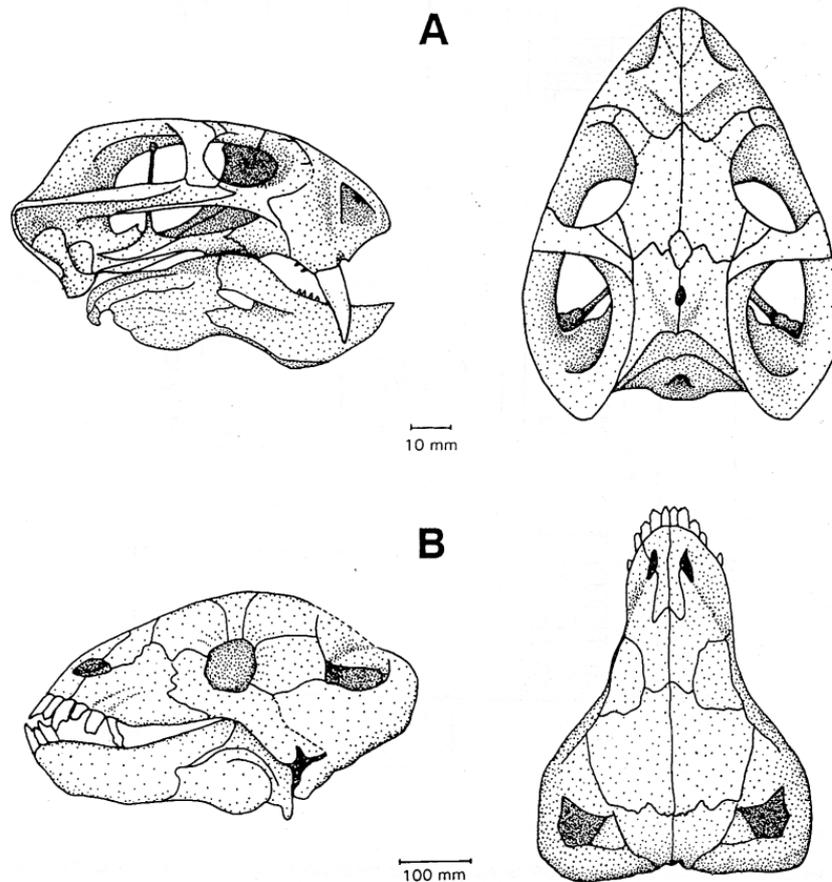


Figure 37. Skulls of two key fossil therapsids from the *Eodicynodon* Assemblage Zone: A – the small dicynodont *Eodicynodon*; B – the rhino-sized dinocephalian *Tapinocaninus* (From Rubidge 1995). Note that fossil vertebrate remains are very rare in sediments of this zone.

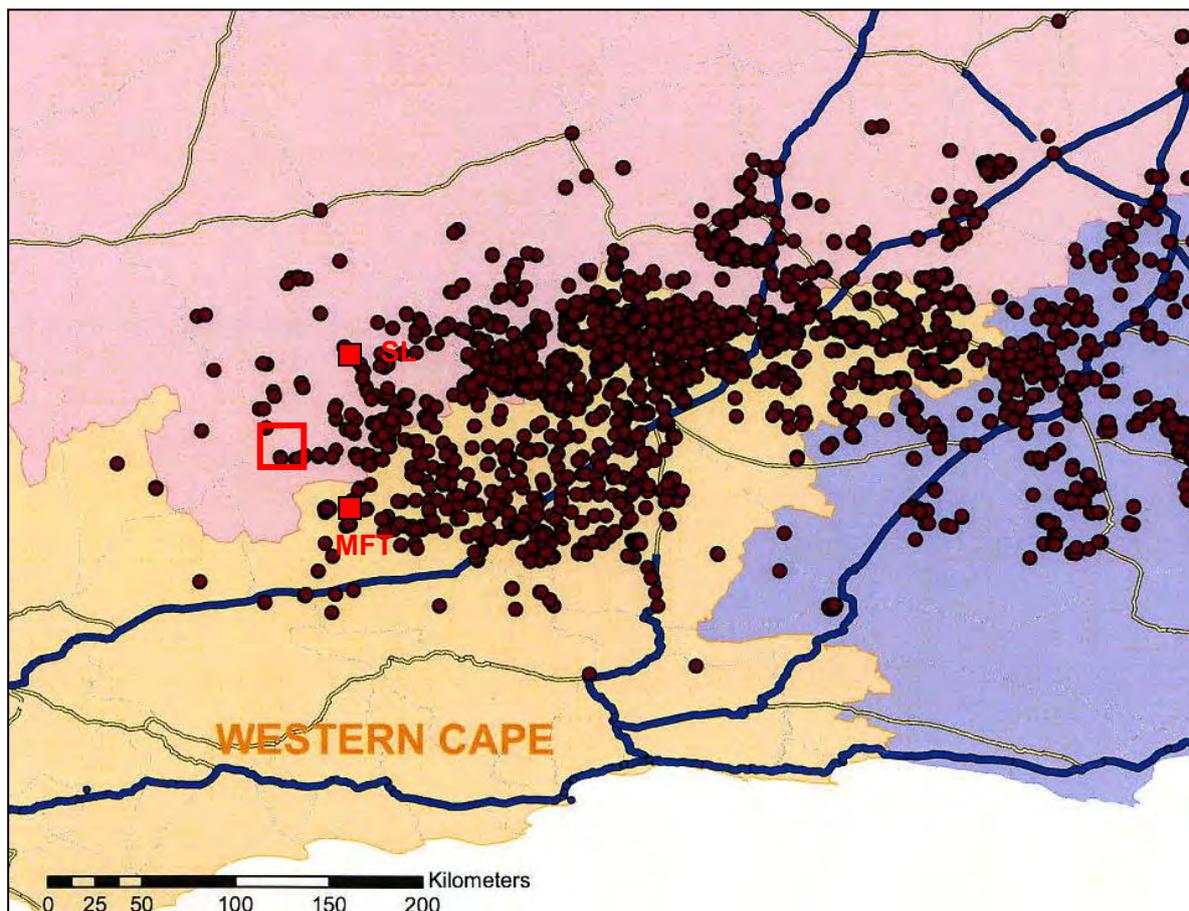


Figure 38. Distribution of recorded vertebrate fossil sites within the south-western portion of the Main Karoo Basin (modified from Nicolas 2007). The approximate location of the Kudusberg WEF study area is indicated by the open red square. Note the lack of known fossil sites in this part of the Karoo. SL = Sutherland. MFT = Matjiesfontein.

Fossils within Late Caenozoic superficial sediments

The diverse Late Caenozoic superficial deposits within the South African interior have been comparatively neglected in palaeontological terms. However, sediments associated with ancient drainage systems, springs and pans in particular may occasionally contain important fossil biotas, notably the bones, teeth and horn cores of mammals as well as remains of reptiles like tortoises (e.g. Skead 1980, Klein 1984b, Brink, J.S. 1987, Bousman *et al.* 1988, Bender & Brink 1992, Brink *et al.* 1995, MacRae 1999, Meadows & Watkeys 1999, Churchill *et al.* 2000, Partridge & Scott 2000, Brink & Rossouw 2000, Rossouw 2006, De Ruiter *et al.* 2010, Backwell *et al.* 2017). Other late Caenozoic fossil biotas that may occur within these superficial deposits include non-marine molluscs (bivalves, gastropods), ostrich egg shells, trace fossils (e.g. calcretised termitaria, coprolites, invertebrate burrows, rhizcretions), and plant material such as peats or palynomorphs (pollens) in organic-rich alluvial horizons (Scott 2000) and diatoms in pan sediments. In Quaternary deposits, fossil remains may be associated with human artefacts such as stone tools and are also of archaeological interest (e.g. Smith 1999 and refs. therein). Ancient solution hollows within extensive calcrete hardpans may have acted as animal traps in the past. As with coastal and interior limestones, they might occasionally contain mammalian bones and teeth (perhaps associated with hyaena dens) or invertebrate remains such as snail shells.

No fossil remains were recorded within the Late Caenozoic superficial deposits within the Kudusberg WEF project area during the recent field survey.



Figure 39. Isolated subcylindrical sandstone body (to left of 30 cm-long hammer) enclosed in massive Abrahamskraal Formation overbank mudrock – possibly a large vertebrate burrow cast (unconfirmed) (Loc. 043).



Figure 40. Array of vertical, subcylindrical casts of lungfish burrows (arrowed) within laminated dark grey lacustrine mudrocks underlying the ferruginised casting sandstone (Scale = 15 cm) (Loc. 135). This locality lies fairly close to the crest of the central turbine ridge crest but outside the development footprint (cf Figs. 41 & 52).



Figure 41. Geological setting of the fossil lungfish burrow assemblages seen in the previous figure (fossil horizon is arrowed), located close to the crest of the central turbine ridge (Loc. 135).



Figure 42. Pale (possibly tuffitic) speckled and laminated sandstone bed within the Abrahamskraal Formation showing dark cross-sections through infilled cylindrical invertebrate burrows (Scale in cm and mm) (Loc. 141).



Figure 43. Wave rippled sandstone bed top with poorly-preserved, silt-infilled, small-scale cylindrical burrows of the *Scoyenia* ichnofacies (Scale in cm and mm) (Loc. 103)

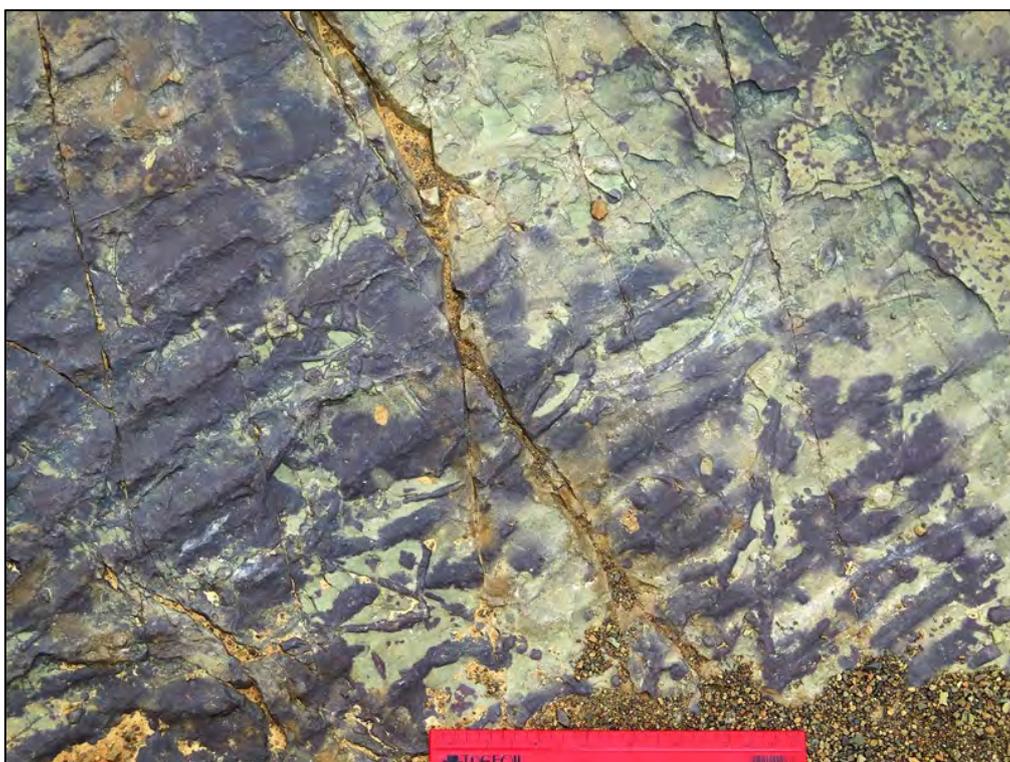


Figure 44. Wave-rippled sandstone bed top preserving straight to arcuate, subhorizontal invertebrate burrows (Scale in cm) (Loc. 103)



Figure 45. Float block of Abrahamskraal wacke preserving an *in situ* vertical stem cast (arrowed) and partial horizontal leaf whorl of the sphenophyte fern *Schizoneura africana* (Scale in cm) (Loc. 039).



Figure 46. Sandstone bed top with overlapping plant fossil moulds, possibly including the opposite-leaved sphenophyte fern *Schizoneura gondwanensis*. The longitudinally-striated leaves are c. 7 cm long (Loc. 039).



Figure 47. Partially mineralised compression or mould of a plant axis (possibly equisetalean) (Scale in cm) (Loc. 041).



Figure 48. Secondarily mineralised fossil mould within a dark grey wacke interpreted as a compressed, long-leaved lycopod such as *Cyclodendron*. The narrow, strap-shaped leaves are c. 7 cm long (Loc. 041).



Figure 49. Poorly-preserved, ferruginised moulds of woody stems associated with a mudrock intraclast breccia within a yellowish-brown sandstone package, Gats Rivier 156 (Loc. 143) (Scale = c. 15 cm). Similar preservation is common in the Koornplaats Member of the Abrahamskraal Formation.



Figure 50. Thin- to medium-bedded sandstone package containing reworked, fragmentary plant debris in association with tabular wackes and a thin intraclast breccia (at level of 30 cm-long hammer), Gats Rivier 143 (Loc. 143).

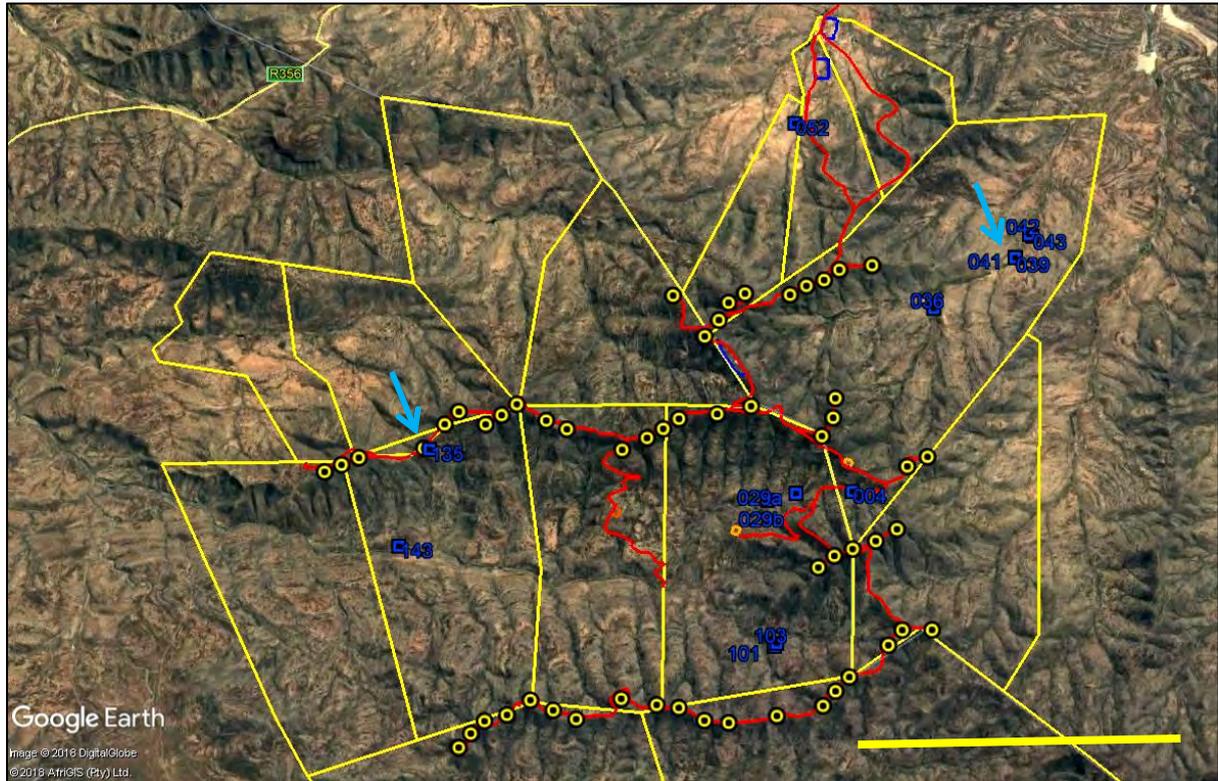


Figure 51. Google Earth© satellite image of the core Kudusberg WEF project area in the Klein Roggeveld region showing numbered fossil sites recorded during the field survey (blue) in relation to the proposed layout of wind turbines (yellow dots) and access roads (red lines). Note that (1) none of the identified sites lies directly within the development footprint and (2) the majority of sites are of low palaeontological heritage significance (Proposed Field Rating IIIC). Scientifically-important fossil plant and lung fish burrow sites (Locs. 038-041,135 &143) (Proposed Field Rating IIIA) as well as the *equivocal* vertebrate burrows and tracks (Locs. 29b, 042 & 043) all lie well outside (> 50 m) the proposed development footprint and do not require mitigation as part of the WEF development (See also Fig. 52 and locality details tabulated in Appendix 1). Scale bar = 7 km. N towards the top of the image.



Figure 52. Close-up satellite image of fossil site Loc. 135 (assemblage of lungfish burrows within lacustrine mudrocks) situated close to the crest of the central turbine ridge on Gats Rivier 156. It lies in an erosion gully over 50 m from the nearest proposed access road (red) and wind turbine position (yellow dot) (Fig. 41) and is therefore unlikely to be impacted by the WEF development. Mitigation is therefore not proposed for this site. Scale bar = 300 m. N towards the top of the image.

1.4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The present combined desktop and field-based palaeontological heritage assessment report contributes to the consolidated heritage assessment for the proposed Kudusberg WEF and falls under the South African Heritage Resources Act (Act No. 25 of 1999). It will also inform the Environmental Management Programme (EMPr) for this alternative energy project (See Section 1.8).

The various categories of heritage resources recognised as part of the National Estate in Section 3 of the National Heritage Resources Act include, among others:

- geological sites of scientific or cultural importance;
- palaeontological sites; and
- palaeontological objects and material, meteorites and rare geological specimens.

According to Section 35 of the National Heritage Resources Act, dealing with archaeology, palaeontology and meteorites:

- (1) The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.
- (2) All archaeological objects, palaeontological material and meteorites are the property of the State.
- (3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the

- responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.
- (4) No person may, without a permit issued by the responsible heritage resources authority—
- (a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
 - (b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
 - (c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
 - (d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.
- (5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—
- (a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;
 - (b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;
 - (c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and
 - (d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Minimum standards for the palaeontological component of heritage impact assessment reports (PIAs) have been published by SAHRA (2013).

Please note that:

- All South African fossil heritage is protected by law (South African Heritage Resources Act, 1999) and fossils cannot be collected, damaged or disturbed without a permit from the relevant Provincial Heritage Resources Agency (in this case Heritage Western Cape & SAHRA);
- Any mitigation recommendations made by the palaeontological specialist and approved by the relevant Heritage management Authority or Authorities must be incorporated into the Environmental Management Program (EMPr) for the Kudusberg WEF alternative energy project;
- The suitably qualified palaeontologist concerned with potential mitigation work will need a valid fossil collection permit from Heritage Western Cape / SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection);
- All palaeontological specialist work should conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).

1.5 IDENTIFICATION OF KEY ISSUES

1.5.1 Key Issues Identified

The proposed Kudusberg WEF study area is located in a region of the Great Karoo that is underlain by potentially-fossiliferous sedimentary rocks of Late Palaeozoic and younger, Late Tertiary or Quaternary, age. In particular, these include (1) Middle Permian continental deposits of the Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) that may contain scientifically important fossils of Permian vertebrates and terrestrial plants as well as (2) Late Caenozoic alluvium that may contain important mammalian remains such as teeth and bones (These rock units and fossils are described in more detail in Section 1.3 of this report).

The high palaeontological heritage sensitivity of the Palaeozoic bedrocks in the Komsberg REDZ2 focus area has been emphasized by Fourie *et al.* (2015) as well as on the SAHRIS palaeosensitivity map maintained by SAHRA.

The 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 new access roads, wind turbine placements, on-site substation, underground cables, laydown areas and construction yards. Construction of the WEF may adversely affect potential 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 planning, operational and de-commissioning phases of the WEF are unlikely to involve further adverse impacts on local palaeontological heritage and are therefore not separately assessed in this report.

1.5.2 Identification of Potential Impacts

The potential impacts identified during the PIA assessment are as follows:

1.5.3 Construction Phase

Potential Impact 1: Disturbance, damage or destruction of fossil heritage resources preserved at or below the ground due to ground clearance and excavations

1.5.4 Operational Phase

No significant impacts on palaeontological heritage anticipated.

1.5.5 Decommissioning Phase

No significant impacts on palaeontological heritage anticipated

1.5.6 Cumulative impacts

Cumulative impact 1: Potential loss of a significant fraction of fossil heritage preserved within the lower Abrahamskraal Formation of the SW Karoo through multiple wind farm developments in the Klein Roggeveld – Sutherland region.

1.6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

1.6.1 Results of the Field Study

A desktop review of the palaeontology of the Middle Permian Abrahamskraal Formation in the Klein Roggeveld, including several palaeontological heritage impact assessments for WEF and other developments in the region, shows that well-preserved fossil remains are generally scarce in this sector of the Great Karoo. However, several scientifically important occurrences of vertebrate bones, teeth, burrows and trackways are recorded here, as well as rare petrified wood and plant-rich lacustrine beds with diverse associated insect faunas (Section 1.3). A six-day palaeontological survey of numerous exposures of Abrahamskraal Formation bedrocks as well as Late Caenozoic superficial sediments within the Kudusberg WEF project area (Appendix 1) suggests that fossils are also rare here, although the local occurrence of important fossil remains in the subsurface obviously cannot be excluded. The fossils observed mainly comprise horizons with reworked, fragmentary vascular plants as well as low-diversity trace fossil assemblages that are of low conservation and research interest. Scientifically-important fossil plant and lung fish burrow sites occur at Locs. 038-041,135 &143 (See Appendix 1). No fossil vertebrates were recorded, but a few occurrences of *equivocal* vertebrate burrows and poorly-preserved tetrapod tracks were found (Locs. 29b, 042 & 043). None of the recorded fossil sites lies within the proposed WEF footprint (Appendix 1 and Figs. 51 & 52) and they should not be threatened by the proposed development. The Permian bedrocks are mostly mantled with Late Caenozoic colluvial and alluvial deposits as well as surface gravels and gravelly soils. This applies to the great majority of the ridge crests where the wind turbines will be situated as well as to the footprints of the access roads and various site options for the on-site substation and construction yards (Figs. 2 and 3).

1.6.1.1 Assessment of impacts on fossil heritage

The potential impact of the proposed Kudusberg WEF development (*revised* layout of October 2018) on local fossil heritage resources is evaluated here and summarized in Table 1 below (Section 1.7). This assessment applies only to the construction phase of the WEF development since further significant impacts on fossil heritage during the planning, operational and decommissioning phases of the WEF are not anticipated. The assessment applies to the key infrastructure described in Section 1.2 that will be situated within the main WEF project area, as shown in Figures 2 and 3, *i.e.* wind turbines, access roads, on-site substation, underground cables and 33 kV transmission lines, construction yard(s) and associated infrastructure. A separate Basic Assessment processes will be undertaken to assess the connection of the WEF to the national grid.

1.6.2 Disturbance, damage or destruction of fossils (Construction Phase)

The destruction, damage or disturbance out of context of legally-protected fossils preserved at the ground surface or below ground that may occur during construction of the WEF entail *direct negative* impacts to palaeontological heritage resources that are confined to the development footprint (*site specific*). These impacts can often be mitigated but cannot be fully rectified (*i.e.* they are *permanent / non-reversible*). All of the sedimentary formations represented within the study area contain fossils of some sort, so impacts at some level on fossil heritage are definite. However, most (but not all) of the fossils concerned are probably of widespread occurrence elsewhere within the outcrop areas of the formations concerned (*low irreplaceability*), while unique, well-preserved fossils are rare in this region of the Karoo. The probability of loss of *unique or rare, scientifically-important fossil heritage* is therefore rated as *very unlikely*. Because of the generally sparse occurrence of scientifically important, well-preserved, unique or rare fossil material within the bedrock formations concerned here - notably those underlying the proposed wind turbine sites and access roads - as well as within the overlying superficial sediments (soil, alluvium, colluvium etc), the consequence of the anticipated palaeontological impacts is conservatively rated as *slight*.

As a consequence of (1) the paucity of irreplaceable, unique or rare fossil remains within the development footprint, as well as (2) the extensive superficial sediment cover overlying most potentially-

fossiliferous bedrocks within the Kudusberg WEF study area, **the overall impact significance of the construction phase of the proposed wind energy project is assessed as VERY LOW (negative status)**. This assessment applies to the wind turbines, laydown areas, access roads (including both alternatives on Urias Gat 193), on-site substation (all three site options), construction camps (all three site options) and associated infrastructure within the WEF project area. A comparable very low impact significance is inferred for all project infrastructure alternatives and layout options under consideration that are outlined in Section 1.2 and Figures 2 and 3, including different options for routing of access roads, turbine layouts and siting of construction camp(s) and the on-site substation. **There are no preferences on palaeontological heritage grounds for any particular layout among the various options under consideration.**

1.6.2.1 Proposed monitoring and mitigation

Since scientifically valuable fossils are rare within the Kudusberg WEF project area and none of the recorded fossil sites lie within the development footprint (Figs. 51 & 52), no specialist palaeontological monitoring or mitigation is recommended for this development, pending the potential discovery of significant new fossil material here during the construction phase.

The ECO should be made aware of the possibility of important fossil remains (bones, teeth, petrified wood, plant-rich horizons *etc*) being found or unearthed during the construction phase. Monitoring of all major surface clearance and deeper (> 1m) excavations for fossil material 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 (Western Cape sites) or SAHRA (Northern Cape sites) for recording and sampling by a professional palaeontologist. A protocol for Chance Fossil Finds is appended to this report. These recommendations must be included within the EMPr for the Kudusberg WEF development.

Provided that the recommended monitoring and mitigation measures outlined here and tabulated in Section 1.8 (Table 2) are followed through, residual impacts for the Kudusberg WEF are rated as *very low*. Inevitable loss of some fossil heritage during the construction phase may be - at least partially - offset by an improved understanding of local palaeontological heritage through professional recording and mitigation of any significant new fossil finds (*positive* impact).

No significant further impacts on fossil heritage are anticipated during the operational and decommissioning phases of the WEF. The no-go alternative (*i.e.* no WEF development) will have a neutral impact on palaeontological heritage.

There are no fatal flaws in the Kudusberg WEF development proposal as far as fossil heritage is concerned. *Provided that* the proposed recommendations for palaeontological monitoring and mitigation are fully implemented, there are no objections on palaeontological heritage grounds to authorization of the Kudusberg WEF project.

Due to the generally low levels of bedrock exposure within the study area and the unavoidably superficial, reconnaissance level of the brief field assessment of the extensive study area, confidence levels for this palaeontological heritage assessment are only moderate (*medium*). These conclusions are supported, however, by several previous palaeontological field assessments undertaken in the broader Klein Roggeveld region by the author (See References and following discussion on cumulative impacts).

1.6.2.2 Cumulative Impacts

Cumulative impacts addressed here concern the *potential* loss of a significant fraction of scientifically valuable fossil heritage preserved within the lower Abrahamskraal Formation of the SW Karoo through multiple alternative energy developments in the Klein Roggeveld – Sutherland region.

Cumulative impacts inferred for the various alternative energy developments in the Klein-Roggeveld region between Matjiesfontein and Sutherland have been assessed here based on desktop and field-based palaeontological impact assessment reports for these projects, the great majority of which were submitted by the present author (See projects listed in the text below, Table 1 and references provided

below under Almond and SAHRIS website). Several of the projects concerned lie within a radius of some 50-70 km of the proposed Kudusberg WEF project area (Fig. 53) Relevant published palaeontological literature for the region has also been taken into account (e.g. Looock *et al.* 1994, Day & Rubidge 2014). This assessment applies only to the construction phases of the WEF developments, since significant additional impacts on palaeontological heritage during the operational and de-commissioning phases are not anticipated.

It should be emphasized that, in the case of palaeontological heritage, it only makes sense to consider cumulative impacts on *comparable fossil assemblages* present in the same formations that are represented in the present study area as well as in the broader study region. For example, impacts on Early Permian aquatic fossil invertebrates in the Whitehill Formation (Ecca Group) that crops out in WEF project areas to the southwest of the Kudusberg WEF study area are not directly relevant to - or cannot be weighed against - impacts on Middle Permian fossil assemblages of terrestrial vertebrates in the Lower Beaufort Group that is represented in the present study area. The analysis in Table 2 is therefore restricted to considering cumulative impacts on fossil heritage preserved within rock units and fossil assemblages that are represented in the Kudusberg WEF study area as well as in nearby project areas – specifically the lower Abrahamskraal Formation (*Eodicynodon* Assemblage Zone – See Section 1.3). Since potentially-fossiliferous consolidated Late Caenozoic alluvial deposits will normally not be impacted in WEF developments because they usually lie along well-buffered drainage lines they are not considered for the purpose of this analysis.

WEF projects in the SW Karoo close to the Kudusberg WEF project area that share comparable fossil assemblages in the lower Abrahamskraal Formation include the following: Kareebosch WEF (Almond 2014), Karusa WEF (Almond 2015c), Rietkloof WEF (Almond 2016b), Brandvalley WEF (Almond 2016c), Esizayo WEF (Almond 2016f), Maralla West WEF (Almond 2016h) and Maralla East WEF (Almond 2016i). Additional PIAs (palaeontological impact assessments) of relevance include those for the Eskom Gamma-Omega 765kV transmission line (Almond 2010a) and the Komsberg Substation (Almond 2015b). Other WEF projects in the wider region, such as the Perdekraal East WEF (Almond 2015a), Soetwater WEF (Almond 2015d), Gunsfontein WEF (Almond 2015g), Komsberg West WEF (Almond 2015f), Komsberg East WEF (Almond 2015e), Sutherland WEF (Almond 2010c), Suurplaat WEF (Almond 2010b) and the Great Karoo WEF (for which no field-based palaeontological study was done) are underlain by younger rocks within the Lower Beaufort Group, or by much older Dwyka Group and Ecca Group rocks. These successions contain different, significantly older or younger fossil assemblages and so are not relevant to the present cumulative impact assessment. This also applies to further alternative energy facilities within the Cape Fold Belt near Touwsrivier and Laingsburg, such as the Konstabel WEF (Almond 2010d) and the Witberg WEF (Hart & Miller 2010) which are underlain by older bedrocks, as well as to solar energy facilities above the Great Escarpment near Sutherland that overlie younger portions of the Abrahamskraal Formation.

In all the strictly *relevant* field-based palaeontological studies listed above the palaeontological sensitivity of the project area and the palaeontological heritage impact significance for the developments concerned has been rated as *low*. In all cases it was concluded by the author that, despite the undoubted occurrence of scientifically-important fossil remains (notably fossil vertebrates, vertebrate trackways and burrows, petrified wood and – as more recently discovered – rich lacustrine plant-insect assemblages), the overall impact significance of the proposed developments was low because the probability of significant impacts on *scientifically important, unique or rare fossils* was slight. While fossils do indeed occur within most of the formations present, they tend to be sparse – especially as far as fossil vertebrates are concerned - while the great majority represent common forms that occur widely within the outcrop areas of the rock units concerned. Important exceptions include (1) rich horizons of fossil plants and associated insect faunas from lacustrine beds (Prevec & Matiwane 2018) and (2) vertebrate burrows attributed to small therapsids, and also to lungfish (Almond 2016b, Almond 2016c). Well-preserved vertebrate trackways made by temnospondyl amphibians or other, unidentified tetrapods that have been found both above and below the Great Escarpment near Sutherland (Almond 2016e) are not really relevant here because they occur within significantly younger sediments of the Lower Beaufort Group.

Cumulative impacts for the Kudusberg WEF in the context of comparable alternative energy projects proposed or authorised in the Klein-Roggeveld region are assessed in Table 2. **It is concluded that the cumulative impact significance of the Kudusberg WEF and other regional projects is very low (negative), provided that the proposed monitoring and mitigation recommendations made for all**

these various projects are followed through. Unavoidable residual negative impacts may be partially offset by the improved understanding of Karoo palaeontology resulting from appropriate professional mitigation. This is regarded as a *positive* impact for Karoo palaeontological heritage. However, *without* mitigation the magnitude or consequence of cumulative (negative, direct) impacts of such a large number of WEFs affecting the same (albeit sparsely) fossiliferous rock successions would be significantly higher (*moderate consequence*) and probable (*likely*). The cumulative impact significance without mitigation is accordingly assessed as low.

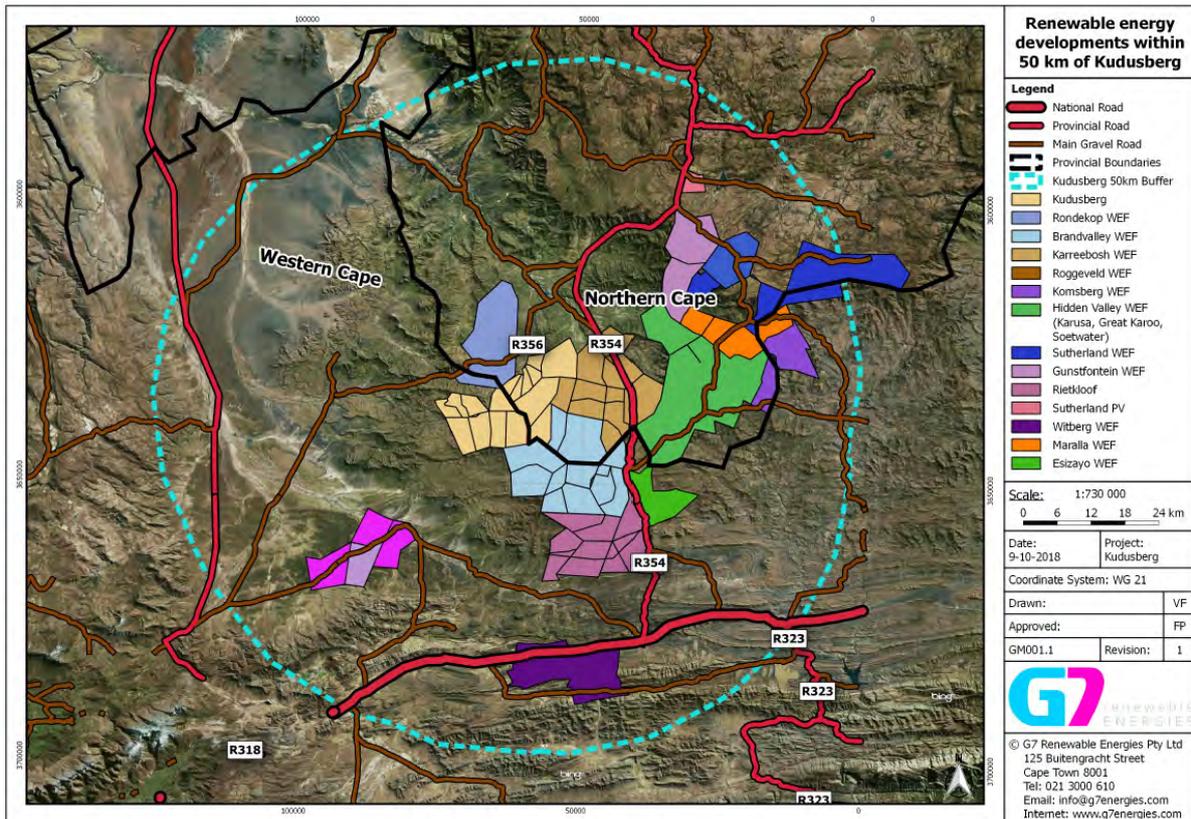


Figure 53. Map of the Klein Roggeveld region, SW Great Karoo, showing project areas for the numerous WEF developments proposed within a c. 50 km radius of the Kudusberg WEF project area (*N.B.* not all these developments have been approved) (Image provided by the G7 Renewable Energies (G7)).

Table 1. List of other WEF projects within a 50 km radius of the proposed Kudusberg WEF site:

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
WIND PROJECTS							
14/12/16/3/3/2/967	Scoping and EIA	Biotherm Energy (Pty) Ltd	Proposed 140 MW Esizayo Wind Energy Facility and its associated infrastructure near Laingsburg within the Laingsburg Local Municipality in the Western Cape	WSP/Parsons Brinckerhoff	Wind	140 MW	Approved
East -14/12/16/3/3/2/962 West- 14/12/16/3/3/2/693	Scoping and EIA	Biotherm Energy (Pty) Ltd	East: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the farm Welgemoed 268, the remainder of the farm Schalkwykskraal 204 and the remainder of the farm Drie Roode Heuvels 180 north of the town of Laingsburg within the Laingsburg and Karoo Hoodland Local Municipalities in the Western and Northern Cape Provinces	WSP/Parsons Brinckerhoff	Wind	140 MW	Approved

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			West: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the Farm Drie Roode Heuvels 180, the remainder of the farm Annex Drie Roode Heuvels 181, portion 1 of the farm Wolven Hoek 182 and portion 2 of the farm Wolven Hoek 182 north of the town of Laingsburg within the Karoo Hoodland Local Municipality in the Northern Cape Province				
12/12/20/1966/AM5	Amendment	Witberg Wind Power (Pty) Ltd	Proposed establishment of the Witberg Wind Energy Facility, Laingsburg Local Municipality, Western Cape Province	Environmental Resource Management (Pty) Ltd / Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
12/12/20/1783/2/AM1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal West (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Environmental Resource Management (Pty) Ltd	Wind	110 MW	Under construction
12/12/20/1783/1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal East (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Savannah Environmental Consultants (Pty) Ltd	Wind	150 MW	Approved
14/12/16/3/3/2/899	Scoping and EIA	Rietkloof Wind Farm (Pty) Ltd	Proposed Rietkloof Wind Energy (36 MW) Facility within the Laingsburg Local	EOH Coastal & Environmental Services	Wind	36 MW	Approved

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			Municipality in the Western Cape Province				
TBC	BA		Proposed Rietkloof Wind Energy Facility, Western Cape, South Africa	WSP	Wind	140 MW	In progress
14/12/16/3/3/2/826	Scoping and EIA	Gunstfontein Wind Farm (Pty) Ltd	Proposed 200 MW Gunstfontein Wind Energy Facility on the Remainder of Farm Gunstfontein 131 south of the town of Sutherland within the Karoo Hooglands Local Municipality in the Northern Cape Province, south of Sutherland.	Savannah Environmental Consultants (Pty) Ltd	Wind	200 W	Approved
12/12/20/1782/AM2	Scoping and EIA	Mainstream Power Sutherland	Proposed development of 140 MW Sutherland Wind Energy Facility, Sutherland, Northern and Western Cape Provinces	CSIR	Wind	140 MW	Approved
Karusa - 12/12/20/2370/1 Soetwater -12/12/20/2370/2	Scoping and EIA	African Clean Energy Developments Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Karusa & Soetwater)	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Preferred bidders. Construction to commence in 2019
12/12/20/2370/3	Scoping and EIA	African Clean Energy Developments Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Greater Karoo))	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
West -14/12/16/3/3/2/856 East - 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farm (Pty) Ltd	Proposed 275 MW Komsberg West Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Approved

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
			Proposed 275 MW Komsberg East Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces				
12/12/20/1988/1/AM1	Amendment	Roggeveld Wind Power (Pty) Ltd	Proposed Construction of the 140 MW Roggeveld Wind Farm within the Karoo Hoogland Local Municipality and the Laingsburg Local Municipality in the Western and Northern Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Preferred bidders. Construction to commence in 2019.
14/12/16/3/3/2/807/AM1	Scoping and EIA Amendment	Karreebosch Wind Farm (Pty) Ltd	Proposed Karreebosch Wind Farm (Roggeveld Phase 2) and its associated infrastructure within the Karoo Hoogland and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
14/12/16/3/3/2/900	Scoping and EIA	Brandvalley Wind Farm (Pty) Ltd	Proposed 147 MW Brandvalley Wind Energy Facility North of the Town of Matjiesfontein within the Karoo Hoogland, Witzenberg and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	EOH Coastal & Environmental Services	Wind	140 MW	Approved
TBA	Scoping and EIA	Rondekop Wind Farm (Pty) Ltd	Proposed establishment of the Rondekop WEF, south-west of Sutherland in the Northern Cape	SIVEST SA (Pty) Ltd	Wind	325 MW	In process
West 14/12/16/3/3/2/856 East 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farms (Pty) Ltd	Komsberg East and West WEF	Arcus Consulting Services (pty) Ltd	Wind	140 MW each	

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MEGAWATT	STATUS
TBC	BA	ENERTRAG SA (Pty) Ltd	Proposed Development of the Tooverberg Wind Energy Facility and the associated grid connection near Touws River, Western Cape Province)	SiVEST SA (Pty) Ltd	Wind	140 MW	In process
SOLAR PROJECTS							
12/12/20/2235	BA	Inca Sutherland Solar (Pty) Ltd	Proposed Photovoltaic (PV) Solar Energy Facility on A Site South Of Sutherland, Within The Karoo Hoogland Municipality Of The Namakwa District Municipality, Northern Cape Province	CSIR	Solar	10 MW	Approved

1.7 IMPACT ASSESSMENT SUMMARY

Potential impacts on palaeontological heritage are assessed below in Table 2 for the construction phase of the Kudusberg WEF. Further significant impacts on fossil heritage during the operational and decommissioning phases of the WEF are not anticipated. Cumulative impacts in the context of comparable WEF developments in the Klein Roggeveld region (< 50 km radius) are assessed in Table 2.

Table 2. Impact assessment summary table for the Construction Phase:

Impact pathway	Nature of potential impact/risk	Status ¹	Extent ²	Duration ³	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
PALAEONTOLOGICAL HERITAGE															
CONSTRUCTION PHASE															
Direct Impacts															
Surface clearance & excavations	Disturbance, damage or destruction of fossils	Negative	Site specific	Perma- nent	Slight	Unlikely	Non- reversible	Low	Very low	No	Yes	Monitoring of major excavations for fossil material by the ESO on an on-going basis during construction phase. Significant fossil finds to be reported to Heritage Western Cape (Western Cape sites) or SAHRA (Northern Cape sites) for recording and sampling by a professional palaeontologist	Very low	5	Medium

¹ Status: Positive (+); Negative (-)

² Site; Local (<10 km); Regional (<100); National; International

³ Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 years); Long-term (project duration); Permanent (beyond project decommissioning)

Table 3. Cumulative impact assessment summary table

Impact pathway	Nature of potential impact/risk	Status ⁴	Extent ⁵	Duration ⁶	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ impact (after mitigation)	Ranking of impact/ risk	Confidence level
PALAEONTOLOGICAL HERITAGE															
CONSTRUCTION PHASE															
Direct Impacts															
Surface clearance & bedrock excavations	Disturbance, damage or destruction of significant fraction of fossil heritage within the lower Abrahamskraal Formation (Karoo Supergroup)	Negative	Regional	Permanent	Slight	Unlikely	Non-reversible	Low	Very Low	No	Yes	Monitoring of major excavations for fossil material by the ESO on an on-going basis during construction phase. Significant fossil finds to be reported to Heritage Western Cape (Western Cape sites) or SAHRA (Northern Cape sites) for recording and sampling by a professional palaeontologist	Very Low	5	Medium

⁴ Status: Positive (+); Negative (-)

⁵ Site; Local (<10 km); Regional (<100); National; International

⁶ Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 years); Long-term (project duration); Permanent (beyond project decommissioning)

1.8 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAM

Recommendations for palaeontological monitoring and mitigation by the ECO for the construction phase of the Kudusberg WEF are tabulated below for inclusion in the EMPr (See also the tabulated Chance Fossil Finds Protocol in Appendix 2). Pending the discovery of significant new fossil remains during construction, no specialist palaeontological mitigation or monitoring is considered necessary. All recorded fossil sites (Figs. 51 & 52) lie outside the development footprint. No recommendations are made for the operational and de-commissioning phases of the development (*N.B.* The Chance Fossil Finds Protocol still applies).

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. CONSTRUCTION PHASE					
A.1. PALAEOLOGICAL IMPACTS					
Potential impact on fossil heritage as a result of the proposed Kudusberg WEF and associated infrastructure.	Avoid or minimize impacts to fossils sites on site.	<ul style="list-style-type: none"> ▪ Alert ECO to potential for important new fossil finds during the construction phase (Provide Fossil Finds Protocol). ▪ Appoint suitably qualified palaeontologist for professional mitigation should new fossil sites be discovered. 	<ul style="list-style-type: none"> ▪ Monitoring of all major surface clearance and deeper (> 1m) excavations for fossil material (bones, teeth, petrified wood, plant-rich beds <i>etc.</i>). ▪ Significant fossil finds to be safeguarded and reported to Heritage Western Cape (Western Cape sites) or SAHRA (Northern Cape sites). ▪ Recording and sampling of important new fossil finds and relevant geological data. 	<ul style="list-style-type: none"> ▪ On-going during construction phase. ▪ As soon as possible after fossils are found. ▪ As soon as possible after fossils are found. 	<ul style="list-style-type: none"> ▪ ECO ▪ ECO ▪ Professional palaeontologist

1.9 CONCLUSION AND RECOMMENDATIONS

Kudusberg Wind Farm (Pty) Ltd is proposing to develop a wind energy facility (WEF) of up to 325 MW generation capacity on a site located between Matjiesfontein and Sutherland in the mountainous Klein Roggeveld region, Western and Northern Cape Provinces. The WEF project area is underlain by Middle Permian (c. 265-270 Ma.) continental sediments of the Abrahamskraal Formation (Lower Beaufort Group, Karoo Supergroup) that are generally considered to be of high palaeontological sensitivity (SAHRA Palaeotechnical Report for the Northern Cape, SAHRIS website, Komsberg REDZ *in SEA* for Wind & Solar Photovoltaic Energy in South Africa, CSIR 2015). However, several previous palaeontological field assessments in the Klein Roggeveld region of the south-western Karoo suggest that the Beaufort Group bedrocks here are generally fossil-poor, apart from fairly common horizons with plant debris or low-diversity invertebrate trace fossils. Occasional scientifically important fossil finds of large tetrapod (*i.e.* terrestrial vertebrate) burrows and trackways, disarticulated skeletal remains (dispersed bones, teeth), petrified wood and rich assemblages of plants and insects within lacustrine sediments have been recorded from these beds but they are very rare. The Late Caenozoic superficial sediments (alluvium, colluvium, calcretes, soils, surface gravels *etc*) overlying the Palaeozoic bedrocks are generally of low palaeontological sensitivity but may contain important mammalian bones and teeth. None of the fossil sites recorded during the 6-day palaeontological field survey of the Kudusberg WEF project area lie within the proposed development footprint. They include two plant fossil sites and one lungfish burrow site that are of scientific research interest as well as a few *equivocal* records of vertebrate burrows and tracks (Fig. 51 and Appendix 1).

In terms of palaeontological heritage resources, the overall impact significance of the construction phase of the proposed wind energy project is assessed as VERY LOW (negative), both before and after mitigation. This is a consequence of (1) the paucity of irreplaceable, unique or rare fossil remains within the development footprint as well as (2) the extensive superficial sediment cover overlying most potentially-fossiliferous bedrocks within the Kudusberg WEF study area. Furthermore, some of the near-surface bedrocks are highly weathered. This assessment applies to the wind turbine corridors, laydown areas, access roads, the on-site substation, construction yards, underground cables, 33kV powerlines and other associated WEF infrastructure within the study area.

Given the similar underlying geology, a comparable very low impact significance is inferred for all project infrastructure alternatives and layout options under consideration, including different options for routing of access roads into the northern sector of the project area, turbine layouts and siting of construction yards and the on-site substation. **There are therefore no preferences on palaeontological heritage grounds for any particular layout among the various options considered. No significant further impacts on fossil heritage are anticipated during the operational and decommissioning phases of the WEF.** The no-go alternative (*i.e.* no WEF development) will have a neutral impact on palaeontological heritage.

There are no fatal flaws in the Kudusberg WEF development proposal as far as fossil heritage is concerned. Provided that the recommendations for palaeontological monitoring and mitigation outlined below are followed through, there are no objections on palaeontological heritage grounds to authorisation of the Kudusberg WEF project. Cumulative impacts on palaeontological heritage resources that are anticipated as a result of the numerous alternative energy developments currently proposed or authorised for the Klein-Roggeveld region - including additional impacts envisaged for the Kudusberg WEF project – are predicted to be **very low (negative)**, *provided that* the proposed monitoring and mitigation recommendations made for these various projects are followed through. Unavoidable residual negative impacts (low significance) may be partially offset by

the improved understanding of Karoo palaeontology resulting from appropriate professional mitigation. This is regarded as a significant *positive* impact for Karoo palaeontological heritage.

The great majority of the Kudusberg WEF project area is assessed as being of low palaeontological sensitivity due to the scarcity of significant fossil vertebrate, plant and other remains here. Sensitive no-go areas within the proposed development footprint itself have not been identified in this study. Scientifically-important fossil plant and lung fish burrow sites (Locs. 038-041,135 &143) as well as the *equivocal* vertebrate burrows and tracks (Locs. 29b, 042 & 043) all lie well outside (> 50 m) the proposed development footprint (Appendix 1 and Figs. 51 & 52) and no mitigation measures regarding them are recommended here (*N.B.* Taping-off the sites might only draw unwelcome attention to the fossils). Pending the potential discovery of significant new fossil remains during the construction phase - in which event the Chance Fossil Finds Protocol appended to this report should be applied (Appendix 2) – no specialist palaeontological mitigation is recommended for the Kudusberg WEF project.

The ECO responsible for the Kudusberg WEF development should be made aware of the potential occurrence of scientifically-important fossil remains (*e.g.* vertebrate bones, teeth, burrows and trackways, petrified wood, plant-rich beds) within the development footprint. During the construction phase all major clearance operations (*e.g.* for new access roads, turbine placements) and deeper (> 1 m) excavations should be monitored for fossil remains on an on-going basis by the ESO. Should substantial fossil remains be encountered at surface or exposed during construction, the ECO should safeguard these, preferably *in situ*. They should then alert the relevant provincial heritage management authority as soon as possible - *i.e.* Heritage Western Cape for the Western Cape (Contact details: Protea Assurance Building, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 086-142 142. Fax: 021-483 9842. Email: hwc@pgwc.gov.za) and SAHRA for the Northern Cape (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). This is to ensure that appropriate action (*i.e.* recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the developer's expense.

These mitigation recommendations must be incorporated into the EEMPr for the Kudusberg WEF.

Please note that:

- All South African fossil heritage is protected by law (South African Heritage Resources Act, 1999) and fossils cannot be collected, damaged or disturbed without a permit from SAHRA or the relevant Provincial Heritage Resources Agency (in this case Heritage Western Cape);
- The palaeontologist concerned with potential mitigation work will need a valid fossil collection permit from Heritage Western Cape / SAHRA and any material collected would have to be curated in an approved depository (*e.g.* museum or university collection);
- All palaeontological specialist work should conform to international best practice for palaeontological fieldwork and the study (*e.g.* data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).

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APPENDICES

Appendix 1: GPS data for key geological and fossil sites

All GPS readings were taken in the field using a hand-held Garmin GPSmap 60CSx instrument. The datum used is WGS 84.

Please note that fossil locality data is not for general publication for heritage conservation reasons.

Loc	GPS data	Comments
001	S32° 53' 26.7" E20° 16' 56.9"	Gats Rivier 156. Lenticular multi-storey channel sandstone bodies – possibly Combrinskraal Mb of Abrahamskraal Fm - near Gatsrivier Springbok accommodation. Colluvial gravels on valley floor dominated by well-rounded corestones of greyish wacke showing rusty-brown surface patina. Underlain by continuous pale cream calcrete hardpan that is well-exposed in farm tracks.
002	S32° 52' 52.5" E20° 19' 42.7"	Oliviers Berg 159. Views towards central ridge from valley floor. Laterally-extensive tabular channel sandstone bodies on hillslopes and along ridge crests=.
003a	S32° 52' 36.0" E20° 20' 43.7"	Oliviers Berg 159. Deeply-incised “dry” river valley below channel sandstone capping. Extensive dark grey overbank mudrock exposure in banks and bed of river valley.
004	S32° 52' 29.7" E20° 21' 50.8"	Oliviers Berg 159, close to Substation 3 site. Stream bed exposures of Abrahamskraal Fm sandstone bedding surfaces. Flat bedding, primary current lineation implies high current velocity (upper flow regime). Vague arcuate horizontal burrows preserved as epichnial ridges (Proposed Field Rating IIC: Local Resource. No mitigation required). Possible dendritic rill marks (falling water levels / microbial mat textures), moulds of small angular mudflake intraclasts. Small sphaeroidal ferruginous diagenetic concretions. Purple-brown overbank mudrocks and single storey sandstone interbed – probably crevasse splay.
005	S32° 53' 02.0" E20° 20' 46.7"	Oliviers Berg 159. Viewpoint to SW towards main southern Koedoesberge ridge – gently convex skyline, gentle hillslopes dissected by numerous stream gullies, few prominent-weathering, laterally-persistent sandstone <i>kranzes</i> – perhaps represent major distributary channels on delta platform.
006	S32° 52' 59.6" E20° 20' 14.3"	Oliviers Berg 159. Substation 2 site. Flat-lying to gently sloping, mantled with scattered coarse sandstone colluvial rubble, silty soils, karroid bossieveld vegetation. No Karoo mudrock exposure.
007	S32° 53' 20.6" E20° 19' 09.9"	Oliviers Berg 159. Views towards Oliviersberg homestead from Uitkyk Pass. Oliviersberg Ridge with thicker sandstone packages towards crest (possible Grootfontein Member).
008	S32° 53' 04.1" E20° 18' 43.7"	Oliviers Berg 159. View SW from Uitkyk Pass towards <i>possible</i> tectonic reduplication (thrust fault) of channel sandstone package.
010	S32° 52' 46.6" E20° 18' 32.2"	Oliviers Berg 159. Substation 1 site adjacent to Uitkyk Pass. Flat terrain mantled in coarse colluvial sandstone angular to subrounded gravels, bossieveld vegetation. No bedrock exposure. Views to NW of central turbine ridge with flat-lying thicker sandstone packages towards crest, in core of anticline (possible Grootfontein Member). Southern slopes of ridge show S-dipping sandstone bedding plane exposure in stream beds.
011	S32° 51' 51.8" E20° 18' 57.0"	Oliviers Berg 159. Crest of Central Ridge at top of Uitkyk Pass and near wind mast. Views along ridge crest. Views N into Amandelboom 158 –thick lower sandstone packages (Combrinskraal Mb) close to N foot of ridge.
012	S32° 51' 46.6" E20° 17' 48.0"	Oliviers Berg 159. Views from crest of Central Ridge along ridge – upper sandstone package (Grootfontein Member).
013	S32° 51' 40.3" E20° 17' 36.5"	Oliviers Berg 159. Western end of track along crest. Views along ridge of Grootfontein Mb sandstone package.
014	S32° 51' 46.5" E20° 17' 52.5"	Oliviers Berg 159. Crest of Central Ridge. Carpet of downwasted, well-rounded to subrounded, poorly-sorted sandstone / wacke corestones (pebble to boulder-sized) overlying thin brown gravelly soil or sandstone channel body at depth.
016	S32° 51' 51.3" E20° 18' 33.0"	Oliviers Berg 159. Crest of Central Ridge Patch of crumbly blue-grey overbank mudrocks overlying channel sandstone with horiozns of sparse, small

Loc	GPS data	Comments
		palaeocalcrete nodules, silicified gypsum pseudomorphs, intermittent lenses of irregular to lenticular ferruginous carbonate concretions (up to few dm across) along strike.
017	S32° 52' 24.2" E20° 18' 40.0"	Oliviers Berg 159. Steep N-facing section through Abrahamskraal Fm in stream valley close to Uitkyk Pass. Good exposure of tabular grey-green mudrocks interbedded with tabular single-storey sandstones (m- to few m scale) – possibly crevasse splays. Lower part of succession with coarsening-upwards packages of few m thickness from (1) grey-green, crumbly claystones mudrocks with occasional horizons of ferruginous carbonate concretions through (2) laminated siltstones, (3) thin-bedded sandstones / heterolithic packages to (4) medium-bedded sandstones / wackes, last with gradational bases and sharp tops. Possible infills of interdistributary bays on delta platform / top. Upper part of exposure with sharp-based sandstones (1-few m thick) and more typical fluvial style. Cleaner-washed pale sandstones towards top of succession. <i>i.e.</i> Possible shoreline transition between deltaic and fluvial deposition on delta platform. Views SSSE towards Oliviersberg showing fault-displaced (or slumped) thick channel sandstone body (c. 750 m west of Substation 2 site, 32 53 04 S, 20 19 44.4 E). Possibly represent major distributary or fluvial channels on delta platform. Contrast with numerous, thin, highly tabular sandstone ridges above.
018	S32° 53' 11.0" E20° 18' 42.1"	Oliviers Berg 159. West-facing hillslope showing thick lenticular multi-storey channel sandstone with thinner spaced tabular sandstones on either side. Possible locus of channel development on delta platform.
020	S32° 53' 11.8" E20° 18' 55.5"	Oliviers Berg 159. Gentle hillslope exposures of grey-green mudrocks near Uitkyk Pass track. Surface gravels dominated by spheroidal gypsum rose pseudomorphs up to c. 6 cm diameter with radiating crystals internally, small lenticular crystals visible on exterior. Indicates / evaporative arid period on floodplain overlying delta platform. Poorly sorted surface gravels also comprise well-rounded wacke corestones, occasional fine-grained wacke flaked artefacts, downwasted ferruginous carbonate concretionary material.
021	S32° 53' 26.4" E20° 19' 25.6"	Oliviers Berg 159. East-facing riverbank section through major tabular to lenticular, well-jointed, multi-storey, grey-green wacke package at low elevation (valley floor). Probably Combrinksraal Mb. Sharp erosive base with local gullying. Beds pinch and swell along strike. Thin (few dm) to thick (few m) lenticular horizons of mudflake intraclast breccio-conglomerates (sometimes ferruginized; no reworked palaeocalcrete nodules or plant material / wood seen) between thick-bedded massive to horizontally-laminated to low angle current cross-bedded channel wacke packages. Underlying succession upward-coarsening from dark hackly massive mudrocks into thin-bedded, locally slickesided siltstone facies. Major erosive sandstone sole surfaces show well-developed current crescents and sandstone-infilled mudcracks; <i>i.e.</i> subaerial deposition.
022	S32° 53' 22.3" E20° 19' 26.7"	Oliviers Berg 159. Riverbank sections through coarse boulder alluvium dominated by angular to subrounded cobbles and boulders of wacke / sandstone, clast-supported, with poorly-developed imbrication of platy clasts. Overlain by thin sandy alluvium and gravels. Coarse alluvial conglomerates wedge out along strike to interbedded semi-consolidated brown sandy and poorly-sorted gravelly alluvial deposits.
023	S32° 52' 39.8" E20° 20' 09.4"	Oliviers Berg 159. River bed and bank exposure of Combrinksraal Mb wackes and grey-green as well as mottled purple-brown overbank mudrocks. Sandstones lenticular, v. fine-grained, massive with gradational, upward-coarsening bases. Small-scale wave ripples preserved at several horizons within grey-green, fine-grained wackes. Well-exposed packages of upward-coarsening purple-brown and grey-green siltstones and fine wackes with sharp tops – small spectrum of grain size variation. Riverbank sections through pale brown, rubbly, massive diamictites (probably debrites) with subrounded sandstone clasts within sandy matrix.
024	S32° 52' 35.3" E20° 20' 23.5"	Oliviers Berg 159. Good riverbank sections through several m-thick coarse alluvial and colluvial gravels with massive wacke boulders suspended in a sandy matrix. Basal horizon is a matrix-supported debrite diamictite with a gritty matrix while upper parts of succession include imbricated, clast-supported alluvial conglomerates. Coarse succession capped by sandy alluvium with minor gravels.
025	S32° 52' 37.3" E20° 20' 24.5"	Oliviers Berg 159. Stream bank and bed exposures of massive to well-bedded, hackly-weathering, purple-brown and grey green mudrocks grading up into

Loc	GPS data	Comments
		tabular, laterally-extensive, thin wackes with possible local slumping or collapse of wacke blocks into soupy mudrocks. Combrinkskraal Member.
026	S32° 52' 35.4" E20° 20' 43.7"	Oliviers Berg 159. Deeply-incised, meandering "dry" river valley below channel sandstone capping, downstream of dry waterfall. Extensive dark grey to purple-brown overbank mudrock exposure in banks and bed of river valley.
027	S32° 52' 33.7" E20° 20' 48.7"	Oliviers Berg 159. Bed of dry river valley with grey-green wackes sharply overlain by purple-brown mudrocks, upward-coarsening mudrock to wacke packages, Late Caenozoic coarse, crudely imbricated alluvial rubble overlies bedrocks.
028	S32° 52' 34.0" E20° 20' 50.4"	Oliviers Berg 159. Extensive riverbank exposure of Combrinkskraal Member overbank mudrocks and channel sandstones. Latter fine-grained, massive, gradational (towards base of succession) to sharp and erosive-based (higher in succession), undulose-topped, but locally show evidence of loading into soupy mudrocks. Possibly multiple transitions across deltaic – fluvial boundary within Combrinkskraal Member.
029	S32° 52' 30.6" E20° 20' 56.3"	Oliviers Berg 159. Steep gully bank exposure of Combrinkskraal succession – massive to thinly-bedded purple-brown mudrock facies well represented, with subordinate thin sandstone interbeds. No calcrete palaeosols observed, but occasional possible gypsum pseudomorphs. Capped by thick, cliff-forming, well-jointed, tabular channel sandstone package.
029a	S32° 52' 31.0" E20° 21' 04.9"	Oliviers Berg 159. Float blocks below base of main channel sandstone showing poorly-preserved, backfilled cylindrical burrows of the <i>Scoyenia</i> Ichnofacies (Proposed Field Rating IIIC: Local Resource. No mitigation required).
029b	S32° 52' 35.9" E20° 20' 41.8"	Oliviers Berg 159. Small roadside exposure of a sandstone palaeosurface (possibly crevasse splay sandstone) bearing <i>possible</i> tetrapod tracks associated with small scale, linear-crested wave ripples. (Proposed Field Rating IIIB: Local Resource. Site should be recorded if disturbance is expected here during development. Site lies outside proposed development footprint).
030	S32° 53' 03.8" E20° 21' 02.4"	Oliviers Berg 159. Gullied hillslope exposures of thin- to medium-bedded grey-green and purple-brown overbank mudrocks, thin (dm-scale) sandstone interbeds – probably crevasse splays (stratigraphically between major sandstone packages). Cobble-sized ferruginous carbonate concretions.
031	S32° 53' 04.3" E20° 21' 04.1"	Oliviers Berg 159. Low hillslope step or <i>kranz</i> of thin-bedded purple-brown mudrocks grading upwards to sandstones. Cobble-sized ferruginous carbonate concretions in lower mudrocks.
032	S32° 52' 23.9" E20° 22' 20.0"	Matjes Fontein 194. Nek in Pad de Hoek pass – patches of grey-green mudrock exposure on lower hillslopes. Views of NE end of Central Ridge.
033	S32° 52' 15.3" E20° 22' 29.7"	Matjes Fontein 194. Pad se Hoek pass below wind mast. Extensive gullied hillslope exposure of crumbly, weathered, grey-green, massive to laminated overbank mudrocks as well as S-dipping highly-weathered, pale brown sandstone packages. Views towards west show gentle anticlinal fold in Abrahamskraal Fm.
034	S32° 51' 27.6" E20° 22' 43.3"	Matjes Fontein 194. Views west from Pad se Hoek pass showing stream gullies at eastern end of Central Ridge with exposure of channel sandstone <i>kranzes</i> and some mudrocks on steeper gully slopes. Local lenticular thickening of multi-storey channel sandstones associated with major water falls, exposed grey-green mudrocks beneath. Carpet of lichen-covered sandstone colluvium on gentler hillslopes.
035	S32° 50' 54.6" E20° 22' 49.7"	Matjes Fontein 194. Gully exposures of low-elevation, poorly-sorted colluvial sands and gravels. Dominated by brown-patinated, well-rounded to angular wackes with minor vein quartz. Possible debrite diamictite facies with suspended large sandstone clasts in sandy matrix. Fine-grained sandstones show conchoidal fracture.
036	S32° 50' 23.0" E20° 22' 57.7"	Matjes Fontein 194. Modern boulder to cobbly alluvial gravels in shallow stream bed. Views of N turbine ridge from SE showing gently folding of Abrahamskraal Fm succession on N flanks of ridge. River bank exposure of hackly grey-green mudrocks (some laminated distal floodplain, possibly lacustrine packages, horizons with sphaeroidal to irregular, cobble-sized ferruginous carbonate concretions) with thin (< 1m), sharp-based crevasse splay sandstones. Sandstone bed tops with dispersed rounded casts of reedy plant stems – probably sphenophyte ferns. (Proposed Field Rating IIIC: Local Resource. No mitigation required).
037	S32° 50' 01.6" E20° 23' 50.7"	Matjes Fontein 194. Extensive channel sandstone bedrock exposure just downstream of Matjiesfontein homestead. Low angle cross-lamination in medium-

Loc	GPS data	Comments
		to coarse grained, medium- to thick-bedded, grey-green sandstone. Stream bank exposure of grey-green mudrocks with lenticular, ferruginous carbonate concretions, sharp-based, gradational-topped, fine-grained tabular sandstones SE of homestead.
038	S32° 49' 50.2" E20° 24' 03.6"	Matjes Fontein 194. Good riverine exposures of Abrahamskraal Fm sandstones and mudrocks c. 0.5 km NE of homestead. Upward-thickening succession grading up into base of thin-bedded sandstone packages. Hackly mudrocks v. dark grey, massive, thin-bedded to laminated – possibly lacustrine facies. Laterally-persistent horizons of ferruginous carbonate concretions (several dm thick). Small-scale (sev. m across) channel cut-and-fill feature overlying, and incising, dark grey thin-bedded facies. Abrahamskraal Fm bedrocks capped by several meters of semi-consolidated, rubbly, poorly-sorted High Level Gravels (mainly sandstone clasts, up to boulder-sized)
039	S32° 49' 47.6" E20° 24' 04.9"	Matjes Fontein 194. Upper bedding plane of loaded, gradational-based, current ripple cross-laminated wacke with thin concentration of plant debris impressions. Casts of <i>in situ</i> stems and radiating, longitudinally-ridged, strap-like leaves of <i>Schizoneura africana</i> and <i>S. gondwanensis</i> as well as an undescribed new sphenophyte. Setting possibly a playa lake margin. Soft substrates indicated by loading, dewatering flame structures. Intermittent exposure indicated by small-scale cracking of muddy veneers on current-rippled surfaces. Overlying mudrocks with flame structures, then sandstone packages showing upward-thinning, sharp bases. (Proposed Field Rating IIIA: Local Resource. Site lies well outside WEF footprint so should be protected from disturbance or damage during construction. No mitigation recommended).
041	S32° 49' 47.2" E20° 24' 05.0"	Matjes Fontein 194. Unidentified reworked vascular plant debris – including sphenophytes and long-leaved lycopods - at same site, in part enclosed within dark grey, fine-grained wacke and showing low-relief 3d preservation (pale grey to rusty-brown, mineralised, not simply carbonaceous compressions). Associated large-scale mudcracks, ferruginous carbonate concretions, overlain by thin loaded wacke within grey-green mudrocks (Proposed Field Rating IIIA: Local Resource. Site lies well outside WEF footprint so should be protected from disturbance or damage during construction. No mitigation recommended). <i>N.B.</i> stream gully to east of nearby farm track was not checked for possible extension of fossiliferous horizon beneath capping sandstones.
042	S32° 49' 31.4" E20° 24' 16.5"	Matjes Fontein 194. Roadside stream gully exposure of Abrahamskraal sediments. <i>Possible</i> vertebrate burrow cast c. 30 cm wide (requires confirmation). (Proposed Field Rating IIIB: Local Resource. No mitigation required).
043	S32° 49' 32.6" E20° 24' 19.1"	Matjes Fontein 194. Stream gully exposure of Abrahamskraal sediments. Thin, possibly upward-fining packages of grey-green, laminated to thin-bedded siltstone beneath package of fine-grained channel sandstones. <i>Possible</i> subcylindrical vertebrate burrow cast c. 30-40 cm wide of grey-green wacke enclosed in crumbly mudrock, overlies top of channel sandstone (requires confirmation). (Proposed Field Rating IIIB: Local Resource. No mitigation required).
044	S32° 47' 56.9" E20° 25' 02.2"	Krans Kraal 189. Stream bank exposure of single-storey fine-grained channel wacke.
045	S32° 48' 52.6" E20° 24' 37.7"	Matjes Fontein 194. Stream gully exposure of dark grey-green Abrahamskraal Fm mudrocks, pale grey calccrete nodules, gradational-based sandstone interbeds, loaded into underlying mudrocks.
046	S32° 51' 05.1" E20° 22' 43.1"	Matjes Fontein 194. Hillslope and roadside exposure of crumbly-weathering purple-brown and grey-green mudrocks.
047	S32° 51' 16.7" E20° 22' 26.1"	Matjes Fontein 194. Deeply-incised stream kloof exposure of Abrahamskraal Fm. Series of upward-coarsening packages capped by tabular, upward-coarsening wackes, sharply overlain by grey-green mudrocks with ferruginous carbonate horizons.
048	S32° 51' 16.7" E20° 22' 23.5"	Matjes Fontein 194. Waterfall in stream kloof formed by upward-coarsening, prograding package. Massive to laminated grey-green mudrocks – heterolithic, thin bedded facies – medium to thick-bedded, sharp-based, fine-grained, yellow-brown wackes. Heterolithic package beneath main channel sandstones is extensively loaded. Resembles Waterford deltaic facies spectrum.
049	S32° 51' 27.9" E20° 22' 02.5"	Matjes Fontein 194. Major sandstone dry waterfall and overhang in stream kloof. Two closely-spaced major channel sandstone packages, clear lenticular bedding, internal channel features (high relief reactivation surfaces). Very dark grey

Loc	GPS data	Comments
		wackes, thin- to thick-bedded. Upper thick package with sharp erosive base into recessive-weathering, darker underlying silty wackes or sandy siltstones. Mudflake intraclasts on bedding plane surfaces.
049a	S32° 51' 28.8" E20° 22' 09.6"	Matjies Fontein 194. Stream section showing Waterford-like upward-coarsening packages, loading into dark grey mudrocks beneath major sandstone units, horizons of rusty-brown ferruginous carbonate concretions, speckled diamictite-like immature sediments with dispersed small angular mudclasts suspended in silty wacke matrix. Thick, rubbly, immature alluvium towards base of stream gully.
050	S32° 52' 04.5" E20° 20' 04.3"	Oliviers Berg 159. Obvious large overhang at base of laterally-persistent, tabular –bedded channel sandstone package. Scree of large sandstone blocks on underlying slopes.
051	S32° 46' 52.1" E20° 18' 31.7"	Wind Heuwel 190. View SE into northern sector of WEF study area (Urias Gat 193).
052	S32° 48' 14.2" E20° 21' 03.7"	Urias Gat 193. Stream bed and bank exposure of Abrahamskraal Fm channel sandstone, interbedded sandstone and mudrock. Small-scale, slightly sinuous crested wave ripples on upper bedding surfaces (shallow pond / playa lake setting). Coarse modern bouldery to sandy alluvium along stream banks. Possible vertical plant stem casts (e.g. sphenophyte reeds). (Proposed Field Rating IIIC: Local Resource. No mitigation required).
053	S32° 48' 14.9" E20° 21' 15.0"	Urias Gat 193. Gentle hillslope exposure of crumbly to hackly grey-green mudrocks. Well-developed horizons of rusty-brown ferruginous carbonate concretions – perhaps reflect high water tables on swampy floodplain.
054	S32° 48' 45.1" E20° 21' 31.6"	Urias Gat 193. Hillslope gully exposure of weathered, khaki to grey overbank mudrocks, thin sandstones with gradational bases. Horizons of oblate sandstone load casts – suggests soupy substrates, rapid deposition.
055	S32° 48' 45.6" E20° 21' 37.4"	Urias Gat 193. Long hillslope gully exposure of thin-bedded grey-green overbank mudrocks passing up into thinly-interlaminated / striped, fine-grained, micaceous sandstone-siltstone facies. Overlain by dark grey, thin-bedded siltstone with subordinate thin sandstones showing undulose bed tops. Upward increase in bed thickness with extensive development of large (m-scale) oblate, ferruginous carbonate nodules, heterolithic facies where fine-grained wackes have gradational bases and tops. Upper part of exposed succession with small grey palaeocalcrete concretions as well as ferruginous carbonate concretions, c.2 m-thick, sharp-, erosive-based, medium-grained wacke.
056	S32° 49' 13.1" E20° 21' 52.8"	Urias Gat 193. Relict patch of weathered grey-green to khaki mudrock showing sparse gypsum pseudomorphs near to wind mast. Bedrocks of grey-green wacke. Views southwards towards N turbine ridge – tabular sandstone packages building plateau, Great Escarpment to NE beyond Windheuwel. View westwards towards alternative WEF access road ridge to N turbine ridge. Prism of brownish-hued, thick, sandy to gravelly colluvium at base of slope to N.
057	S32° 47' 20.0" E20° 21' 18.1"	Urias Gat 193. Stream bank exposure of medium-bedded, tabular grey-green wackes and siltstones near old farmstead. Lenticles of ferruginous carbonate concretions up to 30 cm thick.
058	S32° 46' 18.4" E20° 21' 43.5"	Urias Gat 193. Gullied roadside exposure of thick (sev. m) pale brown sandy alluvium on valley floor. Sparse gravels of well-rounded to angular wacke, vein quartz, with some flaked artefacts of greyish wacke. Local development of creamy calcrete glaebules. Downwasted surface gravels on alluvial plains mainly composed of wacke.
059	S32° 45' 11.2" E20° 21' 46.1"	Urias Gat 193. Deep trenches near Windheuwel farmstead exposing several meters of coarse gravelly to sandy alluvium of Uriasgatrivier. Older alluvium richer in coarse wacke clasts.
101	S32° 54' 16.9" E20° 20' 47.1"	Oliviers Berg 159. Long riverine exposure of Abrahamskraal Fm purple-brown and greenish-blue hackly mudrocks and laterally-persistent, tabular, sharp-based sandstones, overlain by coarse alluvial gravels. Gypsum pseudomorphs, pale greyish palaeocalcrete nodules in mudrocks. Tops of thin sandstone beds with round casts of reedy plants (e.g. sphenophytes) (Proposed Field Rating IIIC: Local Resource. No mitigation required).
102	S32° 54' 12.9" E20° 20' 49.6"	Oliviers Berg 159. Riverine cliff section through interbedded tabular to lenticular, medium-bedded wackes and mudrocks of Abrahamskraal Fm. Close spacing of wacke units seen here (upward-coarsening mudrock – wacke cycles only a few m thick). Thick (c. 2 m) massive, well-sorted, fine-grained, erosive-based wacke

Loc	GPS data	Comments
		towards base of succession builds prominent step. Mudrocks mottled purple and greenish-blue, with slickensides. Pale calcareous flowstone developed over part of cliff face, locally forming stalactites beneath overhangs.
103	S32° 54' 14.8" E20° 20' 49.1"	Oliviers Berg 159. Small-scale linear to sinuous-crested wave ripples towards top of major sandstone unit. Rippled surfaces locally show poorly-preserved, arcuate horizontal burrows (c. 3-5 mm wide) as well as round casts of plant stems. Possible <i>Scoyenia</i> Ichnofacies traces. Mudrock horizons with mudcrack infills. Probably crevasse-splay ichnoassemblages. (Proposed Field Rating IIC: Local Resource. No mitigation required). Succession of sharp-based tabular wackes overlying purple-brown to blue-green mudrocks exposed on lower valley slopes upstream.
104	S32° 54' 13.0" E20° 21' 06.9"	Oliviers Berg 159. View along valley to ESE showing thick, sharp-based channel sandstone at river level overlying blue-grey and purple-brown overbank mudrocks.
105	S32° 54' 24.2" E20° 21' 17.2"	Oliviers Berg 159. Views towards southern turbine ridge (Koedoesberge) show major channel sandstone underlying plateau along crest. Coarse colluvial gravels of wacke mantling hillslopes. Almost no mudrock exposure.
106	S32° 54' 46.9" E20° 21' 18.1"	Oliviers Berg 159. Viewpoint westwards along Koedoesberge ridge. Regular banding of hillslopes reflects underlying tabular-bedded Abrahamskraal Fm bedrocks. Views towards sandstone capping of Koedoesberge to SE show possible upward- and laterally-stepping successive channel sandstones, reflecting lateral channel migration through time..
107	S32° 55' 04.7" E20° 21' 08.2"	Muishond Rivier 161. Patch of crumbly- to hackly-weathering grey-green mudrocks along crest of Koedoesberge ridge. Khaki-hued where highly weathered. Downwasted pebble-sized, greyish to brownish palaeocalcrete concretions.
108	S32° 55' 05.0" E20° 20' 52.0"	Muishond Rivier 161. Pale yellowish-green to grey-green, speckled, angular surface gravels near wind mast represent fine-grained tuff (volcanic ash) horizon (probably < 10 cm thick) that crops out in this area (possibly traceable along strike to west as pale areas on satellite images). Tuff horizon lies below level of highest channel sandstone body seen capping ridge to the west. Crest of ridge otherwise dominated by extensive, coarse, poorly-sorted surface gravels of Abrahamskraal wacke and gravely to sandy soils with very little mudrock exposure.
110	S32° 53' 55.1" E20° 20' 10.9"	Oliviers Berg 159. Extensive riverine exposure of thick successions of tabular-, thin-bedded to massive, crumbly, greyish as well as minor purple-brown mudrock facies of Abrahamskraal Fm (i.e. succession between major sandstone packages). Thin crevasse splay sandstone interbeds. Laterally-persistent horizons of rusty-brown ferruginous carbonate concretions as well as palaeosols marked by smaller (cobble-sized), pale grey to ferruginous palaeocalcrete nodules. Upper part of succession with several thin upward-coarsening cycles ending with laminated sandstone or thin channel sandstone (dm scale). Extensive bedding plane exposure of channel wackes in stream bed – massive, fine-grained, well-jointed. Distal floodplain facies, possibly with repeated packages of lacustrine infill. Occasional horizons of loading.
111	S32° 53' 55.4" E20° 20' 12.2"	Oliviers Berg 159. Several m-thick upward fining package (fine single storey sandstone, possibly crevasse-splay – thin-bedded purple-brown siltstone – grey-green thin-bedded to massive siltstone to claystone sharply capped by thick channel sandstone package). Good examples of several m-thick upward coarsening packages with thin-bedded wackes capped by medium-bedded wackes.
112	S32° 53' 42.2" E20° 18' 09.9"	Oliviers Berg 159. View eastwards from old stone kraal towards low hillslopes featuring repeated thin (few m), S-dipping upward-coarsening, sandstone-capped cycles. Well-developed calcrete hardpan beneath colluvial gravels of brown-patinated wacke.
113	S32° 53' 29.5" E20° 17' 25.2"	Gats Rivier 156. Vertically stacked, lenticular, thick-bedded channel sandstone bodies, increasing successively in width/thickness ratio over time. Core channel bodies overlie dipping, convex-downward, thinner-bedded, heterolithic zone incised into flat-bedded, mudrock-rich Abrahamskraal succession.
115	S32° 57' 15.8" E20° 17' 03.4"	Klip Banks Fontein 395. Long riverbank exposure through NE-dipping lower Abrahamskraal Fm succession of numerous successive sandstone-mudrock packages. Change in dip within succession may reflect episodic basinward collapse of sediment prism. At western (lower) end of exposed succession,

Loc	GPS data	Comments
		massive grey-green and purple-brown siltstones with horizons of large ferruginous carbonate concretions, overlain by crumbly claystones with gypsum pseudomorphs (subaerial deposition). Well-jointed thin (<1m) sandstones higher up succession are lenticular, often mottled, fine-grained wackes with gradational bases. May cap upward-coarsening packages.
116	S32° 57' 14.9" E20° 17' 09.8"	Klip Banks Fontein 395. Same riverine exposure as above. Thick mudrock package with well-developed ferruginous carbonate concretions towards the base. Purple-brown and grey-green siltstones coarsen upwards via thin-bedded zone into thin sandstone capping.
117	S32° 57' 13.8" E20° 17' 10.8"	Klip Banks Fontein 395. Same riverine exposure as above. Thick (>1m) fine-grained tabular sandstone with gradational, loaded base. Overlying heterolithic zone with undulating bedding planes, perhaps due to small-scale channeling and sediment prism subsidence. Sizeable (sev. dm-scale) sandstone loadcasts within overlying mudrocks. Thick package of thin-bedded purple-brown and blue-green mudrocks towards top of exposed succession.
118	S32° 55' 18.1" E20° 16' 24.9"	Klip Banks Fontein 395. Small stream gully and hillslope exposures of heterolithic purple brown or grey-green siltstone / fine sandstone succession. Mudcrack infills.
119	S32° 55' 21.7" E20° 16' 34.3"	Klip Banks Fontein 395. Coarse colluvial gravels, angular to subrounded, with abundant ferruginous palaeocalcrete clasts as well as Abrahamskraal wacke clasts. Views eastwards along Koedoesberge ridge showing largely flat-lying stratigraphy, paucity of bedrock exposure.
120	S32° 55' 13.9" E20° 16' 41.4"	Klip Banks Fontein 395. Low exposures of yellowish-brown weathering, crumbly ("biscuit-like") sandstones, parallel-laminated, with darker brown m-scale corestones.
121	S32° 55' 11.5" E20° 16' 52.3"	Klip Banks Fontein 395. Several low Abrahamskraal Fm hillslope and gully exposures across crest of ridge. Crumbly, blue-grey overbank mudrocks, wacke surface gravels.
122	S32° 55' 09.2" E20° 16' 51.6"	Klip Banks Fontein 395. Gully exposure of thin-bedded Abrahamskraal blue-grey mudrocks with ferruginous carbonate concretions capped by thin crevasse splay sandstone.
123	S32° 55' 09.1" E20° 16' 54.5"	Klip Banks Fontein 395. Low hillslope exposures of blue-grey Abrahamskraal Fm mudrocks with occasional thin sandstone interbeds. Small (few cm diam.) flattened to sphaeroidal, pinkish-grey calcrete nodules and occasional gypsum pseudomorphs within mudrocks – calcrete forms common component of downwasted gravels in stream gullies.
124	S32° 54' 58.4" E20° 17' 25.9"	Klip Banks Fontein 395. Thick (several m) tabular channel sandstone at ridge crest forming well-jointed <i>kranz</i> with skirt of coarse scree. Uppermost and thickest of series of prominent-weathering tabular sandstone units. Gypsum pseudomorphs common in poorly-exposed interbedded mudrocks.
125	S32° 55' 00.2" E20° 17' 40.1"	Klip Banks Fontein 395. Hillslope exposure of crumbly purple-brown mudrocks. Numerous pebble to cobble-sized palaeocalcrete concretions weathering out at surface. Concretions weather pale grey and show septarian (shrinkage) cracking internally.
126	S32° 54' 59.2" E20° 17' 46.7"	Klip Banks Fontein 395. Hillslope exposures of Abrahamskraal tabular-bedded sediments. Low <i>kranz</i> of greyish wacke interbedded grey-green and purple-brown siltstone with laterally-persistent horizon of ferruginous carbonate concretions.
127	S32° 54' 57.5" E20° 17' 44.8"	Oliviers Berg 159. Stream gully exposure of thin-bedded overbank siltstones and highly-jointed tabular wackes building upward-coarsening packages.
128	S32° 55' 19.4" E20° 17' 41.4"	Klip Banks Fontein 395. Major local thickening of channel sandstones (vertical amalgamation) exposed in stream gully waterfall. Pattern repeated in stream gully to the west.
129	S32° 55' 26.2" E20° 17' 51.9"	Klip Banks Fontein 395. Coarse, subrounded wacke corestones building colluvial gravels mantling hillslopes. Occasional flaked weathered MSA artefacts of brown-patinated wacke recorded here. Stepped hillslopes in region display lichen-covered stable gravels overlying sandstone bedrock.
130	S32° 55' 19.1" E20° 18' 19.7"	Klip Banks Fontein 395. Hillslope and gully exposure of massive grey mudrocks with horizons of grey to rusty-brown calcrete concretions. Overlain by finely-laminated to cross-laminated thin sandstone and then speckled diamictite facies with development of small-scale load balls beneath. Mudrocks with wide (2-3 cm) polygonal desiccation crack infills extending for several dm into mudrocks – suggests period of protracted aridity on floodplain. Possible playa lake bed

Loc	GPS data	Comments
		succession.
131	S32° 57' 31.6" E20° 16' 22.2"	Klip Banks Fontein 395. Road cutting near Klipbanksfontein farmstead showing several meters of heterolithic, gey-green, interbedded wacke and siltstone. Isolated, vertical, upwards-tapering wacke plug (c. 25 cm across towards exposed base, circular cross-section) piercing and deforming strata may be a dewatering pipe.
132	S32° 52' 39.5" E20° 16' 16.8"	Gats Rivier 156. Viewpoint on southern slopes of central turbine ridge. S-sloping sandstone surfaces mantled with colluvial rubble. Mudrock exposure limited to several stream gullies, steeper hillslope patches. Sandstone package along ridge crest also represented close to river in valley due to steep regional dip to the south.
133	S32° 52' 02.1" E20° 16' 03.8"	Gats Rivier 156. Gentle hillslope exposures of crumbly grey-green mudrocks with thin sandstone capping close to ridge crest. Ferruginous carbonate concretions.
134	S32° 52' 00.8" E20° 16' 04.7"	Gats Rivier 156. Long gully-side cliff exposure through dark grey, thin-bedded siltstones, massive siltstones with horizon of large (boulder-sized) ferruginous carbonate concretions, laterally-persistent ferruginised, speckled sandstone bed with gradational base, thin crevasse-splay sandstone capping.
135	S32° 52' 00.7" E20° 16' 04.9"	Gats Rivier 156. Same exposure as above. Zone c. 1 m –thick of sparse to closely-spaced, vertical, cylindrical lungfish burrow casts (6-8 cm diameter) extending downwards from base of thin ferruginised sandstone marker bed into thin-bedded dark grey mudrocks – probable playa lake facies. Sandstone casts fracture into discs, show vague vertical ridges and grooves. Occur sporadically along strike. (Proposed Field Rating IIIA: Local Resource. Site lies well outside (> 50 m) WEF footprint so no mitigation recommended).
136	S32° 52' 07.2" E20° 15' 25.0"	Gats Rivier 156. Low exposure of crumbly grey-green mudrocks near central turbine ridge crest.
137	S32° 52' 15.8" E20° 15' 33.2"	Gats Rivier 156. Thick package of grey-green, massive to laminated mudrocks exposed on N-facing gully slopes, thin sandstone interbeds (crevasse-splays), succession capped by thin-bedded greyish wackes and then sharp-based, yellowish crumbly channel sandstone. Ferruginous carbonate concretions common within mudrocks. Isolated blobs of greyish wacke embedded in mudrock – possibly pillows, or vertebrate burrow casts (no specific evidence for latter interpretation). Possible evidence for large-scale slumping of channel sandstone bodies lower down in succession, with rapid changes in dip and strike of medium-bedded sandstones.
139	S32° 52' 25.0" E20° 16' 11.9"	Gats Rivier 156. S-sloping channel sandstone top showing exfoliation weathering, surface scatter of sandstone rubble.
140	S32° 52' 42.5" E20° 16' 11.3"	Gats Rivier 156. Long stream bank dip section through Abrahamskraal grey-green mudrocks and thin sandstones, overlying major channel sandstone body. Informative section for Lower Abrahamskraal Fm sedimentology. Massive and thin-bedded overbank mudrock facies with horizons of ferruginous carbonate concretions. Coarsening-up top of section with thin-bedded and then medium-bedded wackes.
141	S32° 52' 44.5" E20° 16' 09.1"	Gats Rivier 156. Downstream part of same panel section showing pale laminated sandstone (c. 10 cm thick) containing darker, vertical to oblique burrows with circular cross-section (c. 5 mm wide). Speckled texture of burrow infill possibly reflected faecal pellets or may be diagenetic effect. Pale bed might be tuffaceous (unconfirmed).
142	S32° 52' 57.2" E20° 16' 19.0"	Gats Rivier 156. Riverine bank section through khaki, medium- to thin-bedded, markedly tabular sandstones Beds mottled / speckled, crumbly ("biscuit" texture), parallel-laminated to massive (cf Koornplaats Member of Abrahamskraal Fm).
143	S32° 53' 08.0" E20° 15' 38.4"	Gats Rivier 156. W-facing stream kloof section through thin- to thick-bedded, tabular, khaki-hued Abrahamskraal sandstones interbedded with thin laminated siltstone facies. Some sandstone beds loaded at base and secondarily ferruginised, others with wave-rippled bed tops. <i>In situ</i> sandstone bedding planes and broken surfaces of fallen blocks with abundant, dispersed, fragmentary plant remains (e.g. finely-striated stem axes preserved as ferruginised compressions - probably sphenophytes, ferruginised moulds of woody material). Reworked plant material also associated with intraclast breccias of reworked mudrock. . (Proposed Field Rating IIIC: Local Resource. No mitigation required).

Appendix 2: CHANCE FOSSIL FINDS PROTOCOL: KUDUSBERG WEF between Matjiesfontein and Sutherland

Province & region:	Western Cape (Cape Winelands District Municipality) and Northern Cape (Namakwa District Municipality)	
Responsible Heritage Management Authority	Heritage Western Cape for the Western Cape (Contact details: Protea Assurance Building, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 086-142 142. Fax: 021-483 9842. Email: hwc@pgwc.gov.za) and SAHRA for the Northern Cape (Contact details: South African Heritage Resources Agency. 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel : 021 462 4502).	
Rock unit(s)	Abrahamskraal Formation (Lower Beaufort Group), Late Caenozoic alluvium	
Potential fossils	Fossil vertebrate bones, teeth, large burrows, trackways, petrified wood, plant-rich beds in the Abrahamskraal Fm bedrocks. Fossil mammal bones, teeth, horncores, freshwater molluscs, plant material in Late Caenozoic alluvium.	
ECO protocol	1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (<i>N.B.</i> safety first!), safeguard site with security tape / fence / sand bags if necessary.	
	2. Record key data while fossil remains are still <i>in situ</i> : <ul style="list-style-type: none"> • Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo • Context – describe position of fossils within stratigraphy (rock layering), depth below surface • Photograph fossil(s) <i>in situ</i> with scale, from different angles, including images showing context (e.g. rock layering) 	
	3. If feasible to leave fossils <i>in situ</i> : <ul style="list-style-type: none"> • Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation • Ensure fossil site remains safeguarded until clearance is given by the Heritage Management Authority for work to resume 	3. If <i>not</i> feasible to leave fossils <i>in situ</i> (emergency procedure only): <ul style="list-style-type: none"> • <i>Carefully</i> remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock) • Photograph fossils against a plain, level background, with scale • Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags • Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist • Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Management Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.	
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Management Authority	
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Management Authority minimum standards.	

ARCHAEOLOGICAL IMPACT ASSESSMENT

**Basic Assessment for the Proposed Development of the
325MW Kudusberg Wind Energy Facility and associated
infrastructure, between Matjiesfontein and Sutherland in
the Western and Northern Cape Provinces: BA REPORT**

HWC Case Number: 18071105

DEA Number: To be confirmed

Report prepared for:

CSIR – Environmental Management Services

P O Box 320
Stellenbosch 7599
South Africa

Report prepared by:

Katie Smuts – Professional Heritage
Practitioner and Archaeological Consultant

PO Box 178
Stanford, Western Cape, 7210
South Africa

31 October 2018

EXECUTIVE SUMMARY

Site Name

The proposed development is the Kudusberg Wind Energy Facility.

Location

The development is proposed for an area straddling the border of the Western and Northern Cape Provinces to the west of the R345 that runs between Sutherland and Matjiesfontein. The project falls within the Witzenberg Municipality, Cape Winelands District within the Western Cape, and the Karoo Hoogland Municipality, Namakwa District in the Northern Cape.

The affected farm portions are:

Western Cape:

- Portion 1 of 156 Gats Rivier Farm;
- Portion 2 of 156 Gats Rivier Farm;
- Remainder of 156 Gats Rivier Farm;
- Portion 1 of 157 Riet Fontein Farm.
- Portion 1 of 158 Amandelboom Farm;
- Remainder of 158 Amandelboom Farm;
- Portion 1 of 159 Oliviers Berg Farm;
- Remainder of 159 Oliviers Berg Farm;
- Portion 2 of 157 Riet Fontein Farm;
- Remainder of 161 Muishond Rivier Farm; and
- Remainder of 395 Klipbanks Fontein Farm.

Northern Cape:

- Portion 4 of 193 Urias Gat Farm;
- Portion 6 of 193 Urias Gat Farm;
- Remainder of 193 Urias Gat Farm;
- Remainder of 194 Matjes Fontein Farm; and
- Remainder of 196 Karree Kloof Farm.

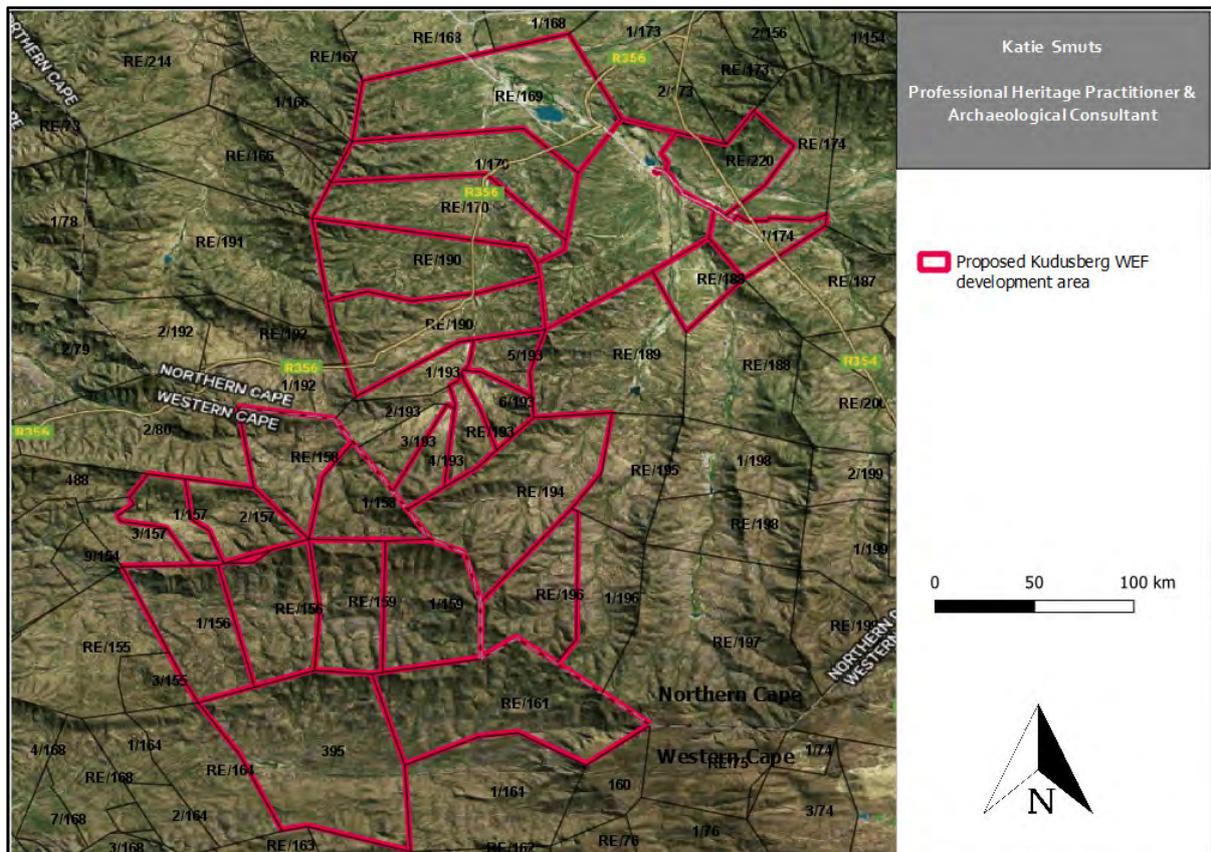
Properties affected by public access road:

- 169 Zeekoegat Farm;
- Portion 1 of 170 Roodeheuvel Farm;
- Remainder of 170 Roodeheuvel Farm;
- Remainder of 190 Wind Heuvel Farm;
- Portion 1 of 190 Wind Heuvel Farm;
- Portion 5 of 193 Urias Gat Farm;
- Remainder of 171 VinkeKuil Farm;
- Alkant Re/220 Farm; and
- Portion 1 of 174 Lange Huis Farm.

The central GPS co-ordinates for the proposed development are:

-32.8769836382S; 20.3214413375E

Locality Plan



Locality Plan showing proposed Kudusberg WEF development area.

Description of Proposed Development

The proposed Kudusberg WEF will have an energy generation capacity (at 132kV point of utility connection) of up to 325 megawatt (MW), and will include the following:

- Up to 56 wind turbines, each between 3 MW and 6.5 MW in nameplate capacity with a foundation of up to 30m in diameter and up to 5 m in depth.
- The hub height of each turbine will be up to 140 m and its rotor diameter up to 180m.
- Permanent compacted hardstanding laydown areas (also known as crane pads) for each wind turbine of 90mx50m (total footprint for 56 turbines = 25.2ha) during construction and for ongoing maintenance purposes for the lifetime of the turbines.
- Electrical transformers (690V/33kV) adjacent to each turbine (typical footprint of 2m x 2m but can be up to 10m x 10m at certain locations) to step up the voltage to 33kV.
- Underground 33kV cabling between turbines buried along access roads, where feasible, with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the onsite 33/132kV substation.
- Internal access roads up to 12m wide, including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 82.44ha. Where possible, existing roads will be upgraded. Turns will have a radius of up to 50m for abnormal loads (especially turbine blades) to access the various turbine positions.
- One 33/132kV onsite substation. The 33kV footprint will need to be assessed in this wind farm basic assessment and the 132kV footprint in a separate basic assessment process as the current applicant will remain in control of the low voltage components of the 33/132kV substation, whereas the high voltage components of this substation will likely be ceded to Eskom shortly after the completion of construction. The total footprint of this onsite substation will be approximately 2.25 ha.
- Up to 4 x 140m tall (depending on the final hub height) wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Temporary infrastructure including a construction camp (~12.6ha) which

includes an on-site concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase.

- Fencing will be limited around the construction camp, substation and batching plant. The entire facility would not be fenced off. The height of fences around the construction camp is anticipated to be up to 4m.
- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks. The necessary approvals from the Department of Water and Sanitation (DWS) will be applied for separately.

The proposed development site is located entirely within the Renewable Energy Development Zone 2 (REDZ 2) known as Komsberg, published in terms of Section 24(3) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) in Government Notice (GN) R. 114 of 16 February 2018. Considering this, a Basic Assessment (BA) Process as contemplated in terms of regulation 19 and 20 of the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended), is required for the authorisation of this large scale WEF.

Heritage Resources Identified

Identified heritage resources include archaeological and built environment features (Figures 5.1.1-5.1.5). Archaeological resources include scattered, isolated Middle and Later Stone Age artefacts, although these were very infrequent. A single cave with finger painted rock art, Later Stone Age artefactual material and a single sherd of thick-walled, highly burnished pot was also identified. Several stone-built kraals, either rounded or rectilinear in shape, and dry stacked or mortared, were recorded and are likely of historic age, although some could be pre-colonial. Ruined rectilinear dwellings and other disused farm buildings that are all likely over 100 years old were also recorded, usually in association with one or more kraals. Built environment features included farmsteads and associated outbuildings at several farms. At Wind Heuvel 1/156, Urias Gat 4/193 and Oliviers Berg Re/159 and 1/159 these structures are still inhabited, while at Gatsrivier Re/156 the cottages are used for tourist

accommodation; the farm buildings at Matjiesfontein Re/194 appear disused. Several stone cairns were found that were identified as likely burials; one area containing over ten cairns was clearly an informal graveyard (KDB072 – KDB076, comprising site complex KDBc11). In addition to these cairns a single, fenced grave with marble headstone was recorded (KDB057), a likely child's grave (KDB064) and a further graveyard containing about 12 graves with hand carved sandstone headstones and stone covered graves (KDB081).

Almost all features were found along valley bottoms or on open plains near watercourses, with no significant heritage resources of any kind identified at higher elevations.

Anticipated Impacts on Heritage Resources

With the ridges apparently devoid of artefactual material of any kind, impacts are likely only to occur at sites at lower elevations. These impacts will arise from the widening of existing roads, the construction of new access roads, the development of construction camps and the onsite substation. Impacts could be direct or indirect and include damage, destruction and degradation of sites, as well as loss of sense of place resulting in diminished significance of heritage resources.

The anticipated direct impacts of the turbines themselves on heritage resources are expected to be low. The originally proposed alignment of Access Alternative 1 would have resulted in impacts to sites including one stone cairn (KDB058), a U-shaped stone-built structure, several kraal structures and a three-roomed stone-built structure (KDBc7), and further kraals and a stone and mudbrick-built structure (KDBc8). Similarly, Common Access Road 1 would have bisected Wind Heuvel farmstead (KDB059), and passed directly adjacent to the graveyard located there (KDB081). Impacts to these sites would have been high to very high. The applicant has subsequently amended these layouts, reducing likely impacts to low or insignificant. Construction Camp Alternative 3 is proposed for construction on the site of the informal graveyard (KDBc6), posing a very high threat of impact to those sites – construction camp 2 is preferred. A moderate, indirect threat is posed to the stone-built features in the landscape, and a low threat to the rock art cave (KDB045) derived from the increase of people in the landscape who could accidentally or

intentionally damage or destroy features. Further indirect impacts are likely to the context of the region by the nature of the proposed development which will detract from the sense of place and degrade the cultural landscape. Cultural landscapes are addressed fully in a separate report (Rabe Bailey 2018) and in the full HIA (Smuts 2018).

Recommendations

- In summary, recommendations are as follow:
- Substation Alternative 1 is the recommended substation alternative, although Substation Alternatives 2 and 3 are not considered to be a no-go option;
- Construction Camp 2 is the recommended construction camp alternative, although Construction Camp 1 is likely to be an acceptable alternative. Construction Camp 3 should be considered a no-go option;
- The realignment of Access Road Alternative 1 renders it an acceptable choice, while Access Road Alternative 2 is likely to be an acceptable alternative. The proposed alignment for Access Road Alternative 2 should be subjected to a walkdown by an archaeologist prior to commencement of development to identify any areas or sites that require protection or mitigation, should it be selected;
- Common Access Road 1 has been realigned to the east to avoid Wind Heuvel farmstead and is considered an acceptable route. The road should not be widened or altered at this point and a proper fence should be erected around the Stadler graveyard (KDB081);
- The following buffers should be observed around identified heritage resources:
 - Graves: no development should be permitted within 50m of identified graves and cemeteries; existing roads within this buffer should not be altered or widened;
 - Cave site (KDB045): construction staff should not be permitted within 200m of the site;
 - Farmsteads: no turbines should be located within 500m of farmsteads;
 - Kraals, stone walling and ruins > 100 years: construction staff should not be permitted within 100m of these sites and no development should occur within 15m of these sites; and

- Archaeological finds: no buffers are recommended for the isolated artefacts identified in this survey.
- All site crew should be informed of the heritage significance of the resources in the study area, and those sites near development infrastructure, or easily reached (Table 1) should be inspected by the ECO during the construction phase to ensure they are being respected;
- If any archaeological material or human burials are uncovered during the course of development, then work in the immediate area should be halted. The find should be reported to the heritage authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.

Given the generally low significance of archaeological heritage resources in the study area, it is not anticipated that the proposed development will have significant impacts to heritage resources, and it is therefore recommended that the project be authorised, subject to implementation of the above recommendations. These recommendations should be included in the Environmental Management Programme (EMPr) and the Environmental Authorisation (EA).

Author/s and Date

31/10/2018

Katie Smuts – main author

MadelonTusenius and Emmylou Bailey – content contributors

SPECIALIST EXPERTISE

Katie Smuts holds an MPhil from UCT in Archaeology (History and Archaeology of the Western Cape; 2012), having specialised in archaeological analysis of historic built fabric and forms. Prior to that, her BA (Hons), obtained from UCT with distinction in 1999, was focused on analysis of depictions of human figures in the rock art of the Western Cape.

Katie has worked both as a commercial archaeologist and as a Heritage Officer for the national Heritage Agency, SAHRA, and later Manager of the National Inventory there, where she was responsible for the maintenance of the country's online heritage management platform and heritage resource database, SAHRIS (the South African Heritage Resources Information System). Katie currently works as a freelance heritage practitioner and archaeological consultant, drafting Heritage Impact Assessments, Archaeological Impact Assessments, Heritage Inventories, heritage scoping reports and heritage components for Strategic Environmental Assessments, Environmental Management Frameworks and similar planning initiatives.

EMPLOYMENT HISTORY

Period	Position	Employer
October 2017-Present	Archaeological Consultant & Heritage Practitioner	Self Employed
February 2017-September 2017	Heritage Specialist	CTS Heritage
October 2013-December 2016	Manager of the National Inventory	SAHRA
May 2012-September 2013	Heritage Officer, APM Unit	SAHRA
March 2009-May 2012	Archaeological Consultant	Self Employed
August 2006-September 2006	Section Manager: Butrint World Heritage Site	Institute of World Archaeology
February 2006-February 2009	Part-time contract archaeologist	ACO
October 2004-January 2006	Contract archaeologist	Various, UK
June 2003-March 2004	Part-time contract archaeologist	ACO
January 2000-December 2000	Co-Director	Clanwilliam Living Landscapes Project
January 1999-May 2000	Tutor and lecturer	Archaeology Department, UCT

QUALIFICATIONS

2012:	MPhil (Archaeology), UCT
09/10-11/10:	Architecture & Urban Conservation II: Skills Development (UCT)
04/10-06/10:	Architectural & Urban Conservation I: Theory & Development (UCT)
1999:	B.A. Honours Distinction (Historical Studies of Western Cape), UCT
1998:	B.A. 1st Class (Archaeology, Classics), UCT

AFFILIATIONS

2018-present:	Chair of Stanford Heritage Committee (SHC)
2017-present:	Vice-chair of Overstrand Heritage and Aesthetics Committee (OHAC)
2017-present:	Co-chair of Association of Southern African Professional Archaeologists (ASAPA) Cultural Resource Management (CRM) Committee
2015-present:	Member of Association of Professional Heritage Practitioners (APHP)
2015-present:	Treasurer of Heritage Association of Southern Africa (HASA)
2013-present:	Member of the South African Museums Association (SAMA)
2008-present:	ASAPA CRM accreditation in Rock Art, Coastal Shell Middens, Stone Age Archaeology and Grave Relocation

RELEVANT PROJECT EXPERIENCE

- Compilation of Heritage Impact Assessments, Archaeological Impact Assessments and Heritage Scoping Reports for:
 - Renewable energy applications
 - Mixed use developments
 - Mining applications and borrow pits
 - Roadworks
 - Infrastructural developments
- Compilation of Notifications of Intent to Develop in terms of Section 38 applications in the Western Cape
- Compilation of permit applications in terms of Sections 27, 34 and 35
- Heritage components of Environmental Management Frameworks
- Heritage surveys for inventory purposes
- Archaeological and heritage research projects

SPECIALIST DECLARATION

I, Katie Smuts, declare that –

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



Signature of the Specialist

N/A

Name of Company:

29/10/2018

Date

LIST OF ABBREVIATIONS

AIA	Archaeological Impact Assessment
BA	Basic Assessment
BAR	Basic Assessment Report
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Later Stone Age
M A.S.L.	Metres Above Sea Level
MSA	Middle Stone Age
MW	Mega Watts
NEMA	National Environmental Management Act
NCW	Not Conservation Worthy
NHRA	National Heritage Resources Act
OES	Ostrich Eggshell
PHRA	Provincial Heritage Resources Authority
REDZ	Renewable Energy Development Zone
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
WEF	Wind Energy Facility

GLOSSARY

Definitions	
<i>Asbos</i>	Local bush which is dried and used to build <i>skerms</i>
<i>Early Stone Age</i>	Stone Age period approximately 1.5 million years ago - 250 000 years ago
<i>Kookskerm</i>	Shelter built from dried bushes to provide protection from the wind for cooking activities
<i>Kommando</i>	Boer militia units
<i>Kraal</i>	Livestock enclosure common throughout the area.
<i>Krans</i>	Cliff
<i>Later Stone Age</i>	Stone Age period approximately last 30 000 years
<i>Legplaats</i>	Stockpost
<i>Matjieshuis</i>	Mat or reed house
<i>Middle Stone Age</i>	Stone Age period approximately 250 000 - 30 000 years
<i>Skerm</i>	Circular enclosures constructed out of dried bushes
<i>Trekboer</i>	Semi-nomadic subsistence farmers who moved out of the Cape Colony

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain-	Pp ix-x
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;	
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	P xi
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 3.1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 3
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 5.1, 5.2, 5.3, 5.4
d) the date, duration and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 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 5 and 6
g) an identification of any areas to be avoided, including buffers;	Section 5.3
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 5.4
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3.2
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;	Sections 5.2, 7.1, 7.2
k) any mitigation measures for inclusion in the EMPr;	Section 7.2
l) any conditions for inclusion in the environmental authorisation;	Section 7.2
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 7.2
n) a reasoned opinion-	Sections 7.1, 7.2
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;	
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 3
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A. Relevant comments received during the review of the DBAR will be incorporated into the HIA.
q) any other information requested by the competent authority.	Appendix1
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.	N/A

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1. BACKGROUND TO DEVELOPMENT PROPOSAL

Kudusberg wind farm (Pty) Ltd (hereafter “Kudusberg”) is proposing to develop the 325 MW Kudusberg Wind Energy Facility (WEF) at Kudusberg between Sutherland and Matjiesfontein in the Northern Cape and Western Cape Provinces. Katie Smuts was appointed by the CSIR to undertake the Archaeological Impact Assessment (AIA) for the proposed Kudusberg Wind Energy Facility (WEF) on behalf of the project applicant, Kudusberg Wind Farm (Pty) Ltd.

The proposed Kudusberg WEF will have an energy generation capacity (at 132kV point of utility connection) of up to 325 megawatt (MW), and will include the following:

- Up to 56 wind turbines, each between 3MW and 6.5MW in nameplate capacity with a foundation of up to 30m in diameter and up to 5m in depth.
- The hub height of each turbine will be up to 140m and its rotor diameter up to 180m.
- Permanent compacted hardstanding laydown areas (also known as crane pads) for each wind turbine of 90mx50m (total footprint for 56 turbines = 25.2ha) during construction and for ongoing maintenance purposes for the lifetime of the turbines.
- Electrical transformers (690V/33kV) adjacent to each turbine (typical footprint of 2m x 2 m but can be up to 10m x 10m at certain locations) to step up the voltage to 33kV.
- Underground 33kV cabling between turbines buried along access roads, where feasible, with overhead 33kV lines grouping turbines to crossing valleys and ridges outside of the road footprints to get to the onsite 33/132kV substation.
- Internal access roads up to 12m wide, including structures for stormwater control would be required to access each turbine and the substation, with a total footprint of about 82.44ha. Where possible, existing roads will be upgraded. Turns will have a radius of up to 50m for abnormal loads (especially turbine blades) to access the various turbine positions.
- One 33/132kV onsite substation. The 33kV footprint will need to be assessed in this wind farm basic assessment and the 132kV footprint in a separate basic assessment process as the current applicant will remain in control of the low

voltage components of the 33/132kV substation, whereas the high voltage components of this substation will likely be ceded to Eskom shortly after the completion of construction. The total footprint of this onsite substation will be approximately 2.25 ha.

- Up to 4 x 140m tall (depending on the final hub height) wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Temporary infrastructure including a construction camp (~12.6ha) which includes an on-site concrete batching plant for use during the construction phase and for offices, administration, operations and maintenance buildings during the operational phase.
- Fencing will be limited around the construction camp, batching plant and substation. The entire facility would not be fenced off. The height of fences is anticipated to be up to 4m.
- Temporary infrastructure to obtain water from available local sources/ new or existing boreholes including a potential temporary above ground pipeline (approximately 35cm diameter) to feed water to the on-site batching plant. Water will potentially be stored in temporary water storage tanks. The necessary approvals from the Department of Waters and Sanitation (DWS) will be applied for separately.

The proposed facility is located entirely within the Komsberg Renewable Energy Development Zone (REDZ), one of the eight REDZ formally gazetted in South Africa for the purpose of development of solar and wind energy generation facilities. In line with the gazetted process for projects located within REDZ, the Kudusberg WEF is subject to a Basic Assessment (BA) process instead of a full Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) as amended, EIA Regulations 2014 (as amended in 2017).

2. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Kudusberg WEF is proposed for an area straddling the border of the Western and Northern Cape Provinces to the west of the R345 that runs between Sutherland

and Matjiesfontein (Figures 1-3). The project falls within the Witzenberg Local Municipality, Cape Winelands District in the Western Cape, and the Karoo Hoogland Local Municipality, Namakwa District in the Northern Cape. The central GPS co-ordinates for the proposed development are: -32.8769836382S; 20.3214413375E

The affected farm portions are:

Western Cape:

- Portion 1 of 156 Gats Rivier Farm;
- Portion 2 of 156 Gats Rivier;
- Remainder of 156 Gats Rivier Farm;
- Portion 1 of Farm 157 Riet Fontein.
- Portion 1 of 158 Amandelboom;
- Remainder of 158 Amandelboom;
- Portion 1 of 159 Oliviers Berg;
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- Portion 4 of 193 Urias Gat;
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- Portion 1 of 190 Wind Heuvel
- Portion 5 of 193 Urias Gat
- Remainder of 171 VinkeKuיל
- Farm 220
- Portion 1 of 174 Lange Huis
- Portion 1 of 188 Brakwater

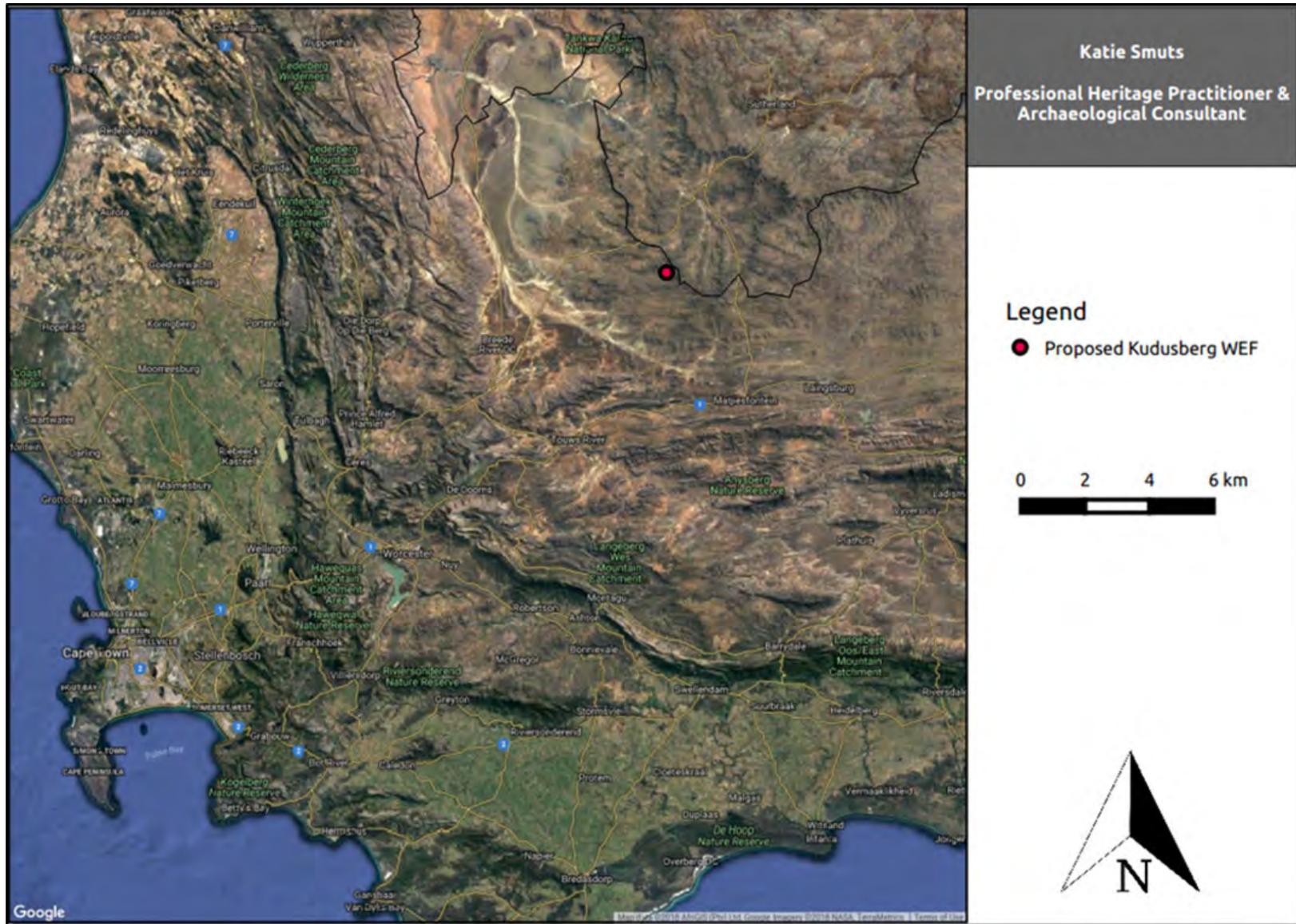


Figure 1: Location of the proposed Kudusberg WEF (centroid)

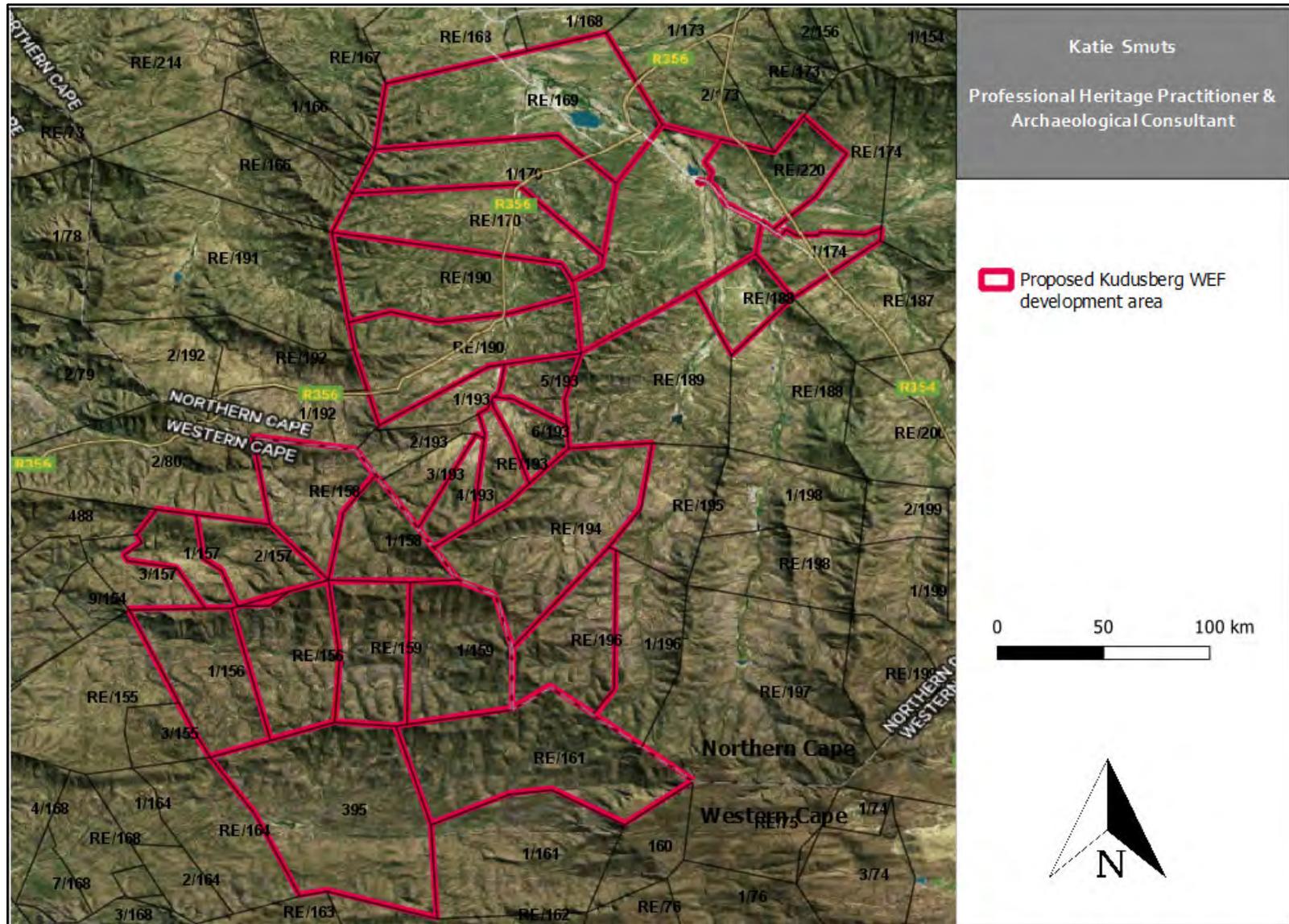


Figure 2.1. Proposed Kudusberg WEF development area showing portions in Western and Northern Cape.

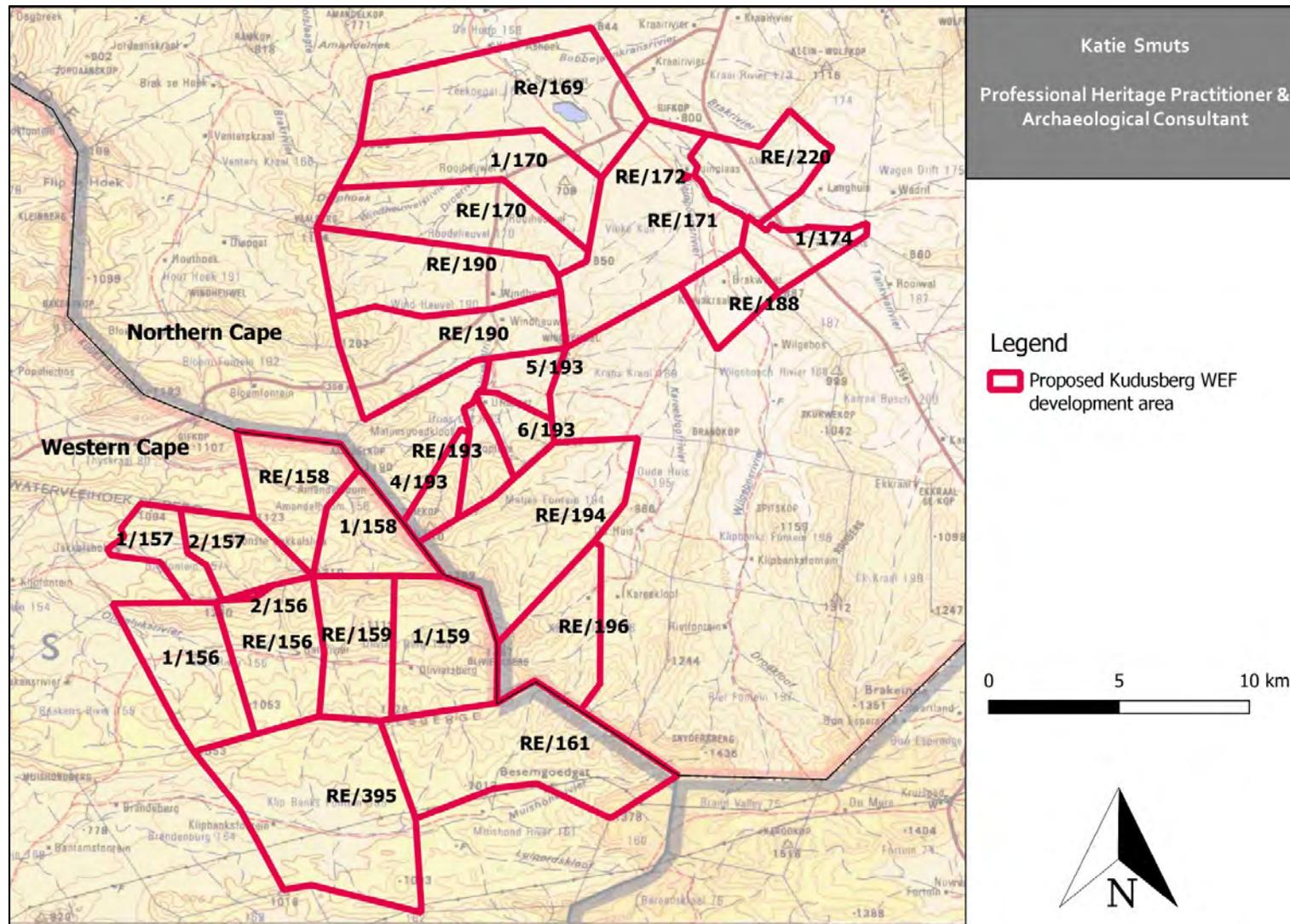


Figure 2.2. Topographical map showing proposed layout of Kudusberg WEF. (1:250k map 3220 Sutherland, courtesy of the Office of the Chief Surveyor General)

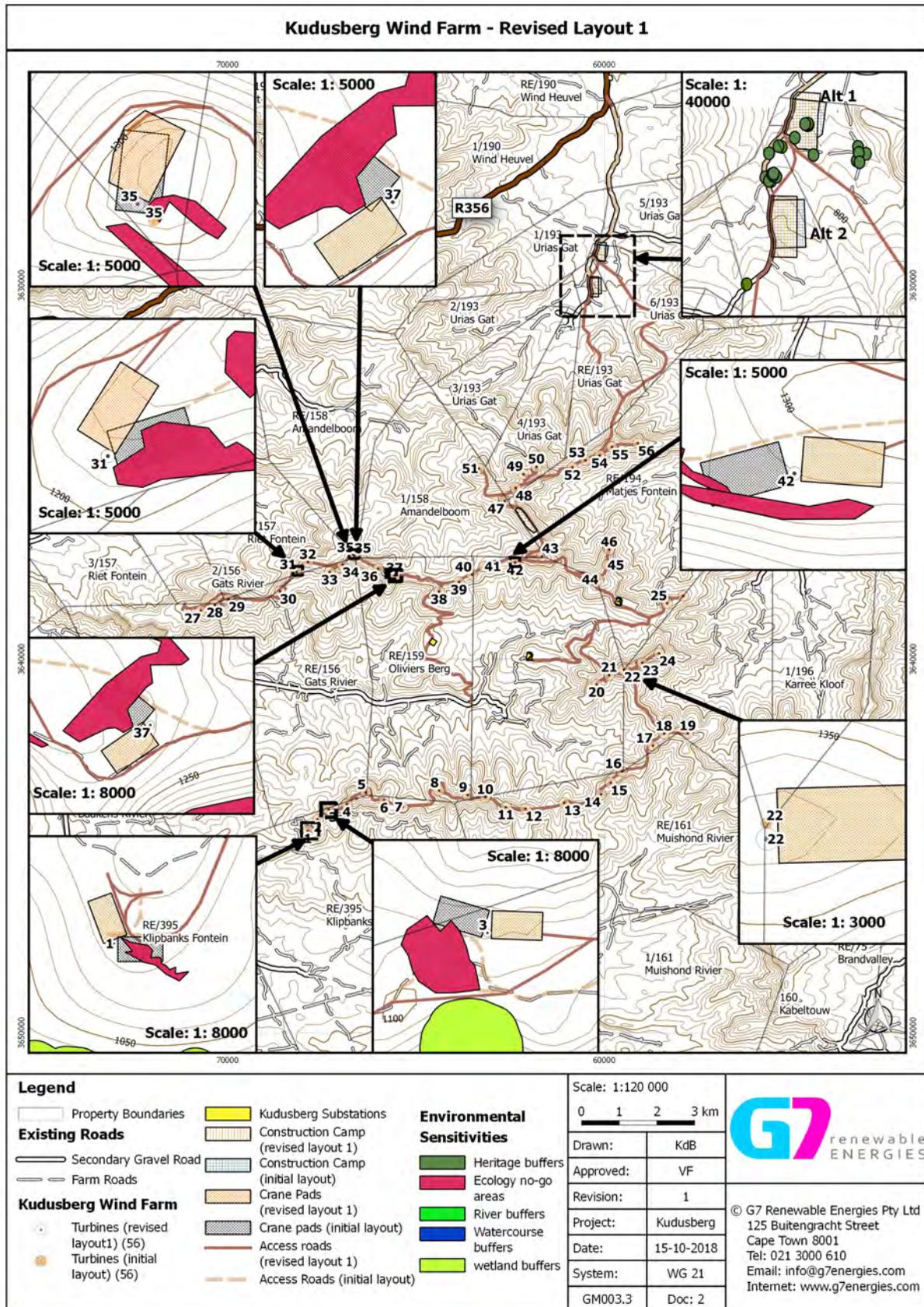


Figure 3.Revised infrastructure layout for Kudusberg WEF.

The proposed development area is located towards the southwest of the main Karoo region, with the centre of the study area some 11km south of the R356 and 22km west of the R354, the Sutherland-Matjiesfontein road. The area is on the border of the summer and winter rainfall regions and receives some snow and precipitation in winter as well as summer thunderstorms, although precipitation is limited and the region is semi-arid. The vegetation is characteristic of the Succulent Karoo biome in the low-lying areas and the Karoo Renosterveld Fynbos in the high-lying portions (Mucina and Rutherford 2006). The development area lies within the foothills of the Great Escarpment, and is characterised by valleys located between long ridges, and flat plains surrounded by hills and mountains. The ridges are largely undeveloped, while the valleys and plains contain several farmsteads comprising varying numbers of buildings. There are local roads and tracks servicing the area, some of which lead up to the hilltops, with recently created tracks servicing the wind masts scattered across peaks in the region. Together with farm infrastructure such as wire fenced stock camps and farm boundaries, wind pumps and reservoirs, these are the predominant features in an otherwise undeveloped, natural environment.

Several of the affected farms are no longer engaged in active agriculture, have changed hands in recent times and are owned by absentee landlords. Many of the farms are now relying solely on tourist accommodation for income, and high levels of predation is making sheep farming unsustainable.

3. DESCRIPTION OF METHODOLOGY

This study was commissioned as part of a Basic Assessment process as the development is located within the Komsberg REDZ. The site visit was conducted from 17-20 July 2018, with between 30- and 35-hours' survey conducted within this period. The survey team consisted of two archaeologists, a palaeontologist and an assistant. The survey was conducted in a 4x4 vehicle as well as on foot, with existing roads and farm tracks utilised for vehicular access. Heritage resources identified in the field were recorded, mapped and photographed where appropriate. Tracks and waypoints were recorded on a handheld GPS device (Garmin Etrex) and photographs were taken with a digital camera. 1:50k and 1:250k maps were obtained from the Directorate for Surveys and Mapping for use in the field. Maps and overlays

were created for the report using Google Earth and QGIS.

To ensure the survey was adequate for the purpose, given the hilly terrain and extensive infrastructure proposed, a strategic decision was adopted to sample landforms rather than try to focus narrowly on the footprint. This strategy involved conducting a survey of one ridge top, some of the ridge slopes, three caves, several river valleys and one open plain. The palaeontologist and his assistant accessed further ridge tops and areas and contributed waypoints to the study where they encountered heritage resources other than palaeontology. This meant that a sample of turbine footprints was assessed, all three substation alternatives, two of the three construction camp alternatives and some of the road alignments. Vegetation was relatively sparse, making visibility good, although the banks of the rivers were crowded in places with acacias and karee trees, impeding visibility there. The season did not affect visibility or the success of the survey. The extent of the site visit is considered sufficient to inform this process.

Background research was conducted by reviewing Heritage Impact Assessments (HIAs) conducted in the immediate area. These reports are freely accessible on the South African Heritage Resources Information System (SAHRIS) and covered work done in the area between 2010 and 2017. This information is, therefore, recent and up to date. While some reports are more comprehensive than others, all were found to be of very high quality.

Public consultation will be undertaken as part of the BA process, and in accordance with HWC's regulations pertaining to Public Participation Processes (PPP) for heritage, and the results of that will be incorporated into the final HIA.

In addition to the Archaeological Impact Assessment (AIA), a Palaeontological Desktop Report and Palaeontological Impact Assessment (PIA; Almond 2018) were compiled in addition to the Archaeological Impact Assessment (AIA; Smuts 2018). These together with a cultural landscape assessment study (Appendix 4; Rabe Bailey 2018) have been integrated into the HIA and are available as appendices to that report.

3.1 Scope of Works

This AIA considers the potential impacts of the proposed construction of a WEF on the several properties in the Komsberg REDZ on the border of the Western and Northern Cape Provinces.

The AIA achieves the following:

- Describe and map the heritage features of the site and surrounding area. This is based on desk-top reviews, fieldwork, available databases, findings of the Wind and Solar SEA (CSIR, 2015) and findings from other heritage studies in the area, where relevant. Reference to the grade of heritage feature and any heritage status the feature may have been awarded has been included.
- Assess the impacts and provide mitigation measures to be included in the EMPr.
- Map heritage sensitivity for the site. Clearly show any “no-go” areas in terms of heritage (i.e. “very high” sensitivity), and provide recommended buffers or set-back distances.
- Identify and assess potential impacts from the project on the archaeology, as required by heritage legislation.
- Liaise with the relevant authority in order to obtain a final comment in terms of section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), including Regulations issued hereunder, as necessary. It is critical that the report follows the specific format required by Heritage Western Cape (HWC).
- Load the relevant documents on SAHRIS.

3.2 Restrictions and limitations

- The vast area and hilly terrain, as well as the expansive layout of the proposed development meant that an exhaustive survey was not possible. Strategic sampling of the landscape was employed to characterise the project area;
- Areas between spot checks conducted from the vehicle were not surveyed and could contain archaeological heritage resources;
- Farm roads were in variable condition, which made progress across the study area slow and limited the time available for foot survey;

- The survey can only account for artefacts and archaeological features visible on the ground, and sub-surface heritage could be present.

3.3 Gradings

The grading of sites is stipulated in Section 7 of the NHRA in order that the appropriate level of management can be accorded to sites. SAHRA is the managing authority for all Grade I national sites, the Provincial Heritage Resources Agencies (PHRAs) are the managing authorities for all Grade II or provincial sites, while Grade III or local sites are intended for management by the local authorities.

Significant to this project, which straddles the Western and Northern Cape, is the different grading systems implemented by HWC (2016a) and the SAHRA (2007). To regulate grading in the Western Cape, HWC has proposed a model that divides sites of local significance, that is Grade III sites, into:

- Grades IIIa – high local significance;
- Grade IIIb – medium local significance;
- Grade IIIc – low local significance; and
- Not Conservation Worthy (NCW) – little to no significance and not requiring mitigation.

In the absence of a fully competent PHRA in the Northern Cape, SAHRA's grading system should be employed there; SAHRA the term field rating to describe gradings assigned as part of Section 38 processes, while grading is reserved for official significance as designated by authorities. This system grades locally important sites as follows:

- Field Rating/Grade IIIa - high local significance that should be preserved in their entirety;
- Field Rating/Grade IIIb – medium local significance that can be mitigated and preserved in part;
- Field Rating/Grade IIIc sites are recorded as:
 - Field Rating/Grade IVa – high or medium significance requiring mitigation;
 - Field Rating/Grade IVb – medium significance requiring recording; and
 - Field Rating/Grade IVc – low significance not requiring mitigation

For the purposes of this report, sites within the Western Cape have been graded in terms of the HWC system, while those in the Northern Cape have been graded according to the SAHRA system. As the SAHRA system is only intended for application to archaeological heritage, not built environment, for the purposes of this report, the HWC system (Grades IIIa, IIIb and IIIc) have been retained for built environment (i.e. buildings, not including stone walling and structures – these terms are used to indicate archaeological built forms) in the Northern Cape.

4. BACKGROUND TO AND CONTEXT OF ARCHAEOLOGY COMPONENTS

Until recently, this region was fairly poorly understood from an archaeological perspective. This, however, is no longer strictly true, given the creation of the Komsberg REDZ, and the ensuing applications for WEFs in this area (Fourie et al 2015). Several HIAs, all of them with archaeological components have, as a result, been conducted within the area. Little research work, which is generally more thorough and comprehensive, has been done, however, so that while we have a broad understanding of the heritage character of the region, more specific conclusions cannot be derived.

Over 10 HIAs have been compiled near the study area, all with respect to windfarms and their associated infrastructure, and the findings of these reports are largely congruent. The reports identified surprisingly little pre-colonial or stone age archaeology (Booth 2012, 2015a and 2015b; Hart and Webley 2013; Hart and Kendrick 2014; Hart 2015; van der Walt 2016), with the little that has been identified in the form of scatters located on the flat floodplains up to the foothills of the mountains, and within river valleys along watercourses (Booth 2016a and 2016b). The dry, fairly desolate ridges, which are subject to high winds and, therefore the proposed locations for the turbines, are generally entirely devoid of Stone Age archaeological remains (Webley and Halkett 2017). These findings were also supported by the Heritage Scoping Assessment Report (Fourie et al 2015) compiled as part of the Department of Environmental Affairs' (2015) Strategic Environmental Assessment wind and solar energy developments. A mitigation phase excavation (Evans et al. 1985) has been undertaken at two small rock shelters in the grounds of

the South African Astronomical Observatory near Sutherland in the early 1980s. More recently, changing farming methods as represented by the distribution and variety of stone-built features (walls and kraals) was assessed as part of a Master's thesis (Regensberg 2016).

The area is known to have been inhabited since the Early Stone Age (ESA), with some surface scatters identified on a survey west of Matjiesfontein (Hart and Miller 2011) and a well-preserved ESA site with complete and well-formed bifaces south of Sutherland (Hart et al. 2010). Middle Stone Age (MSA) material is also present, and most often found in the form of occasional flakes and rare open sites (Hart et al. 2010). Later Stone Age (LSA) scatters have also been documented throughout the region, although at remarkably low density (Booth 2012, 2016a and 2016b; Hart and Webley 2013; Hart and Kendrick 2014; Hart 2015; van der Walt 2015). Rescue excavations conducted at two shelters near Sutherland, however, yielded significant LSA cultural material including various stone artefacts such as cores, utilized flakes, blades and chunks, and formal tools such as scrapers, adzes, backed blades, points and miscellaneous retouched pieces. Fragments of ostrich eggshell (OES) and ostrich eggshell beads, faunal remains and fresh water molluscs were also recorded (Evan et al. 1985). This archaeological signature represents the earliest inhabitants of this region, and, by the time of the LSA, these people constitute the antecedents of the San hunter gatherers who occupied the landscape in the last 10 000 years. Most tools are made on hornfels, quartzite and chert, while quartz and Karoo shale were also utilised (Hart et al. 2010).

Within the last 2 000 years, pastoralists, the Khoekhoen, arrived in the area, bringing with them livestock, thin-walled ceramics and new social and economic systems. In this area, there is extensive evidence for the presence of these groups in the landscape. This evidence comes in the form of circular, stone-built enclosures constructed of piled stone up to half a metre high and from 3m to 4m to 9 m in diameter (Hart et al. 2010). These enclosures represent living spaces, which contained grass huts or Matjieshuise (mat covered houses) and kraals. The kraals are generally situated on the leeward slopes of low ridges and likely date to between 300 and 1 000 years ago (Hart et al. 2010). The kraals sometimes form complexes of

as many as 13 interlocking enclosures, often with adjoining 'lammerkraals' (lamb pens). These sites can be found with fine, red burnished pottery and OES fragments. Other evidence for herders in this area has been identified in the form of open camps situated along dry river beds in valley bottoms. These sites are large, measuring 80m x 80m, and are associated with fine, thin walled Cape Coastal pottery, frequent informal stone tools, stone features, grinding surfaces, ash middens, animal bone and several graves with broken grindstones atop them; colonial period artefacts have also been found in association with these sites (Ibid.).

Rock art, which can be attributed to the San hunter gatherers or the pastoralists, is known within the region, although it's not commonly identified, and more concentrated in the Cape Fold Mountains to the south of the project area (Booth 2016a and 2016b; van der Walt 2015). These paintings tend to be of the fine line tradition, attributed to hunter gatherers, or finger painting, which is attributed to the herders.

Early *Trekboere* entered the region in the late 1700s, moving their livestock down into the valleys and plains of the Karoo from the better watered escarpment to escape the harsh winters there. As a result of this pattern of seasonal movement of flocks the *Trekboere* usually had a loan farm on the plateau, and a stockpost (*legplaats*) in the Karoo. The itinerant *trekboere* initially lived much like the pre-colonial herders, travelling with grass huts or *Matjieshuise* that could be easily erected where necessary (Hart and Kendrick 2014). The early arrival of these *trekboere* was initially met with resistance from the San, initially with the result that settlement of the area was impeded (Schoeman 1986). In retaliation against their stock losses, and the killing of Khoisan herders and slaves, the settlers established the *Kommando* system, which resulted in officially sanctioned hunting of the San by the late 1770s (Hart and Webley 2011). These massacres are recorded archivally and in placenames in the area, such as the farm Oorlogskloof near Sutherland where more than 30 stone cairn burials are to be found. Further mass graves might be found on Gunstfontein Farm, while there is purportedly also a cave where the San made a last stand against the *kommandos* (Ibid.).

Increasingly, as exploitation of the area became better established, and particularly after the Great Trek of the 1830s, their structures and imprint on the landscape became more permanent. The evidence for this early inhabitation of the region is to be found in historic farmhouses and associated buildings, stone cairns, stone walling, farm infrastructure such as reservoirs and, more recent wind pumps. Artefactual material from this period includes European ceramics, glass and iron fragments. The stone walling and kraals of this period are distinguished from the pre-colonial kraals as they are usually rectilinear and are faced on two sides with infill between the faces and are often mortared using local materials.

The area was witness to a further period of military action during the South African War, with some skirmishes near Skietfontein in the Komsberg Mountains (Hart and Webley 2011). The threat of Boer guerrilla activities also prompted the British to build several defensive structures in the region, including redoubts, gun platforms and blockhouses (van der Walt 2015; Hart and Webley 2011; Orton and Halkett 2011).

Some 79 sites are known and mapped within 30km of the development area (Table 1, Figures 4.1-4.2). These sites have largely been identified through impact assessment surveys conducted in this vicinity. More sites occur in the area but have not, as yet, been mapped on SAHRIS.

Table 1: Known sites in vicinity of project area

Site ID	Site number	Site name	Site Type	Grading
94454	KSW2	KSW2	Archaeological, Stone walling	Ungraded
94455	KSW3	KSW3	Archaeological, Stone walling	Ungraded
35648	GK125	Gamma Kappa 125	Artefacts	IIIa
35526	GK078	Gamma Kappa 078	Artefacts	IIIb
35555	GK041	Gamma Kappa 041	Artefacts	IIIb
35564	GK042	Gamma Kappa 042	Artefacts	IIIb
35568	GK046	Gamma Kappa 046	Artefacts	IIIb
35578	GK056	Gamma Kappa 056	Artefacts	IIIb
35131	ROG001	Roggeveld 001	Artefacts	IIIc
35132	ROG002	Roggeveld 002	Artefacts	IIIc
35541	GK032	Gamma Kappa 032	Artefacts	IIIc
35543	GK034	Gamma Kappa 034	Artefacts	IIIc

Site ID	Site number	Site name	Site Type	Grading
35544	GK035	Gamma Kappa 035	Artefacts	IIIc
35545	GK036	Gamma Kappa 036	Artefacts	IIIc
35574	GK052	Gamma Kappa 052	Artefacts	IIIc
35202	ROG028	Roggeveld 028	Artefacts	IIIc
35228	ROG040	Roggeveld 040	Artefacts	IIIc
35661	GK126	Gamma Kappa 126	Artefacts	IIIc
35571	GK049	Gamma Kappa 049	Building	IIIa
35240	ROG045	Roggeveld 045	Building	IIIa
35214	ROG032	Roggeveld 032	Building	IIIb
35753	ROG050	Roggeveld 050	Building	IIIb
35135	ROG005	Roggeveld 005	Building	IIIc
35140	ROG009	Roggeveld 009	Building	IIIc
35141	ROG010	Roggeveld 010	Building	IIIc
35152	ROG012	Roggeveld 012	Building	IIIc
35159	ROG015	Roggeveld 015	Building	IIIc
35216	ROG034	Roggeveld 034	Building	IIIc
35222	ROG037	Roggeveld 037	Building	Ungraded
35542	GK033	Gamma Kappa 033	Burial Grounds & Graves	IIIa
35547	GK037	Gamma Kappa 037	Burial Grounds & Graves	IIIa
35552	GK040	Gamma Kappa 040	Burial Grounds & Graves	IIIa
35565	GK043	Gamma Kappa 043	Burial Grounds & Graves	IIIa
35570	GK048	Gamma Kappa 048	Burial Grounds & Graves	IIIa
35185	ROG023	Roggeveld 023	Burial Grounds & Graves	IIIa
35219	HDV001	Hidden Valley 01	Burial Grounds & Graves	IIIa
35226	ROG038	Roggeveld 038	Burial Grounds & Graves	IIIa
35645	GK122	Gamma Kappa 122	Burial Grounds & Graves	IIIa
35646	GK123	Gamma Kappa 123	Burial Grounds & Graves	IIIa
35229	ROG041	Roggeveld 041	Burial Grounds & Graves	IIIa
35650	GK124	Gamma Kappa 124	Burial Grounds & Graves	IIIa
35239	ROG044	Roggeveld 044	Burial Grounds & Graves	IIIa
35241	ROG046	Roggeveld 046	Burial Grounds & Graves	IIIa
35243	ROG048	Roggeveld 048	Burial Grounds & Graves	IIIa
35512	GK015	Gamma Kappa 015	Burial Grounds & Graves	IIIc
35513	GK016	Gamma Kappa 016	Burial Grounds & Graves	IIIc
35514	GK017	Gamma Kappa 017	Burial Grounds & Graves	IIIc
35540	GK031	Gamma Kappa 031	Burial Grounds & Graves	IIIc
35137	ROG007	Roggeveld 007	Burial Grounds & Graves	IIIc
35201	ROG027	Roggeveld 027	Burial Grounds & Graves	IIIc

Site ID	Site number	Site name	Site Type	Grading
35178	ROG022	Roggeveld 022	Conservation Area	IIIc
35204	ROG029	Roggeveld 029	Cultural Landscape	IIIc
35215	ROG033	Roggeveld 033	Cultural Landscape	IIIc
29518	GEO044	Geosite: Ashoek intertributary sandstone and mudstone	Geological	IIIb
24901	Onder Karoo Road (Plant 1)	Onder Karoo Road (Plant 1)	Palaeontological	
24902	Onder Karoo Road (Plant 2)	Onder Karoo Road (Plant 2)	Palaeontological	
35191	ROG025	Roggeveld 025	Ruin > 100 years, Artefacts	IIIc
35188	ROG024	Roggeveld 024	Ruin > 100 years	IIIb
35217	ROG035	Roggeveld 035	Ruin > 100 years	IIIc
35569	GK047	Gamma Kappa 047	Stone walling	IIIb
35220	HDV002	Hidden Valley 02	Stone walling	IIIb
35224	HDV003	Hidden Valley 03	Stone walling	IIIb
35515	GK018	Gamma Kappa 018	Stone walling	IIIc
35138	ROG008	Roggeveld 008	Stone walling	IIIc
35550	GK038	Gamma Kappa 038	Stone walling	IIIc
35551	GK039	Gamma Kappa 039	Stone walling	IIIc
35154	ROG013	Roggeveld 013	Stone walling	IIIc
35566	GK044	Gamma Kappa 044	Stone walling	IIIc
35567	GK045	Gamma Kappa 045	Stone walling	IIIc
35576	GK054	Gamma Kappa 054	Stone walling	IIIc
35171	ROG016	Roggeveld 016	Stone walling	IIIc
35172	ROG017	Roggeveld 017	Stone walling	IIIc
35174	ROG019	Roggeveld 019	Stone walling	IIIc
35175	ROG020	Roggeveld 020	Stone walling	IIIc
35177	ROG021	Roggeveld 021	Stone walling	IIIc
35208	ROG030	Roggeveld 030	Stone walling	IIIc
35218	ROG036	Roggeveld 036	Stone walling	IIIc
35238	ROG043	Roggeveld 043	Stone walling	IIIc
35157	ROG014	Roggeveld 014	Transport infrastructure	IIIc

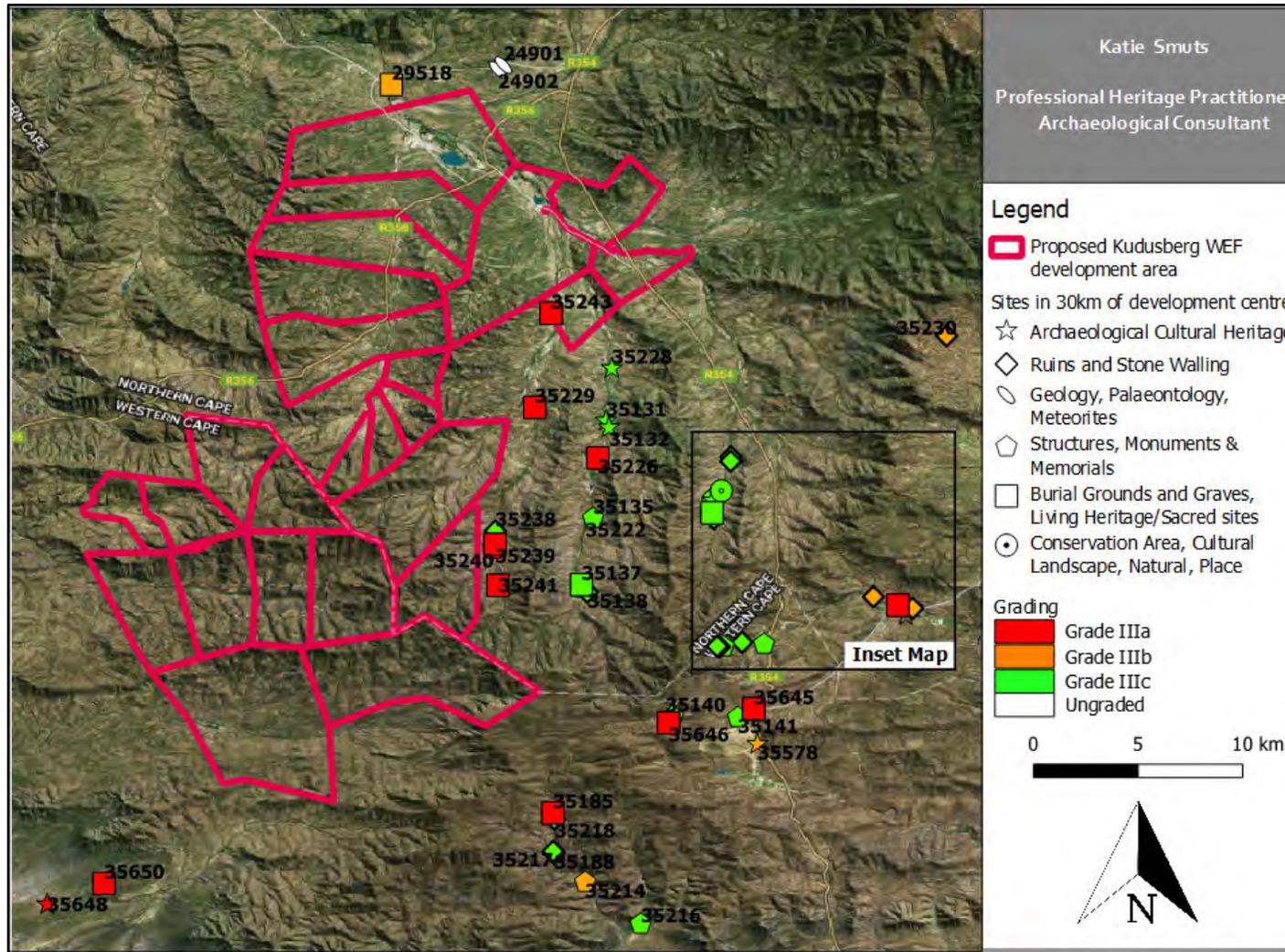


Figure 4.1. All known sites within 30 kms of the proposed development, as recorded on SAHRIS (Site IDs provided. See Table 1).

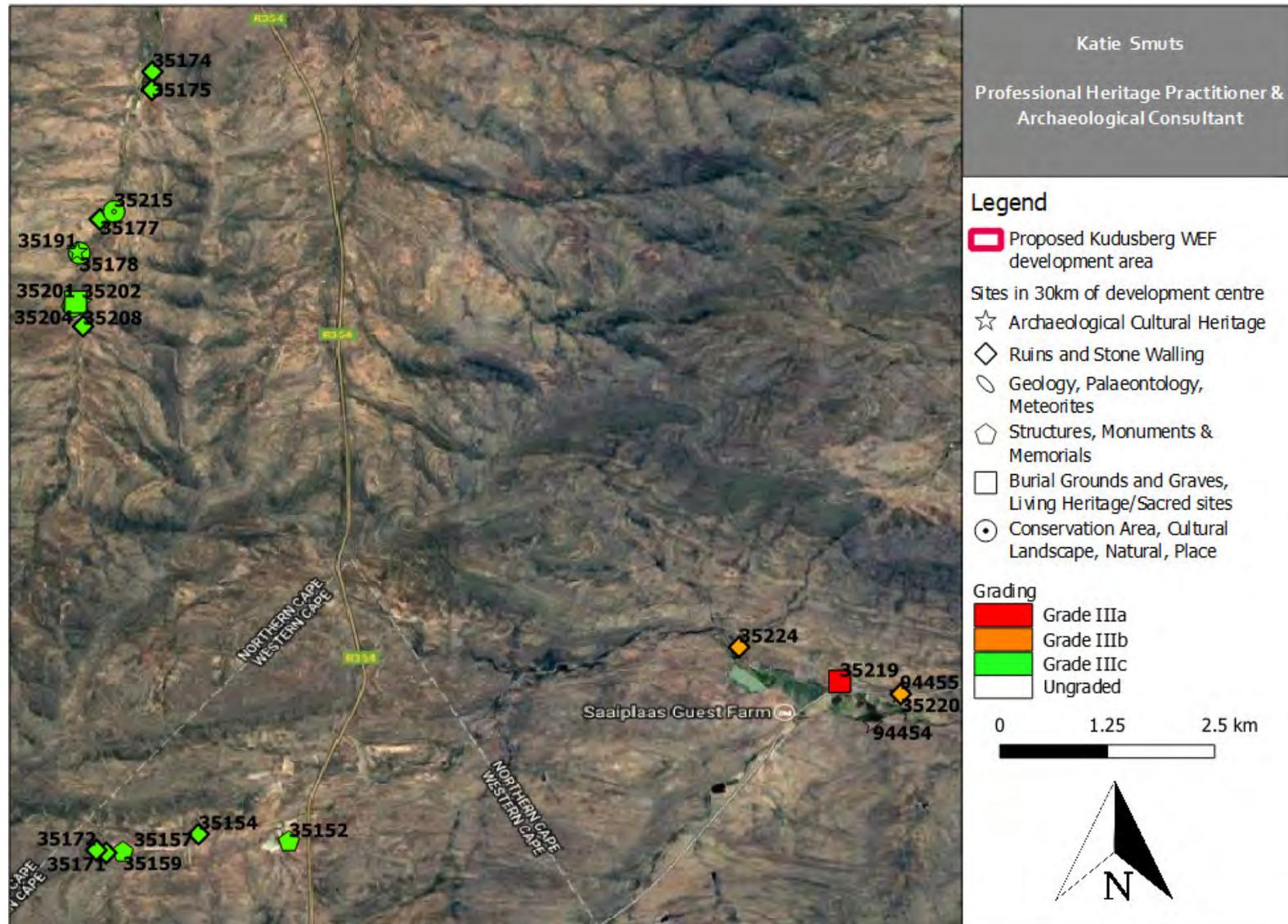


Figure 4.2. Inset Map

5. DESCRIPTION OF HERITAGE RESOURCES / PROJECT RESULTS

As indicated in section 3.1, exhaustive survey of the infrastructure footprint was impeded by various restrictions including the hilly terrain and the expansive proposed footprint (Figures 2.1, 2.2 and 3). As such, it was decided to sample the various landforms present in the study area to determine the heritage character of the ridges, slopes, plains and valleys (Figure 5.1.1). This approach was considered sufficient to inform this study, particularly in light of the findings of other specialists who have worked in the area.

The survey yielded sites of various types, including Stone Age artefacts, rock art, stone-built ruins and walling as well as built environment. The final heritage resource to be considered is that of the cultural landscape, which is addressed in the HIA; this report only considers impacts to physical, tangible heritage resources.

All recorded sites are listed in Table 2, while only selected sites are discussed in the text below. Where stone-built features can be identified as kraals, their site type has been recorded as structures, while alignments of stone walling have been recorded simply as stone walling where the nature of the structure was not clear. Ruined dwellings have been recorded as ruins > 100 years. These site types are all considered archaeological, and their grading (in the Northern Cape in terms of the SAHRA 2007 guidelines) reflects this. Built structures that are still in use but older than 60 years have been recorded as buildings, and the SAHRA grading system has not been applied to them where they occur in the Northern Cape.

Table 2. Sites identified during field survey

Site No.	Site Complex ¹	Site Description	Site Type	Grading/ Field Rating	Co-ordinates	
					South	East
Western Cape						
KDB001	KDBc1	OES and European ceramics and glass near historic reservoir	Artefacts	NCW	-32.8858888888889	20.2684444444444
KDB002	KDBc1	Red brick rubble, possible demolished historic storage space	N/A	NCW	-32.8858888888889	20.2683888888889
KDB003	KDBc1	Cobble stone and brick-built reservoir with wind pump	Structure	IIIc	-32.8860833333333	20.2683333333333
KDB004	KDBc1	Stone embankment behind reservoir	Stone walling	IIIc	-32.88625	20.2685277777778
KDB005		Irrigation sluice built on river bed to control flow for irrigation	Structure	IIIc	-32.8885555555556	20.2706111111111
KDB006		Eastern extent of long low wall below krans	Stone walling	IIIc	-32.8897777777778	20.2769166666667
KDB006a		Western extent of long low wall below krans	Stone walling	IIIc	-32.8898946103	20.2762558591
KDB007		Small stone wall	Stone walling	IIIc	-32.8899166666667	20.2788611111111
KDB008	KDBc10	Ruined stone-built structure with three rooms, 1 cobbled	Ruin > 100 years	IIIc	-32.8905555555556	20.2811111111111
KDB008a	KDBc10	Gatsrivier cottage 1, stone built, altered	Structure	IIIc	-32.8905763699688	20.2823636047795
KDB008b	KDBc10	Gatsrivier cottage 2, stone built, altered	Structure	IIIc	-32.889609748582	20.2832680656306
KDB008c	KDBc10	Gatsrivier cottage 3, stone built, altered	Structure	IIIc	-32.8894716589515	20.2842821581
KDB045		Cave with finger painted panels, flakes and cores	Rock art, deposit, artefacts	IIIa	-32.8681111111111	20.3350277777778
KDB084		Stone tools, likely MSA	Artefacts	IIIc	-32.8865833	20.3154166666667
KDB085		Circular cobble-built structure, piled stone, likely hut or shelter	Structure	IIIc	-32.8640556	20.3087777777778
KDB086	KDBc9	Stone walling	Stone walling	IIIc	-32.8939013695344	20.2965307608247
KDB087		Ruined rectangular stone-built structure	Ruin > 100 years	IIIc	-32.8877769577183	20.2639240035513
KDB088		Ruined rectangular stone-built structure	Ruin > 100 years	IIIc	-32.8885448496193	20.2265530985055
KDB089		Stone walling	Stone walling	IIIc	-32.8906986024231	20.2781007159501
KDB091		Oliviersberg farmstead, stone-built farmstead, two cottages, dam	Building	IIIc	-32.8957041237057	20.3301189820295
KDB092	KDBc9	Large rectilinear kraal	Structure	IIIc	-32.8928339083084	20.302446154276

1 Where individual sites were clustered sufficiently to read as a single complex, they have been assigned site complex numbers in addition to their individual site numbers.

Site No.	Site Complex ¹	Site Description	Site Type	Grading/ Field Rating	Co-ordinates	
					South	East
KDB093		Lime-rich cement brick in linear arrangement / drying stack	Artefacts	IIIc	-32.8949576569721	20.3308689035475
KDB094	KDBc9	Small circular kraal, piled cobbles	Structure	IIIc	-32.8934335789827	20.3005910722216
KDB095	KDBc9	Large rectangular kraal, faced stone, mortar	Structure	IIIc	-32.894773130506	20.3028470266098
KDB096		Large rectangular kraal, faced stone, mortar	Structure	IIIc	-32.8868089802563	20.3257718682289
Northern Cape						
KDB011		Stone-built embankment for old road	Transport infrastructure	IVc	-32.8660277777778	20.3749722222222
KDB012	KDBc3	Matjiesfontein Farm	Building	IIIc	-32.8335551028335	20.3960914659395
KDB014	KDBc2	Stone-built curved tower structure built against low kran	Stone walling	IIIb	-32.8483611111111	20.3785833333333
KDB015	KDBc2	Southernmost stone tower against kran	Stone walling	IIIb	-32.8484166666667	20.3784166666667
KDB016	KDBc2	Northernmost stone tower against kran	Stone walling	IIIb	-32.8483333333333	20.3786111111111
KDB017a	KDBc2	Southernmost collapsed stone tower	Stone walling	IIIb	-32.8483333333333	20.3786111111111
KDB017b	KDBc2	Northernmost collapsed stone tower	Stone walling	IIIb	-32.8481944444444	20.3786944444444
KDB018		Heaped rocks representing possible ruined stone-built structure	Ruin > 100 years	IVc	-32.8399444444444	20.3823055555556
KDB019		Old Road alignment with stone embankment	Transport infrastructure	IVc	-32.8395277777778	20.38275
KDB020	KDBc3	Large circular cobble-built structure infilled with broken rock fragments; likely old reservoir	Structure	IVb	-32.8334722222222	20.3955
KDB021	KDBc3	Three roomed stone-built ruin	Ruin > 100 years	IVb	-32.8331111111111	20.3963055555556
KDB022	KDBc3	Large rectilinear kraal	Structure	IVb	-32.8324722222222	20.39575
KDB023	KDBc3	Historic dump associated with Matjiesfontein farmstead; glass, ceramics, metal, bone	Artefacts, deposit	IVb	-32.8335277777778	20.3966388888889
KDB024	KDBc3	Threshing floor	Structure	IVb	-32.8337222222222	20.3961944444444
KDB025	KDBc3	Kraal with lammerhok	Structure	IVb	-32.8345277777778	20.3961666666667
KDB026	KDBc3	Large rectilinear kraal	Structure	IVb	-32.8342777777778	20.3958888888889
KDB027	KDBc3	Stone alignment	Stone walling	IVb	-32.8341666666667	20.3961944444444
KDB028	KDBc4	Circular kraal with piled rocks, no mortar	Structure	IVb	-32.8248055555556	20.4028888888889
KDB029	KDBc4	Small rectilinear ruined structure with mortared stone walls	Ruin > 100 years	IVb	-32.8248333333333	20.4029444444444
KDB030	KDBc4	Rectilinear ruined dwelling of dressed stone with mortar	Ruin > 100 years	IVb	-32.8246944444444	20.4032222222222

Site No.	Site Complex ¹	Site Description	Site Type	Grading/ Field Rating	Co-ordinates	
					South	East
KDB031	KDBc4	Historic dump associated with nearby structures; glass, ceramics, metal, bone	Artefacts, deposit	IVb	-32.8246111111111	20.4030555555556
KDB032	KDBc4	Piled stone cairn; possible burial	Burial Grounds & Graves	IIIa	-32.8248888888889	20.4026666666667
KDB033		Kranskraal historic farmstead with farmhouse, stone-built outbuildings	Building	IIIc	-32.7661111111111	20.4349166666667
KDB034	KDBc5	Large sub-rectilinear kraal, northern wall; piled cobbles, no mortar	Structures	IVb	-32.8168055555556	20.4016666666667
KDB035	KDBc5	Large sub-rectilinear kraal, southern wall	Structures	IVb	-32.8169722222222	20.4015277777778
KDB036	KDBc5	Large sub-rectilinear kraal, eastern wall	Structures	IVb	-32.8170833333333	20.4016111111111
KDB037	KDBc5	Large sub-rectilinear kraal robbed return wall	Structures	IVb	-32.8170833333333	20.4016944444444
KDB038	KDBc5	Ruined rectangular structure of dressed stone with mortar	Ruin > 100 years	IVb	-32.8182222222222	20.4019444444444
KDB039	KDBc5	2mx2m stone-built hut; dressed stone with mortar	Ruin > 100 years	IVb	-32.8185555555556	20.4017222222222
KDB040	KDBc5	5mx5m Oblong stone-built kraal dressed stone with mortar	Structures	IVb	-32.8182777777778	20.4017222222222
KDB041	KDBc5	5mx4m stone-built dwelling, dressed stone with mortar	Ruin > 100 years	IVb	-32.8181111111111	20.4025555555556
KDB042	KDBc5	Circular stone structure, piled dry stone build	Structures	IVb	-32.8181944444444	20.4026944444444
KDB043		Overhang	Natural	N/A	-32.8546111111111	20.3731666666667
KDB044		Waterfall Cave	Natural	N/A	-32.8576666666667	20.3674166666667
KDB050	KDBc7	U-shaped structure. Stone built with three phases of construction, faced stone and mortar	Structure	IVa	-32.7896666666667	20.3548611111111
KDB051		Stone built 20 th Century farm store	Building	IIIc	-32.80375	20.3501111111111
KDB052	KDBc8	Horseshoe shaped dry wall cobble-built kraal	Structure	IVa	-32.8028888888889	20.3505555555556
KDB053	KDBc8	4mx5m dwelling, dressed stone, mortar, gum pole roof structure	Ruin > 100 years	IVa	-32.8026388888889	20.3505833333333
KDB054	KDBc8	Lammerkraal, piled circular stone	Structure	IVa	-32.8024166666667	20.3506111111111
KDB055	KDBc8	Large rectilinear kraal with large faced stone blocks with infill	Ruin > 100 years	IVa	-32.8021666666667	20.3500555555556
KDB056	KDBc8	Stone dwelling, mud and grass plaster, rietdak with mud cap, mudbrick and breeze block extension	Ruin > 100 years	IVa	-32.8025833333333	20.3493611111111
KDB057	KDBc8	Single gravestone in fenced cemetery; EM Fourie, mother (b. 1873 d. 1937) JO Fourie, father (b. 1878 d. 1944)	Burial Grounds & Graves	IIIa	-32.8014444444444	20.3497222222222

Basic Assessment for the Proposed Development of the 325MW Kudusberg Wind Energy Facility and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces

Site No.	Site Complex ¹	Site Description	Site Type	Grading/ Field Rating	Co-ordinates	
					South	East
KDB058		Stone cairn, possible grave	Burial Grounds &Graves	IIIa	-32.7981666666667	20.3530555555556
KDB059	KDBc11	Wind Heuvel historic farmhouse and asbos skerm	Building, living heritage	IIIb	-32.7535412146123	20.3641834094368
KDB060	KDBc11	Wind Heuvel kraal complex	Structures	IIIb	-32.7521407016719	20.36389594526
KDB061	KDBc7	3-roomed structure 12mx5m; faced stone and mortar	Ruin > 100 years	IVa	-32.7899722222222	20.3553888888889
KDB062	KDBc7	Stone-built weir in dry river bed, mortared	Stone walling	IVb	-32.7899444444444	20.3551944444444
KDB063	KDBc7	Kraal with pen, drywall cobble built	Structure	IVa	-32.7894722222222	20.3555555555556
KDB064		65cmx50cm metal enclosed feature, likely grave	Burial Grounds & Graves	IIIa	-32.78725	20.3564166666667
KDB065		1930s farm House in werf	Building	IIIc	-32.7871944444444	20.3561111111111
KDB066		Large rectangular kraal	Structure	IVa	-32.78775	20.3552222222222
KDB068		Core, likely LSA	Artefacts	IVc	-32.7896111111111	20.3565277777778
KDB069		Reservoir and leivoor	Structures	IVb	-32.7865277777778	20.3576388888889
KDB071	KDBc6	Cairn 1, likely grave	Burial Grounds & Graves	IIIa	-32.7855555555556	20.3588333333333
KDB072	KDBc6	Cairn 2, likely grave	Burial Grounds & Graves	IIIa	-32.7852777777778	20.3589166666667
KDB073	KDBc6	Cairn 3, likely grave	Burial Grounds & Graves	IIIa	-32.7855	20.3588888888889
KDB074	KDBc6	Cairn 4, likely grave	Burial Grounds & Graves	IIIa	-32.7855	20.3588611111111
KDB075	KDBc6	Cairn 5, likely grave	Burial Grounds & Graves	IIIa	-32.7854444444444	20.3588611111111
KDB076	KDBc6	Cairn 6, likely grave	Burial Grounds & Graves	IIIa	-32.7854166666667	20.3588888888889
KDB077	KDBc6	Stone alignment	Stone walling	IVc	-32.7854444444444	20.3586111111111
KDB080	KDBc11	Temporary accommodation and asboskookskerms on Wind Heuvel farmstead	Living heritage	IIIb	-32.7572777777778	20.3641388888889
KDB081	KDBc11	Stadler cemetery. 10 graves with sandstone headstones at roadside. No fence	Burial Grounds & Graves	IIIa	-32.7527777777778	20.3630555555556
KDB082		Rooiheuvel farmstead with asbos skerm	Building, living heritage	IIIb	-32.7118611111111	20.3635
KDB083		Church with grave	Building, living	IIIa	-32.6946944444444	20.4398611111111

Site No.	Site Complex ¹	Site Description	Site Type	Grading/ Field Rating	Co-ordinates	
					South	East
			heritage, burial grounds and graves			
KDB097		Flake	Artefacts	IVc	-32.77161111111111	20.36205555555556
KDB098		MSA point	Artefacts	IVc	-32.79208333333333	20.35533333333333
KDB099	KDBc7	Large rectangular kraal, northern end	Structure	IVa	-32.7893640753	20.3556328174
KDB100	KDBc7	Large rectangular kraal lammerkraal	Structure	IVa	-32.7894111816	20.3554938454
KDB101	KDBc7	Large rectangular kraal southern end	Structure	IVa	-32.7895218227	20.3555905726
KDB102	KDBc7	Curved walling near large kraal, eastern extent	Structure	IVa	-32.7896312065	20.3558908124
KDB103	KDBc7	Large rectangular kraal eastern end	Structure	IVa	-32.789486954	20.3557243478
KDB104	KDBc7	Curved walling near large kraal, western extent	Structure	IVa	-32.7895038016	20.3557919059
KDB105	KDBc7	Large rectangular kraal western end	Structure	IVa	-32.7894045599	20.3555516806
KDB106		Irregular kraal structure (identified from Google Earth)	Structure	IVc	-32.7879034636563	20.3593715749197
KDB107	KDBc12	Large, circular kraal structure (identified from Google Earth)	Structure	IVa	-32.7883836195093	20.3634164044642
KDB108	KDBc12	Small circular kraal structure (identified from Google Earth)	StructureIIIb	IVa	-32.7872744836467	20.3635366471262
KDB109	KDBc12	Large kraal with lammerhok (identified from Google Earth)	Structure	IVa	-32.7878388810924	20.3642781435414
KDB110	KDBc12	Multi-roomed structure (identified from Google Earth)	Ruin > 100 years	IVa	-32.7877602587774	20.3636101287529
KDB111	KDBc12	Two-roomed structure (identified from Google Earth)	Ruin > 100 years	IVa	-32.7885127837993	20.3636669100099

5.1 Resources identified

5.1.1 Stone Age archaeology

Very little Stone Age material was identified during the course of the survey, and what was recorded comprised isolated stone artefacts. In general these were made on predominantly locally derived stones, including Karoo sandstone and greywacke, as well as hornfels and chert. While some material appeared MSA in type, with so few artefacts identified, it was generally not possible to ascribe age to them (Plates 1-3).

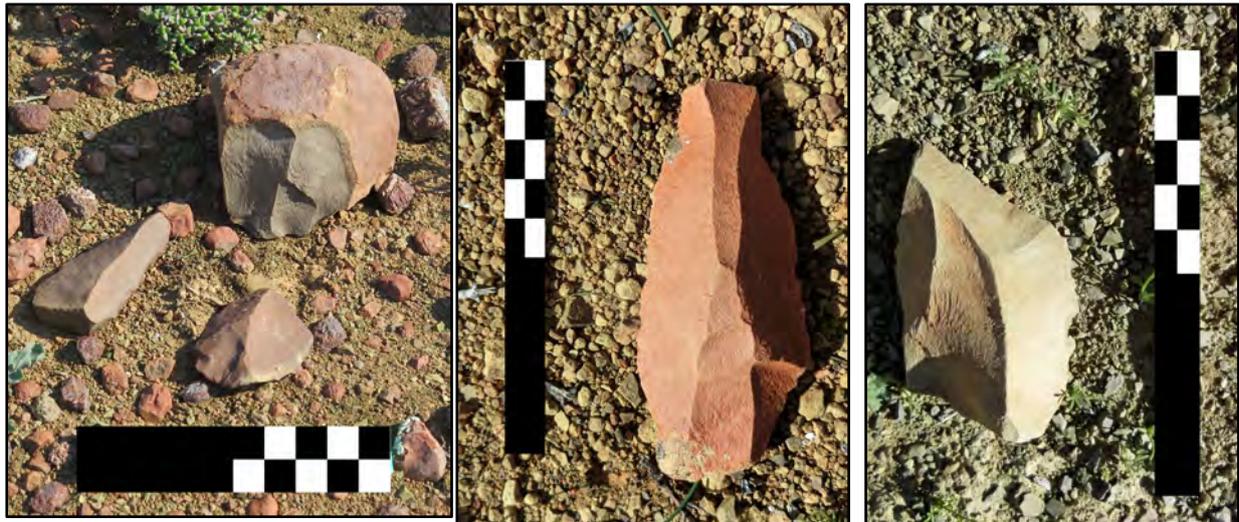


Plate 1. Stone tools KDB084

Plate 2. Stone tool KDB098

Plate 3. Stone tool KDB097

Most of the stone tools identified were found on the flat, open plain in the northern extent of the development footprint, while the three artefacts observed at KDB084 (Figure 5.1.2) represent the only artefacts identified on higher lying ground, at some 300m above the lower lying areas (Plate 1). None of the artefacts identified were considered significant, and no artefactual remains were found on the ridges.

The only significant archaeological site was identified some distance from any proposed infrastructure, but its presence in the study area is significant in terms of determining the heritage character of the area. KDB045 is a large south west facing rock shelter that was identified at the apex of a low lying kloof at approximately 1124m a.s.l. (Plate 4; Figure 5.1.2 and 5.1.3). This site contained rock art, stone artefacts, tortoise bone and ostrich eggshell as well as a single piece of thick walled, highly burnished ceramic with a glossy red exterior (Plates 5 and 6). Although the cave floor was thickly covered with sheep dung, and fairly churned, it is likely that there is anthropogenic deposit at the site. The site also contained several panels with finger painted rock art in vibrant red ochre, with some apparent animal and human shapes discernible as well as finger daubs (Plate 7). Faint traces of apparent eland-type shapes could indicate the presence of earlier fine line imagery at the site (Plate 8). This site is of high significance.



Plate 4. Rock shelter. KDB045



Plate 5. Artefacts from KDB045, including a core, broken blade and backed piece



Plate 6. Burnished ceramic at KDB045



Plate 7. Possible human figures



Plate 8. Possible fineline eland torsos

A ubiquitous feature in the landscape is the stone-built kraal. While determining relative age of such structures from a survey such as this, is not always feasible, it is useful to consider that prehistoric kraals tend to be built of piled cobbles and are usually round, while historic kraals are often rectilinear and built from packed stone, sometimes dressed, faced and infilled with smaller stones or built with mortar. Very few of the many identified kraals and stone walls conformed to this pre-colonial building method, although several small, circular kraals were identified that were built of piled stone rather than packed stone that could represent pre-colonial herder activity in the region (Plate 9).

5.1.2 Historical archaeology

The most predominant type of archaeological material identified in the landscape was historical ruins. These ranged from packed stone walling, some with drystone walling, and some with mortar, to stone-built kraals displaying a variety of construction methods, ruined huts and rectilinear dwellings, one abandoned farmhouse (KDB056 at KDBc8) and one abandoned structure that was possibly an old school (KDB050 at KDBc7) (Plates 9-13; Figure 5.1.4). These structures were concentrated along valley floors and on open plains in the north of the project area near watercourses. Individually, they are of little significance, but collectively serve as significant traces of long-term occupation of this landscape, and multiple expressions of the same economic activities, i.e. sheep farming.

An interesting feature of the stone structures is an apparent reuse of favoured areas for consecutive periods of use and occupation. This reuse is expressed in newer kraals built adjacent to, and even within the footprint of earlier kraals, where the phasing of these structures is evident in the changing styles of construction. Rounded kraals are often found in close association with well-built rectilinear structures that have been interpreted as dwellings (KDBc3, KDBc5, KDBc7, KDBc8; KDBc12 Figures 5.1.3 and 5.1.4). These clustered sites often, then, comprise one or two large kraals with either lammerhokke attached or freestanding small stone kraals, a rectangular dwelling of between one and three rooms, and a smaller rectangular or square hut.

The most significant complexes, comprising these clusters of stone walling, kraals, huts and ruins are on *Boplaaswerf* on Urias Gat 4/193 (KDBc8; Figure 5.1.4), which is located along the proposed Access Road Alternative 1 from the north, and the Matjiesfontein farmstead (KDBc3; Figure 5.1.3) which is not at direct risk of impact from the development.



Plate 9. Small stone kraal (KDB042), possibly precolonial



Plate 10. Large kraal (KDB026) at Matjiesfontein Farm 194 (KDBc3)



Plate 11a. U-shaped structure (KDB050), view to northeast (KDBc7)



Plate 11b. U-shaped structure (KDB050), view to west



Plate 12. Packed stone kraal wall (KDB055), with ruined cottage (KDB056) and repurposed reservoir currently occupied by migrant labourers to rear on Boplaas (KDBc8)



Plate 13. Oblong kraal cobble-built structure (KDB040) in foreground, with rectilinear faced stone dwelling (KDB041) to rear; both built with mortared stone (KDBc5)

A single stone circle built with sub rectangular stones and filled with brush was identified on a relatively high altitude, KDB085 at 1220m a.s.l., and constitutes the highest lying feature encountered (Plate 14; Figure 5.1.1). It was not possible to determine the age of this structure which was identified as a possible shelter or shepherd's hut, and it is likely that it dates to the recent historic period. No cultural material or evidence of associated deposit was noticed near the site. This site is considered to have low-medium significance and does not warrant further mitigation.



Plate 14. Possible shepherd's hut KDB085

One of the more enigmatic features was located along a low rocky outcrop in a wide bottomed valley on Matjiesfontein Farm 194 (KDBc2, comprising KDB14-17b; Figure

5.1.3). The feature consisted of at least 5 conical stone-built structures backing onto the krans, with two of those five collapsed, and possibly more (Plates 15-18). The stone work was neat and coursed, and the centre of each “tower” was filled with small irregular stone fragments (Plate 18). There was no other artefactual material, nor any other walling in the area or between the towers. The regularity of the feature, and the very orderly style of build suggests a defensive, military origin, but this could not be established. Due to the uniqueness of this structure and its fine method of construction, it is deemed to be of medium-high significance.



Plate 15. View of krans with conical stone features (KDBc2) built against it



Plate 16. Southernmost tower (KDB015)



Plate 17. Northernmost tower (KDB016)



Plate 18. Northernmost tower (KDB016) showing infill

5.1.3 Built Environment

Several historic farmhouses, workers' cottages and related built structures occur within the project area. Many of these structures are currently unoccupied, and several structures are falling to ruin, including at Boplaaswerf on Urias Gat 4/193 (KDBc8; Figure 5.1.4); Matjiesfontein 194 (KDBc3; Figure 5.1.3) and Urias Gat 4/193 and Re/193 (KDB065; Figure 5.1.4), all located in the Northern Cape. These structures include buildings sufficiently old to have been recorded as ruins > 100

years, and are dealt with above, while others have been recorded as structures in terms of Section 34 of the NHRA. As with most of the archaeological features, these structures are all located on valley floors and on the open plains close to watercourses. As many of the farms are no longer actively engaged in sheep farming anymore, some of these dwellings have been repurposed as guest accommodation, such as GatsrivierRe/156. It was not always possible to determine whether some of the more derelict cottages, for instance at Gatsrivier1/156 and Re/156, OliviersBerg1/159 and Re/ and on Urias Gat 4/193, were in use by labourers, either permanently or seasonally.



Plate 19. Oliviersberg dwelling with double chimney and unsympathetic redevelopment

Of the farmsteads that are likely to be affected by the proposed WEF, the most likely to be impacted are Oliviersberg1/159 (KDB091) and Gatsrivier1/156 and Re/156 (KDB008-KDB008c) in the Western Cape, which lie between several ridges proposed for turbine placement (Figure 5.1.2). In the Northern Cape, Wind Heuvel Re/190 (KDB059 at KDBc11; Figure 5.1.5), which lies along the proposed access route from the north, will be impacted, while the turbines will be visible from Matjiesfontein 194 (KDB012). The three cottages at Gatsrivier Re/156 have been altered to accommodate tourists and are of little intrinsic heritage significance. The original dwelling at Oliviersberg 1/159 has been much altered by the owner, to the detriment of any heritage value, but retains some interesting architectural features (Plate 19). The Wind Heuvel Re/190 farmhouse looks to be a 1930s or 1940s structure, although it likely has a much older core, and older elements exist in and around the

werf, such as stone walling and kraals (KDB060). It is not clear whether the Matjiesfontein farmstead is still in use, and the werf appears unused in recent times. Again, although none of these structures is of high significance in and of themselves, where they constitute significant cultural landscapes and temporal layering of the area, they hold cultural significant that is of higher heritage value than the separate constituent elements.

5.1.4 Burial grounds and graves

One single grave with two burials (KDB057 at KDBc8; Figure 5.1.4) and one burial ground were identified (KDB081 at KDBc11; Figure 5.1.5), and one likely child burial (KDB064; Figure 5.1.4). Several stone cairns were also noted as likely graves, including one isolated cairn (KDB058) and one group of more than 10 cairns (KDBc6) (Figure 5.1.4). All the graves identified were located within the Northern Cape.

The single grave (KDB057) was located on Boplaaswerf on Urias Gat 4/193 (Plates 20 and 21). The inscribed marble headstone of this grave records the death of E.M. Fourie, mother (b. 1873 d. 1937) and J.O. Fourie, father (b. 1878 d. 1944). The grave is within a fenced area and is some 350m west of Access Alternative 1. The isolated stone cairn (KDB058) while not positively identifiable as a grave, should be considered a possible grave, and is located beyond 50m from Access Road Alternative 1. The likely child burial (KDB064) is located on Uria's Gat (KDB065) and is a small, low, rectangular metal railing edged with stone and cement that measures 650mm long by 500mm wide (Plate 22). It is located equidistant from Access Road Alternatives 1 and 2, and the farm fence lies between the grave and Access Road Alternative 2.



Plate 20. Fourie grave (KDB057) with fenced camp



Plate 21. Fourie headstone



Plate 22. Likely child's grave (KDB064) at Urias Gat (KDB065)

The group of stone cairns (KDBc6) is located 300m northeast of the Urias Gat farmhouse (Plates 23 and 24). These cairns vary in size from just over 1m in length to approximately 1.8m. It is likely, given the uniformity of appearance and the grouping of these features that they do represent graves. These cairns lie approximately 165m east of Common Access Road 1 from the north, 190m northeast of the fork between Access Road Alternatives 1 and 2.



Plate 23. Small cairn at KDBc6 (KDB072)



Plate 24. Large cairn at KDBc6 (KDB071)



Plate 25. Stadler graveyard (KDB081) at Wind Heuvel farmstead (KDBc11)

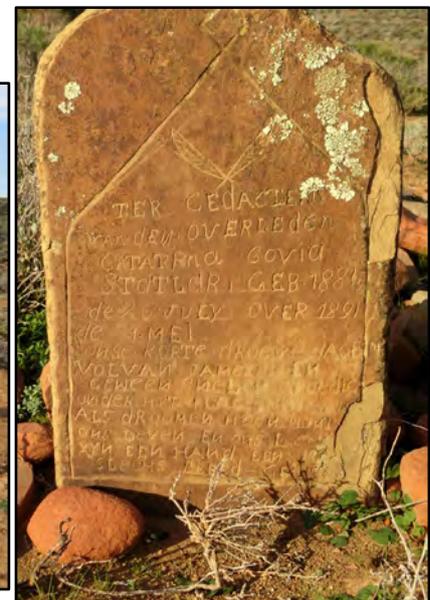


Plate 26. Stadler headstone at KDBc11

The other graves encountered (KDB081) were directly adjacent, 12m east, to Common Access Road 1 where it passes Wind Heuvel Farm (KDB059). This graveyard consists of some 10-12 graves (Plate 25), with hand inscribed sandstone headstones, and is the family graveyard of the historic – and present – owners of Wind Heuvel, the Stadlers, and most graves date to the late nineteenth and early twentieth centuries (Plate 26). Most of the graves are marked with stone cairns, while some have rectangular stone edging. The graveyard is not fenced, although its perimeter is demarcated by a small furrow that encloses the graves.

5.1.5 Cultural landscapes and Living heritage

While cultural landscape will be dealt with fully in the HIA, certain aspects are worth mentioning here due to the material expression of longstanding, continuous traditions. Wind Heuvel farmstead (KDBc11), which is located on the proposed access road from the north, comprises an historic structure that appears much altered from the exterior (KDB059), a large rectilinear kraal complex (KDB060), and a farm cemetery (KDB081) that lies directly adjacent to the existing farm road. In addition to these heritage resources, the farm displays examples of living heritage and continuity of traditional practices. While the seasonal farm labourers are housed in shipping containers – the workers travel down from the escarpment with the farmer in the winter – there are several *asboskookskerm*s erected either freestanding or adjacent to the containers (KDB080; Plate 27). Adjacent to the main house there is a further large *asbosenclosure* that stands at least 6m high (Plate 28).



Plate 27. Kookskerm at Wind Heuvel



Plate 28. Freestanding asbos skerm

5.2 Impacts to heritage resources

Due to the survey method employed – i.e. to sample as many landforms as possible to define the area's heritage character given that accessing all footprint areas was not possible – not all resources identified in the field are likely to be impacted. Similarly, however, not all areas where impacts will likely result were assessed.

The table below (Table 3) provides the details and co-ordinates of all heritage resources that will be directly impacted, and those likely to experience high levels of

indirect impact. Resources are listed by province and degree of significance.

Table 3. Table of sites liable to direct and/or indirect impacts from WEF

Site No.	Site Complex	Site Description	Site Type	Grading/ Field Rating	Coordinates
Western Cape					
KDB045		Cave with finger painted panels, flakes and cores	Rock art, artefacts, deposit	IIIa	-32°52'5.2" ; 20°20'6.1"
KDB084		Stone tools, likely MSA	Artefacts	IIIc	-32°53'11.70" ; 20°18'55.50"
KDB085		Circular cobble-built structure, piled stone, likely hut or shelter	Structure	IIIc	-32°51'50.60" ; 20°18'31.60"
KDB091		Oliviers Berg farmstead, stone-built farmstead, two cottages, dam	Building	IIIc	-32°53'44.53" ; 20°19'48.43"
KDB093		Lime-rich cement brick in linear arrangement / drying stack	Artefacts	IIIc	-32°53'41.85" ; 20°19'51.13"
KDB096		Large rectangular kraal, faced stone, mortar	Structure	IIIc	-32°53'12.51" ; 20°19'32.78"
Northern Cape					
KDB057	KDBc8	Single gravestone in fenced cemetery; EM Fourie, mother (b. 1873 d. 1937) JO Fourie, father (b. 1878 d. 1944)	Burial Grounds & Graves	IIIa	-32°48'5.2" ; 20°20'59"
KDB058		Stone cairn, possible grave	Burial Grounds & Graves	IIIa	-32°47'53.4" ; 20°21'11"
KDB060	KDBc11	Wind Heuvel kraal complex	Structures	IIIb	-32°45'7.71" ; 20°21'50.03"
KDB064		65cmx50cm metal enclosed feature, likely grave	Burial Grounds & Graves	IIIa	-32°47'14.1" ; 20°21'23.1"
KDB071	KDBc6	Cairn 1, likely grave	Burial Grounds & Graves	IIIa	-32°47'8" ; 20°21'31.8"
KDB072	KDBc6	Cairn 2, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.9" ; 20°21'32.1"
KDB073	KDBc6	Cairn 3, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.8" ; 20°21'32"
KDB074	KDBc6	Cairn 4, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.8" ; 20°21'31.9"
KDB075	KDBc6	Cairn 5, likely grave	Burial Grounds & Graves	IIIa	-32°47'7.6" ; 20°21'31.9"
KDB076	KDBc6	Cairn 6, likely grave	Burial Grounds	IIIa	-32°47'7.5" ; 20°21'32"

Site No.	Site Complex	Site Description	Site Type	Grading/ Field Rating	Coordinates
			&Graves		
KDB081	KDBc11	Stadler cemetery. 10 graves with sandstone headstones at roadside. No fence	Burial Grounds & Graves	IIIa	-32°45'10" ; 20°21'47"
KDB083		Church with grave	Building, living heritage, Burial Grounds & Graves	IIIa	-32°41'40.9" ; 20°26'23.5"
KDB059	KDBc11	Wind Heuvel historic farmhouse and asbos skerm	Building, living heritage	IIIb	-32°45'9.7" ; 20°21'46.4"
KDB080	KDBc11	Temporary accommodation and asboskookskerms on Wind Heuvel farmstead	Living heritage	IIIb	-32°45'26.2" ; 20°21'50.9"
KDB082		Rooiheuvel farmstead with asbos skerm	Building	IIIb	-32°42'42.7" ; 20°21'48.6"
KDB050	KDBc7	U-shaped structure. Stone built with three phases of construction, faced stone and mortar	Ruin > 100 years	IVa	-32°47'22.8" ; 20°21'17.5"
KDB052	KDBc8	Horseshoe shaped dry wall cobble-built kraal	Structure	IVa	-32°48'10.4" ; 20°21'2"
KDB053	KDBc8	4mx5m dwelling, dressed stone, mortar, gum pole roof structure	Ruin > 100 years	IVa	-32°48'9.5" ; 20°21'2.1"
KDB054	KDBc8	Lammerkraal, piled circular stone	Structure	IVa	-32°48'8.7" ; 20°21'2.2"
KDB055	KDBc8	Large rectilinear kraal with large faced stone blocks with infill	Structure	IVa	-32°48'7.8" ; 20°21'0.2"
KDB056	KDBc8	Stone dwelling, mud and grass plaster, rietdak with mud cap, mudbrick and breeze block extension	Ruin > 100 years	IVa	-32°48'9.3" ; 20°20'57.7"
KDB061	KDBc7	3-roomed structure 12mx5m; faced stone and mortar	Ruin > 100 years	IVa	-32°47'23.9" ; 20°21'19.4"
KDB063	KDBc7	Kraal with pen, drywall cobble built	Structure	IVa	-32°47'22.1" ; 20°21'20"
KDB066		Large rectangular kraal	Structure	IVa	-32°47'15.9" ; 20°21'18.8"
KDB099	KDBc7	Large rectangular kraal, northern end	Structure	IVa	-32°47'21.71" ; 20°21'20.28"
KDB100	KDBc7	Large rectangular kraal lammerkraal	Structure	IVa	-32°47'21.88" ; 20°21'19.78"
KDB101	KDBc7	Large rectangular kraal southern end	Structure	IVa	-32°47'22.28" ; 20°21'20.13"
KDB102	KDBc7	Curved walling near large kraal, eastern extent	Structure	IVa	-32°47'22.67" ; 20°21'21.21"
KDB103	KDBc7	Large rectangular kraal eastern end	Structure	IVa	-32°47'22.15" ; 20°21'20.61"

Site No.	Site Complex	Site Description	Site Type	Grading/ Field Rating	Coordinates
KDB104	KDBc7	Curved walling near large kraal, western extent	Structure	IVa	-32°47'22.21" ; 20°21'20.85"
KDB105	KDBc7	Large rectangular kraal western end	Structure	IVa	-32°47'21.86" ; 20°21'19.99"
KDB107	KDBc12	Large, circular kraal structure (identified from Google Earth)	Structure	IVa	-32°47'18.18" ; 20°21'48.30"
KDB108	KDBc12	Small circular kraal structure (identified from Google Earth)	Structure	IVa	-32°47'14.19" ; 20°21'48.73"
KDB109	KDBc12	Large kraal with lammerhok (identified from Google Earth)	Structure	IVa	-32°47'16.22" ; 20°21'51.40"
KDB110	KDBc12	Multi-roomed structure (identified from Google Earth)	Ruin > 100 years	IVa	-32°47'15.94" ; 20°21'49.0"
KDB111	KDBc12	Two-roomed structure (identified from Google Earth)	Ruin > 100 years	IVa	-32°47'18.65" ; 20°21'49.20"
KDB062	KDBc7	Stone-built weir in dry river bed, mortared	Stone walling	IVb	-32°47'23.8" ; 20°21'18.7"
KDB069		Reservoir and leivoor	Structure	IVb	-32°47'11.5" ; 20°21'27.5"
KDB011		Stone-built embankment for old road	Transport infrastructure	IVc	-32°51'57.7" ; 20°22'29.9"
KDB068		Core, likely LSA	Artefacts	IVc	-32°47'22.6" ; 20°21'23.5"
KDB077	KDBc6	Stone alignment	Stone walling	IVc	-32°47'7.6" ; 20°21'31"
KDB097		Flake	Artefacts	IVc	-32°46'17.8" ; 20°21'43.4"
KDB098		MSA point	Artefacts	IVc	-32°47'31.5" ; 20°21'19.2"
KDB065		1930s farmhouse in werf	Building	IIIc	-32°47'13.9" ; 20°21'22"
KDB051		Stone built 20 th Century farm store	Building	IIIc	-32°48'13.5" ; 20°21'0.4"
KDB106		Irregular kraal structure (identified from Google Earth)	Structure	IVc	-32°47'16.45" ; 20°21'33.74"

5.2.1 Direct Impacts

5.2.1.1 Construction Phase

Direct impacts to **archaeological resources**, burial grounds and graves, and built environment may result from construction vehicles in the study area, the building of roads, clearing of land, earthmoving, and similar activities related to construction. Stone Age archaeology is very sparse in this area, with only a very few, isolated artefacts found in the development footprint (KDB068, KDB084, KDB097, KDB098). As a result, the impact significance to Stone Age archaeology is likely to be **low**

before mitigation. The preponderance of archaeological remains in the study area are the remains of built structures, likely of historic age, but some possibly pre-colonial. These structures are predominantly easy to identify and fairly robust, but several were located in very close proximity to access roads. These roads were subsequently realigned. The vulnerable sites included KDBc6 and KDBc7 and a kraal at KDB066 (Figure 5.2.1). The realignment of Access Road Alternative 1 to avoid these sites reduces the likely impacts to them from **high** to **low**, and, as such, no mitigation is required. Should Access Road Alternative 2 be chosen as the preferred option, the likelihood of impacts to these sites is also likely to be **low**. Farming infrastructure is located at KDB069 and a kraal at KDB106 (Figure 5.1.3), which are fairly close to Access Road Alternative 2, but the alignment is beyond the recommended buffers for these sites (Figure 5.2.1). As such, Access Road Alternative 2 remains an acceptable alternative choice.

Burial grounds and graves at risk during the construction phase are likely to be subject to **very high** direct impacts without mitigation. Revised Layout 1 has taken this into account, and avoids Grave 057 and possible grave KDB058 as well as the graveyard at KDB081 (Figure 5.1.5) by adequate buffers. The group of stone cairns at KDBc6 is located on the proposed site for Construction Camp 3 (Figure 5.2.2) and is a **no-go option**; Construction Camp 2 is the preferred alternative. The design of Revised Layout 1 reduces, the significance of impacts to these sites to **very low**.

The significance of the **built environment** is very low in this area, and it is likely that the significance of impacts to the built environment will be **low** without mitigation. If structures are avoided sufficiently not to cause structural damage to them, mitigation will result in impacts of **very low** significance to built-environment structures.

Sites of moderately high cultural significance in the study area include the Wind Heuvel farmstead (KDBc11), with its evidence for **living heritage** in the form of *asboskookskerms* and other *skerm* structures (Figure 5.1.5). The originally proposed Common Access Road 1 from the north passed through the farmstead with likely impacts of **moderate** significance to this resource. This portion of the road has been

moved west sufficiently that it doesn't intrude on the farmstead. It is, therefore, anticipated that the significance of impacts to the cultural significance of this site will be **low**. The other sites with living heritage aspects are unlikely to be affected, due in the case of Rooiheuvel (KDB082) to their distance from the road, and in the case of the Tuinplaas Church and Graveyard (KDB083) due to the unlikelihood of significant changes to the road at that point (Figure 5.1.5).

5.2.1.2 Operational Phase

Impacts to **archaeological resources, burial grounds and graves and built environment** are unlikely during the operational phase, as no new areas will be disturbed through operational activities. The significance of impacts without mitigation would, therefore be **very low**. Mitigation should only be to ensure that existing roads are used and no previously undisturbed areas subject to disturbance. With mitigation, impacts will remain of **very low** significance. The realignment proposed for Common Access Road 1 further ensures that the Stadler graveyard at KDB081 (Figure 5.2.2) is avoided by an appropriate buffer. This realignment ensures that impacts from heavy vehicle traffic for maintenance of turbine locations and roads are unlikely to cause impacts to the graveyard, and the likelihood of significant impacts is **very low**.

Impacts to sites of **living heritage** will be continuous throughout the operational phase as a result of vehicles and personnel on site for maintenance, and the presence of roads, turbines and associated infrastructure in the landscape. Should the mitigation measures recommended above be implemented, the significance of these impacts will, however, remain **low**.

5.2.1.3 Decommissioning Phase

Impacts to **archaeological resources, burial grounds and graves and built environment** are unlikely during the decommissioning phase, as no new areas will be disturbed through decommissioning activities. The significance of impacts without mitigation would, therefore be **very low**. Mitigation should only be to ensure that existing roads are used and no previously undisturbed areas should be subject to disturbance. With mitigation, impacts will remain **very low**.

Impacts to sites of **living heritage** will be continuous throughout the decommissioning phase as a result of vehicles and personnel on site for turbine dismantling and removal, and the remnants of access roads, and locations of turbines and associated infrastructure in the landscape. It should be noted, however, that any resulting impacts will be of a short duration. Should the mitigation measures recommended above be implemented, the significance these impacts will, however, remain **low**.

5.2.2 Cumulative Impacts

There are currently multiple applications being made for the development of WEFs in the area surrounding the Kudusberg proposed WEF development site (within a radius of 50 km). Three of these have been approved to commence construction in early 2019 (see Table 4 for a list of these projects, and Figure 6 for the map of their distribution).

Due to the likely low impacts to the sparse, low density StoneAge **archaeological heritage** anticipated in this region, the significance of cumulative impacts is similarly expected to be **low**. Cumulative impacts to archaeological built heritage, in the form of stone walling, kraals and ruined stone-built structures, however, is anticipated to be **high** without mitigation. Mitigation, which should include protection and avoidance of these features, can be easily implemented across the wider REDZ and, should that occur, direct cumulative impacts to these features will likely be **very low**.

Burial grounds and graves can occur throughout this region, and are not always easily recognised as graves, making possible impacts to them from cumulative developments **very high**. These features, both formal graves and stone cairns should be avoided where they are encountered in the landscape, such that the need for relocation does not arise. Should this mitigatory approach be adopted throughout the REDZ, the significance of cumulative impacts to graves will be **low**.

Where significant **built environment** features do occur, these should be avoided, with buffers implemented to protect them from encroachment and impact from roads, infrastructure and turbines which will result in **very high** impacts. No turbines should

be placed within 500m of farmsteads. Despite these mitigatory measures, the significance of cumulative impacts to these structures, which are often the only structures in the landscape for many kilometres, will remain **moderate to high**.

Similarly, cumulative impacts to **living heritage** sites will be unavoidably **high** without mitigation, with losses including to 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 to high**.

Table 4: Cumulative projects within 50kms

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MW	STATUS
WIND PROJECTS							
14/12/16/3/3/2/967	Scoping and EIA	Biotherm Energy (Pty) Ltd	Proposed 140 MW Esizayo Wind Energy Facility and its associated infrastructure near Laingsburg within the Laingsburg Local Municipality in the Western Cape	WSP / Parsons Brinckerhoff	Wind	140 MW	Approved
East -14/12/16/3/3/2/962 West- 14/12/16/3/3/2/693	Scoping and EIA	Biotherm Energy (Pty) Ltd	East: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the farm Welgemoed 268, the remainder of the farm Schalkwykskraal 204 and the remainder of the farm DrieRoodeHeuvels 180 north of the town of Laingsburg within the Laingsburg and Karoo Hoodland Local Municipalities in the Western and Northern Cape Provinces West: Proposed 140 MW Maralla West Wind Energy Facility on the remainder of the Farm DrieRoodeHeuvels 180, the remainder of the farm Annex DrieRoodeHeuvels 181, portion 1 of the farm Wolven Hoek 182 and portion 2 of the farm Wolven Hoek 182 north of the town of Laingsburg within the Karoo Hoodland Local Municipality in the Northern Cape Province	WSP / Parsons Brinckerhoff	Wind	140 MW	Approved
12/12/20/1966/AM5	Amendment	Witberg Wind Power (Pty) Ltd	Proposed establishment of the WitbergWind Energy Facility, Laingsburg Local Municipality, Western Cape Province	Environmental Resource Management (Pty) Ltd / Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
12/12/20/1783/2/AM1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Environmental Resource Management (Pty) Ltd	Wind	110 MW	Under construction

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MW	STATUS
		West (Pty) Ltd					
12/12/20/1783/1	Scoping and EIA	South Africa Mainstream Renewable Power Perdekraal East (Pty) Ltd	Proposed development of a Renewable Energy Facility (Wind) at the Perdekraal Site 2, Western Cape Province	Savannah Environmental Consultants (Pty) Ltd	Wind	150 MW	Approved
14/12/16/3/3/2/899	Scoping and EIA	Rietkloof Wind Farm (Pty) Ltd	Proposed Rietkloof Wind Energy (36 MW) Facility within the Laingsburg Local Municipality in the Western Cape Province	EOH Coastal & Environmental Services	Wind	36 MW	Approved
TBC	BA		Proposed Rietkloof Wind Energy Facility, Western Cape, South Africa	WSP	Wind	140 MW	In progress
14/12/16/3/3/2/826	Scoping and EIA	Gunstfontein Wind Farm (Pty) Ltd	Proposed 200 MW Gunstfontein Wind Energy Facility on the Remainder of Farm Gunstfontein 131 south of the town of Sutherland within the Karoo Hooglands Local Municipality in the Northern Cape Province, south of Sutherland.	Savannah Environmental Consultants (Pty) Ltd	Wind	200 W	Approved
12/12/20/1782/AM2	Scoping and EIA	Mainstream Power Sutherland	Proposed development of 140 MW Sutherland Wind Energy Facility, Sutherland, Northern and Western Cape Provinces	CSIR	Wind	140 MW	Approved
Karusa - 12/12/20/2370/1 Soetwater - 12/12/20/2370/2	Scoping and EIA	African Clean Energy Developments Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Karusa&Soetwater)	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW each	Preferred bidders. Construction to commence in 2019
12/12/20/2370/3	Scoping and EIA	African Clean Energy Developments Renewables Hidden Valley (Pty) Ltd	Proposed Hidden Valley Wind Energy Facility on a site south of Sutherland, Northern Cape Provinces (Greater Karoo))	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
West -14/12/16/3/3/2/856 East - 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farm (Pty) Ltd	Proposed 275 MW Komsberg West Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces	Savannah Environmental Consultants	Wind	140 MW each	Approved

DEA REFERENCE NUMBER	EIA PROCESS	APPLICANT	PROJECT TITLE	EAP	TECHNOLOGY	MW	STATUS
			Proposed 275 MW Komsberg East Wind Energy Facility near Sutherland within the Northern and Western Cape Provinces	(Pty) Ltd			
12/12/20/1988/1/AM1	Amendment	Roggeveld Wind Power (Pty) Ltd	Proposed Construction of the 140 MW Roggeveld Wind Farm within the Karoo Hoogland Local Municipality and the Laingsburg Local Municipality in the Western and Northern Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Preferred bidders. Construction to commence in 2019.
14/12/16/3/3/2/807/AM1	Scoping and EIA Amendment	Karreebosch Wind Farm (Pty) Ltd	Proposed Karreebosch Wind Farm (Roggeveld Phase 2) and its associated infrastructure within the Karoo Hoogland and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	Savannah Environmental Consultants (Pty) Ltd	Wind	140 MW	Approved
14/12/16/3/3/2/900	Scoping and EIA	Brandvalley Wind Farm (Pty) Ltd	Proposed 147 MW Brandvalley Wind Energy Facility North of the Town of Matjiesfontein within the Karoo Hoogland, Witzenberg and Laingsburg Local Municipalities in the Northern and Western Cape Provinces	EOH Coastal & Environmental Services	Wind	140 MW	Approved
TBA	Scoping and EIA	Rondekop Wind Farm (Pty) Ltd	Proposed establishment of the Rondekop WEF, south-west of Sutherland in the Northern Cape	SiVEST SA (Pty) Ltd	Wind	325 MW	In process
West 14/12/16/3/3/2/856 East 14/12/16/3/3/2/857	Scoping and EIA	Komsberg Wind Farms (Pty) Ltd	Komsberg East and West WEF	Arcus Consulting Services (pty) Ltd	Wind	140 MW each	
TBC	BA	ENERTRAG SA (Pty) Ltd	Proposed Development of the Tooverberg Wind Energy Facility and the associated grid connection near Touws River, Western Cape Province)	SiVEST SA (Pty) Ltd	Wind	140 MW	In process
SOLAR PROJECTS							
12/12/20/2235	BA	Inca Sutherland Solar (Pty) Ltd	Proposed Photovoltaic (PV) Solar Energy Facility on A Site South Of Sutherland, Within The Karoo Hoogland Municipality Of The Namakwa District Municipality, Northern Cape Province	CSIR	Solar	10 MW	Approved

5.2.3 Indirect Impacts

Indirect impacts occur through contextual impacts arising from the intrusion of incompatible structures in the area that can lead to loss of sense of place and negative impacts to the rural cultural landscape and heritage resources within it. These contextual impacts will be experienced during all phases but are most problematic during the operational phase. These contextual impacts can only be mitigated through sensitive placement of turbines, roads and infrastructure, as noted above for direct impacts. While the impacts are unavoidable, with mitigation, these impacts can be reduced to **low to moderate**.

The presence of people and vehicles in the landscape during any of these phases can also pose an indirect impact to resources through intentional and/or accidental damage and disturbance. Rock art sites are highly vulnerable to damage through graffiti, the lighting of fires and similar activities, while stone-built features in the landscape can attract attention from people who are ignorant of their heritage significance. The rock art cave (KDB045) is sufficiently far from likely areas of high traffic and activity that the likelihood of impacts to it is **low**. The kraals and ruins in the development area are, however, at **moderate** risk of impacts. To prevent such indirect impacts, all site crew need to be informed of the heritage sensitivity of features in the landscape, and any vulnerable sites adjacent to road alignments or construction areas – camps, substations or turbine placements – should be cordoned off and indicated as no-go area. If these measures are implemented, impacts can be reduced to **very low**.

5.3 Buffers

The following buffers should be observed around identified heritage resources (Figures 5.3.1 to 5.3.4):

- Graves: no development should be permitted within 50m of graves and cemeteries; existing roads within this buffer should not be altered or widened
- Cave site (KDB045): construction staff should not be permitted within 200m of the site;
- Farmsteads: no turbines should be located within 500m of farmsteads;
- Kraals, stone walling and ruins > 100 years: construction staff should not be

permitted within 50m of these sites and no development should take place within 15m;

- Archaeological finds: no buffers are recommended for the isolated artefacts identified in this survey.

5.4 Mapping of resources

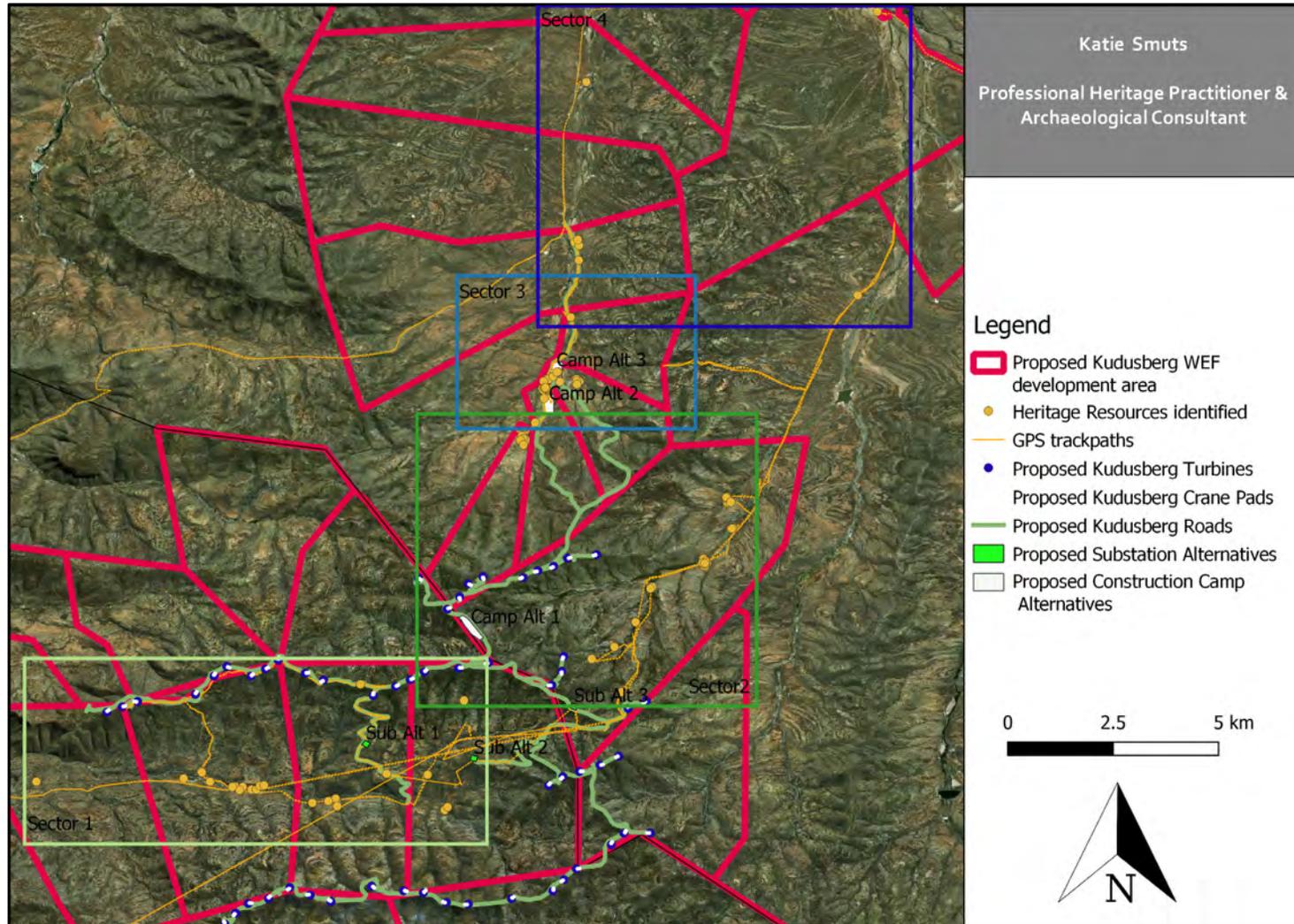


Figure 5.1.1. Overview of revised layout indicating trackpaths and identified heritage resources

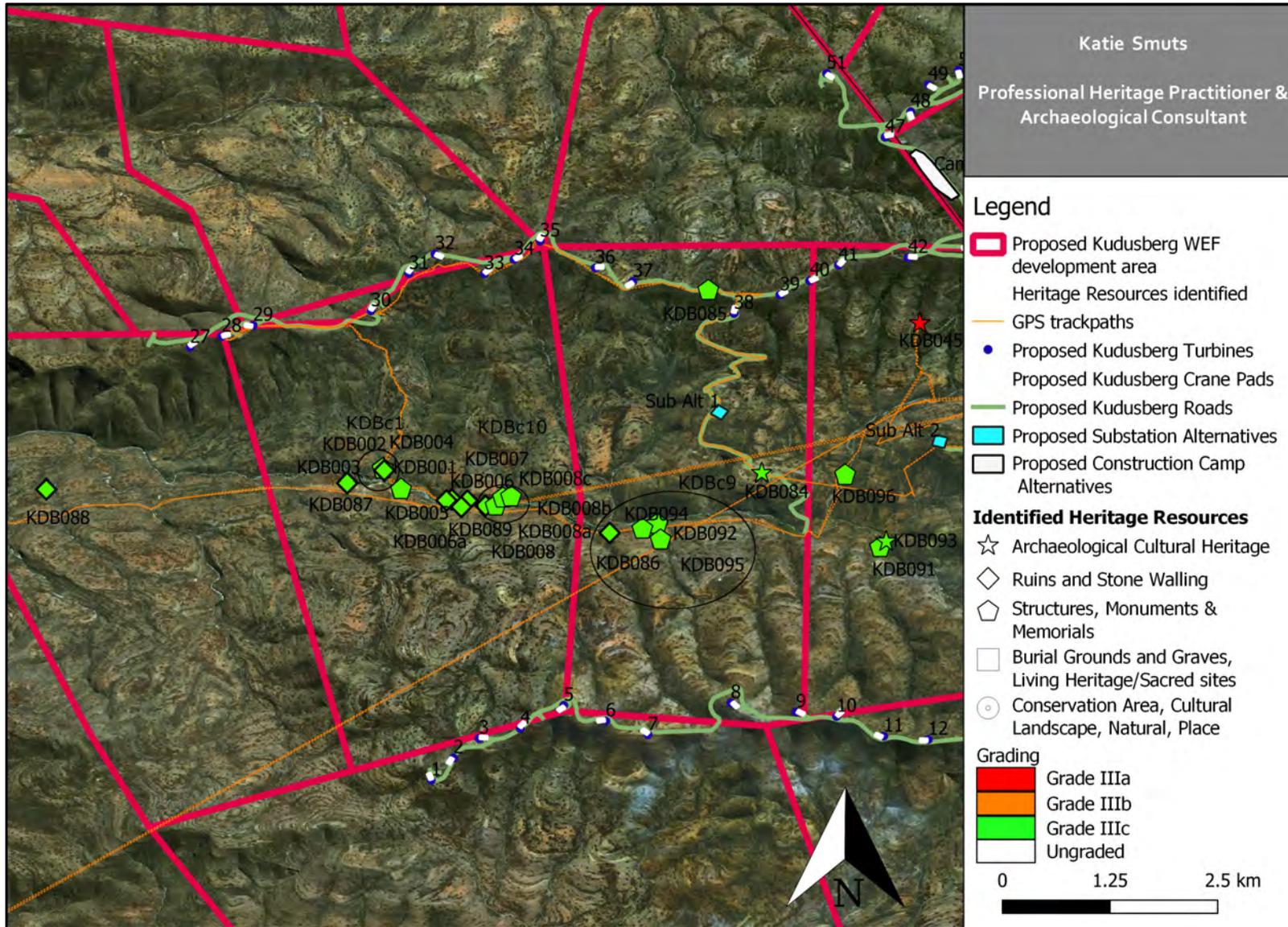


Figure 5.1.2. Heritage resources identified in Sector 1

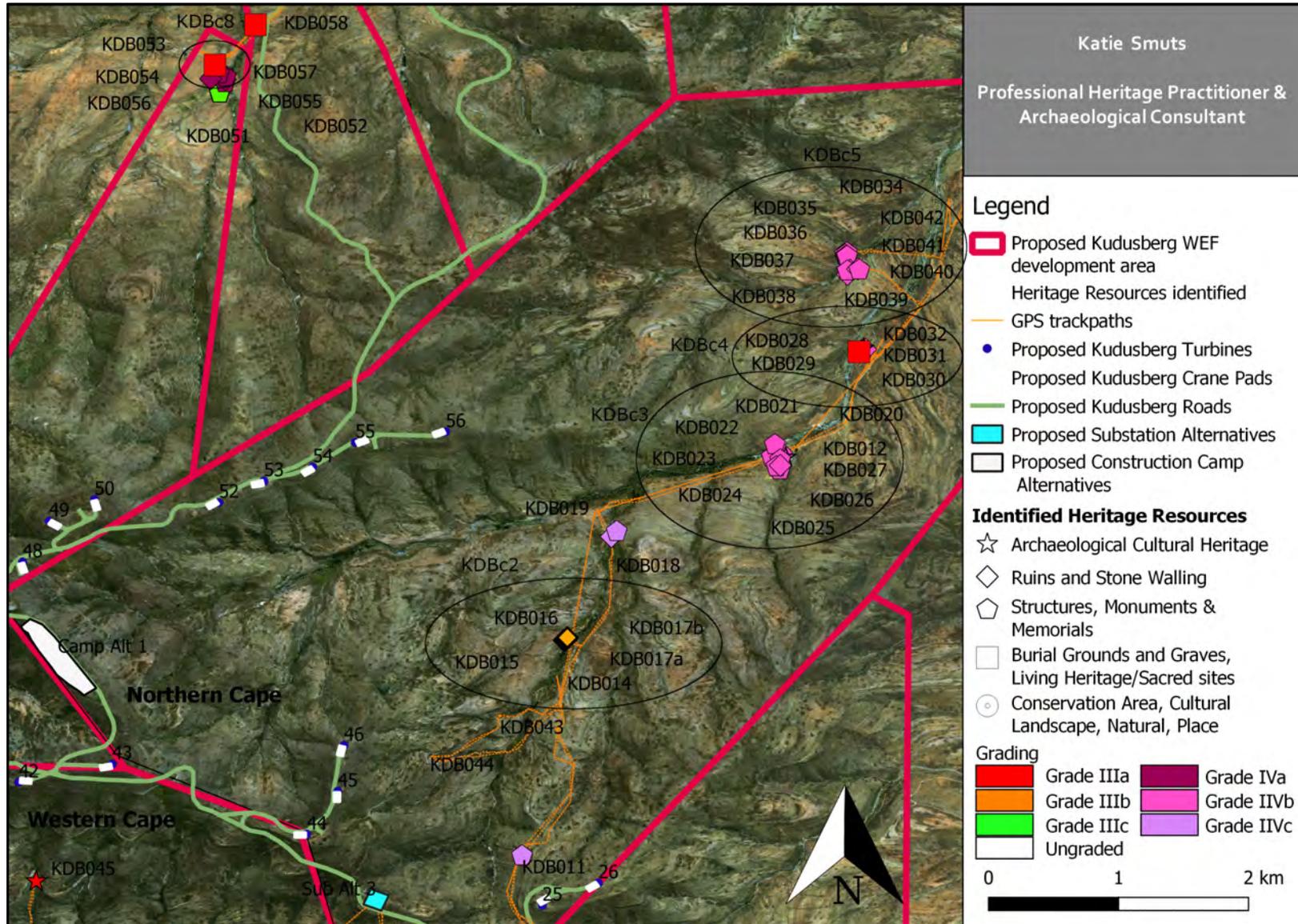


Figure 5.1.3. Heritage resources identified in Sector 2

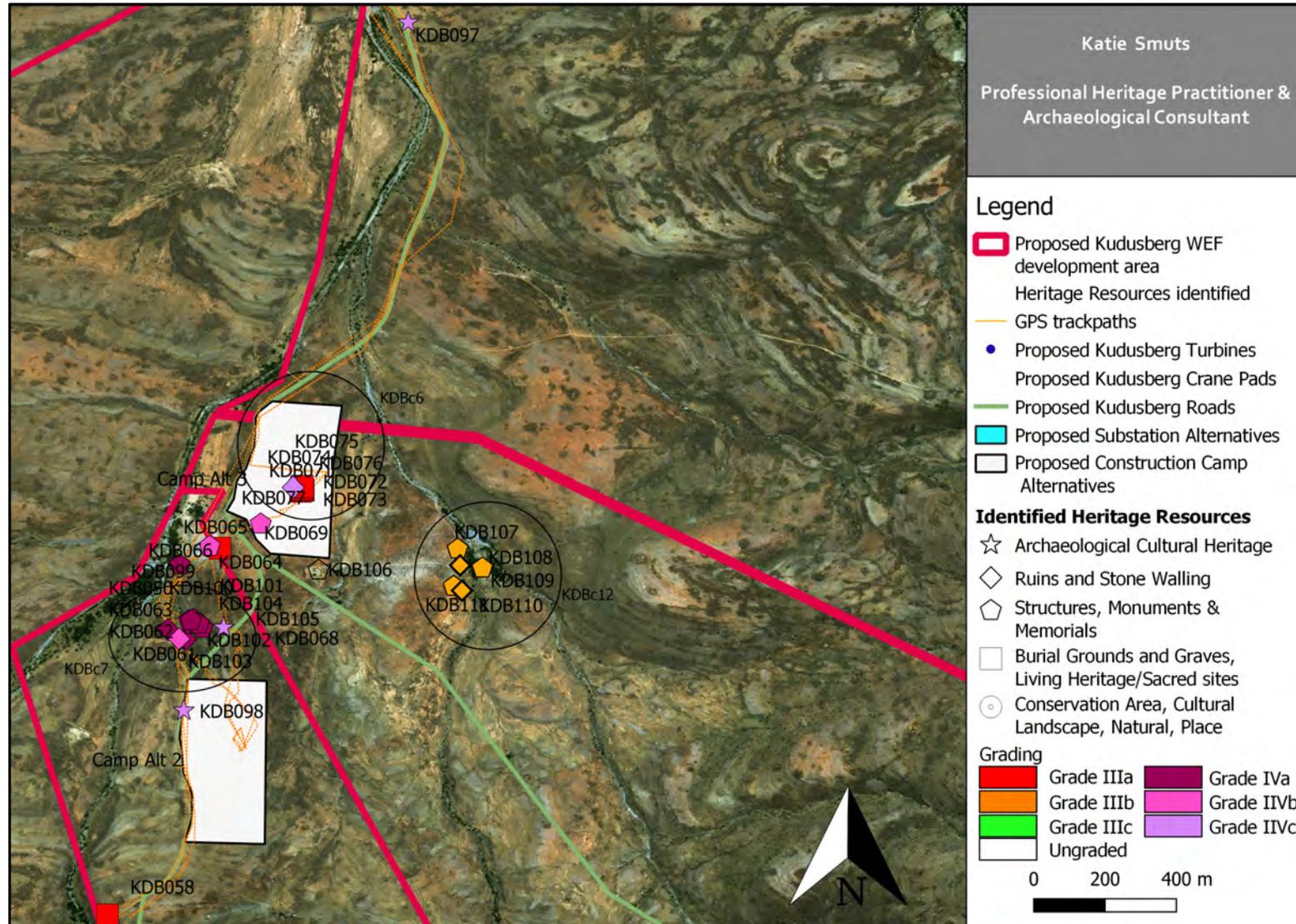


Figure 5.1.4. Heritage resources identified in Sector 3.

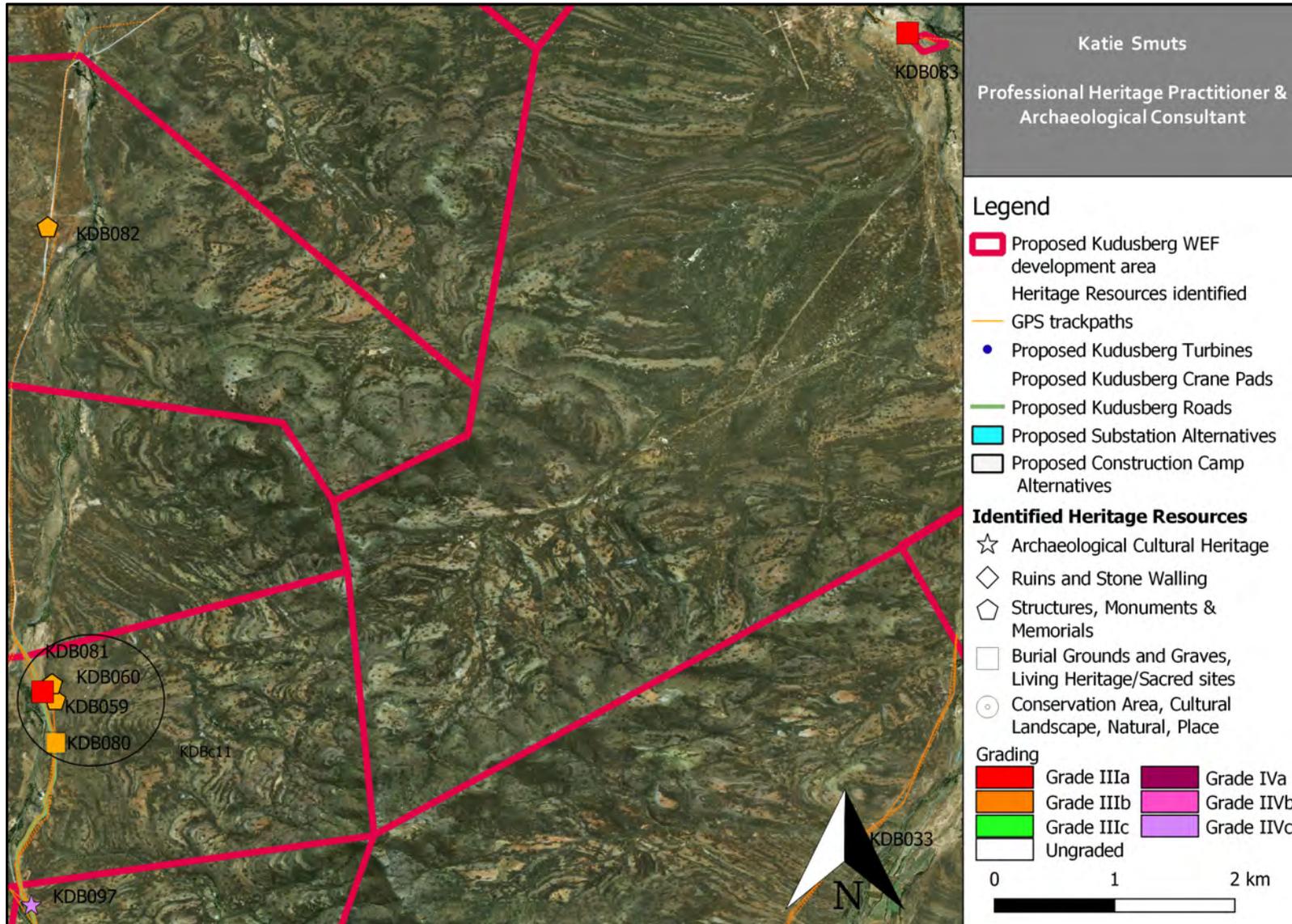


Figure 5.1.5. Heritage resources identified in Sector 4

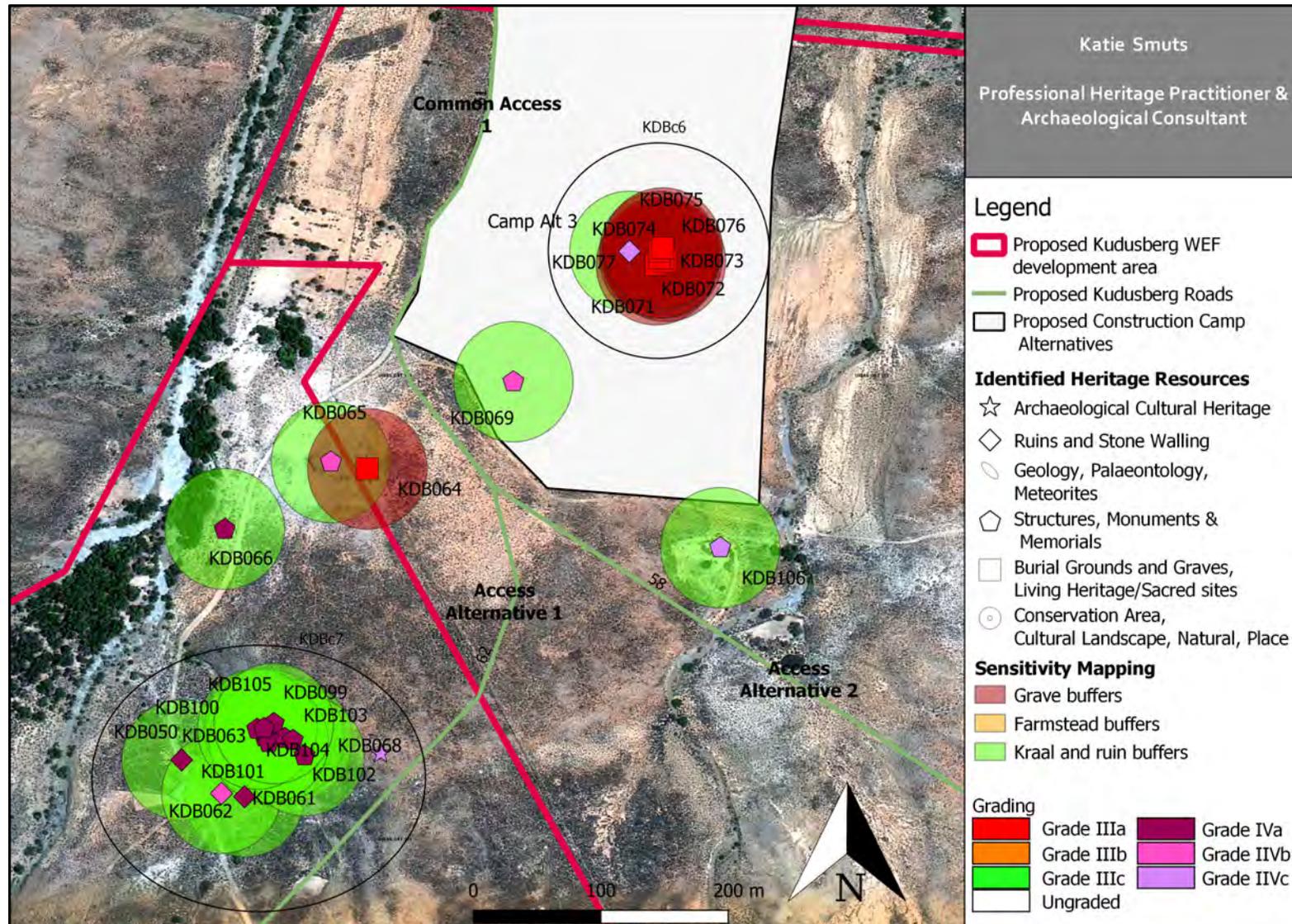


Figure 5.2.1. Sites in and near site complexes KDBc6 and KDBc7 relative to revised alignment (Sector 3)

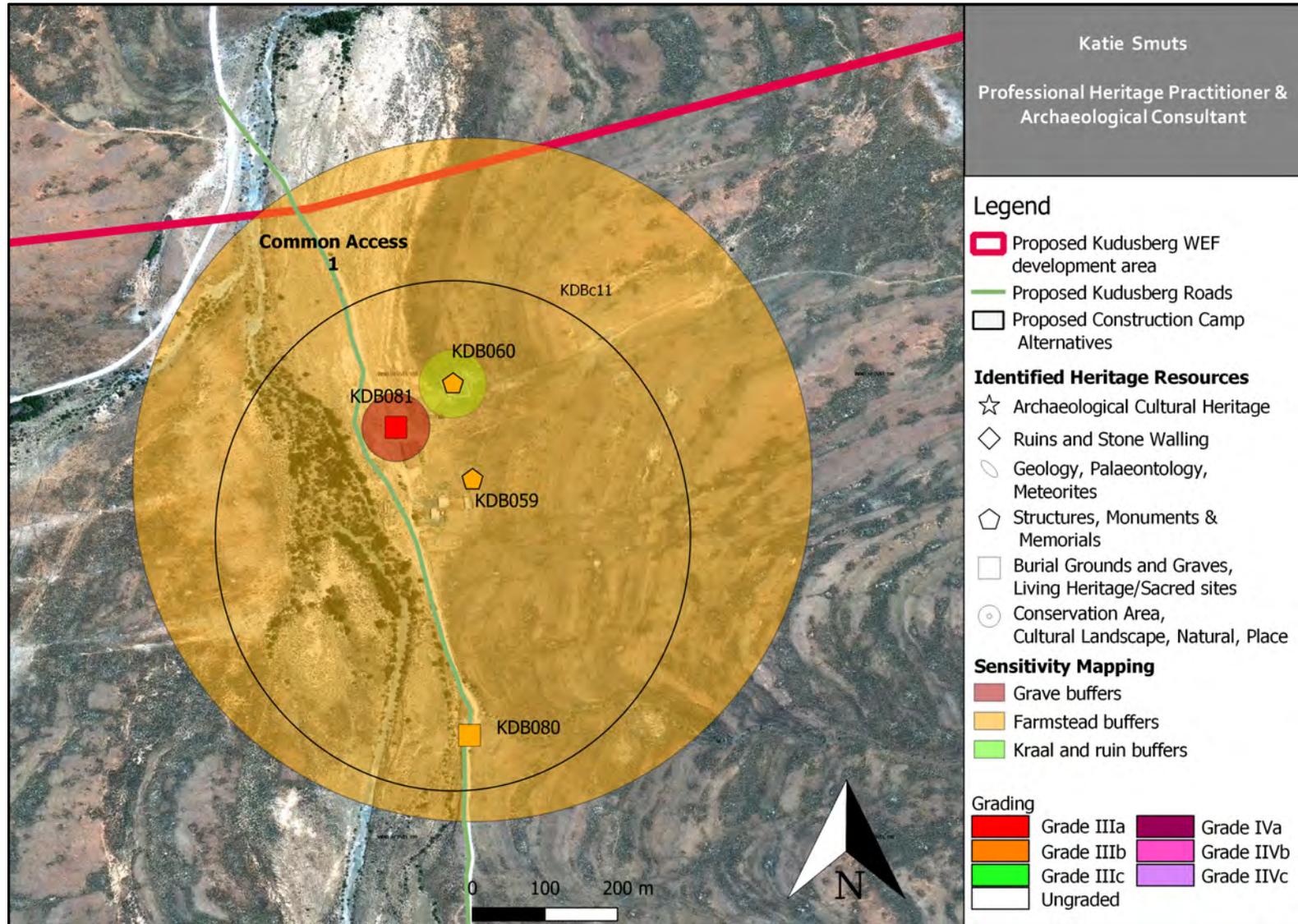


Figure 5.2.2. Sites in and near site complex KDBc11 relative to revised alignment (Sector 4)

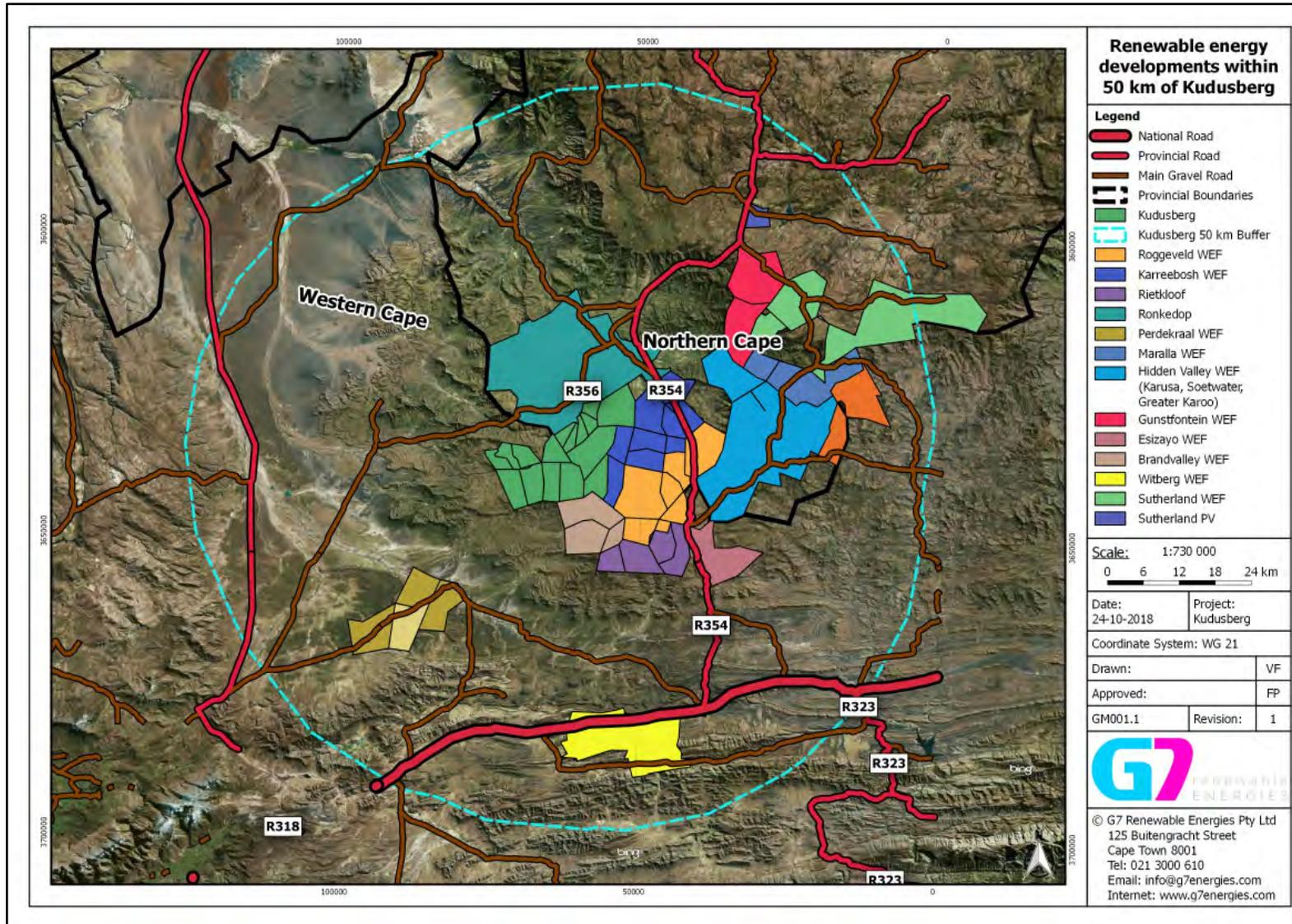


Figure 6. Cumulative WEFs proposed for the Komsberg REDZ relative to Kudusberg.

5.5 Impact Assessment tables

Table 5. Impact assessment summary for the Construction Phase

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Significance of impact/risk= consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact(after mitigation)	Ranking of impact/risk	Confidence level
HERITAGE															
CONSTRUCTION PHASE															
Direct Impacts															
Construction of access roads, construction camp, substation and turbines	Destruction of archaeological remains, graves and built environment features	Negative	Local	Permanent	Moderate	Very likely	Non-reversible	High	Low	No	Yes	<ul style="list-style-type: none"> Revised Layout 1 makes Access Alternative 1 preferred choice and Common Access 1 acceptable Use Construction Camp 2 	Low	4	Medium
Indirect Impacts															
<ul style="list-style-type: none"> Contextual impacts; Accidental/deliberate damage by people or vehicles 	<ul style="list-style-type: none"> Loss of heritage significance; Destruction of archaeological remains, graves and built environment 	Negative	Local	Permanent	Moderate	Likely	Non-reversible	High	Low	No	Yes	<ul style="list-style-type: none"> Placement of turbines and associated infrastructure to observe buffers Inform site crew of heritage sensitivity of landscape Cordon off vulnerable sites as no-go areas 	Low	4	Medium

Table 6. Impact assessment summary for the Operational Phase

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk= consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ Impact(after mitigation)	Ranking of impact/ risk	Confidence level
HERITAGE															
OPERATIONAL PHASE															
Direct Impacts															
Construction of access roads, construction camp, substation and turbines	Destruction of archaeological remains, graves and built environment features	Negative	Local	Permanent	Slight	Unlikely	Non-reversible	High	Very low	Yes	Yes	<ul style="list-style-type: none"> Use existing roads Do not disturb new areas outside of the development footprint 	Very low	5	High
Indirect Impacts															
<ul style="list-style-type: none"> Contextual impacts; Accidental/deliberate damage by people or vehicles 	<ul style="list-style-type: none"> Loss of heritage significance; Destruction of archaeological remains, graves and built environment 	Negative	Local	Permanent	Slight	Unlikely	Non-reversible	High	Low	No	Yes	<ul style="list-style-type: none"> Keep site crew informed of heritage sensitivity of landscape 	Low	4	High

Table 7. Impact assessment summary for the Decommissioning Phase

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk= consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ Impact (after mitigation)	Ranking of impact/ risk	Confidence level
HERITAGE															
DECOMMISSIONING PHASE															
Direct Impacts															
Decommissioning of substation and turbines	Destruction of archaeological remains, graves and built environment features	Negative	Local	Permanent	Moderate	Unlikely	Non-reversible	High	Low	Yes	Yes	<ul style="list-style-type: none"> Use existing roads Do not disturb new areas outside of the development footprint 	Very low	5	High
Indirect Impacts															
<ul style="list-style-type: none"> Contextual impacts; Accidental/deliberate damage by people or vehicles 	<ul style="list-style-type: none"> Loss of heritage significance; Destruction of archaeological remains, graves and built environment 	Negative	Local	Permanent	Moderate	Unlikely	Non-reversible	High	Low	No	Yes	<ul style="list-style-type: none"> Keep site crew informed of heritage sensitivity of landscape Keep vulnerable sites cordoned off as no-go areas 	Low	4	High

Table 8. Cumulative impact assessment summary table

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk= consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/ Impact (after mitigation)	Ranking of impact/ risk	Confidence level
HERITAGE															
CUMULATIVE IMPACTS															
<ul style="list-style-type: none"> • Construction of access roads, construction camp, substation and turbines • Contextual impacts; • Accidental/deliberate damage by people or vehicles 	<ul style="list-style-type: none"> • Destruction of archaeological remains, graves and built environment features • Loss of heritage significance; 	Negative	Local	Permanent	Severe	Very likely	Non-reversible	High	High	No	Yes	<ul style="list-style-type: none"> • Protect and avoid archaeological sites wherever possible • Avoid graves and graveyards • Keep turbines >500m from homesteads 	Low	4	Medium

6. STATEMENT OF SIGNIFICANCE

Section 38(3)b of the NHRA (no. 25 of 1999) requires an assessment of the significance of heritage resources identified in surveys such as this. This task is mediated by the s. 2(vi) of the NHRA, as well as by HWC (2016a, 2016b) and SAHRA (2007) guidelines. Significance, or, more accurately, cultural significance in terms of s. 2(vi) of the NHRA should be assessed with regard to the “aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance” of a resource.

While most of the heritage resources identified in this survey are of low intrinsic heritage significance, that is IIIc in terms of the HWC grading system, or Iva, IVb or IVc in terms of the SAHRA system, several sites are worthy of higher grading. All **burialsites** – and in this case, likely burials have been included in this category – have been graded IIIa for their very high cultural significance. Further to this, although it is not likely to be impacted by this development, the shelter with **rock art** and **artefacts** at KDB045 has been graded IIIa for its likely scientific importance as a possible research site.

Little of the **built environment** of this region survives in intact form, and most of the historic structures of interest are in ruins – i.e. archaeological resources, rather than built environment ones. As such, the built environment significance of the study area is also low. Where these elements show evidence for continuing living heritage, as in the case of Wind Heuvel Re/190 (KDBc11) and Rooiheuvel 170 (KDB082) farmsteads with their *asboskookskerms* incorporated into the current farming traditions, these have been graded as Grade IIIb features. Grade IIIb grading has also been proposed for the stone-built towers at KDBc2. These are unusual features that exhibit a high degree of technological significance due to their careful, meticulous construction. This fact, together with their uncertain use and origins supports a grading that is sufficiently high to ensure their protection.

The **cultural and natural landscape** has high significance – Grade IIIa – in this area. Despite increasing development of WEFs in the wider Komsberg REDZ, the hilly nature of this environment currently excludes much of this other infrastructure

from view. This factor serves to retain the landscape as a wilderness landscape with some layering of historic and recent agricultural activities and related infrastructure. With three windfarms approved for development in early 2019, it is likely that this grading would need to be reviewed for those areas within close proximity to these facilities, and therefore experiencing high visual impacts from them.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

This assessment has shown that while there are few significant heritage resources in the study area, the presence of clusters of related structures and features within the landscape holds relatively high significance in some instances.

Of the infrastructural elements surveyed, it is recommended that **Construction Camp Alternative 2 be selected**, as there are no significant heritage resources on that site. **Construction Camp Alternative 3** will have high impacts on an informal graveyard (KDBc6) and should be considered **a no-go option**. Construction Camp Alternative 1 is at elevation – approximately 1 300m a.s.l. – and is therefore it is unlikely to pose an impact to significant heritage resources; this alternative was not supported by the Visual Assessment, however (Gibb 2018).

Of the three substation alternatives, none was found to contain any heritage resources, and the recommendations of the other specialists should be implemented.

The realignment of Access Road Alternative 1 reduces the previously high impacts on several sites and site clusters, including KDBc6, KDBc7 and KDBc8. These sites are now avoided entirely, and the advised buffers have been adopted to inform the alignment of the proposed roads. As such, **Access Road Alternative 1** is the **preferred access** route. Access Road Alternative 2 is would appear to be devoid of any significant heritage resources, and this route could be used as a viable alternative.

The study area is largely devoid of heritage resources at elevation, and entirely devoid of significant heritage resources above 1200masl (where most

infrastructure are proposed). As such, it is not anticipated that turbines located on ridges will negatively impact on heritage resources, This applies to other high lying infrastructure, such as Construction Camp Alternative 1, any of the substations, and access roads at altitudes above that height.

7.2 Recommendations

In summary, then, recommendations are as follow:

- **Substation Alternative 1** is the **recommended** substation alternative, although Substation Alternatives 2 and 3 are not considered to be a no-go option;
- **Construction Camp 2** is the **recommended** construction camp alternative, although Construction Camp 1 is likely to be an acceptable alternative. **Construction Camp 3 should be considered a no-go option;**
- The realignment of **Access Road Alternative 1** renders it an **acceptable** choice, while Access Road Alternative 2 is likely to be an acceptable alternative. The proposed alignment for Access Road Alternative 2 should be subjected to a walkdown by an archaeologist prior to commencement of development to identify any areas or sites that require protection or mitigation, should it be selected;
- **Common Access Road 1** has been realigned to the east to avoid Wind Heuvel farmstead and is considered an **acceptable** route. The road should not be widened or altered at this point and a proper fence should be erected around the Stadler graveyard (KDB081);
- The following buffers should be observed around identified heritage resources:
 - Graves: no development should be permitted within 50m of identified graves and cemeteries; existing roads within this buffer should not be altered or widened;
 - Cave site (KDB045): construction staff should not be permitted within 200m of the site;
 - Farmsteads: no turbines should be located within 500m of farmsteads;
 - Kraals, stone walling and ruins > 100 years: construction staff should not be permitted within 100m of these sites and no development should occur within 15m of these sites; and
 - Archaeological finds: no buffers are recommended for the isolated artefacts identified in this survey.

- All site crew should be informed of the heritage significance of the resources in the study area, and those sites near development infrastructure, or easily reached (Table 1) should be inspected by the ECO during the construction phase to ensure they are being respected;
- If any archaeological material or human burials are uncovered during development, then work in the immediate area should be halted. The find should be reported to the relevant heritage authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.

Given the generally low significance of heritage resources in the study area, it is not anticipated that the proposed development will have significant impacts to heritage resources, and it is therefore recommended that the project be authorised, subject to implementation of the above recommendations. These recommendations should be included in the EMP(r) and the EA)

8. REFERENCES

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9. APPENDICES

9.1 Appendix 1 HWC Response to NID: 13 September 2018

Our Ref: HM/CENTRAL KAROO/LAINGSBURG/PORION 1 OF 156 GATS RIVIER FARM, REMAINDER OF 156 GATS RIVIER FARM, REMAINDER OF 159 OLIVIERBERG, PORTION 1 OF 159 OLIVIERBERG, REMAINDER OF 161 MUIHONDRIVIER, REMAINDER OF 395 KLIPBANKS FONTEIN, PORTION 1 OF 158 AMANDELBOOM, REMAINDER OF 158 AMANDELBOOM, PORTION 2 OF 156 GATS RIVIER; AND PORTION 1 OF FARM 157 RIET FONTEIN

Case No.: 18071105AS0904E
Enquiries: Andrew September
E-mail: andrew.september@westerncape.gov.za
Tel: 021 483 9543
Date: 13 September 2018

Katie Smuts
34 Caledon Street
Stanford
7210
katie.smuts@gmail.com



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

NOTIFICATION OF INTENT TO DEVELOP: PROPOSED KUDUSBERG WIND ENERGY FARM ON PORTION 1 OF 156 GATS RIVIER FARM, REMAINDER OF 156 GATS RIVIER FARM, REMAINDER OF 159 OLIVIERBERG, PORTION 1 OF 159 OLIVIERBERG, REMAINDER OF 161 MUIHONDRIVIER, REMAINDER OF 395 KLIPBANKS FONTEIN, PORTION 1 OF 158 AMANDELBOOM, REMAINDER OF 158 AMANDELBOOM, PORTION 2 OF 156 GATS RIVIER AND PORTION 1 OF FARM 157 RIET FONTEIN, LAINGSBURG, CENTRAL KAROO, SUBMITTED IN TERMS OF SECTION 38(8) OF THE NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

CASE NUMBER: 18071105AS0904E

The matter above has reference.

Heritage Western Cape is in receipt of your application for the above matter received on 04 September 2018. This matter was discussed at the Heritage Officers meeting held on 10 September 2018.

You are hereby notified that, since there is reason to believe that the proposed development will impact on heritage resources, HWC requires that a Heritage Impact Assessment (HIA) that satisfies the provisions of section 38(3) of the NHRA be submitted. This HIA must have specific reference to the following:

- Impacts to archaeological heritage resources
- Impacts to palaeontological heritage resources
- Visual impacts to the cultural landscape

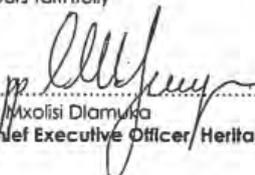
The required HIA must have an integrated set of recommendations.

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

HWC reserves the right to request additional information as required.

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

Yours faithfully

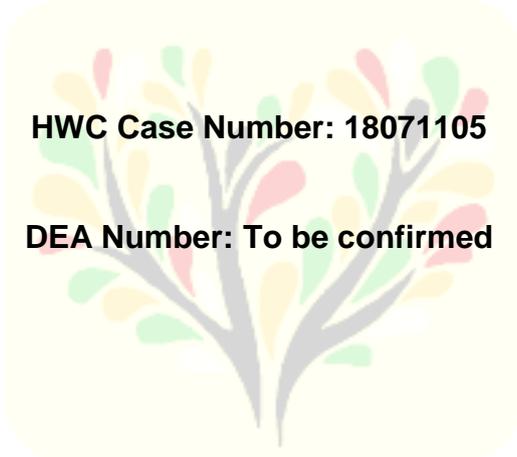

.....
Dr. Axolisi Dlamuka
Chief Executive Officer, Heritage Western Cape

www.westerncape.gov.za/ces

Street Address: 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

CULTURAL LANDSCAPES ASSESSMENT

**Basic Assessment for the Proposed Development of the
325MW Kudusberg Wind Energy Facility and associated
infrastructure, between Matjiesfontein and Sutherland in
the Western and Northern Cape Provinces: BA REPORT**



HWC Case Number: 18071105

DEA Number: To be confirmed

Report prepared for:

CSIR – Environmental Management Services

P O Box 320

Stellenbosch, 7599

South Africa

Report prepared by:

Emmylou Rabe Bailey– Hearth Heritage

Erf 4452, Valley Road

Hout Bay, 7806

South Africa

21 August 2018

EXECUTIVE SUMMARY

Site Name

The proposed development is the Kudusberg Wind Energy Facility.

Location

The proposed development is located west of the R354 that runs between Sutherland and Matjiesfontein on the Western and Northern Cape Province boundary. The project falls within the Witzenburg Municipality, Cape Winelands District within the Western Cape, and the Karoo Hooglands Municipality, Namakwa District in the Northern Cape.

The affected farm portions are -

Western Cape:

- Portion 1 of 156 Gats Rivier Farm;
- Portion 2 of 156 Gats Rivier Farm;
- Remainder of 156 Gats Rivier Farm;
- Portion 1 of 157 Riet Fontein Farm.
- Portion 1 of 158 Amandelboom Farm;
- Remainder of 158 Amandelboom Farm;
- Portion 1 of 159 Oliviers Berg Farm;
- Remainder of 159 Oliviers Berg Farm;
- Portion 2 of 157 Riet Fontein Farm;
- Remainder of 161 Muishond Rivier Farm; and
- Remainder of 395 Klipbanks Fontein Farm.

Northern Cape:

- Portion 4 of 193 Urias Gat Farm;
- Portion 6 of 193 Urias Gat Farm;
- Remainder of 193 Urias Gat Farm;
- Remainder of 194 Matjes Fontein Farm; and
- Remainder of 196 Karree Kloof Farm.

Properties affected by public access road:

- 169 Zeekoegat Farm;
- Portion 1 of 170 Roodeheuvel Farm;

- Remainder of 170 Roodeheuvel Farm;
- Remainder of 190 Wind Heuvel Farm;
- Portion 1 of 190 Wind Heuvel Farm;
- Portion 5 of 193 Urias Gat Farm;
- Remainder of 171 Vinkekuil Farm;
- Alkant Re/220 Farm; and
- Portion 1 of 174 Lange Huis Farm.

The central GPS co-ordinates for the proposed development are:

-32.8769836382S ; 20.3214413375E

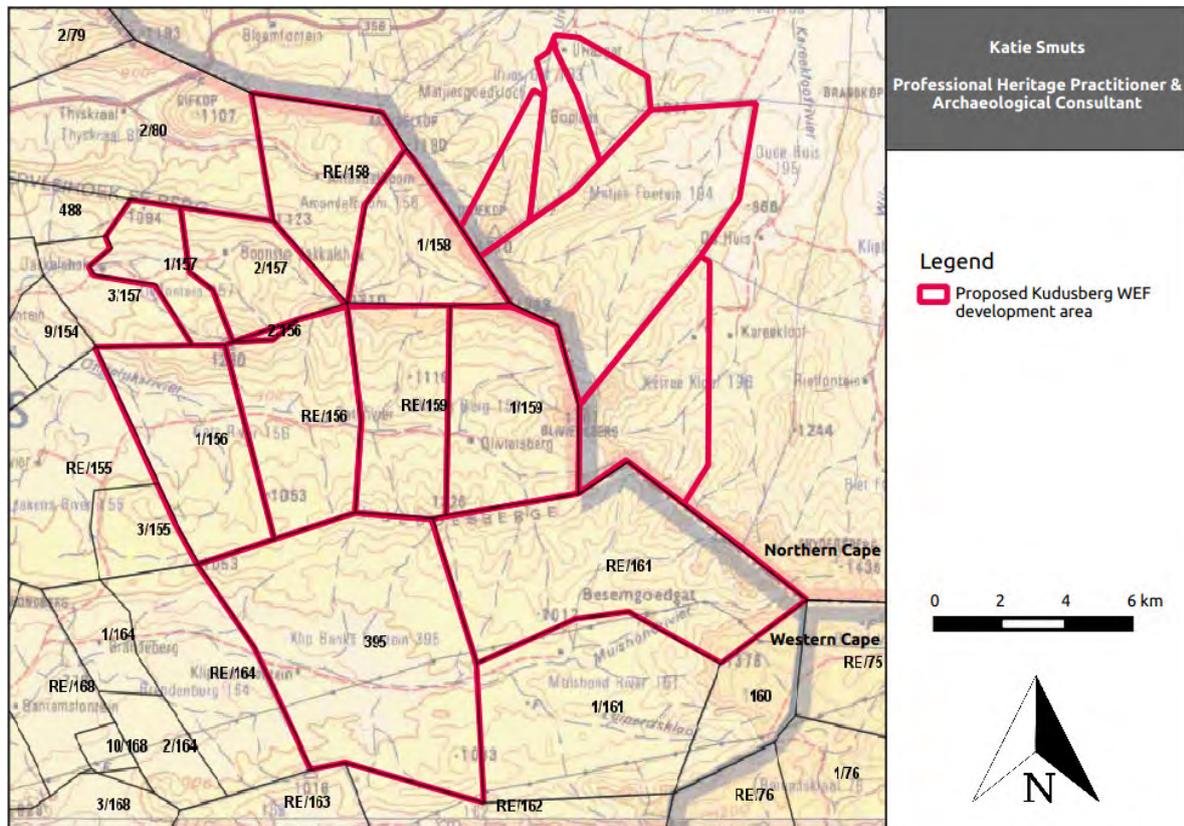


Figure 1: Proposed development area for Kudusberg WEF showing affected farm portions (farm boundaries indicated in red).

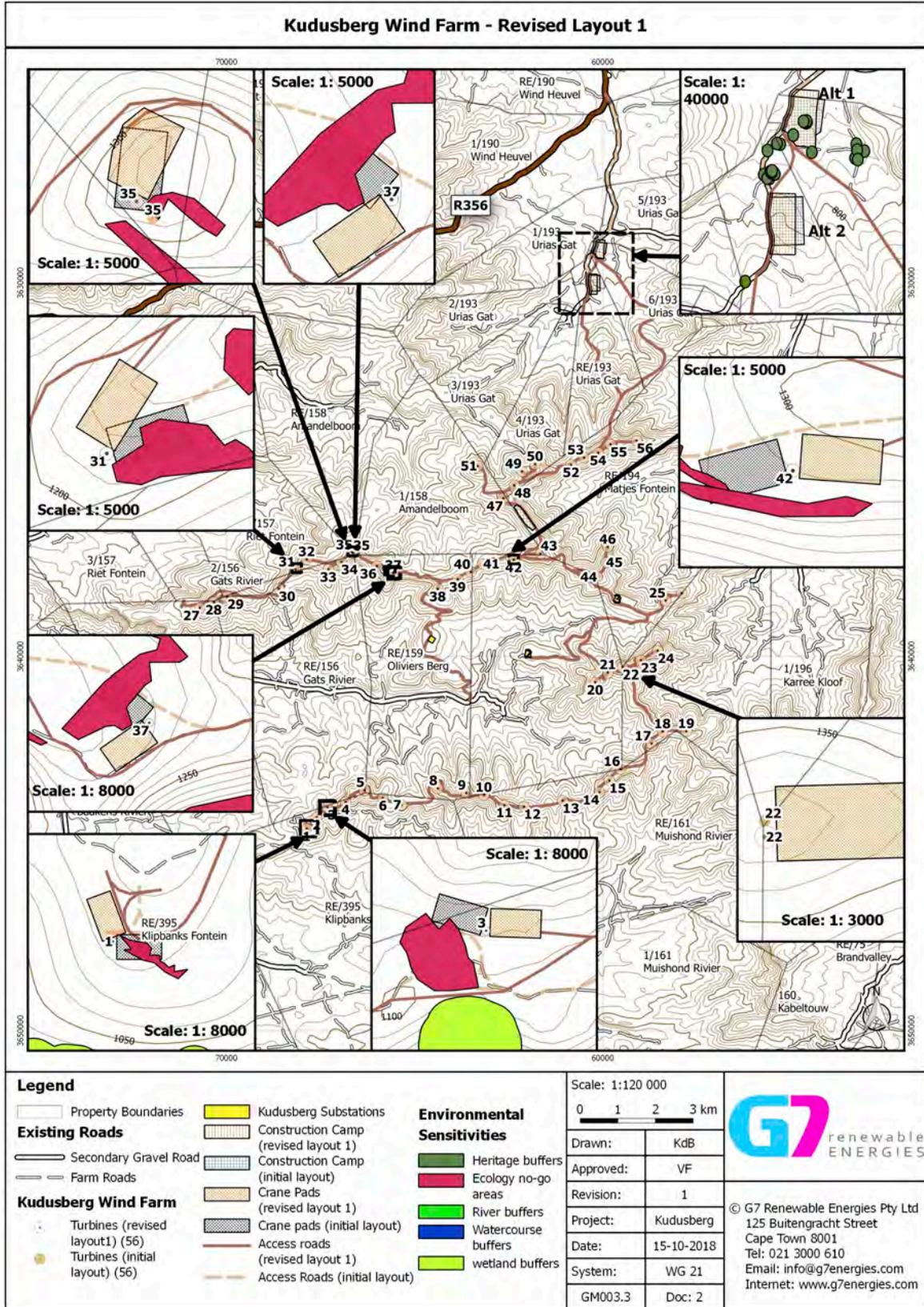


Figure 2: Revised Layout 1 of proposed Kudusberg WEF

Description of Kudusberg Cultural Landscape

The study area and its surrounding landscape is, and has always been, a landscape of movement, meeting, conflict, death and discovery. This cultural landscape is testament to the herds, first wildlife and then stock, and the people following them, moving across the landscape, meeting each other, congregating and going their separate ways, trade, support and conflict over scarce resources, innovation and survival. It is a vast and sparse landscape that pushes its inhabitants to the limits, resulting through history in repeat periods of conflict over scarce resources, such as water, wildlife and grazing. It is a testament to the resilience and skill of the people who chose to inhabit, however transiently, the landscape. Its history and character lend itself to a cultural landscape most valuably experienced by moving through it, seeing its changes in colours and textures, forms and patterns, as visual and visceral reflections of its immense biodiversity, deep history and stark reality.

The proposed Kudusberg Wind Energy Facility (WEF) is located on the semi-arid ridges and valleys south of the Roggeveld Mountains in the Great Karoo, west of the R354 and south and east of the R356. The area in which the study area is located had various names over time and discipline, with shifting borders depending on the political, social, natural climate of the time. It is in an area that has, as its constant cultural landscape characteristic, flux and change, movement and transference.

The proposed development area can be characterised by 5 main Landscape Character Areas: Ridges, Ridge Slopes, Ridge Saddles, Valleys with River Courses and Farm Roads.

The area is sparsely populated with a few farmsteads and their associated structures located on the valley floors, usually adjacent to water courses. Sites of habitation are usually layered in their historic signature, with various periods of habitation evident on the same site over time, such as farmsteads, stone kraals and more recent 20th century associated farm structures (sheds and seasonal labourers' residence) (Plates 1, 13, 20, 34). Many farm buildings in the area contain elements greater than 60 years of age and fall within the general protection of the National Heritage Resources Act (NHRA). These farmsteads are connected to each other through a series of farm tracks, one of which has historic significance, having portered people from the Cape to Sutherland and beyond. Other roads service fenced stock camps and associated small dams and their accompanying wind pumps. These roads usually travel up the river valleys, skirting the ridge slopes, over the ridge saddles and down into the adjacent valley, avoiding the high ridge peaks.

The historic R356 which runs from Karooport past the north of the Kudusberg study site and on towards Sutherland is evident in most historic maps and the subject of a well-known non-fiction book, *Die Vergete Grootpad* (Smuts and Alberts, 1988). Along this historic route, travellers experience the vastness and dramatic sense of place of the surrounding area that has long been the subject of romantic explorers' descriptions, as well as the low saddles and water courses that have been crossed by people with various plans and motives over centuries.

Anticipated Impacts on Cultural Landscape Area and Recommendations

The following Cultural Landscape Areas (CLA) of significance have been identified:

Ridges – Grade IIIA for scenic qualities.

The cumulative visual impact of turbines located on the surrounding open landscape, historic roads and scenic routes will be high. This together with the additional proposed turbines for WEF's in the surrounding area, will impact negatively on the sense of "wilderness area" and the vast open character of the landscape for which it is highly valued.

Impact and recommendations:

The impact of the ridge turbines on the adjacent CLAs is unmitigable and should be considered in the context of 4 nearby WEF developments that have already been approved. Further the limited amount of people who will experience the impact of all ridges simultaneously is low and therefore reduces the perceived impact on the CLAs.

Gatsrivier Valley CLA – Graded IIIB for historic road and CLA

The road that runs through the Gatsrivier Valley CLA is evident on historic maps and considered as a Grand Trunk Road on the Lainsberg Imperial map of 1900 – 1919. The farm road runs next to the Gatsrivier entering the narrow valley from the west (off the R356) running west to east and exiting the valley to the north at the Oliviersberg farmstead. The valley floor along the Gatsrivier has archaeological evidence of continual land use over the last few centuries. Historic farmsteads (Gatsrivier and Oliviersberg, stone kraals, packed stone residential structures and evidence of water harvesting are all evident, as are remnant remains of cultivation. According to the local farm manager (pers comm) there are historic stone buildings that are thought to be old school buildings (across from Springbok Cottage) which is also the site of the old Gatsrivier farmstead on the 1:50k topographical map (3220CD 2005 ED3 GEO). No clear pre-colonial material was identified but it cannot be ruled out due to the limited time for full survey and, considering also, the relatively nearby

rock shelter north of Oliviersberg farmstead that contained pre-colonial material. Considering the increased traffic that would have travelled along this valley in the past, relative to other surrounding roads, there is an increased potential for significant archaeological remains that form part of the story of the relationship between people and the land in this place. It should be noted that no project infrastructure are proposed in this area.

Impact and recommendations:

The high Oliviersberg and Koedoesberg ridges, although having no significant tangible heritage resources directly, run on either side of the narrow Gatsrivier Valley CLA, and as such the visual impact of these turbines on this cultural landscape will be very high and overwhelming. The cultural landscape of the valley will be surrounded by turbines on all but the western side. As with all ridges to be developed, the impact is unmitigable and should be considered in the context of 4 WEF developments in the surrounding landscape which have already been approved. Further the limited amount of people who will experience the impact of all ridges simultaneously is low and therefore reduces the perceived impact on the CLAs. No new roads or road widenings are proposed along the valley floor of Gatsrivier except for the access road up the Oliviersberg ridge slope past proposed substation alternative 1, which is already built.

Historic Cape Town – Sutherland Route CLA - Graded IIIB

The farm track that passes through the Gatsrivier valley, turning onto the Oliviersberg ridge slope at the Oliviersberg homestead, over the saddle south of Pad se Hoek, and down into the Matjiesfontein se Kloof valley to the north and beyond to Sutherland, is a noted historic road visible on the Lainsberg Imperial Map dated 1900 - 1919 as a Grand Trunk Road (Figure 5). Remnants of stone packed retaining walls of the old road are evident as one travels along certain areas of the current road (Plates 10, 11). This road connects the historic farmsteads in the area to each other and would have connected these farmsteads and communities to opportunities for trade and resources with people travelling between Cape Town and Sutherland (and beyond). The route transects and follows 4 of the 5 cultural landscape areas of the Kudusberg site, as it travels along river courses through valleys, up ridge slopes and over ridge saddles, in so doing connecting these areas in use, memory and function over space and time.

Impact and recommendations:

As recommended, the proposed revised layout does not negatively threaten any of the historic stone retaining structures and turbine placement is not located on the saddle or on

the historic road.

Where the construction of new roads or widening of current roads overlap with the historic Gatsrivier to Matjiesfontein road, especially over the ridge saddle just south of Pad se Hoek close to proposed turbines 25 and 26, it is recommended that a detailed archaeological survey is carried out to mitigate the negative impact on potential significant remains (i.e. a final walkthrough of the site prior to the finalisation of the layout before the start of construction).

Uriasgatrivier Valley CLA (Living Heritage) – Graded IIIA

This valley contains material evidence of historic transhumant land use patterns which continue to the present day. It is “a continuing landscape 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” (WHC, 2017). The northern entry point to Wind Heuvel farm and the Uriasgat Rivier valley, is off the historic Karoopoort to Sutherland road (R356) that runs through the Tankwa Karoo, past Hangklip and through historic ridge saddles. Windheuwel farm is identified on historic maps, labeled as 'Wind Heuwel Station' on Burchell's map Southern Africa (Plate 21, Figure 7). Wider and flatter than the other two identified valley CLAs, Uriasgatrivier Valley CLA has a more spread out development pattern. Many tributaries travelling downslope over more even land, resulted in more space and opportunity for habitation, cultivation and stock farming for which there is evidence over time (Plates 22 – 35). Aerial survey identified round kraals as well as rectangular kraals in different places within the valley, potentially indicating precolonial and colonial stock farming land use. Identified graves and graveyards, formal marble headstones and more informal cairns, were found during foot survey and add to strengthen the relationship between the landscape and its inhabitants over time (Plates 23, 35). Evidence of living heritage exists in the skerms and kookskerms still present and being used by the people who live and work on the landscape (Plates 22, 26). Seasonal stock labourers work on the farm during the winter months when the stock is brought down from the escarpment, as has been done for centuries. In speaking to the family members (an older lady and a younger lady with a young boy of 8 months pers. comm.) living in the temporary living quarters next to which they have built kookskerms and skerms for other uses (Plate 25), it was said that they travel with the owner of the farm, a farmer, down to Windheuwel when it gets too cold on the escarpment. It was said that the farmer has another farm on the escarpment where they stay in summer. This continued seasonal transhumant movement and the associated knowledge of building

techniques, stock farming and plant harvesting, on the same landscape over time, are all significant intangible heritage resources that constitute a landscape of living heritage.

Impact and recommendations:

Of all the CLA's identified in this survey, the Uriasgatrivier Valley CLA is identified as the most significant in terms of cultural heritage resources, tangible and intangible, as they relate to the continued relationship and use of the landscape by people over time. It is also the CLA most impacted on by the proposed Kudusberg WEF, as the proposed entry point, access roads and construction camp are located in this valley. The impact of the proposed turbines on the ridges to the south of Uriasgatrivier CLA is not negative and viewed as another layer to the development and landuse of the area as long as they are experienced 'in the background' as a non-invasive layer (Plate 28, 33). The proposed roads and construction camps will, however, impact very negatively on this CLA and its associated heritage resources (Plates 30-31). New roads and roads to be widened should stay clear of farmsteads and labourers' residences, historic structures and kraals, water harvesting structures and any grave sites (Plates 27, 28, 34). Separating the land use of the stock farming and agricultural from the WEF development may mitigate the impact of the new development on the material remains as well as the associated intangible living heritage resources on the landscape. It is recommended that all new roads be located no closer than 200 m to existing land use structures to mitigate the potential negative social and land use impact on the living heritage of the CLA. Distances to historic structures no longer in use and identified and graded by the relevant specialist (archaeologist) as appropriate for this, can be less.

The proposed location of construction camps 2 and 3 fall within the Uriasgatrivier Valley CLA. Proposed construction camp 3 is located on an area with existing and identified tangible heritage resources making the impact high. Proposed construction camp 2 is located within the same valley but is further away from tangible built heritage resources or occupied farmsteads. The impact on cultural landscape as a whole would therefore be high, but the impact on the built heritage resources would be reduced relative to proposed construction camp 3, making the overall impact medium-high. Construction camp 1 is the preferred alternative in terms of cultural landscape significance, while construction camp 2 is a feasible alternative given the implementation of appropriate buffers as achieved in the revised layout proposal.

The proposed entry road runs through Uriasgatrivier Valley CLA and runs very close to the

established farmstead at Wind Heuvel as well as the associated labourers' residence. These identified cultural landscape features are parts of the living heritage of the CLA. A separate entry road completely avoiding all live-in structures would cause additional environmental and visual impacts which would impact negatively on the landscape and not necessarily reduce the potential negative impact on the living heritage. The revised proposed access road layout locates it further from the Wind Heuvel farmstead which reduces the impact on the built heritage structures identified there. The labourers' residence is seasonal and temporary (containers) which would suggest that they could be moved if necessary to the inhabitants. Therefore, the impact of the proposed revised entry road is considered **potentially** medium to high and unmitigable. The realignment of Common Access Road 1 and Access Alternative 1 in terms of Revised Layout 1 goes some way to reduce the impact on the tangible CL elements, the impact on the CLA remains potentially high and unmitigable.

No public participation or interviews were done as part of the cultural landscape assessment to ascertain whether any meaningful intangible heritage resources are associated with any of the built structure or natural features in the Uriasgatrivier Valley. It is a seasonally occupied space and, as such, the amount of people to whom this space may be significant is limited. It is possible that the economic benefits of the proposed WEF may outweigh the heritage significance in this area. Therefore, the impact to the living heritage at Uriasgatrivier Valley CLA is **potentially** medium to high and unmitigable.

Matjiesfontein se Kloof Valley CLA - Graded IIIB

This valley contains material evidence of historic transhumant land use patterns which continue to the present day (Plates 12, 14, 15, 18, 19). It is "a continuing landscape 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" (WHC, 2017). Similar to the other valley landscape character areas, built structures cluster along river courses and around confluences, with the evolution of sites' development over time and space traceable at a few sites, such as Matjiesfontein werf (Plate 13) and the stone structure complex (Plate 16, 17) which is located close to a spring identified on the 1:50k topographic map of 2005 (3220CD 2005 ED3 GEO).

Impact and recommendations:

No development is proposed within the Matjiesfontein se Kloof Valley Cultural Landscape area for the Kudusberg WEF, and as such only the visual impact of turbines on the scenic quality and sense of place of the valley and associated material remains need be considered. The continuing agricultural land use of this valley reduces its “wilderness” sense of place characteristic, lending itself to an area where impact of turbines would be considered low in terms of sense of place and cultural landscape significance.

Conclusions and Recommendations:

The proposed Kudusberg WEF is located within the greater cultural landscape of the Karoo. Roads, fences, stone walls, water courses all run long distances criss crossing the vast landscape, punctuated by sites of settlement and land management such as stone kraals, homesteads, graveyards, dams and wind pumps. The study area, similar to the surrounding landscape, is sparsely populated with a few farmsteads and their associated structures located on the valley floors, usually adjacent to water courses. Sites of habitation are layered in their historic signature, with various periods of habitation evident on the same site over time. The landscape portrays the relationship between man and nature over time; the evidence of temporal agricultural landuse being ubiquitous in the area. These farmsteads are connected to each other through a series of farm tracks, some with historic significance. These roads usually travel up the river valleys, skirting the ridge slopes, over the ridge saddles and down into the adjacent valley, avoiding the high ridge peaks. It should be noted that this area has been identified as a REDZ and that there are at least 4 other WEFs approved for the surrounding area already, thus changes to current the cultural landscape are already in process.

As the tangible elements that embody the ephemeral, intangible and scenic qualities for which the cultural landscape is valued, and which symbolise its sense of place, the aspects of the study site which hold this significant sense of place should be sensitively managed in proposed development. **Potential threats** to the cultural landscape can be summarised as follows:

- Negative impact of proposed development on scenic qualities and sense of place of CLAs, historic routes and scenic drives.
- Negative impact of proposed development on tangible elements that embody the historic relationship of man and place in the landscape, such as built forms, land use practices, water management, historic routes, Indigenous Knowledge Systems (IKS), so that the relationship and its evolution over time can no longer be read on the

landscape by its inhabitants or visitors.

- Real or perceived negative impact of proposed development on cultural lifeways of local inhabitants of (permanent or seasonal habitation, owners or labourers), either through loss of valued cultural practices, language, sites of memory, land use practices.
- The loss of local inhabitants (of permanent or seasonal habitation, owners or labourers) themselves to the area, due to the perceived negative impact of the development on their lifeways and landscape.

To mitigate the negative impact of the proposed Kudusberg WEF on the cultural landscape the following recommendations should be followed:

- The more recent cumulative technological development on the landscape along the R354, such as the already highly visible transmission lines, developments along the N1 as well as the recent addition of the Square Kilometer Array (SKA) facility to the landscape of that route further north of this proposed WEF, reduces the individual impact of the Kudusberg WEF. It is preferable to cluster the development along routes/ areas of other development, such as the R354, where impacts are already present and in so doing reduce impact in more unchanged landscapes such as along the historic R356. The R356 is a significant historic route and should be considered for recognition as such to protect it from negative impact due to future development.
- New construction work, construction camps, substations or access roads should not impact negatively or threaten any of the historic built form, which is part of the history and land use evolution of the cultural landscape. To achieve this, a reasonable distance should be kept from all historic built features on the landscape, as has been addressed by the revised layout proposal .

Living heritage resources should be protected by, :

- If this is supported in consultation with local inhabitants (of permanent and seasonal habitation, owners **and labourers**), the negative impact of non-local inhabitants on cultural lifeways and language should be reduced by housing employees associated with the new WEF away from the CLAs.
- Impact of the proposed WEF on local inhabitants (of permanent and seasonal habitation, owners and labourers) should be monitored by the Holder of the Environmental Authorisation through a grievance mechanism described in the EMP. Such a grievance mechanism should take into account economic and social inequality and be made accessible and known to all inhabitants of the CLAs, not just the land owners. Such a grievance mechanism should be in place for the duration of

the development process through to the end of the decommissioning phase. .

Author and Date



HEARTH
HERITAGE
conversations about conservation

Emmylou Rabe Bailey

21 August 2018

SPECIALIST EXPERTISE

Emmylou Rabe Bailey holds an MA in Archaeology and Heritage Conservation from the University of Leicester, UK (Memorialisation at Prestwich Place and New York Burial Ground; 2008), specialising in the conservation and representation of archaeological resources and cultural landscapes. Her BA(Hons) was interdisciplinary research which 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) is currently on hold.

Emmylou's work has focused on the interdisciplinary research of heritage landscapes and working towards effective and sustainable management practices. She has worked as a Cultural Heritage Specialist for SAHRA, where she was responsible for the research and compilation of site nomination reports for proposed Grade 1 Cultural Landscapes. Before that she was a Heritage Conservation Officer at Heritage Western Cape and the Heritage Conservation Coordinator at the City of Cape Town. Since 2009, Emmylou has worked as an independent heritage specialist as Hearth Heritage, focusing on cultural landscapes and bio-cultural diversity conservation and management through policy, reports and community initiatives.

TERTIARY EDUCATION (chronologically from most recent)

- Rhodes University, Institute for Social and Economic Research 2011 – (on hold)
PhD candidate in Environmental Anthropology (Indigenous knowledge systems, environmental ethics and conservation)
- **South African Netherlands Programme for Alternatives in Development** (SANPAD) RCi PhD programme 2011-2012
- University of Cape Town, Department of Social Anthropology 2010
Ethnographic Research Methods and Methodology
- University of Leicester (UK) 2008
MA in Archaeology and Heritage Conservation
 - Dissertation: *“Memories and memorials: Memorialisation at Prestwich Memorial, Cape Town and New York African Burial Ground, New York”*
- University of Cape Town 2005
Architecture and Urban Conservation: Theory and Practice
- University of Cape Town, Centre for African Studies 2003
MA course in Public Culture (incl Representation of Public Culture through public exhibition)
- University of Cape Town 2002
BA (HONS) – Archaeology, African Studies, History, Environmental Science
 - Dissertation: *“Towards a Conservation Management Plan for Luyolo, Simonstown”*
- University of Cape Town 1999 – 2001
Bachelor of Arts • Majoring in: Social Anthropology; Archaeology, Environmental and Geographical Science

CONTINUING PROFESSIONAL DEVELOPMENT

- **Introduction to Permaculture 2016**
Oregon State University Online Course

WORK EXPERIENCE (for more information on any of the following projects, please contact me)

- Hearth Heritage – since 2009
Professional Heritage Consultancy
Director; professional heritage practitioner, researcher, writer, photojournalist
- University of Cape Town, Department of Social Anthropology February 2010 – July 2010
Lecturer and tutor on Conservation and Development
- Department of Cultural Affairs and Sport, Western Cape Provincial Government: Museum Services October 2009
Workshop Facilitator: Heritage conservation and management (as Hearth Heritage)
- Silimela Development Services (Pty) Ltd. August 2009
Xhariep NSDP Application Project: Survey coordinator and translator
- vidamemoria heritage consultants – January 2009 – June 2010
Specialist heritage research consultant and report writer (as Hearth Heritage)
- Blomfontein Nature Reserve (near Nieuwoudtville, Northern Cape) - November 2008 – January 2009
Cultural landscape research project (voluntary)
Research, community consultation and report writing
- Nicolas Baumann and Sarah Winter Heritage Consultants June 2003 - 2011
Heritage Specialist (research and report-writing)
- City of Cape Town: Environmental and Heritage Management January 2005 – March 2007
Heritage Conservation Coordinator
- Department of Cultural Affairs and Sport, Western Cape Provincial Government: Heritage Resource Management Services (HRMS) July 2004 – December 2004
Heritage Conservation Officer
- South African Heritage Resources Agency: Western Cape (SAHRA) January 2004 to June 2004
Cultural Heritage Specialist

RELEVANT PROJECT EXPERIENCE

- Compilation of Heritage Scoping Reports, Heritage Basic Assessment Reports and Historical Background Reports for Heritage Impact Assessments – Built environment and cultural landscapes (Western Cape).
- Compilation of National Heritage Site nomination reports for Grade 1 Cultural Landscapes.
- Completion of, and input into, Heritage Conservation Management Plans (Western Cape)

- Heritage resources surveys for inventories.
- Over 15 years experience, local and international, in **research, data analysis and report writing** as expert environmental and cultural heritage conservation consultant, specialising in cultural landscapes, IKS, memorialisation, environmental ethics, community heritage conservation projects.
- Over 15 years experience in development, **management and implementation of projects**, programmes, systems, policies and practices dealing with conservation and community management of significant and sensitive environmental and cultural landscapes and resources.
- **Facilitation of coordination and communication** between national, provincial and local heritage and environmental management authorities as well as private and government bodies in terms of conservation and management policy formulation and implementation, as well as facilitating coordination on broader issues of heritage and environmental conservation management.

AFFILIATIONS

- Vice Chair (2018 -) and accredited member (2015 -) for Association for Professional Heritage Professionals (APHP)
- Heritage Specialist for Hout Bay and Llandudno Heritage Trust (2015 -)
- ASnA and ASAPA registrations in progress for 2019.

SPECIALIST DECLARATION

I, Emmylou Rabe Bailey, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- 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 have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:



Name of Specialist: Emmylou Rabe Bailey

Date: 21 August 2018

LIST OF ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
CL	Cultural Landscape
CLA	Cultural landscape area
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
IKS	Indigenous Knowledge Systems
MW	Mega Watts
NCW	Not Conservation Worthy
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PPP	Public Participation Process
REDZ	Renewable Energy Development Zone
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SEA	Strategic Environmental Assessment
WEF	Wind Energy Facility

GLOSSARY

Definitions	
<i>Asbos</i>	Local bush which is dried and used to build <i>skerms</i>
<i>Early Stone Age</i>	Stone Age period approximately 1.5 million years ago - 250 000 years ago
<i>Kookskerm</i>	Shelter built from dried bushes to provide protection from the wind for cooking activities
<i>Kommando</i>	Boer militia units
<i>Koppie</i>	Small hill
<i>Kraal</i>	Livestock enclosure common throughout the area.
<i>Krans</i>	Cliff
<i>Later Stone Age</i>	Stone Age period approximately last 30 000 years
<i>Legplaats</i>	Stockpost
<i>Matjieshuis</i>	Mat or reed house
<i>Middle Stone Age</i>	Stone Age period approximately 250 000 - 30 000 years
<i>Skerm</i>	Circular enclosures constructed out of dried bushes
<i>Trekboer</i>	Semi-nomadic subsistence farmers who moved out of the Cape Colony
<i>Werf</i>	Yard, usually related to farming activity such as 'farmyard'

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1. SCOPE OF STUDY

Hearth Heritage was consulted to provide a Cultural Landscape Assessment Report to Katie Smuts to be included in the final HIA for the proposed development of the 325 MW Kudusberg Wind Energy Facility (WEF) located west of the R354 between Matjiesfontein and Sutherland in the Northern and Western Cape.

2 METHODOLOGY

Due to limited time allocated for the cultural landscape assessment, the following methodology was followed.

Desktop study

- Review of relevant AIA and HIA reports on the surrounding Komsberg and Moordenaars Karoo areas;
- 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 historic and current maps of the study area and surrounds;
- Review of Renewable Energy Development Zones (REDZ) Strategic Environmental Assessment (SEA) reports (DEA, 2015); and
- Review of relevant international cultural landscapes best practice.

Field Survey

- Field survey of identified sample landscape areas of the study area over 3.5 days together with archaeologists and palaeontologist (18 – 21 June 2018); and
- Walking and driving surveys of ridges, valleys, ridge sides, river courses, historic roadways and scenic drives.

Landscape Character Assessment according to landuse, habitation and natural features to assist in an understanding of the various landscape areas and potential development impact (Swanwick, 2002).

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

No public participation or interviews were done as part of the cultural landscape assessment to ascertain whether any meaningful intangible heritage resources are associated with any of the built structure or natural features. It is a seasonally occupied space and, as such, the amount of people to whom this space may be significant is limited. It is possible that the economic benefits of the proposed WEF may outweigh the heritage significance in this area. 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 Kudusberg CLA.

3 DESCRIPTION OF STUDY AREA

A cultural landscape as a cultural heritage resource is significant for representing the “combined works of nature and man” and should include in its description all significant features of the property as well as paying special attention to the interaction of people and nature (WHC, 2017). Herewith follows a study site description based on the heritage elements which could, provisionally, be recognised, as is required for this BA process.

The proposed Kudusberg WEF is located on ridges and valleys south of the Roggeveld Mountains in the Great Karoo, west of the R354 and south and east of the R356. The area straddles the border of the Karoo Hoogland Local Municipality, Namakwa District, Northern Cape and Witzenberg Local Municipality, Cape Winelands District, Western Cape. The area in which the study area is located has had various names over time and discipline, with shifting borders depending on the political, social, natural climate of the time. It is in an area that has, as its constant cultural landscape characteristic, flux and change, movement and transference.

The Kudusberg study area and surrounding landscape is a semi-arid region known as the Moordenaarskaroo, with rainfall mainly in the form of summer thunderstorms in recent years, some snow and precipitation in winter. The vegetation is characteristic of the Succulent Karoo biome. The northern portion of the site is in the Klein Roggeveld, a series of low foothills below the great escarpment, the southern portion in the main Moordenaarskaroo. The area is characterised by a series of very high and long ridges with valleys in-between. On a regional scale, viewed from the lower surrounding valleys floors and more distant plains, the high ridges are a dramatic sight and create the layers of blue and grey typical of the Karoo. When walking by foot, the ridges are windswept, dry, and un-developed, apart from dirt farm tracks and newer construction tracks laid out for WEF investigation and offer some very dramatic vistas of the surrounding landscape. Views from the northern ridges of

the study area take in the farmed valleys nearby, homesteads and stone kraals hugging the water courses that have been managed for centuries in this dry environment and extend to the rise of the great escarpment and beyond.

The area is sparsely populated with a few farmsteads and their associated structures located on the valley floors, usually adjacent to water courses. Sites of habitation are usually layered in their historic signature, with various periods of habitation evident on the same site over time, such as farmsteads, stone kraals and more recent 20th century associated farm structures (sheds and seasonal labourers residence). Many farm buildings in the area contain elements greater than 60 years of age and fall with the general protection of the NHRA.

The historic R356 which runs from Karooport pass the north of the Kudusberg study site and on towards Sutherland is evident in most historic maps and the subject of a well-known non-fiction book, *Die Vergete Grootpad* (Smuts and Alberts, 1988). Along this historic route, travellers experience the vastness and dramatic sense of place of the surrounding area that has long been the subject of romantic explorers' descriptions, as well as the low saddles and water courses that have been crossed by people with various plans and motives over centuries. There are several farm tracks which cross the study area, some historic roads which portered people from the Cape to Sutherland and beyond, others service fenced stock camps and associated small dams and their accompanying wind pumps. (Plates 4, 10, 11, 20).

*Years and years I've trecked across it,
Ridden back and fore,
Till the silence and the glamour
Ruled me to the core;
No man ever knew it better,
none could love it more.*

- Perceval Gibbon (description of the Great Karoo in Green, 1955)

The study area and its surrounding landscape is, and has always been, a landscape of movement, meeting, conflict, death and discovery. This cultural landscape is testament to the herds, first wildlife and then stock, and the people following them, moving across the landscape, meeting each other, congregating and going their separate ways, trade, support and conflict over scarce resources, innovation and survival. It is a vast and sparse landscape

that pushes its inhabitants to the limits, resulting through history in repeat periods of conflict over scarce resources, such as water, wildlife and grazing. It is a testament to the resilience and skill of the people who chose to inhabit, however transiently, the landscape. Its history and character lend itself to a cultural landscape most valuably experienced by moving through it, seeing its changes in colours and textures, forms and patterns, as visual and visceral reflections of its immense biodiversity, deep history and stark reality.

4 OTHER RELEVANT STUDIES

Research into the natural landscape characteristics has explored *inter alia* biomes, vegetation, rock formations, terrestrial ecology, all of which add to the understanding of the way in which people may have used the landscape through time. Historical, anthropological and archaeological research in the area has been scant in the past, reflected mainly in the stories of travellers' dreams and colonial romantics, and it is only in the last couple of decades that the detail and intricacies of life in this harsh and unforgiving landscape has been explored by academic researchers, notably in response to development proposals for alternative energy facilities such as this one. The stories and reflections on the landscape, should however, not be sidelined in an assessment of the cultural landscape of the area, as the memories and relationships to the land expressed in them, form an important intangible aspect of the heritage value of the study area.

Research done in the last decade on the surrounding area, for input into HIAs required for other proposed WEFs, has highlighted archaeological, palaeontological and cultural landscape resources that are significant and require further research if threatened by proposed development. It must be noted that the focus of heritage studies in the area has been on the material and tangible aspects of the landscape. Cultural landscape assessments would ideally include consideration of intangible resources and a public participation process dealing with issues regarding *inter alia* intangible heritage, oral histories, language and lifeways of the people who inhabit and use the landscape. This does, however, fall outside the ambit of this BA process and would require in depth research which is not the responsibility of the WEF developer.

4.1 Other cultural landscape research

Other cultural landscape research for HIAs in the area have noted the following possible impacts and made recommendations on cultural landscapes:

- HIA for proposed WEF south west of Sutherland (Hart and Webley, 2011) -

“Recommendations: Cultural Landscape: The proposed energy facility will not be visible from any major transport routes (N1) but there will be visibility from tertiary roads in the area and especially the R543 between Matjiesfontein and Sutherland, a scenic tourism route. This will affect the sense of wilderness of a large chunk of the region. Conservation-worthy buildings or places of celebrated heritage significance are limited. The visual impact of the turbine positions will be assessed by a separate Visual Impact Assessment.”

- HIA for proposed Roggeveld WEF (Hart and Webley, 2013) - “a number of distinct cultural landscape areas that have been identified and described previously – notable of these within the study area is the Ekkraal Valley. To the south and west of the study area is the Barendskraal-Hartjieskraal farm areas which contain collections of interesting heritage sites and buildings... Although this is a highly scenic area, it is very remote and not celebrated as a place with visual heritage qualities... In overall terms the study area represents a remote wilderness landscape, which even in prehistoric times appears to have been marginally inhabited. Colonial occupation of the area was also sparse being limited to valley bottoms. The predominant presence is that of open wilderness. While the area is highly scenic, within the project boundary there are no major tourism enterprises and is very seldom visited by persons other than those directly involved in farming.” No practical mitigation is suggested and according to the report there will be “no irreplaceable loss of resources”. The clustering of at least 6 proposed WEFs in the Sutherland area is considered to progressively and more negatively erode the cultural landscape.
- HIA for proposed Kareebosch WEF (Hart and Kendrick, 2014) - “The proposed energy facility will not be visible from any major transport routes (N1) but there will be visibility from tertiary roads in the area, especially the R354, a scenic tourism route. This will affect the sense of wilderness of a large chunk of the region. Conservation-worthy buildings or places of celebrated heritage significance are limited. The presence of existing transmission lines and further planned lines are destined to lead to further industrial clutter. The landscape grading of the study area ranges from Grade IIIA to II. The visual impact of the turbine positions has been assessed by a separate VIA with the finding that receptors in the study area including the regional roads will experience a significant impact.”
- AIA for proposed Brandvalley WEF (Booth, 2016) - “Changes to character of the landscape which negatively impacts on sense of place and aesthetic value as well as impedes and threatens untouched heritage resources... Mitigation: Effective rehabilitation of the landscape after decommissioning.”

- AIA for proposed Rietkloof WEF (Booth, 2016) - "...the general area of the Rietkloof WEF landscape is considered a remote wilderness, sparsely inhabited and seldom visited by tourists. The landscape has not yet been impacted by large developments or industry and therefore retains its aesthetic qualities... Proposed grading: IIIA - with views down the valleys from the southern ridges...The Karoo has been considered as a wilderness landscape whereby the cumulative impact will involve significant sterilisation of the aesthetic qualities of the landscape, the Karoo heritage and its character and sense of place."

4.2 The Renewable Energy Development Zones

The Final SEA for wind and solar photovoltaic energy in South Africa (DEA, 2015) does not consider intangible heritage resources, identifying only areas with material remains and previously identified natural and cultural heritage sites or protected areas, such as Karoopoort, Matjiesfontein and Touw Local Nature Reserve, as cultural landscapes in the Komsberg Focus Area 2 (REDZ 2). There has not been any investigation into the living heritage of the area or intangible resources attached to the landscape, such as language or oral history. Although recognised as "Very High to High Sensitivity Zones", "no buffer" has been suggested for the sensitivity mapping application. The proposed Kudusberg WEF is in an area that has been graded as "High" in the Combined Heritage Sensitivity Map for Focus Area 2. Mitigation recommended for the impact of development on cultural landscapes in the Komsberg area is also limited to adjusting buffers and consideration of viewshed analysis, which considers only tangible heritage resources' and visual impacts.

The only intangible landscape characteristics and resources identified for the cultural landscape in the reviewed reports have focused on “aesthetic qualities”, “wilderness qualities”, “sense of place” and “scenic value”. These concepts are, however not unpacked or considered in a way that is very useful for WEF impact assessment and focus entirely on the scenic and visual aspects of the study areas. Other examples from the reports of identified cultural landscapes are valleys with some material resources such as farmsteads or pre-colonial archaeological remains. Due to the thin material scatter that remains, researchers in material culture tend to describe the landscape as sparse or barren, attributing lower gradings of heritage significance as a result (bar scenic value).

This low ‘on the ground’ visibility does, however, not deserve a low grading, as it is as the direct result of the liminal and seasonal occupation of the area which in and of itself is part of the value and significance of the landscape; in fact, it is the tangible evidence of the historic character of the landscape, a character of movement and habitation in very challenging conditions. Further the suggestion that intangible resources can be “rehabilitated after decommissioning” is unfounded; oral history, language, indigenous knowledge systems are by nature dynamic, living resources which will be impacted upon permanently by any new introductions to the landscape. This is not to suggest that new introductions or change are always a negative impact, but the impacts of proposed development on intangible heritage should be investigated and considered at least as thoroughly as the tangible heritage resources. The tendency to deal in detail with tangible heritage resources, such as buildings, archaeology or memorials, at the expense or complete neglect of intangible heritage resources, is an echo of old heritage management strategies.

5 LANDSCAPE CHARACTER AREA DESCRIPTIONS

The proposed Kudusberg WEF area can be divided into the following landscape character areas:

5.1 Ridges

This area is characterised by a series of very high and long ridges with valleys in-between. On a regional scale, viewed from the lower surrounding valleys floors and more distant plains, the high ridges are a dramatic sight and create the layers of blue and grey typical of the Karoo. When walking by foot, the ridges are windswept, dry, and undeveloped, apart from dirt farm tracks and newer construction tracks laid out for WEF investigation, and offer some very dramatic vistas of the surrounding landscape.

The ridge running east to west north of and parallel to the Gatsrivier was surveyed on foot, as was the proposed location of Substation 1, 2 and 3 (Plate 7). Views from here and the saddle just south of Pad se Hoek, on the dirt road between Oliviersberg farmstead and Matjiesfontein farmstead, take in the farmed valleys nearby, homesteads and stone kraals hugging the water courses that have been managed for centuries in this dry environment, and extend to the rise of the great escarpment and beyond (Plate 5, 8, 9).

5.2 Ridge slopes

Ridge slopes rise with variable inclines to the ridge tops from the valleys in-between, stepped with exposed weathered rock formations in the higher reaches. Rows of non-perennial tributaries run down the slopes, perpendicular to the ridge line, cutting shallow kloofs into the side of the ridges as they weather away the rock on their way down towards the valley floors. Some of the shallow kloofs have modest waterfalls after times of rain, cascading down the stepped sections, exposing various aspects of the significant palaeontological heritage of the area. Other kloofs hold rock shelters and overhangs, some of which contain material remains of stone age and pre-colonial periods, such as stone tools and flakes, pottery and rock art. The sheep flocks and small herds of antelope roam these ridges, drinking from the stream trickles if there is water, leaving animal tracks running over the ridges through the shrubby vegetation.

A few overhangs on the slope ridges adjacent to the Oliviersberg to Matjiesfontein farm track were surveyed on foot, one of which did have some pre-colonial material remains and rock art, most likely used by the Khoekhoen groups who lived in these areas.

5.3 Ridge saddles

Here and there along the high ridges, there is a slight dip in the line, where the ridge slopes meet the ridge lines at a slightly gentler angle, flattening out just a little more to allow for easier travel. These lower lying ridge saddles often have farm tracks running up to and over them, and have, over time, been used by animals and people as the place to cross over ridge lines to the valleys, water and people on the other side.

These saddles, acting as funnels of movements across the landscape, therefore, may hold the material scatter of those who passed over them and, where identified historic tracks are still used, these are heritage elements of land use and one of the ways in which the landscape would have determined the movement and, therefore, settlement and interaction of people on the landscape. Travelling up to the saddle just south of Pad se Hoek on the

Oliviersberg to Maatjiesfontein farm track, the views down into the Matjiesfontein se Kloof River and Karreekloofrivier Valleys to the north and east are breathtaking, but also a very good point from which to see who or what is happening down in the valleys (Plate 9).

5.4 Valleys with river courses

The valleys between the high ridges can be narrow with steep ridge slopes either side, such as the Gatsrivier Valley, or with relatively wide valley floors such as the Uriasgatrivier valley. Each valley is a watershed area, fed by a network of non-perennial streams running down from the ridges over the ridge slopes. Where these tributaries meet each other or a larger stream or river, there is often the remains of historical human habitation, such as the Matjiesfontein historic farm werf (Plate 13), some still being inhabited in the present day, such as the Oliviersberg farmstead (Plate 3). Further down the valleys the water courses end up as rivers; all of them are non-perennial except where springs may be present. A few fortunate points along the rivers, mostly where springs are also present, show signs of small-scale cultivation, most likely for supplemental stock feed. The landscape is largely undeveloped with indigenous vegetation, stone packed kraal and homestead structures and complexes making up the light scattering of built environment. The three valley landscape character areas that were surveyed during field work for this assessment were the Gatsrivier valley, the Uriasgatrivier valley and the Matjiesfontein se Kloof valley.

Historically the pastoralist farmsteads would have been located as close as possible to the best sources of clean, consistent water supply which would have been the springs and seeps along the tops of the watersheds. Later, with the introduction of windpumps in the late 18th century, farmers could move further down the valleys (Regensberg, 2016). This human settlement evolution is evident at Uriasgatrivier valley cultural landscape area in the north eastern part of the study site, where abandoned older structures and round kraals are found further up the water courses (Plate 16), with the more recent farmstead and associated labourers containers located further down the valley, closer to the public road and historic track which runs through Karoopoort towards Sutherland, now known as the R356 (Plates 34, 28, 25, 22).

Each of these valleys are evidence of the continual use of the land for sheep farming and, more sparingly, cultivation, over centuries (Plate 13, 14, 18). The evolution of the landscape and the way in which its inhabitants related to it and used it, is reflected in the use and abandonment of structures, kraals and homesteads, showing the dynamic essence of the landscape and how mobility, adaptability and perseverance have been essential to survival

on this landscape.

5.5 Farm roads

The R356 runs to the west and north of the Kudusberg WEF study area, the farm tracks of the Uriasgatrivier valley ending up joining this road at the Windheuwel farmstead's gate. The historic R356 which runs from Karoopoort past the north of the Kudusberg study site and on towards Sutherland is evident in most historic maps and the subject of a well-known non-fiction book, *Die Vergete Grootpad* (Smuts and Alberts, 1988) (Figures 7, 8). Along this historic route, travellers experience the vastness and dramatic sense of place of the surrounding area that has long been the subject of romantic explorers' descriptions, as well as the low saddles and water courses that have been crossed by people with various plans and motives over centuries (Plate 20).

The farm track that passes through the Gatsrivier valley, turning onto the Oliviersberg ridge slope at the Oliviersberg homestead, over the saddle south of Pad se Hoek, and down into the Matjiesfontein se Kloof valley to the north and beyond to Sutherland, is a noted historic road visible on the Lainsberg Imperial Map dated 1900 - 1919 as a Grand Trunk Road (Figures 5, 6). Interestingly the R356 is shown as a farm road on this map, which reflects the dynamic and changing relationships that people had with this landscape over time.

Many of the roads and farm tracks in the study site as well as surrounding area are visible on maps dating back to the 18th and 19th centuries. As a landscape that maintains a dominant characteristic of movement, change, travel and mobility, the roads and paths that cross this landscape are an essential element, connecting the significant points, places of refuge and conflict, trade and subsistence, to each other in a vast and challenging space over time. Like the rivers, they were at times a lifeblood for the area, bringing supplies, news, innovation and gold, at other times bringing conflict and death. A history of this landscape can be told through its roads and pathways.

6 CULTURAL LANDSCAPE

6.1 Cultural landscape as concept

Cultural landscapes can be interpreted as complex and rich extended historical records conceptualised as organisations of space, time, meaning, and communication moulded through cultural process. The connections between landscape and identity and, hence, memory are fundamental to the understanding of landscape and human sense of place. Cultural landscapes are the interface of culture and nature, tangible and intangible heritage, and biological and cultural diversity. They represent a closely woven net of relationships, the essence of culture and people's identity. They are symbolic of the growing recognition of the fundamental links between local communities and their heritage, human kind, and its natural environment. In contemporary society, particular landscapes can be understood by taking into consideration the way in which they have been settled and modified including overall spatial organisation, settlement patterns, land uses, circulation networks, field layout, fencing, buildings, topography, vegetation, and structures. The dynamic and complex nature of cultural landscapes can be regarded as text, written and read by individuals and groups for very different purposes and with very many interpretations. The messages embedded in the landscape can be read as signs about values, beliefs, and practices from various perspectives. Most cultural landscapes are living landscapes where changes over time result in a montage effect or series of layers, each layer able to tell the human story and relationships between people and the natural processes.

6.2 Kudusberg WEF Cultural Landscape

Cultural landscapes are a significant factor in the evaluation of the impact of proposed development on cultural heritage resources, tangible (eg. Historic settlements, landscapes, technological) and intangible (eg. language, indigenous knowledge systems, oral traditions). The area investigated for the proposed Kudusberg WEF, situated in the Karoo Hoogland Local Municipality and Witzenberg Local Municipality, is considered as having a **high to very high cultural landscape heritage significance**.

6.2.1 Tangible heritage resources

The significance of the cultural heritage resources occurring on the proposed Kudusberg WEF landscape range from **medium to very high** depending on the current role they play in the cultural landscape of the greater area and the significance they hold in the memory and sense of place of the area and its history. The relationship between the place and its inhabitants has fluctuated and evolved over time, the stories and expressions of that relationship captured in the tangible landscape elements now found on the landscape.

These elements include, but are not limited to:

- Stone age material scatter;
- Rock art;
- Farmsteads and associated structures;
- Kraals of precolonial and colonial periods and their associated structures;
- Land use - sheep farming, game farming, tourism, water harvesting, crops, pastoral and hunting;
- Graveyards;
- Views and vistas allowing monitoring of large tracts of land for stock and security;
- Technological advancement - windpumps, wire fencing, power lines;
- Roads for movement across the landscape - historic and current; and
- The scattered and 'thin' material remains of habitation on the landscape, which reflects the history of movement by people across the landscape rather than extended periods of habitation and reiterates the reality of a harsh and unforgiving environment with limited resources.

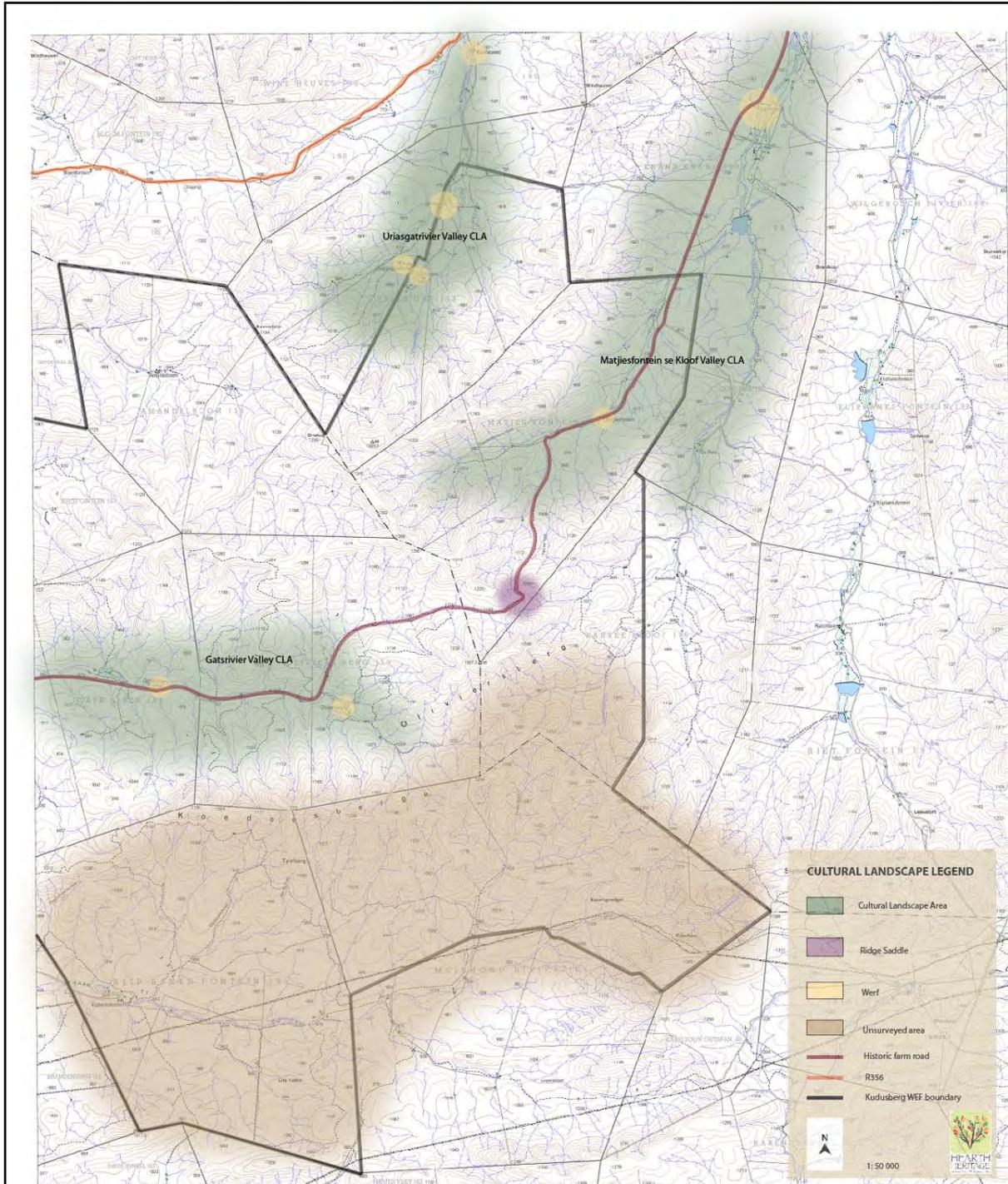


Figure 4: Cultural Landscape Area map for Kudusberg WEF generated from site inspection (June 2018) by cultural landscape specialist.

6.2.2 Identified Cultural Landscape Areas (CLA) of significance

6.2.2.1 Ridges – Grade IIIA for scenic qualities.

The cumulative visual impact of turbines located on at least 2 rows of high parallel ridges, (Oliviersberg north of Gatsrivier and Koedoesberg), on the surrounding open landscape, historic roads and scenic routes will be high. This together with the additional proposed turbines for WEF's in the surrounding area, will impact negatively on the sense of "wilderness area" and the vast open character of the landscape for which it is highly valued.

6.2.2.2 Gatsrivier Valley CLA – Graded IIIB for historic road and CLA

The road that runs through the Gatsrivier Valley CLA is evident on historic maps and considered as a Grand Trunk Road on the Lainsberg Imperial map of 1900 – 1919. The farm road runs next to the Gatsrivier entering the narrow valley from the west (off the R356) running west to east and exiting the valley to the north at the Oliviersberg farmstead. The valley floor along the Gatsrivier has archaeological evidence of continual land use over the last few centuries. Historic farmsteads (Gatsrivier and Oliviersberg), stone kraals, packed stone residential structures and evidence of water harvesting are all evident, as are remnant remains of cultivation. According to the local farm manager there are historic stone buildings that are thought to be old school buildings (across from Springbok Cottage) which is also the site of the old Gatsrivier farmstead. No clear pre-colonial material was identified but it cannot be ruled out due to the limited time for full survey and, considering also, the relatively nearby rock shelter north of Oliviersberg farmstead that contained pre-colonial material. Considering the increased traffic that would have travelled along this valley in the past, relative to other surrounding roads, there is an increased potential for significant archaeological remains that form part of the story of the relationship between people and the land in this place.

6.2.2.3 Historic Cape Town – Sutherland Route CLA - Graded IIIB

The farm track that passes through the Gatsrivier valley, turning north onto the Oliviersberg ridge slope at the Oliviersberg homestead, over the saddle south of Pad se Hoek, and down into the Matjiesfontein se Kloof valley to the north and beyond to Sutherland, is a noted historic road visible on the Lainsberg Imperial Map dated 1900 - 1919 as a Grand Trunk Road. Remnants of stone packed retaining walls of the old road are evident as one travels along certain areas of the current road. This road connects the historic farmsteads in the area to each other and would have connected these farmsteads and communities to opportunities for trade and resources with people travelling between Cape Town and Sutherland (and beyond). The route transects and follows 4 of the 5 cultural landscape areas of the

Kudusberg site, as it travels along river courses through valleys, up ridge slopes and over ridge saddles, in so doing connecting these areas in use, memory and function over space and time.

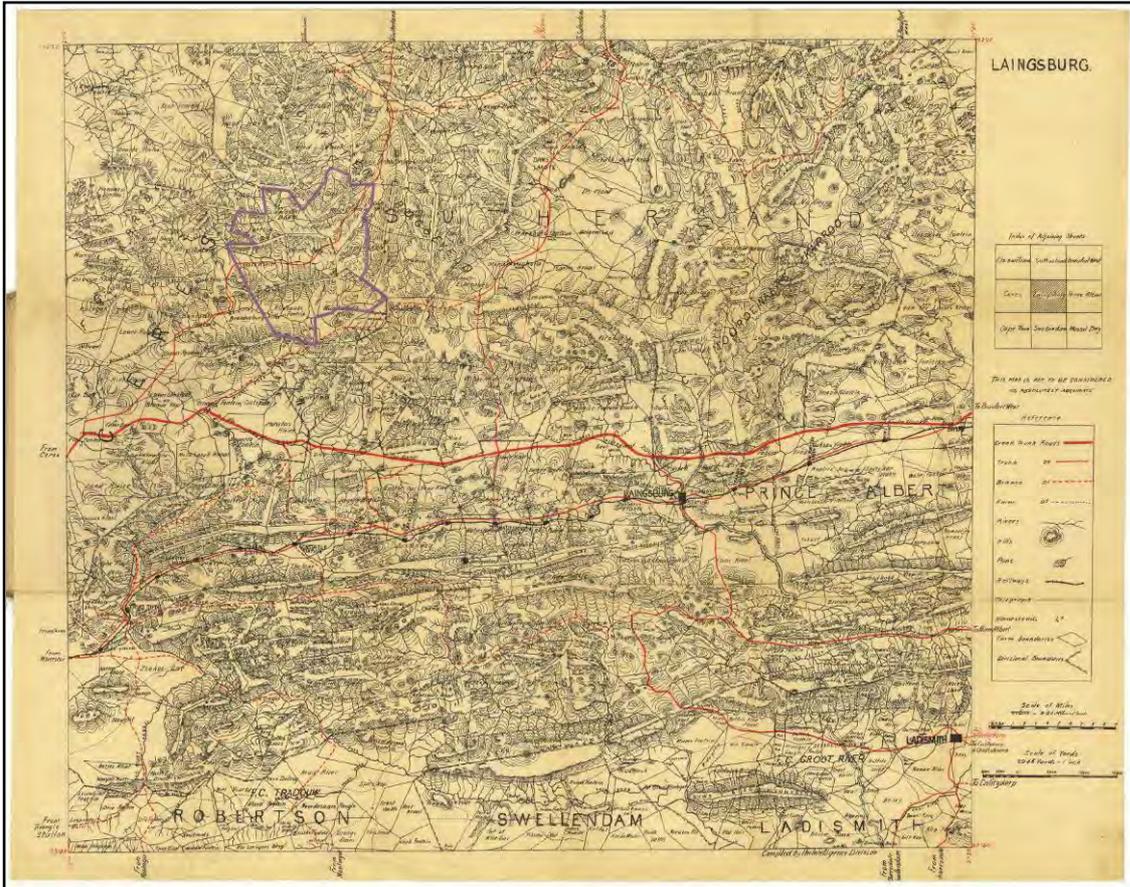


Figure 5: 159 Lainsburg Imperial 1900 – 1919 map showing Kudusberg WEF in purple.

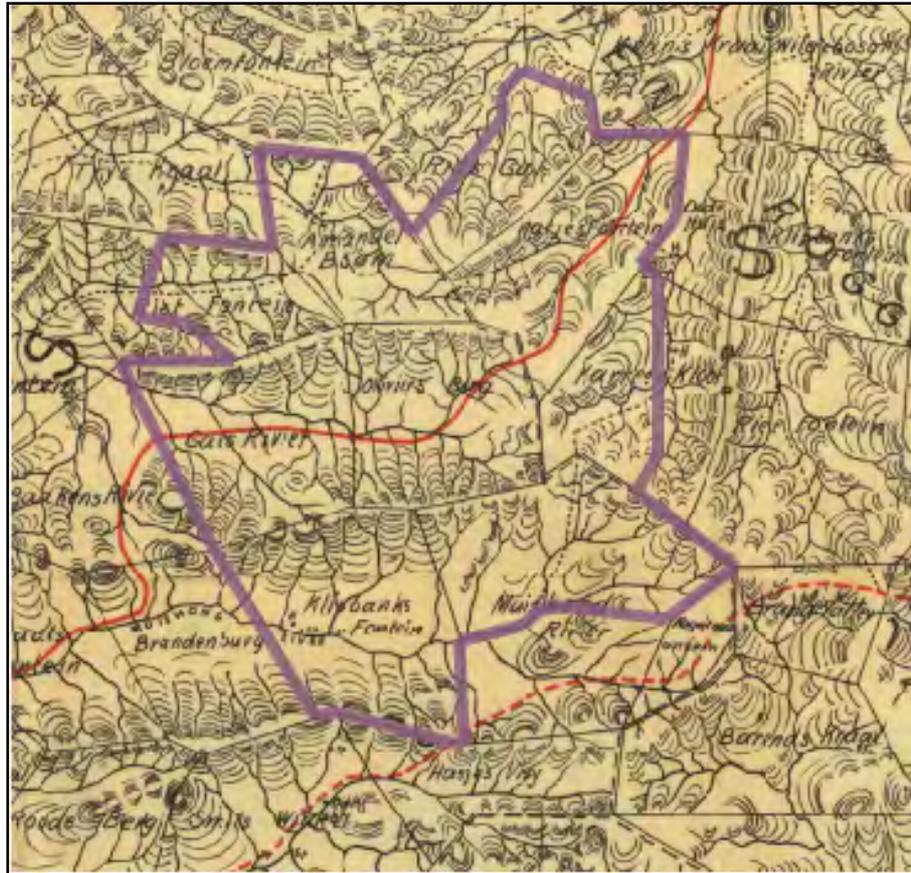


Figure 6: Close up of 159 Lainsburg Imperial 1900 – 1919 map showing Kudusberg WEF in purple and historic route through the landscape in red

6.2.2.4 Uriasgatrivier Valley CLA (Living Heritage) – Graded IIIA

This valley contains material evidence of historic transhumant land use patterns which continue to the present day. It is “a continuing landscape 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” (WHC, 2017). The northern entry point to Windheuvel farm and the Uriasgatrivier valley, is off the historic Karooport to Sutherland road (R356) that runs through the Tankwa Karoo, past Hangklip and through historic ridge saddles. Windheuvel farm is identified on historic maps, labeled as ‘Wind Heuvel Station’ on Burchell’s map Southern Africa (Figure 7). Wider and flatter than the other two identified valley CLAs, Uriasgatrivier Valley CL has a more spread out development pattern. Many tributaries travelling downslope over more even land, resulted in more space and opportunity for habitation, cultivation and stock farming for which there is evidence over time. Aerial survey identified round kraals as well as rectangular kraals in different places within the valley, potentially indicating precolonial and colonial stock farming land use. Identified graves and graveyards, formal marble headstones and more informal cairns, were found

during foot survey and add to strengthen the relationship between the landscape and its inhabitants over time. Evidence of living heritage exists in the skerms and kookskerms still present and being used by the people who live and work on the landscape. Seasonal stock labourers work on the farm during the winter months when the stock is brought down from the escarpment, as has been done for centuries. In speaking to the family members (an older lady, a younger lady and a young boy of 8 months) living in the temporary living quarters next to which they have built kookskerms and skerms for other uses, it was said that they travel with the owner of the farm, a farmer, down to Windheuwel when it gets too cold on the escarpment. It was said that the farmer has another farm on the escarpment where they stay in summer. This continued seasonal transhumant movement and the associated knowledge of building techniques, stock farming and plant harvesting, on the same landscape over time, are all significant intangible heritage resources that constitute a landscape of living heritage.

6.2.2.5 Matjiesfontein se Kloof Valley CLA - Graded IIIB

This valley contains material evidence of historic transhumant land use patterns which continue to the present day. It is “a continuing landscape 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” (WHC, 2017). Similar to the other valley landscape character areas, built structures cluster along river courses and around confluences, with the evolution of sites’ development over time and space traceable at a few sites, such as Matjiesfontein werf.

6.2.3 Intangible heritage resources

Intangible heritage resources that have been identified and described for the Kudusberg study site and surrounding landscape are:

- Geographical place names

The study area stretches across different landscape areas, which have been variously named and classified over time and discipline, in different languages by the many travellers that have moved across the landscape. The names given to places on the landscape are very descriptive and tell a story about the way people who named it felt about it, thought about it and how they navigated their way around it. The names often refer to natural features of the area or places in relation to one another, such as Kranskloof and Boplaas, perhaps by which people recognised their place on the vast open landscape. Also evident in

many names are aspects of the landscape which held value to its inhabitants, such as names of wildlife which may have been hunted or avoided, such as Koedoesberg and Muishondrivier, and vegetation which may have been used, such as Matjiesgoedhoek. Some names describe the climate and weather, some the rock formations, some the herds of wildlife for which the area was valued, others, like Moordenaarskaroo, allude to the atrocities that have occurred over time on the landscape, a result of the struggle for and conflict over scarce resources.

These names, in and of themselves, hold an intangible heritage value, in their ability to describe the ways in which the people, who moved through this space, used this space and lived on it, have interacted with it, navigated it and what the various landscape elements were valued for. They are intangible heritage resources that have been incised on the land and hold the memories, nature of relationships and sense of place of the cultural landscape over time.

- Transhumant land use patterns and characteristics - Living heritage

The Karoo and surrounds, which include the Kudusberg study area, was used for centuries by local indigenous pastoralists and hunter gatherer groups, their movements over this landscape organised to respond to the seasonal variations in grazing and water resources, for wild and domesticated animals; movement or mobility being essential for survival (Penn, 2005). Even after the initial movement of *trekboers* into the area, “pastoral production was the major occupation of all the societies of the frontier zone with the exception of the hunter gatherer San, and it was principally through the dynamics of pastoralism that they transformed each others’ cultures while exploiting, serving or co-operating with each other” (Ibid: 15).

Although stark, vast and largely devoid of large settlements or congregated groups of people, to consider this area as only a “wilderness area” is an eerily colonial echo of the way in which the early colonists moved over and then into South African landscape, interpreting the openness and thin scattering of pastoral and hunter-gatherer groups as a sign of free and available land and resources. These areas of the Karoo that are still open and undeveloped, still used as seasonal grazing by transhumant farmers, are rare examples of South African history and heritage which are fast being lost to development and industrialisation. These aspects of our history are part of the story of how and why South Africa is the people and country it is today, and this landscape offers an opportunity to recognise and celebrate the work, lives and lifeways of those people who inhabited these

ridges and plains and the ways in which they related to their landscape and each other under difficult and trying circumstances, throughout history into the present day.

"I am like an eagle," an old farmer told me. "I look all round and see no one, not even the smoke of a neighbour's chimney. That is why I love the Great Karoo." - Green, 1955

- Indigenous Knowledge Systems

"It was, initially, far more important for the *trekboers* to work together with the local Khoekhoen pastoralists whose knowledge of local conditions and skills in maintaining pastoral production in an arid environment was quite different to that of the south-western Cape" (Penn, 2005: 92). Other Indigenous Knowledge Systems (IKS) regarding the uses of the natural resources of the area could also be present, considering especially the location of the Kudusberg site in an area of exceptionally rich botanical diversity (Clark et al. 2011: 116) which has been described as "rivalling those of rainforests" (South African National Biodiversity Institute 2006).

The IKS of the Komsberg area, including the Kudusberg landscape, could include valuable knowledge about, for instance, sustainable and low impact agricultural practices in semi-arid climates. IKS relating to the biocultural diversity of the various landscape areas may hold knowledge as of yet unrecorded or untapped and may be of various significances (WHC, 2017: 81). Without further research into these possibilities, a valuable and true assessment of the impact of the development on the cultural landscape cannot be made.

- Frontier Zone History - 'Khoisan' Heritage

This area is relatively well known for being occupied by Khoekhoen and /Xam people before and during the early periods of colonial influence and then settlement. The memory and material culture of these pre-colonial people are still evident on the landscape through the IKS that is potentially still held in the stories and lifeways of current inhabitants, through the stone kraals and stone implements they used, through the seasonal land use patterns that persist to this day, through the art they left on the landscape.

The Great Karoo, including the Klein Roggeveld and Moordenaarskaroo in which the Kudusberg Study area is located, offers the potential to recognise the historic dispossession of indigenous groups of people of their lifeways, land use practices, language and culture. The fact that the precolonial stone kraals were abandoned by their initial builders and then either left to delapidate or reused by first *trekboers* and later colonial stock farmers, does not

reduce their significance, but is rather a testament to the reality of conflict, atrocity and dispossession that occurred on this landscape.

As suggested by Penn (2005: 14), “It is no exaggeration to state that the history of conquest, extermination or incorporation of the Khoisan societies of the northern frontier zone in the 18th century has not been told. Nor has the strength, scale or diversity of Khoisan resistance been adequately described” or recognised. This history, and the memory thereof, embodied by Komsberg cultural landscape and surrounding Karoo area, is significant in the identity shaping of many present-day South Africans. Recognising the cultural landscape as a significant heritage resource has the potential to encourage the recognition of a place and time in South African history that has shaped our people and country in a way that is often overlooked or blatantly ignored.

- Aesthetic and scenic qualities
- Vast landscapes with far horizons and unbroken views
- Wilderness qualities
- Memory and attachment to the landscape characteristics by some South African communities

Detailed research on the intangible heritage resources of the study area has not been done as this falls outside the requirements of the BA process. Notwithstanding these risks and limitations, the aforementioned potential intangible resources, identified through the review of other reports and historical literature on the area, are likely to exist in the landscape, and should be explored within a different research context to determine their full significance in terms of the NHRA. These potential intangible heritage resources are elements of the cultural landscape and cannot be confined, without further investigation, to specific sites or places.

7 EVALUATION CRITERIA

The identification and evaluation of cultural landscape for this basic assessment report has been done according to the NHRA (Act 25 of 1999), the DEA&DP Guidelines, HWC NID application process and the WHC Operational Guidelines (2017). The details of the NHRA are included here to emphasise the detail and definitions on what qualifies as cultural landscapes, intangible heritage and living heritage.

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

Heritage resources are protected under the National Heritage Resources Act (NHRA, Act 25 of 1999). 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. The identification of resources was undertaken in accordance with Section 3(2) of the act which specifies the following types of heritage resources included in the national estate:

- a) places, buildings, structures and equipment of cultural significance;
- b) places to which oral traditions are attached or which are associated with living heritage;
- c) historical settlements and townscapes;
- d) landscapes and natural features of cultural significance;
- e) geological sites of scientific or cultural importance;
- f) archaeological and palaeontological sites;
- g) graves and burial grounds, including:
 - i. ancestral graves;
 - ii. royal graves and graves of traditional leaders;
 - iii. graves of victims of conflict;
 - iv. graves of individuals designated by the Minister by notice in the Government Gazette;
 - v. historical graves and cemeteries; and
 - vi. other human remains which are not covered in terms of the Human Tissue Act (No. 65 of 1983);
- h) sites of significance relating to the history of slavery in South Africa; and
- i) movable objects (these resources are excluded from this study as by definition these objects are not spatially fixed).

Scenic Routes

Although not directly stipulated in the NHRA, “scenic routes” are considered as a category of heritage resource in the 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. This is also given recognition in the NID application used by HWC.

7.2 World Heritage Convention

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

- Cultural properties and 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 on the basis of their representivity 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 virtue of the powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent.

According to the above UNESCO Guidelines, Cultural Landscapes are considered a separate category from Historic Towns and Heritage Routes.

7.3 Grading

It should be noted that without proper research and investigation of the intangible and living heritage found at the Kudusberg study site or surrounding Komsberg REDZ, 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.

Significant to this project, which straddles the Western and Northern Cape, is the different grading systems implemented by HWC (2012) and SAHRA (2007).

In order to regulate grading in the Western Cape, HWC has proposed a model that divides sites of local significance, that is Grade III sites, into:

- Grades IIIa – high local significance;
- Grade IIIb – medium local significance;
- Grade IIIc – low local significance; and
- Not Conservation Worthy (NCW) – little to no significance and not requiring mitigation.

In the absence of a fully competent PHRA in the Northern Cape, SAHRA's grading system should be employed there; SAHRA uses the term field rating to describe gradings assigned as part of Section 38 processes, while grading is reserved for official significance as designated by authorities. This system grades locally important sites as follows:

- Field Rating/Grade IIIa - high local significance that should be preserved in their entirety;
- Field Rating/Grade IIIb – medium local significance that can be mitigated and preserved in part;
- Field Rating/Grade IIIc sites are recorded as:
 - Field Rating/Grade IVa – high or medium significance requiring mitigation;
 - Field Rating/Grade IVb – medium significance requiring recording; and
 - Field Rating/Grade IVc – low significance not requiring mitigation

8 ANTICIPATED IMPACTS ON CULTURAL LANDSCAPE

8.1 Anticipated impacts on identified Cultural Landscape Areas

Ridges – Grade IIIA for scenic qualities

Impact and recommendations:

The impact of the ridge turbines on the adjacent CLAs is unmitigable and should be considered in the context of 4 nearby WEF developments that have already been approved. Further the limited amount of people who will experience the impact of all ridges simultaneously is low and therefore reduces the perceived impact on the CLAs.

Gatsrivier Valley CLA – Graded IIIB for historic road and CLA

Impact and recommendations:

The high Oliviersberg and Koedoesberg ridges, although having no significant tangible heritage resources directly, run on either side of the narrow Gatsrivier Valley CLA, and as such the visual impact of these turbines on this cultural landscape will be very high and overwhelming. The cultural landscape of the valley will literally be surrounded by turbines on all but the western side. As with all ridges to be developed, the impact is unmitigable and should be considered in the context of 4 WEF developments in the surrounding landscape which have already been approved. Further the limited amount of people who will experience the impact of all ridges simultaneously is low and therefore reduces the perceived impact on the CLAs. **No new roads or road widenings are proposed along the valley floor of Gatsrivier except for the access road up the Oliviersberg ridge slope past proposed substation alternative 1, which is already built.** New construction work should not impact negatively on any of the historic built form, which is part of the history and land use evolution of the cultural landscape.

Historic Cape Town – Sutherland Route CLA - Graded IIIB

Impact and recommendations:

As recommended, the proposed revised layout does not negatively threaten any of the historic stone retaining structures and turbine placement is not located on the saddle or on the historic road.

Where the construction of new roads or widening of current roads overlap with the historic Gatsrivier to Matjiesfontein road, especially over the ridge saddle just south of Pad se Hoek close to proposed turbines 25 and 26, it is recommended that a detailed archaeological survey is carried out to mitigate the negative impact on potential significant remains (i.e. a final walkthrough of the site prior to the finalisation of the layout before the start of

construction).

Uriasgatrivier Valley CLA (Living Heritage) – Graded IIIA

Impact and recommendations:

Of all the CLA's identified in this survey, the Uriasgatrivier Valley CLA is identified as the most significant in terms of cultural heritage resources, tangible and intangible, as they relate to the continued relationship and use of the landscape by people over time. It is also the CLA most impacted on by the proposed Kudusberg WEF, as the entry point, access roads and construction camps are proposed for this valley. **The impact of the proposed turbines on the ridges to the south of Uriasgatrivier CLA are not negative and can be seen as another layer to the development and landuse of the area.** The proposed roads and construction camps will, however, impact very negatively on this CLA and its associated heritage resources. New roads and roads to be widened should stay clear of farmsteads and labourers residences, historic structures and kraals, water harvesting structures and any grave sites. Separating the land use of the stock farming and agricultural from the WEF development may mitigate the impact of the new development on the material remains as well as the associated intangible and living heritage resources on the landscape. It is recommended that all new roads be located no closer than 200 m to existing land use structures that are in use so as to mitigate the potential negative social and land use impact on the living heritage of the CLA. Distances to historic structures no longer in use and identified and graded by the relevant specialist (archaeologist) as appropriate for this, can be less.

The proposed location of construction camps 2 and 3 fall within the Uriasgatrivier Valley CLA. Proposed construction camp 3 is located on an area with existing and identified tangible heritage resources making the impact high. Proposed construction camp 2 is located within the same valley but is further away from tangible built heritage resources or occupied farmsteads. The impact on cultural landscape as a whole would therefore be high, but the impact on the built heritage resources would be reduced relative to proposed construction camp 3. Construction camp 1 is the preferred alternative in terms of cultural landscape significance, while construction camp 2 is a feasible alternative given the implementation of appropriate buffers as achieved in the revised layout proposal.

The proposed entry road runs through Uriasgatrivier Valley CLA and runs very close to the established farmstead at Wind Heuvel as well as the associated labourers' residence. These identified cultural landscape features are parts of the living heritage of the CLA. A separate

entry road completely avoiding all live-in structures would cause additional environmental and visual impacts which would impact negatively on the landscape and not necessarily reduce the potential negative impact on the living heritage. The revised proposed access road layout locates it further from the Wind Heuvel farmstead which reduces the impact on the built heritage structures identified there. The labourers' residence is seasonal and temporary (containers) which would suggest that they could be moved if necessary to the inhabitants. Therefore the impact of the proposed revised entry road is considered **potentially** medium to high and unmitigable. The realignment of Common Access Road 1 and Access Alternative 1 in terms of Revised Layout 1 goes some way to reduce the impact on the tangible CL elements, the impact on the CLA remains potentially high and unmitigable.

No public participation or interviews were done as part of the cultural landscape assessment to ascertain whether any meaningful intangible heritage resources are associated with any of the built structure or natural features in the Uriasgatrivier Valley. It is a seasonally occupied space and, as such, the amount of people to whom this space may be significant is limited. It is possible that the economic benefits of the proposed WEF may outweigh the heritage significance in this area. Therefore, the impact to the living heritage at Uriasgatrivier Valley CLA is **potentially** medium to high and unmitigable.

Matjiesfontein se Kloof Valley CLA - Graded IIIB

Impact and recommendations:

No development is proposed within the Matjiesfontein se Kloof Valley Cultural Landscape area for the Kudusberg WEF, and as such only the visual impact of turbines on the scenic quality and sense of place of the valley and associated material remains need be considered. The continuing agricultural land use of this valley reduces its "wilderness" sense of place characteristic, lending itself to an area where visual impact of turbines would be considered low in terms of cultural landscape significance.

8.2 Lack of proper research of intangible heritage resources and cultural landscape significance.

The value of a landscape for its people is by nature dynamic and changeable over time. It is this relationship between people and their landscape, and the way in which they mould each other over time, that creates the area called a cultural landscape. This is not to suggest that new introductions or change are always a negative impact. The needs for renewable energy and economic upliftment are real, but the impacts of proposed development on intangible

heritage should be investigated and considered at least as thoroughly as the tangible heritage resources, to make sure that the value attributed to the cultural landscape and the heritage elements it contains, both tangible and intangible, are not weathered away, irrevocably and negatively altered or lost. The tendency to deal in detail with tangible heritage resources, such as buildings, archaeology or memorials, at the expense or complete neglect of intangible heritage resources, is an echo of old heritage management strategies.

Most elements of living heritage are under threat of extinction due to neglect, modernisation, urbanisation, globalisation, and environmental degradation. Living heritage is at the centre of people's culture and identity, it is important to provide space for its continued existence. Living heritage must not be seen as merely safeguarding the past, but it must be seen as safeguarding the logic of continuity of what all communities or social groups regard as their valuable heritage, shared or exclusive.

The dynamic relationship between people and their landscape, which fluctuates over time, necessitates sustainable and integrated heritage management policy and planning. This essential interplay between people and their environment can be disrupted or affected by, for instance, economic change which can be caused by urban expansion, development or tourism and beyond human intervention, natural disasters and climate change. Cultural landscape management and conservation processes bring people together in caring for their collective identity and heritage and provide a shared local vision within a global context. Local communities need, therefore, to be involved in every aspect of identification, planning and management of the areas as they are the most effective guardians of landscape heritage.

8.3 Demographical change degrading IKS and living heritage, and consequentially cultural landscape

The Socio-economic assessment of the Final SEA Report (DEA, 2015, Part 3, Section 15, Pg 2) identified "demographical changes" as a potential negative impact of the proposed WEF's in the Komsberg REDZ, within which the Kudusberg WEF is located, stating that "An influx of migrant workers and job seekers can change the demographics of the area and trigger and increase in social pathologies such as health issues, crime, prostitution, xenophobia and others". Such demographical changes could have direct and indirect negative impacts on the intangible heritage resources of the Kudusberg landscape. An influx of 'outsiders' into a relatively closed and isolated community could impact negatively on the

potentially valuable IKS, language and lifeways of the local population. The IKS here has not been considered at all in previous HIAs so it is not possible to make an informed decision, but history suggests that the IKS of less dominant or influential groups are often under most threat in times of contact, resulting in loss of *inter alia* IKS, language, culture, social capital and biocultural diversity.

8.4 Cumulative visual impact of multiple WEFs and power line developments on the Komsbergs cultural landscape

There are currently multiple applications being made for the development of WEFs in the area surrounding the Kudusberg proposed WEF development site. The cumulative visual impact on the area, which has a high significance in terms of cultural landscapes' scenic value and the vast and open sense of place, will be negatively impacted upon by the potentially highly visible turbine and construction roads along the ridge slopes and ridges.

Contrary to most other cultural landscape reports, it is proposed that the significance of the scenic value of the R354 and N1, be weighed up against the significance of the intangible and living heritage resources and the cultural landscape. Further, an investigation on the heritage significance of remaining historic roads and tracks is required to determine the relative impact on them as scenic drives of historic importance. The main Matjiesfontein Station to Sutherland road (R354) is considered a main tourist thoroughfare with scenic value, however it is the proposal of this report that the historic route running from Karoopoort to Sutherland, via Windheuwel (R356), may hold more heritage significance. Various historic maps (Figures 5-8) show historic routes with close alignment to the current R356, travelling close to or through the Kudusberg WEF. Compared to the relatively more current R354, the wide dirt road R356 has a much more layered history and a longer relationship to the surrounding cultural landscape. It should be considered that the impact of visible wind turbines on the R354 will have less of a negative impact on the combined heritage values of the cultural landscape, than the older R356. In addition, the inclusion of more recent technological development on the landscape may, in fact, suit the R354 better as it adds to the already highly visible transmission lines, developments along the N1 as well as the recent addition of the SKA facility to the landscape of that route.



Figure 7: Portion of J W Burchell’s 1782? – 1863 “Map of Extratropical Part of Southern Africa” showing Kudusberg WEF and surrounding area and Burchell’s route in red – note it runs through ‘Wind Heuwel Station’, which is located in the Uriasgatrivier CLA.



Figure 8: Cape Colony 1901 map showing district borders in black and roads in red. The approximate location of the Kudusberg WEF is shown in purple. The historic route, also highlighted in purple, aligns closely with the current R356, and runs close (if not through the Kudusberg WEF area). Material remains of this route may exist on unsurveyed portions of the Kudusberg WEF.

9 RISKS AND LIMITATIONS

- Restricted access on farm roads extended travel times between landscape areas further limiting the amount of useful study area that could be surveyed.
- Limited previous research completed on the area in terms of cultural landscape assessment.
- No time for stakeholder participation for cultural landscapes assessment to determine intangible heritage resources for the study area.

10 CONCLUSIONS AND RECOMMENDATIONS

The proposed Kudusberg WEF is located within the greater cultural landscape of the Karoo. Roads, fences, stone walls, water courses all run long distances criss crossing the vast landscape, punctuated by sites of settlement and land management such as stone kraals, homesteads, graveyards, dams and wind pumps. The study area, similar to the surrounding landscape, is sparsely populated with a few farmsteads and their associated structures located on the valley floors, usually adjacent to water courses. Sites of habitation are layered in their historic signature, with various periods of habitation evident on the same site over time. The landscape portrays the relationship between man and nature over time; the evidence of temporal agricultural landuse being ubiquitous in the area. These farmsteads are connected to each other through a series of farm tracks, some with historic significance. These roads usually travel up the river valleys, skirting the ridge slopes, over the ridge saddles and down into the adjacent valley, avoiding the high ridge peaks.

As the tangible elements that embody the ephemeral, intangible and scenic qualities for which the cultural landscape is valued, and which symbolise its sense of place, the aspects of the study site which hold this significant sense of place should be sensitively managed in proposed development.

Potential threats to the cultural landscape can be summarised as follows:

- Negative impact of proposed development on scenic qualities and sense of place of CLAs, historic routes and scenic drives.
- Negative impact of proposed development on tangible elements that embody the historic relationship of man and place in the landscape, such as built forms, land use practices, water management, historic routes, IKS, so that the relationship and its evolution over time can no longer be read on the landscape by its inhabitants or visitors.

- Real or perceived negative impact of proposed development on cultural lifeways of local inhabitants of (permanent or seasonal habitation, owners or labourers), either through loss of valued cultural practices, language, sites of memory, land use practices.
- The loss of local inhabitants (of permanent or seasonal habitation, owners or labourers) themselves to the area, due to the perceived negative impact of the development on their lifeways and landscape.

In order to mitigate the negative impact of the proposed Kudusberg WEF on the cultural landscape the following recommendations should be followed:

- The more recent cumulative technological development on the landscape along the R354, such as the already highly visible transmission lines, developments along the N1 as well as the recent addition of the Square Kilometer Array (SKA) facility to the landscape of that route further north of this proposed WEF, reduces the individual impact of the Kudusberg WEF. It is preferable to cluster the development along routes/ areas of other development, such as the R354, where impacts are already present and in so doing reduce impact in more unchanged landscapes such as along the historic R356. The R356 is a significant historic route and should be considered for recognition as such to protect it from negative impact due to future development.
- New construction work, construction camps, substations or access roads should not impact negatively or threaten any of the historic built form, which is part of the history and land use evolution of the cultural landscape. To achieve this, a reasonable distance should be kept from all historic built features on the landscape, as has been addressed by the revised layout proposal.

Living heritage resources should be protected by:

- If this is supported in consultation with local inhabitants (of permanent or seasonal habitation, owners or labourers), the negative impact of non-local inhabitants on cultural lifeways and language, employees associated with the new WEF should be reduced by housing the employees away from the CLAs.
- Impact of the proposed WEF on local inhabitants (of permanent and seasonal habitation, owners and labourers) should be monitored by the Holder of the Environmental Authorisation through a grievance mechanism described in the EMP. Such a grievance mechanism should take into account economic and social inequality and be made accessible and known to all inhabitants of the CLAs, not just the land owners. Such a grievance mechanism should be in place for the duration of the development process through to the end of the decommissioning phase.

11 KUDUSBERG WEF PHOTOGRAPHS



Plate 1: Gatsrivier Valley CLA showing temporal layers of built form – visual impact



Plate 2: Gatsrivier Valley CLA stone packed kraal on south bank (looking N) between river and historic road – visual impact



Plate 3: Gatsrivier Valley CLA Oliviersberg homestead – visual impact



Plate 4: Gatsrivier Valley CLA western entrance - historic route (looking E) – ridges on either side of this valley, as well as the perpendicular ridge on the horizon, are proposed locations for turbine sites of the Kudusberg WEF



Plate 5: Gatsrivier Valley CLA Oliviersberg werf with Koedoesberg ridge in the background (looking SE) – this ridge is proposed for location of turbines



Plate 6: Gatsrivier Valley CLA valley floor adjacent to Gatsrivier (looking W) - visual impact



Plate 7: Site for proposed Substation Alt 1 on ridge slope looking east



Plate 8: View from Oliviersberg ridge looking south towards Gatsrivier Valley CLA – ridge on right proposed for turbine site



Plate 9: Historic road ridge saddle looking north towards Matjiesfontein se Kloof CLA - turbines proposed for koppies on either side of kloof



Plate 10: Stone packed retaining wall of old historic road along Matjiesfontein se Kloof CLA – visual impact



Plate 11: Stone packed retaining wall of old historic road along Matjiesfontein se Kloof CLA – visual impact



Plate 12: Sheep grazing on ridge slope in Matjiesfontein se Kloof CLA upper valley (looking west) – visual impact



Plate 13: Matjiesfontein historic werf looking east from the stone kraal over the Matjiesfontein se Kloof River in the foreground to historic and recent buildings further back (looking east) – minimal visual impact

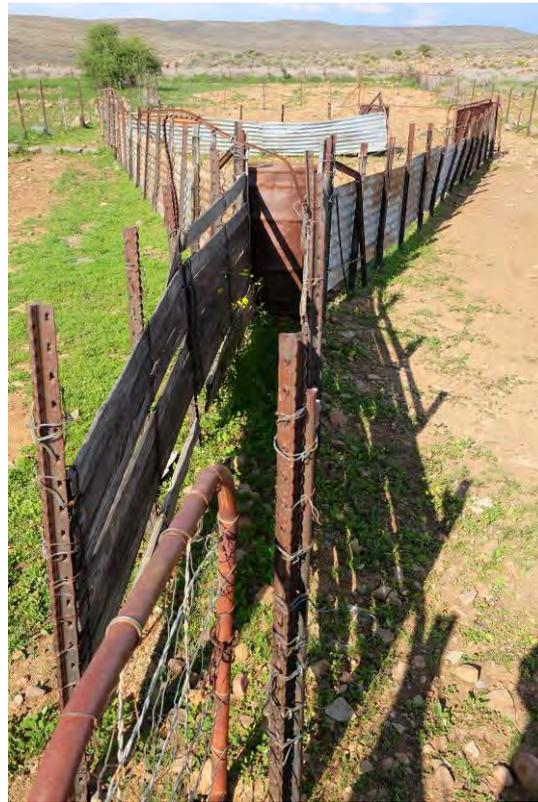


Plate 14: Matjiesfontein werf showing recent sheep farming infrastructure adjacent to historic stone kraals – minimal visual impact



Plate 15: Matjiesfontein werf building showing temporal layers of building techniques and materials on single structure – minimal visual impact



Plate 16: Matjiesfontein se Kloof CLA historic stone structure complex - looking west over water course with acacia thicket - minimal visual impact



Plate 17: Historic stone packed homestead part of abandoned stone structure complex adjacent to water course in Matjiesfontein se Kloof CLA mid reaches of valley (looking north east – escarpment on the horizon) – minimal visual impact



Plate 18: Matjiesfontein se Kloof CLA Kranskraal - more recent farming methods using wire fencing for stock management in lower valley (looking W) – minimal visual impact



Plate 19: Matjiesfontein se Kloof CLA Kranskraal – working farmstead at lower end of valley (looking E) – minimal visual impact



Plate 20: Historic route, R356, crossing a shallow ridge saddle, looking north east to escarpment – visual impact



Plate 21: Entrance gate to Windheuwel Farm and Uriasgatrivier Valley CLA off the historic R356 (to the right) – highest ridge in background is proposed for turbine placement and road proposed for entry road – high impact



Plate 22: Current Windheuwel homestead with large asbosskerm included in the fabric of the werf – high impact



Plate 23: Windheuwel farmstead surrounds showing graveyard in foreground, with windpump as well as a rectangular stone kraal on the slope to the back – high impact



Plate 24: Historic stone farmstead near to current Wind Heuvel farmstead with acacia thicket behind marking water course of Uriasgatrivier – entry road to pass between this and Wind Heuvel famstead.



Plate 25: Occupied Wind Heuvel farm labourers' residence with asbosskerm in use – proposed access road is to follow this existing road – high impact



Plate 26: Asbosskerm in use at labourers' residences



Plate 27: Looking south up the Uriasgatrivier Valley CLA from stone kraal complex located between Uriasgat werf and historic building (visible in middle distance) - access road to pass just north of this area and CC2 proposed for open area in middle distance to left of house,



Plate 28: Stone kraal complex (foreground), stone packed historic structure (left middle) and historic but more recent building (right middle) in Uriasgatrivier Valley CLA – access road located to north of these features, turbines proposed for ridge



Plate 29: Historic building in Uriasgatrivier Valley CLA



Plate 30: Proposed site for Construction Camp 2 - looking east



Plate 31: Proposed site for Construction Camp 3 where many stone cairns are located - looking south up Uriasgatrivier Valley CLA



Plate 32: Proposed site for Construction Camp 3 with stone cairns in foreground, Uriasgat homestead, wind pump and stone dam in middle and ridge proposed for turbine sites in background (left) - looking south east up Uriasgatrivier Valley CLA



Plate 33: Uriasgatrivier Valley CLA looking south from middle reaches towards ridges proposed for turbine placement, with Boplaas and Matjiesgoedhoek farmsteads visible in the middle distance



Plate 34: Historic stone (foreground) and brick (background) buildings with recent alterations and additions serving as labourers' residence at Boplaas on upper reaches of Uriasgatrivier Valley CLA



Plate 35: Looking south west across fenced graveyard with marble headstone located near road fork between Boplaas (4/193 Urius Gat) and Matjiesgoedhoek (background blue roof) farmsteads in Uriasgatrivier Valley CLA

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