of test-pitting/sampling or systematic excavations and collections of the finds may then be conducted to establish the contextual significance of the finds and possibly remove the archaeological deposit before development activities continue.

3.4 Consultation

The main stakeholders for the site currently are the owners of the property, the Local Authorities, the managers of the WEF and the heritage authority for the Western Cape, Heritage Western Cape (HWC).

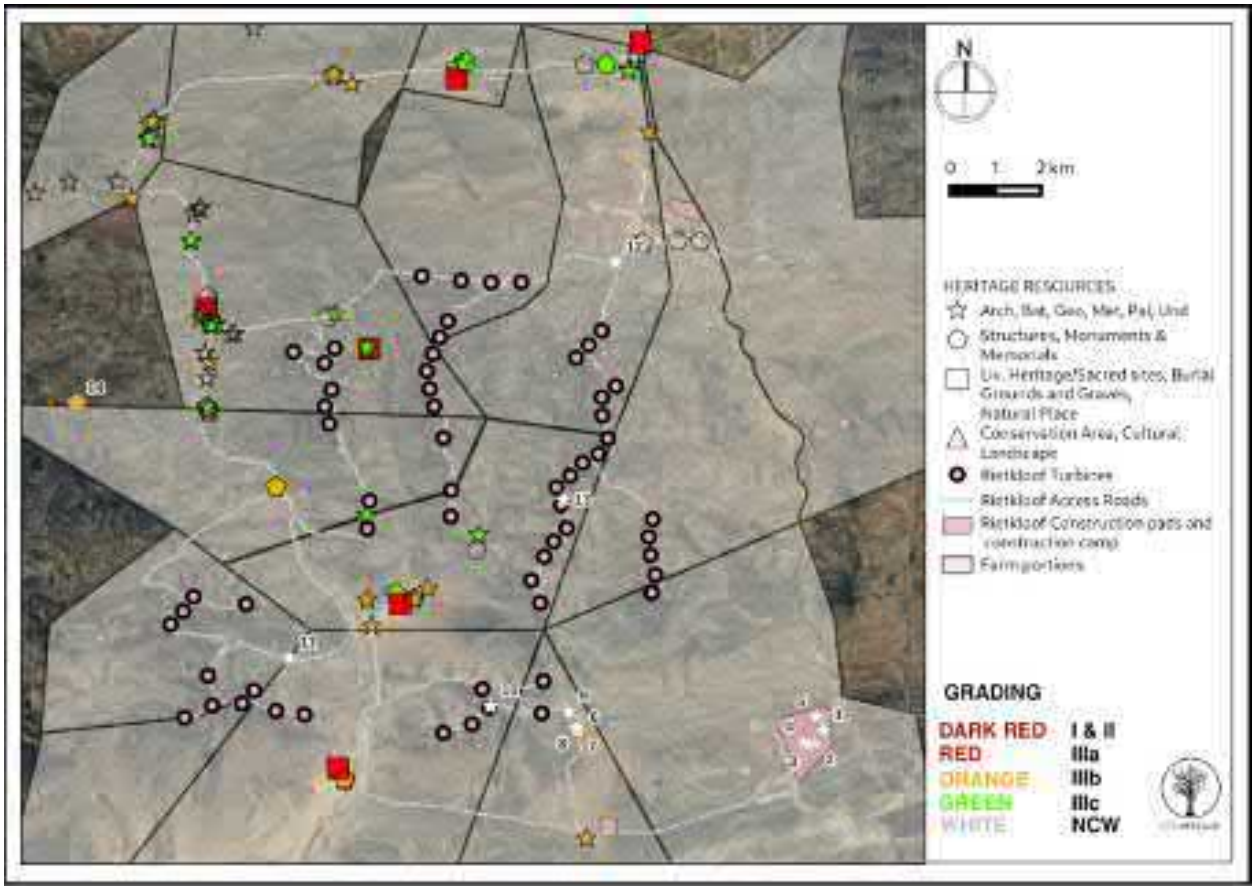


Figure 9.1: Map of all known heritage resources relative to the final Rietkloof WEF Layout

4. MONITORING

4.1 Objectives of Monitoring

The following recommendations are made for long-term management of the identified heritage resources to conserve the significance of the place as part of the irreplaceable history and shared cultural heritage of the landscape. The following management goals provide guidelines for use and maintenance of the heritage, acceptable physical protection and conservation, visitor education, monitoring and research.

4.2 Monitoring and Site Maintenance

Action	Responsible party	Performance Indicators	Evidence
CONSTRUCTION PHASE			
The area marked in Orange in Figure 3.2 and 3.3 has high levels of palaeontological sensitivity and as such, these two areas should be inspected for fossil wood occurrences by a professional palaeontologist prior to construction.	Palaeontologist	Significant fossil material collected and stored at Iziko	Workplan application and Workplan Report
Exclusion of sensitive ecological, heritage and paleontological areas from construction activities must inform micro siting of all development activities.	ECO	Final layout adhered to in the final construction	Bi-Annual Site Inspection and monitoring Report to be submitted to HWC
All construction and maintenance crew and vehicles (except small vehicles which may use existing farm tracks) must be kept out of the buffer zones.	ECO	No unplanned impact or unplanned impact halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to HWC
All site crew should be informed of the heritage significance of the resources in the study area	ECO	Once-off meeting held with site crew	Minutes of meeting
Sites near development infrastructure, or easily reached should be inspected by the ECO during the construction phase to ensure they are being respected	ECO	Site inspections conducted at all sites at regular intervals	Bi-Annual Site Inspection and Monitoring Report to be submitted to HWC
New construction work, construction camps, substations or access roads should not impact	ECO	No unplanned impact or unplanned impact halted within 4 hours	Bi-Annual Site Inspection and

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			Monitoring Report to be submitted to HWC
Implementation of the Chance Fossil Finds Procedure	ECO	Implementation of the Chance Fossil Finds Procedure	Written correspondence with relevant heritage authority regarding the find and minutes of relevant meetings
Construction of the final approved layout including implementation and enforcement of the identified buffer areas and no-go areas.	ECO	Final layout adhered to in the final construction	Bi-Annual Site Inspection and monitoring Report to be submitted to HWC
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 Heritage Western Cape and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take. This would be at the cost of the developer.	ECO	No unplanned impact or unplanned impact halted within 4 hours	Written correspondence with relevant heritage authority regarding and minutes of relevant meetings
OPERATIONAL PHASE			
Use existing roads for maintenance purposes	Site Manager	No unplanned impact or unplanned impact managed halted within 4 hours	Site Inspection every 5 years and Monitoring Report to be submitted to HWC
Keep all disturbance within existing development footprint and ensure identified buffers and no-go areas are adhered to	Site Manager	No unplanned impact or unplanned impact managed halted within 4 hours	Site Inspection every 5 years and Monitoring Report to be submitted to HWC
All site crew should be informed of the heritage significance of the resources in the study area	Site Manager	Meeting held with site crew	Minutes of meeting
Implementation of the Chance Fossil Finds Procedure	Site Manager	Implementation of the HWC Chance Fossil Finds Procedure	Written correspondence with relevant heritage authority regarding

			finds and minutes of relevant meetings
If any archaeological material or human burials are uncovered during the course of operations, then work in the immediate area should be halted at once. The find should be reported to Heritage Western cape and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.	Site Manager	No unplanned impact or unplanned impact halted within 4 hours	Written correspondence with relevant heritage authority regarding finds and minutes of relevant meetings
Should it be necessary that structures that have been graded or structures that are older than 60 years require alteration or demolition during this phase, HWC must be contacted regarding permission in terms of section 34 of the NHRA. Contact details are provided in Appendix 1.	Site Manager	Section 34 permit application to HWC	Permit issued in terms of section 34 from the relevant heritage authority or correspondence in this regard.
DECOMMISSIONING PHASE			
Use existing roads for maintenance purposes	Site Manager/ECO	No unplanned impact or unplanned impact managed halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to HWC
Keep all disturbance within existing development footprint and ensure identified buffers and no-go areas are adhered to	Site Manager/ECO	No unplanned impact or unplanned impact managed halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to HWC
All site crew should be informed of the heritage significance of the resources in the study area	Site Manager/ECO	Meeting held with site crew	Minutes of meeting
Implementation of the Chance Fossil Finds Procedure	Site Manager/ECO	Implementation of the HWC Chance Fossil Finds Procedure	Written correspondence with relevant heritage authority regarding finds and minutes of relevant meetings
If any archaeological material or human burials are uncovered during the course of operations, then work in the immediate area should be halted at once. The find should be reported to Heritage Western Cape and may require inspection by an archaeologist to	Site Manager	No unplanned impact or unplanned impact halted within 4 hours	Written correspondence with relevant heritage authority regarding and minutes of relevant meetings

determine whether mitigation should take place and what form that mitigation should take.			
Should it be necessary that structures that have been graded or structures that are older than 60 years require alteration or demolition during this phase, HWC must be contacted regarding permission in terms of section 34 of the NHRA. Contact details are provided in Appendix 1.	Site Manager	Section 34 permit application to HWC	Permit issued in terms of section 34 from the relevant heritage authority or correspondence in this regard.

5. APPLICABLE LEGISLATION

The development of the Rietkloof WEF triggers sections 38(1) and 38(8) of the National Heritage Resources Act (Act 25 of 1999) as this proposed development constitutes a change of character to a site exceeding 5000m^2. As such, this proposed development requires an evaluation of impacts to heritage resources in terms of other legislation (NEMA). This section states that the consenting authority (DFFE for Renewable Energy Facilities) must ensure that the assessment completed for impacts to heritage satisfies the requirements of the relevant heritage authority in terms of section 38(3) of the NHRA (Heritage Western Cape in the Western Cape), and that the recommendations of the relevant heritage authority must be taken into consideration prior to the granting of consent.

Section 38(3) of the NHRA details the information that MUST be included in a Heritage Impact Assessment drafted in terms of section 38 of the NHRA. Furthermore, HWC has published Minimum Standards for Archaeological and Palaeontological Impact Assessments. All such guidelines and minimum standards have been complied with in the HIA that was conducted for the Rietkloof WEF development (Booth, 2016).

In terms of section 38(10) of the NHRA, if the applicant complies with the recommendations and requirements of the relevant heritage authority issued in terms of section 38(8) of the NHRA, then the applicant MUST be exempted from compliance with all other (general) protections included in the NHRA. As such, as long as the requirements of the heritage authority are satisfied, no permit application is required for the destruction of or impact to any heritage resource ***that has been identified in the HIA.***

Should any heritage resources be newly uncovered during excavation activities ie. heritage resources that were not identified in the HIA, then as per the monitoring table above, work must cease in that area and the relevant heritage authority must be contacted regarding a way forward. Any alteration or destruction to or of heritage resources NOT anticipated in the HIA remains subject to the general protections and require permission from the relevant heritage authority.

- Impacts to any structures older than 60 years require a permit from HWC in terms of section 34 of the NHRA
- Impacts to archaeological or palaeontological heritage not anticipated in the HIA requires a permit from HWCin terms of section 35 of the NHRA
- Impacts to burial grounds or graves that are older than 60 years requires a permit from HWC in terms of section 36 of the NHRA

6. DOCUMENTATION AND MONITORING

All site record sheets, digital photos and mapping have been loaded securely to SAHRIS so that the EA holder, site manager and ECO are able to access the information online. Access to the database is governed by SAHRA and certain categories of information are not freely available to the general public without special permission such as GPS coordinates of archaeological sites.

Please see the following links for information:

- Case Application on SAHRIS (Case ID 13234)
  https://sahris.sahra.org.za/cases/rietkloof-147mw-wef

It is important that any new or previously unrecorded heritage resources identified during the course of the Construction, Operational or Decommissioning Phases are recorded on SAHRIS.

7. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
359488	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	09/03/2016	Brandvalley Wind Energy Facility
53187	HIA Phase 1	Timothy Hart, Lita Webley	01/03/2011	HERITAGE IMPACT ASSESSMENT PROPOSED WIND ENERGY FACILITY
337370	PIA Phase 1	Duncan Miller	01/03/2011	Palaeontological Impact Assessment Proposed Roggeveld Wind Energy Facility
356316	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	02/02/2016	Heritage Screener CTS15_015b EOH Brandvalley Wind Energy Facility
356318	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	01/02/2016	Heritage Screener CTS15_015a EOH Rietkloof Wind Energy Facility
364162	PIA Phase 1	John E Almond	01/04/2016	PALAEONTOLOGICAL HERITAGE ASSESSMENT: COMBINED DESKTOP & FIELD-BASED STUDY - PROPOSED BRANDVALLEY WIND ENERGY FACILITY LAINGSBURG, WESTERN & NORTHERN CAPE PROVINCES
364163	AIA Phase 1	Celeste Booth	01/04/2016	A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) FOR THE PROPOSED BRANDVALLEY WIND ENERGY FACILITY (WEF) SITUATED IN THE KAROO HOOGLAND LOCAL MUNICIPALITY (NAMAKWA DISTRICT MUNICIPALITY), THE WITZENBURG LOCAL MUNICIPALITY (CAPE WINELANDS DISTRICT MUNICIPALITY) AND LAINGSBURG LOCAL MUNICIPALITY (CENTRAL KAROO DISTRICT MUNICIPALITY).
4843	AIA Phase 1	Hilary Deacon	28/03/2008	Archaeological Impact Assessment: Proposed Breede Valley De Doorns Housing Project
	HIA	Dave Halkett, Lita Webley	11/04/2011	HERITAGE IMPACT ASSESSMENT: PROPOSED PERDEKRAAL WIND AND SOLAR ENERGY FACILITY , WESTERN CAPE PROVINCE

Additional References:

Hart, T. et al. (2016). **HERITAGE IMPACT ASSESSMENT (SCOPING) FOR THE PROPOSED KOLKIES WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION TO BE SITUATED IN THE SOUTHERN TANKWA KAROO.** (Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of an EIA). For Arcus Consulting. Unpublished and not submitted.

Hart, T. et al. (2016). **HERITAGE IMPACT ASSESSMENT (SCOPING) FOR THE PROPOSED KAREE WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION TO BE SITUATED IN THE SOUTHERN**

TANKWA KAROO. (Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of an EIA). For Arcus Consulting. Unpublished and not submitted.

Shaw, Matthew & Ames, Christopher & Phillips, Natasha & Chambers, Sherrie & Dosseto, Anthony & Douglas, Matthew & Goble, Ron & Jacobs, Zenobia & Jones, Brian & Lin, Sam & Low, Marika & Mcneil, Jessica-Louise & Nasoordeen, Shezani & O'driscoll, Corey & Saktura, Rosaria & Sumner, T. & Watson, Sara & Will, Manual & Mackay, Alex. (2020). **The Doring River Archaeology Project: Approaching the Evolution of Human Land Use Patterns in the Western Cape, South Africa.**

Smith, Andrew B., and Michael R. Ripp. "**An Archaeological Reconnaissance of the Doorn/Tanqua Karoo.**" The South African Archaeological Bulletin, vol. 33, no. 128, 1978, pp. 118–133

APPENDICES

APPENDIX 1:

A Summary of the SAHRA Minimum Standards for Archaeological Site Museums and Rock Art Sites open to the Public

The archaeological heritage of South Africa is unique and it is non-renewable. Archaeological sites, including those with rock paintings or rock engravings, are especially vulnerable to damage caused by visitors. All such sites are protected by the National Heritage Resources Act (Act No. 25 of 1999). Anyone opening a site to the public, either as a formal site museum or simply as a place of interest, must take basic precautions to ensure the safety of the site and its contents. This guide is also applicable to mitigate the negative impacts of increased human activity in proximity to significant archaeological sites.

Expert advice should be sought from the South African Heritage Resources Agency (SAHRA) or HWC and/or from one of the museums or university departments listed below. Interventions should be reversible and the integrity of the site should be maintained as far as possible. No site should be opened to the public without a prior professional investigation that includes a conservation management plan approved by the appropriate heritage agency and, for rock art sites, complete documentation in case of later damage.

Remember that a permit is required for ANY disturbance at an archaeological site for activities that fall outside of those activities assessed in a formal Heritage Impact Assessment process and this includes erecting noticeboards, boardwalks, fences, etc. Liaison with the local publicity office and regional services council is recommended.

THE FOLLOWING MINIMUM STANDARDS MUST FORM PART OF THE MANAGEMENT PLAN:

1. Notify HWC or SAHRA of intention to open site

2. Engage a professional with specialist knowledge to document the site, draw up a conservation management plan and advise on interpretation of the site.

3. Approach to the Site

3.1 Arrangements for visiting

* if the site is open at all times, there should be adequate signposting;

* if the site is kept locked, there should be clear arrangements for the collection and return of a key;
* if it is open only by appointment, there should be a specialist guide or a specially trained local guide who has had clear instructions on what to do and say.

3.2 Provision for vehicles

* there should be an adequate and well-maintained road, preferably paved to limit dust, with off-road parking;
* the parking should not encroach on the site: vehicles should not park closer than about 100 m from the edge of the site;
* the parking area should be marked by a barrier between it and the start of the path.

3.3 Facilities

* there should be a litter bin at the parking lot and it should he emptied regularly;
* consider the need for toilets and the supply of refreshments and other facilities such as a shop, public telephone, restroom, etc., depending on the number of visitors expected;
* consider the need to establish an interpretive centre separate from the site, where people can see displays and where you may be able to store material, provide accommodation, etc. Remember that a permit from HWC is required to collect any archaeological material and so displays are best done in collaboration with a professional or institution.

3.4 Design of the path

* make sure that the path to the site is distinct;
* the path should follow the contours to avoid unnecessary erosion of any hill slope;
* make sure there are discreet signs to indicate direction where the path crosses a rocky area;
* the path should not enter the site at a position where the deposits or the rock art can be damaged;
* the introductory notice board should be displayed at the end of the path and the beginning of the site, where it will not interfere with good photographic views.

4. Provision of Information

* at least an introductory notice board explaining that the site is protected by law;
* where appropriate, a display with more detailed information on what can be seen at the site and what it means;

* a visitors' book in a container to protect it from the weather, or at a farmhouse or other convenient place (copies of these can be sent to HWC for record purposes);
* a leaflet or pamphlet explaining visitor etiquette.
* an explanatory leaflet or pamphlet that is specific to the site.

5. Guides

* specialist guides or specially trained local guides ensure that the meaning of the rock art or, in the case of archaeological sites, the story of the people who used the site is interpreted and so enhance the experience for the visitor. They also teach appropriate visitor etiquette and contribute to the safety of the site.

6. Protection of the Site

* measures used to protect archaeological deposits should be effective, reversible and recognisable, yet harmonious. It is important that visitors appreciate that the site is being well looked after, so it should be clean and as natural as possible. Remember that a permit is required for any disturbance or intervention at a site.

7. Protection of the Art

* a psychological or physical barrier should be set up between the visitor and the rock art, or display area, in the form of anything from a low wooden railing to a fence that encloses the entire site, depending on the vulnerability of the site or precautions necessary for the safety of the visitor;
* boardwalks are recommended and may include railings. They must be of treated wood or non-flammable material,
* every effort should be made to remove graffiti from the site, as it attracts more graffiti. A permit is required to remove graffiti at a rock art site.

8. Protection of the Surface and Deposits

* an effective cover should be put on the floor of the site to prevent dust being kicked up and damaging rock art and to stop people picking up material on the surface. Cover can be provided by a boardwalk, geotextile, or medium to large slabs of natural rock from the surrounds of the site.
* excavated sections should be backfilled, in consultation with HWC

9. Regular Maintenance

* arrangements should be made with the appropriate heritage agency or museum for a monitoring programme.

* provision should be made for regular visits to the site by the manager or property owner to check on litter, damage, graffiti, etc., which should be reported to the heritage agency.
* there should be regular monitoring of vegetation around the site so that, if necessary:
    - measures can be taken to protect it against trampling,
    - potentially dangerous plants such as those with thorns can be controlled,
    - dead wood can be removed so that damage by veld fires can be avoided,
    - firebreaks can be maintained.

10. Avoid having:

* a litter bin on site unless very large groups are catered for;
* braai or picnic places on the site or right next to it;
* camping places within 500 m of an archaeological site;
* plastic sheeting or plastic bags exposed to view unless there is no other option;
* concrete barriers or surfaces;
* metal poles or wire in contact with rock shelter or cave walls as they rust and stain the rock;
* a sandy surface on the outer side of a fence as this will be eroded by people walking there and the fence will be under-cut.

11. Contact Information

South African Heritage Resources Agency (SAHRA)

Contact Person: Mr Phillip Hine

Tel: 021 462 4502

Email: phine@sahra.org.za

Website: www.sahra.org.za

Heritage Western Cape

Contact Person: Mrs Colette Scheermeyer

Tel: 021 483 5959

Email: colette.scheermeyer@westerncape.gov.za

Website: http://www.hwc.org.za/

Iziko South African Museums

Contact Person: Dr Wendy Black

Tel: 021 481 3883

Email: wblack@iziko.org.za

Website: www.iziko.org.za

University of Cape Town: Archaeology Department

Contact Person: Prof. John Parkington

Tel: 021 650 2353

Email: john.parkington@uct.ac.za

Website: http://www.archaeology.uct.ac.za/

CTS HERITAGE

APPENDIX 2:

Known heritage resources within the Rietkloof WEF Development Area (SAHRIS)

SAHRIS ID	Site No	Site Name	Description (Detailed descriptions on SAHRIS)	Co-ordinates		Grading
35140	ROG009	Roggeveld 009	Building	-32,952639	20,506639	Grade IIIc
35141	ROG010	Roggeveld 010	Building	-32,953139	20,539944	Grade IIIc
35154	ROG013	Roggeveld 013	Stone walling	-32,915	20,542083	Grade IIIc
35157	ROG014	Roggeveld 014	Transport infrastructure	-32,917083	20,534	Grade IIIc
35159	ROG015	Roggeveld 015	Building	-32,917222	20,532667	Grade IIIc
35578	GK056	Gamma Kappa 056	Artefacts	-32,966667	20,55	Grade IIIb
35171	ROG016	Roggeveld 016	Stone walling	-32,917306	20,530583	Grade IIIc
35172	ROG017	Roggeveld 017	Stone walling	-32,916972	20,529361	Grade IIIc
35188	ROG024	Roggeveld 024	Ruin > 100 years	-33,022167	20,445861	Grade IIIb
35214	ROG032	Roggeveld 032	Building	-33,036861	20,46175	Grade IIIb
35216	ROG034	Roggeveld 034	Building	-33,058111	20,490194	Grade IIIc
35217	ROG035	Roggeveld 035	Ruin > 100 years	-33,021111	20,445361	Grade IIIc
35218	ROG036	Roggeveld 036	Stone walling	-33,004861	20,446111	Grade IIIc
35753	ROG050	Roggeveld 050	Building	-33,095038	20,478026	Grade IIIb
35185	ROG023	Roggeveld 023	Burial Grounds & Graves	-33,001639	20,44525	Grade IIIa
35645	GK122	Gamma Kappa 122	Burial Grounds & Graves	-32,9488	20,54806	Grade IIIa
35646	GK123	Gamma Kappa 123	Burial Grounds & Graves	-32,95595	20,50446	Grade IIIa
137160	BWE-052	Brandvalley Wind Energy	Deposit	-32,945889	20,456472	
137163	BWE-055	Brandvalley Wind Energy	Deposit	-32,976361	20,424111	
137164	BWE-056	Brandvalley Wind Energy	Deposit	-32,9765	20,412806	
137165	BWE-057	Brandvalley Wind Energy	Deposit	-32,978667	20,404583	
137179	BWE-071	Brandvalley Wind Energy	Deposit	-32,982944	20,442222	
137180	BWE-072	Brandvalley Wind Energy	Deposit	-32,982	20,443417	
137181	BWE-073	Brandvalley Wind Energy	Deposit	-32,981611	20,443917	
137182	BWE-074	Brandvalley Wind Energy	Deposit	-33,002222	20,444528	

137183	BWE-075	Brandvalley Wind Energy	Deposit	-33,006528	20,451972	
137184	BWE-076	Brandvalley Wind Energy	Deposit	-33,006694	20,451111	
137185	BWE-077	Brandvalley Wind Energy	Deposit	-33,010417	20,444917	
137186	BWE-078	Brandvalley Wind Energy	Deposit	-33,015444	20,445361	
137199	KWF-014	KAREEBOSCH WIND FARM	Building	-32,952639	20,506639	
137200	KWF-015	KAREEBOSCH WIND FARM	Building	-32,953139	20,539944	
137203	KWF-018	KAREEBOSCH WIND FARM	Stone walling	-32,915	20,542083	
137204	KWF-019	KAREEBOSCH WIND FARM	Archaeological	-32,917083	20,534	
137205	KWF-020	KAREEBOSCH WIND FARM	Building	-32,917222	20,532667	
137233	KWF-021	KAREEBOSCH WIND FARM	Stone walling	-32,917306	20,530583	
137234	KWF-022	KAREEBOSCH WIND FARM	Stone walling	-32,916972	20,529361	
137251	KWF-039	KAREEBOSCH WIND FARM	Structures	-33,058111	20,490194	
137252	KWF-040	KAREEBOSCH WIND FARM	Structures	-33,021111	20,445361	
137253	KWF-041	KAREEBOSCH WIND FARM	Stone walling	-33,004861	20,446111	
137254	KWF-042	KAREEBOSCH WIND FARM	Burial Grounds & Graves	-33,001639	20,44525	
137255	KWF-043	KAREEBOSCH WIND FARM	Structures	-33,022167	20,445861	
137257	KWF-044	KAREEBOSCH WIND FARM	Building	-33,036861	20,46175	
137258	KWF-045	KAREEBOSCH WIND FARM	Building	-33,09475	20,477833	
137059	RFWE-001	RIETKLOOF WIND ENERGY	Artefacts	-33,059253	20,4833	Grade IIIb
137060	RFWE-002	RIETKLOOF WIND ENERGY	Artefacts	-33,064411	20,484358	Grade IIIb
137061	RFWE-003	RIETKLOOF WIND ENERGY	Artefacts	-33,059161	20,494414	Grade IIIb
137062	RFWE-004	RIETKLOOF WIND ENERGY	Artefacts	-33,057033	20,4976	Grade IIIb
137063	RFWE-005	RIETKLOOF WIND ENERGY	Burial Grounds & Graves	-33,092617	20,476444	Grade IIIa
137064	RFWE-006	RIETKLOOF WIND ENERGY	Burial Grounds & Graves	-33,060081	20,491175	Grade IIIa
137065	RFWE-007	RIETKLOOF WIND ENERGY	Stone walling	-33,009861	20,483528	Grade IIIc
137066	RFWE-008	RIETKLOOF WIND ENERGY	Stone walling	-33,0425	20,483183	Grade IIIc
137067	RFWE-009	RIETKLOOF WIND ENERGY	Stone walling	-33,046394	20,509708	Grade IIIc
137068	RFWE-010	RIETKLOOF WIND ENERGY	Artefacts	-33,106533	20,535194	Grade IIIb

137069	RFWE-011	RIETKLOOF WIND ENERGY	Structures	-33,059019	20,494419	
137070	RFWE-012	RIETKLOOF WIND ENERGY	Structures	-33,049383	20,509278	
137091	BWE-001	Brandvalley Wind Energy	Building	-32,951006	20,547308	
137092	BWE-002	Brandvalley Wind Energy	Building	-32,953931	20,504614	
137093	BWE-003	Brandvalley Wind Energy	Building	-33,004111	20,445992	
137094	BWE-004	Brandvalley Wind Energy	Building	-32,988272	20,562172	
137095	BWE-005	Brandvalley Wind Energy	Building	-32,988511	20,548528	
137096	BWE-006	Brandvalley Wind Energy	Artefacts	-32,954075	20,545319	Grade IIIb
137097	BWE-007	Brandvalley Wind Energy	Artefacts	-32,957006	20,479683	Grade IIIb
137098	BWE-008	Brandvalley Wind Energy	Artefacts	-32,955186	20,475436	Grade IIIb
137099	BWE-009	Brandvalley Wind Energy	Artefacts	-32,964364	20,433081	Grade IIIb
137100	BWE-010	Brandvalley Wind Energy	Artefacts	-32,967936	20,431478	Grade IIIb
137101	BWE-011	Brandvalley Wind Energy	Artefacts	-32,979669	20,427667	Grade IIIb
137102	BWE-012	Brandvalley Wind Energy	Artefacts	-33,009253	20,4833	Grade IIIb
137103	BWE-013	Brandvalley Wind Energy	Artefacts	-33,012139	20,445897	Grade IIIb
137104	BWE-014	Brandvalley Wind Energy	Burial Grounds & Graves	-33,001589	20,445144	Grade IIIa
137105	BWE-015	Brandvalley Wind Energy	Burial Grounds & Graves	-33,009578	20,483883	Grade IIIa
137106	BWE-016	Brandvalley Wind Energy	Stone walling	-32,954514	20,545272	Grade IIIc
137107	BWE-017	Brandvalley Wind Energy	Stone walling	-32,953139	20,505872	Grade IIIc
137108	BWE-018	Brandvalley Wind Energy	Stone walling	-32,964397	20,432517	Grade IIIc
137109	BWE-019	Brandvalley Wind Energy	Stone walling	-32,965083	20,431736	Grade IIIc
137110	BWE-020	Brandvalley Wind Energy	Stone walling	-32,967803	20,431731	Grade IIIc
137111	BWE-021	Brandvalley Wind Energy	Stone walling	-32,988264	20,441697	Grade IIIc
137112	BWE-022	Brandvalley Wind Energy	Stone walling	-33,003419	20,443878	Grade IIIc
137113	BWE-023	Brandvalley Wind Energy	Stone walling	-33,003636	20,446264	Grade IIIc
137114	BWE-024	Brandvalley Wind Energy	Stone walling	-33,004503	20,446278	Grade IIIc
137115	BWE-025	Brandvalley Wind Energy	Stone walling	-33,00455	20,447753	Grade IIIc
137116	BWE-026	Brandvalley Wind Energy	Stone walling	-33,004961	20,446706	Grade IIIc

137117	BWE-027	Brandvalley Wind Energy	Stone walling	-33,002567	20,47595	Grade IIIc
137118	BWE-028	Brandvalley Wind Energy	Stone walling	-33,009861	20,483528	Grade IIIc
137119	BWE-029	Brandvalley Wind Energy	Stone walling	-33,009167	20,483183	Grade IIIc
137120	BWE-030	Brandvalley Wind Energy	Stone walling	-33,021044	20,445492	Grade IIIc
137122	BWE-032	Brandvalley Wind Energy	Stone walling	-32,989144	20,546881	Grade IIIc
137123	BWE-033	Brandvalley Wind Energy	Artefacts	-32,96445	20,432489	Grade IIIb
137124	BWE-034	Brandvalley Wind Energy	Artefacts	-32,988025	20,4416	Grade IIIc
137125	BWE-035	Brandvalley Wind Energy	Artefacts	-33,009192	20,483242	Grade IIIc
137127	BWE-037	Brandvalley Wind Energy	Structures	-32,953206	20,534781	
137128	BWE-039	Brandvalley Wind Energy	Structures	-32,955419	20,475283	
137129	BWE-040	Brandvalley Wind Energy	Structures	-32,967983	20,432272	
137131	BWE-042	Brandvalley Wind Energy	Structures	-32,999217	20,445583	
137132	BWE-043	Brandvalley Wind Energy	Structures	-33,003103	20,474044	
137133	BWE-044	Brandvalley Wind Energy	Structures	-32,988206	20,556772	
	RK001	Rietkloof 001	Chert core, patinated hornfels flakes, Artefacts on level ground, small pans but quite rocky	-33.08508	20.59137	NCW
	RK002	Rietkloof 002	Patinated hornfels flakes in pan	-33.08766	20.58939	NCW
	RK003	Rietkloof 003	Chert and hornfels cores	-33.08808	20.58759	NCW
	RK004	Rietkloof 004	Hornfels biface	-33.0875	20.58678	NCW
	RK005	Rietkloof 005	Hornfels flake	-33.08242	20.58963	NCW
	RK006	Rietkloof 006	Stone walled kraal 50x25m	-33.08555	20.53359	IIIB
	RK007	Rietkloof 007	Matjiesfontein chert formal retouched flake. Chert flakes dropped on slopes of large valley below	-33.08518	20.53314	NCW
	RK008	Rietkloof 008	Chert bladelet and flake	-33.08461	20.53302	NCW
	RK009	Rietkloof 009	Hornfels flake. Artefacts dropping off on ridges considerably	-33.08148	20.53103	NCW
	RK010	Rietkloof 010	Chert flake. Isolated flake on top of ridge which was unusual, not part of larger	-33.08025	20.51256	NCW

			site			
	RK011	Rietkloof 011	Chert flake	-33.07075	20.46493	NCW
	RK012	Rietkloof 012	Chert, hornfels, quartzite flakes	-32.99232	20.5421	NCW
	RK013	Rietkloof 013	Isolated chert flake	-33.03938	20.52984	NCW
	RK014	Rietkloof 014	Farmers trap, corrugated sheet, wire, wooden post	-33.02031	20.41447	NCW

CTS HERITAGE

APPENDIX 3:

Chance Fossil Finds Procedure

HWC PROCEDURE: CHANCE FINDS OF PALAEONTOLOGICAL 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.

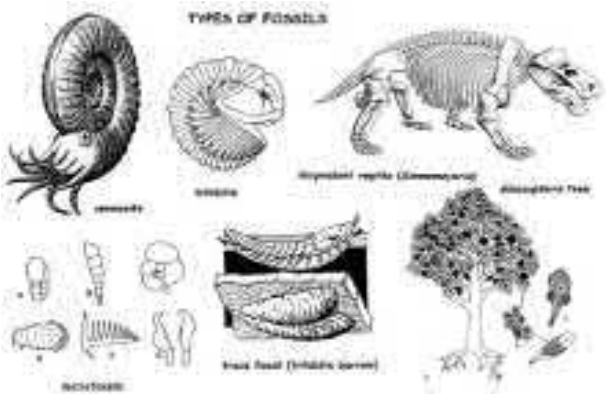
No work may continue in the vicinity of the find until HWC has indicated, in writing, that it is appropriate to proceed.

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:	

Palaeontology: what is a fossil?

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

- Body fossils preserve parts, casts or impressions of the original tissues of an organism (e.g. bones, teeth, wood, pollen grains); and
- Trace fossils such as trackways and burrows record ancient animal behaviour.



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

If you think you have identified a fossil:

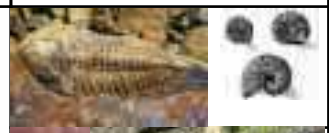
Immediately inform the ECO or Site Agent. He/she will then contact HWC and write a report and if necessary operations will stop in that specific area until the fossil is recovered

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

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

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

Below there is a list of few examples of fossils which may be identified during excavations in the Western Cape.

Image	Description	Image	Description
	Leaves		Snail shells and other shells
	Fossil wood		Bones of larger animals
	The remains of fish and marine life (e.g. teeth, scales, starfish)		Large burrows made by moles and other animals
	Stromatolites		Traces made by burrowing insects (ants, wasps, dung-beetles etc.).
	Animal footprints		

Images provided by Dr John Almond

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

APPENDIX

G AVIFAUNA WALKDOWN REPORT AND PRE-CONSTRUCTION MONITORING

Final Avian Re-Assessment for turbines proposed for the RIETKLOOF WIND ENERGY DEVELOPMENT AREA, ROGGEVELD

Produced for:

CONTENTS

1 SUMMARY

This study contains a re-appraisal of the impacts and mitigation suggested for the proposed Rietkloof Wind Energy Facility by Rietkloof Wind Energy Facility (Pty) Limited. It is also a part 2 amendment given that the turbine numbers and dimensions have changed from that authorised (below). The avian component was previously surveyed in 2016 by African Insights (Williams 2016), and Birds & Bats Unlimited were asked to undertake a short re-assessment of the priority raptors in May 2021. The primary aim was to determine if the receiving environment has changed, if the eagle nests found in 2016 remain the same, to summarise the avian impacts of the previous avian assessment report, and to re-assess if the impacts have changed with the change in turbine numbers and dimensions.

The number of turbines has been decreased to 60 and then down to 34 (in November 2021) from the previously assessed 70 turbines and thus with a reduced overall footprint from 2016. Each turbine will general up to 7 MW, and all have a hub height of 125 m and a rotor diameter of 180 m (i.e., blade length of 90m). The original pre-construction monitoring by African Insights (2016), for Rietkloof (the southern-most farm in the Euronotus cluster) covered a total 20 days in the development site itself, across four seasons in the period April 2015 to January 2016. This was a period of intense drought and low avian activity.

The impact zone of the originally proposed facility lies in a small area in the Nama/Succulent Karoo biomes – in mountainous Roggeveld terrain. The area held very few birds at the time, but four priority species were recorded, a Verreaux's Eagle *Aquila Verreauxii* pair with a nest, Booted Eagle *Aquila pennatus,* Jackal Buzzard *Buteo rufofuscus* and Karoo Korhaans *Eupodotis vigorsii*.

African Insights' report did not report Passage Rates or flight heights but recorded priority bird flights and observation hours. We could, thus, reconstruct Passage Rates to quantitatively compare their 2016 findings with our 2021 surveys. The low activity in 2016 was reflected in the low Verreaux's Eagle Passage Rate of 0.08 eagles per hour, and all Priority Species of 0.11 birds per hour. An active Verreaux's Eagle nest was recorded from the R354 tar road in 2016 and a 1.5-km buffer was recommended around this nest and designated a No-Go area.

Our surveys in May 2021 revealed more species than recorded previously and a Passage Rate fourfold higher (at 0.32 eagles per hour) than in 2016. We also located a second Verreaux's Eagle nest site in the south-western corner of the Rietkloof site at S33.084875° E 20.441221° on a large south-facing cliff. The two nests were attended by an adult in May 2021.

Additional priority birds seen (over and above the four species recorded by African Insights) were Ludwig's Bustard *Neotis ludwigii* and Greater Flamingo *Phoenicopterus roseus*. All are Red Data species. The passage rate of all these priority species throughout the Euronotus cluster was low at 0.25 priority birds per hour, but still double that of 2016.

Given the discovery of the Verreaux's Eagle nest the guidelines for this species (Ralston Paton 2017) recommend a 3-km buffer around both eagle nests on site. However, African Insights' surveys and recommendations were made prior to the first Verreaux's Eagle guidelines in 2016, and the Environmental Authorisation, based on recommendations by Africa Insights, allows a 1.5-km buffer.

Given the risk involved to the eagles BBU recommended that the turbines within 3 km of this nest be relocated. Red Rocket have not only undertaken this but have moved all 11 turbines away from this new Verreaux's Eagle nest, such that the nearest turbine is now 5.6 km east. This will substantially reduce the risk to the eagles.

The increase in hub height from 120-m to 125-m increases the risk of collision to three birds per turbine per year for the nine turbines to which it is applied. This is countered by a reduction in the overall number of turbines (from 60 to 34). Thus, there is a *decrease* in the Significance of the impacts from the authorised layout to the newly proposed Amendment.

An additional form of mitigation, for any turbines across the farm that kill more than one highly threatened Red Data species per year, would be the addition of automated shut-down on demand of the problem turbines. This can be achieved by the installation of Bioseco, DT-bird, or a suitable alternative.

Operational-phase monitoring is essential to determine the actual impacts on birds and will inform the required mitigation measures and thresholds. This plan must allow for:

(i) changes to be implemented within a maximum timeframe of two months;
(ii) the Wind Farm must agree to follow the mitigation measures that may result from the operational monitoring and Adaptive Management Plan; and
(iii) in accordance with the Adaptive Management Plan, appropriate mitigation measures are implemented, such as curtailment during specific environmental conditions, or during high-risk periods.

Given the high occurrence of eagles in the proposed development area, and their proximity to the proposed turbines, a further six months of monitoring is recommended to, more precisely, determine flight paths and perch areas.

These data can be integrated into the micro-siting of the 11 turbines closest to the newly discovered Verreaux's Eagle nest.

1.1 Qualifications of Specialist Consultants

Dr Rob Simmons, Director of Birds & Bats Unlimited is an ecologist, ornithologist, and environmental consultant, with three decades research experience in North America, Africa, Europe and Asia. He is a Permanent Resident in South Africa. Currently a Research Associate of the FitzPatrick Institute's Centre of Excellence, University of Cape Town. Formerly employed in Namibia's Ministry of Environment & Tourism as the state ornithologist, specialising in wetland, avian and montane biodiversity. Schooled in London (Honours: Astrophysics), Canada (MSc: Biology) and South Africa (PhD: Zoology).

SURVEY EXPERIENCE:

- **Sandwich Harbour avifauna** - A 30-year project assessing fluctuations in wetland avifauna relative to Walvis Bay and revealing long term declines in palearctic migrant shorebirds - published *Conservation Biology* (2015)
- **Arid species diversity across a steep rainfall gradient -** a 3-year project at 5 sites across a 270 km gradient, in the wet and dry seasons, assessing avian richness and functional diversity in 3 habitats in Namibia. Dry rivers found to be critical refugia as biodiversity declined with increasing aridity. Published *Ecosystems* (2015).
- **Population monitoring of Namibian endemics**–Determined densities and overall population numbers of all 16 Namibian endemic birds with Edinburgh University, published *Biological Conservation* Robertson et al (1996);
- **Damara Tern status** –Stratified random survey of the 1470-km Namibian coast, to determine the global population of this tern. Published *Ibis* 1998. Angolan breeding colonies published *Af J Mar Sci, Ostrich*
- **Black Harrier status** – 18-year study of *Endangered* Black Harriers in South Africa, followed by satellite tags to determine ecology and migration with FitzPatrick students. *PlosOne* Garcia-Heras et al. (2019).

Research on new avian mitigation measures for the wind and power industry:

- **testing use of vulture restaurants** to draw vultures away from wind farms in Lesotho.
- proposing and **testing coloured-blade mitigation** to reduce raptor fatalities in SA.
- **Implementing staggered pylons on parallel lines** as first effective mitigation for high bustard deaths.

Environmental Impact Assessments (renewable energy, power lines, mining, airports)

- birds impacted by a proposed Haib **copper mine** near the Orange River (1994);
- siting of proposed Lüderitz **wind farm** prior to formal assessments for NamPower (1997);
- impact of **water abstraction** from Karst System wetland birds Tsumeb (2003) (J Hughes);
- impact of **uranium mine** at Valencia, Khan River, Namibia (Aug 2007, Feb 2008)
- Impact on birds by a proposed **airport** in Caledon, Western Cape (2009)
- **Biodiversity surveys** in Namib Desert, Angola, (SANBI–Angola joint surveys- Dr B. Huntley)
- **Wind farm** assessments on the west coast at Kleinsee and Koingnaas (Savannah – 2011)
- EIA report on avian impacts at Namaqualand + Kareebosch **wind farms** (Mulilo –2015, 2017)
- Pre-construction avian impacts at the Witteberg (Karoo) **wind farm** site – (Anchor Environmental 2011-2012) and Verreaux's Eagles (G7/Building Energy 2014-2015, 2019);
- Pre-construction avian impacts at Happy Valley (E Cape) **wind farm** (EDP Renewables 2014)
- Pre-construction avian monitoring Karoshoek CSP-trough **CSP-tower** Solar Park (Upington) (Savannah Environmental for Emvelo Eco Projects, 2015-2016)
- Pre-construction avian impacts at a Tankwa Karoo **wind farm** (Genesis Eco-Energy 2016-17)
- Pre-construction avian impacts at **Juno WEF,** Strandfontein (AMDA Pty Ltd, 2016-2017)
- Specialist studies of Red Data raptors at Jeffreys Bay **wind farm** (Globeleq, 2016-2019)
- Pre-construction avian impacts: Namas+Zonnequa **wind farms**, Kleinsee (Atlantic Energy + Genesis 2016/17);
- Pre-construction avian impacts and mitigation test at Lesotho **wind farm**, IFC compliant (eGEN+AGR 2017-18);
- Walvis Bay **waterfront development** impacts on Walvis Bay lagoon avifauna (ECC) 2017
- Avian-**power line** EIA study of 450 km-long, 400 kV line (Lithon-Nampower 2017-2018);
- Pre-construction avian impacts of Kappa 1 and 2 and 3 **wind farms** in Tankwa (Eco-Genesis 2018-2020);
- Pre-construction avian impacts of Nama Karoo **wind farms** Komas + Komas (Enertrag) 2019;
- Avian impacts along Kruisvallei **Hydro-project power line** Free State and IFC compliance(Building Energy 2019)
- Amendments to avian impact (hub heights) Kareebosch (Nama-Karoo) **wind farm** site (Mulilo 2019) and the Namas and Zonnequa **wind farms** (Enertrag) 2019
- Specialist studies of Black Harriers at **Elands Bay** wind farm and aquaculture site (Planet Capital 2019/20)
- Pre-construction avian impacts at Kotulo-Tsatsi **solar and wind farm** (Savannah 2021)
- Avian impact assessment at the Euronotus and Roggeveld **wind farm** cluster **(x4)** Karoo (Red Rocket 2021)

Consultancy work at: http://www.birds-and-bats-unlimited.com

Papers and academic background at: www.fitzpatrick.uct.ac.za/fitz/staff/research/simmons

2 SPECIALIST DECLARATION

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

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

PROJECT TITLE

EA AMENDMENT: RIETKLOOF WIND ENERGY FACILITY, NORTHERN CAPE PROVINCE - AVIAN SPECIALIST REPORT – 2021

Kindly note the following:

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

Departmental Details

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

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road, Arcadia
Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

Specialist Details

Specialist Company Name:	Birds & Bats Unlimited			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100
Specialist name:	Dr Robert E Simmons			
Specialist Qualifications:	PhD (Wits), MSc (Acadian Univ, Canada), BSc Hons (London)			
Professional affiliation/registration:	Birdlife South Africa, Honourary Research Associate University of Cape Town			
Physical address:	8 Sunhill Estate, Trigg Road, Capri, Cape Town			
Postal address:	As above			
Postal code:	7975	Cell:	0827 800 133	
Telephone:	As above	Fax:		
E-mail:	Rob.Simmons@uct.ac.za			

2.1 DECLARATION of INDEPENDENCE by the SPECIALIST

I, _Dr Rob Simmons_____, 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

Birds & Bats Unlimited

Name of Company:

1 December 2021

Date

2.2 UNDERTAKING UNDER OATH/AFFIRMATION

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

Signature of the Specialist

Birds & Bats Unlimited

Name of Company

1 December 2021

Date

Signature of the Commissioner of Oaths

Date

3 TERMS of REFERENCE

The Terms of Reference (ToR) for the avian impact amendment assessment are: to compile an addendum to the 2016 specialist' avian reports addressing the following:

- Re-survey the study site to determine if the receiving environment has changed.
- Survey the priority species to determine if they occur with the same frequency as before.
- Survey the site to assess if any changes to the breeding species have occurred since 2016.
- The implications of the proposed amendments in terms of the potential impact(s).
- A detailed description of measures to ensure avoidance, management and mitigation of impacts associated with the proposed changes.
- The re-assessment must take into account and address public comments.
- The re-assessment must consider the findings of the 12-month pre-construction monitoring.

Subsequently the turbine dimensions were amended, and the numbers decreased from 70 turbines, to 60, to 32 (a 51% reduction) thus the ToR includes:

- A part 2 Amendment to assess the change in impacts due to increased hub height (now 125 m for 9 turbines originally of 120 mm hub height) and blade lengths increased as in Table 1 below.

Table 1: Authorised (approved) VS New specifications for the Rietkloof Wind Energy Facility (WEF), October 2021.

	New Specification for Rietkloof WEF (October 2021	**Approved for Rietkloof WEF**
Turbine Generation Capacity	7 MW	Not specified (up to 183MW – with 60 turbines)
Hub Height	125-m	9 turbines – up to 120-m 51 turbines – up to 125-m
Rotor Diameter	180-m	9 turbines – up to 140-m, 51 turbines – up to 160-m
Blade Length	90-m	9 turbines – up to 70-m 51 turbines – up to 80-m
Max upper tip height	215-m	9 turbines – 190-m 51 turbines – 205-m

3.1 STUDY AREA

The proposed Rietkloof wind farm lies in the Roggeveldberg a north-south lying mountain range rising to about 1500-m asl.

The habitat in the study area is described as *Central Mountain Shale Renosterveld* (Mucina & Rutherford 2006, p178). The vegetation comprises components of both the Nama and Succulent Karoo biomes, but mainly with Karoo bushes. The habitat is described *as Least Threatened*, with none conserved in formal protected areas.

This region just north of Matjiesfontein lies in the winter rainfall region but with summer rains also evident. Mean Annual Rainfall varies between 180- and 410-mm with a mean of 290-mm/year. Temperatures vary from a mean of 29.9℃ in summer to 0.9℃ in winter. Winds sweep across the open and undulating landscape, reducing temperatures to low levels. Frost days are common.

Land use is mainly low-level sheep farming, with large and small farm reservoirs attracting wetland birds (African Insights 2016). Indigenous wildlife comprises Klipspringer, Red Rock Hare, Mountain Rhebok and a raptor component reported on below.

3.2 BACKGROUND

The following report is a revision, re-assessment, and a part 2 amendment of the avian impacts EIA Report (African Insights 2016) for the proposed Rietkloof wind energy facility. This is required to re-examine possible impacts arising from:

(i) proposed reductions in the number of wind turbines; and
(ii) proposed increase in turbine dimensions over the authorised turbines (see Table 1)
(iii) possible changes in the receiving environment.

The latter is important given the intense drought apparent in 2016 (African Insights 2016) and the slow return to typical rainfall in 2021.

Specifically, the proposed amendments to the authorised wind farm include the following:

- 70 turbines reduced to 60 turbines and then 34 (a 43% reduction over the Authorised number)
- A reduction in footprint size due to the decrease in number of turbines.

Given the drought conditions in 2016 we may expect an increase in species diversity and possibly breeding by the larger priority species on site in 2021. Thus, one of our main priorities was to check all areas for the breeding of Verreaux's Eagles that are known to occur here (African Insights 2016).

The overall generation capacity has not changed. The layout, of the 34 turbines as defined earlier (African Insights 2016) is shown in Figure 1.

4 METHODS

- This report compares data from 2016 when a years was undertaken (April 2015, August 2015, October 2015, February 2016) with avian surveys covering all seasons in 12 months (African Insights 2016).
- The total number of hours from vantage points (VPs) on Rietkloof in 2016 was 384-hours from eight VPs (African Insights 2016).
- We estimated Passage Rates from the number of flights depicted in Figures 9 and 10 of the African Insights report (2016) and reproduced below (Figures 2 and 3).
- In 2021 Birds & Bats Unlimited undertook a site visit in May and spent 18.8-hours observing from eight VPs (as close as possible to those used by African Insights).
- May is the start of breeding for Verreaux's Eagles (Simmons 2005), thus, the visit was timed to coincide with territorial flights of the main priority species recorded here.
- We define 'Priority Species' as the top 100 most collision-prone species for wind farms (Ralston Paton et al. 2017).

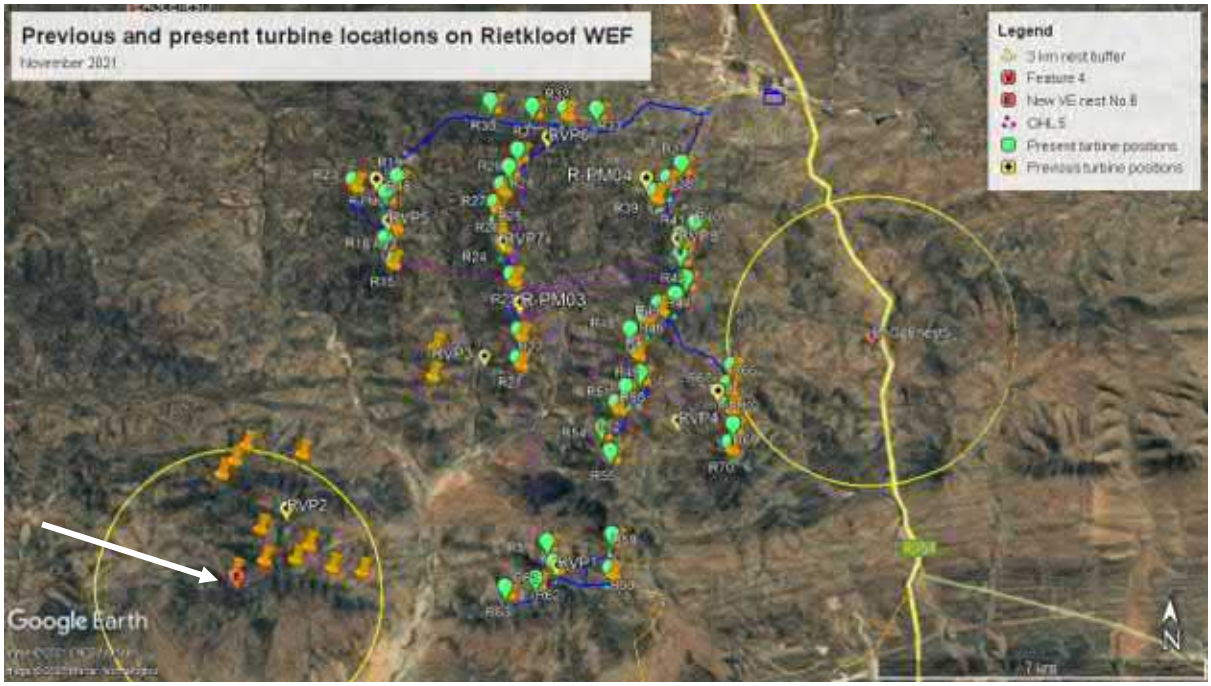


Figure 1: Previous (= orange pins) and newly located (= green pins) turbine positions in the Rietkloof wind farm in the Roggeveld mountains, October 2021 layout. The turbines have been moved away from the south-west corner near the Verreaux's Eagle nest (= red balloon, arrowed) by the client to reduce collision risk to the eagles.

5 SUMMARY of FINDINGS of ORIGINAL EIA REPORT

The main findings of the original avian assessment for Rietkloof (African Insights 2016) can be summarised as follows:

- Four site visits, spanning all four seasons, were undertaken in 2015/2016.
- From eight Vantage Points, 384-hours of observation were undertaken to record priority species on Rietkloof.
- Five raptor species were recorded in that time (Table 1).
- The Verreaux's Eagle was the only Red Data species recorded.
- One active Verreaux's Eagle nest was recorded from the R354 in the east of the site.
- The Passage Rate for the Verreaux's can be estimated at 0.08 eagle flights/hour in 2016.
- The Passage Rate for the remaining Priority species (Booted Eagle, Jackal Buzzard, Pale Chanting Goshawk, excluding the Rock Kestrel) was estimated at 0.04 birds/hour.

Table 1: Four priority raptor species (and the Rock Kestrel) identified in the avian EIA report for Rietkloof in 2015/2016 (African Insights 2016).

Common name	Conservation status	Relative importance of local population[1]	Susceptibility to collision	Susceptibility to electrocution	Susceptibility to disturbance	Likelihood of occurrence
Verreaux's Eagle	Vulnerable	Moderate	High	Low	Medium	Not reported
Pale Chanting Goshawk	Least Concern	Low	Low	Low	Low	Not reported
Booted Eagle	Least Concern	Medium	High	Low	Low	Not reported
Jackal Buzzard	Least Concern	Low?	Very high	High	Moderate	Not reported
Rock Kestrel	Least Concern	Low?	High	Moderate	Moderate	

[1] **An indication whether the population is a core, or marginal, one, relative to the main population.**

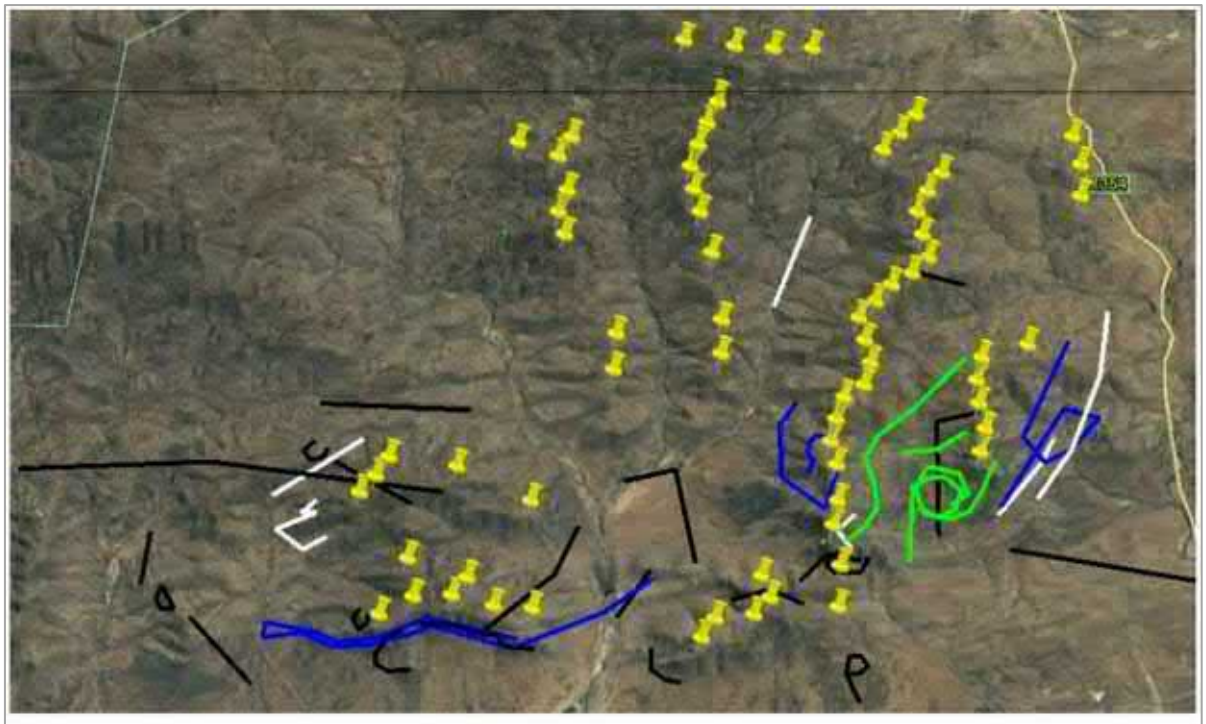


Figure 9: **Verreaux's Eagle seasonal flight paths: autumn: white; winter: black; spring: green; and summer: blue.**

Figure 2: A screenshot from African Insights' report (2016) of the Verreaux's Eagle flights recorded in 2015/16 over 384-hours over four seasons. The Passage Rate for this species, estimated from 30 flights in 384-hours, is ~0.08 eagle flights/hour.

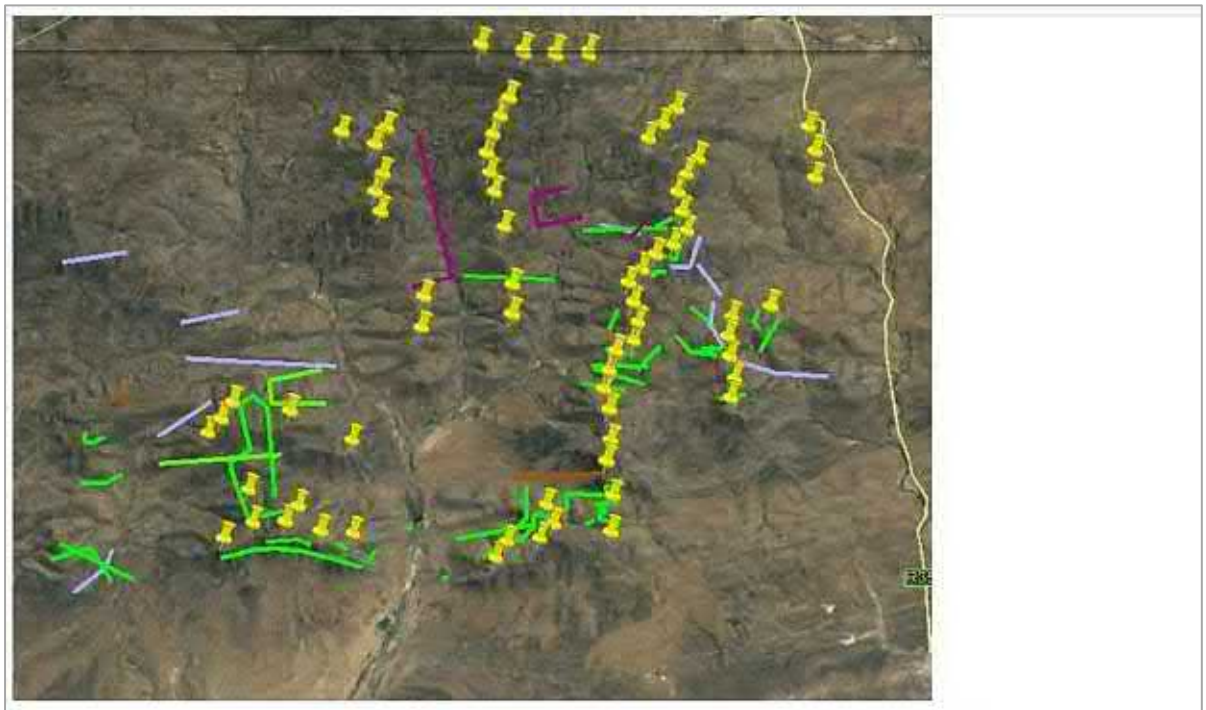


Figure 10: Flight paths across the four seasons of raptors, other than Verreaux's Eagles. Rock Kestrel in green; Pale Chanting Goshawk - grey; Booted Eagle- purple; Jackal Buzzard- brown.

Figure 3: A screenshot from African Insights' report (2016) of all raptor flights (other than Verreaux's Eagles) recorded in 2015/16 over 384-hours over four seasons. The Passage Rates estimated for these four species is approximately 46 flights in 384-hours, or 0.12 flights/hour. Excluding the Rock Kestrel (not a Priority Species) the Passage Rate was 0.04 birds/hour.

6 RESULTS from the 2021 SITE VISIT

Six days spent in the Euronotus cluster, and two days on Rietkloof itself, were devoted to surveying the wind farm to record eagles in flight, and to check all possible nest sites.

Figure 4: All raptor flights (= red lines, zoomed below) over the proposed southern Rietkloof wind farm (turbines = orange pins) recorded in May 2021 in 18.8-hours. Verreaux's Eagles were the only priority species present and the Passage Rates here, based on six flights in 18.8-hours, was 0.32 eagles/hour. As important, an over-looked eagle nest was present in the south-west corner (= New VE nest no. 6) at S 33° 05'5.55" E 20°26'28.40" (arrowed). Yellow circles represent a 3-km buffer around the nests.

- The most important finding in our reassessment of the Rietkloof site in 2021 was the discovery of a previously unrecorded **Verreaux's Eagle nest** site in the south-western corner of the wind farm (Figure 4, and Photo 1). The nesting cliff supported two eagle nests (Photo 1) and during the first drone flight an adult bird was disturbed from the nest cliff. This indicates that the site is active and not merely a historical site.

The second (right hand) nest showed whitewash behind the nest (Photo 1) indicating use within the last year. This nest was not reported by African Insights (2016).

Photo 1: Both new Verreaux's Eagle nests (No. 6) in the south-west corner of the Rietkloof site taken from drone footage of the cliff face. An adult eagle was disturbed from its perch just to the left of this image, indicating that the nest sites are active.

Photo 2: The Verreaux's Eagle nest No. 5 visible from the R354 in the south-east section of the Rietkloof site taken from the tar road in May 2021. The nest is circled (left) and the female is circled to the right. This nest was first reported by African Insights (2016).

- A second important discovery was the recent confirmation (November 2021) of the Black Harrier nest suspected by African Insights (2013), confirmed by F le Roex on 18 November 2021 (Photo 3). The nest is located on the Brandvalley site, but the recommended 3-5 km buffer of this nest just overlaps the Rietkloof WEF. The nearest turbine (R20) on Rietkloof is 4.9-km away, marginally inside the recommended 5-km buffer of the Birdlife South Africa Black Harrier guidelines. Given the marginal nature of this distance we do not believe this turbine offers much risk to the breeding birds here.

Photo 3: The Black Harrier nest located in July 2021 was found to be active on 18 November 2021 as shown above, with a single egg and a pair of birds in attendance. In July the nest had had no eggs, so this is a newly active nest.

In the Northern section of the wind farm, where three turbines occur in the revised layout for the WEF, multiple flights of Black Harriers were recorded in July 2021 (Figure 5).

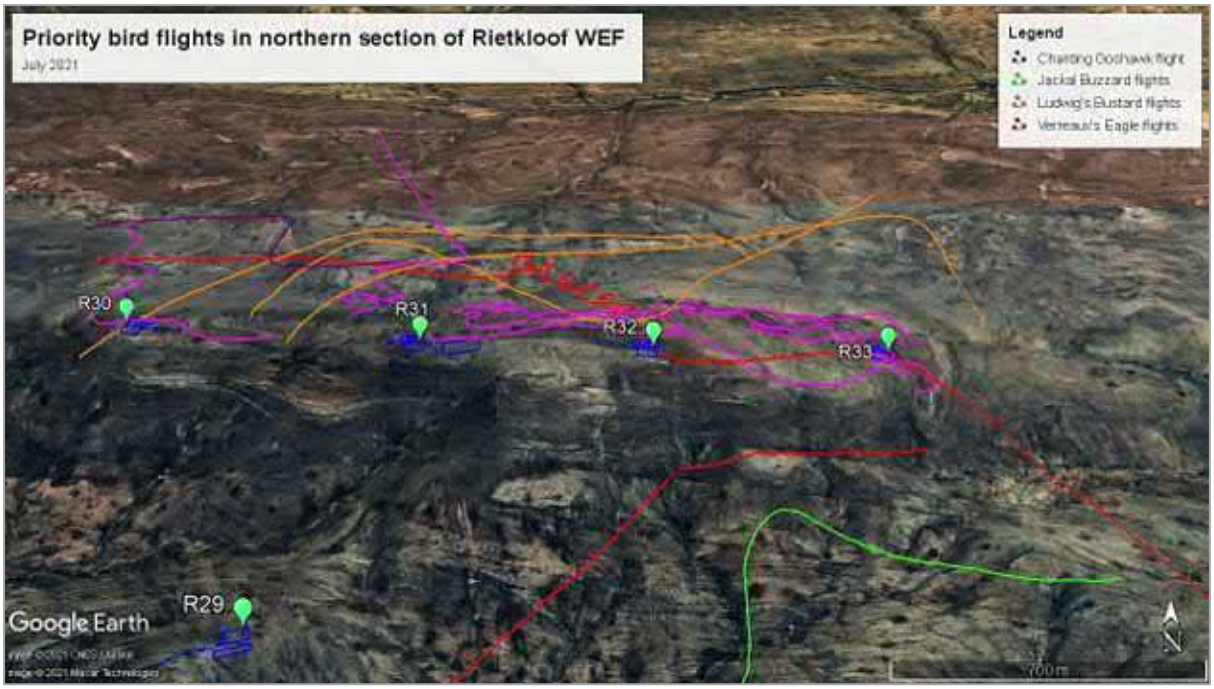


Figure 5: The presence of multiple Black Harrier flights (= purple lines) recorded in July 2021 in the northern section of the Rietkloof wind farm relative to the revised turbine layout for November 2021. BBU recommends that if Red Rocket are in a position to drop certain turbine positions (due to fewer turbines being required), then some or all of these turbines (R30, R31, R32, R33) are considered. More harrier flights were recorded here in November 2021 but are not shown here.

6.1 PASSAGE RATES OVER THE PROPOSED STUDY SITE COMPARED

We completed a total of 56 hours of observations throughout the three development sites in the Euronotus cluster in April 2021. In the Rietkloof wind farm itself we used the same VPs used by African Insights but undertook fewer hours on site (18.8-hours) as this is a re-assessment of the findings, not a full EIA.

- We recorded six eagle flights on Rietkloof in that time giving a Passage Rate of 0.32 eagle/hour for the site.
- This compares with 0.08 eagles/hour recorded in 2015/16 on Rietkloof, a four-fold higher rate in 2021.
- For all Priority species on Rietkloof the Passage Rate was identical (0.32 birds/hour) since all priority birds were Verreaux's Eagles.
- This compares with 0.11 birds/h recorded in 2015/16 on Rietkloof, a three-fold higher rate in 2021 for the priority birds.
- All 2021 flights are shown in Figures 4 and 5.

6.2 EFFECTS of CHANGES and REDUCTIONS in TURBINE POSITIONS

The authorised and proposed turbines will change as follows:

- A total of 60 (authorised) turbines will be reduced to a (proposed) 34 turbines (43% reduction).
- Nine (authorised) turbines had a hub height of 120-m and these are (proposed) to increase to 125-m.
- The remaining 51 (authorised) turbines are (proposed) to remain at 125-m hub height.
- Their (authorised) blade length of 80-m is (proposed) to increase to 90-m (13% increase).

Given that the reduction in numbers of turbines (43%) is more than three-fold higher than the increase in blade length (13%), we do not expect any increase in avian fatalities. Taller turbines and longer blades are generally associated with greater avian fatalities (Loss et al. 2013, Thaxter et al. 2020). To quantify this, we asked UCT statisticians (Drs Birgit Erni and Francisco Cervantes Peralta) to model the increase, using a combination of published data (kindly provide by Dr Scott Loss) and the limited South African data of fatalities from hub heights above 80-m (Ralston Paton et al. 2017).

The two graphs below indicate that (i) avian fatalities increase exponentially as hub height is increased (Figure 1a); but (ii) the exponential increase flattens out when South African data are added to the graph (Figure 1b).

By reading what is predicted at the authorised (120-m) and proposed (125-m) hub heights, we can see (Figure 1b) that the expected fatalities differ by about three birds (16 vs 19).

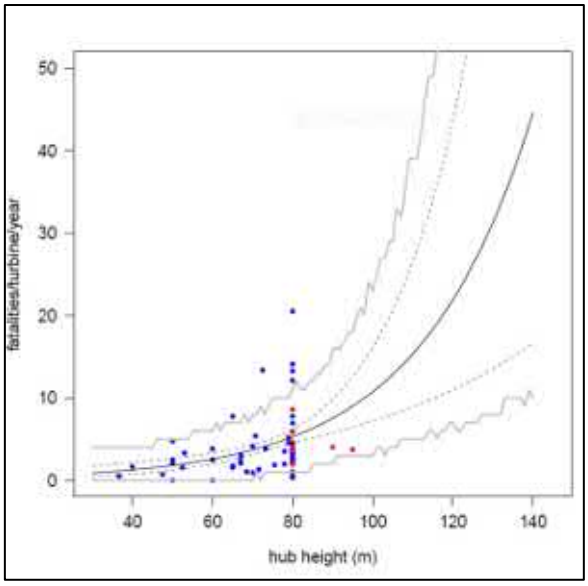


Figure 1a: Prediction intervals from bootstrapping analyses (jagged line) based on North American hub height/fatality data (Loss et al. 2013 = blue data points) to determine if South African data (= red data points) fall within 95% confidence intervals. All 7 data points fall within the confidence intervals.

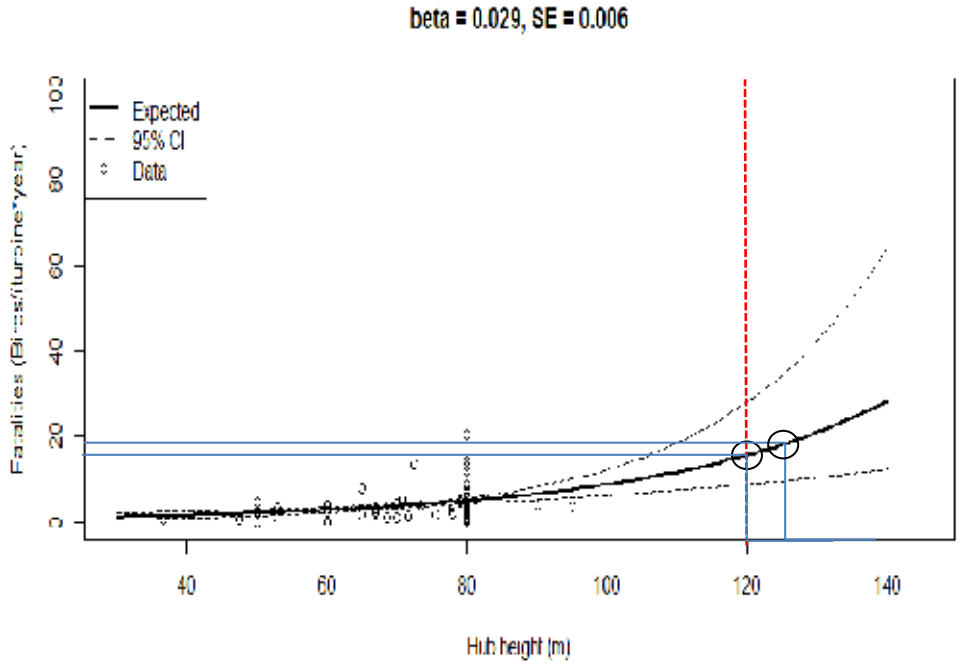


Figure 1b: Modelled data combining avian fatalities from the USA (Loss et al. 2013) and from South Africa (Ralston-Paton et al. 2017) and their relation to hub height. The South African data (n = 7 farms) include two with hub heights of 90 m and 95 m. The combined data and 95% confidence limits predict that 16 birds (95% CI = 9, 28) will be killed on average per year for 120 m-high turbines and about 19 birds on average for 125 m-high turbines. Thus, the increase in fatalities is marginal (3 birds/ turbine/y) according to this assessment. We were not able to model the fatalities due to blade length increase, but we assume they will be similar to that predicted here.

This means that with a decrease in the number of turbines from 60 to 34 the following fatalities are expected

- 60 turbines of 120-m hub height are predicated to kill 60 x 16 birds = 960 fatalities (from Figure 1b).
- 34 turbines of 125-m hub height are predicated to kill 34 x 19 birds = 661 fatalities (from Figure 1b)

Thus, the fewer, larger, turbines are expected to kill fewer birds and, thus, the significance of the predicted impacts will be lower. The above calculation is simplified using 60 turbines of 120-m hub height. The actual number of larger turbines is only nine, and, thus, even fewer fatalities are predicted for the *proposed* VS the *authorised* turbines.

A further reduction in the significance of the impacts is expected from the following action by Red Rocket (Pty) Ltd.

In mid-November 2021, following discussions with the client, eleven turbines were relocated away from the newly discovered Verreaux's Eagle nest in the south-west corner of the Rietkloof site. The number of turbines were also reduced from the original 60, to 34. The changes are, thus, highly advantageous in reducing the possible threats to the breeding eagles and the nearest turbines to the eagle nest are now 5.6-km away. As such this is beyond what the new Verreaux's Eagle guidelines (Ralston Paton and Murgatroyd in prep.) recommend *(5.2-km) and, thus, unlikely to impact Verreaux's Eagles here.*

As this report is revised in line with the new layout (November 2021) confirmation has been received that Black Harriers are breeding 4.9-km to the west of the Rietkloof WEF (on the Brandvalley WEF) and, thus, marginally within the 3-5-km buffer recommended for this *Endangered* species. We don't expect this to have a major impact on this species given that only one short harrier flight has been recorded near the closest turbine (R20) in July and (the current) November 2021 site visits.

Most flights of Black Harriers were recorded on the northern-most ridge (Figure 5). This area is, thus, designated of *High* sensitivity even though no harrier nests are known here.

7 MITIGATIONS

The discovery of the new Verreaux's Eagle nest in the southwest sector, and the newly active Black Harrier nest on the adjacent Brandvalley WEF (within 5-km of the Rietkloof site), presents a challenge for the developers as Red Rocket (Pty) Ltd have already selected positions for turbines in this area, without any previous knowledge of Red Data species nests here.

Eleven turbines are planned for this south-western area (Figure 6) and some will be affected by whichever buffer is created around the nest. We have shown both the 1.5- and 3.0-km buffers in our Figure 6 below. However, in discussions with **Red Rocket they have agreed to drop all eleven turbines from this south-west section** and thereby reduce, considerably, the risk to the Verreaux's Eagles.

Birds & Bats Unlimited is grateful that the developer is willing to undertake this to reduce the risk to the eagles.

These positions are shown in Figure 6 for clarity.

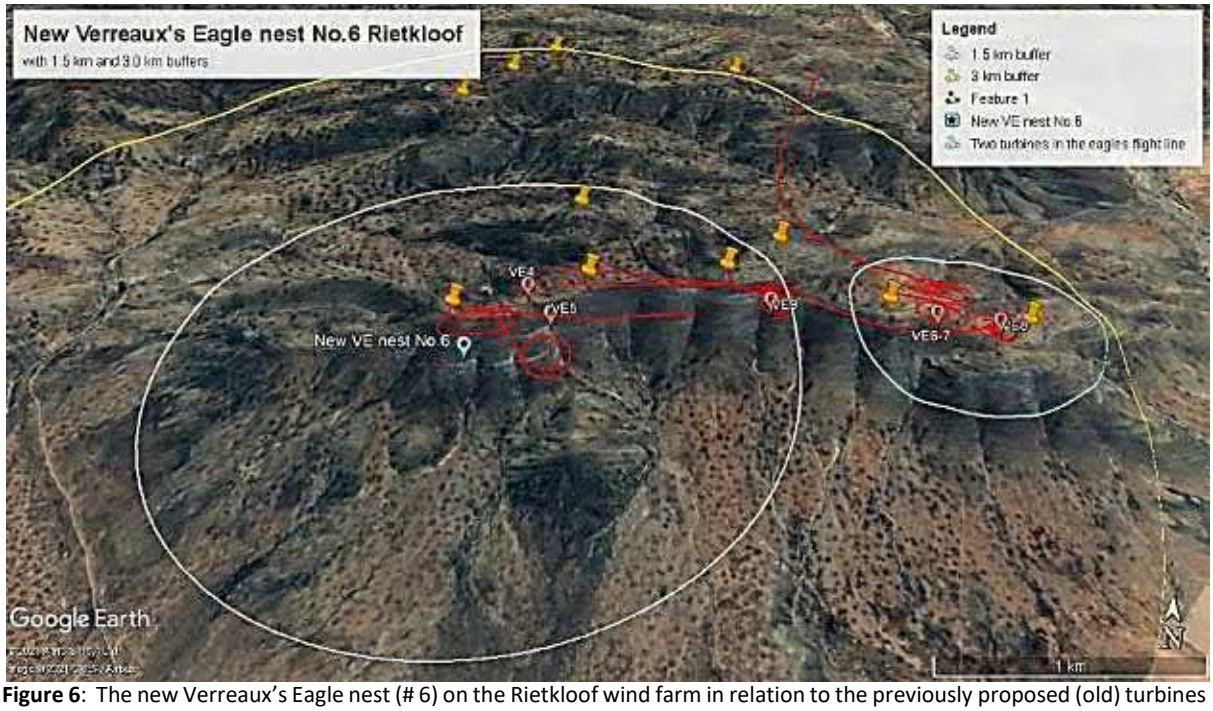


Figure 6: The new Verreaux's Eagle nest (# 6) on the Rietkloof wind farm in relation to the previously proposed (old) turbines (=orange pins) and two possible buffers. All of these turbines have now been removed (dropped) from this area by the developer: this will substantially reduce the risk to the Verreaux's Eagles in this wind farm.

The second area of concern is the ridge in the northern section of the WEF (Figure 7). This area showed unusually high activity of Black Harrier flights even though no nest is known nearby.

We recommend, the following:

- if the client has the opportunity to drop turbines from the authorised layout (because of the reduction from 60 to 34 turbines) that they do so from this northern ridge, that is: the four turbines R30, R31, R32, R33.
- If this compromises the energy yield of the wind farm, then these four turbines can remain, but they should be mitigated with striped-blade mitigation and/or automated shut down on demand (SDOD), or observer-lead SDOD.

These mitigations should reduce the risk to Black Harriers flying through this area.

8 CONCLUSIONS

The presence of four to five Priority and Red Data bird species in the Rietkloof Wind Farm area (particularly Verreaux's Eagles and Black Harriers) requires careful siting of the proposed turbines.

Our 2021 monitoring revealed that:

- Passage Rates of the Priority birds at 0.32 birds/hour were three-fold higher for all Priority birds and four-fold higher (0.32 vs 0.08 birds/hour) for the Red Data Verreaux's Eagles, than Passage Rates recorded in 2016 (African Insights 2016). This is probably related to the drought conditions present in 2016.
- We also discovered a second Verreaux's Eagle nest site (VE nest No. 6) in the south-west corner of the Rietkloof site, with two nest structures and an adult eagle in attendance in May 2021. We doubt this is a recently started nest area given the size of the structures and number of nests here.
- The previously recorded nest (2016) in the south-east corner, visible from the R354 was also active in 2021.

The 2016 African Insights' monitoring recommended a 1.5-km buffer around the Verreaux's Eagle nest and the Environmental Authorisation reflected that. This is at odds with the Verreaux's Eagle guidelines (Ralston 2017) that a year later recommending 3.0-km nest buffers.

Eleven proposed turbines fall within the recommended 3.0-km buffers, and four proposed turbines fall within the Authorised 1.5-km buffers.

On recommending a 3.0-km buffer around this newly discovered eagle nest Red Rocket have removed (November 2021) all 11 turbines that occur within these buffers. In doing so they have not only complied with the new Verreaux's Eagle guidelines but have significantly reduced the likely impact of these turbines on the foraging eagles.

During our November 2021 monitoring we verified an active Black Harrier nest to the west of the Rietkloof WEF but outside the recommended buffers of 3- to 5-km for this species. As such this nest is not at risk. However, the high flight activity of Black Harriers along the northern-most ridge of the WEF is cause for concern from turbines R30, 31, 32, 33 and if these turbine positions can be dropped as part of the reduction in turbine numbers, this too, will go a long way towards reducing impacts to this *Endangered* species.

To mitigate further any impacts to Priority birds and, specifically,

the harriers and eagles, we recommend:

(i) Erecting the turbines with striped-blade mitigation (painted before installation) to increase turbine visibility for the eagles (May et al. 2020).

(ii) The advantages of this mitigation are that:
   (a) raptors see well in colour.
   (b) Two broad stripes across the blade are the most visible pattern to both raptors (kestrels and buzzards) and humans (McIsaac 2001).
   (c) 'Signal red' is already approved by South African Civil Aviation for towers and other tall structures.
   (d) Blade manufacturers, such as Siemens and Vestas, already produce painted blades in Europe; and
   (e) this mitigation has no running costs.
   www.engineeringnews.co.za/article/opinion-black-blade-mitigation-a-new-and-exciting-mitigation-for-wind-turbines-to-reduce-impacts-to-birds-of-prey-2020-10-09/

(iii) Should painted blades be ineffective, additional mitigations should include automatic shut-down on demand with systems such as DT-Bird and Bioseco.

If post-construction monitoring indicates that one or more highly threatened Red Data raptors are killed at one turbine then an adaptive management plan must be initiated within two months to reduce the fatalities. We recommend, then, an automated shut down-on-demand system for each problem turbine.

Mitigations during construction phase should include avoiding road or powerline construction within 500-m of active nests of Red Data species during the early breeding season. For Verreaux's Eagles this is May-July and again during August-September when small vulnerable nestlings are present (Simmons 2005). Since *Endangered* Black Harriers have been found breeding, construction should be avoided in August-September.

We suggest that the Rietkloof wind farm proceeds with caution given the likelihood of avian fatalities, and:

(i) an additional 6-months pre-construction monitoring be undertaken as prescribed by the DFFE;
(ii) all mitigation detailed above be implemented; and
(iii) construction-phase and post-construction phase monitoring be undertaken for a minimum of 24 months to inform the possible, and actual, impacts to the avian community.

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5 July 2021
Revised 1 December 2021

APPENDIX 1:

Striped patterns tested for conspicuousness by McIsaac (2001) on raptors and people. For both groups, pattern No. 4 was perceived best of all, while the white blade (No. 1) was amongst the least conspicuous of the spinning blades tested.

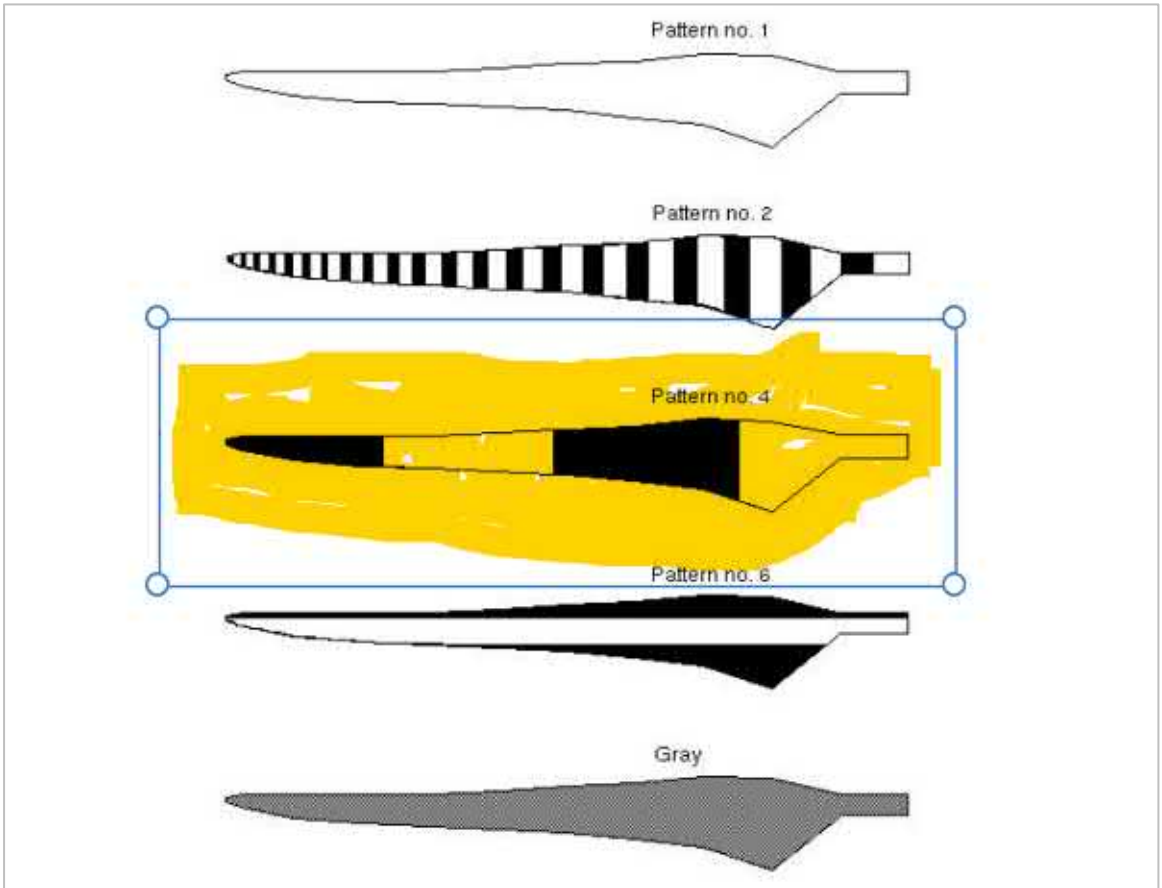

FIGURE 12. Kestrel-perceived blade-pattern conspicuity: stimulus blade patterns. *Depicted are the four black-and-white test patterns and the gray control pattern that were used to determine pattern conspicuity as perceived by a kestrel.*

APPENDIX

H BAT WALKDOWN LETTER

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13 November 2021

Verification of the authorised Rietkloof wind energy facility (WEF) turbine layout, in relation to the bat sensitivity map and impacts on bats.

Animalia Consultants (Pty) Ltd) completed the 12-months pre-construction bat monitoring for the 147MW Rietkloof Wind Energy Facility (WEF). The final preconstruction bat impact report also served as the EIA phase bat report and was submitted in May 2015. It included the assessments of impacts as required for the EIA phase.

In November 2016, the Department of Environmental Affairs (DEA) issued the Environmental Authorisation (EA), a Part 2 Amendment is proposed by the applicant for a turbine hub height of 125m and a rotor diameter of 180m. Therefore, the assessment of the turbine layout, bat sensitivity map and on-site verification, in relation to impacts on bats, considered the proposed turbine dimensions of a hub height of 125m and a rotor diameter of 180m.

A site visit was conducted on 13 September 2021 by Animalia Consultants (Pty) Ltd to verify the turbine layout in relation to the approved bat sensitivity map. The proposed turbine layout respects the bat sensitivity map as was applicable during the preconstruction guidelines that was in use during the EIA assessment and subsequent amendments (**Figure 1**). It also respects the current guideline criteria which requires turbine blade length to be outside the high sensitivity buffers, except for Turbines R27, R37 and R49.

According to the passive bat activity data collected on site during the preconstruction study, bat activity at 50m height was significantly less than activity at a lower altitude of 10m. However, the decrease in the lowest rotor swept height is not significant enough to influence the assessments of the impacts as identified in the EIA phase bat assessment report. But it should be noted that the larger rotor diameter effectively brings the impact zone of each turbine closer to all bat sensitivity buffers, and no part of the turbine (including the turbine blades) is allowed to intrude into high bat sensitivity buffers.

The sensitivity map for the Rietkloof Wind Farm site was updated in October 2018. This update predominantly consisted of the delineation of watercourses within of the Riektloof project area, using the open source SAGA GIS tool. This tool uses the topography of the area based on a 5m digital elevation model to calculate the channel flow. The tool first fills the sinks. A sink is a cell or set of spatially connected cells whose flow direction cannot be assigned one of the eight valid values in a flow direction raster. This can occur when all neighbouring cells are higher than the processing cell or when two cells flow into each other, creating a two-cell loop. To create an accurate representation of flow direction and, therefore, accumulated flow, it is best to use a dataset that is free of sinks. A digital elevation model (DEM) that has been processed to remove all sinks is called a

depressionless DEM. Next, the flow accumulation is calculated meaning how much water can accumulate in one cell (in m3). Thresholds of 50k, 75k and 100k were considered and 75k was determined to be the most accurate threshold with the least amount of data 'noise' (**Figure 1**).

On a flat surface the distance from a high sensitivity must be 200m, which constitutes the high sensitivity buffer. This includes all parts of a turbine such as the turbine blades, and is in line with the MacEwan, et al. (2020) Preconstruction Guidelines. Therefore, based on a rotor diameter of 180m (blade length of 90m), the turbine base position must be 290m or more from any high bat sensitivities and 90m from high sensitivity buffers. However, in this case the actual bat sensitivities are at a lower elevation in valleys and the turbines are proposed on the ridges. In cases where the turbine base was closer than 90m to the high sensitivity buffer, a formula was applied to consider the hub height of 125m, 90m blade length and difference in elevation of turbine base and sensitivity. In order to calculate the distance of the base to the buffer required for maintaining a minimum of 200m from a blade tip to an actual sensitivity. This formula was only required for Turbine R27 since its blades are intruding into the high bat sensitivity buffers to the East (**Figure 2**).

Formula used: b=√((200+bl)2 -(hh+ed)2), derived from Mitchell-Jones & Carlin (2009).

Where:

b= horizontal distance required from turbine base to high sensitivity buffer

bl = blade length

hh= hub height

ed= elevation difference between turbine base and actual sensitivity

When considering a 90m blade length, based on above calculation considering the difference in elevation between the bat sensitivity and the turbine base position, Turbines R27, R37 and R49 base centre points should be moved to be outside the high b at sensitivity buffer. All other turbines proposed can remain in the currently authorised positions. The significance ratings of the original impacts identified will not change as a result of the amendments.

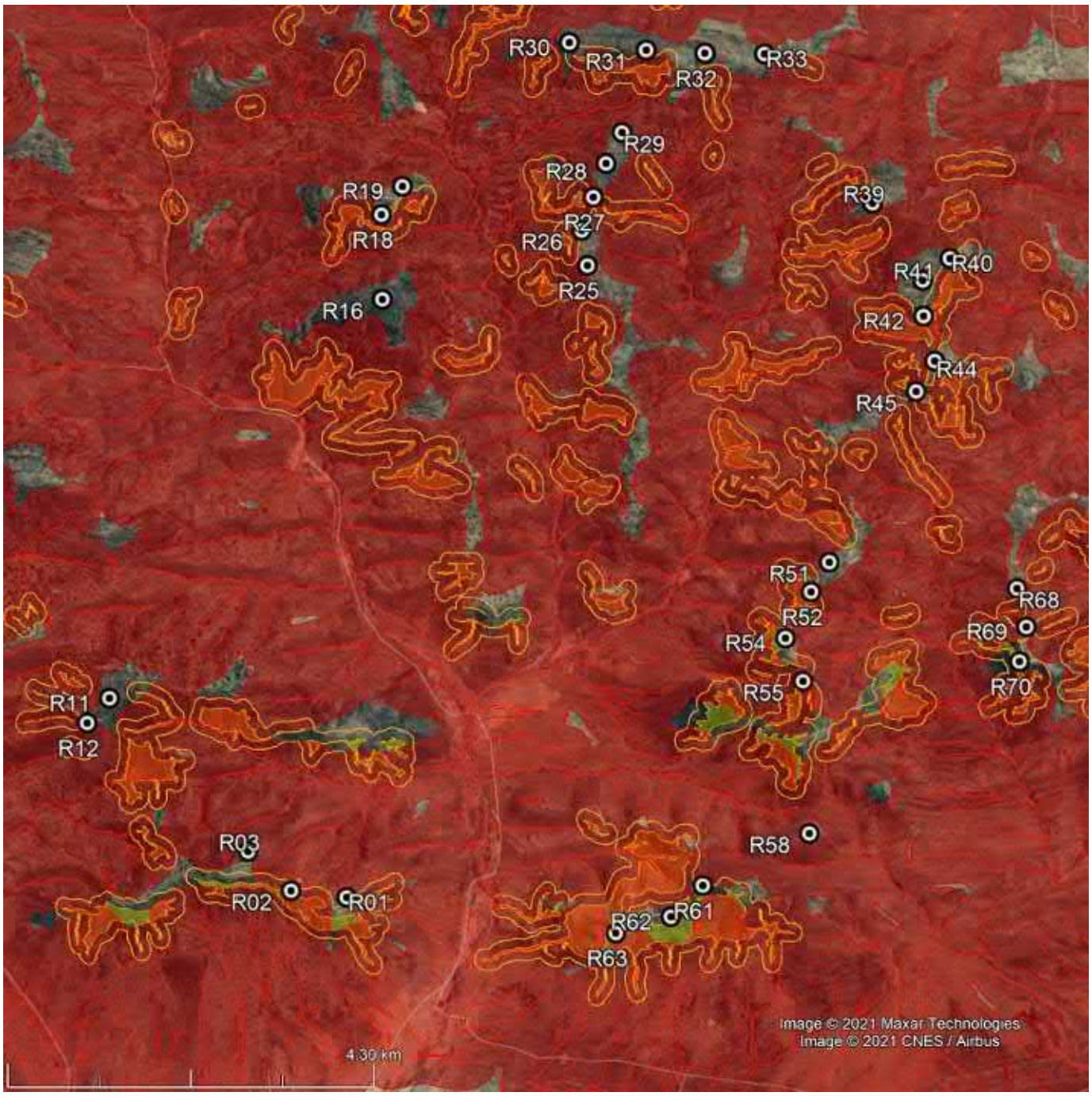

Figure 1: Bat sensitivity map of the Rietkloof site with proposed turbine layout.

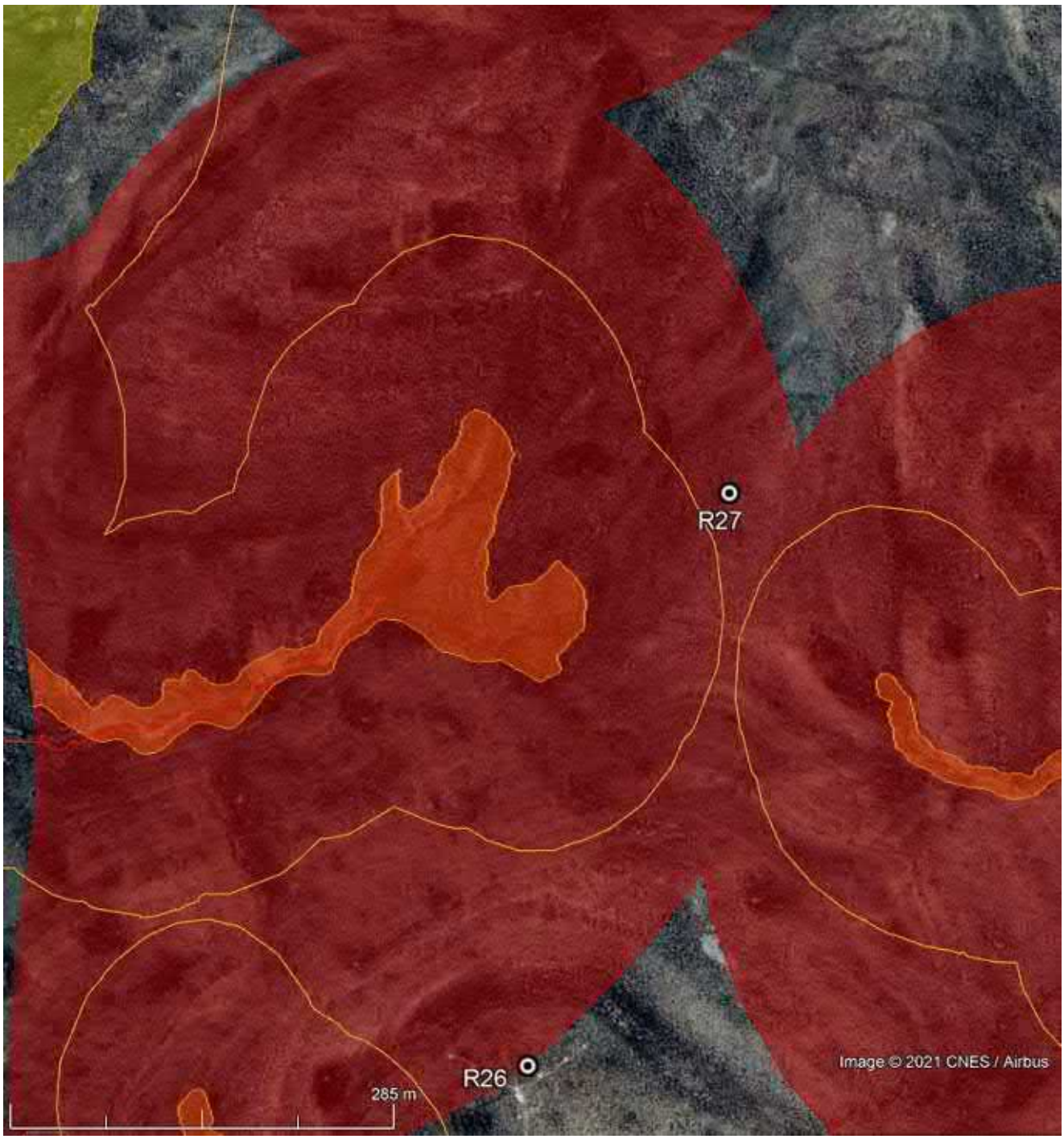

Figure 2: Indication of Turbine 27 in relation to the bat sensitivity buffers (without applying 3D model). Turbine 27 is still inside the high sensitive buffer when applying the 3D model

ANiMALiA
consultants

In summary, the proposed layout is acceptable from a bat sensitivity perspective if all conditions of the EA are adhered to, an operational bat impact monitoring study is conducted for a minimum of 2 years, and Turbines R27, R37 and R49 base centre points should be moved to be outside the high b at sensitivity buffer.

If there are any queries, please do not hesitate to contact me.

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APPENDIX

I ECOLOGY WALKDOWN REPORT

Project N#: TP210521-01

TERRESTRIAL ECOLOGY & BIODIVERSITY WALKDOWN REPORT RIETKLOOF WIND ENERGY PROJECT

Client: WSP in Africa
Building C
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Report N#: TP210521-01C – REVISION 2
Date: 2021/11/25

1 Report Release Notice

Report Status	Date	Authorised
Internal Draft	2021/09/27	Jamie Pote
Reviewed	2021/10/07	Malcolme Logie
Final Report	2021/10/07	Malcolme Logie
Final Report (Revised Layout) Rev 1	2021/11/20	Malcolme Logie
Final Report (Revised Layout) Rev 2	2021/11/25	Malcolme Logie

2 Revision Tracker

Date	Section	Revision
2021/11/25	Methodology	Additional text – New laydown area
2021/11/25	Project Description	Revised bullet points
2021/11/25	Turbines, Roads and other Infrastructure	Update text reference to Table 6 and Table 7
2021/11/25	Turbines, Roads and other Infrastructure	Update Table 10
2021/11/25	Turbines, Roads and other Infrastructure	Delete Figure 8 - redundant
2021/11/25	Walkdown Conclusions and Recommendations	Update text reference to Table 6 and Table 7
2021/11/20	Project Description	Updated the number of turbines on site
2021/11/20	Site locality	Replaced Figure 1 Revised Layout
2021/11/20	Regional Vegetation Units	Replaced Figure 2 Revised Layout
2021/11/20	Bioregional Planning (Critical Biodiversity Areas)	Replaced Figure 3 Revised Layout
2021/11/20	Refined vegetation mapping	Replaced Figure 4 Revised Layout
2021/11/20	Sensitive and Critical Habitat features identified during walkdown (Overview)	Replaced Figure 5 Revised Layout

2021/11/20	Sensitive and Critical Habitat features identified during walkdown (North)	Replaced Figure 6 Revised Layout
2021/11/20	Sensitive and Critical Habitat features identified during walkdown (South)	Replaced Figure 7 Revised Layout
2021/11/20	Critical Habitat identified and WEF infrastructure	Replaced Figure 8 Revised Layout
2021/11/20	Walkdown Conclusions and Recommendations	Revised turbine numbers

Contents

3 List of Tables

4 List of Figures

5 Abbreviations

AOI	Area of Influence
AOO	Area of Occupancy (the area within its 'extent of occurrence' which is occupied)
CARA	Conservation of Agricultural Resources Act, Act 43 of 1983
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs (*now DFFE, see below*)
DENC	Northern Cape Department of Environmental Affairs and Nature Conservation
DFFE	The Department of Environmental Affairs was renamed the Department of Forestry and Fisheries and the Environment (DFFE), incorporating the forestry and fisheries functions from the previous Department of Agriculture, Forestry and Fisheries and department of Environmental Affairs (DEA).
DEMC	Desired Ecological Management Class
DWS	Department of Water Affairs and Sanitation
DWAF	Department of Water Affairs and Forestry (former department name)
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMC	Ecological Management Class
EMP	Environmental Management Plan
EMPr	Environmental Management Programme report
EOO	Extent of Occurrence (the spatial spread of the areas currently occupied)
ER	Environmental Representative
ESS	Ecosystem Services
IAP's	Interested and Affected Parties
IEM	Integrated Environmental Management
LHS	Left Hand Side (refers to river bank facing downstream)
LM	Local Municipality
MAP	Mean Annual Precipitation
masl	meters above sea level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, Act 107 of 1998
NFA	National Forests Act
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NFA	National Forest Act, Act 84 of 1998
PEMC	Present Ecological Management Class
PES	Present Ecological State
PNCO	Provincial Nature and Environment Conservation Ordinance (No. 19 of 1974).
RDL	Red Data List
RHS	Right Hand Side (refers to river bank facing downstream)
RoD	Record of Decision
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SoER	State of the Environment Report
SCC	Species of Conservation Concern
ToPS	Threatened of Protected Species (NEM:BA)
ToR	Terms of Reference
+ve	Positive
-ve	Negative

6 Definitions

Area of Influence	Area of Influence WB OP 4.01, Annex A, para. 6: "The area likely to be affected by the project, including all its ancillary aspects, such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, and construction camps, as well as unplanned developments induced by the project." A single project may have more than one AOI, for example different environmental and social aspects will/may have different AOI
Alien Invasive Species (AIS)	An alien species whose introduction and/or spread threaten biological diversity (Convention on Biological Diversity). Note: "*Alien invasive species"* is considered to be equivalent to "*invasive alien species"*. An alien species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity (*IUCN*).
Area of Occupancy (AOO)	Area of Occupancy is the area within its 'extent of occurrence' which is occupied. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats.
Biodiversity	Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.
Boundary	Landscape patches have a boundary between them which can be defined or fuzzy (Sanderson and Harris, 2000). The zone composed of the edges of adjacent ecosystems is the boundary.
Catchment	In relation to a watercourse or watercourses or part of a watercourse, means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points.
Connectivity	The measure of how connected or spatially continuous a corridor, network, or matrix is. For example, a forested landscape (the matrix) with fewer gaps in forest cover (open patches) will have higher connectivity.
Corridors	Have important functions as strips of a landscape differing from adjacent land on both sides. Habitat, ecosystems or undeveloped areas that physically connect habitat patches. Smaller, intervening patches of surviving habitat can also serve as "steppingstones" that link fragmented ecosystems by ensuring that certain ecological processes are maintained within and between groups of habitat fragments.
Critically Endangered (CR)	A category on the IUCN Red List of Threatened Species which indicates a taxon is considered to be facing an extremely high risk of extinction in the wild (*IUCN*).
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat(*IUCN*).
Degraded Habitat/Land	Land that has been impacted upon by human activities (including introduction of invasive alien plants, light to moderate overgrazing, accelerated soil erosion, dumping of waste), but still retains a degree of its original structure and species composition (although some species loss would have occurred) and where

	ecological processes still occur (albeit in an altered way). Degraded land is capable of being restored to a near-natural state with appropriate ecological management.
Disturbance	An event that significantly alters the pattern of variation in the structure or function of a system, while fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. Disturbance is generally considered a natural process.
Ecological Function	How each of the elements in the landscape interacts based on its life cycle events [Producers, Consumers, Decomposers Transformers]. Includes the capacity of natural processes and components to provide goods and services that satisfy human needs, either directly or indirectly.
Ecological Processes	Ecological processes typically only function well where natural vegetation remains, and where the remaining vegetation is well-connected with other nearby patches of natural vegetation. Loss and fragmentation of natural habitat severely threatens the integrity of ecological processes. Where basic processes are intact, ecosystems are likely to recover more easily from disturbances or inappropriate actions if the actions themselves are not permanent. Conversely, the more interference there has been with basic processes, the greater the severity (and longevity) of effects. Natural processes are complex and interdependent, and it is not possible to predict all the consequences of loss of biodiversity or ecosystem integrity. When a region's natural or historic level of diversity and integrity is maintained, higher levels of system productivity are supported in the long run and the overall effects of disturbances may be dampened.
Ecosystem	All the organisms of a habitat, such as a lake or forest, together with the physical environment in which they live. A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
Ecosystem Services	Ecosystem services valued by humans are often underpinned by biodiversity. Impacts on biodiversity can therefore often adversely affect the delivery of ecosystem services. This Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle.
Edge	The portion of an ecosystem near its perimeter, where influences of the adjacent patches can cause an environmental difference between the interior of the patch and its edge. This edge effect includes a distinctive species composition or abundance in the outer part of the landscape patch. For example, when a landscape is a mosaic of perceptibly different types, such as a forest adjacent to a grassland, the edge is the location where the two types adjoin. In a continuous landscape, such as a forest giving way to open woodland, the exact edge location is fuzzy and is sometimes determined by a local gradient exceeding a threshold, as an example, the point where the tree cover falls below thirty-five percent.
Endangered (EN)	Endangered terrestrial ecosystems have lost significant amounts (more than 60 % lost) of their original natural habitat, so their functioning is compromised. A taxon (species) is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild (*IUCN*).
Endemic	A plant or animal species, or a vegetation type, which is naturally restricted to a defined region or limited geographical area. Many endemic species have widespread distributions and are common and thus are not considered to be under any threat. They are however noted to be unique to a region, which can

	include South Africa, a specific province or a bioregion, vegetation type, or a localised area. In cases where it is highly localised or known only from a few or a few localities, and is under threat, it may be red listed either in terms of the South Africa Threatened Species Programme, NEMBA Threatened or Protected Species (ToPS) or the IUCN Red List of Threated Species.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Evolutionary Processes	The process by which genetic changes have taken place and continue to take place in populations of plants and animals over successive generations in response to environmental changes. Evolutionary Processes includes the mechanisms that produce the biodiversity of life and include Mutation and Migration (Gene Flow), Genetic Drift, Natural Selection, Common Descent, Speciation, Sexual Selection, and Biogeography. Disruptions to evolutionary processes can prevent ecosystems and species from adapting to environmental change over time. Significant fragmentation is considered to be an important disrupter of evolutionary pr0cesses.
Exotic	Non-indigenous; introduced from elsewhere, may also be a *weed* or alien *invasive* species. Exotic species may be invasive or non-invasive.
Extent of Occurrence (EOO)	Extent of Occurrence is the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence.
Fragmentation (Habitat Fragmentation)	The 'breaking apart' of continuous habitat into distinct pieces. Causes land transformation, an important current process in landscapes as more and more development occurs.
Habitat	The home of a plant or animal species. Generally, those features of an area inhabited by animal or plant which are essential to its survival.
IFC PS6	International Finance Corporation Performance Standard 6 – A standard guiding biodiversity conservation and sustainable management of living natural resources for projects financed by the International Finance Corporation (IFC)
Indicator species	A species whose status provides information on the overall condition of the ecosystem and of other species in that ecosystem. They reflect the quality and changes in environmental conditions as well as aspects of community composition.
Indigenous	Native; occurring naturally in a defined area.
Indigenous Species (Native species)	A species that has been observed in the form of a naturally occurring and self-sustaining population in historical times (*Bern Convention 1979*). A species or lower taxon living within its natural range (past or present) including the area which it can reach and occupy using its natural dispersal systems (*modified after the Convention on Biological Diversity*)
Indirect Impact	Impacts triggered in response to the presence of a project, rather than being directly caused by the project's own operations (BBOP)
Landscape	An area of land that contains a mosaic of ecosystems, including human-dominated ecosystems (Millennium Ecosystem Assessment).
Least Threatened / Least Concern (LC)	These ecosystems have lost only a small proportion (more than 80 % remains) of their original natural habitat and are largely intact (although they may be degraded to varying degrees, for example by invasive alien species, overgrazing, or overharvesting from the wild). A taxon (species) is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category (*IUCN*).

Matrix	The "*background ecological system*" of a landscape with a high degree of connectivity.
Near Threatened (NT)	A taxon (species) is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (*IUCN*).
Patch	A term fundamental to landscape ecology, is defined as a relatively homogeneous area that differs from its surroundings. Patches are the basic unit of the landscape that change and fluctuate, a process called patch dynamics. Patches have a definite shape and spatial configuration and can be described compositionally by internal variables such as number of trees, number of tree species, height of trees, or other similar measurements.
Protected Area	A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Rare or Critically Rare	Non-IUCN category status for species, as indicated by SANBI where formal assessment and classification has not been undertaken, or species does not meet IUCN criteria, but species is thought to be under threat.
Refugia	A location which supports an isolated or relict population of a once more widespread species. This isolation can be due to climatic changes, geography, or human activities such as deforestation and overhunting.
Rehabilitation	Measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised. Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services, whereas the goals of restoration also include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure (BBOP).
Restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. An ecosystem has recovered when it contains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy. It would sustain itself structurally and functionally, demonstrate resilience to normal ranges of environmental stress and disturbance, and interact with contiguous ecosystems in terms of biotic and abiotic flows and cultural interactions (IFC).
Riparian	Pertaining to, situated on or associated with the banks of a watercourse, usually a river or stream.
Riparian Habitat	Includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.
Seep	A moist or wet place where water, usually groundwater, reaches the earth's surface from an underground aquifer
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED).
Terrestrial	Occurring on, or inhabiting, land.
Threatened Species	Umbrella term for any species categorised as Critically Endangered, Endangered or Vulnerable by the IUCN Red List of Threatened Species (*IUCN*). Any species that is likely to become extinct within the foreseeable future throughout all or part of its range and whose survival is unlikely if the factors causing numerical decline or habitat degradation continue to operate (EU).
Transformation	In ecology, transformation refers to adverse changes to biodiversity, typically

	habitats or ecosystems, through processes such as cultivation, forestry, drainage of wetlands, urban development or invasion by alien plants or animals. Transformation results in habitat fragmentation – the breaking up of a continuous habitat, ecosystem, or land-use type into smaller fragments.
Transformed Habitat/Land	Land that has been significantly impacted upon as a result of human interferences/disturbances (such as cultivation, urban development, mining, landscaping, severe overgrazing), and where the original structure, species composition and functioning of ecological processes have been irreversibly altered. Transformed habitats are not capable of being restored to their original states.
Vulnerable (Vu)	Vulnerable terrestrial ecosystems have lost some (more than 60 % remains) of their original natural habitat and their functioning will be compromised if they continue to lose natural habitat. A taxon (species) is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild (*IUCN*).
Watercourse	Natural or man-made channel through or along which water may flow. A river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows. and a reference to a watercourse includes, where relevant, its bed and banks;
Weed	An indigenous or non-indigenous plant that grows and reproduces aggressively, usually a ruderal pioneer of disturbed areas. Weeds may be unwanted because they are unsightly, or they limit the growth of other plants by blocking light or using up nutrients from the soil. They can also harbour and spread plant pathogens. Weeds are generally known to proliferate through the production of large quantities of seed.
Wetlands	A collective term used to describe lands that are sometimes or always covered by shallow water or have saturated soils, and where plants adapted for life in wet conditions usually grow.

7 Introduction

Trusted Partners were appointed by WSP in Africa to undertake an ecological site walkdown for the proposed Rietkloof Wind Energy Facility.

The Rietkloof Wind Energy Facility walkdown has been undertaken in fulfilment of specific conditions contained in the Environmental Authorisation Reg. No. 14/12/16/3/3/1/1977 dated 10 April 2019 and subsequent amendments issued by Department of Environmental Affairs

- Condition 32: *The final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by ecological, avifaunal, bat, surface water and heritage specialists.*

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Environmental Authorisation Reg. No. 14/12/16/3/3/1/1590 dated 23 November 2016 and subsequent amendments issued by Department of Environmental Affairs

- No walkdown is specified in the EA.

The primary purpose of the ecological walkdown, as per the EA condition is to *ensure that the micro-siting of the turbines and power line has the least possible impact* and *all protected plant species impacted are identified*. As a secondary outcome a species list of protected species as well as species suited to translocation is provided.

This report is one of several undertaken for a series of adjacent Wind Energy Facility Projects within an overlapping Area of Influence. The general descriptions provided in this report are thus an overview of the broader area and may contain information that has been summarised from separate but contiguous or overlapping site assessments in order to more effectively contextualise the broader environment and the area of influence as well as to better understand the *'bigger picture'*, since the natural environment is interconnected, and as will become evident the local environment is strongly influenced by the surrounding area.

8 Methodology

The site walkdown was undertaken in the time-period between August 30, 2021, and September 11, 2021. The Level-of-Effort was three persons, consisting of two Natural Scientists and one Technician. The site walkdown was undertaken shortly after a particularly rainy period, which

was evident in the notable flowering proliferation, which progressed throughout the site visit period. While the seasonal response of local flora does vary throughout the year, with certain species flowering during different seasons, the time during which the walkdown was undertaken is deemed to have been at a time that would most effectively identify the most species. Many geophytic species which may be dormant for large parts of the year were visible, if not flowering. It is possible that certain flora were not visible at the time of the walkdown.

Following a revision of the site development plan, the newly proposed Construction camp and primary laydown area adjacent to and south of the existing Karro Batching Plant was assessed by walk-down on November 18, 2021. This followed a period of good rains and many plants, and geophytes were in flower. During this assessment sheep were grazing the area, however no other mammals/animal species were observed.

8.1 Data sources and references

A comprehensive list of references, including data sources is provided in Section 13. Data sources that were utilised for the walkdown and report include the following:

- National (DFFE) Web Based Screening Tool – to generate the sites potential environmental sensitivity.
- National Vegetation Map 2018 (NVM, 2018), Mucina & Rutherford (2006) and National Biodiversity Assessment (NBA, 2019) – description of vegetation types, species (including endemic) and vegetation unit conservation status.
- National and Regional Legislation including Provincial Nature Conservation Ordinance (P.N.C.O). NEM:BA Threatened or Protected Species (ToPS).
- Botanical Database of Southern Africa (BODATSA) and New Plants of Southern Africa (POSA) – lists of plant species and potential species of concern found in the general area (SANBI.)
- International Union for Conservation of Nature (IUCN) - Red List of Threatened Species.
- Animal Demography Unit Virtual Museum (VM) – potential faunal species.
- Global Biodiversity Information Facility (GBIF) – potential faunal species.
- Southern African Bird Atlas Project 2 (SABAP2) – for bird species records.
- National Red Books and Lists - mammals, reptiles, frogs, dragonflies & butterflies.
- National Freshwater Ecosystem Priority Areas assessment (NFEPA, 2011) - important catchments.

- National Protected Areas Expansion Strategy (NPAES, 2018) and South Africa Protected Area database (2020) – protected area information.
- Critical Biodiversity Areas of the Northern Cape (2016) – Bioregional Plan.
- Namakwa District Biodiversity Sector Plan (2008) – Bioregional Plan.
- Succulent Karoo Ecosystem Planning (SKEP, 2002).
- SANBI BGIS – All other biodiversity GIS datasets.
- Aerial Imagery – Google Earth, Esri, Chief Surveyor General (http://csg.dla.gov.za).
- Cadastral and other topographical country data - Chief Surveyor General (http://csg.dla.gov.za).
- Original Ecological conducted for the project, excluding bats and avifauna by Todd (2011, 2014, 2016, 2019); and other adjacent Critical Habitat and Biodiversity Assessments by Trusted Partners (2020).
- Other sources include peer-reviewed journals, regional and local assessments and studies in the general location of the project and its area of influence, landscape prioritization schemes (Key Biodiversity Areas), systematic conservation planning assessments and plans (as above), and any pertinent masters and doctoral theses, among others.

8.2 Assumptions and Limitations

- The site visit was undertaken in early spring 2021, preceded by a period of good winter rain and was thus a good time for undertaking the survey.
- Threatened and protected species are by their nature elusive to find and can be missed when surveying extensive areas. All reasonable measures have been taken to minimise this risk.
- Flora species are known to grow and flower at slightly different times of the year and in some cases do not lower every year, hence it is possible that certain species may not have been representing at the time of survey. The time period of the survey was thus at a time when most species were likely to be visible.
- Information provided by WSP in Africa;

9 Project Description

The Rietkloof Wind Farm and the associated infrastructure is located on a site ~20km north of Matjiesfontein. The site falls within the Laingsburg Local Municipality (Central Karoo District Municipality) in the Western Cape. It must be noted that the Rietkloof Wind Farm is located within the Komsberg Renewable Energy Development Zone (REDZ) as determined by the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa (2015 – CSIR/DEA) and formally gazetted on 16 February 2018 (GN 114).

The WEF consists of the following:

- 47 wind turbines with a maximum generating capacity of 147MW;
- Transformer hard standing area per turbine;
- Construction camp and Primary Laydown Area - located adjacent to and south of the editing Karroo Batching Plant on northern access road;
- Satellite Laydown Areas – supporting different project areas;
- Access roads;
- Overhead 33kV powerlines and underground cabling;
- Low voltage substation;
- 125m tall wind measuring lattice masts.

The location of the site is indicated in Figure 1 below.

Project : Euronotus

Layout - Topographic Locality Map

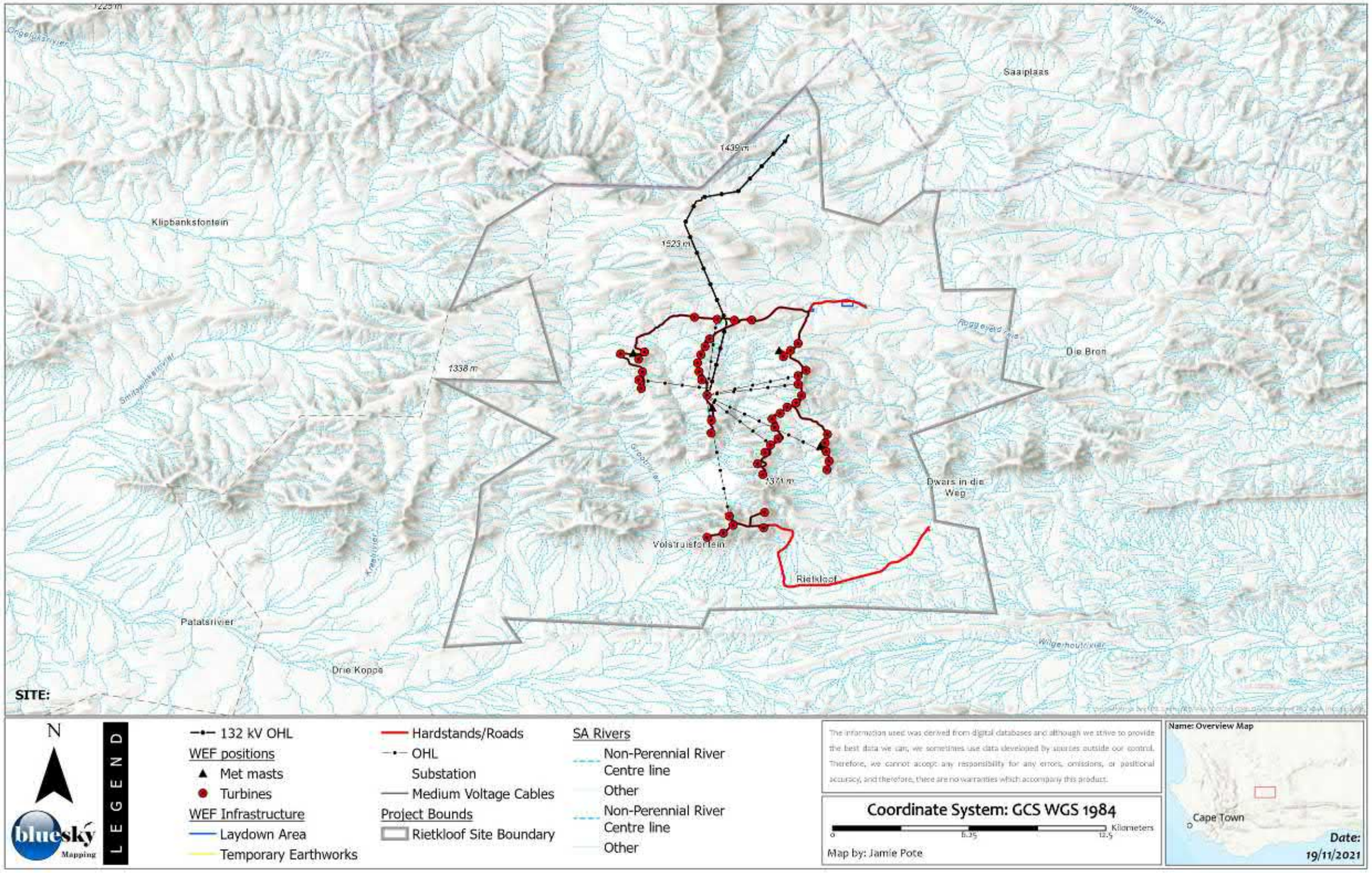

Figure 1: Site Locality

10 General Terrestrial Biodiversity

10.1 Vegetation Units and Habitats

It is clearly evident from the site investigation that the vegetation units which represented within the project area of influence are transitional rather than distinct units. The Renosterveld complex, of which the Shale Renosterveld is recognised as one unit is clearly associated with the higher lying mountains which extend along the Roggeveldberge from the Hantam Karoo near Calvinia in the north-west to the Nuweveldberge between Fraserburg and Merweville in the north-east and extending southwards into the Koedoesberge towards Matjiesfontein. The higher-lying mountainous areas receive a higher rainfall compared to the surrounding distinctly karroid areas, which promotes a less and distinctly wood succulent shrub and herbaceous component compared to the strongly succulent karroid vegetation.

Project : Euronotus

Layout - Vegetation & Status (NBA)

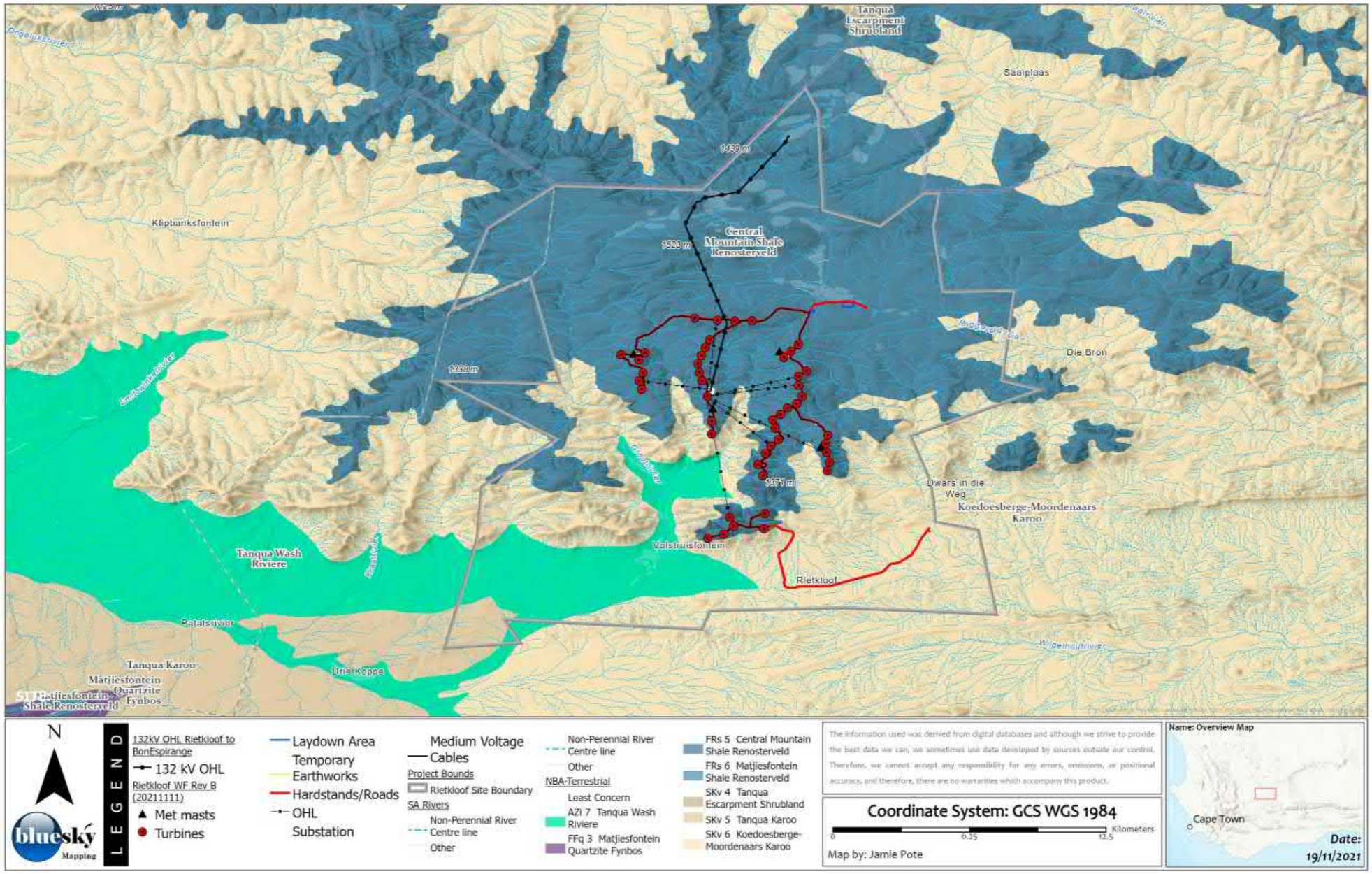

Figure 2: Regional Vegetation Units

The vegetation occurring within the area surrounding the site and area of influence is broadly according to the national vegetation classification and descriptions for *Central Mountain Shale Renosterveld* on the higher mountains and slopes, transitioning with *Koedoesberge-Moordenaars Karoo* on the lower mountains and valleys in the south, east and west with strong *Tanqua Karroo* influences in the west and *Tanqua Escarpment Shrubland* in the north. *Tanqua Wash Riviere* elements are found encroaching towards the site from the west, into the lower lying valleys running south, north and westwards (Figure 2). It is further evident that the *Koedoesberge-Moordenaars Karoo* present on the west side of the project area has several dominant species not occurring on the western side, with appearance of species such as *Euphorbia hamata* suggesting that the vegetation unit in this area may be more closely aligned with the Tanqua Karoo than with the Moordenaars Karoo found to the east.

Central Mountain Shale Renosterveld is the predominant vegetation occurring on higher lying mountains, slopes and valleys within the site area at altitude of around 1 050–1 500 m. Regionally, this unit occurs within the Northern and Western Cape Provinces particularly on the southern and south-eastern slopes of the Klein-Roggeveldberge and Komsberg below the Roggeveld section of the Great Escarpment (facing the Moordenaars Karoo) as well as farther east below the Besemgoedberg and Suurkop, west of Merweville and in the west in the Karookop area between Losper se Berg and high points around Thyshoogte.. The vegetation occurs on slopes and broad ridges of low mountains and escarpments, with tall shrubland dominated by Renosterbos and large suites of mainly non-succulent karoo shrubs and with a rich geophytic flora in the undergrowth or in more open, wetter or rocky habitats. Soils are clayey, overlying mudstones and subordinate sandstones. Glenrosa and Mispah forms are prominent and Land types mainly Ib and Fc. The area has an arid to semi-arid climate with MAP 180–410 mm, with relatively even rainfall, but still showing a slight high in autumn-winter. Mean daily maximum and minimum temperatures 29.9 °C and 0.9 °C for January and July, respectively. Frost incidence is 20–50 days per year.

A general list of species that are represented in the vegetation type and conservation status characteristics is provided in Table 1.

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Table 1: Central Mountain Shale Renosterveld

Growth Form	Description/Species
Geophytic herbs	*Bulbine asphodeloides, Drimia intricata, Othonna auriculifolia, Oxalis obtusa. Succulent*
Grasses	*Ehrharta calycina, Karroochloa purpurea, Merxmuellera stricta*
Herbs	*Crassula deceptor, C. muscosa, C. tomentosa var. glabrifolia, Senecio radicans, Dianthus caespitosus subsp. caespitosus, Heliophila pendula, Lepidium desertorum, Osteospermum acanthospermum, Senecio hastatus.*
Low shrubs	*Elytropappus rhinocerotis (d), Amphiglossa tomentosa, Asparagus capensis var. capensis, Chrysocoma ciliata, C. oblongifolia, Diospyros austro-africana, Eriocephalus africanus var. africanus, E. ericoides subsp. ericoides, E. eximius, E. grandiflorus, E. microphyllus var. pubescens, E. pauperrimus, E. purpureus, Euryops imbricatus, Exomis microphylla, Felicia filifolia subsp. filifolia, F. muricata subsp. muricata, F. ovata, Galenia africana, Helichrysum dregeanum, H. lucilioides, Hermannia multiflora, Lessertia fruticosa, Lycium cinereum, Nenax microphylla, Pelargonium abrotanifolium, Pentzia incana, Pteronia ambrariifolia, P. glauca, P. glomerata, P. incana, P. sordida, Rosenia glandulosa, R. humilis, R. oppositifolia, Selago albida, Tripteris sinuata, Zygophyllum spinosum.*
Succulent Shrubs	*Delosperma subincanum, Drosanthemum lique, Euphorbia stolonifera, Trichodiadema barbatum, Tylecodon reticulatus subsp. reticulatus, T. wallichii subsp. wallichii. Woody Climber: Asparagus aethiopicus*
Biogeographically Important Taxa	None recorded in descriptions
Endemic Taxa	None recorded in descriptions
Conservation Status	Least Concern
Conservation Target	Target 27 % (National Biodiversity Assessment, 2018).
Conserved in	None conserved in statutory or private conservation areas.
Threat activities	Only about 1% transformed. Erosion moderate.
Protection Level	*Not Protected*
Remarks	This is a very poorly known renosterveld type despite its interesting biogeographical borderline position—the unit straddles the Fynbos, Succulent Karoo and marginally the Nama-Karoo Biomes. *It does not appear to have any endemic species.*

The Koedoesberge-Moordenaars Karoo vegetation is the predominant vegetation occurring on lower-lying valleys, slopes and mountains at lower elevations, of around 500–1 250 m, to the north, west and south of the project area. Regionally, the unit is found within the Western Cape and Northern Cape provinces in the vicinity of the Koedoesberge and Pienaar se Berg low mountain ranges bordering on southern Tanqua Karoo to the west and separated by the Klein Roggeveld Mountains from the Moordenaars Karoo in the broad area of Laingsburg and Merweville to the east. The unit also includes the Doesberg region east of Laingsburg and piedmonts of the Elandsberg as far as beyond the Gamkapoort Dam at Excelsior (west of Prince Albert). The vegetation is comprised of a slightly undulating to hilly landscape covered by low succulent scrub and dotted by scattered tall shrubs, patches of 'white' grass visible on plains, the most conspicuous dominants being dwarf shrubs of *Pteronia, Drosanthemum* and *Galenia*.

Soils are derived from Mudstones, shales, sandstones and Dwyka Group diamictites, which gives rise to shallow, skeletal soils. The region is classified largely as Fc land type, with Ib land type playing a subordinate role. MAP is low, slightly above 200 mm, being an arid area. There are two slight rainfall optima: one being in March and another spread from May to August. MAT is close to 16 °C and incidence of frost relatively high (30 days).

A general list of species that are represented in the vegetation type and conservation status characteristics is provided in Table 2.

Table 2: Koedoesberge-Moordenaars Karoo

Growth Form	Description/Species
Succulent shrubs	*Hereroa odorata (d), Antimima fergusoniae, A. maxwellii, A. wittebergensis, Aridaria noctiflora subsp. straminea, Crassula nudicaulis, C. rupestris subsp. commutata, Cylindrophyllum comptonii, Drosanthemum framesii, D. karrooense, D. lique, Euphorbia decussata, E. eustacei, E. mauritanica, Hoodia gordonii, H. grandis, Lycium oxycarpum, Manochlamys albicans, Peersia macradenia, Pelargonium crithmifolium, Ruschia grisea, R. intricata, Salsola aphylla, Sarcocaulon crassicaule, Sceletium rigidum, Tetragonia robusta var. psiloptera, Trichodiadema barbatum, Tylecodon reticulatus, T. wallichii subsp. wallichii, Zygophyllum flexuosum*
Succulent herbs	*Astroloba foliolosa, A. spiralis, Brownanthus vaginatus, Crassula deceptor, C. muscosa, C. tomentosa, Deilanthe thudichumii, Haworthia marumiana var. archeri, Mesembryanthemum stenandrum, Pectinaria articulata, Piaranthus parvulus, Psilocaulon coriarium, P. junceum, Quaqua arenicola subsp. arenicola, Q. arida, Q. ramosa, Stapelia pillansii, S. rufa, Stapeliopsis exasperata, Tetragonia microptera, Tripteris aghillana var. integrifolia*
Tall shrubs	*Diospyros pallens*
Low Shrubs	*Pteronia incana (d), Amphiglossa tomentosa, Aptosimum indivisum, A. spinescens, Asparagus burchellii, A. capensis var. capensis, Athanasia minuta subsp. inermis, Barleria stimulans, Berkheya spinosa, Chrysocoma ciliata, Eriocephalus africanus, E. ericoides, E. pauperrimus, E. spinescens, Euryops lateriflorus, Felicia filifolia, F. macrorrhiza, F. muricata, F. scabrida, Galenia africana, G. fruticosa, Garuleum bipinnatum, Helichrysum lucilioides, Hermannia grandiflora, H. multiflora, Lessertia fruticosa, Limeum aethiopicum, Melolobium candicans, Menodora juncea, Microloma armatum, Monechma spartioides, Muraltia scoparia, Pelargonium hirtum, Pentzia incana, Polygala seminuda, Pteronia adenocarpa, P. ambrariifolia, P. empetrifolia, P. glauca, P. glomerata, P. pallens, P. scariosa, P. sordida, Rhigozum obovatum, Senecio haworthii, Tripteris sinuata, Zygophyllum microphyllum, Z. retrofractum, Z. spinosum.*
Geophytic herbs	*Drimia intricata, Geissorhiza karooica, Ixia marginifolia, I. rapunculoides, Ornithogalum adseptentrionesvergentulum, Oxalis obtusa, Romulea austinii, R. tortuosa subsp. tortuosa, Strumaria karooica, S. pubescens, Trachyandra thyrsoidea*
Grasses	*Aristida adscensionis, A. diffusa, Ehrharta calycina, E. delicatula, Enneapogon scaber, Fingerhuthia africana, Karroochloa tenella, Pentaschistis airoides, Stipagrostis ciliata, S. obtusa*
Herbs	*Atriplex suberecta, Felicia bergeriana, Gazania jurineifolia subsp. scabra, Hermannia althaeifolia, H. pulverata, Lepidium africanum, L. desertorum, Leysera tenella, Pelargonium minimum, P. nervifolium, Syncarpha dregeana,*

	Ursinia nana, Zaluzianskya inflata, Z. peduncularis
Semiparasitic shrub	*Thesium lineatum*
Herbaceous climber	*Fockea sinuata*
Semi parasitic epiphytic shrub	*Viscum capense*
Parasitic herb	*Hyobanche glabrata*
Woody climber	*Asparagus fasciculatus, A. racemosus, A. retrofractus, Microloma sagittatum*
Biogeographically Important Taxa	([GKB]Great Karoo basin endemic, [RH]Roggeveld-Hantam endemic, [S]Southern distribution limit, [W]Western distribution limit) ▪ Succulent Shrubs: *Deilanthe peersii*[W], *Hereroa crassa*[GKB], *Pleiospilos nelii*[GKB], *Rhinephyllum graniforme*[GKB], *Ruschia crassa*[GKB], *R. perfoliata*. ▪ Low Shrubs: *Felicia lasiocarpa*[GKB], *Sericocoma pungens*[S]. ▪ Herbs: *Helichrysum cerastioides* var. *aurosicum*[W], *Ifloga molluginoides*[S]. ▪ Geophytic Herbs: *Brunsvigia comptonii*[S], *Drimia karooica*[W]. ▪ Succulent Herbs: *Aloe longistyla*[W], *Crassula hemisphaerica*[W], *Pectinaria longipes* subsp. *longipes*[RH], *Piaranthus comptus*[GKB], *Quaqua parviflora* subsp. *gracilis*[RH], *Tridentea parvipuncta* subsp. *parvipuncta*[GKB].
Endemic Taxa	▪ Succulent Shrubs: *Antimima karroidea, A. loganii, Calamophyllum teretiusculum, Cerochlamys gemina, Drosanthemum comptonii, Ruschia karrooica, Tanquana archeri, Trichodiadema hallii, Tylecodon faucium.* ▪ Low Shrub: *Pelargonium stipulaceum subsp. ovato-stipulatum.* ▪ Semiparasitic Shrub: *Thesium marlothii.* ▪ Geophytic Herbs: *Lachenalia comptonii, Strumaria undulata.* ▪ Succulent Herbs: *Haworthia nortieri var. pehlemanniae.*
Conservation Status	Least Concern
Conservation Target	Target 19 % (National Biodiversity Assessment, 2018)
Conserved in	Only a very small portion enjoying statutory conservation in the Gamkapoort Nature Reserve
Threat activities	Transformed only to a very small extent. No serious alien plant invasions recorded. Erosion is moderate (88%) and only to lesser extent high or very low.
Protection Level	*Not Protected*
Remarks	Koedoesberge-Moordenaars Karoo remains poorly researched from the vegetation-ecological point of view, despite its proximity to major university centres in the Western Cape as well as good accessibility (N1 road cuts through the region in east-west direction).

Tanqua Karoo, although not spatially associated with the project area, is represented by species common to the unit along the western sides of the greater project area. Regionally it is found at lower altitudes (240–960 m) in the Western and Northern Cape Provinces in basin encompassing valleys of the Tanqua and Doring Rivers between Cederberg (Swartruggens) in the west, the Roggeveld Escarpment in the east and Klein Roggeveld Mountains in the southeast; towards the north this unit borders on higher elevated plains of the Hantam Karoo. It is present on slightly undulating intra-mountain basins sheltered by steep slopes of mountain ranges. The plain is interrupted by a series of solitary dolerite butts and elevated ridges, extensive, flat sheet-washes and deeper incised channels of intermittent rivers (these habitats support vegetation of the Tanqua Wash Riviere). The plains are very sparsely vegetated (low

succulent shrubland with *Ruschia, Drosanthemum, Aridaria, Augea, Zygophyllum*), in extreme precipitation-poor years appearing barren, while the slopes of the koppies and adjacent mountain piedmonts support well-developed medium-tall succulent *Euphorbia hamata–Pteronia incana* shrubland (Rubin 1998). Small quartz patches occur in the southern Tanqua Basin. Annual flora (*Gazania lichtensteinii, Euryops annuus, Ursinia nana*) becomes conspicuous with sufficient precipitation, while geophytes and grasses play a subordinate role. *Stipagrostis ciliata* and *S. obtusa* can become locally dominant in places. The unit occurs on Mudrocks, Dwyka Group diamictites and sandstones (Bokkeveld Group) and soils are sandy-loamy of various depths. Quartz patches are a rare phenomenon concentrated in the southern portions of the Tanqua Basin. Fc is the dominant land type, with Ag land type playing subordinate role. Climatically the unit falls within a winter-rainfall regime with most of the precipitation between May and August, while December and January are virtually precipitation-free. The region has high spatial variability of precipitation, with some rainshadows experiencing as little as 40 mm of rainfall per year (in extremely dry years). MAP varies from a low of 72 mm in the central part of the unit to 112 mm in the north of the unit and to 111 mm in the south of the unit. MAT is slightly above 17 °C, but in winter the temperature can often fall below the frost mark (15 days in a year). Mean maximum and minimum monthly temperatures of 35.9 °C and 5.64 °C occur in January and July, respectively.

A general list of species that are represented in the vegetation type and conservation status characteristics is provided in Table 3.

Table 3: Tanqua Karoo ([W]Western distribution limit)

Growth Form	Description/Species
Geophytic herbs	*Drimia intricata*, *Lachenalia ameliae*, *Moraea pallida*, *M. speciosa*, *Ornithogalum xanthochlorum*, *Ornithoglossum viride*, *Oxalis pes-caprae*, *Strumaria unguiculata*, *Tritonia florentiae*
Grasses	*Stipagrostis ciliata* (d), *S. obtusa* (d), *Aristida adscensionis*, *Cladoraphis spinosa*, *Ehrharta calycina*, *Enneapogon desvauxii*, *E. scaber*, *Fingerhuthia africana*.
Herbs	*Gazania lichtensteinii* (d), *Amellus microglossus*, *A. strigosus* subsp. *pseudoscabridus*, *Dicoma capensis*, *Emex australis*, *Euryops annuus*, *Hebenstretia parviflora*, *Helichrysum herniarioides*, *Lepidium africanum*, *L. desertorum*, *Lessertia pauciflora*, *Leysera tenella*, *Lotononis parviflora*, *Lyperia tristis*, *Oncosiphon grandiflorum*, *Osteospermum pinnatum*, *Pelargonium minimum*, *Plantago cafra*, *Radyera urens*, *Ursinia nana*.
Semiparasitic shrub	*Thesium lineatum*
Succulent Shrubs	*Antimima hantamensis* (d), *Augea capensis* (d), *Gibbaeum gibbosum* (d), *Ruschia spinosa* (d), *Antimima wittebergensis*, *Aridaria noctiflora* subsp. *noctiflora*, *A. noctiflora* subsp. *straminea*, *Braunsia apiculata*, *Cephalophyllum curtophyllum*, *C. framesii*, *Crassula subaphylla*, *C. tetragona* subsp. *connivens*, *Drosanthemum delicatulum*, *D. framesii*, *D. lique*, *Euphorbia decussata*, *E.*

	mauritanica, *E. multiceps*, *E. rectirama*, *Hoodia gordonii*, *Leipoldtia schultzei*, *Lycium cinereum*, *Othonna pteronioides*, *Peersia macradenia*, *Pelargonium crithmifolium*, *Phyllobolus grossus*, *P. splendens*, *Ruschia intricata*, *Salsola aphylla*, *S. namibica*, *Sarcocaulon crassicaule*, *Scopelogena bruynsii*, *Tetragonia fruticosa*, *T. robusta* var. *psiloptera*, *Tylecodon reticulatus*, *T. wallichii* subsp. *wallichii*, *Zygophyllum flexuosum*, *Z. microcarpum*
Low Shrubs	*Tripteris sinuata* (d), *Aptosimum indivisum*, *Asparagus capensis* var. *capensis*, *Berkheya spinosa*, *Chrysocoma ciliata*, *Eriocephalus africanus*, *E. ericoides*, *E. pauperrimus*, *E. spinescens*, *Euryops cuneatus*, *Galenia africana*, *G. fruticosa*, *Hermannia multiflora*, *Lessertia fruticosa*, *Limeum aethiopicum*, *Monechma spartioides*, *Pelargonium grandicalcaratum*, *Pteronia aspalatha*, *P. ciliata*, *P. erythrochaeta*, *P. glauca*, *P. intermedia*, *P. oblanceolata*, *P. pallens*, *P. scariosa*, *P. sordida*, *Rhynchosia bullata*, *Stachys cuneata*[W], *Zygophyllum microphyllum*
Herbaceous climber	*Cyphia comptonii*
Succulent herbs	*Brownanthus vaginatus*, *Crassula muscosa*, *Duvalia caespitosa* subsp. *caespitosa*, *Mesembryanthemum excavatum*, *M. guerichianum*, *M. stenandrum*, *Psilocaulon articulatum*, *P. junceum*, *Tetragonia microptera*.
Woody climber	*Asparagus fasciculatus*, *Microloma sagittatum*
Biogeographically Important Taxa	([RH]Roggeveld-Hantam endemic, [S]Southern distribution limit) Low Shrubs: *Nenax cinerea*[RH], *Stachys aurea*[RH]. Herbs: *Alatoseta tenuis*[RH], *Dimorphotheca polyptera*[S], *Nemesia karroensis*[RH]. Geophytic Herbs: *Haemanthus barkerae*[RH], *Lapeirousia violacea*[RH]. Succulent Herbs: *Stapelia surrecta*[RH], *Tridentea parvipuncta subsp. truncata*[RH], *Tromotriche thudichumii*[RH]
Endemic Taxa	Succulent Shrubs: *Braunsia stayneri*, *Cephalophyllum corniculatum*, *Didymaotus lapidiformis*, *Drosanthemum bellum*, *D. lignosum*, *Euphorbia gentilis* subsp. *tanquana*, *Hammeria meleagris*, *Hereroa nelii*, *H. teretifolia*, *Malephora crassa*, *Ruschia tardissima*, *Tanquana prismatica*. Geophytic Herbs: *Haemanthus tristis*, *Strumaria karoopoortensis*.
Conservation Status	Least Concern
Conservation Target	*19 %*
Conserved in	About 10% statutorily conserved in the Tankwa Karoo National Park and a further 4% in private reserves, including Inverdoorn, Zwartbosch, Jakkalsfontein, Basjanskloof, Groote Kapelsfontein, Uintjieskraal and Vaalkloof.
Threat activities	Only a small portion of this area of low agricultural production has been transformed but due to overgrazing in some places, aliens such as *Atriplex lindleyi* subsp. *inflata* have invaded. Erosion is moderate (47%), high (36%) as well as very low (14%).
Protection Level	*Moderately Protected*
Remarks	Tanqua (Tankwa) Karoo is one of the driest forms of the Succulent Karoo Biome, and the whole appearance of the landscape resembles desert rather than semidesert during most of the year (in extremely precipitation-poor years in particular). The eastern edge (the foot of the Roggeveld Escarpment) and southern parts of the Tanqua Karoo, are wetter and consequently more densely vegetated. The classification status of the driest parts of the Tanqua Karoo as rain-shadow desert rather than semidesert (Succulent Karoo) remains open for the time being. The mapped unit nevertheless lies within the same range of MAP corresponding to some of the Succulent Karoo mapped elsewhere within the winter-rainfall region (Port Nolloth southwards to Wallekraal) but lacks the coastal fog of the latter area. The role of heavy grazing pressure in the 19th and early 20th centuries in the Tanqua Karoo needs to be evaluated in places where it is 'terribly tramped out' according to Acocks (1953). Tanqua Karoo (including the extensive sheet-wash plains) is an important local centre of endemism housing two endemic genera (*Didymaotus* and *Eurystigma*) and three near-endemic genera (*Braunsia, Hammeria* and

	Tanquana)—all of the family Aizoaceae.
References	Lane (1977), Jürgens (1986), Acocks (1988), Mackay (1994), Mackay & Zietsman (1996), Milton et al. (1997), Rubin (1998), Schmiedel & Mucina (2006).

Although not directly associated with the project footprint, influences from Tanqua Escarpment Shrubland elements are prevalent along the northern and western sides of the greater project area. The unit is present in the Northern Cape province along a narrow belt on northwest-facing slopes of the Klein-Roggeveldberge and on southwest-facing and west-facing slopes of the Roggeveld Escarpment as far north as Bloukrans Pass, south of Calvinia. Generally found at altitudes between 620–1 600 m. The vegetation is found on steep flanks below an escarpment overlooking a basin, generally facing southwest supporting succulent shrubland of medium height with *Tylecodon* (Botterboom) and *Euphorbia mauritanica* (melkboom) prominent and with undergrowth of both succulent (*Aridaria, Crassula*) and non-succulent (*Asparagus, Pteronia*) shrubs. Soils are derived from Mudrocks as well as brown to grey shales, siltstones, and sandstones, broken by network of intrusive Jurassic Karoo dolerites. The shallow soils form the basis for the classification of most of the area into Ib land type (with Dc land type being of lesser importance). The area has a less pronounced winter-rainfall regime with most of the rainfall is spread between March and August (peaking from June to August). MAT is almost 16 °C and the incidence of frost is relatively high (30 days).

A general list of species that are represented in the vegetation type and conservation status characteristics is provided in Table 4.

Table 4: Tanqua Escarpment Shrubland

Growth Form	Description/Species
Geophytic herbs	*Androcymbium volutare, Asplenium cordatum, Boophone disticha, Cyanella hyacinthoides, Empodium plicatum, Oxalis obtusa*
Grasses	*Ehrharta calycina, Fingerhuthia africana, Merxmuellera dura*
Herbs	*Galium capense subsp. garipense, Lasiospermum brachyglossum, Leysera tenella, Pelargonium moniliforme, Tripteris microcarpa.*
Low shrubs	*Pteronia incana (d), Asparagus capensis var. capensis, A. striatus, Berkheya cardopatifolia, Chrysocoma ciliata, Eriocephalus africanus, E. ericoides, E. spinescens, Felicia filifolia, F. macrorrhiza, F. scabrida, Galenia africana, G. fruticosa, Heliophila cornuta var. squamata, Hermannia multiflora, Lessertia fruticosa, Limeum aethiopicum, Pelargonium grandicalcaratum, Pteronia oblanceolata, P. sordida, Salvia disermas, Selago albida, S. polycephala, Tripteris sinuata, Ursinia pilifera,*
Semiparasitic shrub	*Thesium lineatum*
Succulent Shrubs	*Tylecodon paniculatus (d), T. wallichii subsp. wallichii (d), Aridaria noctiflora subsp. straminea, Crassula tetragona subsp. connivens, Drosanthemum lique, Euphorbia caterviflora, E. mauritanica, Lycium*

Growth Form	Description/Species
	cinereum, Manochlamys albicans, Tetragonia robusta var. psiloptera, Tylecodon ventricosus.
Herbaceous climber	*Fockea sinuata*
Succulent herbs	*Crassula tomentosa, C. umbella, Tetragonia microptera*
Tall shrubs	*Diospyros austro-africana, Gomphocarpus fruticosus, Montinia caryophyllacea, Rhus burchellii, R. undulata*
Woody climber	*Asparagus fasciculatus, A. multituberosus, Microloma sagittatum*
Biogeographically Important Taxa	([RH]Roggeveld-Hantam endemic, [S]Southern distribution limit, [W]Western distribution limit) ▪ Low Shrubs: *Felicia burkei*[S], *Nenax cinerea*[RH], *Pelargonium magenteum*[RH], *Pteronia aspalatha*[RH], *Selago polygala*[RH], *Stachys aurea*[RH]. ▪ Herbs: *Cromidon hamulosum*[RH], *Diascia macrophylla*[RH], *Jamesbrittenia thunbergii*[RH], *Lotononis maximiliani*[RH], *Nemesia anisocarpa*[S], *Polycarena aurea*[RH], *Trigonocapnos lichtensteinii*[RH]. ▪ Succulent Herb: *Crassula dodii*[RH]. ▪ Graminoids: *Ehrharta melicoides*[W], *Secale strictum* subsp. *africanum*[RH].
Endemic Taxa	▪ Low Shrub: *Indigofera hantamensis*.
Conservation Status	Least Concern
Conservation Target	Target 19 % (National Biodiversity Assessment, 2018)
Conserved in	Only a very small portion statutorily conserved in Tankwa Karoo National Park.
Threat activities	No visible signs of transformation or invasion of alien plants. Erosion is moderate (59%) and low (41%).
Protection Level	*Moderately Protected*
Remark	Tanqua Escarpment Shrubland is part of the Hantam-Roggeveld Centre of Endemism (Van Wyk & Smith 2001) and remains one of the least studied vegetation types of the country.
Reference	Van Wyk & Smith (2001).

Also not directly associated with the project footprint, being found in the lower lying alluvial valleys to the west of the project area, Tanqua Wash Riviere elements are represented along watercourses in the valleys that drain towards the north, west and south of the project area.

The unit is found within the Western Cape and Northern Cape Provinces along alluvia of the Tankwa and Doring Rivers and sheet-wash plains of their less important tributaries embedded within SKv 5 Tanqua Karoo. It is found at altitude ranging from 300–1 000 m within deeply incised valleys of intermittent rivers supporting a mosaic of succulent shrublands with *Salsola* and *Lycium* alternating with *Acacia karroo* gallery thickets. The broad sheet-wash plains support sparse vegetation of various *Salsola* species, often building phytogenic hillocks interrupting the monotonous barren face of a sheet wash. Occasional rainfalls in early winter result in localised displays of annuals and early flowering geophytes along washes. Found within broad Quaternary alluvial floors and drainage lines filled with recent sediments mostly from eroded Karoo Supergroup sediments and having sodic loamy to sandy soils (Ia land type). The run-off

in these habitats is very low and spread over large areas. Climatically, the region is characterised by arid to hyper-arid climate, with MAP ranging between 100 mm and 170 mm and overall MAP 162 mm, mainly falling in autumn and winter. Mean daily maximum and minimum temperatures are 32.5 °C and 3.0 °C for January and July, respectively while overall MAT is slightly higher than 17 °C. Due to basin macro-topography the occurrence of frost is fairly frequent.

A general list of species that are represented in the vegetation type and conservation status characteristics is provided in Table 5.

Table 5: Tanqua Wash Riviere

Growth Form	Description/Species
Important Taxa	Riparian thickets: Small Tree: *Acacia karroo* (d). Alluvial shrublands & herblands: Low Shrub: *Galenia africana*. Succulent Shrubs: *Lycium cinereum* (d), *Malephora luteola*, *Salsola arborea*, *Sarcocornia mossiana* agg. Geophytic Herbs: *Moraea speciosa*, *Tritonia florentiae*. Graminoids: *Cladoraphis spinosa*, *Stipagrostis obtusa*. Sheet washes: Succulent Shrubs: *Augea capensis*, *Salsola aphylla*. Herbs: *Euryops annuus*, *Gazania lichtensteinii*, *Osteospermum pinnatum*, *Ursinia nana*.
Endemic Taxa	Alluvial shrublands & herblands: Herbs: *Limonium* sp. nov. (*Mucina 310104/1* STEU). Sheet washes: Succulent Shrub: *Salsola ceresica* (d).
Conservation Status	Least Concern
Conservation Target	Target 19 % (National Biodiversity Assessment, 2018)
Conserved in	About 13% statutorily conserved in the Tankwa National Park and in some private reserves (Inverdoorn, Jakkalsfontein, Uintjieskraal, Groote Kapelsfontein, Vaalkloof).
Threat activities	About 3% already transformed for cultivation or dam building (Oudebaaskraal Dam and Swartkop se Dam). Alien *Atriplex lindleyi* subsp. *inflata* and *Prosopis* species can become frequent in places.
Protection Level	*Moderately Protected*
Remark	This unit is of heterogeneous character at present and the ecological and floristic relationship between the *Acacia karroo*-dominated riparian vegetation on the one hand and the *Salsola*-dominated sheet-wash vegetation on the other, deserves re-evaluation in the light of new data still to be collected.
Reference	Rubin (1998).

It is notable across the vegetation types that a suite of species tends to be represented across most of the area, but dominant species vary depending on climatic factors which are influenced by aspect and altitude. Slight variations in community structure, composition and dominant species are also noted within the vegetation units represented on site.

Within the Mountainous area, more specifically the Renosterveld, there is a distinct and visible difference between north and south facing slopes, with north-facing slopes being drier and having a strong succulent shrub composition. Wetter south-facing slopes have a notable lower succulent shrub composition, with herbaceous shrubs dominating. This difference is less noticeable in lower lying areas, within the Moordenaars Karoo, where north and south facing slopes tend to both have more prominent succulent shrub and herb component.

Within lower lying areas, dominant species include shrubs such as *Ruschia intricata, Eriocephalus microphyllus* var. *microphyllus*, *Chrysocoma ciliata, Hirpicium alienatum, Asparagus capensis, Amphiglossa tomentosa, Pteronia ciliata, Pteronia sordida, Pentzia incana, Tripteris sinuata* and *Oedera genistifolia*, grasses including *Ehrharta calycina* and *Merxmuellera stricta* and succulents such as *Tylecodon wallichii* and *Crassula tetragona* subsp. *connivens*.

There is a clear change in the vegetation discernible above 1 350 m, where the cooler and wetter conditions result in a change in composition compared to the lower elevation areas. Although the vegetation is broadly similar in terms of the dominant species as listed above, species which characterise these areas which are not present or uncommon at lower elevations include *Rosenia spinescens*, *Eriocephalus grandiflorus* (Rare), *Ehrharta eburnea* (NT) and *Tribolium purpureum, Pelargonium griseum, Zygophyllum spinosum, Berkheya heterophylla* var. *heterophylla* and *Ruschia lineolata*. The abundance of geophytes and other species of potential concern are significantly higher within the slopes and higher lying areas, compared to the lower lying plains and river valleys.

Observations made during the walkdown supplemented by previous ecological and biodiversity assessments undertaken on several adjacent G7 WEF projects by Todd (2011, 2014, 2016, 2019) identify the following vegetation and flora characteristics:

1) Most of the central uplands of the project area are classified as Central Mountain Shale Renosterveld, transitioning to Koedoesberge-Moordenaars Karoo on the south and east sides. Although the vegetation on the west side is designated as Koedoesberge-Moordenaars Karoo, the composition is clearly different to the same unit on the east side where the vegetation appears to transition towards Tanqua Karoo rather than Koedoesberge-Moordenaars Karoo. Furthermore, there is a transition towards Tanqua Escarpment Shrubland towards the north and Tanqua Karoo to the west, with elements of both these units being represented within the peripheral boundaries of the project area,

even though they do not overlap with the mapped vegetation as per the National Vegetation Map (2018).

2) In the field the vegetation unit distinction is not always obvious and there is a large overlap in the species composition of the units with a distinct transitional aspect. At a local level, altitude, aspect and soil depth are the dominant drivers of vegetation composition. High-lying areas are dominated by typical Renosterveld species while the proportion of succulents and karroid species increased with decreasing altitude or on drier aspects, thus transitioning into the surrounding low-lying drier Karroid vegetation. Higher altitude south-facing slopes are also distinctly less arid compared to north-facing slopes.

3) High-lying areas and cooler southern aspects are typically dominated largely by woody shrubs such as *Elytropappus rhinocerotis, Euryops lateriflorus, Eriocephalus africanus and Eriocephalus grandiflorus, Pteronia ambrariifolia, Pteronia glomerata, Pteronia glauca, Rosenia glandulosa* and *Asparagus capensis;* succulents such as *Ruschia cradockensis, Leipoldtia schultzei, Crassula deltoidea, Crassula tetragona*. Grasses tend to be scarce but become more common in patches where there is some soil present. Common grasses tend to be restricted to the tufted species including *Tenaxia (Merxmuellera) stricta*, *Ehrharta calycina* and *Karroochloa purpurea*. Grasses tend to be scarce in the rocky outcrops, stone benches and rocky pavements. It has also been postulated that south-facing slopes are likely to represent an important climate change refugia for biodiversity, and these areas have been designated as such in the Namakwa Biodiversity Sector Plan (2008).

4) The drier, sunny aspects and lower lying areas contain a larger proportion of succulent species and are dominated by succulents such as *Ruschia cradockensis*, *Crassula rupestris*, *Crassula deltoidea*, *Crassula nudicaulis*, *Tylecodon reticulatus*, *Sarcocaulon patersonii*, common woody or herbaceous shrubs include *Pteronia glomerata*, *Pteronia sordida*, *Eriocephalus ericoides*, *Pelargonium magenteum* and *Pelargonium abrotanifolium*.

5) Although Renosterveld is usually a fire-prone ecosystem, there is little evidence of regular fires at the site. Discussions with the local farmers also confirmed that although fires do occasionally occur, they are not a regular feature and are not used by farmers as a veld management tool. Within arid Renosterveld types, the significance of fire is reduced, and it does not appear that fire is an important ecosystem driver at the site that may be disrupted by the development. Fire scars in the broader area indicate that occasional fires may be caused by lightning ground-strikes, but their subsequent spread appears to be limited to high-lying areas of dense vegetation along south-facing slopes.

6) In terms of unique and sensitive habitats at the site, a few different potentially sensitive environments are identified.

a) In general, the slopes are more speciose and contained a greater variety of habitat types than the lower lying valleys and mountain ridges and crests, which tend to be more broadly homogenous. The varied aspects as well as microhabitats created by rocky outcrops on the slopes, is likely to be a contributing factor to the higher diversity.

b) There are several wetlands and rivers within the study area which should be avoided by the development as these are important habitats for plants as well as fauna and are especially sensitive to disturbance. Several specific sites have been identified that are at risk from the current layout.

c) *Brunsvigia josephinae* which is listed as Vulnerable, is widespread across the project area, from lower lying areas to mid-slope and occasionally on lower mountain tops. It is also found sporadically along riverbanks of watercourses with one notable sub-population found on an upper order tributary of the Groot River. Several small to large sized population of a few Ha was noted to be present in the broader area with many unaffected but some within or near project component footprints. The specific species will require relocation where affected by project components, but due to the extensive coverage in the wider project area, it is not anticipated that the project specific impact will be significant to the species as a whole.

d) Several other species of conservation concern were found to be present, as small scattered and localised populations or very few individuals to single individual occasionally noted within the areas surveyed. These include *Indigofera hantamensis, Antimima androsacea, Euryops sulcatus, Antimima loganii, Geissorhiza karooica, Lotononis venosa, Romulea eburnea, Romulea hallii, Romulea syringodeoflora* and *Romulea tortuosa*.

e) Although no quartz patches were observed at the site, several gravel patches and rock pavements are present, particularly along ridges. Although these often look biologically depauperate due to their low plant cover, they frequently contain rare or endemic geophytes and dwarf succulent species and should also not be disturbed. They are also likely to a somewhat unique landscape feature for specific faunal species, including reptiles.

10.2 Faunal Habitat and Communities

Observations made during the walkdown supplemented by previous ecological and biodiversity assessments undertaken on several adjacent G7 WEF projects by Todd (2011, 2014, 2016, 2019) identify the following faunal attributes:

10.2.1 Mammals

At least 50 mammal species potentially occur at the site (Appendix 2). Due to the diversity of habitats available, which includes rocky uplands, densely vegetated kloofs and riparian areas, as well as open plains and low shrublands, the majority of species with a distribution that includes the site are likely to be present in at least part of the site. The mammalian community is therefore relatively rich and due to the remote and inaccessible nature of the area probably has not been highly impacted by human activities. Larger carnivores such as jackal and caracal are persecuted by the local farmers to reduce livestock losses. Nevertheless, discussions with the local farmers indicate that these species appear to remain relatively common in the area. There is likely to be quite a large differentiation in community composition between the lowlands and the uplands of the site. The uplands provide suitable habitat for species which require or prefer rock cover such as Cape Rock Elephant Shrew, *Elephantulus edwardii*, Smith's Red Rock Rabbit, *Pronolagus rupestris*, Namaqua Rock Mouse *Micaelamys namaquensis* and Rock Hyrax, *Procavia capensis*. The lowlands are likely to contain an abundance of species associated with lowland habitats such as deeper soils and floodplain habitats, which includes Brants's Whistling Rat *Parotomys brantsii*, the Bush Vlei Rat *Otomys unisulcatus*, Hairy- footed Gerbil *Gerbillurus paeba* and Common Duiker *Sylvicapra grimmia*. In general, the ungulates present at the site are likely to be fairly widespread. Springbuck are confined by fences and occur only where farmers have introduced them or allowed them to persist and should be considered as part of the farming system rather than as wildlife per se. Both Duiker and Steenbok *Raphicerus campestris* are adaptable species that can tolerate high levels of human activity and are not likely to be highly sensitive to the disturbance associated with the development. Klipspringer *Oreotragus oreotragus* and Grey Rhebok *Pelea capreolus* are somewhat more specialized in their habitat requirements and make use of the upper slopes of the site. Klipspringer are associated with steep slopes, cliffs and rocky outcrops and may be more vulnerable to impact from the development due to greater overlap between their habitat and the distribution of the wind turbines.

The Riverine Rabbit which is listed as Critically Endangered (IUCN 2010) and is regarded as the most threatened mammal in South Africa is known to occur within the broad area. Populations

of this species occur between Sutherland and Fraserburg to the northeast as well as around Touwsriver to the southwest. Based on the available information, the habitat at the site does not appear to be suitable for this species and there are no known records from the area, indicating that it is highly unlikely that it occurs at the site. Should it occur at the site it would most likely be associated with the alluvial soils and riparian fringe along the major drainage lines that occur in the lowlands of the site which would not be directly impacted by the development which is restricted to the uplands. It is further established that the site is outside of the typical Riverine Rabbit distribution range.

10.2.2 Reptiles

There is a wide range or environments present for reptiles at the site, including rocky uplands and cliffs, open lowlands and densely vegetated riparian areas. As a result, the site has a rich reptile fauna which is potentially composed of 7 tortoise species, 20 snakes, 17 lizards and skinks, two chameleons and 10 geckos. The site falls within the range of the little-known Fisk's House Snake Lamprophis fiskii which is listed as Vulnerable and has usually been recorded in karroid sandy areas. This species may therefore occur within the lowlands of the site and as such would probably not be significantly impacted by the development especially given its nocturnal, largely subterranean and secretive nature. Several protected and listed lizard species are likely to occur at the site including the Namaqua Plated Lizard *Gerrhosaurus typicus* (Near Threatened), the Karoo Girdled Lizard *Cordylus polyzonus* (protected) and the Cape Crag Lizard *Pseudocordylus microlepidotus*. Since the Karoo Girdled Lizard and Cape Crag Lizard are associated with rocky outcrops, it is not likely that these species will be directly affected by the development if the turbines are not positioned in areas with steep slopes where such outcrops are likely to be located. The Namaqua Plated Lizard may be more common than believed (Alexander & Marais 2007) and occurs in karroid succulent veld where it digs burrows at the base of shrubs. This species is therefore likely to be restricted to the lowlands of the site which will be little impacted by the development.

Tortoises were relatively abundant at the site and many Angulate Tortoises, *Chersina angulata* were observed as were several Karoo Tent Tortoises, *Psammobates tentorius tentorius*. Tortoises may be negatively impacted by the development as they are vulnerable to collisions with motor vehicles and predation by avian predators while traversing open areas. Attractive species such as tent tortoises are also vulnerable to collection for use as pets or trade, and the increased accessibility resulting from the new roads that will be constructed as part of the development would raise the risk for these species.

Several outcrops will be marginally affected by the turbine layout and construction. Rehabilitation measures should be implemented to reduce the overall effects.

10.2.3 Amphibians

Although there are no perennial rivers at the site, several of the larger drainage lines in the area were observed to contain rocky, sheltered pools that are likely to contain water on a permanent basis. Several wetlands with dense stands of sedges were also observed at the site and are likely to represent important amphibian habitats. Consequently, amphibians which require near-permanent water as well as those adapted to more arid conditions are likely to occur at the site. Nevertheless, only eight frog and toad species are likely to occur at the site, all of which are quite widespread species of low conservation concern. The Karoo Dainty Frog, *Cacosternum karooicum* is listed as Data Deficient reflecting the little-known distribution and ecology of this species. To date, the Karoo Dainty Frog has been recorded from a few scattered locations across the Karoo in the Western and Northern Cape, but it is likely that it occurs more widely across the karoo in general. The site also falls within the distribution of two other regional endemic species, the Cape Sand Frog, *Tomopterna delalandii* and the Raucous Toad, *Amietophrynus rangeri*. The Cape Sand Frog occurs in lowlands and valleys in fynbos and succulent karoo throughout most of the Western Cape and into Namaqualand. The Raucous Toad is more widely distributed and occurs throughout much of South Africa inland and along the east coast into Gauteng and Mpumalanga. There do not therefore appear to be any range-restricted species which occur at the site which would be vulnerable to population-level impacts. In general, the most important areas for amphibians at the site are the riparian areas, seeps and wetlands and the man-made earth dams which occur in the area. As these are widely recognized as sensitive habitats, the development is likely to avoid these areas as far as possible and the potential conflict between amphibians and the development is likely to be low. Amphibians are however extremely sensitive to pollutants and the large amount of construction machinery and materials present at the site during the construction phase would pose a risk to amphibians should any spills occur.

10.2.4 Invertebrates

An aggregating, ground-nesting bee (Hymenoptera) was observed at several places generally associated with lower-lying alluvial deposits. While it is not possible to accurately identify without collected specimens, it has been determined that it possibly within one of six bee families/subfamilies, based on the fact that they were ground-nesting on flat, non-friable soil

with no turrets marking each nest; aggregating in a large population; and some photographed specimens appeared to have pollen on their bodies. These families/subfamilies are Melittidae, Andrenidae, Colletidae, Halictidae, Megachilidae (subfamily Fideliinae) and Apinae (Tribe Anthophorini). Based on the robustness of the bodies, it is more likely that they are Andrenids, Megachilids or in the Apinae, as the other groups mentioned above tend to have slimmer body designs (Owen, 2021). All of these groups are largely data-deficient, and it is thus difficult to find information on population sizes, ranges and conservation statuses. None the less, based on available literature sources, ground-nesting bees are vulnerable to any activities that will till the soil, such as agriculture or construction, or loss of their host plants from which they collect pollen or leaf material for nest provisioning (Owen, 2021). All of these groups are important pollinators, although undervalued because of the general focus on the African Honey Bee as a pollinator. Since the bees are found in populations that are not confined to a single burrow, but occupy numerous burrows in a wider area, making relocation not feasible, together with their important ecological role as pollinators, these populations should be retained where identified, as they were found to be uncommon across the broader project area of influence.

10.3 Bioregional Planning

Since the component projects and area of influence overlaps the Western Cape and Northern Cape boundary, these two regional plans (Western Cape Biodiversity Spatial Plan and Northern Cape Critical Biodiversity Areas) will be briefly considered for contextual purposes. Additional Plans that overlap with the project area include the Namakwa Bioregional Plan and the Succulent Karroo Ecosystem Planning (SKEP) project, which will be briefly incorporated where relevant aspects are identified that are relevant. These regional plans are not specifically relevant to the walkdown and were considered as part of the original ecological assessments undertaken for the project. They are however important to consider in terms of regional planning processes.

With reference to Figure 3, the project area overlaps with Critical Biodiversity Areas (CBA) 1 & 2 and Ecological Support Areas (ESA) designated as per the Western Cape Biodiversity Spatial Plan and Northern Cape Critical Biodiversity Areas. In general terms the CBA 1 area runs from the south-west (connecting with the Tanque Was Riviere) of the project area through the south-western side towards the east and north, with CBA 2 in the north-east and ESA 1 corresponding with the Tanqua Wash Riviere draining to the north-west of the project area.

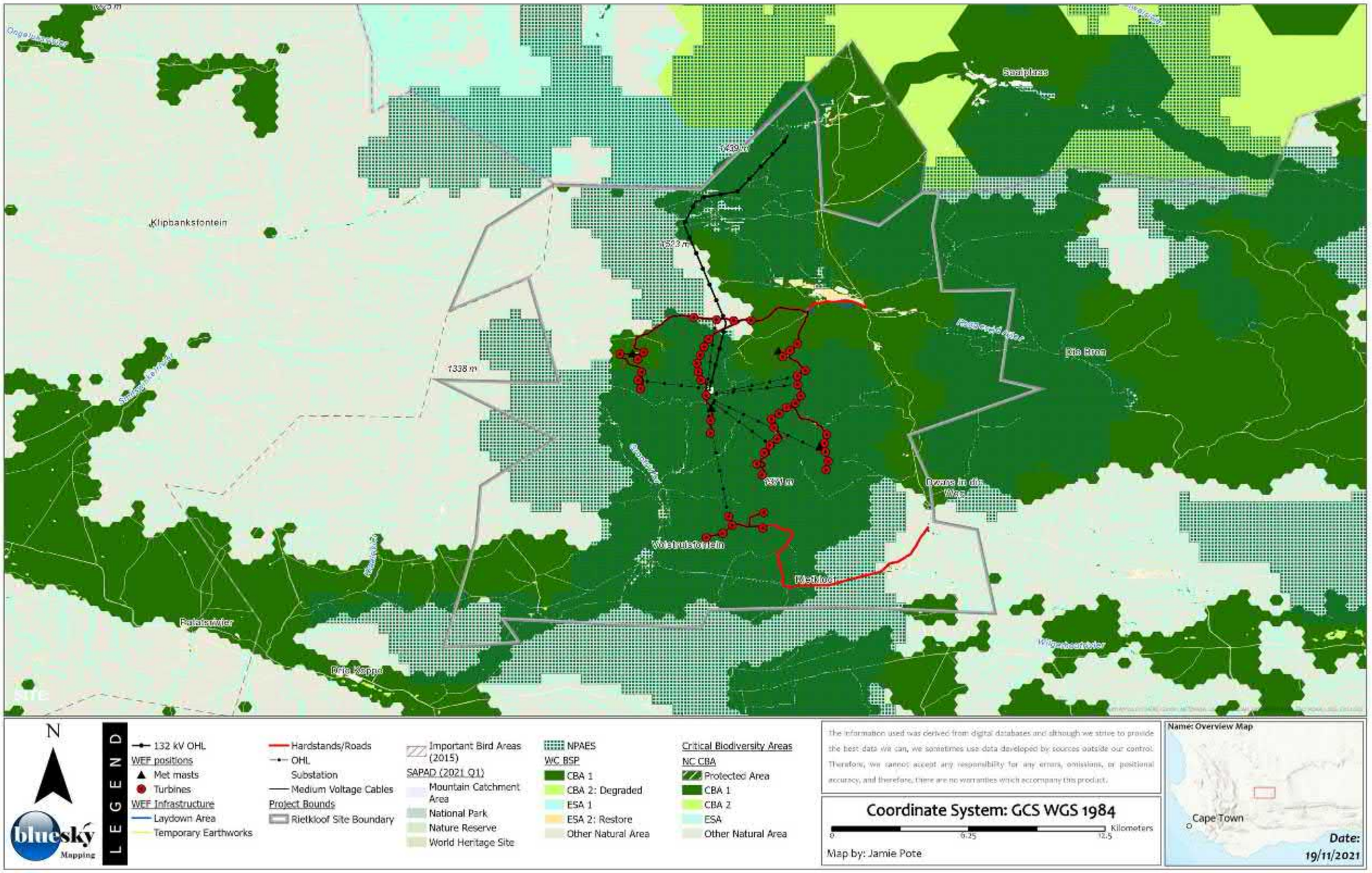

Figure 3: Bioregional Planning (Critical Biodiversity Areas)

11 Walkdown Findings

11.1 Vegetation

Since the original ecological assessments were undertaken for each of the separate wind energy facility projects, this walkdown has been undertaken for the wider project area and thus it has been possible to refine and better understand the vegetation composition and local distribution of flagged species of conservation concern within the greater area of influence. Figure 4 below provides a refinement of the national vegetation map, based on broad level observations during the walkdown.

11.2 Flora

Flora species typical of the vegetation include…

Several Species of Conservation Concern were identified during the initial ecological assessments. In addition, with the inclusion of additional available information and surveying, additional species have been identified. Where these species have been identified as occurring, measures have been taken to try and better understand the species, the broader distribution of the species and local populations within the project site and broader area of influence. A list of flora species of conservation concern that have been identified or recorded or during the walkdown is provided in Table 6 below, with photos and additional information relating to the species and populations from respective databases and walkdown observations is provided in Table 7.

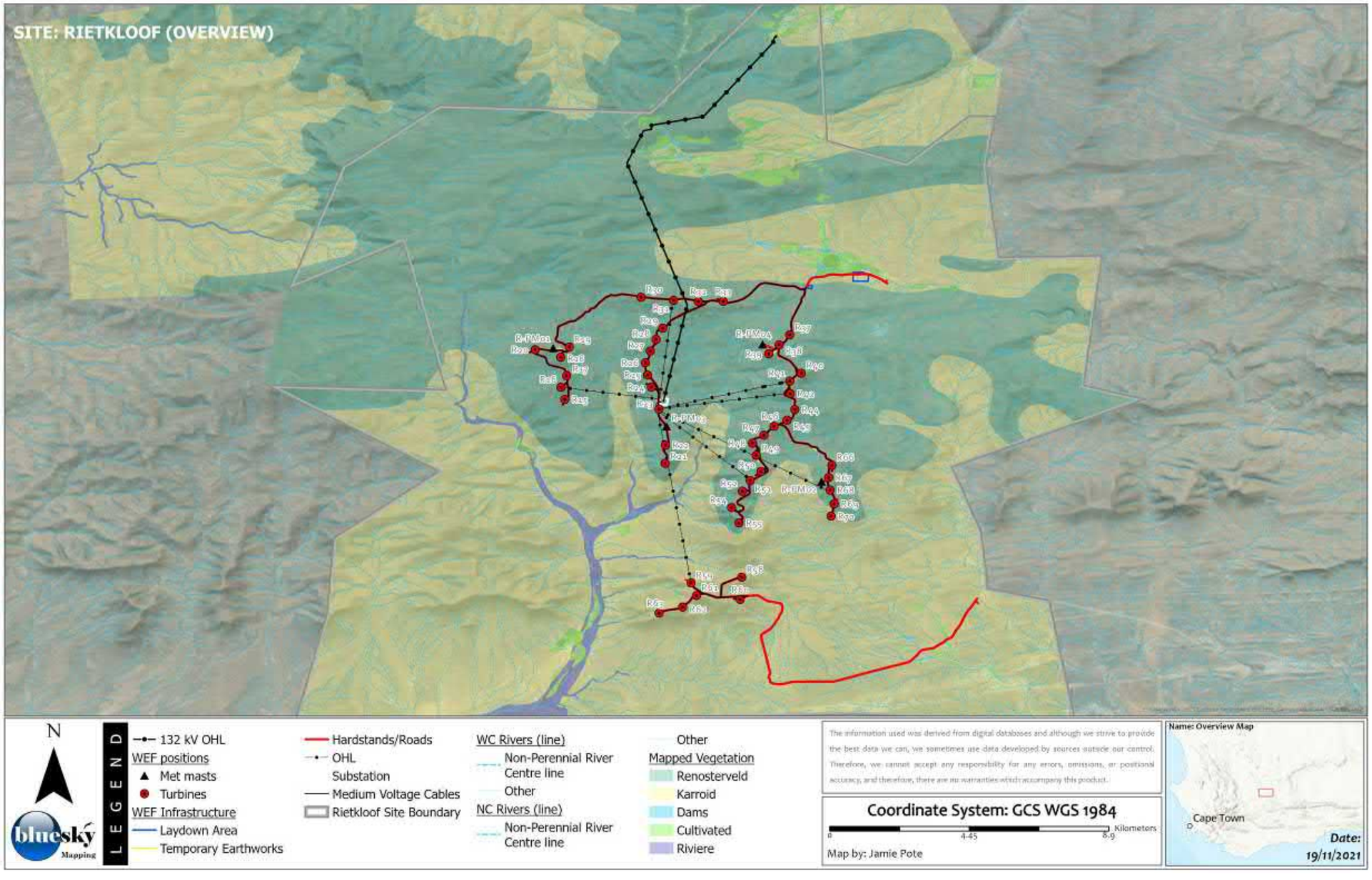

Figure 4: Refined vegetation mapping.

Table 6: Flora species of Conservation Concern confirmed to be present

Scientific Name	Family	IUCN Status*	Description and Distribution
Antimima androsacea	Aizoaceae	Critically Rare	A range-restricted species (EOO 10km²), known from one site where it is not threatened. Sutherland, Roggeveld Escarpment.
Antimima loganii	Aizoaceae	Vulnerable	Poorly known and apparently rare species. Its distribution range is not well known, but occurrence records suggest that it is very small. There is currently one known location, but it is likely an underestimate, as it may be overlooked due to taxonomic uncertainty. It is potentially threatened by overgrazing. Endemic to Roggeveld Escarpment near Sutherland in the Northern Cape.
Brunsvigia josephinae	Amaryllidaceae	Vulnerable	Long-lived bulb occurs as widely scattered subpopulations in lowland areas that are subject to continued habitat loss to. Herbarium specimens record about 18 subpopulations, and an estimated further 70 unrecorded subpopulations may exist. All subpopulations consist of fewer than 50 adult plants and are declining due to collection on an ongoing basis for medicinal purposes. Nieuwoudtville to Baviaanskloof.
Euryops sulcatus	Asteraceae	Vulnerable	Has a restricted range, with an extent of occurrence (EOO) of 1083 km². It has been recorded from five locations, but likely to occur at a few more within unexplored suitable habitat within its range. It continues to decline due to ongoing habitat degradation as a result of drought and overgrazing. Endemic to the Roggeveld and Nuweveld escarpments on the border between the Western and Northern Cape
Geissorhiza karooica	Iridaceae	Near Threatened	A range restricted species, EOO 497 km², known from six locations where it is potentially threatened by habitat loss and degradation as a result of overgrazing and erosion. Known from Roggeveld Mountains to Matjiesfontein.
Indigofera hantamensis	Fabaceae	Rare	A rare species, known from only three subpopulations scattered over a large area. Not threatened. Roggeveld to Calvinia.
Lotononis venosa	Fabaceae	Endangered	An endemic species to the Klein Roggeveld escarpment (extent of occurrence 84km², and area of occupancy 16km²). It is known from four locations. Some of the habitat has been transformed for crop cultivation in the past. Overgrazing by livestock and more frequent and persistent droughts are causing ongoing habitat degradation. Klein Roggeveld Mountains.
Romulea eburnea	Iridaceae	Vulnerable	A rare, localized endemic to the Roggeveld Escarpment, where it is known from two locations and potentially threatened by habitat degradation due to overgrazing. Klein Roggeveld.
Romulea hallii	Iridaceae	Vulnerable	A Roggeveld endemic known from two locations, (EOO 39km²). It is potentially threatened by road maintenance and expansion and livestock overgrazing. Roggeveld Plateau southwest of Sutherland.
Romulea	Iridaceae	Near	A range restricted Roggeveld endemic (EOO

Scientific Name	Family	IUCN Status*	Description and Distribution
syringodeoflora		Threatened	474km²), known from nine location and possibly occurring at a few more in unsurveyed parts of its range. Experiencing ongoing decline of habitat to crop cultivation as well as habitat degradation as a result of livestock overgrazing. Stony shale flats and slopes, Roggeveld Plateau.

* IUCN/SANBI Status

Antimima androsacea

Indigofera hantamensis

Antimima loganii

Lotononis venosa

Geissorhiza karooica

Romulea syringodeoflora

Brunsvigia josephinae

Romulea eburnea

Euryops sulcatus

Romulea hallii

Table 7: Flora species descriptions

Scientific Name	Occurrence within Area of Influence
Antimima androsacea	Large sub-population on north-facing slope as indicated on north side of Brandvalley WEF. Found to be common within the broader area. Population is unlikely to be at risk from irreversible loss on condition relocation is undertaken before commencement, where affected. Unlikely to be significantly affected.
Antimima loganii	Widespread within broader project area, on slopes and ridges, mostly to the west, south-west and north-west. Unlikely to be significantly affected.
Brunsvigia josephinae	Occurs throughout are, several large sub-populations outside of project footprint. Several sub-populations across the broader areas are far larger than the '*fewer than 50 adult plants*' as described in the conservation assessment for the species. Population is unlikely to be at risk from irreversible loss on condition that all affected adults and juveniles are relocated before commencement.
Euryops sulcatus	Scattered, sporadic clumps on slopes and valleys. Appears to be more common in valleys to the west of the Brandvalley but extends eastward onto slopes and hilltops on the north side of the Brandvalley WEF extending through the south-western side of the Rietkloof WEF. Unlikely to be significantly affected.
Geissorhiza karooica	Present, scattered throughout the site in low-lying areas. Unlikely to be significantly affected.
Indigofera hantamensis	Few scattered individuals recorded near Karreebosch powerline. Unlikely to be

Scientific Name	Occurrence within Area of Influence
	significantly affected as on west-facing slopes outside of project footprints.
Lotononis venosa	Possibly recorded on site in original assessment by Todd. Not recorded during walkdown. Unlikely to be significantly affected.
Romulea eburnea	Recorded and common in seep areas and on south-facing slopes. Unlikely to be significantly affected.
Romulea hallii	Scattered on south-facing slopes and peaks. Unlikely to be significantly affected.
Romulea syringodeoflora	Scattered widespread clumps. Unlikely to be significantly affected.

11.3 Fauna

Fauna species of Conservation Concern typical of the vegetation and site include species listed in Table 8.

Table 8: Fauna species

Scientific Name	Family	IUCN Status	Occurrence/Comment
MAMMALS			
Bunolagus monticularis (Riverine Rabbit)	Lagomorpha	CR	**Not Present.** Confined to riparian bush on the narrow alluvial fringe of seasonally dry watercourses in the Central Karoo. Presence highly unlikely. Site is outside of known distribution range.
Felis nigripes (Black-footed cat)	Carnivora	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub. May a be transient species.
REPTILES			
Psammobates tentorius tentorius (Karoo Tent Tortoise)	Testudinidae	NT	Tortoises are highly susceptible to collisions with motor vehicles and trucks on new roads. Found throughout the project area but observed to be more common in lowland areas.
Psammobates tentorius veroxii (Bushmanland Tent Tortoise)	Testudinidae	NT	Tortoises are highly susceptible to collisions with motor vehicles and trucks on new roads. Found throughout the project area but observed to be more common in lowland areas.
AMPHIBIANS			
None of Concern			
INVERTEBRATES			
Aloeides thyra orientis (Red copper)	Lycaenidae	LC	In vicinity of known distribution range of related subspecies (Brenton Blue). No Lycaenidae species observed during walkdown.

11.4 Sensitive Areas and species populations

Sensitive areas identified either in the original biodiversity assessment and/or observed during the walkdown include the following:

- Rocky Outcrops and Ridges on slopes and mountain peaks;
- Rivers, seeps, wetlands and pans; and
- Sub-populations of flagged species of conservation concern.

A summary of the Critical Habitat is provided in Table 9 and shown in Figure 5 to Figure 7.

Table 9: Critical Habitat identified in proximity to project infrastructure

Label	Sensitivity	Vegetation	Comment
1	*Indigofera hantamensis*	Karroid	Few individuals of *Indigofera hantamensis* sp. To be avoided.
2	*Brunsvigia josephinae*	Karroid/ Renosterveld	Extensive population of scattered *Brunsvigia josephinae*. Due diligence during any activities.
3	*Brunsvigia josephinae*	Renosterveld	Sub population of dense *Brunsvigia josephinae*. No further loss without relocation.
4	*Brunsvigia josephinae*	Renosterveld	Sub population of dense *Brunsvigia josephinae*. No further loss without relocation.
5	Rocky Garden	Renosterveld	Sensitive rocky habitat. No infrastructure to be placed in vicinity. To be demarcated and signposted as no-go area.
6	*Brunsvigia josephinae*	Renosterveld	Extensive population of scattered *Brunsvigia josephinae*. Due diligence during any activities.
7	Pan (No-Go)	Karroid	No-Go ephemeral pan adjacent to site camp and road at risk from vehicles as a turning point. To be demarcated with fence and signage.
8	Seep (No-Go)	Renosterveld	Intact seep area. No-Go area. Not suitable for pylon placement.
9	Canal (No-Go)	Karroid	Canal traversing proposed site. At risk from flooding during rainfall. Not suitable for Site Camp.
10	*Brunsvigia josephinae*	Renosterveld	Extensive population of scattered *Brunsvigia josephinae*. Due diligence during any activities.
11	*Antimima androsacea* (dense)	Renosterveld	Dense population of Critically Rare species. Due diligence ot be applied working in this area and infrastructure to be kept to minimum. Relocation required where necessary.
12	Seep/Watercourse (No-Go)	Renosterveld	Seep/canal area. At risk from flooding during rainfall. Not suitable for Site Camp.
13	*Brunsvigia josephinae*	Karroid	Moderate density *Brunsvigia josephinae* population. Not suited for proposed Karreebosch powerline.
14	High Biodiversity slope	Karroid	Elevated and rich biodiversity along southernmost slopes. Loss to be kept to minimum.
15	High Biodiversity slope	Karroid	Elevated and rich biodiversity along southernmost slopes. Loss or impacts to be kept to minimum.
16	Aggregating, ground-nesting Bee species	Karroid	Population of unknown aggregating, ground-nesting Bee species. To be avoided, as sensitive to disturbance and bees are critical ecologically as pollinators.
17	Aggregating, ground-nesting Bee species	Karroid	Population of unknown aggregating, ground-nesting Bee species. To be avoided, as sensitive to

Label	Sensitivity	Vegetation	Comment
			disturbance and bees are critical ecologically as pollinators.
18	Watercourse/Seep (No-Go)	Renosterveld	Extensive seep and watercourse area at risk from multiple road crossings. Road to be adjusted to reduce impact.
19	*Brunsvigia josephinae*	Renosterveld/ Karroid	Extensive population of large *Brunsvigia josephinae* associated with watercourse and riparian vegetation. Edge of new road to not extend closer to river than existing access track edge.
20	Watercourse (No-Go)	Karroid	Watercourse next to access track. To be avoided and not used for project access.
21	*Antimima androsacea* (sparse)	Renosterveld/ Karroid	Critically Rare species present sporadically. Not specifically at risk from project as generally more common on south facing slopes but small clumps also on summits. Due diligence to be implemented with pre-construction screening and relocation before commencement on footprint within this area.

Project : Euronotus

Layout - Sensitivity Overview

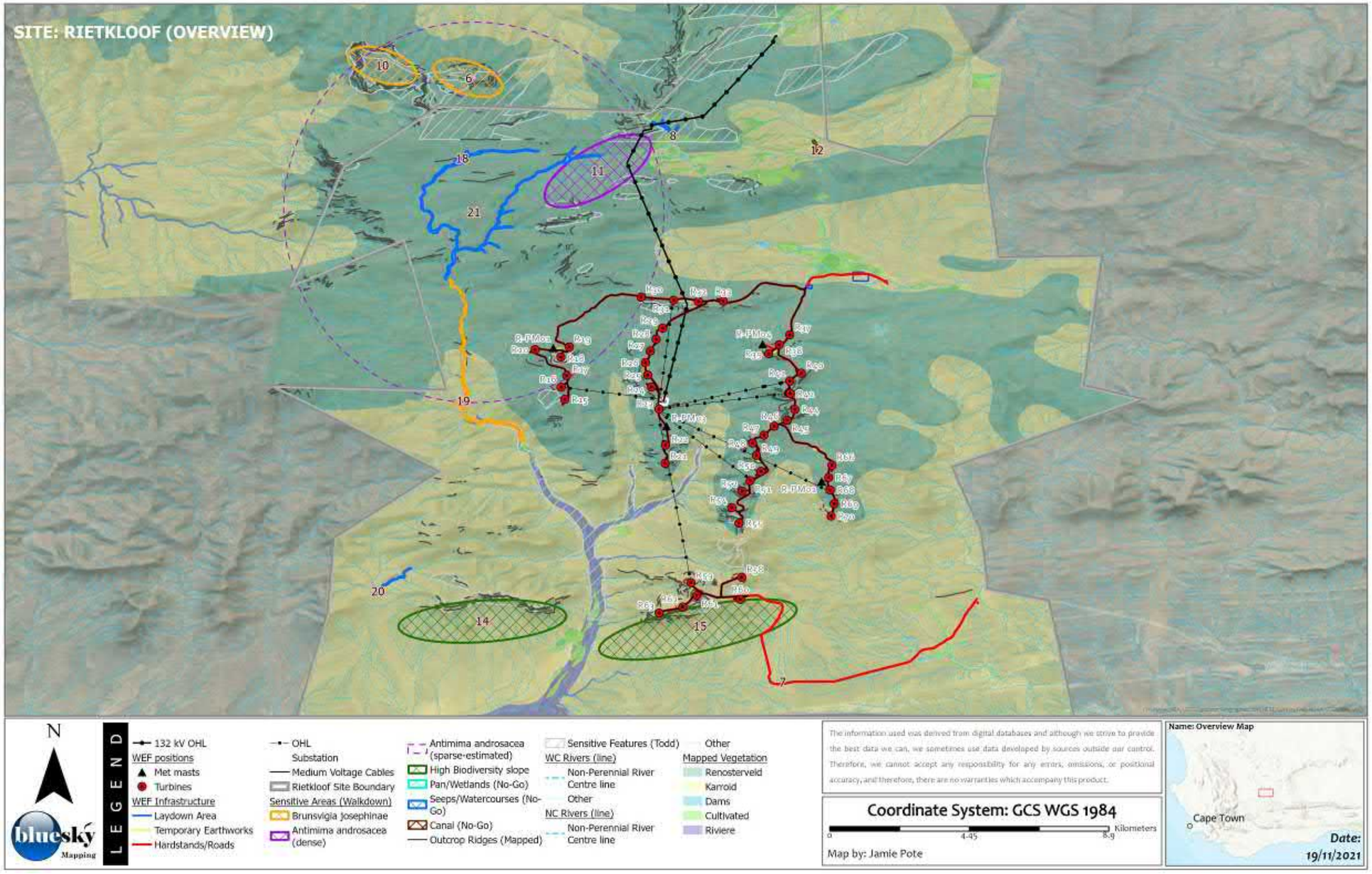

Figure 5: Sensitive and Critical Habitat features identified during walkdown (Overview)

Project : Euronotus

Layout - Sensitivity Overview

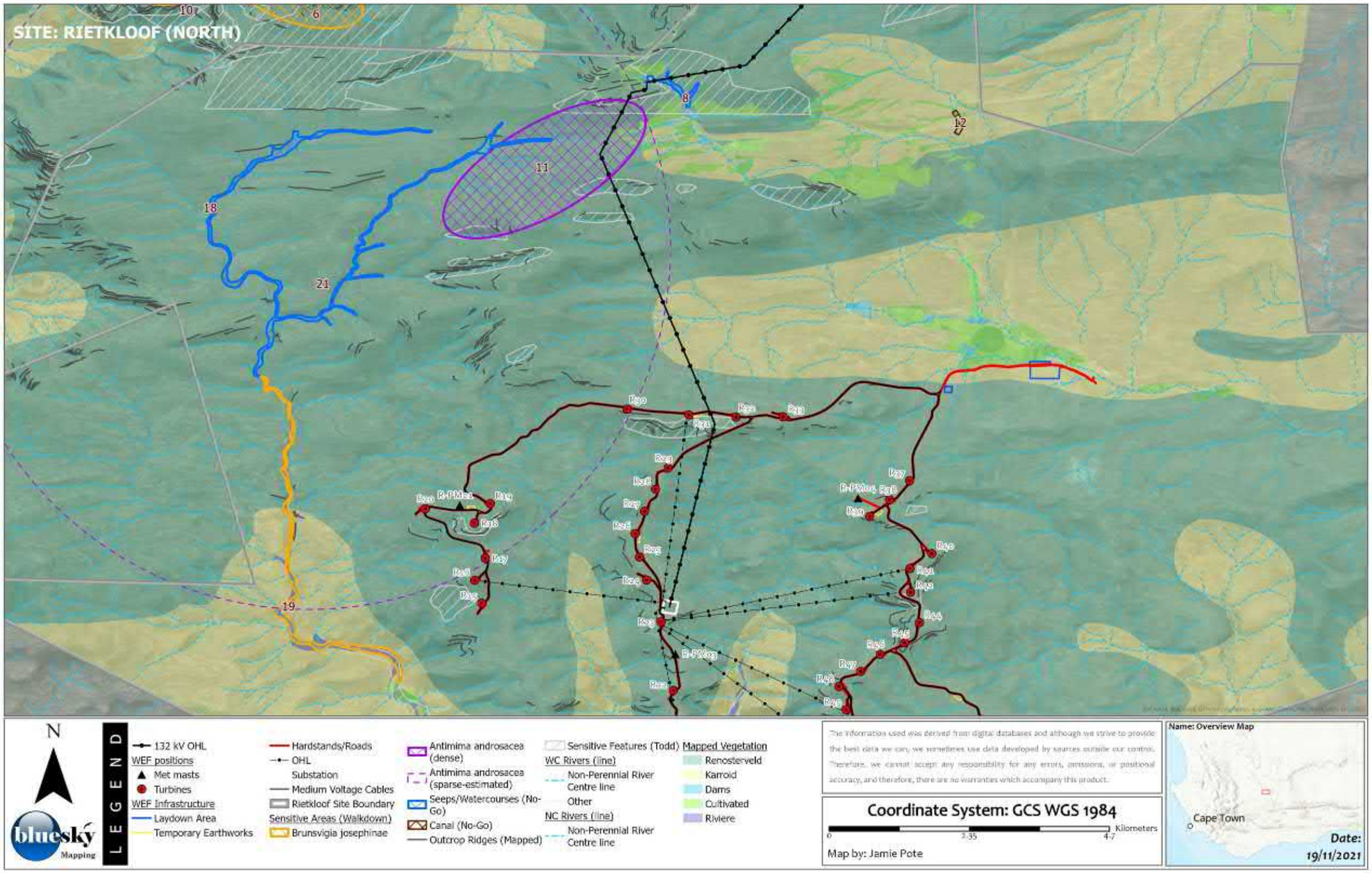

Figure 6: Sensitive and Critical Habitat features identified during walkdown (North)

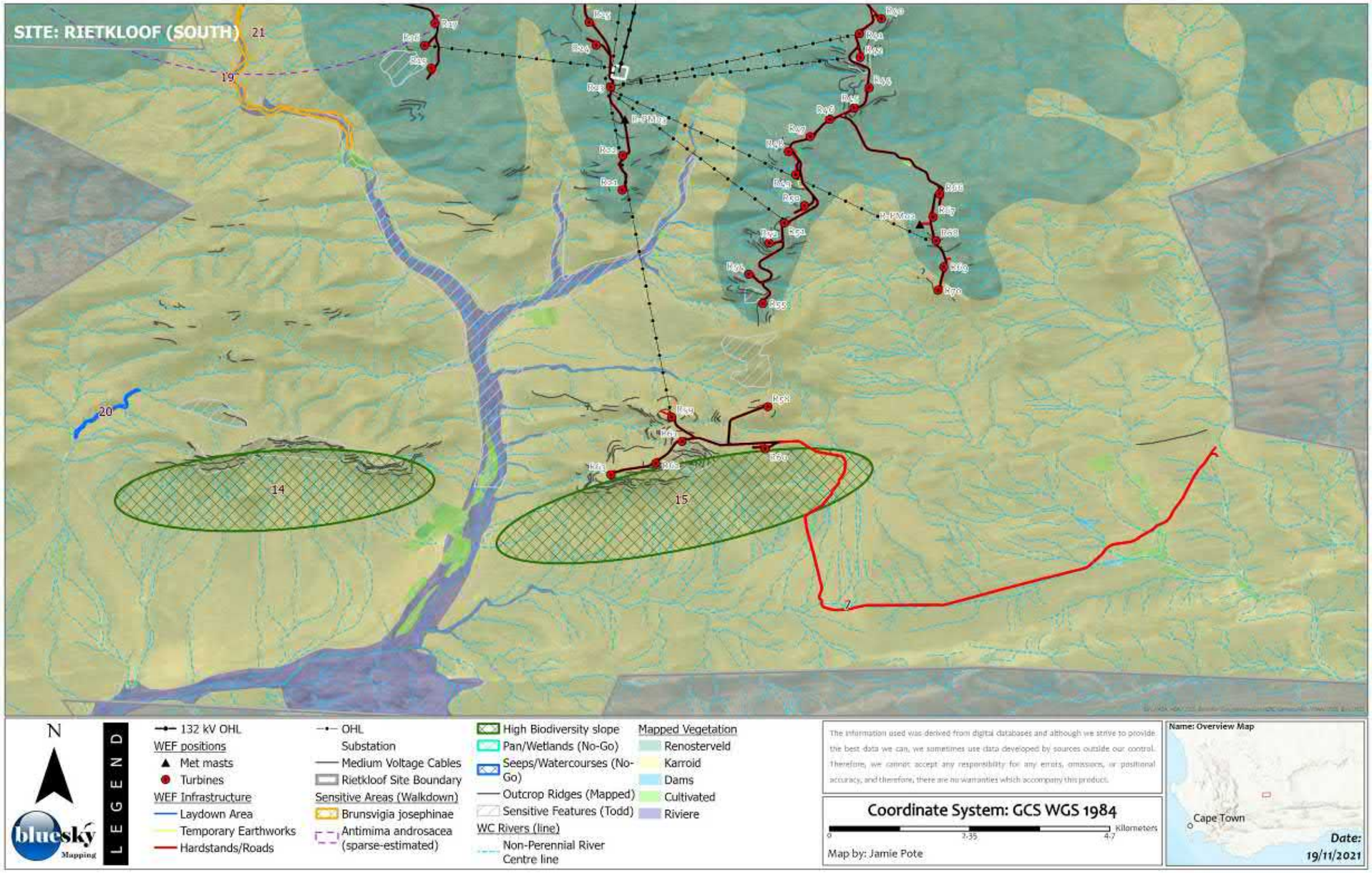

Figure 7: Sensitive and Critical Habitat features identified during walkdown (South)

11.4.1 Turbines, Roads and other Infrastructure

A summary analysis of specific infrastructure risks is provided in Table 10 and indicated in Figure 6 and Figure 7.

Table 10: Summary of WEF and infrastructure vegetation and sensitivities.

WTG / Segment	Vegetation	Species	Sensitivity/Comment
R37	Renosterveld	*Brunsvigia josephinae*	Protected species
R40	Renosterveld	*Brunsvigia josephinae*	Protected species
R41	Renosterveld	*Brunsvigia josephinae*	Protected species
R44	Renosterveld	*Brunsvigia josephinae*	Protected species
R45	Renosterveld	*Brunsvigia josephinae*	Protected species
R46	Renosterveld	*Brunsvigia josephinae*	Protected species
R55	Renosterveld		Rocky Outcrop
R68	Renosterveld		Rocky Outcrop
Northern Access Road	Renosterveld		Access road passes through and along seep area (Sentries Area 18) multiple times. Access road should be realigned.
Southern Access Road	Karroid	*Antimima androsacea*	Wetland pan (Sentries Area 7) near western site camp to be fenced to avoid not being used for vehicle turning/parking – i.e. no access permitted.
Powerline	Karroid/ Renosterveld		Central (east-west) portion traverses seep area (Sentries Area 8), with pylons in seep. Should be realigned. Passes through species area (Sentries Area 11), due care to be taken during construction within minimal pylons.
WTG 58-63	Karroid		Road passes through diverse area (Sentries Area 15) on south facing slope with large number of species.

12 Walkdown Conclusions and Recommendations

The following general recommendations are made based on the findings of the walkdown, with reference to Table 10, Figure 6 and Figure 7:

- Turbines 55 & 68 are located adjacent to outcrops. The outcrops should be avoided as far as possibly during final surveying and pegging out.
- Central (east-west) portion of the powerline traverses a seep area (Sensitive Area 8), where pylons would be required in the seep. This section should be realigned.
- Powerline also passes through an area having a high density of *Antimima androsacea* (Sensitive Area 11), due care to be taken during construction within minimal pylons.
- The access road passes through and along seep area (Sensitive Area 18) multiple times and along watercourse with large *Brunsvigia josephinae* population (Sensitive Area 19). Access road should be aligned as far from watercourse as possible and should not extend closer to watercourse than inner side of existing access track.
- Wetland pan (Sensitive Area 7) near western site camp must be fenced to avoid being used for vehicle turning, storage, etc – No Access Area.
- The access road passes through area having a high diversity (Sensitive Area 14, Sensitive Area 15) in comparison to surrounding area of influence with several species present that are not recorded elsewhere. Care to be taken with access road alignment to minimise loss and species search and rescue is required.
- Watercourse (Sensitive Area 20) noted adjacent to existing access track must not be used for site access.
- *The species Antimima androsacea* was found to occur at low densities throughout a broader area as indicated (Sensitive Area 21)

The following specific recommendations should be included in any updated EMPr for the project.

- A flora and fauna search and rescue (relocation) must be undertaken before commencement of vegetation clearing. A more comprehensive list is species for which permits will be required is provided in Appendix 1: Plant Species of Conservation Concern (Red listed) and Appendix 2: Flora Protected in Terms of Provincial Ordinance(s).

- Several turbine footprints are identified that overlap slightly with outcrops. Where possible, minor layout adjustments should be implemented during final surveying and pegging out to avoid such areas as far as possible.
- Where there are further changes/updates to the vertical and horizontal alignments of the road network and site laydown area, such sections/areas must be reassessed in order to determine any further risks and impacts to the ecology and/or species.

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14 Appendix 1: Plant Species of Conservation Concern (Red listed)

Species include those having elevated conservation status or identified as being having a distribution range overlapping or in proximity to the site. The list includes species from various online database sources that were also screened for possible occurrence, as well as data from original ecological assessments (Todd, 2011, 2014, 2016, 2019) have been included and verified for any recent name and status changes. Species that were previously noted, but now confirmed to either not having overlapping distribution ranges (due to improved databases and distribution records), or have not been recorded, are included for clarification.

The IUCN Red List Categories define the extinction risk of species assessed. Nine categories extend from NE (Not Evaluated) to EX (Extinct). Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) species are considered to be threatened with extinction. Additional non-IUCN status categories include Rare and Critically Rare, as determined by SANBI as possibly under threat, but not yet evaluated in terms of the IUCN criteria and categories.

Permits for the identified species would be required either in terms of the respective Provincial legislation and/or under the NEMBA Threatened of Protected Species (ToPS).

Highlighted species confirmed to be present.

Scientific Name	Family	Status*	Comment
Plants			
Acmadenia argillophila	Rutaceae	NT	Not recorded, found to the south in the Swartberg.
Adromischus mammillaris	Crassulaceae	EN, NC	Not recorded, known locations in Calitzdorp area
Adromischus phillipsiae	Crassulaceae	Rare, NC	Not recorded. NEST projected. Roggeveld Mountains to Kamiesberg. Sheltered rock crevices in loam soil.
Agathosma acocksii	Rutaceae	VU, NC	Not recorded. NEST projected. Witberg to the south, outside of project area in Fynbos.
Aloidendron dichotomum	Asphodelaceae	VU, WC, NC	Not recorded
Aloinopsis loganii	Aizoaceae	VU, WC, NC	Not recorded
Amphithalea spinosa	Fabaceae	VU	Not recorded. NEST projected, known locations to the south in the Hex River Valley/ Witteberg area

Scientific Name	Family	Status*	Comment
Amphithalea villosa	Fabaceae	NT	Not recorded
Anisodontea procumbens	Malvaceae	Rare	Not recorded. NEST projected
Antimima androsacea	Aizoaceae	CR Rare, WC, NC	A range-restricted species (EOO 10km²), known from one site where it is not threatened. Sutherland, Roggeveld Escarpment.
Antimima emarcescens	Aizoaceae	VU, WC, NC	Not recorded. NEST projected
Antimima hamatilis	Aizoaceae	VU, WC, NC	Not recorded, known locations to the south in the Robertson/Worcester area
Antimima loganii	Aizoaceae	VU, WC, NC	Poorly known and apparently rare species. Its distribution range is not well known, but occurrence records suggest that it is very small. There is currently one known location, but it is likely an underestimate, as it may be overlooked due to taxonomic uncertainty. It is potentially threatened by overgrazing. Endemic to Roggeveld Escarpment near Sutherland in the Northern Cape.
Antithrixia flavicoma	Asteraceae	VU	Not recorded. Outside of range (Namaqualand).
Aspalathus candicans	Fabaceae	EN	Not recorded, known locations in Worcester area to the south-west
Aspalathus intricata subsp. anthospermoides	Fabaceae	Rare, NC	Not recorded. NEST projected
Aspalathus intricata subsp. intricata	Fabaceae	Rare, NC	Not recorded. NEST projected
Aspalathus intricata subsp. oxyclada	Fabaceae	Rare, NC	Not recorded. NEST projected
Asparagus mollis	Asparagaceae	VU	Not recorded. NEST projected
Astroloba herrei	Asphodelaceae	VU, WC, NC	Not recorded. NEST projected, known locations to the south in the Swartberg mountains around Matjiesfontein & Prince Albert
Babiana cuneata	Iridaceae	*LC, WC, NC*	Present on site
Babiana sambucina	Iridaceae	EN, WC, NC	Not recorded.
Braunsia stayneri	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Brunsvigia josephinae	Amaryllidaceae	VU, WC, NC	Long-lived bulb occurs as widely scattered subpopulations in lowland areas that are subject to continued habitat loss to. Herbarium specimens record about 18 subpopulations, and an estimated further 70 unrecorded subpopulations may exist. All subpopulations consist of fewer than 50 adult plants and are declining due to collection on an ongoing basis for medicinal purposes. Nieuwoudtville to Baviaanskloof.
Bulbine torta	Asphodelaceae	Rare, WC, NC	Not recorded
Calamophyllum teretiusculum	Aizoaceae	DDT, WC, NC	Not recorded. Karoo Endemic, taxonomically problematic.
Calobota elongata	Fabaceae	VU	Not recorded
Cineraria lobata subsp. lasiocaulis	Asteraceae	Rare	Not recorded. NEST projected

Scientific Name	Family	Status*	Comment
Cleretum booysenii	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Cliffortia arborea	Rosaceae	VU	Not recorded. NEST projected
Crassula alpestris subsp. massonii	Crassulaceae	Rare, NC	Not recorded
Crassula brachystachya	Crassulaceae	Rare, NC	Not recorded
Crassula congesta subsp. laticephala	Crassulaceae	Rare, NC	Not recorded
Crassula dodii	Crassulaceae	DD, NC	Not recorded. Roggeveld-Hantam endemic, Known from general area. Widespread.
Crassula roggeveldii	Crassulaceae	Rare, NC	Not recorded
Crassula vestita	Crassulaceae	Rare, NC	Not recorded
Cromidon hamulosum	Scrophulariaceae	DD	Not recorded. Roggeveld-Hantam endemic, Known from general area. Widespread.
Delosperma sphalmanthoides	Aizoaceae	VU, WC, NC	Not recorded. NEST projected
Didymaotus lapidiformis	Aizoaceae	VU, WC, NC	Not recorded, known locations generally to the south-west in Tanqua karoo and Wash Riviere.
Drosanthemum comptonii	Aizoaceae	DDT, WC, NC	Not recorded. Karoo Endemic, taxonomically problematic.
Drosanthemum worcesterense	Aizoaceae	EN, WC, NC	Not recorded. NEST projected
Duvalia parviflora	Apocynaceae	VU, NC	Not recorded, known locations in the south around Ladismith & Oudshoorn
Erica glandulipila	Ericaceae	Rare, WC, NC	Not recorded. NEST projected
Eriocephalus grandiflorus	Asteraceae	Rare	Not recorded. Present in area
Eriocephalus microphyllus var. carnosus	Asteraceae	EN	Not recorded. NEST projected
Eriospermum exile	Ruscaceae	Rare	Not recorded
Euryops marlothii	Asteraceae	Rare	Not recorded
Euryops namaquensis	Asteraceae	VU	Not recorded. Outside of range (Namaqualand/ Knersvlakte) quarts patches.
Euryops sulcatus	Asteraceae	VU	Has a restricted range, with an extent of occurrence (EOO) of 1083 km². It has been recorded from five locations, but likely to occur at a few more within unexplored suitable habitat within its range. It continues to decline due to ongoing habitat degradation as a result of drought and overgrazing. Endemic to the Roggeveld and Nuweveld escarpments on the border between the Western and Northern Cape
Gasteria disticha	Asphodelaceae	CR, WC, NC	Not recorded, known locations in Worcester area to the south-west
Geissorhiza karooica	Iridaceae	NT, WC, NC	A range restricted species, EOO 497 km², known from six locations where it is potentially threatened by habitat loss and degradation as a result of overgrazing and erosion. Known from Roggeveld Mountains to Matjiesfontein.
Geissorhiza spiralis	Iridaceae	VU, WC, NC	Not recorded. NEST projected
Globulariopsis wittebergensis	Scrophulariaceae	Rare	Not recorded. NEST projected

Scientific Name	Family	Status*	Comment
Gnidia cyanea	Thymelaeaceae	Rare	Not recorded. NEST projected
Haemanthus tristis	Amaryllidaceae	VU, WC, NC	Not recorded
Haworthia lockwoodii	Asphodelaceae	VU, WC, NC	Not recorded
Haworthia mirabilis	Asphodelaceae	DDT, WC, NC	Not recorded, found to the west near Nieuwoudtville
Haworthia wittebergensis	Asphodelaceae	Rare, WC, NC	Not recorded. NEST projected
Helictotrichon barbatum	Poaceae	VU	Not recorded. NEST projected
Helictotrichon namaquense	Poaceae	VU	Not recorded. NEST projected
Helictotrichon roggeveldense	Poaceae	EN	Not recorded. NEST projected
Heliophila elata	Brassicaceae	VU	Not recorded
Hermannia pillansii	Malvaceae	CR Rare	Not recorded. NEST projected
Hesperantha flava	Iridaceae	Rare, WC, NC	Not recorded. Present in area
Hesperantha glabrescens	Iridaceae	Rare, WC, NC	Not recorded. NEST projected
Hoodia pilifera	Apocynaceae	NT, NC	Not recorded
Hypodiscus sulcatus	Restionaceae	VU, WC, NC	Not recorded, known locations in the south around Laingsburg/Touwsrivier (Matjiesfontein Shale Renosterveld)
Indigofera hantamensis	Fabaceae	Rare	A rare species, known from only three subpopulations scattered over a large area. Not threatened. Roggeveld to Calvinia.
Ixia mollis	Iridaceae	VU, WC, NC	Not recorded
Ixia oxalidiflora	Iridaceae	VU, WC, NC	Not recorded. Present in area
Ixia parva	Iridaceae	VU, WC, NC	Not recorded. NEST projected
Ixia rivulicola	Iridaceae	VU, WC, NC	Not recorded. NEST projected
Lachenalia congesta	Hyacinthaceae	VU, WC, NC	Not recorded
Lachenalia longituba	Hyacinthaceae	VU, WC, NC	Not recorded
Lachenalia martinae	Hyacinthaceae	VU, WC, NC	Not recorded
Lachenalia whitehillensis	Hyacinthaceae	NT, WC, NC	Not recorded
Lampranthus amoenus	Aizoaceae	EN, WC, NC	Not recorded, known locations in the Cape Flats to the south-west
Leobordea globulosa	Fabaceae	VU	Not recorded. NEST projected
Leucadendron cadens	Proteaceae	Rare, WC, NC	Not recorded
Leucadendron sp. nov. (Acocks 23716 NBG)	Proteaceae	CR EN, WC, NC	Not recorded. NEST projected
Lotononis comptonii	Fabaceae	EN	Not recorded, known locations to the south in the Swartberg
Lotononis densa subsp. congesta	Fabaceae	VU	Not recorded, known locations to the west (Piketberg)
Lotononis gracilifolia	Fabaceae	EN	Not recorded, known locations to the south in the Laingsburg/Worcester area
Lotononis venosa	Fabaceae	EN	An endemic species to the Klein Roggeveld escarpment (extent of occurrence 84km², and area of

Scientific Name	Family	Status*	Comment
			occupancy 16km²). It is known from four locations. Some of the habitat has been transformed for crop cultivation in the past. Overgrazing by livestock and more frequent and persistent droughts are causing ongoing habitat degradation. Klein Roggeveld Mountains.
Moraea aspera	Iridaceae	VU, WC, NC	Not recorded. Outside of range (Hantam).
Moraea contorta	Iridaceae	Rare, WC, NC	Not recorded
Moraea fenestrata	Iridaceae	NT, WC, NC	Not recorded
Moraea tanquana	Iridaceae	Rare, WC, NC	Not recorded
Moraea virgata subsp. karooica	Iridaceae	Rare, WC, NC	Not recorded
Muraltia karroica	Polygalaceae	VU	Not recorded, found to the south in the Swartberg.
Nenax velutina	Rubiaceae	Rare	Not recorded. NEST projected
Octopoma nanum	Aizoaceae	VU, WC, NC	Not recorded
Oftia glabra	Scrophulariaceae	Rare	Not recorded. NEST projected
Oxalis marlothii	Oxalidaceae	EN, NC	Not recorded. Present in area
Pauridia breviscapa	Hypoxidaceae	Rare, WC, NC	Not recorded. NEST projected
Peersia frithii	Aizoaceae	VU, WC, NC	Not recorded. Present in area
Pelargonium torulosum	Geraniaceae	Rare, NC	Not recorded
Phiambolia hallii	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Phylica comptonii	Rhamnaceae	Rare, NC	Not recorded. NEST projected
Phylica retorta	Rhamnaceae	Rare, NC	Not recorded. NEST projected
Phyllobolus amabilis	Aizoaceae	Rare, WC, NC	Not recorded
Polhillia involucrata	Fabaceae	EN, NC	Not recorded. NEST projected
Protea convexa	Proteaceae	CR EN, WC, NC	Not recorded. NEST projected, known locations in Northern Cederberg, Witteberg and Klein Swartberg mountains.
Protea lepidocarpodendron	Proteaceae	NT, WC, NC	Not recorded
Psoralea karooensis	Fabaceae	Rare	Not recorded. NEST projected
Pterygodium inversum	Orchidaceae	EN, WC, NC	Not recorded, found to the west in the Ceres/Malmesbury area
Restio aridus	Restionaceae	VU	Not recorded. NEST projected
Restio esterhuyseniae	Restionaceae	Rare, WC, NC	Not recorded. NEST projected
Rhodocoma vleibergensis	Restionaceae	Rare, WC, NC	Not recorded. NEST projected
Romulea eburnea	Iridaceae	VU, WC, NC	A rare, localized endemic to the Roggeveld Escarpment, where it is known from two locations and potentially threatened by habitat degradation due to overgrazing. Klein Roggeveld.
Romulea hallii	Iridaceae	VU [D2],	A Roggeveld endemic known from two

Scientific Name	Family	Status*	Comment
		WC, NC	locations, (EOO 39km²). It is potentially threatened by road maintenance and expansion and livestock overgrazing. Roggeveld Plateau southwest of Sutherland.
Romulea multifida	Iridaceae	VU, WC, NC	Not recorded. Present in area. South African endemic. Roggeveld Plateau. Roggeveld Shale Renosterveld.
Romulea syringodeoflora	Iridaceae	NT, WC, NC	A range restricted Roggeveld endemic (EOO 474km²), known from nine location and possibly occurring at a few more in unsurveyed parts of its range. Experiencing ongoing decline of habitat to crop cultivation as well as habitat degradation as a result of livestock overgrazing. Stony shale flats and slopes, Roggeveld Plateau.
Ruschia acocksii	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Ruschia altigena	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Secale strictum subsp. africanum	Poaceae	CR EN	Not recorded. NEST projected. Roggeveld-Hantam endemic, Found on riverbanks.
Selago albomontana	Scrophulariaceae	Rare	Not recorded. NEST projected
Strumaria karooica	Amaryllidaceae	Rare, WC, NC	Not recorded
Strumaria karoopoortensis	Amaryllidaceae	VU, WC, NC	Not recorded
Strumaria pubescens	Amaryllidaceae	Rare, WC, NC	Not recorded
Strumaria undulata	Amaryllidaceae	DDT, WC, NC	Not recorded. Karoo Endemic, taxonomically problematic.
Tanquana archeri	Aizoaceae	VU, WC, NC	Not recorded. Found south of the site in Koedoesberge-Moordenaars Karoo. Limited population, severely threatened by plant traded harvesting.
Tanquana hilmarii	Aizoaceae	CR, WC, NC	Not recorded, known locations to the south of Laingsburg
Thesium marlothii	Santalaceae	DDT	Not recorded. Karoo Endemic, taxonomically problematic.
Trachyandra sanguinorhiza	Asphodelaceae	Rare, WC, NC	Not recorded
Trichodiadema hallii	Aizoaceae	DDT, WC, NC	Not recorded. Karoo Endemic, taxonomically problematic.
Tritonia florentiae	Iridaceae	Rare, WC, NC	Not recorded. NEST projected
Tylecodon faucium	Crassulaceae	Rare, NC	Not recorded. Karoo Endemic, A range-restricted habitat specialist endemic to the Ceres Karoo and Roggeveld. Site overlaps with possible range, may be present in shaded crevices on south facing slopes.
Wurmbea capensis	Colchicaceae	VU	Not recorded. Outside of range (Swartland area).
Zaluzianskya mirabilis	Scrophulariaceae	Rare	Not recorded. NEST projected
Mammals			
Bunolagus monticularis (Riverine rabbit)	Lagomorpha	CR	**Not Present.** Confined to riparian bush on the narrow alluvial fringe of

Scientific Name	Family	Status*	Comment
			seasonally dry watercourses in the Central Karoo. Presence highly unlikely. Site is outside of known distribution range.
Felis nigripes (Black-footed cat)	Carnivora	VU	Associated with arid country with MAR 100-500 mm, particularly areas with open habitat that provides some cover in the form of tall stands of grass or scrub. May a be transient species.
Birds			
Aquila verreauxii (Verreaux's Eagle)	Accipitridae	VU	Nesting pairs within or peripheral to the site and may be subject to loss of foraging habitat and the risk of collision with the turbine blades.
Polemaetus bellicosus (Martial Eagle)	Accipitridae	EN	Nesting pairs within or peripheral to the site and may be subject to loss of foraging habitat and the risk of collision with the turbine blades. (Vulnerable globally - IUCN)
Circus maurus (Black Harrier)	Accipitridae	EN	Nesting pairs within or peripheral to the site and may be subject to loss of foraging habitat and the risk of collision with the turbine blades. **(Endangered Globally - IUCN)**
Neotis ludwigii (Ludwig's Bustard)	Otididae	EN	Seasonal influxes of this threatened endemic may be displaced from foraging areas and exposed to collision risk with the turbine blades and with new power lines. (Endangered Globally - IUCN)
Reptiles			
Psammobates tentorius tentorius (Karoo Tent Tortoise)	Testudinidae	NT	Tortoises are highly susceptible to collisions with motor vehicles and trucks on new roads
Psammobates tentorius veroxii (Bushmanland Tent Tortoise)	Testudinidae	NT	Tortoises are highly susceptible to collisions with motor vehicles and trucks on new roads
Amphibians			
None of Concern			
Invertebrates			
Aloeides thyra orientis (Red copper)	Lycaenidae	LC	In vicinity of known distribution range of related subspecies (Brenton Blue). Host plants are not present on site.

* IUCN Red List Categories: LC – Least Concern; NT - Near Threatened; VU – Vulnerable; En – Endangered; CR – Critically Endangered; NE – Not Evaluated. WC – Western Cape Nature Conservation Laws Amendment Act (Act No 3 of 2000); NC – Northern Cape Naure Conservation Act (Act No 9 of 2009). ToPS – Threatened or Protected Species in terms of NEMBA.

15 Appendix 2: Flora Protected in Terms of Provincial Ordinance(s)

Highlighted species confirmed to be present.

Scientific Name	Family	Status*	Occurrence/Comment
Adromischus maculatus	Crassulaceae	LC, NC	Present on site
Adromischus mammillaris	Crassulaceae	EN, NC	Not recorded, known locations in Calitzdorp area
Adromischus phillipsiae	Crassulaceae	Rare, NC	Not recorded. NEST projected. Roggeveld Mountains to Kamiesberg. Sheltered rock crevices in loam soil.
Agathosma acocksii	Rutaceae	VU, NC	Not recorded. NEST projected. Witberg to the south, outside of project area in Fynbos.
Albuca concordiana	Hyacinthaceae	LC, WC, NC	Present on site
Aloe comptonii	Asphodelaceae	*LC, WC, NC*	Present on site
Aloe longistyla	Asphodelaceae	LC, WC, NC	Not recorded, Widespread species
Aloidendron dichotomum	Asphodelaceae	VU, WC, NC	Not recorded
Aloinopsis loganii	Aizoaceae	VU, WC, NC	Not recorded
Antimima androsacea	Aizoaceae	CR Rare, WC, NC	A range-restricted species (EOO 10km²), known from one site where it is not threatened. Sutherland, Roggeveld Escarpment.
Antimima emarcescens	Aizoaceae	VU, WC, NC	Not recorded. NEST projected
Antimima hamatilis	Aizoaceae	VU, WC, NC	Not recorded, known locations to the south in the Robertson/Worcester area
Antimima karroidea	Aizoaceae	LC, WC, NC	Not recorded. Karoo Endemic, widespread.
Antimima loganii	Aizoaceae	VU, WC, NC	Poorly known and apparently rare species. Its distribution range is not well known, but occurrence records suggest that it is very small. There is currently one known location, but it is likely an underestimate, as it may be overlooked due to taxonomic uncertainty. It is potentially threatened by overgrazing. Endemic to Roggeveld Escarpment near Sutherland in the Northern Cape.
Aspalathus intricata subsp. anthospermoides	Fabaceae	Rare, NC	Not recorded. NEST projected
Aspalathus intricata subsp. intricata	Fabaceae	Rare, NC	Not recorded. NEST projected
Aspalathus intricata subsp. oxyclada	Fabaceae	Rare, NC	Not recorded. NEST projected
Astroloba corrugata	Asphodelaceae	*LC, WC, NC*	Present on site
Astroloba herrei	Asphodelaceae	VU, WC, NC	Not recorded. NEST projected, known locations to the south in the Swartberg mountains around Matjiesfontein & Prince Albert
Astroloba robusta	Asphodelaceae	LC, WC, NC	Present on site
Babiana cuneata	Iridaceae	*LC, WC, NC*	Present on site
Babiana sambucina	Iridaceae	EN, WC, NC	Not recorded.
Boophone disticha	Amaryllidaceae	LC, WC,	Present on site

Scientific Name	Family	Status*	Occurrence/Comment
		NC	
Braunsia apiculata	Aizoaceae	LC, WC, NC	Present on site
Braunsia stayneri	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Brunsvigia comptonii	Amaryllidaceae	LC, WC, NC	Present on site. Widespread and not in danger of extinction. Common and widespread in project area.
Brunsvigia josephinae	Amaryllidaceae	VU, WC, NC	Long-lived bulb occurs as widely scattered subpopulations in lowland areas that are subject to continued habitat loss to. Herbarium specimens record about 18 subpopulations, and an estimated further 70 unrecorded subpopulations may exist. All subpopulations consist of fewer than 50 adult plants and are declining due to collection on an ongoing basis for medicinal purposes. Nieuwoudtville to Baviaanskloof.
Brunsvigia striata	Amaryllidaceae	LC, WC, NC	Present on site
Bulbine abyssinica	Asphodelaceae	LC, WC, NC	Present on site
Bulbine succulenta	Asphodelaceae	LC, WC, NC	Present on site
Bulbine torta	Asphodelaceae	Rare, WC, NC	Not recorded
Bulbinella cauda-felis	Asphodelaceae	LC, WC, NC	Present on site
Calamophyllum teretiusculum	Aizoaceae	DDT, WC, NC	Not recorded. Karoo Endemic, taxonomically problematic.
Cerochlamys gemina	Aizoaceae	LC, WC, NC	Not recorded. Karoo Endemic, localised population south of the site.
Cheiridopsis namaquensis	Aizoaceae	*LC, WC, NC*	Present on site
Cleretum booysenii	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Conophytum minimum	Aizoaceae	LC, WC, NC	Present on site
Conophytum truncatum	Aizoaceae	NE, WC, NC	Not recorded
Cotyledon cuneata	Crassulaceae	*LC, NC*	Present on site
Cotyledon orbiculata	Crassulaceae	*LC, NC*	Present on site
Cotyledon tomentosa	Crassulaceae	LC, NC	Present on site
Crassula alpestris subsp. massonii	Crassulaceae	Rare, NC	Not recorded
Crassula altropurpurea	Crassulaceae	LC, NC	Present on site
Crassula brachystachya	Crassulaceae	Rare, NC	Not recorded
Crassula clavata	Crassulaceae	*LC, NC*	Present on site
Crassula columnaris	Crassulaceae	*LC, WC, NC*	Present on site
Crassula congesta	Crassulaceae	LC, NC	Present on site
Crassula congesta subsp. laticephala	Crassulaceae	Rare, NC	Not recorded
Crassula cotyledonis	Crassulaceae	LC, NC	Present on site
Crassula dodii	Crassulaceae	DD, NC	Not recorded. Roggeveld-Hantam endemic, Known from general area. Widespread.
Crassula hemisphaerica	Crassulaceae	LC, NC	Not recorded, Widespread species

Scientific Name	Family	Status*	Occurrence/Comment
Crassula muscosa	Crassulaceae	LC, NC	Present on site
Crassula orbicularis	Crassulaceae	*LC, NC*	Present on site
Crassula pageae	Crassulaceae	LC, NC	Present on site
Crassula roggeveldii	Crassulaceae	Rare, NC	Not recorded
Crassula rupestris	Crassulaceae	*LC, NC*	Present on site
Crassula tecta	Crassulaceae	LC, NC	Present on site
Crassula tetragona	Crassulaceae	LC, NC	Present on site
Crassula tomentosa	Crassulaceae	LC, NC	Present on site
Crassula umbella	Crassulaceae	LC, NC	Present on site
Crassula vestita	Crassulaceae	Rare, NC	Not recorded
Deilanthe peersii	Aizoaceae	LC, WC, NC	Not recorded. Great Karoo endemic, Known from general area. Widespread.
Delosperma sphalmanthoides	Aizoaceae	VU, WC, NC	Not recorded. NEST projected
Diascia macrophylla	Scrophulariaceae	LC, WC, NC	Not recorded. Roggeveld-Hantam endemic, Known from general area. Widespread.
Didymaotus lapidiformis	Aizoaceae	VU, WC, NC	Not recorded, known locations generally to the south-west in Tanqua karoo and Wash Riviere.
Drimia arenicola	Hyacinthaceae	LC, WC, NC	Not recorded. Known from Northern Cape, range overlaps with site.
Drimia karooica	Hyacinthaceae	LC, WC, NC	Not recorded, Widespread species
Drosanthemum comptonii	Aizoaceae	DDT, WC, NC	Not recorded. Karoo Endemic, taxonomically problematic.
Drosanthemum framesii	Aizoaceae	*LC, WC, NC*	Present on site
Drosanthemum hispidum	Aizoaceae	LC, WC, NC	Present on site
Drosanthemum worcesterense	Aizoaceae	EN, WC, NC	Not recorded. NEST projected
Duvalia caespitosa	Apocynaceae	*LC, NC*	Present on site
Duvalia parviflora	Apocynaceae	VU, NC	Not recorded, known locations in the south around Ladismith & Oudtshoorn
Erica glandulipila	Ericaceae	Rare, WC, NC	Not recorded. NEST projected
Euphorbia loricata	Euphorbiaceae	LC, NC	Present on site
Euphorbia mauritanica	Euphorbiaceae	*LC, NC*	Present on site
Euphorbia multiceps	Euphorbiaceae	LC, NC	Present on site
Euphorbia multifolia	Euphorbiaceae	LC, NC	Present on site
Gasteria disticha	Asphodelaceae	CR, WC, NC	Not recorded, known locations in Worcester area to the south-west
Geissorhiza karooica	Iridaceae	NT, WC, NC	A range restricted species, EOO 497 km², known from six locations where it is potentially threatened by habitat loss and degradation as a result of overgrazing and erosion. Known from Roggeveld Mountains to Matjiesfontein.
Geissorhiza spiralis	Iridaceae	VU, WC, NC	Not recorded. NEST projected
Gibbaeum gibbosum	Aizoaceae	LC, WC, NC	Present on site
Gibbaeum pubescens	Aizoaceae	LC, WC, NC	Present on site
Gladiolus venustus	Iridaceae	*LC, WC, NC*	Present on site
Gonialoe variegata	Asphodelaceae	*LC, WC, NC*	Present on site
Haemanthus coccineus	Amaryllidaceae	*LC, WC, NC*	Present on site
Haemanthus tristis	Amaryllidaceae	VU, WC,	Not recorded

Scientific Name	Family	Status*	Occurrence/Comment
		NC	
Haworthia arachnoidea	Asphodelaceae	LC, WC, NC	Present on site
Haworthia blackburniae	Asphodelaceae	NE, WC, NC	Not recorded
Haworthia cooperi	Asphodelaceae	NE, WC, NC	Not recorded
Haworthia cymbiformis	Asphodelaceae	NE, WC, NC	Not recorded
Haworthia lockwoodii	Asphodelaceae	VU, WC, NC	Not recorded
Haworthia marumiana	Asphodelaceae	NE, WC, NC	Not recorded
Haworthia mirabilis	Asphodelaceae	DDT, WC, NC	Not recorded, found to the west near Nieuwoudtville
Haworthia nortieri var. pehlemanniae.	Asphodelaceae	LC, WC, NC	Not recorded. Karoo Endemic, widespread.
Haworthia pulchella	Asphodelaceae	NE, WC, NC	Not recorded
Haworthia wittebergensis	Asphodelaceae	Rare, WC, NC	Not recorded. NEST projected
Hereroa crassa	Aizoaceae	LC, WC, NC	Not recorded. Great Karoo endemic, Known from general area. Widespread.
Hesperantha flava	Iridaceae	Rare, WC, NC	Not recorded. Present in area
Hesperantha glabrescens	Iridaceae	Rare, WC, NC	Not recorded. NEST projected
Holothrix aspera	Orchidaceae	LC, WC, NC	Present on site
Holothrix secunda	Orchidaceae	LC, WC, NC	Present on site
Holothrix villosa	Orchidaceae	LC, WC, NC	Present on site
Hoodia pilifera	Apocynaceae	NT, NC	Not recorded
Hypodiscus sulcatus	Restionaceae	VU, WC, NC	Not recorded, known locations in the south around Laingsburg/Touwsrivier (Matjiesfontein Shale Renosterveld)
Ixia mollis	Iridaceae	VU, WC, NC	Not recorded
Ixia oxalidiflora	Iridaceae	VU, WC, NC	Not recorded. Present in area
Ixia parva	Iridaceae	VU, WC, NC	Not recorded. NEST projected
Ixia rivulicola	Iridaceae	VU, WC, NC	Not recorded. NEST projected
Jamesbrittenia thunbergii	Scrophulariaceae	LC, NC	Not recorded. Roggeveld-Hantam endemic, Known from general area. Widespread.
Lachenalia aurioliae	Hyacinthaceae	*LC, WC, NC*	Present on site
Lachenalia comptonii	Hyacinthaceae	LC, WC, NC	Not recorded. Karoo Endemic, Tanqua Karoo to the Roggeveld Escarpment south-west of Sutherland and Matjiesfontein.
Lachenalia congesta	Hyacinthaceae	VU, WC, NC	Not recorded
Lachenalia ensifolia	Hyacinthaceae	LC, WC, NC	Present on site
Lachenalia isopetala	Hyacinthaceae	LC, WC,	Present on site

Scientific Name	Family	Status*	Occurrence/Comment
		NC	
Lachenalia juncifolia	Hyacinthaceae	LC, WC, NC	Present on site
Lachenalia longituba	Hyacinthaceae	VU, WC, NC	Not recorded
Lachenalia martinae	Hyacinthaceae	VU, WC, NC	Not recorded
Lachenalia obscura	Hyacinthaceae	LC, WC, NC	Present on site
Lachenalia violacea	Hyacinthaceae	*LC, WC, NC*	Present on site
Lachenalia whitehillensis	Hyacinthaceae	NT, WC, NC	Not recorded
Lachenalia zebrina	Hyacinthaceae	LC, WC, NC	Present on site
Lampranthus amoenus	Aizoaceae	EN, WC, NC	Not recorded, known locations in the Cape Flats to the south-west
Lampranthus haworthii	Aizoaceae	LC, WC, NC	Present on site
Leucadendron cadens	Proteaceae	Rare, WC, NC	Not recorded
Leucadendron sp. nov. (Acocks 23716 NBG)	Proteaceae	CR EN, WC, NC	Not recorded. NEST projected
Malephora lutea	Aizoaceae	LC, WC, NC	Present on site
Massonia depressa	Hyacinthaceae	LC, WC, NC	Present on site
Mesembryanthemum nodiflorum	Aizoaceae	LC, WC, NC	Present on site
Monsonia crassicaulis Sarcocaulon crassicaule)	Geraniaceae	*LC, NC*	Present on site
Moraea aspera	Iridaceae	VU, WC, NC	Not recorded. Outside of range (Hantam).
Moraea ciliata	Iridaceae	*LC, WC, NC*	Present on site
Moraea contorta	Iridaceae	Rare, WC, NC	Not recorded
Moraea cuspidata	Iridaceae	*LC, WC, NC*	Present on site
Moraea fenestrata	Iridaceae	NT, WC, NC	Not recorded
Moraea miniata	Iridaceae	*LC, WC, NC*	Present on site
Moraea polyanthos	Iridaceae	*LC, WC, NC*	Present on site
Moraea polystachya	Iridaceae	LC, WC, NC	Present on site
Moraea tanquana	Iridaceae	Rare, WC, NC	Not recorded
Moraea virgata subsp. karooica	Iridaceae	Rare, WC, NC	Not recorded
Nemesia anisocarpa	Scrophulariaceae	LC, NC	Not recorded. Roggeveld-Hantam endemic, Known from general area. Widespread.
Octopoma nanum	Aizoaceae	VU, WC, NC	Not recorded
Ornithogalum juncifolium	Hyacinthaceae	LC, WC, NC	Not recorded
Oxalis convexula	Oxalidaceae	LC, NC	Present on site
Oxalis dregei	Oxalidaceae	*LC, NC*	Present on site
Oxalis marlothii	Oxalidaceae	EN, NC	Not recorded. Present in area
Oxalis melanosticta	Oxalidaceae	LC, NC	Present on site
Oxalis pes-caprae	Oxalidaceae	LC, NC	Present on site

Scientific Name	Family	Status*	Occurrence/Comment
Pauridia breviscapa	Hypoxidaceae	Rare, WC, NC	Not recorded. NEST projected
Pectinaria articulata	Apocynaceae	LC, NC	Present on site
Pectinaria longipes subsp. longipes	Apocynaceae	LC, NC	Not recorded. Roggeveld-Hantam endemic, Known from general area. Widespread.
Peersia frithii	Aizoaceae	VU, WC, NC	Not recorded. Present in area
Pelargonim magenteum	Geraniaceae	*LC, NC*	Present on site
Pelargonium alternans	Geraniaceae	*LC, NC*	Present on site
Pelargonium magenteum	Geraniaceae	*LC, NC*	Not recorded. Roggeveld-Hantam endemic, Known from general area. Widespread.
Pelargonium stipulaceum subsp. ovato-stipulatum	Geraniaceae	*LC, NC*	Not recorded. Karoo Endemic, widespread.
Pelargonium torulosum	Geraniaceae	*Rare, NC*	Not recorded
Phiambolia hallii	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Phylica comptonii	Rhamnaceae	Rare, NC	Not recorded. NEST projected
Phylica retorta	Rhamnaceae	Rare, NC	Not recorded. NEST projected
Phyllobolus amabilis	Aizoaceae	Rare, WC, NC	Not recorded
Piaranthus comptus	Apocynaceae	LC, NC	Not recorded. Great Karoo endemic, Known from general area. Widespread.
Piaranthus geminatus	Apocynaceae	*LC, NC*	Present on site
Pleiospilos nelii	Aizoaceae	LC, WC, NC	Not recorded. Outside of range.
Polhillia involucrata	Fabaceae	EN, NC	Not recorded. NEST projected
Protea convexa	Proteaceae	CR EN, WC, NC	Not recorded. NEST projected, known locations in Northern Cederberg, Witteberg and Klein Swartberg mountains.
Protea lepidocarpodendron	Proteaceae	NT, WC, NC	Not recorded
Pterygodium inversum	Orchidaceae	EN, WC, NC	Not recorded, found to the west in the Ceres/Malmesbury area
Quaqua parviflora subsp. gracilis	Apocynaceae	LC, NC	Not recorded. Great Karoo endemic, Known from general area. Widespread.
Restio esterhuyseniae	Restionaceae	Rare, WC, NC	Not recorded. NEST projected
Restio karooicus	Restionaceae	LC, WC, NC	Not recorded. NEST projected
Rhinephyllum graniforme	Aizoaceae	LC, WC, NC	Not recorded. Great Karoo endemic, Known from general area. Widespread.
Rhodocoma vleibergensis	Restionaceae	Rare, WC, NC	Not recorded. NEST projected
Romulea eburnea	Iridaceae	VU, WC, NC	A rare, localized endemic to the Roggeveld Escarpment, where it is known from two locations and potentially threatened by habitat degradation due to overgrazing. Klein Roggeveld.
Romulea hallii	Iridaceae	VU [D2], WC, NC	A Roggeveld endemic known from two locations, (EOO 39km²). It is potentially threatened by road maintenance and expansion and livestock overgrazing. Roggeveld Plateau southwest of Sutherland.

Scientific Name	Family	Status*	Occurrence/Comment
Romulea multifida	Iridaceae	VU, WC, NC	Not recorded. Present in area. South African endemic. Roggeveld Plateau. Roggeveld Shale Renosterveld.
Romulea syringodeoflora	Iridaceae	NT, WC, NC	A range restricted Roggeveld endemic (EOO 474km²), known from nine location and possibly occurring at a few more in unsurveyed parts of its range. Experiencing ongoing decline of habitat to crop cultivation as well as habitat degradation as a result of livestock overgrazing. Stony shale flats and slopes, Roggeveld Plateau.
Romulea tortuosa	Iridaceae	LC, WC, NC	Present on site. Common on site on flat rocky outcrops. Widespread endemic. Occasional on south-facing slopes, not affected.
Ruschia acocksii	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Ruschia altigena	Aizoaceae	Rare, WC, NC	Not recorded. NEST projected
Ruschia cradockensis	Aizoaceae	LC, WC, NC	Present on site
Ruschia crassa	Aizoaceae	LC, WC, NC	Present on site
Ruschia karrooica	Aizoaceae	LC, WC, NC	Not recorded. Karoo Endemic, widespread.
Ruschia perfoliata	Aizoaceae	LC, WC, NC	Not recorded. Great Karoo endemic, Known from general area. Widespread.
Sericocoma pungens	Amaranthaceae	LC, WC, NC	Not recorded, Widespread species
Stapelia rufa	Apocynaceae	LC, NC	Present on site
Strumaria karooica	Amaryllidaceae	Rare, WC, NC	Not recorded
Strumaria karoopoortensis	Amaryllidaceae	VU, WC, NC	Not recorded
Strumaria pubescens	Amaryllidaceae	Rare, WC, NC	Not recorded
Strumaria undulata	Amaryllidaceae	DDT, WC, NC	Not recorded. Karoo Endemic, taxonomically problematic.
Tanquana archeri	Aizoaceae	VU, WC, NC	Not recorded. Found south of the site in Koedoesberge-Moordenaars Karoo. Limited population, severely threatened by plant traded harvesting.
Tanquana hilmarii	Aizoaceae	CR, WC, NC	Not recorded, known locations to the south of Laingsburg
Trachyandra sanguinorhiza	Asphodelaceae	Rare, WC, NC	Not recorded
Trichodiadema hallii	Aizoaceae	DDT, WC, NC	Not recorded. Karoo Endemic, taxonomically problematic.
Trichodiadema marlothii	Aizoaceae	LC, WC, NC	Present on site
Trichodiadema mirabile	Aizoaceae	LC, WC, NC	Present on site
Tridentea gemmiflora	Apocynaceae	LC, NC	Present on site
Tridentea parvipuncta subsp. parvipuncta	Apocynaceae	LC, NC	Not recorded. Great Karoo endemic, Known from general area. Widespread.
Tritonia florentiae	Iridaceae	Rare, WC, NC	Not recorded. NEST projected
Tylecodon faucium	Crassulaceae	Rare, NC	Not recorded. Karoo Endemic, A range-

Scientific Name	Family	Status*	Occurrence/Comment
			restricted habitat specialist endemic to the Ceres Karoo and Roggeveld Mountains (extent of occurrence 1516 km²), known from five subpopulations, this species has no recorded threats and is listed Rare nationally and Least Concern globally. Shaded rock crevices, often on south-facing slopes. Site overlaps with possible range, may be present in shaded crevices on south facing slopes.
Tylecodon paniculatus	Crassulaceae	LC, NC	Present on site
Tylecodon reticulatus	Crassulaceae	LC, NC	Present on site
Tylecodon wallichii	Crassulaceae	LC, NC	Present on site

* IUCN Red List Categories: LC – Least Concern; NT - Near Threatened; VU – Vulnerable; En – Endangered; CR – Critically Endangered; NE – Not Evaluated. WC – Western Cape Nature Conservation Laws Amendment Act (Act No 3 of 2000); NC – Northern Cape Naure Conservation Act (Act No 9 of 2009). ToPS – Threatened or Protected Species in terms of NEMBA.

16 Appendix 3 - About Trusted Partners

Trusted Partners is owned and managed by three Partners, two based in South Africa (Cape Town & Johannesburg) and one in England (London). The Partners have comprehensive experience across the continent and beyond, having collective experience in more than 30 African countries and islands, as well as in the Middle East and Europe. As such, Trusted Partners brings together reputable and experienced professionals and experts who are actively engaged in the African, Middle Eastern and European ESG Risk and Impact Management arenas.

The Partners actively lead projects in order to deliver bespoke ESG Risk Management and Impact Advisory to the Corporate, Financial and Industrial sectors, through our proven gravitas and extensive industry experience. Trusted Partners strives to unlock and drive effective sustainability into our clients' respective portfolios and projects. We take pride in our ability to respond rapidly and competitively.

Our three Partners and network of experienced Associate Partners believe in investing in long-term partnerships with our clients. We support our clients to achieve their strategic goals, rapidly respond to their needs and develop an intimate knowledge of their businesses. Our low-overheads and flexible resourcing model allows us to deliver a high-quality service at a much more affordable rate than our competitors.

Trusted Partners provides hands-on professional ESG risk management and impact advice across Africa. The Partners have extensive experience assessing and managing ESG risks and impacts across the continent in all major sectors on-behalf of investors, development finance institutions and businesses.

Our in-depth understanding of ESG risks and impacts coupled with our extensive knowledge of the Equator Principles, International Finance Corporation (IFC) Performance Standards, World Bank Environmental and Social Safeguards, European Bank for Reconstruction and Development (EBRD) Performance Requirements, and the Development Bank of Southern Africa (DBSA) Environmental and Social Safeguards as well as other International Development Financial Institutions Standards, and country specific environmental and social related regulations across Africa and the Middle East make us Trusted Advisors to our clients.

We are committed to ensuring the highest standards of integrity and honesty in our work and engagement with clients. Our low-overhead approach and flexible resourcing model allows the delivery of high-quality value for money service.

Our services include:

STRATEGIC ADVISORY

- Environmental & Social Impact Assessments
- Environmental & Social Risk Management
- Environmental & Social Management Systems (IFC/EBRD)
- ISO 14001 & ISO 45001
- Environmental & Social Strategic Planning
- Responsible Investment Advisory

TRANSACTION SERVICES

- Environmental & Social Governance Advisory
- Environmental & Social Due Diligence
- Corporate Governance Due Diligence & Assurance
- Equator Principles Assurance
- IFC Performances Standards Assurance
- EIB/EBRD Performance Requirements Assurance
- World Bank Environmental & Social Safeguards Assurance
- Lenders ESG/ESRM Technical Advisor

PROJECT SUPPORT

- Botanical and Ecological Assessments
- Critical Habitats & Biodiversity Assessments
- Stakeholder Engagement & Conflict Resolution
- Resettlement Action Plans & Livelihood Improvement Plans
- Advanced GIS Systems & Analysis
- High Resolution 3D Visualisations & Visual Impact Assessments
- Land Use Planning (Environmental & Social Planning)
- Environmental, Health & Safety Performance Assurance
- Environmental, Health & Safety Compliance Assurance
- Climate Change Risk Assessments
- Environmental, Health & Safety Site Assessments

16.1 Malcolme Logie, Partner

Malcolme Logie is a leading strategic thinking and performance-focused Environmental and Social Management Advisor with 30 years of experience in consulting across Africa and Eastern Europe. As a proven Advisor, Malcolme has guided public listed companies throughout Africa and Eastern Europe on their EHS & Social Strategies, Impacts and Liabilities. He is a motivational leader known for clearly defining mission and goals, aligning people and resources, and consistently delivering results that exceed expectations.

He is an expert in:

- Strategic Environmental Advisory;
- Environmental & Social Risk Management;
- Environmental & Social Governance;
- Equator Principles;
- World Bank - Environmental & Social Safeguards;
- International Finance Corporation - Environmental & Social Performance Standards;
- European Investment Bank - Environmental & Social Standards;
- European Bank for Reconstruction and Development - Environmental & Social Performance Requirements;
- Development Bank of Southern Africa - Environmental & Social Safeguards;
- Environmental & Social Due Diligence;
- Environmental & Social Impact Assessment;
- Critical Habitat & Biodiversity Assessments;
- EHS Compliance and Performance Assurance;
- ISO 14001/ISO 45001 Management Systems; and
- Technical Environmental Advisory.

As a recognised authority in Environmental & Social Risk Management he has led multi-disciplinary teams on projects in South Africa, Angola, Botswana, Cote de Ivoire, Czech Republic, Democratic Republic of Congo, Egypt, Ethiopia, Ghana, Hungary, Kenya, Madagascar, Mauritania, Mozambique, Namibia, Nigeria, Pakistan, Poland, Romania, Slovak Republic, South Sudan, Tanzania, Uganda, and Zambia.

Malcolme has consulted in the following industrial sectors: Aerospace, Agriculture, Forestry, Fisheries, Automotive and Rail Transport, Beverage and Foodstuff Industries, Chemicals and Chemical Products, Constructions, Education, Electricity Supply, Explosive and Munitions, Gas Supply, Glass Ceramics, Health Care Service, Processing of Minerals and Ores, Leather and Leather Products, Manufacture of Coke and Refined Petroleum Products, Manufacturing and Mechanical Engineering, Metals Refining and Processing and Production of Metals, Mining and Quarrying, Oil and Gas, Pharmaceuticals, Production of Cement and Concrete, Pulp and Paper, Renewable Energy, Rubber and Plastic Goods, Ship Building, Textile Industries, Transport and Communication, Waste and Recycling, Water Supply and Wood Industries.

In 2018/20 Malcolme led a Team of International Experts that developed the Environmental & Social Impact Assessment Guidelines for the Oil & Gas Sector in Kenya – encompassing the Onshore and Offshore Environmental, Social, Community, Health & Safety Risks in the Upstream, Midstream and Downstream Activities. The project was funded by the World Bank.

In 2020/21, Malcolme was part of an International team that developed the Environmental and Social Tariff for the Pakistan Energy Sector: Wind, Solar, Run-of-River Hydro, Large Hydro, Biogas, and Fossil Fuel (Coal, HFO, LNG). The project was funded by the IFC.

Malcolme was a specialist Environmental & Social Risk Management Advisor to the IFC (Johannesburg) during the period November 2017- July 2021, where he has provided expert advice on Environmental & Social Risk Management and Management Systems the Consulting and Financial Sectors in South Africa, Ghana and Nigeria. The ESRM Programme aims to increase the uptake of Environmental and Social standards by financial intuitions and loan clients in the sub-Saharan region. Malcolme has also lectured at the Rhodes University Business School on Industrial Environmental Management and EHSS Management Systems.

Malcolme was a member on the South African committee SABS:TC207 which formed part of the global committee that wrote the original ISO 14001:1996 Environmental Management Systems specifications standard. Malcolme was also responsible for the development of the SAATCA requirements for the registration of Environmental Auditors and was elected (under a Grandfather clause) as the first Environmental Verification Auditor in South Africa. Malcolme has more than 16 800 hours of EHS Auditing experience and has led integrated EHSQ certification level audits.

During 2006-2010 Malcolme served on the Education Review Panel for the South African Council for Natural Scientific Professions (SACNASP) where his role was to review the suitability of education and experience of individuals applying for registration as Professional Natural Scientists. Malcolme served on the Application Review Panel at SACNASP for 2016-2017.

Education

- PhD (Biotechnology), Rhodes University, 1995
- MSc (Botany), Rhodes University, 1992
- BSc Honours (Botany), Rhodes University 1990
- BSc (Plant Science & Biochemistry), Rhodes University, 1989

*Certificates available on request

Professional Memberships

- South African Council of Natural Scientific Professions – Environmental Scientist (N#: 400102/95)
- Environmental Assessment Practitioners Association of South Africa (EAPASA: N#: 2020/1403)
- International Association of Impact Assessors
- Royal Society of South Africa

*Certificates available on request

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

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

PROJECT TITLE

RIETKLOOF WEF: TERRESTRIAL BIODIVERSITY ASSESSMENT

Kindly note the following:

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

Departmental Details

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

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

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

1. SPECIALIST INFORMATION

Specialist Company Name:	**Trusted Partners**			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	**4**	Percentage Procurement recognition	**100 %**
Specialist name:	**Malcolme Logie**			
Specialist Qualifications:	**BSc; BSc (Hons); MSc; PhD**			
Professional affiliation/registration:	**SACNASP Environmental Scientist** **Reg. EAP (EAPASA N# 2020/1403)**			
Physical address:	**27 Lighthouse Rd, Kommetjie, 7976, Cape Town**			
Postal address:	**PO Box 48148, Kommetjie, 7975, Cape Town**			
Postal code:	**7975**	Cell:	**083 655 6123**	
Telephone:		Fax:		
E-mail:	**Malcolme@TrustedPartners.Africa**			

2. DECLARATION BY THE SPECIALIST

I, Dr Malcome Logie Malcolme Logie, 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

Trusted Partners

Name of Company:

2021/10/06

Date

3. **UNDERTAKING UNDER OATH/ AFFIRMATION**

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

Signature of the Specialist

Trusted Partners

Name of Company

2021/10/06

Date

7609772-0
Gybers

Signature of the Commissioner of Oaths

2021/10/06

Date

SUID-AFRIKAANSE POLISIEDIENS
COMMUNITY SERVICE CENTRE
06 OCT 2021
OCEAN VIEW W.C
SOUTH AFRICAN POLICE SERVICE

16.2 Jamie Pote, Associate Partner

Jamie is a highly experienced Biodiversity consultant, specialising in terrestrial Ecological and Vegetation Assessments. Over the past 16 years, he has been involved in a diverse range of projects and regions, primarily in Southern but also Western and Central Africa as part of multidisciplinary teams. His experience in South Africa includes most provinces (in particular the Eastern Cape, Western Cape, Northern Cape and Limpopo provinces) and a wide range of bio-geographic regions, and has also worked professionally in Namibia, Mozambique, Democratic Republic of Congo, Republic of Congo and Ghana.

He is an expert in:

- Botanucal and Terrestrial Ecology Assessments
- Critical Habitat & Biodiversity Assessments.
- Terrestrial Biodiversity Assessments
- GIS mapping and analysis

Projects include over 300 independent Biodiversity, Ecological and/or Botanical Assessments throughout Southern, Western and Central Africa within the Energy, Infrastructure, Housing, Agriculture, Forestry, Mining and Industrial Sectors.

In addition, he recently initiated and grew a leading Environmental Business unit at a Civil Engineering company in Port Elizabeth and was the Senior Ecologist and Environmental Assessment Practitioner (EAP) on over 50 environmental applications in the infrastructure, housing, agricultural and mining sectors. He has furthermore played a key role within the road maintenance and construction sphere within the Eastern Cape, undertaking key projects for both the Department of Roads and Public Works and SANRAL, which includes over 40 mining applications for the licensing of more than 300 gravel borrow pits in districts throughout the Eastern Cape.

Jamie has also been lead environmental consultant in construction compliance and monitoring on over 50 civil infrastructure and housing projects.

Key fields of expertise include Terrestrial Biodiversity and Ecological Assessments, Environmental and Ecological Risk-Assessments, Rehabilitation and Restoration Plans, Environmental Management Plans & Programmes, GIS Mapping & Analysis, Alien Invasive Plant Management Plans, Environmental Compliance & Monitoring, Flora Relocation Plans (including implementation), Environmental and Mining applications and Permits and Licensing (including Water Use licensing and Protected Trees, Flora and Fauna).

Jamie's Tertiary Education Qualifications are:

- BSc Honours (Botany), Rhodes University 2003
- BSc (Botany & Environmental Science), Rhodes University, 2002

*Certificates available on request

Jamie's Professional Registrations/Memberships are:

- South African Council of Natural Scientific Professions – Professional Natural Scientist: Ecological Science (N#: 115233)
- International Association of Impact Assessors (N#: 5045)

*Certificates available on request

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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

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Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
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3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

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Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

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

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

1. SPECIALIST INFORMATION

Specialist Company Name:	N/A			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100 %
Specialist name:	Jamie Pote			
Specialist Qualifications:	BSc (Hons)			
Professional affiliation/registration:	SACNASP			
Physical address:				
Postal address:	Postnet Suite 13130, P Bag X13130			
Postal code:	6013	Cell:	076 888 9890	
Telephone:		Fax:		
E-mail:	jamiepote@live.co.za			

2. DECLARATION BY THE SPECIALIST

I, Mr Jamie Pote_____, 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:

25/08/2021

Date:

3. UNDERTAKING UNDER OATH/ AFFIRMATION

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

JAMIE POTE

Signature of the Specialist

N/A

Name of Company

25 August 2021

Date

2713057.8

Signature of the Commissioner of Oaths

SUID-AFRIKAANSE POLISIEDIENS
HILLCREST
2021 -08- 25
HUMEWOOD
SOUTH AFRICAN POLICE SERVICE

2021-08-25

Date

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APPENDIX

J HERITAGE WALKDOWN REPORT

HERITAGE WALKDOWN REPORT

for the approved Rietkloof WEF near Matjiesfontein in the Western Cape

Prepared by

CTS HERITAGE

In Association with

WSP

September 2021

CTS HERITAGE

EXECUTIVE SUMMARY

Rietkloof Wind Farm (Pty) Ltd, a subsidiary of G7 Renewable Energies (Pty) Ltd, has received approval to develop a 140 megawatt (MW) Wind Energy Facility (WEF) near Matjiesfontein, in the Western Cape Province in South Africa. The authorised WEF is located in the Laingsburg Local Municipality, which falls within the Central Karoo District Municipality. It comprises up to 58 turbines, with a generating capacity of between 1.5MW and 4MW each.

In response to the original Heritage Impact Assessment completed by Booth in 2016, it was recommended by HWC that a targeted walk down of the final layout must be conducted by an archaeologist. This recommendation was reiterated as a condition of authorisation in the original EA granted for the Rietkloof WEF project in 2019.

The final layout for the Rietkloof WEF avoids impact to all known significant heritage resources present within the development area. The walkdown of the final layout revealed no new significant heritage resources that are likely to be impacted. It is therefore recommended that this report is accepted as satisfying the following conditions of the Environmental Authorisation issued for the Rietkloof WEF project:

- All wind turbines must avoid all areas designated as "no-go" areas as well as their buffers
- The final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by ecological, avifaunal, bat, surface water and heritage specialists
- A 60m buffer must be applied around all identified archaeological sites.
- Pre-construction archaeological monitoring is required. The appointed archaeologist must keep a list documenting all identified farm infrastructure.
- All buffers and no-go areas stipulated in the EIAr must be adhered to for both the facilities and all roads and powerlines
- The final layout must be shown to the appointed archaeologist before implementation to confirm that all significant heritage resources have been adequately protected.

Although the EA did not make any specific conditions pertaining to the conservation of palaeontological heritage, the PIA completed for the Rietkloof WEF recommended that the area marked in Orange in Figure 4.2 and 4.3 should be inspected for fossil wood occurrences by a professional palaeontologist prior to construction. It is recommended that this mitigation step be completed prior to the construction of the turbines in this area.

Once the above step is complete, all conditions of authorisation have been satisfied for this project in terms of impacts to heritage resources.

CTS Heritage
34 Harries Street, Plumstead, Cape Town
Tel: +27 (0)82 3037870 **Email:** info@ctsheritage.com **Web:** www.ctsheritage.com

CTS HERITAGE

CONTENTS

CTS Heritage
34 Harries Street, Plumstead, Cape Town
Tel: +27 (0)82 3037870 **Email:** info@ctsheritage.com **Web:** www.ctsheritage.com

1. INTRODUCTION

1.1 Background Information on Project

Rietkloof Wind Farm (Pty) Ltd, a subsidiary of G7 Renewable Energies (Pty) Ltd, has received approval to develop a 140 megawatt (MW) Wind Energy Facility (WEF) near Matjiesfontein, in the Western Cape Province in South Africa. The authorised WEF is located in the Laingsburg Local Municipality, which falls within the Central Karoo District Municipality. It comprises up to 58 turbines, with a generating capacity of between 1.5MW and 4MW each.

The Rietkloof Wind Energy Facility (WEF) is proposed in the Western Cape at the border with the Northern Cape along the R354 road which connects Matjiesfontein to Sutherland. An inclusion zone of 10km was assessed around the proposed WEF in order to better characterise the heritage resources of the area. Several WEFs have previously been proposed within the 10km inclusion zone, including the Hidden Valley Phase 1 Karusa, the Hidden Valley Phase 2 Soetwater, the Hidden Valley Phase 3, Great Karoo, Roggeveld Wind Farm Phase 1 and Kareebosch Wind Project (Roggeveld Phase 2). The Brandvalley WEF (a phase of the Roggeveld Wind Farm) is proposed contemporaneously to the Rietkloof WEF on some overlapping properties. This WEF is also a part of Roggeveld Wind Energy Facility

The authorised Rietkloof Wind Energy Facility (WEF) falls entirely within the Western Cape and as such, falls under the jurisdiction of Heritage Western Cape (HWC).

On 20 October 2016, HWC issued a Final Comment on the Rietvally WEF development in terms of section 38(8) of the NHRA. and made a number of recommendations (see below). The validity of this final comment was reiterated in correspondence from HWC dated 6 July 2018. As such, the requirements of section 38(8) of the NHRA have been satisfied. In their Final Comment, the IACom of HWC noted that:

- There are concerns that the archaeological assessment was not sufficiently comprehensive in order to understand the extent and significance of the archaeological heritage resources. However, it would appear from both the HIA and the prior experience of a committee member that the area proposed for the turbines is not likely to be archaeologically rich. The importance of identifying and recording any potential resources is emphasized.
- The built environment assessment was not thorough. However, none of these buildings are to be directly impacted by the proposed turbines.
- The cumulative impacts upon the R354 scenic route will be equally significant and this is an important tourist route into the region. These impacts are inevitable and cannot be mitigated.
- The Wind Energy Facilities proposed in this area are included in the renewable energy development zone (REDZ). It is understood that an SEA was conducted as part of the process of identifying the REDZ's. HWC has not had the opportunity to input into the SEA nor has it had sight of the document.

HWC resolved to support the recommendations of the HIA subject to the following conditions:

- The 20-30 metre buffers proposed in the archaeological specialist study for the graveyard (RK_GI) should be implemented and respected throughout the lifetime of the project;

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- The standard buffer of 500 meters from any wind turbine that applies to occupied buildings must be equally applied to all unoccupied buildings older than 60 years on the site.
- All stone walled sites, regardless of whether they have been identified prior to construction or not, should be regarded as no-go areas. If they cannot be avoided then they should be reported to an archaeologist who would advise on the need for mitigation;
- The small area on Kranskop, Wilgehout Fontein 87, outlined in green on figure 2 of the palaeontological study by J. E. Almond (2016), "features palaeontologically important, well-preserved fossil wood from the Waterford Formation and must be safeguarded from development". Once the final WEF layout is determined and before construction commences, the two areas of Waterford Formation outcrop nearby, that are outlined in red (figure 2 of palaeontological study by J.E. Almond) must be surveyed by a professional palaeontologist to record, safeguard and sample any well preserved fossil material.
- A targeted walk-down of the final layout must be conducted by an archaeologist approved by the responsible heritage authority (and with relevant qualifications and experience and professional standing in heritage management in terms of S 38 (2) (a)), at least six months prior to construction in order to determine whether any archaeological recording and mitigation measures may still be required and to identify any further sites in proximity to the footprint that need to be mitigated or treated as no-go areas during all phases of the project. A report to HWC is required for approval;
- The ECO must be briefed on what to look out for in terms of archaeological and palaeontological heritage resources that might be revealed during construction;
- The ECO must report as described below. If any archaeological material, palaeontological material or human burials are uncovered during the course of development then work in the immediate area must be halted and the find protected in situ as far as is possible. The find would need to be reported to the heritage authorities and may require inspection by an appropriate heritage practitioner. Such heritage is the property of the state and may require excavation and curation in an approved institution.

EA was granted for the Rietvalley WEF on 17 September 2019. In the EA, various requirements were stipulated in terms of impacts to Historical, Cultural and Palaeontological sites (Table 1 below).

Table 1: EA requirements for Heritage

EA Requirements	*Implementation*
All wind turbines must avoid all areas designated as "no-go" areas as well as their buffers	Addressed in this report
The final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by ecological, avifaunal, bat, surface water and heritage specialists	Addressed in this report
If archaeological heritage material, fossils and human remains are uncovered during construction, all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that a systematic and professional investigation / excavation can be undertaken.	During construction
Exclusion of sensitive ecological, heritage and paleontological areas from construction activities	At construction

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must inform micro siting of all development activities.	
A 60m buffer must be applied around all identified archaeological sites.	Addressed in this report
Pre-construction archaeological monitoring is required. The appointed archaeologist must keep a list documenting all identified farm infrastructure.	Addressed in this report
If concentrations of archaeological heritage material, fossils and human remains are uncovered during construction, all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that a systematic and professional investigation / excavation can be undertaken.	During construction
Construction managers/foremen must be informed before construction starts of the possible types of heritage sites and cultural material that may be encountered and the procedures to follow when they find sites.	To be completed
All buffers and no-go areas stipulated in the EIAr must be adhered to for both the facilities and all roads and powerlines	Addressed in this report
Should any human remains be uncovered during development they must be immediately protected in situ and reported to the heritage authorities or to an archaeologist. The remains will need to be exhumed at the cost of the developer	During construction
All construction and maintenance crew and vehicles (except small vehicles which may use existing farm tracks) must be kept out of the buffer zones.	During construction
The final layout must be shown to the appointed archaeologist before implementation to confirm that all significant heritage resources have been adequately protected.	Addressed in this report
A conservation management plan must be drafted and submitted to SAHRA for review and comment	To be completed

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1.2 Description of Property and Affected Environment

The Rietkloof WEF is nearly 18km north of Matjiesfontein on the western side of the R354 that connects Sutherland to Matjiesfontein. This WEF is one of a number of other WEFs that are proposed in the area between Sutherland, Matjiesfontein, the Ceres Karoo and the Moordenaars Karoo. The turbines are mainly located on the top of a series of moderately high ridges and koppies that characterise the study area. The WEF can be accessed from the south via Rietkloof and Volstruisfontein farms or via Fortuin farm in the northeast section of the WEF. Hartjeskraal lies in the centre of the WEF and most of the turbine positions can be access from there as well as from Barendskraal farm towards the northwest end. The southern end of the study area drops down abruptly to a level and wide valley plain that separates the Dwyka tillite ridges overlooking the northern side of Matjiesfontein and continues northwestwards into the Ceres Karoo where another windfarm (Perdekraal) has been built.

The agricultural activities have predominantly consisted of sheep farming with very small scale crop agriculture such as onion seeds accompanied by subsistence farming. Ruins dot the area along the gravel access roads linking up the old farms but the extended drought in the mid 2010s has made a noticeable impact on the vegetation and water levels available. A prolonged water shortage is still in place at Sutherland to the north and much of the farming activities have been scaled back to adapt to the intensely arid conditions experienced here. The vegetation consists of succulent karoo bushes and much of the terrain is broken and rocky. Most of the turbine positions have to be reached on foot as there are only a few connecting jeep tracks, mostly on very steep and unlevel ground, besides the main dirt road linking Barendskraal - Hartjeskraal - Volstruisfontein - Rietkloof and the R354.

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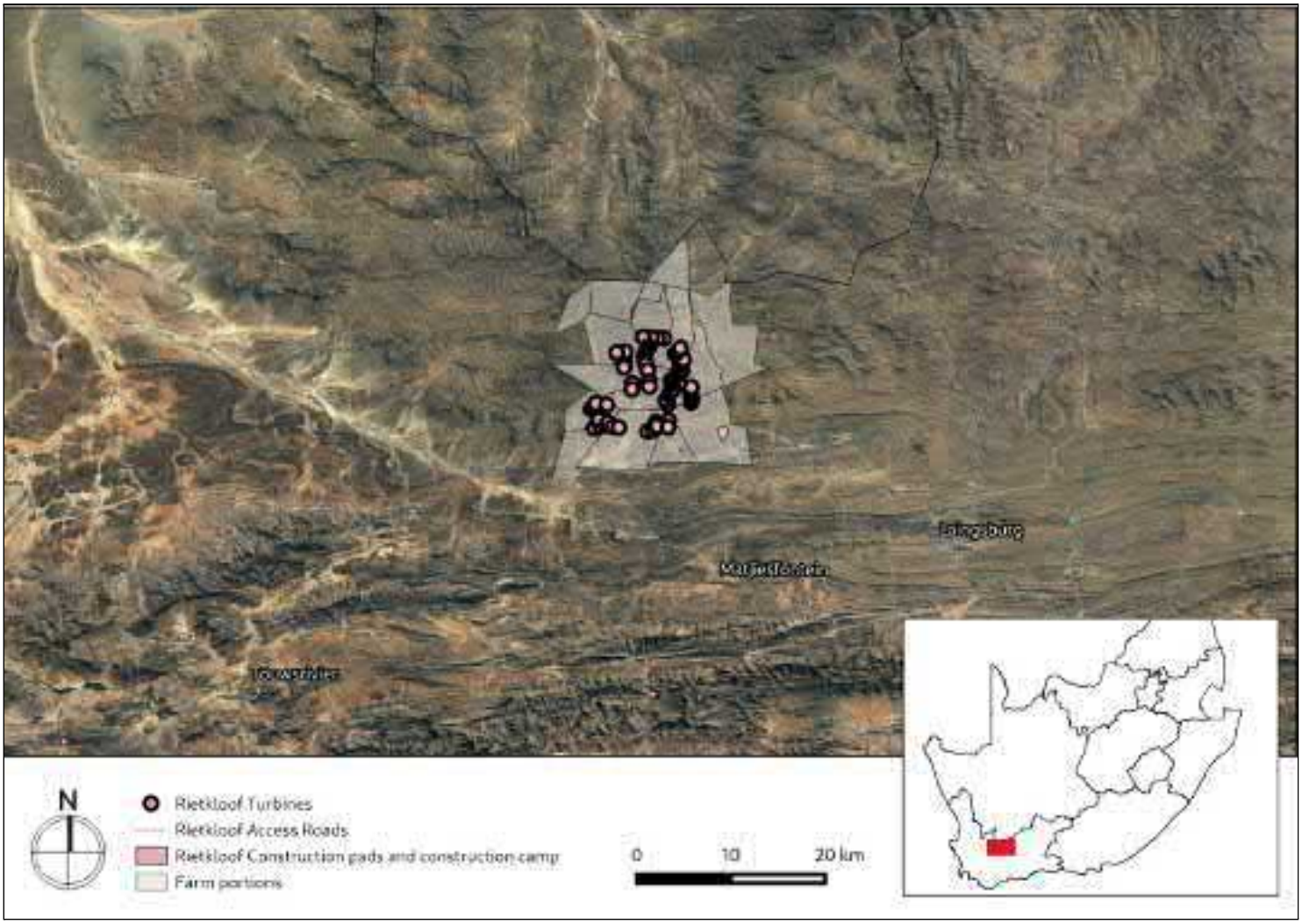

Figure 1.1: Close up satellite image indicating proposed location of the Rietkloof WEF development

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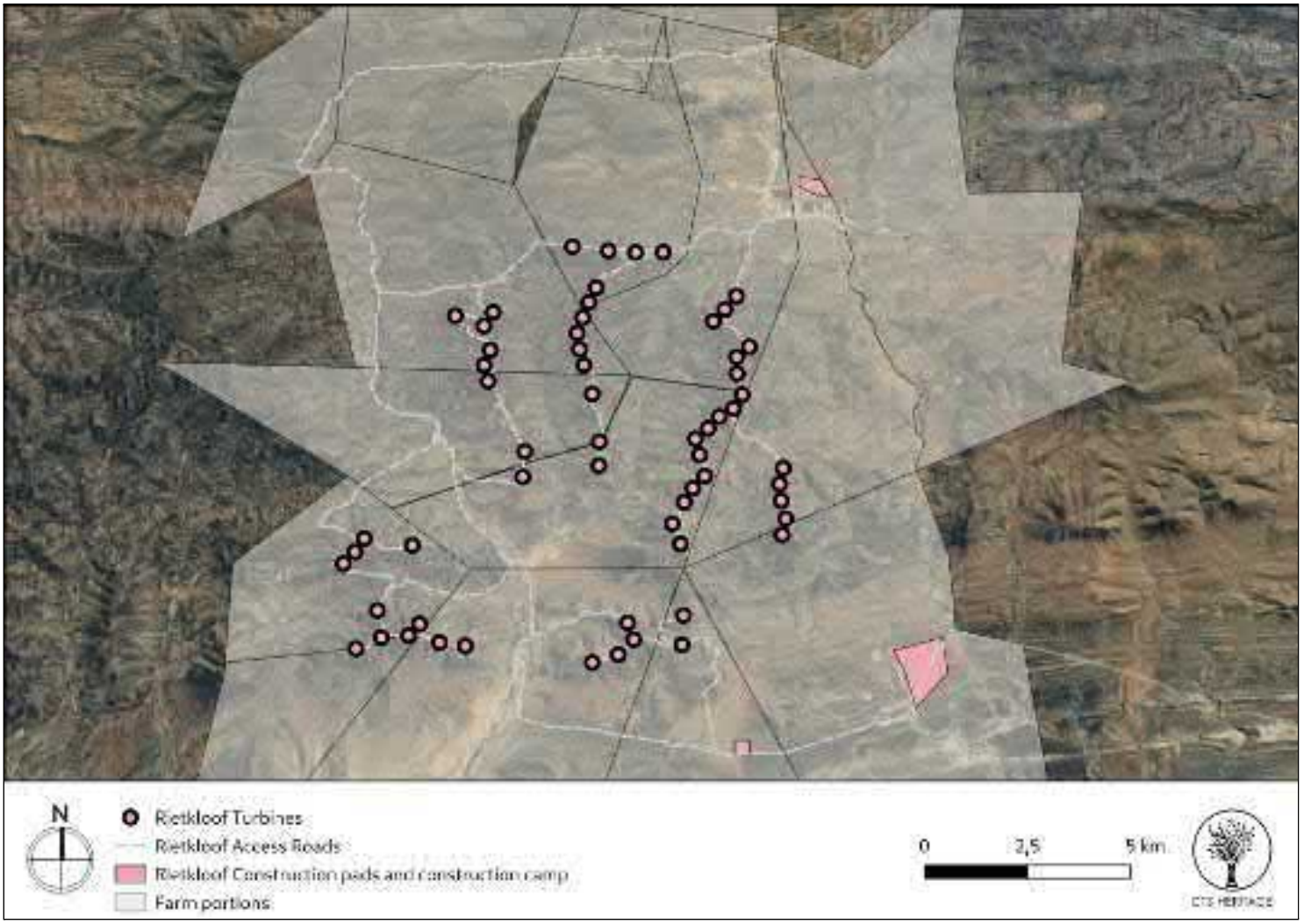

Figure 1.2: Final proposed layout for the Rietkloof WEF development

2. METHODOLOGY

2.1 Purpose of Walkdown

In the conditions of the Environmental Authorisation (2016), it was required that the final layout should be shown to the appointed archaeologist before implementation to confirm that all significant heritage resources have been adequately protected. This was also required by HWC. As the final layout of the Rietkloof WEF has changed, an archaeological walkdown was completed.

2.2 Summary of steps followed

- An archaeologist conducted a full detailed walkdown and micro-siting of the Final development footprint for the Rietkloof WEF between 24 and 28 July 2021 to determine what archaeological resources are likely to be impacted by the approved development.
- The area proposed for development was assessed on foot and by 4x4 vehicle, photographs of the context and finds were taken, and tracks were recorded (at 20m intervals) using a GPS.
- The identified resources were assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999).

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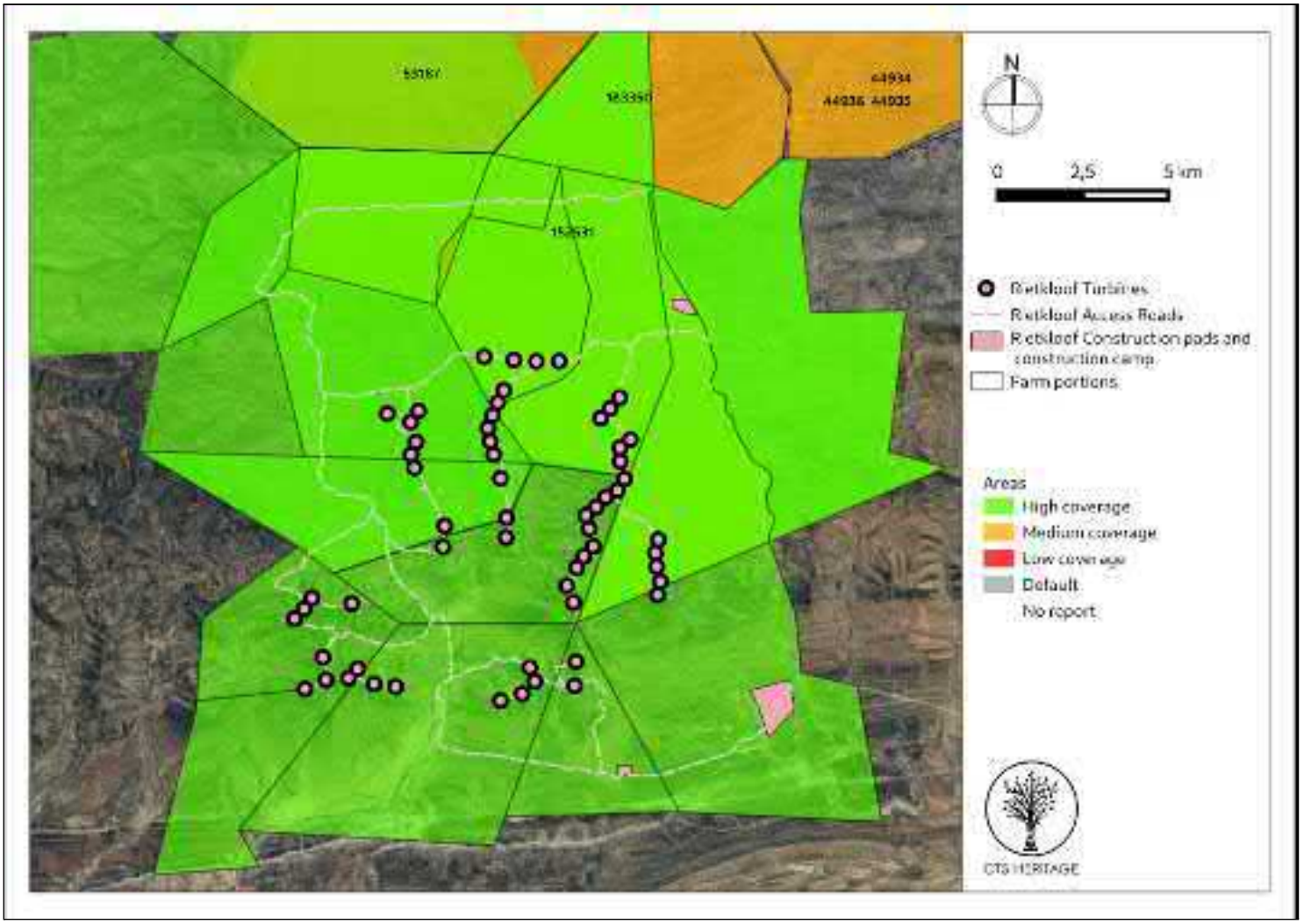

Figure 2: Close up satellite image indicating proposed location of development in relation to heritage studies previously conducted

2.3 Constraints & Limitations

While the overall archaeological visibility was high as the vegetation cover is relatively sparse, movement across this terrain is challenging underfoot as the ridges are covered with eroding sandstone, slates and greywacke. Recording of historical layering of heritage resources such as stock kraals, ruins, windmills and dams was relatively unencumbered as the ridges and access roads provided ample access to identify these structures. Stone Age material was concentrated lower down the valleys, albeit rarely in great densities, while isolated flakes were encountered higher up on the ridges.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

The area proposed for the Rietkloof WEF is located immediately adjacent to the proposed Brandvalley WEF and is located within a REDZ area. The results of the heritage assessments completed for projects in this area have relevance here.

The area proposed for development is located approximately 30km north of Matjiesfontein and is firmly located within

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the southern Roggeveld. This part of the Karoo is prized for its wide-open spaces and expansive vistas. Hart et al. (2016) note that the cultural landscape of this area is agricultural in nature, and consists of mostly stock farming with very occasional agriculture. The area is isolated with natural qualities and semi-desert landscapes. The interaction between the topography, geology, flora and historical remnants of human occupation of the area form a unique cultural landscape.

The Karreebosch HIA (2015) "revealed that the study area is relatively austere in terms of pre-colonial heritage, however valley bottoms contain evidence of early trekboer cultural landscapes – ruins, graves and occasional middens. These consist of collections of ruined stone and mud buildings, threshing floors and kraals located exclusively in the valley areas between the high longitudinal ridges that characterise the study area. There are a number of existing farm houses that contain 19th century fabric, however very few of these have anything more than moderate heritage significance. Parts of the study area enjoy very high aesthetic qualities with the area known by locals as "Gods Window" having grade II aesthetic qualities, hence the significance of the study area lies mainly with its undeveloped wilderness qualities. Interestingly, pre-colonial or stone age heritage and archaeology is extremely scarce in the areas that were searched. Very few archaeological sites of these kinds were recorded despite the fact that overall 9 experienced archaeologists were involved in scouring the landscape."

The HIA for the Karrebosch WEF notes that "The most important colonial archaeological sites in the study area are associated with Ekkraal Valley, the Rietfontein-Wilgebosch River valley and the Krans Kraal-Karrekraal valley. The valley bottoms are archaeologically sensitive…". Similar findings were made by ACO in their report (2010, SAHRIS Ref: 53187) for developments in close proximity. According to the ACO reports (2011, 2013 and 2015), parts of the study area enjoy very high aesthetic qualities hence the significance of the study area lies mainly with its undeveloped wilderness qualities which may be negatively impacted by the development of the proposed development.

A Heritage Impact Assessment was completed by Booth (2016) for the Brandvalley WEF. Booth (2016) notes that the area held several historical features (stone walling kraals and cottages) some with associated historical artefacts situated along the access roads in the valleys and associated with the homestead settlements. The area, however, also held evidence of both Middle and Later Stone Age stone artefacts alongside water courses and on the flat floodplains.

However, it must be noted that the proposed development is located within a Renewable Energy Development Zone which has been identified for this kind of development. In REDZ areas, there is a reasonable expectation that the cultural landscape of an area will be changed to be dominated, or at least heavily altered, by renewable energy development and its associated infrastructure. In fact, this is the intention of the REDZ areas.

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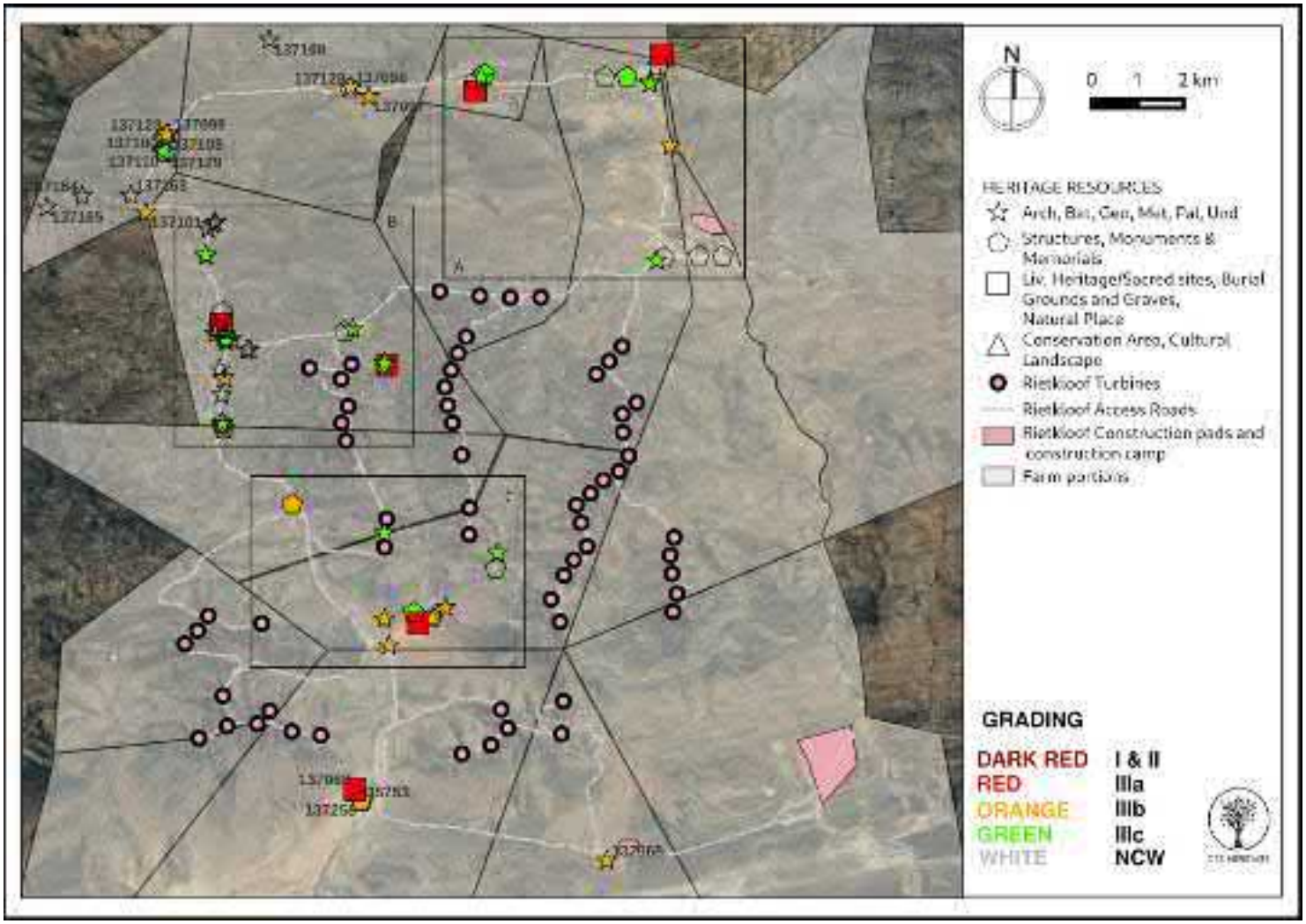

Figure 3. Heritage Resources Map. Heritage Resources previously identified in and near the study area from SAHRIS

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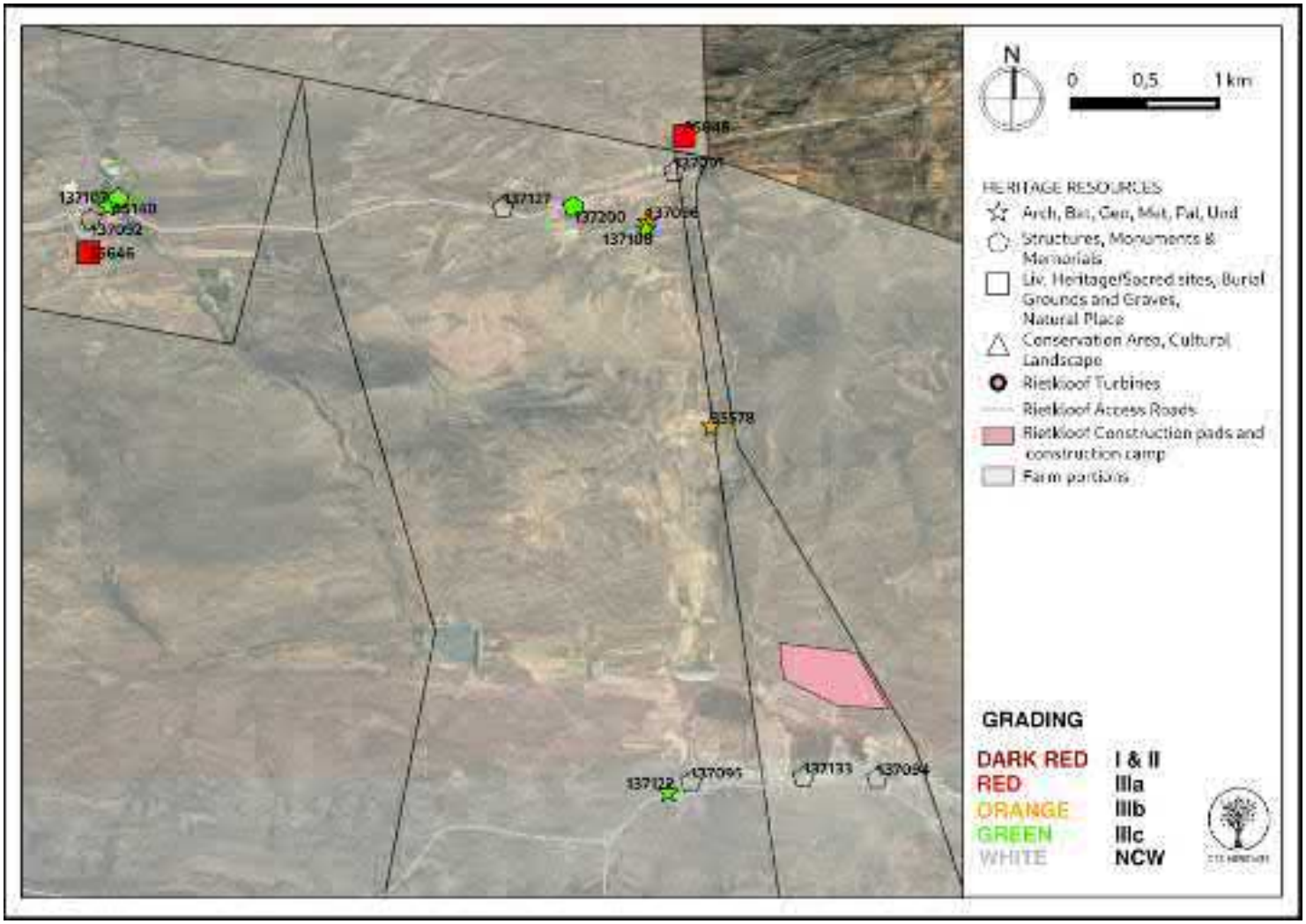

Figure 3.1. Heritage Resources Map. Inset A

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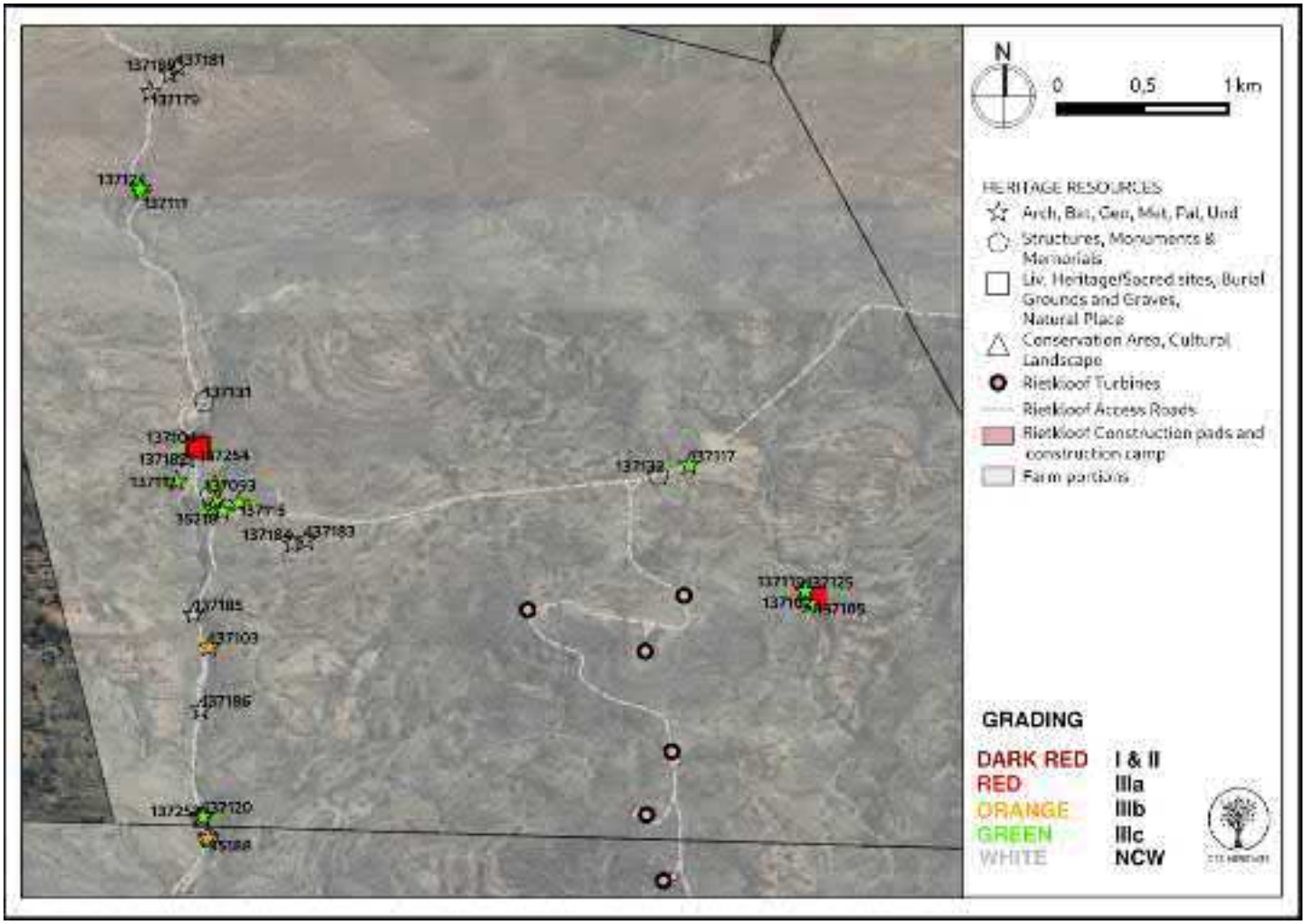

Figure 3.2. Heritage Resources Map. Inset B

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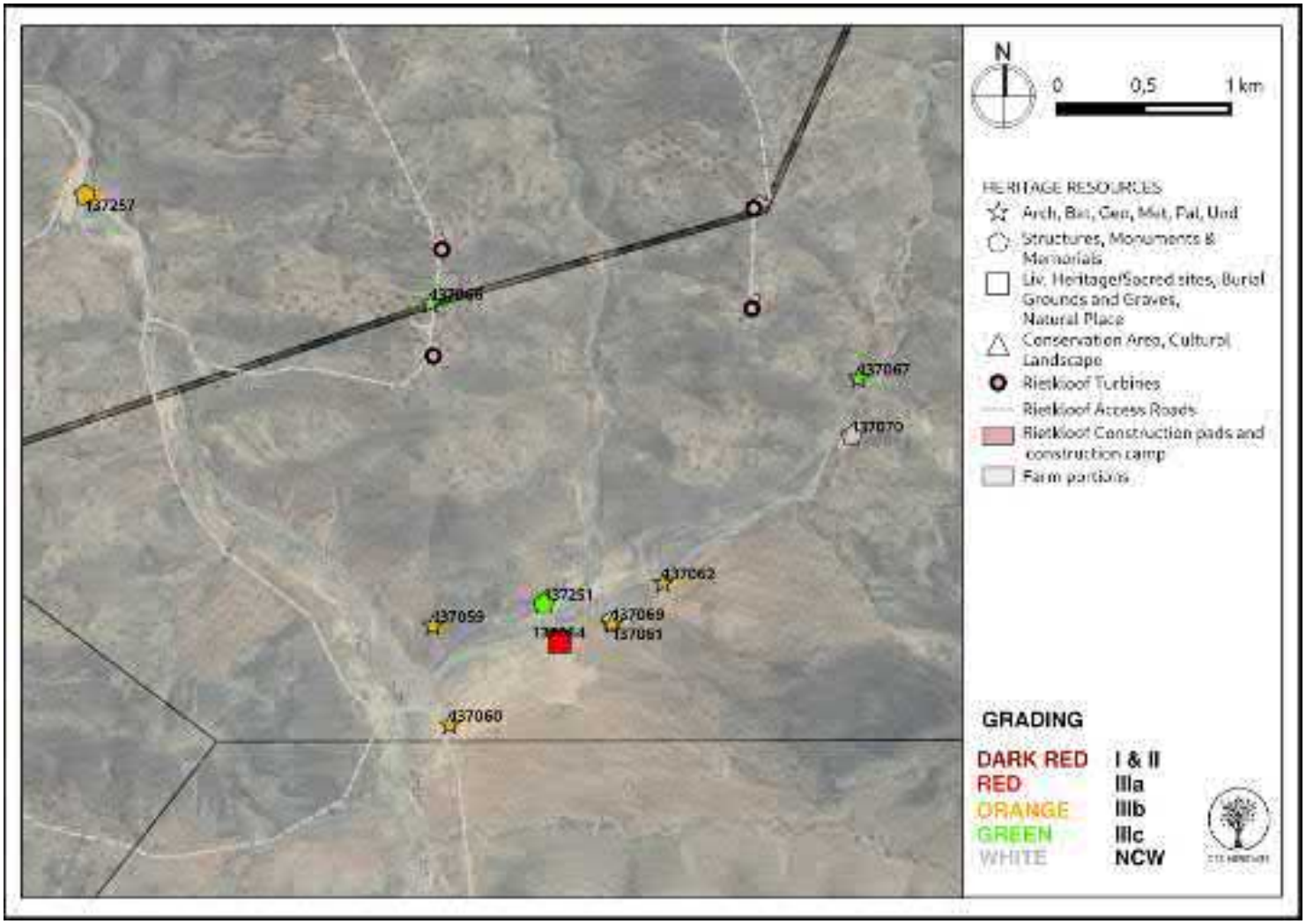

Figure 3.3. Heritage Resources Map. Inset C

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4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Findings of previous assessments

Archaeology, Graves and the Built Environment

Similar findings to those made for the Brandvalley WEF and the Karreebosch WEF were made by Booth in HIA completed for the Rietkloof WEF HIA (2016). Booth (2016) notes that the Rietkloof WEF area "held several historical features (stone walling kraals and cottages) some with associated historical artefacts situated along the access roads in the valleys and associated with the homestead settlements. The area, however, also held evidence of both Middle and Later Stone Age stone artefacts alongside water courses and on the flat floodplains."

All of the heritage resources identified by Booth (2016) have been recorded on SAHRIS and mapped relative to the final proposed layout. The previously identified heritage resources located in close proximity to the development area have been listed in Table 2 and mapped in Figure 3.

Table 2: Archaeological, palaeontological and built environment observations noted during the HIA (2016) completed for the Rietkloof WEF and associated infrastructure, and from other relevant heritage assessments (Mapped in Figure 3)

Site ID	Site no	Full Site Name	Site Type	Grading
35140	ROG009	Roggeveld 009	Building	Grade IIIc
35141	ROG010	Roggeveld 010	Building	Grade IIIc
35578	GK056	Gamma Kappa 056	Artefacts	Grade IIIb
35188	ROG024	Roggeveld 024	Ruin > 100 years	Grade IIIb
35214	ROG032	Roggeveld 032	Building	Grade IIIb
35216	ROG034	Roggeveld 034	Building	Grade IIIc
35217	ROG035	Roggeveld 035	Ruin > 100 years	Grade IIIc
35218	ROG036	Roggeveld 036	Stone walling	Grade IIIc
35753	ROG050	Roggeveld 050	Building	Grade IIIb
35185	ROG023	Roggeveld 023	Burial Grounds & Graves	Grade IIIa
35645	GK122	Gamma Kappa 122	Burial Grounds & Graves	Grade IIIa
35646	GK123	Gamma Kappa 123	Burial Grounds & Graves	Grade IIIa
137160	BWE-052	Brandvalley Wind Energy	Deposit	
137163	BWE-055	Brandvalley Wind Energy	Deposit	
137164	BWE-056	Brandvalley Wind Energy	Deposit	
137165	BWE-057	Brandvalley Wind Energy	Deposit	
137179	BWE-071	Brandvalley Wind Energy	Deposit	
137180	BWE-072	Brandvalley Wind Energy	Deposit	
137181	BWE-073	Brandvalley Wind Energy	Deposit	

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137182	BWE-074	Brandvalley Wind Energy	Deposit	
137183	BWE-075	Brandvalley Wind Energy	Deposit	
137184	BWE-076	Brandvalley Wind Energy	Deposit	
137185	BWE-077	Brandvalley Wind Energy	Deposit	
137186	BWE-078	Brandvalley Wind Energy	Deposit	
137199	KWF-014	KAREEBOSCH WIND FARM	Building	
137200	KWF-015	KAREEBOSCH WIND FARM	Building	
137251	KWF-039	KAREEBOSCH WIND FARM	Structures	
137252	KWF-040	KAREEBOSCH WIND FARM	Structures	
137253	KWF-041	KAREEBOSCH WIND FARM	Stone walling	
137254	KWF-042	KAREEBOSCH WIND FARM	Burial Grounds & Graves	
137255	KWF-043	KAREEBOSCH WIND FARM	Structures	
137257	KWF-044	KAREEBOSCH WIND FARM	Building	
137258	KWF-045	KAREEBOSCH WIND FARM	Building	
137059	RFWE-001	RIETKLOOF WIND ENERGY	Artefacts	Grade IIIb
137060	RFWE-002	RIETKLOOF WIND ENERGY	Artefacts	Grade IIIb
137061	RFWE-003	RIETKLOOF WIND ENERGY	Artefacts	Grade IIIb
137062	RFWE-004	RIETKLOOF WIND ENERGY	Artefacts	Grade IIIb
137063	RFWE-005	RIETKLOOF WIND ENERGY	Burial Grounds & Graves	Grade IIIa
137064	RFWE-006	RIETKLOOF WIND ENERGY	Burial Grounds & Graves	Grade IIIa
137065	RFWE-007	RIETKLOOF WIND ENERGY	Stone walling	Grade IIIc
137066	RFWE-008	RIETKLOOF WIND ENERGY	Stone walling	Grade IIIc
137067	RFWE-009	RIETKLOOF WIND ENERGY	Stone walling	Grade IIIc
137068	RFWE-010	RIETKLOOF WIND ENERGY	Artefacts	Grade IIIb
137069	RFWE-011	RIETKLOOF WIND ENERGY	Structures	
137070	RFWE-012	RIETKLOOF WIND ENERGY	Structures	
137091	BWE-001	Brandvalley Wind Energy	Building	
137092	BWE-002	Brandvalley Wind Energy	Building	
137093	BWE-003	Brandvalley Wind Energy	Building	
137094	BWE-004	Brandvalley Wind Energy	Building	
137095	BWE-005	Brandvalley Wind Energy	Building	

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137096	BWE-006	Brandvalley Wind Energy	Artefacts	Grade IIIb
137097	BWE-007	Brandvalley Wind Energy	Artefacts	Grade IIIb
137098	BWE-008	Brandvalley Wind Energy	Artefacts	Grade IIIb
137099	BWE-009	Brandvalley Wind Energy	Artefacts	Grade IIIb
137100	BWE-010	Brandvalley Wind Energy	Artefacts	Grade IIIb
137101	BWE-011	Brandvalley Wind Energy	Artefacts	Grade IIIb
137102	BWE-012	Brandvalley Wind Energy	Artefacts	Grade IIIb
137103	BWE-013	Brandvalley Wind Energy	Artefacts	Grade IIIb
137104	BWE-014	Brandvalley Wind Energy	Burial Grounds & Graves	Grade IIIa
137105	BWE-015	Brandvalley Wind Energy	Burial Grounds & Graves	Grade IIIa
137106	BWE-016	Brandvalley Wind Energy	Stone walling	Grade IIIc
137107	BWE-017	Brandvalley Wind Energy	Stone walling	Grade IIIc
137108	BWE-018	Brandvalley Wind Energy	Stone walling	Grade IIIc
137109	BWE-019	Brandvalley Wind Energy	Stone walling	Grade IIIc
137110	BWE-020	Brandvalley Wind Energy	Stone walling	Grade IIIc
137111	BWE-021	Brandvalley Wind Energy	Stone walling	Grade IIIc
137112	BWE-022	Brandvalley Wind Energy	Stone walling	Grade IIIc
137113	BWE-023	Brandvalley Wind Energy	Stone walling	Grade IIIc
137114	BWE-024	Brandvalley Wind Energy	Stone walling	Grade IIIc
137115	BWE-025	Brandvalley Wind Energy	Stone walling	Grade IIIc
137116	BWE-026	Brandvalley Wind Energy	Stone walling	Grade IIIc
137117	BWE-027	Brandvalley Wind Energy	Stone walling	Grade IIIc
137118	BWE-028	Brandvalley Wind Energy	Stone walling	Grade IIIc
137119	BWE-029	Brandvalley Wind Energy	Stone walling	Grade IIIc
137120	BWE-030	Brandvalley Wind Energy	Stone walling	Grade IIIc
137122	BWE-032	Brandvalley Wind Energy	Stone walling	Grade IIIc
137123	BWE-033	Brandvalley Wind Energy	Artefacts	Grade IIIb
137124	BWE-034	Brandvalley Wind Energy	Artefacts	Grade IIIc
137125	BWE-035	Brandvalley Wind Energy	Artefacts	Grade IIIc
137127	BWE-037	Brandvalley Wind Energy	Structures	
137128	BWE-039	Brandvalley Wind Energy	Structures	
137129	BWE-040	Brandvalley Wind Energy	Structures	

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137131	BWE-042	Brandvalley Wind Energy	Structures	
137132	BWE-043	Brandvalley Wind Energy	Structures	
137133	BWE-044	Brandvalley Wind Energy	Structures	

Palaeontology

According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by sediments that are of moderate, high and very high palaeontological sensitivity (Figure 4.1).

The Palaeontological assessment completed for the Rietkloof WEF by Almond (2016) notes that "The Rietkloof WEF study area lies in the mountainous Klein-Roggeveldberge region and is underlain by around twelve formations of potentially fossil-bearing sedimentary rocks. The majority of the bedrocks are of Palaeozoic age (Early to Middle Permian) and belong to the Karoo Supergroup which is internationally famous for its rich fossil record. Palaeontological field assessment of the Rietkloof WEF study area shows that in this portion of the south-western Karoo:

- Dwyka Group and Lower to Middle Ecca Group bedrocks in the low-lying, southern portion of the area are tectonically deformed and weathered, with low-diversity trace fossil assemblages of limited scientific interest. This also applies to the Whitehill Formation that elsewhere, outside the study area, may be of high palaeontological sensitivity.
- Waterford Formation (Upper Ecca Group) dealtaic bedrocks underlying the mountainous southern portion of the main development footprint are generally fossil-poor, apart from low-diversity trace fossil assemblages. However, isolated blocks and rare logs of well-preserved petrified wood found within the eastern portion of the study area are of high scientific and conservation value.
- Abrahamskraal Formation (Lower Beaufort Group) fluvial bedrocks underlying the high-lying northern portion of the study area are generally considered to be of high palaeontological sensitivity. However, in this area of the SW Karoo they are fossil-poor, apart from occasional horizons with plant debris or low-diversity trace fossils, including unconfirmed large tetrapod (terrestrial vertebrate) burrows. Fossil vertebrate skeletal remains (bones, teeth) are very rare indeed in these lowermost Beaufort Group rocks. None have been recorded as yet within the Rietkloof WEF study area, but isolated occurrences of probable small dicynodonts have recently been found just to the north (Brandvalley WEF project area).
- Late Caenozoic superficial sediments (alluvium, colluvium, calcretes, soils, surface gravels etc) overlying the Palaeozoic bedrocks are of low palaeontological sensitivity. Pediment and surface gravels along the foot of the Klein-Roggeveld Escarpment locally contain numerous clasts of petrified wood reworked from the Karoo Supergroup outcrop area to the north.

The overall impact significance of the construction phase of the proposed wind energy project is assessed as MODERATE(negative) in terms of palaeontological heritage resources. This is a consequence of (1) the paucity of irreplaceable, unique or rare fossil remains within the development footprint, (2) the high levels of bedrock weathering and tectonic deformation in the southern part of the study area, as well as (3) the extensive superficial sediment cover

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overlying most potentially-fossiliferous bedrocks within the Rietkloof WEF study area… No significant further impacts on fossil heritage are anticipated during the planning, operational and decommissioning phases of the WEF."

Almond (2016) also notes that "The great majority of the Rietkloof WEF study 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. The concentration of blocks and logs of well-preserved petrified wood from the Waterford Formation that are exposed on the slopes of Kranskop, Wilgehout Fontein 87 constitute a notable exception. This highly sensitive area, which in fact lies outside the proposed WEF development footprint, should not be disturbed. Pending the potential discovery of substantial new fossil remains during construction, specialist palaeontological mitigation is only recommended within two narrow upland areas of Waterford Formation outcrop close to Kranskop."

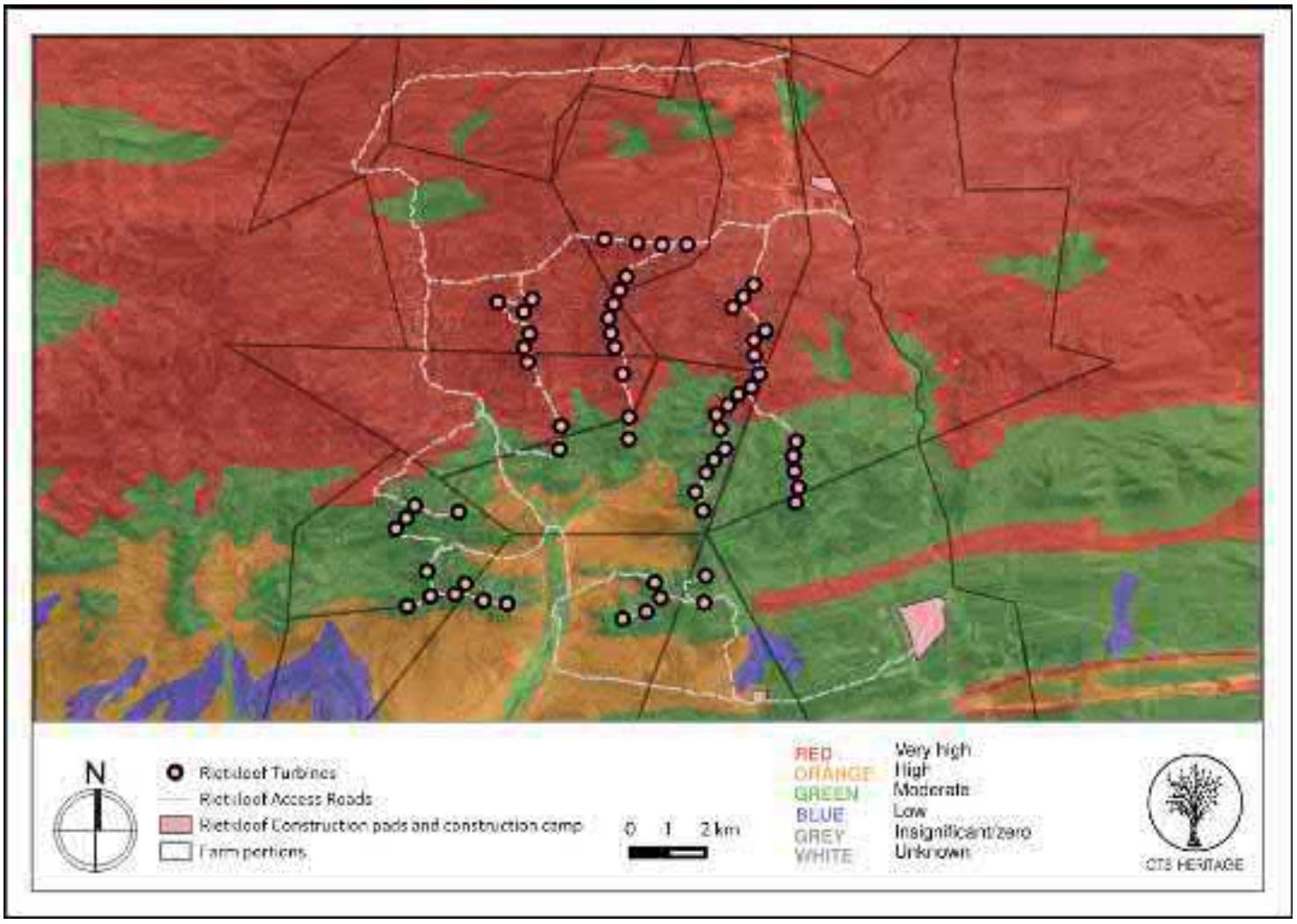

Figure 4.1: Palaeosensitivity Map. Indicating fossil sensitivity underlying the study area

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Summary of heritage recommendations from the completed reports:

The overall area is considered as having a medium - high cultural heritage significance. The proposed development of the Rietkloof WEF may proceed, however, the following recommendations must be considered prior to the development activities:

- This report must be submitted to Heritage Western Cape (HWC), the heritage authority for any Western Cape developments, and as a commenting authority in terms of the National Heritage Resources Act 25 of 1999, Section 38, if the comment issued for the exact same layout is not considered relevant by HWC.
- No turbines are to be constructed on Tafelkop, situated at the meeting of farm boundaries: Hartjieskraal 77, Vogelstruisfontein 81, Annex Hartjieskraal 82 and Rietkloof 88. This recommendation was according to the HWC Final Comment (23/01/2013; Case No. 111020JB18) for the proposed Roggeveld Wind Farm. The current 51 turbine layout respects this mitigation measure.
- If any of the old farm buildings are intended for rehabilitation or re-use or demolition a qualified and experienced professional (historical archaeologist / historical architect) must be consulted.
- Substations: The recommendation included in the EIA report to exclude Substation 7 (SS7) situated on the Farm Hartjieskraal 77 was implemented by the developer. Both substation positions 5 and 6 are acceptable.
- Construction Camps: Construction camp 13 that has been grouped in Area 6 (Figure 16) would be the preferred option for the establishment of the construction camp. The proposed area is suitably situated close to the main road (R354) and does not impede upon the landscape along the valleys. Stone artefact scatters have been observed along this internal access road stretching further towards the foothills of the mountains across the floodplains to the north and south of this internal farm road.
- The existing internal access roads be upgraded up to the 9 m wide proposed expansion except in the cases that heritage resources (including archaeological, historical and palaeontological) as well as the other studies conducted may be negatively impacted and recommend differently. Recommendations for the establishment of 20 m – 30 m buffer zones that are clearly demarcated and, in some instances, the possible rerouting of the proposed road to avoid negative impact and promote the implementation of precautionary measures be adopted for heritage resources occurring along the route (stone and historical artefact scatters, stone walling features, graveyards, etc.) have been detailed in the report and repeated below
    - Stone Artefact Occurrences, Scatters and Sites: The upgrading of the road be limited to the existing internal road. It is expected that scatters of stone artefacts would be uncovered during the upgrade and construction of the access road. This has been established by observance and recording the extent of stone artefacts occurring along this route.
    - It is also recommended that a detailed survey focusing on the floodplains should be conducted to establish the real extent of the artefact occurrences prior to development. Consultation with local Western Cape archaeological repositories (generally museums and universities) can be made to determine whether it would be necessary for to make a collection of artefacts.
    - RK_HS1 (Rietkloof 88): The existing road only measures 3 m with not much space to widen the road without affecting the built environment structures. It is proposed that the road preferably be diverted to the north of the demarcated 84 Rietkloof homestead through flat floodplains to avoid having to go past

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the graveyard. However, if this not possible owing to input from other specialist studies, a buffer to the north of 20 m – 30 m from the farmhouse be established for the diversion of the access road. It is suggested that the existing internal road passing through the homestead (RK_HS1) not be used during the development activities as an access route to avoid negative impact. It is suggested that the existing internal road passing through the homestead (RK_HS1) not be used during the development activities as an access route.

  - RK_SW2 (Rietkloof 88): A 30 m buffer be establishment around the kraal and clearly demarcated to avoid any negative impact during construction of the access road and the proposed access roads to Turbines at the top the hill preferably be constructed 30 m to the west of the stone walling kraal situated on the slope within the proposed access road and 200 m buffer.
  - RK_HS2 (Vogelstruisfontein 81): A 30 m buffer be established around the end portion of this wall and clearly demarcated as to avoid any negative impact. The graveyard area (RK_G2) be fenced off to avoid any possible damage to the graves and informal burials.
  - RK_SW8 (Hartjieskraal 77): A 20 m – 30 m buffer be established and clearly demarcated to avoid any negative impact to the feature.
- An archaeological heritage walk-through survey must be conducted if any changes to the positions of the wind turbines, associated infrastructure and roads outside the scope of this study are made for the final layout and further recommendations and mitigation measures be suggested if necessary.
- If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including burials and graves) are uncovered during construction, all work within close vicinity of the find must cease immediately and be reported the South African Heritage Resources Agency (SAHRA) (021 462 4502) or Heritage Western Cape (HWC) (021 483 5959) so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of testpitting/sampling or systematic excavations and collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities within the specific area can continue.
- Construction managers/foremen and/or the Environmental Control Officer (ECO) should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites

Palaeontology Recommendations

- The area marked in RED in Figure 4.2 and 4.3 has very high levels of palaeontological sensitivity and no impact here is permitted.
- The area marked in Orange in Figure 4.2 and 4.3 has high levels of palaeontological sensitivity and as such, these two areas should be inspected for fossil wood occurrences by a professional palaeontologist. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy). Where practicable, fossils remaining on site should be safeguarded, for example by moving them away from the development footprint.

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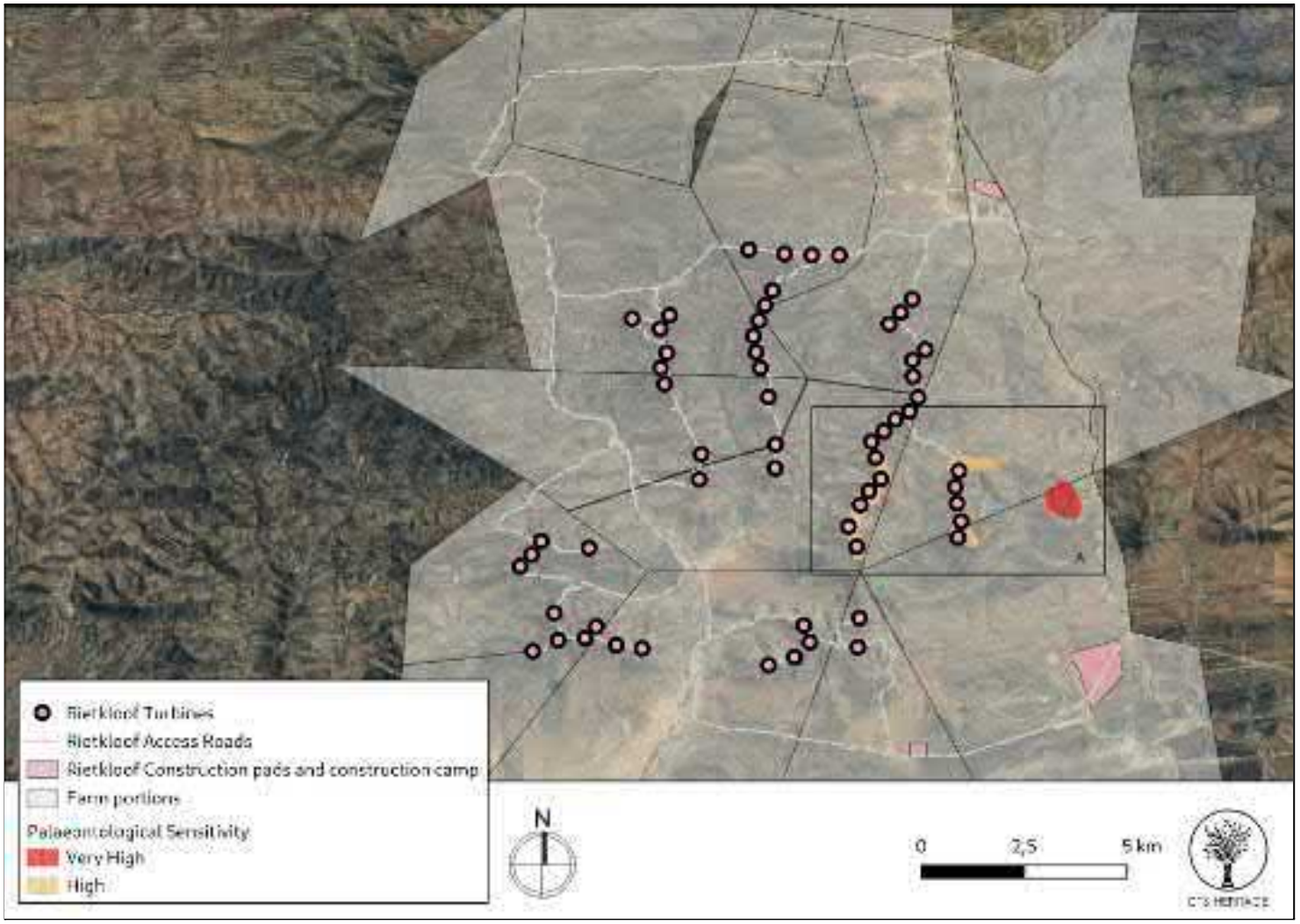

Figure 4.2: Palaeosensitivity Map. Indicating fossil sensitivity underlying the study area

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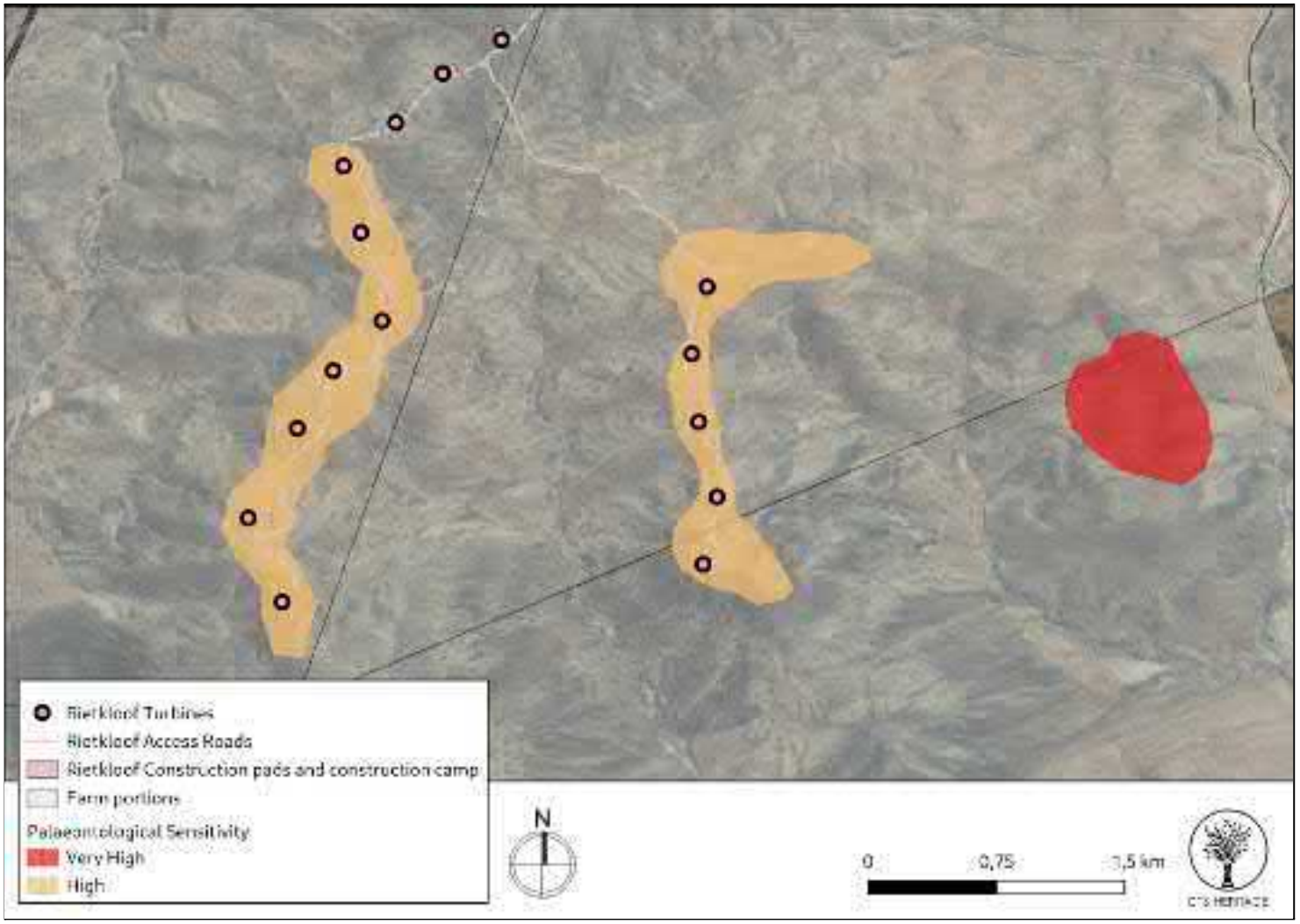

Figure 4.3: Palaeosensitivity Map. Indicating fossil sensitivity underlying the study area

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Figure 5.1: Contextual Image of development area

Figure 5.2: Contextual Image of development area

Figure 5.3: Contextual Image of development area

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Figure 5.4: Contextual Images of Development Area

Figure 5.5: Contextual Images of Development Area

Figure 5.6: Contextual Images of Development Area

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Figure 5.7: Contextual Images of Development Area

Figure 5.8: Contextual Images of Development Area

Figure 5.9: Contextual Images of Development Area

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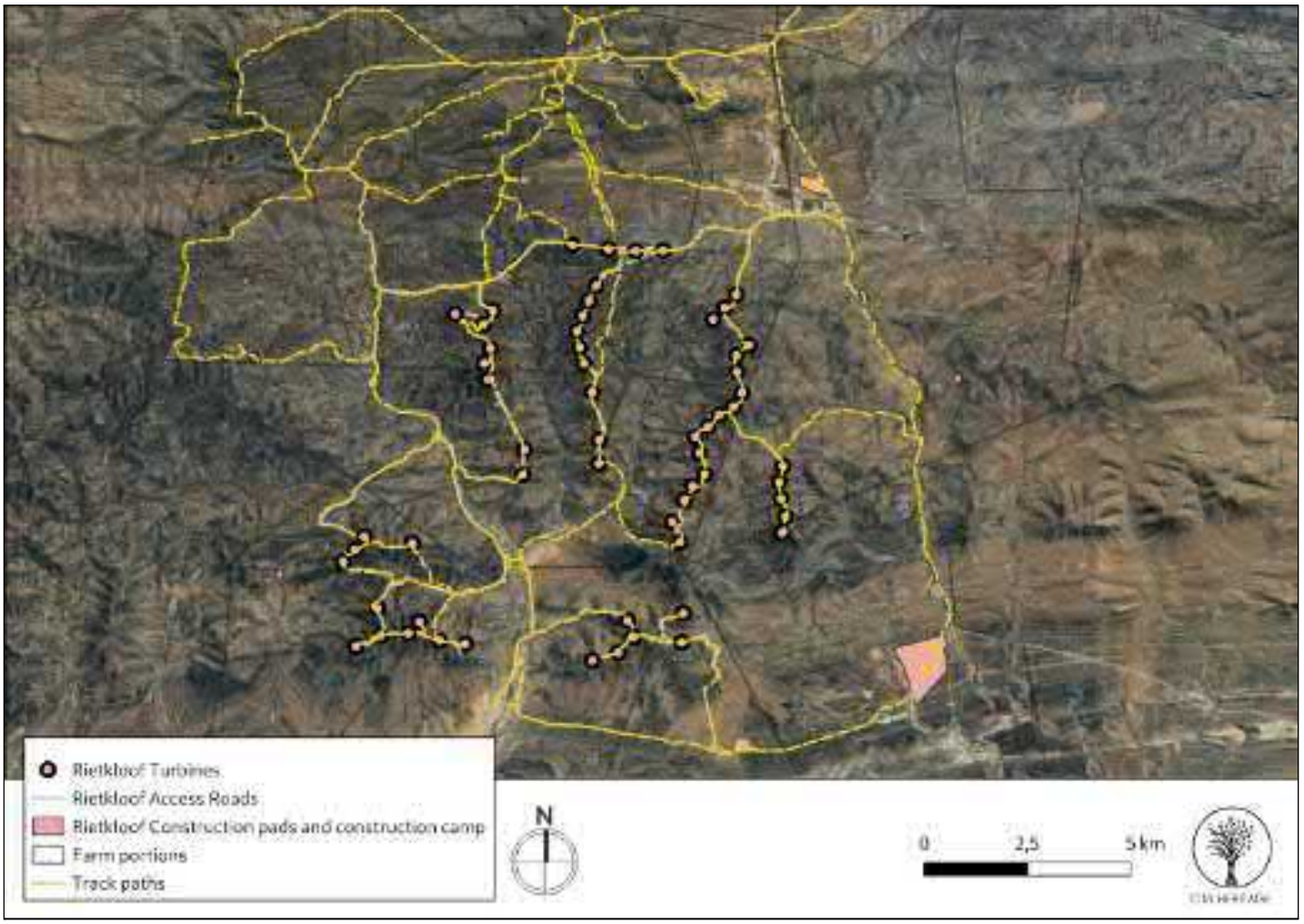

Figure 6.: Overall track paths of foot survey

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4.2 Heritage Resources identifiedin the Walkdown

The locations of recordings made during the previous studies were included in the planning of the walkdown to ensure that additional ruins and historical infrastructure wasn't overlooked due to potential changes in the layout of the final design of the WEF and access roads. Only one fairly large stone walled kraal (RK006) was found that had been missed during the previous surveys and it isn't clear whether the layouts provided then were drawn in the vicinity of this site. However, besides this site, no obvious omissions were found during the survey of the Rietkloof WEF and the coverage along existing jeep tracks and gravel farm roads was therefore deemed to have adequately recorded the historical archaeology and built environment heritage of the area.

Stone Age sites were expected to be very scarce and this was borne out yet again in the foot survey of the ridges where the WEF roads and turbine positions have been planned. Only a few isolated Later and Middle Stone Age sites were located and the artefacts showed signs of retouch, especially on flakes derived from chert. These locations have therefore been interpreted as representing temporary hunting and foraging locales taking advantage of the wide views down onto the valleys either side of the ridges. Less than 1% of the overall archaeological material found in the area is therefore located on the ridges that are windswept, highly rocky and difficult to move through on foot. No overhangs or even substantial outcrops of boulders providing natural shelter were found on the ridges.

Table 3: Archaeological and built environment observations noted during the walk down for the WEF and associated infrastructure

Obs #	SIte Name	Description	Period	Co-ordinates		Grading
RK001	Rietkloof 001	Chert core, patinated hornfels flakes, Artefacts on level ground, small pans but quite rocky	MSA	-33.08508	20.59137	NCW
RK002	Rietkloof 002	Patinated hornfels flakes in pan	MSA	-33.08766	20.58939	NCW
RK003	Rietkloof 003	Chert and hornfels cores	MSA	-33.08808	20.58759	NCW
RK004	Rietkloof 004	Hornfels biface	MSA	-33.0875	20.58678	NCW
RK005	Rietkloof 005	Hornfels flake	MSA	-33.08242	20.58963	NCW
RK006	Rietkloof 006	Stone walled kraal 50x25m	Historic	-33.08555	20.53359	IIIB
RK007	Rietkloof 007	Matjiesfontein chert formal retouched flake. Chert flakes dropped on slopes of large valley below	MSA	-33.08518	20.53314	NCW
RK008	Rietkloof 008	Chert bladelet and flake	MSA	-33.08461	20.53302	NCW
RK009	Rietkloof 009	Hornfels flake. Artefacts dropping off on ridges considerably	MSA	-33.08148	20.53103	NCW
RK010	Rietkloof 010	Chert flake. Isolated flake on top of ridge which was unusual, not part of larger site	LSA	-33.08025	20.51256	NCW
RK011	Rietkloof 011	Chert flake	LSA	-33.07075	20.46493	NCW
RK012	Rietkloof 012	Chert, hornfels, quartzite flakes	LSA, MSA	-32.99232	20.5421	NCW
RK013	Rietkloof 013	Isolated chert flake	LSA	-33.03938	20.52984	NCW
RK014	Rietkloof 014	Farmers trap, corrugated sheet, wire, wooden post	Modern	-33.02031	20.41447	NCW

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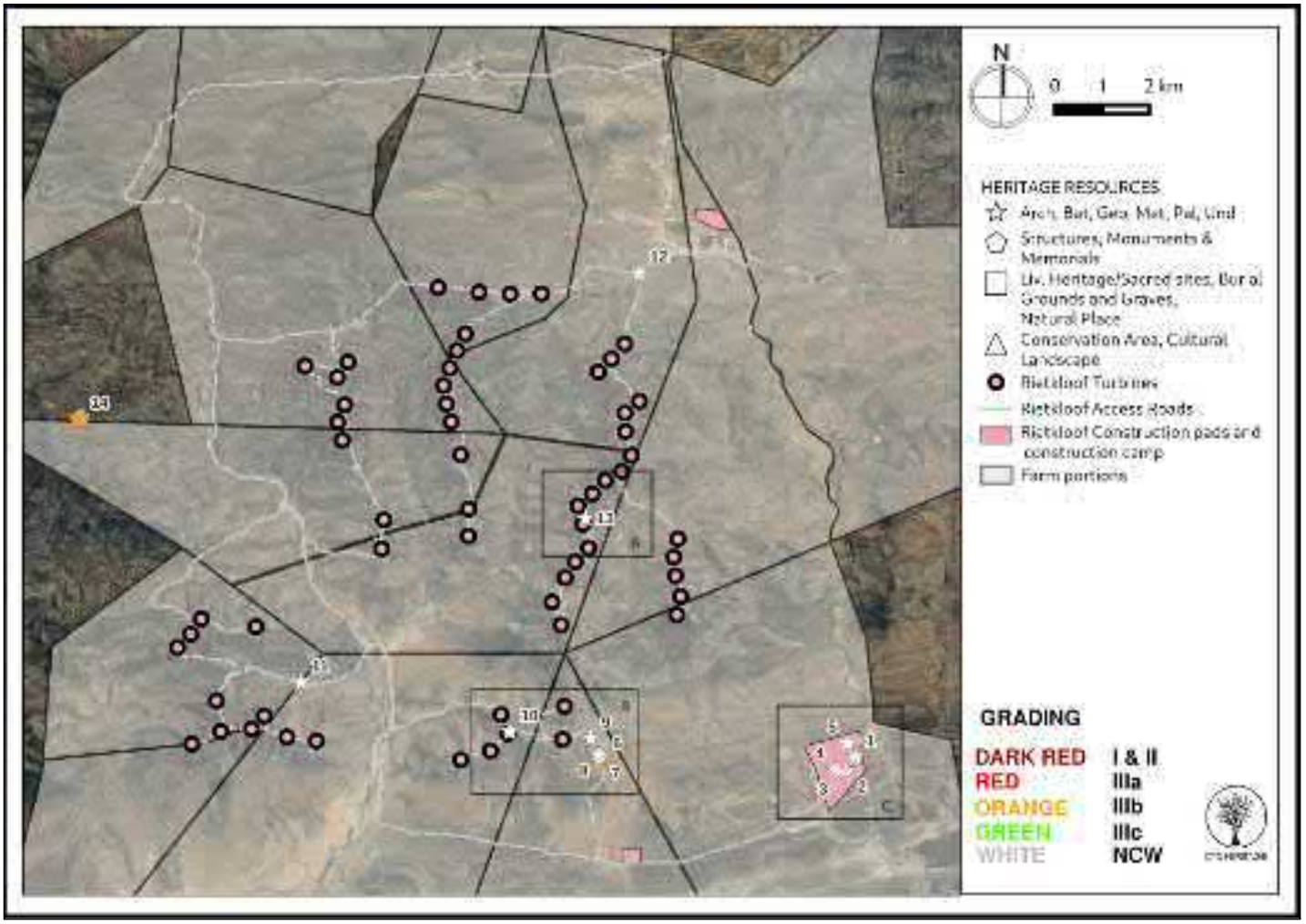

Figure 7.: Location of observations recorded during the walkdown

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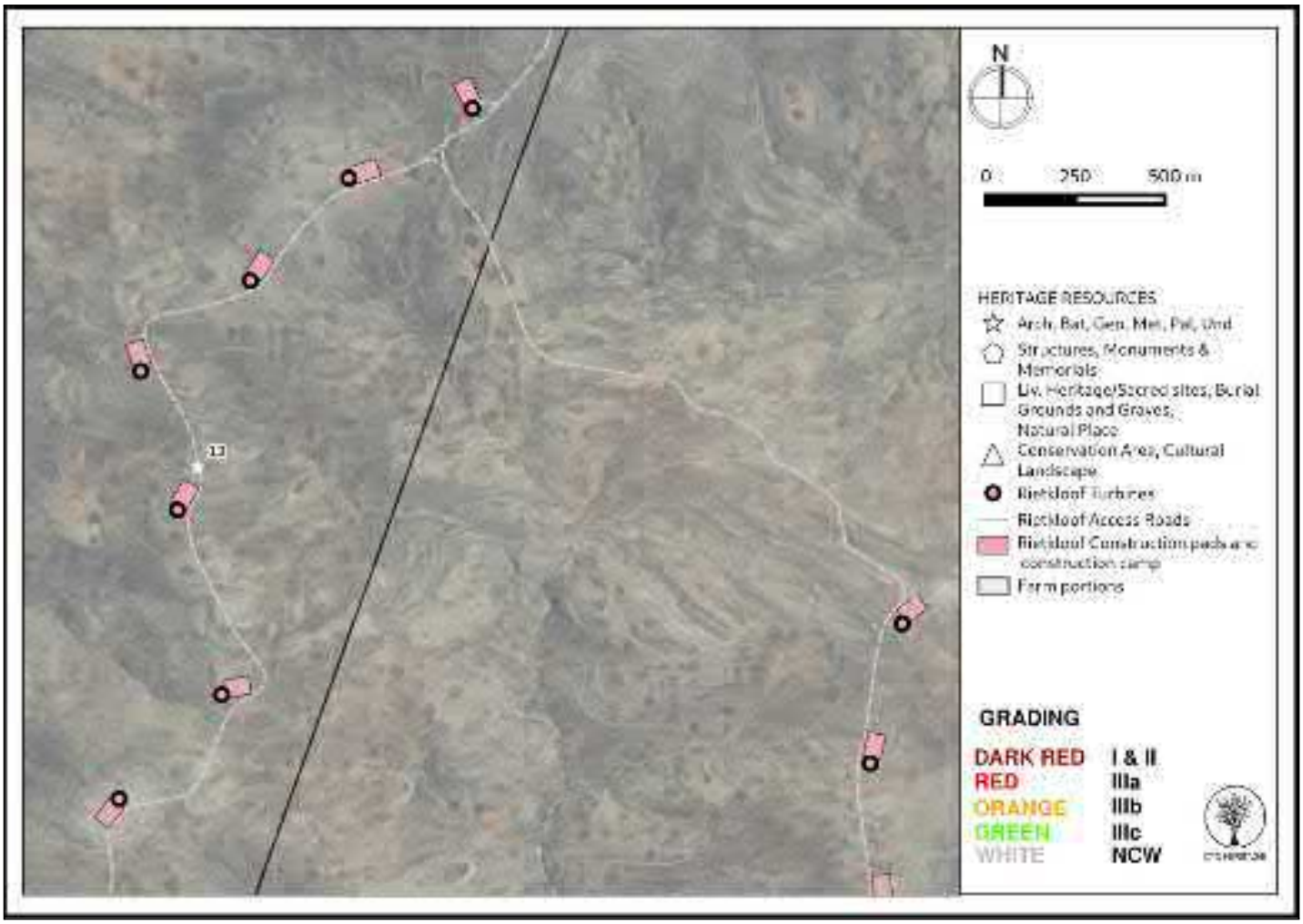

Figure 7.1: Location of observations recorded during the walkdown inset A

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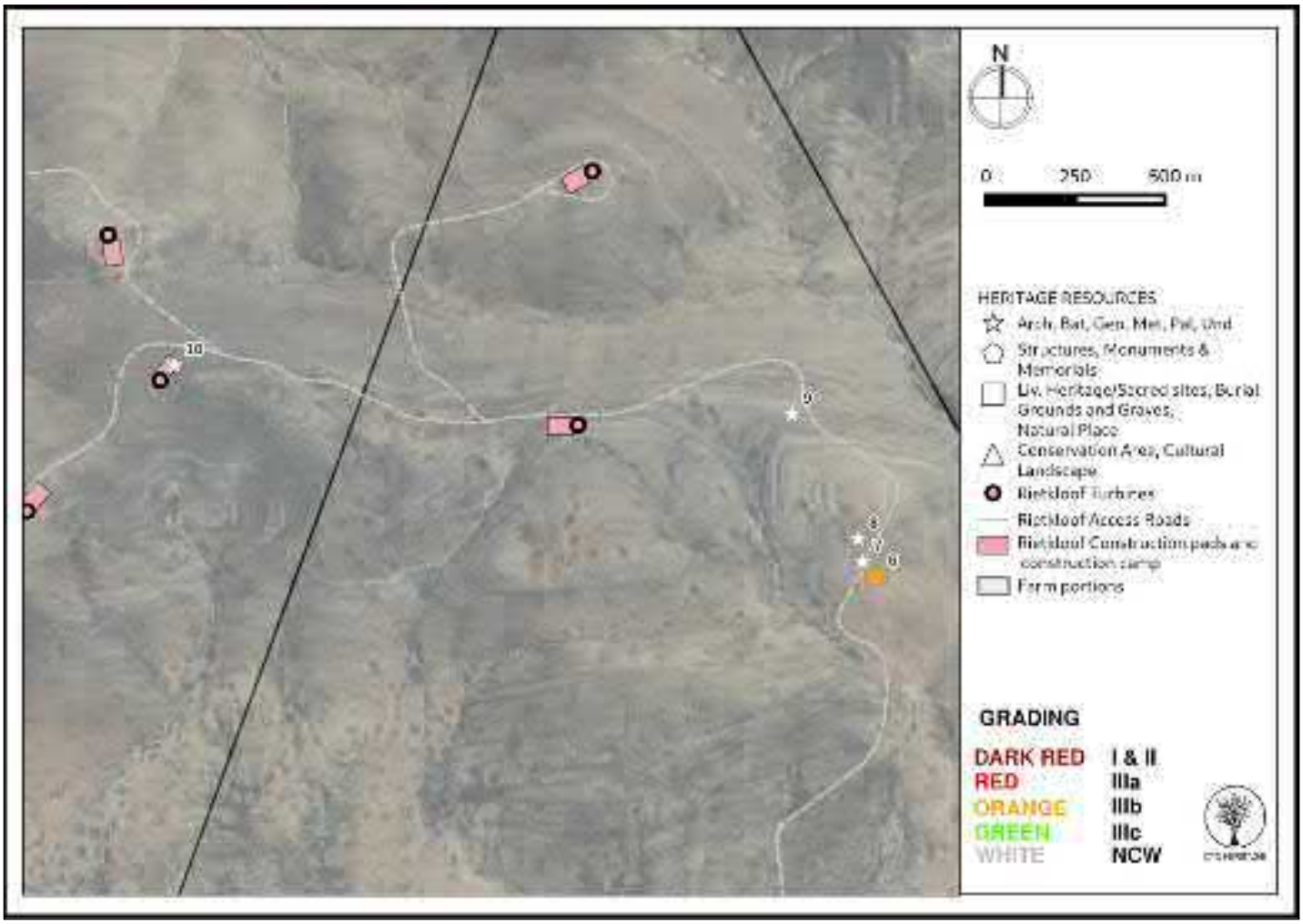

Figure 7.2: Location of observations recorded during the walkdown inset B

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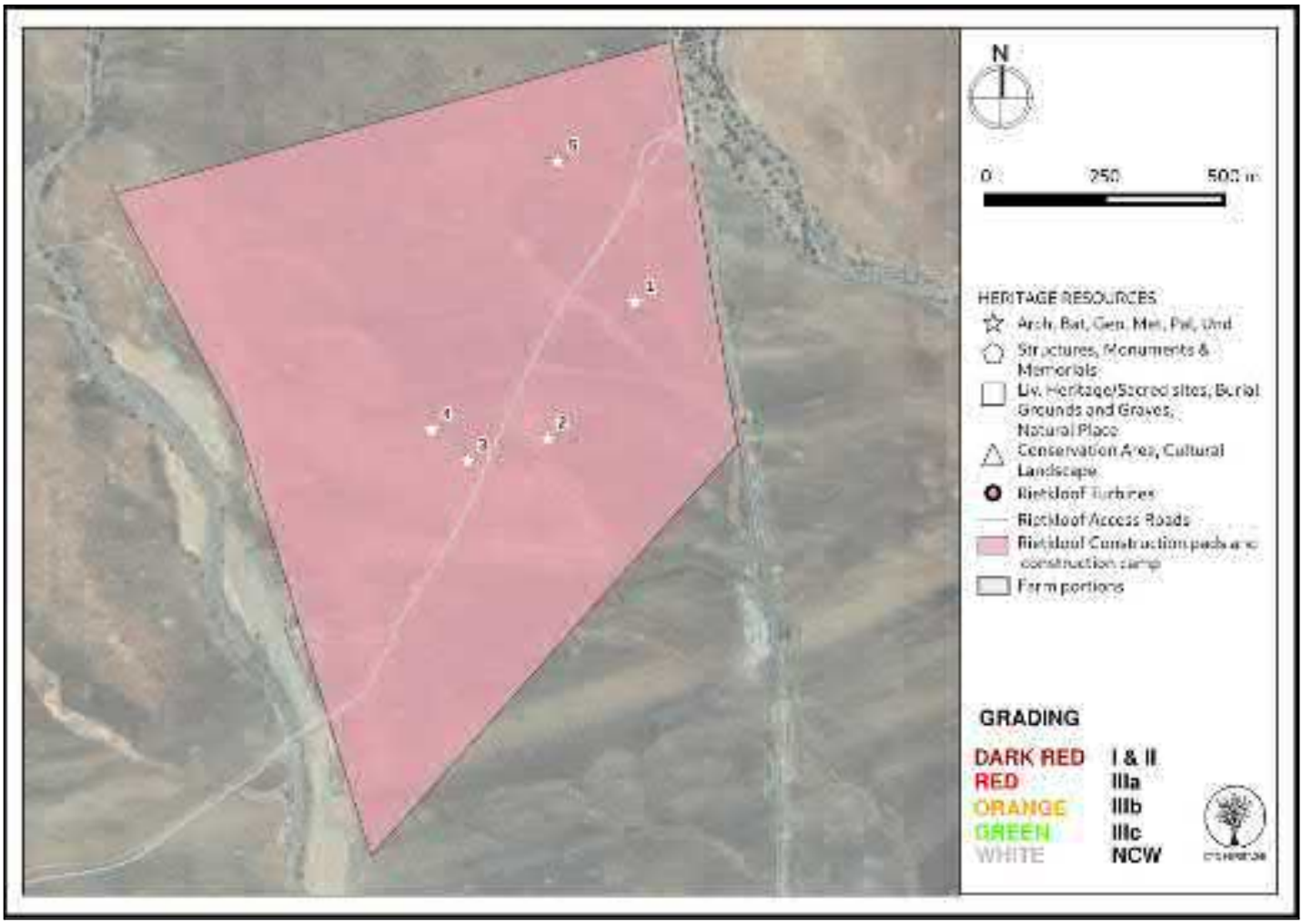

Figure 7.3: Location of observations recorded during the walkdown inset C

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4.3 Selected photographic record

(a full photographic record is available upon request)

Figure 8.1: Observation 001

Figure 8.1: Observation 002

Figure 8.1: Observation 003

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Figure 8.1: Observation 004

Figure 8.1: Observation 005

Figure 8.1: Observation 006

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Figure 8.1: Observation 006

Figure 8.1: Observation 007

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Figure 8.1: Observation 008

Figure 8.1: Observation 009

Figure 8.1: Observation 010

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Figure 8.1: Observation 011

Figure 8.1: Observation 012

Figure 8.1: Observation 013

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Figure 8.2: Observation 014

Figure 8.4: Observation 014

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5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Archaeological Resources

The survey provided a very good account of the generally ubiquitous MSA material spread across the study area in low densities. No impacts on significant heritage resources are anticipated as the layout of the WEF has been drawn up to avoid the previously recorded sites of significance by Booth in 2016.

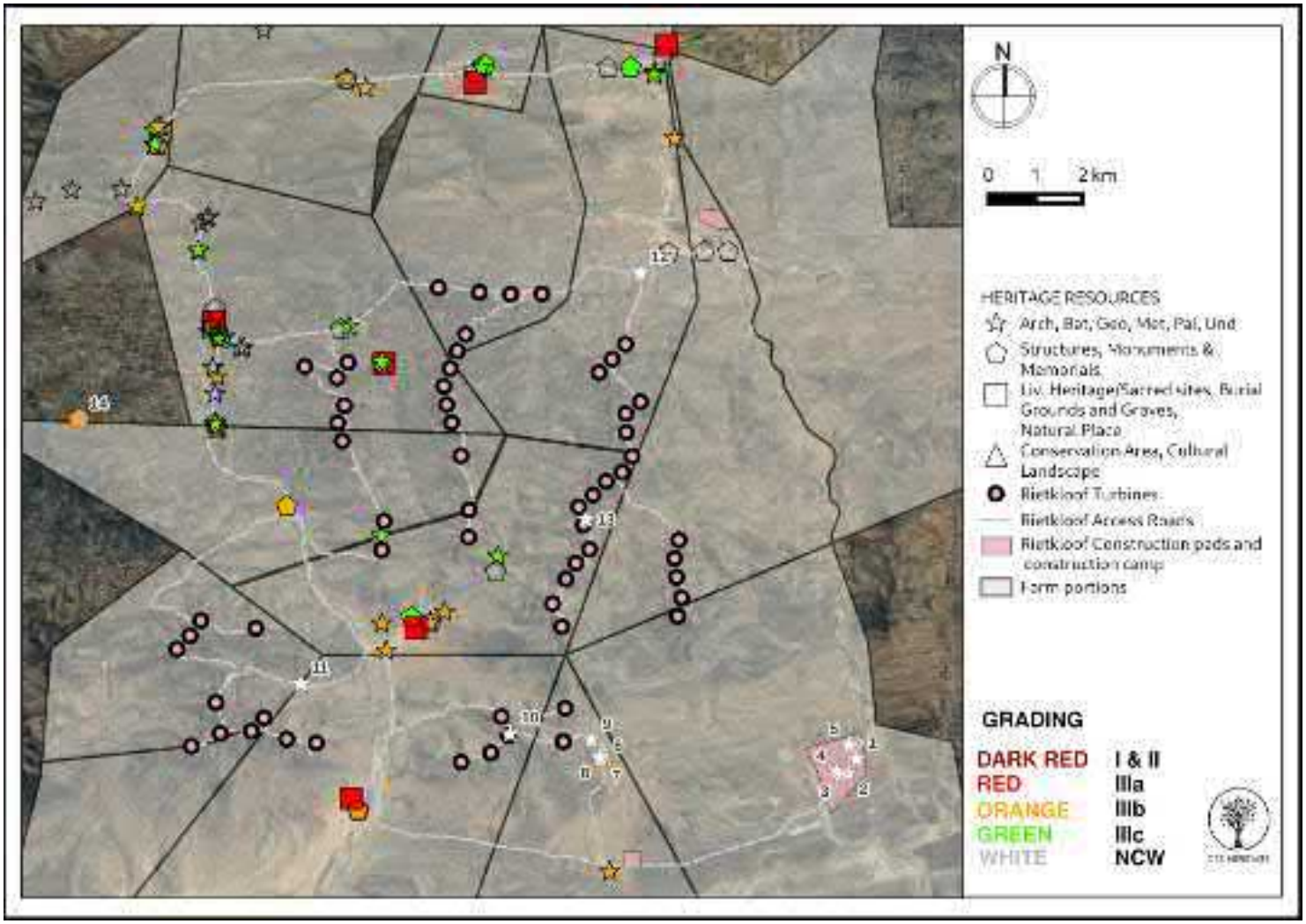

Figure 9: Map of all known heritage resources relative to the final proposed development footprint

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6. CONCLUSION AND RECOMMENDATIONS

In response to the original Heritage Impact Assessment completed by Booth in 2016, it was recommended by HWC that a targeted walk down of the final layout must be conducted by an archaeologist. This recommendation was reiterated as a condition of authorisation in the original EA granted for the Rietkloof WEF project in 2019.

The final layout for the Rietkloof WEF avoids impact to all known significant heritage resources present within the development area. The walkdown of the final layout revealed no new significant heritage resources that are likely to be impacted. It is therefore recommended that this report is accepted as satisfying the following conditions of the Environmental Authorisation issued for the Rietkloof WEF project:

- All wind turbines must avoid all areas designated as "no-go" areas as well as their buffers
- The final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by ecological, avifaunal, bat, surface water and heritage specialists
- A 60m buffer must be applied around all identified archaeological sites.
- Pre-construction archaeological monitoring is required. The appointed archaeologist must keep a list documenting all identified farm infrastructure.
- All buffers and no-go areas stipulated in the EIAr must be adhered to for both the facilities and all roads and powerlines
- The final layout must be shown to the appointed archaeologist before implementation to confirm that all significant heritage resources have been adequately protected.

Although the EA did not make any specific conditions pertaining to the conservation of palaeontological heritage, the PIA completed for the Rietkloof WEF recommended that the area marked in Orange in Figure 4.2 and 4.3 should be inspected for fossil wood occurrences by a professional palaeontologist prior to construction. It is recommended that this mitigation step be completed prior to the construction of the turbines in this area.

Once the above step is complete, all conditions of authorisation have been satisfied for this project in terms of impacts to heritage resources.

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7. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
359488	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	09/03/2016	Brandvalley Wind Energy Facility
53187	HIA Phase 1	Timothy Hart, Lita Webley	01/03/2011	HERITAGE IMPACT ASSESSMENT PROPOSED WIND ENERGY FACILITY
337370	PIA Phase 1	Duncan Miller	01/03/2011	Palaeontological Impact Assessment Proposed Roggeveld Wind Energy Facility
356316	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	02/02/2016	Heritage Screener CTS15_015b EOH Brandvalley Wind Energy Facility
356318	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	01/02/2016	Heritage Screener CTS15_015a EOH Rietkloof Wind Energy Facility
364162	PIA Phase 1	John E Almond	01/04/2016	PALAEONTOLOGICAL HERITAGE ASSESSMENT: COMBINED DESKTOP & FIELD-BASED STUDY - PROPOSED BRANDVALLEY WIND ENERGY FACILITY LAINGSBURG, WESTERN & NORTHERN CAPE PROVINCES
364163	AIA Phase 1	Celeste Booth	01/04/2016	A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) FOR THE PROPOSED BRANDVALLEY WIND ENERGY FACILITY (WEF) SITUATED IN THE KAROO HOOGLAND LOCAL MUNICIPALITY (NAMAKWA DISTRICT MUNICIPALITY), THE WITZENBURG LOCAL MUNICIPALITY (CAPE WINELANDS DISTRICT MUNICIPALITY) AND LAINGSBURG LOCAL MUNICIPALITY (CENTRAL KAROO DISTRICT MUNICIPALITY).
4843	AIA Phase 1	Hilary Deacon	28/03/2008	Archaeological Impact Assessment: Proposed Breede Valley De Doorns Housing Project
	HIA	Dave Halkett, Lita Webley	11/04/2011	HERITAGE IMPACT ASSESSMENT: PROPOSED PERDEKRAAL WIND AND SOLAR ENERGY FACILITY , WESTERN CAPE PROVINCE

Additional References:

Hart, T. et al. (2016). **HERITAGE IMPACT ASSESSMENT (SCOPING) FOR THE PROPOSED KOLKIES WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION TO BE SITUATED IN THE SOUTHERN TANKWA KAROO.** (Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of an EIA). For Arcus Consulting. Unpublished and not submitted.

Hart, T. et al. (2016). **HERITAGE IMPACT ASSESSMENT (SCOPING) FOR THE PROPOSED KAREE WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION TO BE SITUATED IN THE SOUTHERN TANKWA KAROO.** (Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of an EIA). For Arcus Consulting. Unpublished and not submitted.

Shaw, Matthew & Ames, Christopher & Phillips, Natasha & Chambers, Sherrie & Dosseto, Anthony & Douglas, Matthew & Goble, Ron & Jacobs, Zenobia & Jones, Brian & Lin, Sam & Low, Marika & Mcneil, Jessica-Louise & Nasoordeen, Shezani

& O'driscoll, Corey & Saktura, Rosaria & Sumner, T. & Watson, Sara & Will, Manual & Mackay, Alex. (2020). **The Doring River Archaeology Project: Approaching the Evolution of Human Land Use Patterns in the Western Cape, South Africa.**

Smith, Andrew B., and Michael R. Ripp. "**An Archaeological Reconnaissance of the Doorn/Tanqua Karoo.**" The South African Archaeological Bulletin, vol. 33, no. 128, 1978, pp. 118–133

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CTS HERITAGE

14 April 2022

Ashlea Strong
WSP

Dear Ms Strong,

RE: AMENDED LAYOUT FOR THE APPROVED RIETKLOOF WEF NEAR MATJIESFONTEIN IN THE WESTERN CAPE

Rietkloof Wind Farm (Pty) Ltd, a subsidiary of G7 Renewable Energies (Pty) Ltd, has received approval to develop a 140 megawatt (MW) Wind Energy Facility (WEF) near Matjiesfontein, in the Western Cape Province in South Africa. The authorised WEF is located in the Laingsburg Local Municipality, which falls within the Central Karoo District Municipality. It comprises up to 58 turbines, with a generating capacity of between 1.5MW and 4MW each.

The Rietkloof Wind Energy Facility (WEF) is proposed in the Western Cape at the border with the Northern Cape along the R354 road which connects Matjiesfontein to Sutherland. An inclusion zone of 10km was assessed around the proposed WEF in order to better characterise the heritage resources of the area. Several WEFs have previously been proposed within the 10km inclusion zone, including the Hidden Valley Phase 1 Karusa, the Hidden Valley Phase 2 Soetwater, the Hidden Valley Phase 3, Great Karoo, Roggeveld Wind Farm Phase 1 and Kareebosch Wind Project (Roggeveld Phase 2). The Brandvalley WEF (a phase of the Roggeveld Wind Farm) is proposed contemporaneously to the Rietkloof WEF on some overlapping properties. This WEF is also a part of Roggeveld Wind Energy Facility

The authorised Rietkloof Wind Energy Facility (WEF) falls entirely within the Western Cape and as such, falls under the jurisdiction of Heritage Western Cape (HWC).

EA was granted for the Rietvalley WEF on 17 September 2019. In the EA, various requirements were stipulated in terms of impacts to Historical, Cultural and Palaeontological sites (Table 1 below). In their Final Comment, HWC, as well as the EA, required that the Final Layout of the proposed development be subject to a walkdown by an archaeologist. This walkdown was completed by CTS Heritage between 24 and 28 July 2021 with the Walkdown Report completed in September 2021. Subsequent to the completed walkdown assessment, the layout was amended in November 2021 and again in April 2022.

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Table 1: EA requirements for Heritage

EA Requirements	*Implementation*
All wind turbines must avoid all areas designated as "no-go" areas as well as their buffers	Addressed in Walkdown report September 2021
The final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by ecological, avifaunal, bat, surface water and heritage specialists	Addressed in Walkdown report September 2021
If archaeological heritage material, fossils and human remains are uncovered during construction, all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that a systematic and professional investigation / excavation can be undertaken.	During construction
Exclusion of sensitive ecological, heritage and paleontological areas from construction activities must inform micro siting of all development activities.	At construction
A 60m buffer must be applied around all identified archaeological sites.	Addressed in Walkdown report September 2021
Pre-construction archaeological monitoring is required. The appointed archaeologist must keep a list documenting all identified farm infrastructure.	Addressed in Walkdown report September 2021
If concentrations of archaeological heritage material, fossils and human remains are uncovered during construction, all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that a systematic and professional investigation / excavation can be undertaken.	During construction
Construction managers/foremen must be informed before construction starts of the possible types of heritage sites and cultural material that may be encountered and the procedures to follow when they find sites.	To be completed
All buffers and no-go areas stipulated in the EIAr must be adhered to for both the facilities and all roads and powerlines	Addressed in Walkdown report September 2021
Should any human remains be uncovered during development they must be immediately protected in situ and reported to the heritage authorities or to an archaeologist. The remains will need to be exhumed at the cost of the developer	During construction
All construction and maintenance crew and vehicles (except small vehicles which may use existing farm tracks) must be kept out of the buffer zones.	During construction
The final layout must be shown to the appointed archaeologist before implementation to confirm that all significant heritage resources have been adequately protected.	Addressed in Walkdown report September 2021
A conservation management plan must be drafted and submitted to SAHRA for review and comment	Completed October 2021

CTS HERITAGE

The proposed amendments consist of minor deviations (maximum deviation of approx. 600m). As with the previous layout, some of the heritage resources known from this area are located along the proposed road alignments. The road alignments have been slightly amended in the proposed amended layout, however it is not anticipated that these amended road alignments will negatively impact on significant archaeological heritage. Furthermore, it is not anticipated that the proposed change in turbine height and reduction in turbine numbers will negatively impact on heritage resources.

This letter is therefore drafted to confirm that the amended layout dated April 2022 for the Rietkloof WEF does not impact any known heritage resources and adheres to the recommendations included in the CTS Heritage Walkdown report for this development (September 2021) which concludes that "The final layout for the Rietkloof WEF avoids impact to all known significant heritage resources present within the development area. The walkdown of the final layout revealed no new significant heritage resources that are likely to be impacted."

Although the EA did not make any specific conditions pertaining to the conservation of palaeontological heritage, the PIA completed for the Rietkloof WEF recommended that the area marked in Orange in Map 4 should be inspected for fossil wood occurrences by a professional palaeontologist prior to construction. It is recommended that this mitigation step be completed prior to the construction of the turbines in this area.

Please see the attached maps as confirmation.

Please feel free to contact me should you have any further questions or concerns in this regard.

Yours sincerely

Jenna Lavin
Archaeologist, Heritage Assessment Practitioner

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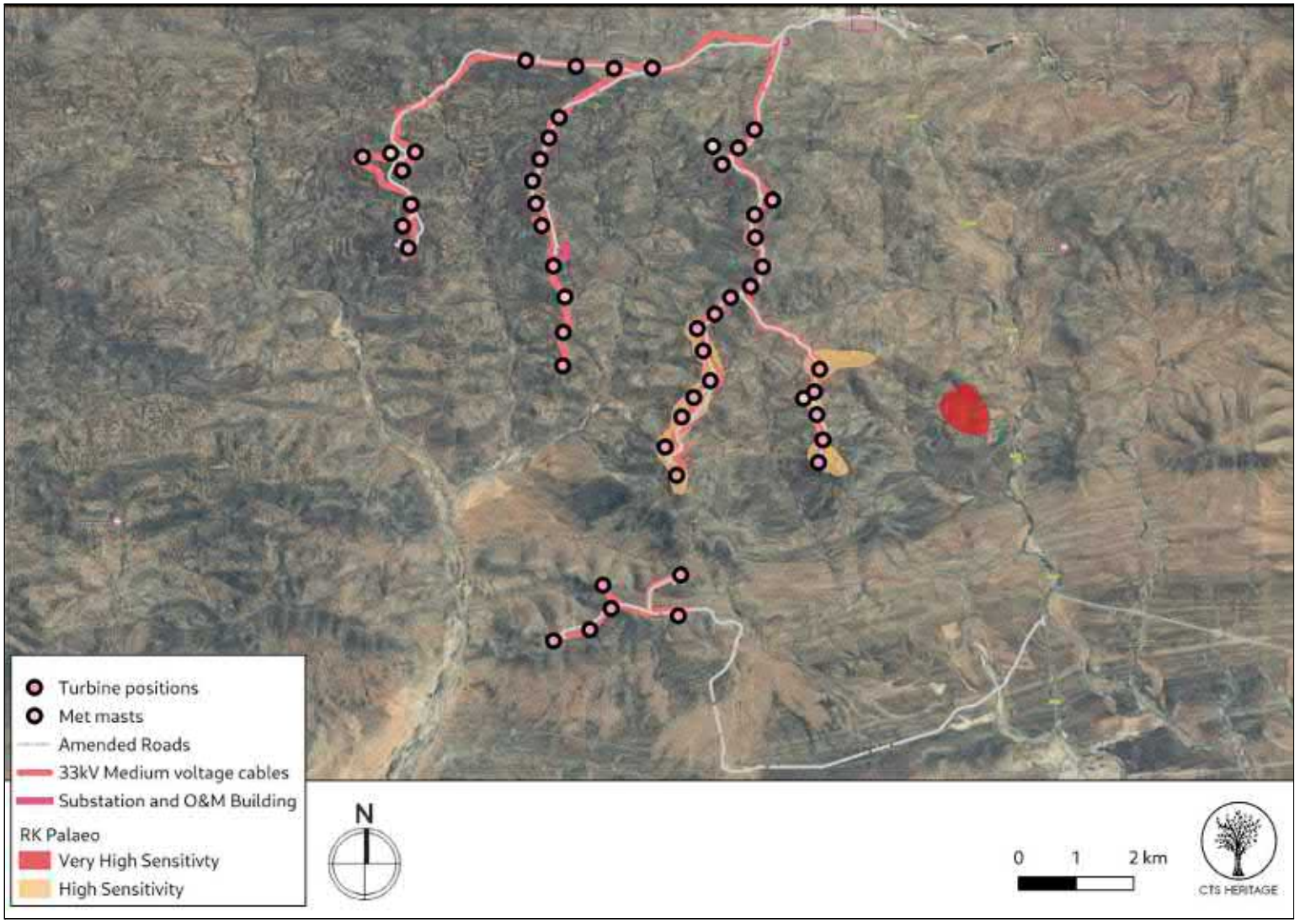
34 Harries Street, Plumstead, Cape Town, 7945
Tel: +27 (0)87 073 5739 **Email:** info@ctsheritage.com **Web:** www.ctsheritage.com



Map 1: Amended final layout of the Rietkloof WEF indicating the amended road alignment

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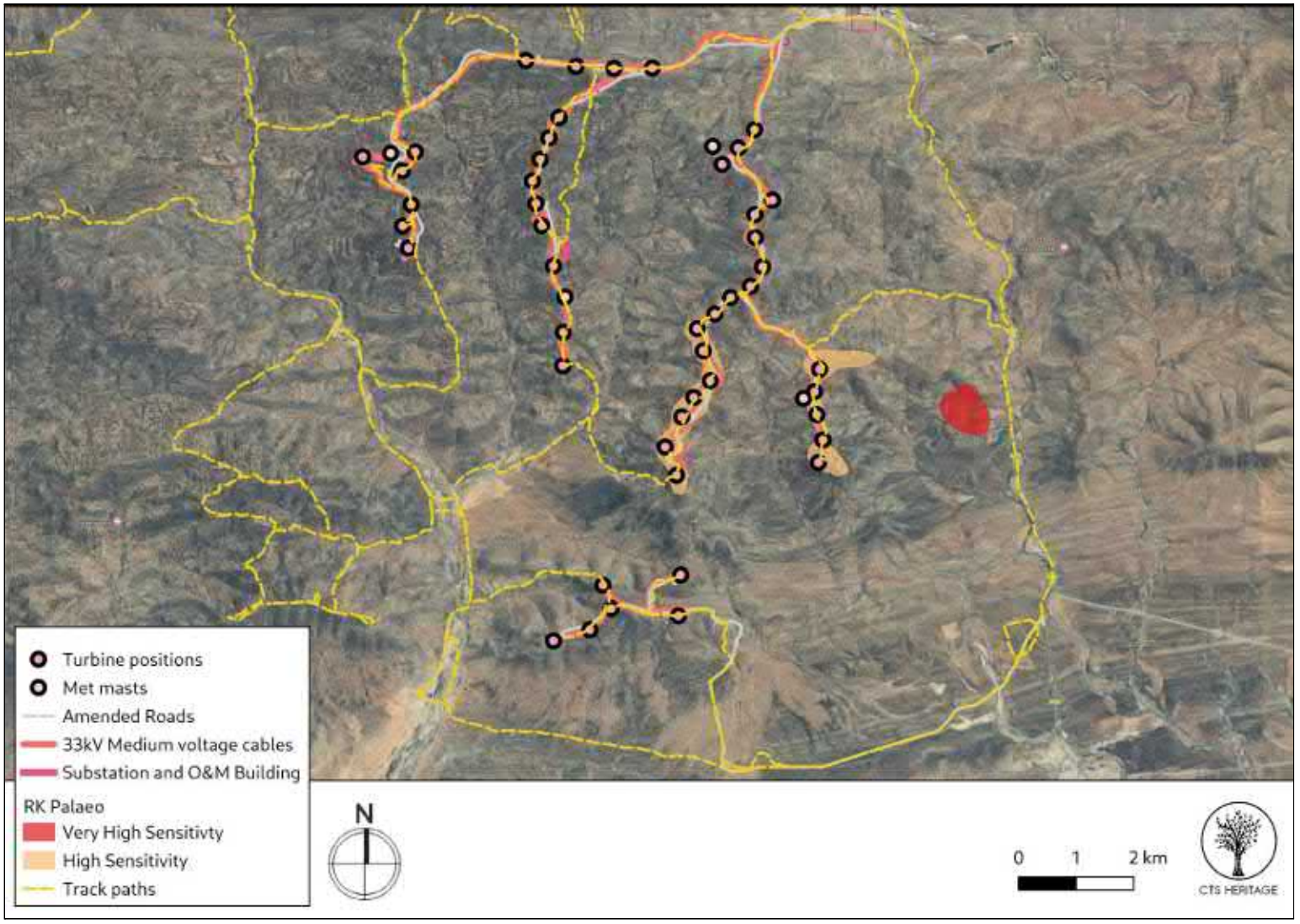

Map 2: Track paths followed for the walkdown of the Final Layout

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34 Harries Street, Plumstead, Cape Town, 7945
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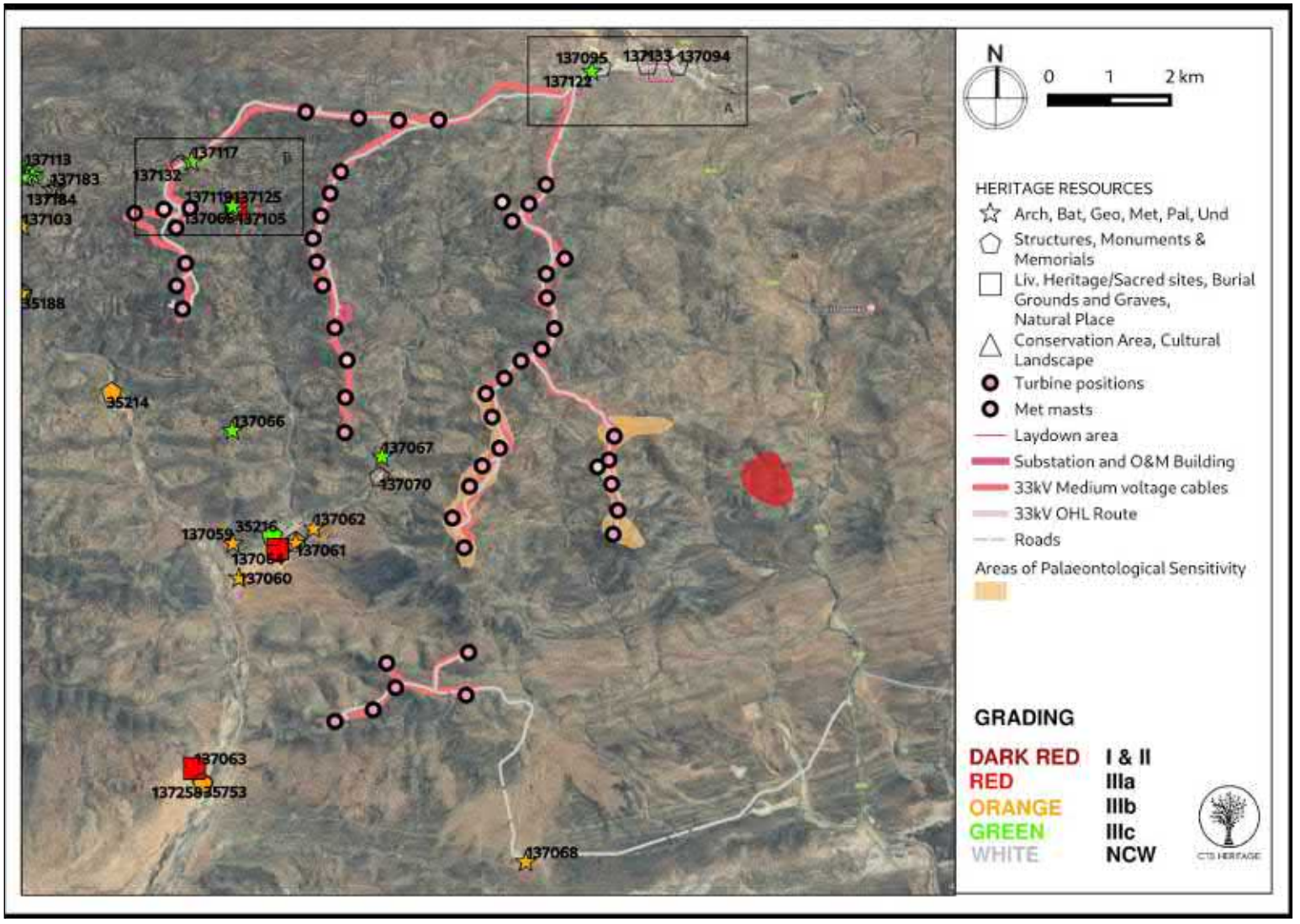

Map 3: Known heritage resources overlain with the proposed amended layout (refer to Walkdown Report September 2021 for the Site details)

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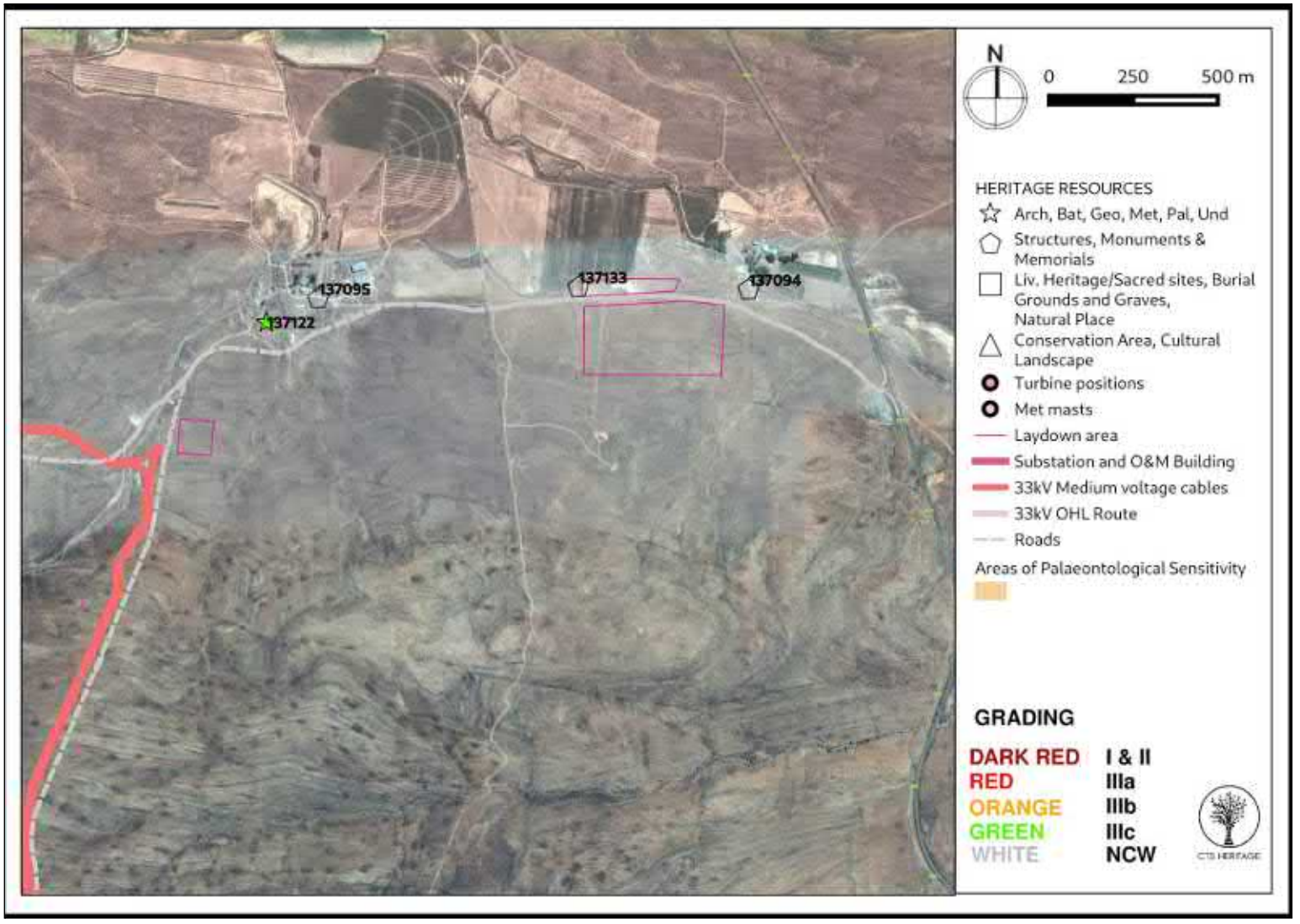

Map 3a: Known heritage resources overlain with the proposed amended layout - Inset A

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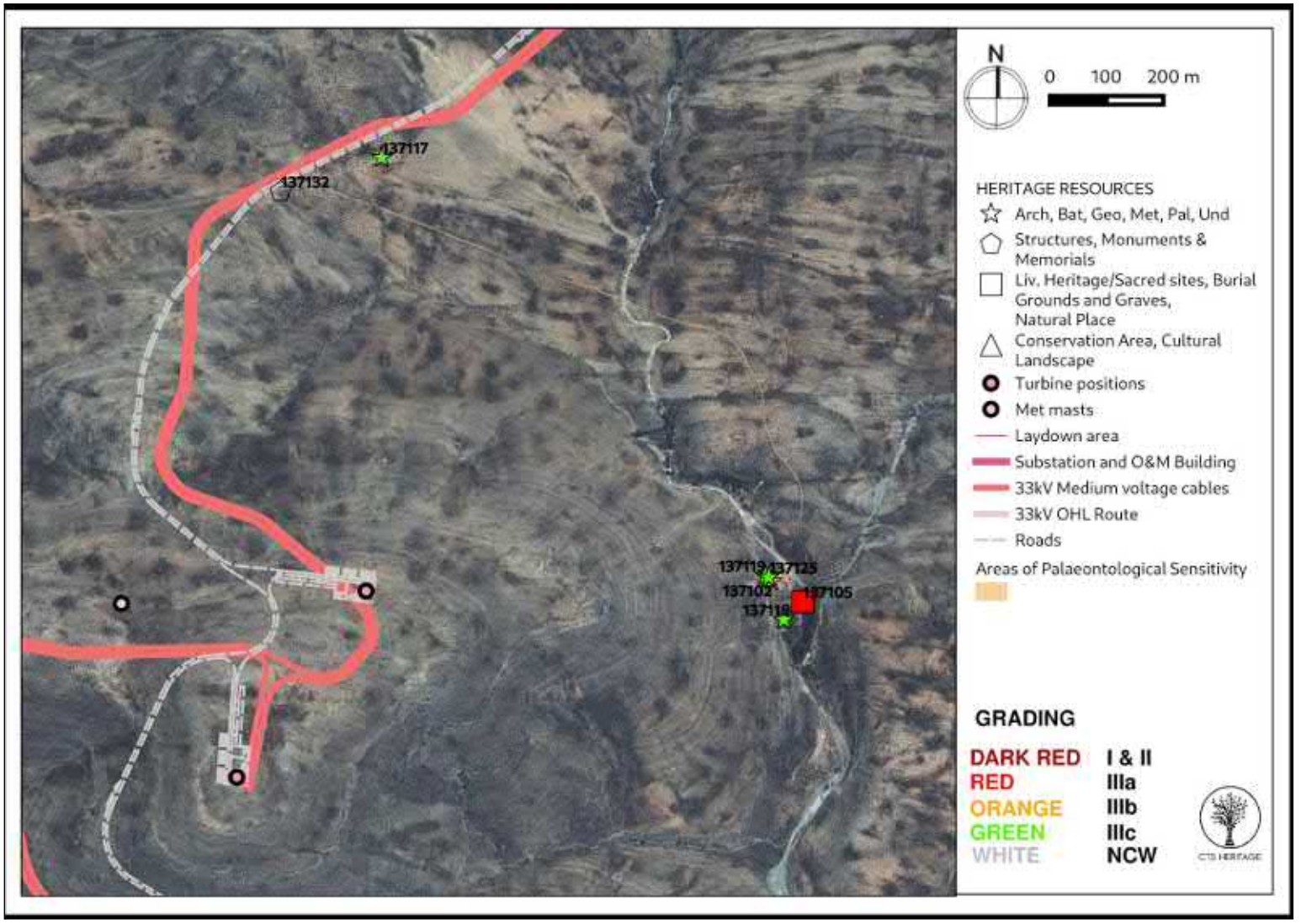

Map 3b: Known heritage resources overlain with the proposed amended layout - Inset B

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APPENDIX

K AGRICULTURAL WALKDOWN REPORT

Johann Lanz
Soil Scientist (Pr.Sci.Nat.)
Reg. no. 400268/12

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RIETKLOOF WIND FARM:
AGRICULTURAL ASSESSMENT OF LAYOUT AND EMPr

The purpose of this specialist input is to assess the acceptability of the WEF layout, and to assess the adequacy of the EMPr, both in terms of the project's impacts on agricultural resources.

The objective and focus of an agricultural assessment for Environmental Authorisation is to assess whether or not a proposed development will have an unacceptable agricultural impact or not, and based on this, to make a recommendation on whether it should be approved or not. Agricultural impacts are done in terms of the protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources. The aim of this protocol is to preserve valuable agricultural land for agricultural production. Valuable land is considered to be predominantly scarce arable land that is suitable for the viable production of cultivated crops. However, all land that is excluded from agricultural use by this development is entirely unsuitable for crop production due predominantly to very significant climate constraints and is therefore not considered particularly preservation-worthy as agricultural production land.

The focus and defining question of an agricultural impact assessment is to determine to what extent a proposed development will compromise (negative impacts) or enhance (positive impacts) current and/or potential future agricultural production. The significance of an impact is therefore a direct function of the degree to which that impact will affect current or potential future agricultural production. If there will be no impact on production, then there is no agricultural impact. Impacts that degrade the agricultural resource base, pose a threat to production and therefore are within the scope of an agricultural impact assessment.

For agricultural impacts, the exact nature of the different infrastructure within a development has very little bearing on the significance of impacts. What is of most relevance is simply the total footprint of the facility that excludes agricultural land use or impacts agricultural land. Whether the footprint comprises a turbine, a road or a substation is largely irrelevant to agricultural impact.

It is also important to consider the scale at which the significance of an impact is assessed. An agricultural impact equates to a temporary or permanent change in agricultural production potential of the land. The change in production potential of a farm or significant part of a farm will obviously always be highly significant at the scale of that farm, but may be much less so at larger scales. This assessment considers a regional and national scale to be the most appropriate one for

assessing the significance of the loss of agricultural production potential.

The significance of all potential agricultural impacts of the Rietkloof WEF is mitigated by two factors:

- the fact that the proposed site is on land of extremely limited agricultural potential that is only viable for low density grazing.
- The agricultural footprint of the wind farm (including all associated infrastructure and roads), that results in the exclusion of land from potential grazing, is insignificantly small in relation to the surface area of the affected farms. All agricultural activities will be able to continue unaffectedly on all parts of the farms other than the insignificantly small development footprint for the duration of and after the project.

A map of the facility layout, overlaid on the screening tool sensitivity, is given in Figure 1.

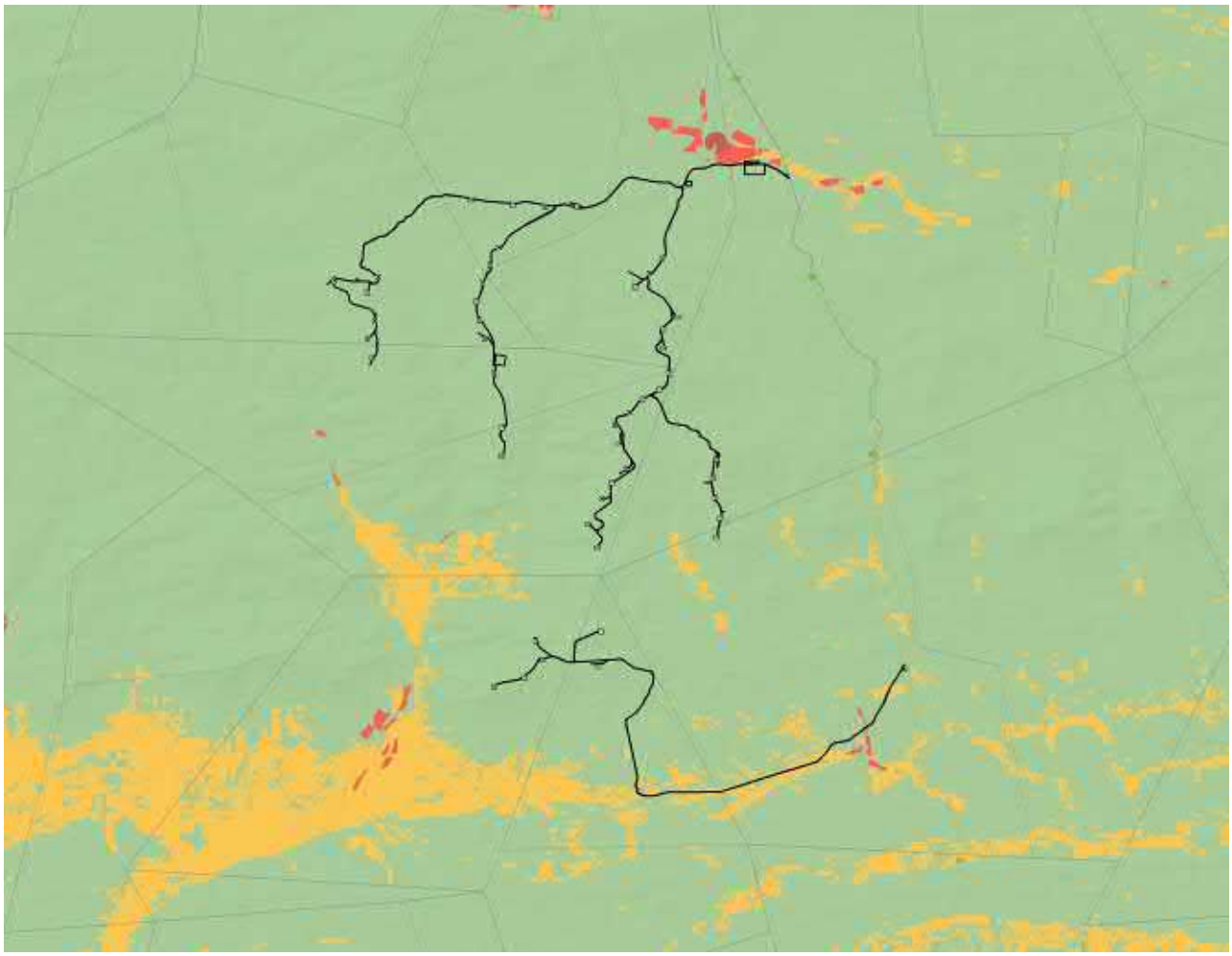

Figure 1. *The proposed layout of the facility overlaid on agricultural sensitivity, as given by the screening tool (green = low; yellow = medium; red = high; dark red = very high).*

The layout is almost entirely on land of very low potential which is rated as low agricultural sensitivity. Only a small part is on medium sensitivity and it entirely avoids any land that is rated more than medium sensitivity, and that would therefore be a higher priority in terms of its conservation for agricultural land use. The layout is therefore acceptable in terms of agricultural impact.

The Environmental Management Program for the Rietkloof WEF has been assessed. The important aspects of the protection of agricultural resources are the prevention of erosion and the maintenance of topsoil on the surface. These aspects are adequately covered in the EMPR and it is therefore considered to be adequate in terms of protecting agricultural resources. No amendments or additions are therefore recommended to the Environmental Management Program.

Johann Lanz (Pr. Sci. Nat.)

APPENDIX

L SURFACEWATER WALKDOWN LETTER

F.E.N. Consulting
Applying science to the real world

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Name: Stephen van Staden
Date: Thursday, 18 November 2021
Ref: FEN 20-2115

Red Rocket South Africa (Pty) Ltd
14th floor, Pier Place,
Heerengracht Street
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Tel: 021 418 3940
Cell: 072 212 1531
E-mail: m.logan@redrocket.energy

Attention: Maggie Logan

MEMORANDUM: FRESHWATER SPECIALIST OPINION REGARDING THE UPDATED LAYOUT FOR THE PROPOSED RIETKLOOF WIND ENERGY FACILITY (WEF), BETWEEN SUTHERLAND AND MATJIESFONTEIN IN THE WESTERN CAPE PROVINCE

FEN Consulting undertook a freshwater ecological assessment in July 2021 as part of the Water Use Authorisation (WUA) process for the proposed Rietkloof Wind Energy Facility (WEF) and associated infrastructure between Matjiesfontein and Sutherland in the Western Cape Province (hereafter referred to as the 'proposed development'). Since submission of the freshwater ecological assessment report in July 2021, the developer updated the layout in November 2021, which differs from that presented in the FEN Consulting July 2021 report. The updated layout entails a reduced number of turbines (currently 47 turbines, as opposed to 60 turbines), fewer internal access road crossings, repositioning of the construction camp and laydown area and confirmation of the proposed 33 kV internal collector systems.

This letter serves to inform the WUA process regarding the potential impact of the updated layout on any watercourses in the vicinity of the development.

Watercourse Assessment

Watercourses associated with the Groot River system, Roggeveld River system and Wilgehout River system are traversed by the proposed development. The Groot River are proposed to be traversed several times by access roads. Most of the watercourses to be traversed by the proposed development and those identified within the investigation area can best be described as headwater episodic[1] drainage lines (EDLs) without riparian vegetation which flow into larger ephemeral tributaries with riparian vegetation, which ultimately flow into the larger riverine systems located outside the investigation area. Although these EDLs cannot be classified as riparian resources in the traditional sense, due to the lack of saturated soil and riparian vegetation, they do still function as waterways, through episodic conveyance of water. However, based on the definition of a watercourse water flows

[1] "Highly flashy systems that flow or flood only in response to extreme rainfall events, usually high in their catchments. May not flow in a five-year period or may flow only once in several years." (Uys and O'Keeffe, 1997, in Rossouw *et. al*, 2006).

regularly or intermittently within these EDLs, conveying water from the upgradient catchment area into the downgradient tributaries and eventually into the larger river systems. As such, they can be considered as watercourses due to their importance for hydrological functioning as they do function as waterways and therefore enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998). Ephemeral tributaries with riparian vegetation and associated channelled valley bottom wetlands were also identified to be traversed by the proposed development.

Sheet wash preferential flow paths (PFPs) were also identified in the most southwestern extent of the investigation area (associated with the Groot and Wilgehout River systems). These sheet wash PFPs formed as a result of extensive erosion of the naturally high erodibility of the soil within the surrounding landscape, predominantly due to historical grazing practices and construction activities associated with the development of the existing electrical transmission lines, and in which small earth dams were created that store the concentrated stormwater runoff during rainfall events.

As with the EDLs, these sheet wash PFPs also lack riparian and wetland characteristics and may potentially only convey surface water for a short period of time after rainfall events. These PFPs consist of shallow braided channels with bleached soil and scattered low growing vegetation. From digital satellite imagery, these flow paths present as continuous light coloured corridors in the landscape. Thus, these features are not considered of ecological importance but contribute to the hydrological functioning of the drainage systems on a more regional scale. The PFPs cannot be considered as watercourses (thus no ecological assessment undertaken) and may potentially only enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998) should a floodline be applicable to these features. Please refer to the outcome of the freshwater ecological assessment (FEN Consulting, 2021) for a detailed description of these watercourses.

July 2021 layout comparison to November 2021 layout, from a watercourses impact perspective

The table below provides a concise comparison of the updated layout (November 2021) versus the July 2021 assessed layout relative to watercourses. The layouts are also visually presented in Figure 1 and 2 in Appendix A.

Table 1: Summary of the distance the proposed surface infrastructure components are located relative to the delineated watercourses.

Proposed surface infrastructure component	Layout as per FEN Consulting (July 2021) (Appendix 1, Figure 1)	Updated layout (November 2021) (Appendix 1, Figure 2)
Construction camp	48 m from the Roggelveld River (thus within the 100m GN509 Zone of Regulation)	Located immediately south of a drainage line, however, a section of the construction camp/laydown area will be located within the existing Roggeveld WEF batching plant footprint, thus no additional impacts are expected. Batching plant located approximately 58 m from a watercourse. Overall impact is reduced
Turbines and Crane pads	Total: 60 turbines and associated hardstands • Crane pad associated with Turbine 59, located approximately 79 m from a watercourse. • Crane pad associated with Turbine 63, located approximately 88 m from a watercourse. • Crane pad associated with Turbine 48, located approximately 75 m from a watercourse. • Crane pad associated with Turbine 49, located approximately 99 m from a watercourse.	Total: 47 turbines and associated hardstands • Crane pad associated with Turbine 17, located approximately 79 m from a watercourse. • Crane pad associated with Turbine 28, located approximately 30 m from a watercourse. • Crane pad associated with Turbine 44, located approximately 96 m from a watercourse. • Crane pad associated with Turbine 69, located approximately 50 m from a watercourse.

Proposed surface infrastructure component	Layout as per FEN Consulting (July 2021) (Appendix 1, Figure 1)	Updated layout (November 2021) (Appendix 1, Figure 2)
	• Crane pad associated with Turbine 59, located approximately 79 m from a watercourse. • Crane pad associated with Turbine 28, located approximately 36 m from a watercourse. • Crane pad associated with Turbine 23, located approximately 92 m from a watercourse. • Crane pad associated with Turbine 69, located approximately 26 m from a watercourse.	
Collector system – Option 1, 2 and 2	Several watercourse crossings: (It must be noted that all powerline support structures will be constructed outside of the delineated extent of the watercourses and as far as feasible, at least 32 m from its delineated extent and therefore are not considered to pose a direct negative risk to the delineated watercourses).	Several watercourse crossings, however, less watercourse crossings noted than the July 2021 layout (It must be noted that all powerline support structures will be constructed outside of the delineated extent of the watercourses and as far as feasible, at least 32 m from its delineated extent and therefore are not considered to pose a significant direct negative risk to the delineated watercourses).
Access roads	• Several watercourse crossings (new and existing). • Upgrading of extensive sections of the proposed access roads which are located adjacent to wetlands and the Groot River.	• Several watercourse crossings (new and existing), noted to be less than what was proposed in the July 2021 road layout. • Upgrading of extensive sections of the proposed access roads which are located adjacent to the Groot River, thus reducing impact and risk - no wetlands will be traversed

DWS Risk Assessment

The outcome of the DWS Risk Assessment as per the freshwater ecological assessment (FEN Consulting, July 2021) indicated that the construction and operation of the proposed Rietkloof WEF, were of 'Moderate' risk significance to the assessed watercourses, with the implementation of the recommended mitigation measures. This was predominantly attributed to the construction and upgrading of roads adjacent to and through sensitive wetlands and an extensive section of the Groot River.

It is noted that the updated November 2021 layout will pose a negligible quantum of risk to any wetlands since all infrastructure components are located outside the delineated wetlands and their associated 500 m Zone of Regulation (ZoR) in accordance with Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to activities as stipulated in Section 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) (NWA). Additionally, no extensive sections of roads will be constructed along the major rivers (with specific mention of the Groot River). This has significantly reduced the significance of any potential impacts of the proposed development on the identified watercourses. A such, the risk significance of the updated November 2021 layout is considered 'Low'. Nonetheless, roads will still cross smaller watercourses which will result in direct negative impacts to the watercourses. It is the opinion of the ecologist that formalising watercourse crossings with appropriate through flow structures is considered advantageous over the long-term as existing informal watercourse crossings have resulted in erosion of the watercourses which have caused interruption of hydrological connectivity between the upstream and downstream reaches.

As such, although the outcome of the DWS Risk Assessment as per the freshwater ecological assessment (FEN Consulting, 2021) indicated a 'Moderate' risk significance, the updated November 2021 layout entails less watercourse crossings and avoids any wetlands and their applicable 500 m ZoR, which results in a reduced (Low) overall risk significance. It is recommended that the mitigation measures as provided in the freshwater ecological assessment (FEN Consulting, 2021) be implemented

to mitigate the significance of the expected impacts on the watercourses. The updated November 2021 layout of the proposed Rietkloof WEF is not considered to be fatally flawed.

It can be concluded that the updated November 2021 layout of the proposed Rietkloof WEF does not pose any additional negative impacts to any watercourses, but rather will generate less impacts and pose less of a risk than the originally assessed layout to the watercourses of the region. The FEN Consulting (2021) freshwater ecological assessment is considered applicable, acceptable and appropriately accurate and comprehensive to inform the required legislative processes for the proposed Rietkloof WEF authorisation and subsequent development when read in conjunction with this Memorandum.

We trust we have interpreted your requirements correctly. Please feel free to contact me if you have any queries in this regard.

Yours Faithfully,

Digital Documentation Not Signed for Security Purposes

Stephen van Staden
Pr. Sci. Nat.

APPENDIX A

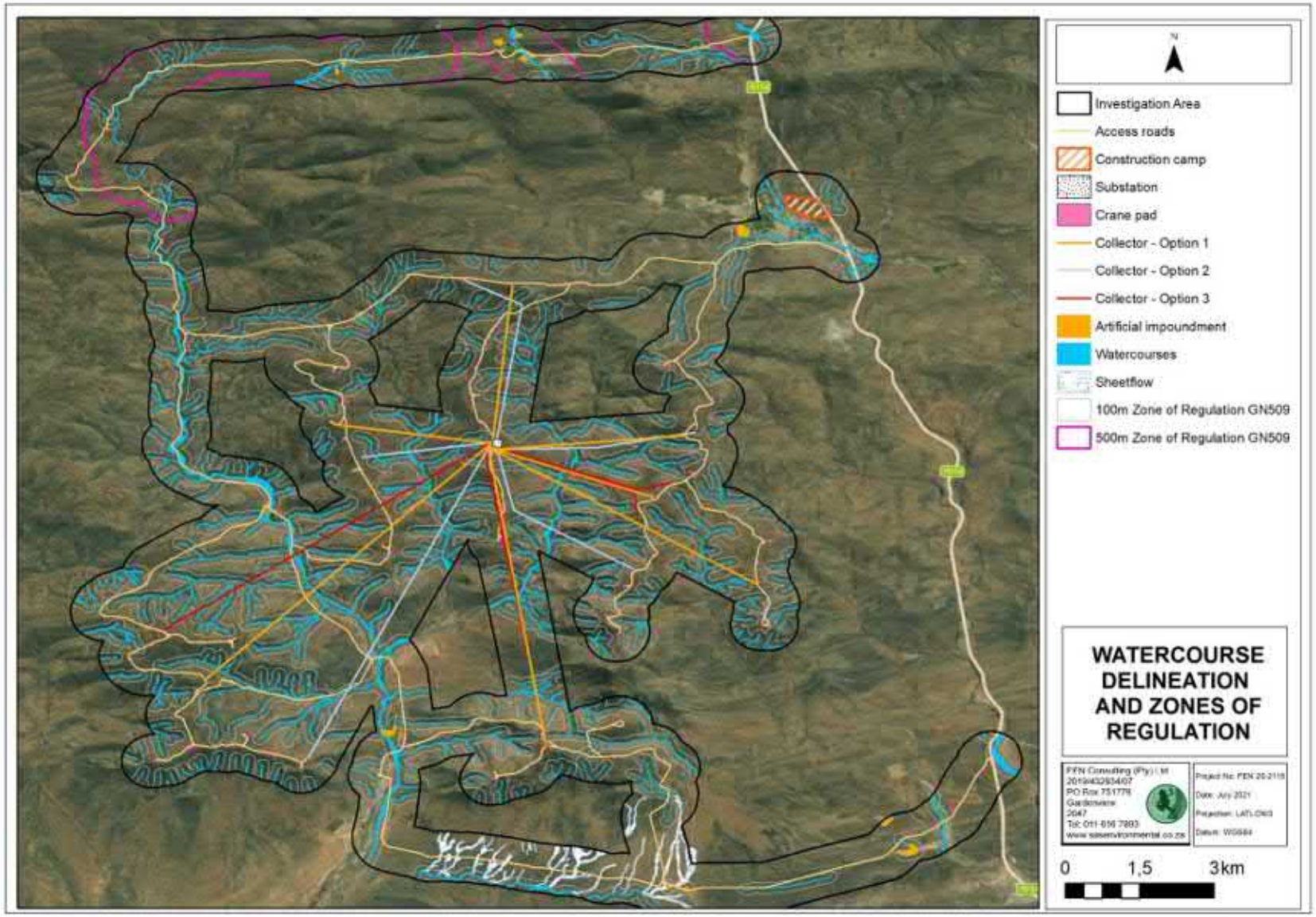

Figure 1: The conceptual presentation of the July 2021 Rietkloof WEF layout relative to the delineated watercourses and the respective legislative Zones of Regulation as it relates to NEMA and NWA.

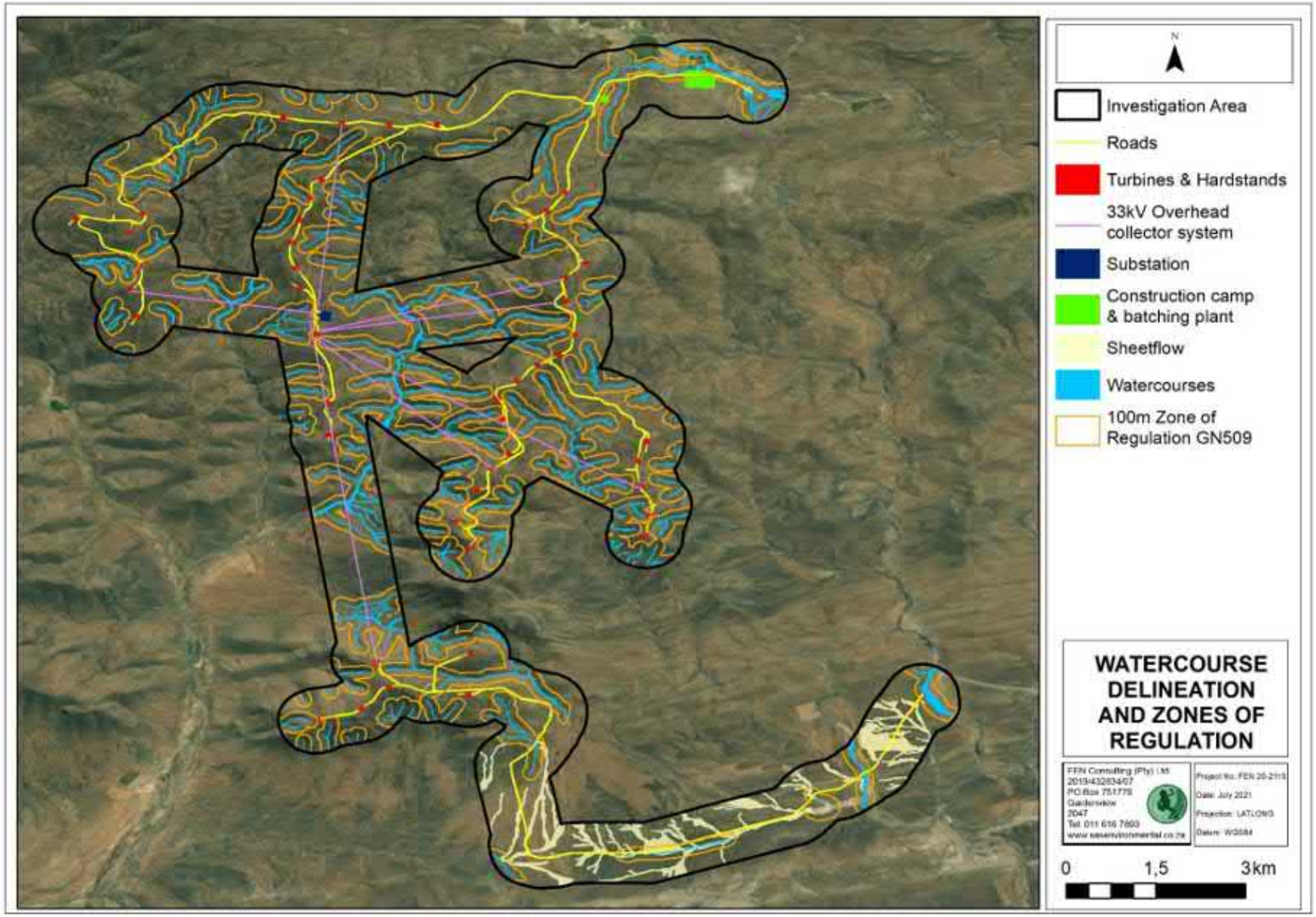

Figure 2: The conceptual presentation of the updated November 2021 Rietkloof WEF layout relative to the delineated watercourses and the respective legislative Zones of Regulation as it relates to NEMA and NWA.

APPENDIX

M VISUAL SPECIALIST STATEMENT

RIETKLOOF WIND FARM (PTY) LTD

Proposed Construction of the Rietkloof Wind Energy Facility near Matjiesfontein, Western Cape Province

Visual Specialist Comment – Part 2 Amendment

DFFE Reference: 14/12/16/3/3/1/1977
Issue Date: 18 November 2021
Version No.: **3**
Project No.: 17026

Date:	18-11-21
Document Title:	Visual specialist comment in respect of the proposed amendment to the authorised Rietkloof Wind Energy Facility near Matjiesfontein, Western Cape Province
Version Number:	3
Author:	**Kerry Schwartz**
Checked by:	
Approved by:	
Signature:	
Client:	Rietkloof Wind Farm (Pty) Ltd

Confidentiality Statement

RIETKLOOF WIND FARM (PTY) LTD

PROPOSED CONSTRUCTION OF THE RIETKLOOF WIND ENERGY FACILITY NEAR MATJIESFONTEIN, WESTERN CAPE PROVINCE

VISUAL SPECIALIST COMMENT – PART 2 AMENDMENT

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GLOSSARY OF TERMS

ABBREVIATIONS

BA	Basic Assessment
DBAR	Draft Basic Assessment Report
DEM	Digital Elevation Model
DFFE`	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EMP	Environmental Management Plan
FBAR	Final Basic Assessment Report
GIS	Geographic Information System
MW	Megawatt
NEMA	National Environmental Management Act
OHP	Overhead power line
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
VIA	Visual Impact Assessment
VR	Visual Receptor
WEF	Wind Energy Facility

DEFINITIONS

Sense of place: The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.

Scenic route: A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.

Sensitive visual receptors: An individual, group or community that is subject to the visual influence of the proposed development and is adversely impacted by it. They will typically include locations of human habitation and tourism activities.

Viewpoint: A point in the landscape from where a particular project or feature can be viewed.

Viewshed / Visual Envelope: The geographical area which is visible from a particular location.

Visual character: The pattern of physical elements, landforms and land use characteristics that occur consistently in the landscape to form a distinctive visual quality or character.

Visual contrast: The degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would conform with the land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape.

Visual exposure: The relative visibility of a project or feature in the landscape.

Visual impact: The effect of an aspect of the proposed development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.

Visual receptors: An individual, group or community that is subject to the visual influence of the proposed development but is not necessarily adversely impacted by it. They will typically include commercial activities, residents and motorists travelling along routes that are not regarded as scenic.

Visual sensitivity: The inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (visual character), spatial distribution of potential receptors, and the likely value judgements of these receptors towards the new development, which are usually based on the perceived aesthetic appeal of the area.

RIETKLOOF WIND FARM (PTY) LTD

PROPOSED CONSTRUCTION OF THE RIETKLOOF WIND ENERGY FACILITY NEAR MATJIESFONTEIN, WESTERN CAPE PROVINCE

VISUAL SPECIALIST COMMENT – PART 2 AMENDMENT

1 INTRODUCTION

Rietkloof Wind Farm (Pty) Ltd, (hereafter referred to as “Rietkloof") was issued with an Environmental Authorisation (EA) for the proposed Rietkloof Wind Energy Facility (WEF) and its associated infrastructure, near Matjiesfontein in the Western Cape Province on 23 November 2016 (DEA Reference 14/12/16/3/3/2/899). However this EA only authorised nine (9) of the sixty (60) turbines originally proposed by Rietkloof, each with a hub height of 120m and a rotor diameter of 140m

Subsequent to this, and on the basis of changes to the relevant Critical Biodiversity (CBA) datasets, the promulgation of the Renewable Energy Development Zones[1], and the proposed implementation of a site Conservation Management Plan for the Rietkloof WEF project area, application was submitted for EA for the remaining fifty-one turbines not previously authorised. This application included an increase in the proposed hub heights and rotor diameters for these turbines to 125m and 160m respectively This application was authorised on 10 April 2019 under DFFE Ref No. 14/12/16/3/3/1/1977.

Electrical infrastructure to serve the Rietkloof WEF was authorised on 23 November 2016, under DFFE Ref No. 14/12/16/3/3/1/1590.

Rietkloof is now proposing to submit a Part 2 Amendment application in respect of further changes to the approved turbine specifications, the project layout and the Environmental Management Plans (EMPrs) for the proposed WEF and associated grid connection infrastructure. SiVEST has been requested to provide visual specialist comment in respect of the proposed amendments and also to provide visual specialist inputs for the updated EMPrs.

[1] formally gazetted (Gazette Number 41445) on 16 February 2018 by the Minister of Environmental Affairs (GN 114)

2 METHODOLOGY

2.1 Part 2 Amendment (Layout Changes) and Update of Associated EMPrs

An assessment of the proposed layout changes for the proposed Rietkloof WEF from a visual perspective will involve the tasks as outlined below.

- A review of the original VIAs undertaken for the project as well as Visual Specialist inputs in respect of any subsequent amendments;
- An assessment of the proposed new turbine specifications and layout changes in relation to the findings of the original VIAs, including:
  - A re-assessment of potential turbine visibility (viewshed) from previously identified receptor locations;
  - An assessment of potential visual sensitivity in relation to the outputs from the National Web Based Environmental Screening Tool, specifically outputs from the Landscape and Flicker Themes.
- Compilation of a Visual Specialist Assessment Report outlining the findings of the assessment and:
  - identifying whether the proposed amendments will result in any additional visual impacts or exacerbate the impacts previously identified in the VIA for this development; and
  - providing additional recommendations or mitigation measures (if necessary) for inclusion in the respective EMPrs for these projects.
- Compilation of a Site Sensitivity Verification Report in accordance with the Assessment Protocols for specialist studies[2].
- Provision of updated inputs where necessary for the respective EMPrs based on the findings of the assessment.

2.2 Update of EMPr for 132kV Power Lines

Updates to the EMPr for the associated 132kV power line will involve the tasks as outlined below.

- A review of the original VIA (where available) undertaken for the project as well as Visual Specialist inputs in respect of any subsequent amendments to identify visual specialist recommendations and mitigation measures relevant to the proposed power line development.
- Provision of updated inputs where necessary for the respective EMPrs.

3 ASSUMPTIONS AND LIMTATIONS

Given the fact that the proposed WEF and associated power line is within the project area originally assessed for the Rietkloof WEF VIA, it has been assumed that the baseline conditions

[2] Formally gazetted on 20 March 2020 (GN No. 320)

and receptor locations in the area remain largely unchanged. This assumption was confirmed by way of a desktop assessment and as such, additional fieldwork was not considered necessary.

4 SUMMARY OF PREVIOUS VIA FINDINGS

EOH Coastal and Environmental Services (EOH CES) undertook a VIA for the proposed 147 megawatt (MW) Rietkloof Wind Energy Facility (WEF) in March 2016. A second VIA for the Rietkloof WEF was undertaken by EOH CES in November 2018 in support of a Basic Assessment application being submitted in respect of the remaining fifty-one turbines.

In summary, both VIAs described the landscape in the vicinity of the Rietkloof WEF project area as typically “Karoo”, largely undeveloped with sheep farming being the dominant activity. The prevailing sense of place is largely associated with remoteness, low levels of development and peace and tranquility.

The proposed WEF covers a large area of land and given the height of the proposed turbines, the development will be visible from a number of local farmhouses, a few guest houses and the R354 main road. Generally however, the development was considered to be positioned in such a way that the turbine structures will be partially screened from view by natural vegetation or by topographic features.

The need for a separate full VIA for the proposed grid connection infrastructure to serve the Rietkloof WEF was not identified as part of the BA process undertaken in for this development However, potential visual impacts were discussed in the Basic Assessment Report (BAR) for the proposed power line development dated 8 August 2016. It was stated in this report that although the proposed power line will affect the sense of place, much of the route alignment either follows the alignment of existing high voltage power lines, or is within the WEF development footprint. As a result, visual impacts resulting from the proposed power line would be very low.

4.1 Sensitive Receptors

The previous visual assessments identified twenty-one (21) farmsteads within a 20 km radius of the Rietkloof WEF turbine layout. The visual impact of the WEF on these homesteads is dependent on the number of turbines visible and their proximity to the turbines (i.e. their visual exposure to the development). It was pointed out that not all of these homesteads are necessarily sensitive to the proposed WEF, as this depends on the occupants’ perception of wind turbines. As such, for the purposes of the VIA, only tourist facilities and the homesteads of interested and affected parties (I&APs) that have objected to the WEF development were considered to be particularly sensitive. In terms of tourist facilities, the Gatsrivier guest farm, Saaiplaas Guest Farm, Blue Berry Hill guest farm and Keurkloof Guest Farm were identified as

sensitive. In addition, homesteads on the farms Zeekoegat and Keurkloof were identified as sensitive receptors due to objections raised by their respective owners.

The R354 main road which passes within 5km of the proposed turbines was also identified as a potential receptor. However, although this road is recognised as a scenic route, it was noted in the VIA that the WEF project was fully supported by the heritage authority and that the development needs to be seen within the context of the area being a designated Renewable Energy Development Zone (REDZ).

4.2 Identified Impacts

In the previous VIA, the assessment and mitigation of impacts involved the following:

- Identification of visual impact criteria (key theoretical concepts);
- Visibility analysis; and
- Assessment of the impacts of the proposed wind farm taking into consideration factors such as sensitive viewers and viewpoints, visual exposure and visual intrusion.

It was determined that the level of visibility, sensitivity and intrusion of the project would all be high. The visual sensitivity the receptors was mostly rated as high, while exposure varied depending on the distance of each receptor from the nearest wind turbine.

4.3 Impact Rating

4.3.1 Construction Phase

Two potential causes of visual impact during construction were identified as outlined below.

- Various activities during the construction phase may have impacts on sensitive visual receptors, and the overall significance of these impacts was rated as **Moderate Negative**.
- Construction camps associated with the proposed facility will have a visual impact, affecting the landscape and rural sense of the place of the area. Construction camps will generally be seen as impacting negatively on the aesthetics of a landscape. The overall significance of these impacts was however rated as **Low Negative**.

4.3.2 Operations Phase

Five potential causes of visual impact during operation were identified as outlined below.

- During operation, the WEF is expected to impact visually on sensitive receptors in the area. The overall significance of these impacts was rated as **High Negative**, with few mitigation measures available to reduce the impacts

- The roads associated with the proposed facility will result in visual impacts affecting the landscape and rural sense of the place of the area. The overall significance of these impacts was however rated as **Moderate Negative**.
- On-site power stations associated with the proposed facility will also result visual impacts affecting the landscape and rural sense of the place of the area. The overall significance of these impacts was however rated as **Low Negative**.
- Wind farms are required by law to be lit at night as they represent hazards to aircraft due to the height of the turbines, thus resulting in light pollution in an otherwise pristine nightscape. The overall significance of these impacts was however rated as **Moderate Negative**.
- Shadow flicker, resulting from the shade cast by a wind turbine and its rotating blades, may impact on any residences in close proximity to the wind turbines. As there are few buildings within 500m of a wind turbine, there no impacts are anticipated as a result of shadow flicker.

4.3.3 Decommissioning Phase

Impacts during the decommissioning phase will be very similar to those identified in the construction phase and the overall significance of these impacts was rated as **Moderate Negative**.

4.3.4 Cumulative Impacts

The VIA recognised that there are a number of other existing and proposed renewable energy and electrical infrastructure developments in close proximity to the Rietkloof WEF. During construction and operation, these facilities would inevitably change the visual character of the area and alter the inherent sense of place, thus giving rise to significant cumulative impacts. The overall significance of these impacts was rated as **High Negative**, with few mitigation measures available to reduce the impacts.

It was further noted however that the study area is located within the Komsberg REDZ (REDZ 2), and thus the relevant authorities support the concentration of renewable energy developments in this area.

4.4 Impact Statement

The VIA concluded that potential losses of scenic resources resulting from the proposed development are not sufficiently significant to present a fatal flaw to the proposed project. It was therefore recommended that the project proceed, on condition that the mitigation measures identified in the VIA are met throughout the various phases of the development.

5 SPECIALIST COMMENT

5.1 Proposed WEF

The layout of the proposed WEF, as depicted in **Figure 1** was fully assessed in the VIA undertaken in August 2018. It has been established, via desktop assessment using Google Earth imagery, that although the landscape to the north and north-east of Rietkloof WEF is undergoing significant change as a result of the development of the Roggeveld, Karusa and Soetwater WEFs, there has been little change since 2018 in the baseline characteristics and the number of sensitive receptors across the remainder of the study area.

5.1.1 Amendments to Turbine Specifications

The proposed new turbine specifications would allow for a hub height of 125m and a rotor diameter of 180m, resulting in a maximum height at the blade tip of 215m, between 10m and 25m higher than the height currently authorised. While an increase in the height of the turbines would increase the visibility of the WEF, a GIS-based visibility analysis has shown that, in this instance the increase in visibility would be marginal. Visual impacts resulting from the larger turbines would be greatest within a 1km to 2km radius, from where the increased height of the structure would be most noticeable. However, no potentially sensitive receptors were identified within 2km of a wind turbine placement, and the larger turbines as proposed are not expected to increase the impacts experienced by any of the identified receptors.

In addition, the change in the turbine specifications being proposed for the Rietkloof WEF has allowed for a reduction in the number of turbines required for the facility. Hence, a total of thirteen (13) turbines have now been removed from the layout depicted in **Figure 1** and Rietkloof has advised that the number of turbines is likely to be further reduced to between 25 and 32. Fewer turbines will result in a slight reduction in the area from which the turbines will be visible (viewshed) there will be less visual clutter in the landscape resulting in a slight reduction in the cumulative impacts experienced.

In light of this, and the limited human habitation and relatively remote location of the proposed Rietkloof WEF, the proposed changes in the turbine specifications are not expected to result in any increased visual impacts on the identified receptors, or affect any additional receptors in the surrounding area.

5.1.2 Updates to WEF Layout

As part of this amendment application, Specialists are being asked to assess an updated layout for the proposed Brandvalley WEF as depicted in the Google Earth Layout (*2021_11_11 EMPr Layouts Rietkloof WF rev B.kmz*) received on 13th November 2021. Updated aspects of the layout include:

- A reduction in the number of turbines, resulting in the removal of between 13 and 35 turbines from the layout. The remaining turbines remain in place (subject to micro-siting);

- An indicative hardstand footprint has been included in the updated layout. The exact orientation, position and dimensions of the hardstands will be subject to minor change pending the final selection of the TSA;
- •Roads with a width of between 9m and 12m widths as stipulated in the respective EIAs (excluding additional width for cut / fill earthworks);
- Substation & O&M facility as per the size and position stipulated in the original EIA;
- MV Collectors will be in the form of cables buried along the roads;
- Laydown Area and Batch Plant have been shifted in line with recommendations made by the contractors;
- Construction Camp has been shifted from the agricultural lands to an area that is currently being used for the Roggeveld WEF Batch Plant.

Considering the fact that the proposed updates in the WEF layout as outlined above do not deviate significantly from the layout assessed in the original EIA and subsequent amendments, it is not anticipated that the final layout will result in any changes in the significance of the impacts identified in the VIA, nor will it result in any additional visual impacts.

5.1.3 Cumulative Impacts

Although the previous VIA considered a number of other existing and proposed renewable energy and electrical infrastructure developments in close proximity to the Rietkloof WEF, it should be noted that there have been some changes in the status of some of these projects in the interim. Construction is either well under way or has been completed in respect of three of the identified projects, namely Roggeveld, Karuso and Soetwater WEFs. Hence the landscape has already undergone noticeable change.

In addition, Rietkloof and Brandvalley WEFs have both been awarded preferred bidder status and one new project in the broader area has been granted EA and awarded preferred bidder status. This project, namely Oya Energy Facility is a combined Solar PV and Fuel-based Generator Facility (FBGF), located some 25kms north-west of the proposed Rietkloof WEF. Although the different technologies are expected to have different impacts, all renewable energy developments and associated grid connection infrastructure are relevant as they contribute to the alteration of the visual character of the broader area. In this instance however, given the distance from the Rietkloof WEF and the hilly topography in the broader area which limits the visibility of the facility, it is not anticipated that this development will result in any significant increase in the cumulative impacts affecting the landscape or the visual receptors **within** the assessment area for the Rietkloof project.

Having considered the new information relating to renewable energy developments in the broader area, the overall significance of cumulative impacts remains as **High Negative**, with few mitigation measures available to reduce the impacts.

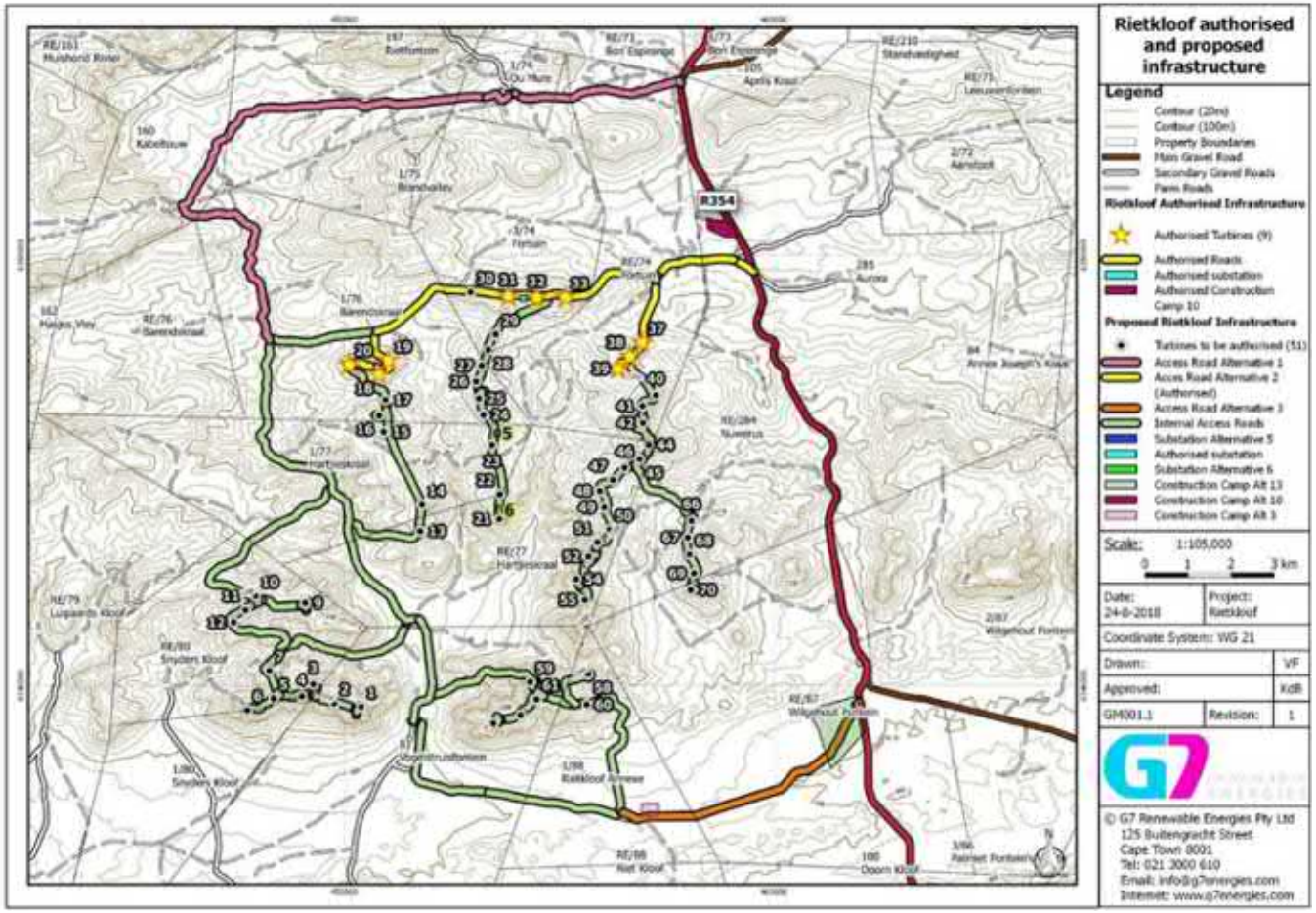

Figure 1: Authorised Rietkloof WEF layout

5.2 Sensitivities identified by the National Web-Based Environmental Screening Tool

5.2.1 Proposed WEF

In support of this visual specialist comment, consideration was given to the Landscape and Flicker Themes of the National Environmental Screening Tool. Under the Landscape Theme, as shown in **Figure 2** below, the tool identifies areas of Very High and High sensitivity in respect of WEF development within the Rietkloof WEF project area. According to the Screening Tool, the high sensitivity rating applied to the project area is associated with the presence of natural features such as mountain tops, high ridges and steep slopes. Based on these criteria, a significant portion of the site would be ruled out for WEF development.

The Screening Tool is however a very high level, desktop study and as such the results of the study must be viewed against factors affecting visual impact, such as:

- the presence of visual receptors;
- the distance of those receptors from the proposed development; and
- the likely visibility of the development from the receptor locations.

As most of the turbines are located on these ridges, they will theoretically be visible from a number of visual receptors. In general however, the development is positioned in such a way that, in most cases turbine structures will be partially screened from view by natural vegetation and topographic features. In addition, viewing distance must be considered when assessing visual impacts, as beyond a certain distance, even large developments tend to be much less visible, and are difficult to differentiate from the surrounding landscape. The visibility of the proposed development from the identified receptors and the expected level of exposure was examined in detail in the original VIA for the Rietvalley WEF. Most of the receptors are more than 5km from the nearest wind turbine and as such, visual impacts will be somewhat reduced.

In addition, the proposed development is located within a designated REDZ, and thus the relevant authorities support the concentration of renewable energy developments and associated transformation in this area.

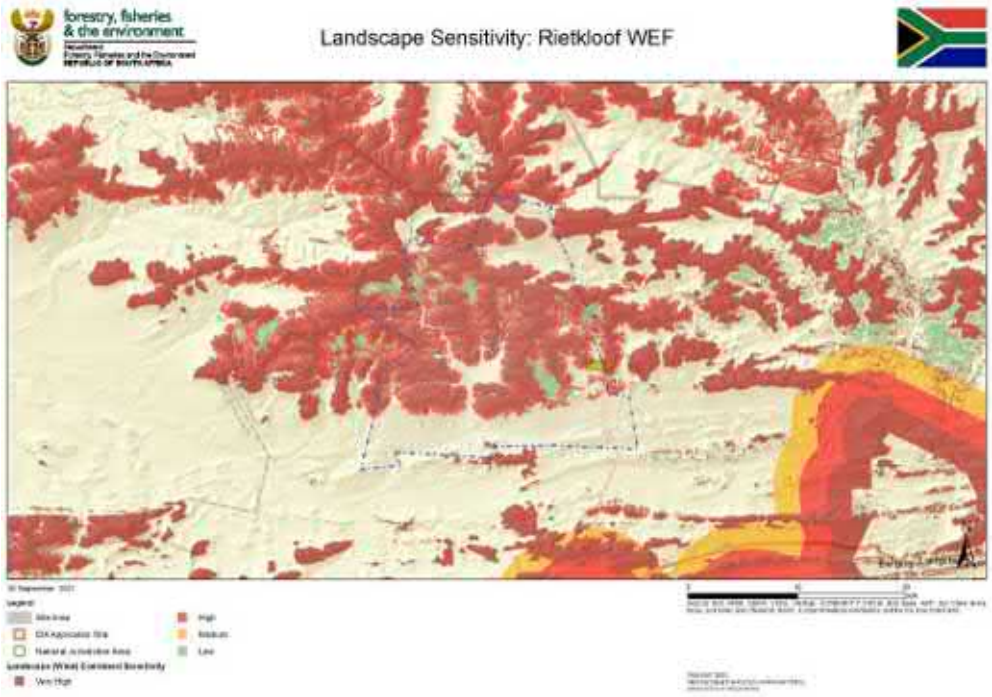

Figure 2: Relative Landscape Sensitivity (September 2021)

The flicker theme demarcates areas (1 km buffers) of sensitivity around identified receptors in the area (**Figure 3**). Under this theme, several "receptors" have been identified within the Rietkloof WEF project area, and the buffers demarcated around these receptors have been assigned a "very high" sensitivity rating. Based on the findings of the original VIA as well a high level Google Earth scan, it has been determined that many of the receptors identified by the Screening Tool are not in fact receptors. In addition, potential impacts resulting from shadow flicker were assessed in the previous VIA for the Rietkloof WEF and it was concluded that although there are a few buildings within 500m of a wind turbine, none of these are occupied and the proposed layout is not expected to result in any flicker impacts affecting the identified receptors.

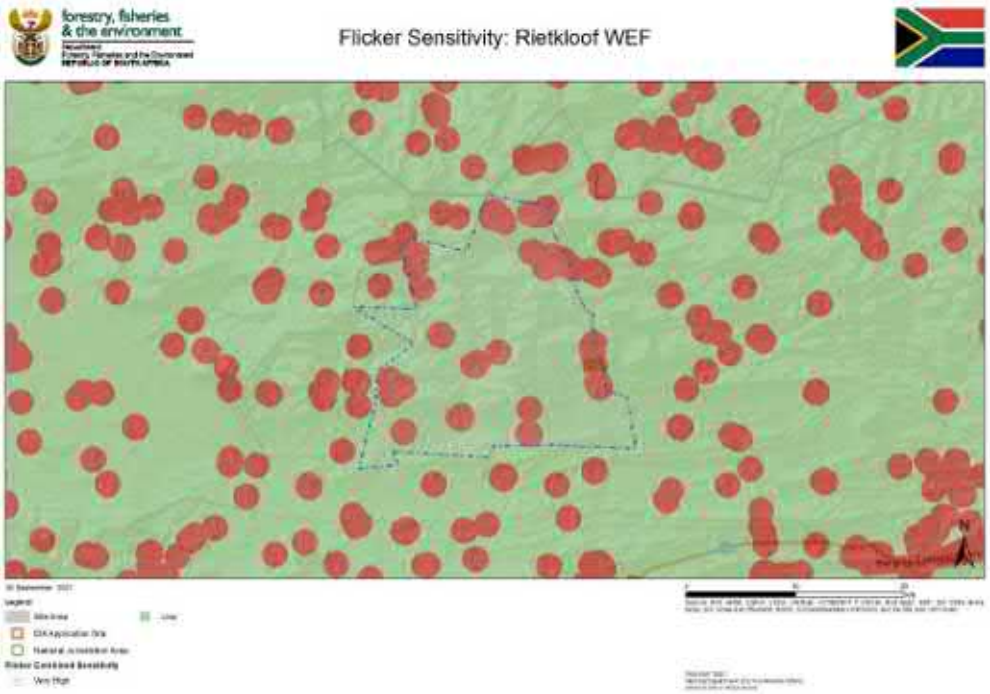

Figure 3: Flicker Sensitivity (September 2021)

5.2.2 Proposed Grid Connection Infrastructure

The National Environmental Screening Tool does not identify any landscape sensitivities in respect of the proposed grid connection.

6 132KV POWER LINE EMPR

An EMPr for the proposed 132kV power line to serve Rietkloof WEF was compiled by EOH CES in July 2016 and was included in the Final Basic Assessment Report (FBAR) submitted for the proposed development. This EMPr does not however include any specific mitigation measures in respect of visual impacts resulting from the proposed power line. In light of this, the potential visual impacts that may result from the power line development have been re-assessed with a view to formulating mitigtiation measures for inclusion in the EMPr. Consideration has been given in this assessment to the proposed power line route alignment and substation layout as presented in the Google Earth file (WIN-0252-IN-DWG-002-A-EMPr Layouts 132kV OHL Rietkloof to BonEspirange.kmz) received on 29th October 2021.

6.1 Identification of Potential Impacts associated with power lines

Potential visual issues / impacts resulting from the proposed development of the power line and associated electrical infrastructure to serve the proposed Rietkloof WEF are outlined below.

6.1.1 Construction Phase

- Potential visual intrusion resulting from large construction vehicles and equipment;
- Potential visual impacts of increased dust emissions from construction activities and related traffic;
- Potential visual scarring of the landscape as a result of site clearance and earthworks; and
- Potential visual pollution resulting from littering on the construction site.

6.1.2 Operational Phase

- Potential alteration of the visual character of the area;
- Potential visual intrusion resulting from infrastructure dominating the skyline in a largely natural / rural area;
- Potential visual effect on surrounding farmsteads; and
- Potential alteration of the night time visual environment as a result of operational and security lighting at the associated substations .

6.1.3 Decommissioning Phase

- Potential visual intrusion resulting from vehicles and equipment involved in the decommissioning process;
- Potential visual impacts of increased dust emissions from decommissioning activities and related traffic; and
- Potential visual intrusion of any remaining electrical infrastructure on the site.

6.2 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

Impact	Mitigation / Management Objectives	Mitigation / Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
A. CONSTRUCTION PHASE					
A.1. VISUAL IMPACTS					
Potential impact on visual resources as a result of the proposed power line and electrical infrastructure.	Avoid or minimize construction impacts on existing visual resources and potentially sensitive receptor locations in the surrounding area. .	○ Carefully plan to minimise the construction period and avoid construction delays. ○ Inform any receptors within 500m of construction works of the construction programme and schedules. ○ Position storage/stockpile areas in unobtrusive positions in the landscape, where possible. ○ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ○ Vegetation clearing should take place in a phased manner. ○ Make use of existing gravel access roads where possible. ○ Limit the number of vehicles and trucks travelling to and from the construction, where possible. ○ Ensure that dust suppression techniques are implemented: ○ on all access roads;	Ensure that visual management measures are monitored by an ECO. This will include monitoring activities associated with visual impacts such as the siting and management of soil stockpiles, screening and dust suppression. Regular reporting to an environmental management team must also take place during the construction phase.	Ongoing during construction	▪ Main Contractor (MC), Environ-mental Officer (EO) and ECO

Impact	Mitigation / Management Objectives	Mitigation / Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		○ in all areas where vegetation clearing has taken place; ○ on all soil stockpiles. ○ Maintain a neat construction site by removing litter, rubble and waste materials regularly.			
B. OPERATION PHASE					
B.1. VISUAL IMPACTS					
Potential impact on visual resources as a result of the proposed grid connection infrastructure.	Avoid or minimize operational impacts on existing visual resources and potentially sensitive receptor locations in the surrounding area.	○ Where possible, limit the amount of security and operational lighting present at substations. ○ Where possible, avoid placing lights on pylon structures. ○ Light fittings for security at night should reflect the light toward the ground and prevent light spill. ○ Lighting fixtures should make use of minimum lumen or wattage. ○ Mounting heights of lighting fixtures should be limited, or alternatively, foot-light or bollard level lights should be used. ○ Where possible, limit the number of maintenance vehicles using access roads. ○ Buildings on the substation sites should be painted with natural	Ensure that visual mitigation measures are monitored by the management team on an on-going basis. This will include monitoring activities associated with visual impacts such as the control of signage, lighting and maintenance vehicles on access roads.	Ongoing during operation	▪ ESKOM

Impact	Mitigation / Management Objectives	Mitigation / Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		tones that fit with the surrounding environment. ○ Non-reflective surfaces should be utilised where possible.			
C. DECOMISSIONING PHASE					
C.1. VISUAL IMPACTS					
Potential impact on visual resources as a result of the proposed grid connection infrastructure.	Avoid or minimize impacts of decommissioning activities on existing visual resources and potentially sensitive receptor locations in the surrounding area.	○ Carefully plan to reduce the decommissioning period. ○ Inform receptors within 500m of decommissioning works of the decommissioning programme and schedules. ○ All infrastructure that is not required for post-decommissioning use should be removed. ○ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ○ Make use of existing gravel access roads where possible. ○ Limit the number of vehicles and trucks travelling to and from the proposed sites, where possible. ○ Ensure that dust suppression techniques are implemented: ○ on all access roads;	Ensure that procedures for the removal of structures and stockpiles during decommissioning are implemented, including recycling of materials. In addition, it must be ensured that rehabilitation of the site to a visually acceptable standard is undertaken.	During decommissioning	▪ MC, EO and ECO

Impact	Mitigation / Management Objectives	Mitigation / Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		○ in all areas where vegetation clearing has taken place; and ○ on all soil stockpiles.			

7 CONCLUSION

7.1 Rietkloof WEF

SiVEST has assessed the previous VIAs undertaken in respect of the proposed Rietkloof WEF in conjunction with the proposed changes to the turbine specifications and the updated layout (*2021_11_11 EMPr Layouts Rietkloof WF rev B.kmz*) received on 13th November 2021. Based on this assessment, it is SiVEST's opinion that the proposed amendments do not give rise to any additional impacts or exacerbate the impacts previously identified in the VIA for this development. No additional mitigation measures or specialist input into the EMPr are deemed necessary. Given the low level of human habitation and the relative absence of sensitive receptors in the area, the site layout is deemed acceptable from a visual perspective and the Environmental Authorisation (EA) should be amended. SiVEST is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

7.2 132kV Power Line

From a visual perspective, potential impacts of the proposed power line have been identified and suitable mitigation measures have been recommended for input into the updated EMPr for the proposed power line.

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APPENDIX

N SOCIAL SUMMARY

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ENVIRONMENTAL MANAGEMENT PLAN

SUMMARY OF KEY SOCIAL ISSUES

BRANDVALLEY, KAREEBSOCH AND RIETKLOOF WIND ENERGY FACILITIES
AND
ASSOCIATED GRID INFRASTRUCTURE

WESTERN AND NORTHERN CAPE PROVINCE

OCTOBER 2021

1. INTRODUCTION

The comments are based on observations during the site visit to the study area in September 20201 undertaken as part of Social Impact Assessments (SIA) for powerline associated with the Kareebosch WEF. Interviews and discussions were held with a number of land owners and community members affected by the proposed powerline. In addition, the affected landowners provided insight into their experience with the construction phase for the Roggeveld, Karusa and Soetwater WEFs. Additional information was obtained from attending a public participation meeting associated with the proposed Kolkies and Sadawa SEF. Most of the attendees at this meeting were land owners in the vicinity of the existing Paardekraal East WEF and the discussion was largely focused on visual impacts associated with WEFs. The issues raised are also likely to be relevant to the Kareebosch, Brandvalley and Rietkloof WEFs given the location of these facilities within the Komsberg REDZ. The key issues raised are summarised below.

2. POSITIVE IMPACTS

- A number of interviewees indicated that the ongoing construction of WEFs in the Komsberg REDZ has had a significant positive impact on the local economy in the area, specifically the town of Sutherland. The benefits associated with providing accommodation for contractors in Sutherland and on surrounding farms has enabled the local hospitality sector and farmers to survive the impact of COVID-19 and the recent major drought. The construction activities have benefited the local hospitality, retail, and services sector.
- The benefit to the Sutherland and Laingsburg economies is expected to continue for some time given the number of projects planned in the Komsberg REDZ.
- For a number of farmers, the WEFs have been a life saver, effectively ensuring the continuation of farming operations which may have folded due to the drought.

3. COMMUNICATION

Communication and the need for early, effective and on-going communication and engagement was identified as a key issue.

- Many directly affected land owners indicated that good, clear, and on-going communication was a key requirement for addressing and managing impacts.
- Experiences differed between projects. However, it would appear that the initial communication and interaction with individual landowners has been poor and that this has impacted on communication and interaction going forward.
- There is a need for developers / contractors to identify a dedicated project go-to person who can be reached at short notice to report incidents or address problems.
- There is need to keep landowners, authorities, and the public updated and informed about activities with regular updates throughout construction phase.
- The failure of contractors and contract workers to inform farmers and report incidents regarding damage to farm gates, boundary fences and other farm infrastructure was raised as a key concern on all of the projects being established in the area. The onus is then placed on the landowner to check up on contractors. This is time consuming and can also lead to conflicts and arguments.
- Some land owners reported the following negative experiences when they reported issues or problems:
    - The issues were treated as inconvenience by the contractors (i.e., were not taken seriously).
    - Issues were down played. Issues such gates being left open, damage to fences, littering, unnecessary damage to veld, etc., were regarded as petty complaints as opposed to serious concerns. In this regard there was a lack of understanding of severity of impacts on farming activities and the livelihoods of the affected landowners.
    - Adversarial attitude: One landowner felt that whenever he raised issues the response was formal and adversarial, instead of being open, understanding and trying to find a solution to the problem.
    - Deferral of responsibility. One landowner was told to monitor damage to gates and fences himself.

4. IMPACTS ON FARMING AND NATURAL AREAS

- All the affected landowners indicated that they did not expect the disturbances to be as extensive as they turned out to be and felt that excessive areas of land were cleared / disturbed during the construction phase. The disturbances were linked to access roads, turbine laydown areas, soil dumping, off-road driving, etc. The landowners affected by the Karusa and Soetwater WEFs and neighbours were all struck by excessive impacts compared to agreed-upon/ anticipated impacts, especially in more remote portions of properties where oversight was more difficult. Some farmers indicted that that entire hilltops levelled and cleared 'like landing strips'.
- Farm gates damaged or left open and damage to fences. This was a common experience on all projects. The impacts associated with leaving farm gates open include time spent recovering livestock, increased risk of stock theft and predation etc. These impacts were often exacerbated by failure to and or delays by the contractor in reporting incidents, resulting in valuable time lost in rectifying the problem.
- Failure to report damage to boundary fences. A number of land owners indicated that incidents on their properties were left unreported – at least one land owner was advised to do regular boundary line checks himself, a time-consuming activity
- Crime and security. No major incidents were reported directly linked to WEF construction workers. One owner did however have trouble at the outset with taxis being used to supply alcohol and narcotics from town to local farm labourers. Some owners also indicated distrust in the security services employed. Concern was that they provided information onto people involved in stock theft etc.

- Stock theft: No incidents involving construction staff were reported. Some properties experienced incidents linked to local farm workers exploiting the cover of construction activities. Many owners have however pointed to the difficulty of establishing stock theft incidents on extensive properties due to gates being left open or fences damaged, and especially if incidents are left unreported. Pressure from the Tankwa Karoo Farmers Association resulted in the operators of the Perdekraal East to install cameras with night-vision and number-plate recognition capabilities at key points (e.g. site or farm entrances). This may need to be considered for the construction of the Kareebosch, Brandvalley and Rietkloof WEFs.
- Compensation for losses associated with need to reduce and or relocated livestock during construction was identified as an option. However, the option of leasing grazing in the region may become scarcer due to competition from various WEFs in the REDZ and the impact of the drought and climate change. One affected landowner indicated that farmers had to travel further afield to find alternative grazing. This resulted in increased transport costs.
- Impact on the Komsberg Road (Karusa, Soetwater): The road was reasonably maintained, but only the portion up to the northern entrance to the Soetwater WEF. The developers maintained that the balance of road was a public road and was not impacted by construction traffic. However, they did not consider the large number of minibus taxis and bakkies that transported workers in and out from Sutherland every day. Need to consider cumulative impacts from other projects in the area, such as Kareebosch, Brandvalley and Rietkloof WEFs.
- Littering: The key issue of concern is potentially fatal ingestion by livestock. Appears to have been managed reasonably well, although some owners discovered isolated incidents. Timing of reporting and addressing issue a key factor as in case of damage to farm gates etc. Again, the issue is making contractors aware of implications. Littering is not simply a neatness issue, but one that can have significant economic implications on farmers livelihoods due to stock losses.
- Interaction with farmworker staff: Owners indicated that they experienced no issues in this regard. This is largely linked to limited contact between the relevant parties on the large properties and Covid-19. Limiting interaction with taxi crews seems to be a factor in limiting the potential flow of contraband onto farms.

5. IMPACTS ON LOCAL COMMUNITIES

- Representatives as the Sadawa meeting indicated that Sexually Transmitted Disease (STD) infection rates in Sutherland had increased significantly and this had placed pressure on local medical services.
- Also reported that teenage and unplanned pregnancies in Sutherland have increased.
- Rental accommodation in and around Sutherland has become scarce and expensive for locals.
- Tourist accommodation in and around Sutherland has been largely booked out to consultants, contractors, etc, thus reducing the availability for visitors. This may impact on the tourism potential of the town. The impact is expected to last for a number of years given the number of projects proposed in the Komsberg REDZ. However, as indicated above, the economy of Sutherland has benefitted significantly from the construction phase and is expected to continue benefitting.
- Perception with Paardekraal East is that the benefits to the local farming community in the area, as opposed to Witzenberg Municipality, has been limited. It is felt that a start could be made by the WEF at least joining the Tankwa Farmers Association and behaving like a part of the community. Similar concerns may develop with projects located in the vicinity of Sutherland and Laingsburg, such as the Kareebosch, Brandvalley and Rietkloof WEFs.

6. VISUAL AND SENSE OF PLACE IMPACTS

- The sense of place in the Klein Roggeveld portion along the Komsberg Road has significantly altered.
- Civil aviation lights: This was the key issue discussed at Sadawa meeting. Local landowners indicated that the impact on the night sky was a major concern. There is a proposal to see if the CAA and Paardekraal East will agree to retrofit the lights with an aircraft activated system. This approach should also be considered for other WEFs in the Komsberg REDZ, such as the Kareebosch, Brandvalley and Rietkloof WEFs.
- Directly affected owners appear to have resigned themselves to visual impacts as long at the major viewsheds from their farm houses are not affected.
- The disturbances are not only linked to the wind turbines but also to access roads and disturbances to the natural veld.

7. KEY RECOMMENDATIONS

7.1 Communication

- Early, clear, and effective communication with affected and adjacent landowners prior to and throughout the construction phase is critical. A detailed ***Stakeholder Engagement Plan*** should be developed prior to the implementation of the construction phase and should be developed in conjunction with the affected landowners and key stakeholders, such as local landowners, the local farming association and municipality.
- A ***Grievance Mechanism*** should be developed and implemented as part of the Stakeholder Engagement Plan.
- A ***Monitoring Committee*** **(MC)** should be established as part of the Stakeholder Engagement Plan. The MC should be made up of representatives from the affected landowners and key stakeholders, such as the local farmers, the local farming association, municipality and proponent.
- Communication should include regular updates and information sharing throughout the construction phase and be carried over to the operation and maintenance phase. The programme for meetings should be outlined in the ***Stakeholder Engagement Plan***.
- A ***Community Liaison Person (CLP)*** should be appointed by the proponent at the outset of the construction phase. Ideally this person should be from the local community and his or her role should be to ensure that the ***Stakeholder Engagement Plan*** is implemented on the ground. The CLP should be involved in the development of the ***Stakeholder Engagement Plan*** and not merely appointed to implement the Plan. In this way he or she will have met with and engaged with the affected landowners and key stakeholders prior to the start of the construction phase and will have a good understanding of farming activities in the area and how these may be impacted by the construction related activities.
- Procedures and timeframes should be identified for reporting and addressing incidents, such as damage to gates and fences etc. Based on the comments from the affected land owners, it would appear that the role played by the ***Environmental Control Officers (ECOs)*** involved in the existing projects can be improved. The ECO and CLP should liaise closely with each other throughout the construction phase.
- The approach to responding to and addressing complaints or concerns should be sympathetic, open, transparent, and constructive. This would go a long way in maintaining good relations. In this regard the ***Stakeholder Engagement Plan*** should be informed by a set of engagement principles that support this approach.
- Contractor training. Contractor training must include making workers aware of the consequences of their actions and the impact that they may have on farming activities. A Contractor Training programme should be developed and implemented prior to the commencement of the construction phase. The programme should inform contract workers of the requirements of the ***Stakeholder Engagement Plan*** and

Environmental Management Plan and their roles and responsibilities in terms of these plans***.***

7.2 Impacts on local communities and the local economy

Based on comments the construction of existing renewable energy projects has benefited the towns of Sutherland and Laingsburg. However, the presence of construction workers has also impacted negatively on local communities. The recommendations contained in the SIA and the EMPr do cover the potential measures to enhance the potential socio-economic benefits. These are outlined below:

Positive impacts

Employment

- Stakeholder engagement processes should be put in place to make sure that all interested and affected party have buy in in the process which will be designed and followed for employment and local procurement opportunities
- Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.
- Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.
- Before the construction phase commences the proponent should meet with representatives from the Laingsburg and Karoo Hoogland LM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
- The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.
- Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

- The proponent should liaise with the LM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work.

The need to implement training and skills development programmes for locals and local service providers prior to the initiation of the construction phase is a key intervention. The benefits are three-fold:

- Firstly, it will maximise the potential employment opportunities for local community members and businesses.
- Secondly, it will assist the renewable energy companies to meet local employment and procurement targets.
- Thirdly, it will raise skills levels in the area and increase the economic mobility of the local community members and companies that benefit from the programme.

Negative impacts

Based on comments the presence of construction workers has had a negative impact on local communities, specifically in the small town of Sutherland. The local community in Laingsburg has also been impacted. The recommendations contained in the SIA and the EMPr do cover the potential measures to address the potential negative impacts. These are outlined below:

- Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories.
- The proponent and the contractor(s) should develop a ***Code of Conduct*** for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be subject to appropriate disciplinary action and/or dismissed. All dismissals must comply with the South African labour legislation.
- The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.
- The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site.
- The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end.
- No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Given the issues raised it is recommended that a ***Development Forum*** consisting of representatives from the Laingsburg and Karoo Hoogland Municipality and renewable energy companies involved in the implementation of projects in the Komsberg REDZ be established. The aim of the ***Development Forum*** would be to implement the measures required to address the potential negative impacts during both the construction and operational phase and enhance the potential opportunities.

Negative impacts

The impact of construction workers on local communities in Sutherland and Laingsburg is a key issue of concern and has been borne out by the experience with the construction of the Karusa and Soetwater WEFs. The impacts include increase in STDs and unplanned pregnancies. This has placed pressure on the local medical services in the town. There is currently no resident doctor in Sutherland and the existing medical and social services are limited. Most residents that require a doctor or treatment travel to the hospital in Worcester and have to rent a private vehicle in the case of emergencies.

Recommended that the renewable energy companies engage with the Western Cape Department of Health and local municipalities of to identify how they can contribute towards increasing the capacity of the local health services in the area, specifically in Sutherland. This may include covering the costs of appointing additional medical staff at the clinic and appointing more social workers.

Food security is also an issue, specifically with regards to young children and the elderly. The ***Development Forum*** should also look at the establishment and or support for community feed schemes.

Positive impacts.

The ***Development Forum*** should co-ordinate the planning and implementation of Social and Economic Development (SED) initiatives in the area, including the design and implementation of a co-ordinated, training and skills development programme that

involves and is supported by each of the different renewable energy companies as opposed to a series of separate, fragmented efforts.

In this regard the ***Development Forum*** would play a role during both the construction and operation phase of the renewable energy projects in the Komsberg REDZ. The option of establishing a Renewable Energy Training and Skills Centre facility in Laingsburg that would provide training and skills development to local community members and SMME's so that they can undertake construction related and maintenance and repair work associated with the renewable energy facilities located in the Komsberg REDZ should be investigated. This would represent a legacy project opportunity for the renewable energy sector that have projects in the Komsberg REDZ. The centre should be linked to a technical training college/ university to provided training and skills development. The focus should be on creating opportunities for members from the local community, with a focus on women and the youth.

7.3 Accommodation for construction workers

Meeting the accommodation needs for construction workers is likely to pose a challenge given the limited accommodation facilities available in the area, specifically in Sutherland. In addition, providing accommodation for construction workers will reduce the availability of accommodation for local residents, tourists and other visitors and business people to towns such as Sutherland, Laingsburg and Matjiefontein. Therefore, while the construction phase will benefit local hospitality industry, it also has the potential to impact negatively on local communities and other visitors who require accommodation.

Based on information for SIAs undertaken for WEFs the total number of workers associated with the construction phase for a single WEF project (depending on size) ranges from 300-600 depending on the stage of the construction phase. Of this total approximately 70 would be classified as skilled workers and 400-500 as semi-skilled and low-skilled workers. The construction phase for a single WEF project typically extends over a period of 12-18 months (depending on size).

Based on the assumption that 20% of the semi-skilled and low skilled workers can be sourced locally, the maximum number of semi and low skilled workers that will need to be provided with accommodation will be in the region of 300. However, due to the low education levels in the area it may not be possible to meet the 20% local employment target. The figure is therefore likely to be in the region of 400.

Therefore, for a single WEF project the total number of workers that would need to be accommodated would be in the region of 500. If more than one WEF is constructed, then this increases the cumulative impacts both in terms of benefits to the local economy and the hospitality sector, but also in terms of potential negative impacts.

The Laingsburg Municipality has indicated that they will not support the establishment of construction camps on private farms, such as was undertaken for the Karusa WEF. This reduces the economic benefits for the local towns in the area. However, in order to meet the demand for accommodation associated with the construction of WEFs in the Komsberg REDZ it may be necessary to establish a dedicated accommodation facility/s in Laingsburg for semi and low skilled workers. Based on initial meetings with the Laingsburg Municipality this proposal is supported.

Such a facility will enable proponents to provide quality accommodation that meets IFC worker accommodation requirements and standards. The establishment of a new accommodation facility will also create an opportunity to employ local contractors and meet local procurement and employment targets. The facility can also be handed over the local municipality and used for the establishment of Renewable Energy Centre (see above) or Community Centre.

In terms of recommendations, recommended that a meeting be set up with the with the Laingsburg and Karoo Hoogland Municipality to discuss accommodation requirements and the option of establishing an accommodation facility, including planning and rezoning requirements, bulk services, role of local contractors etc.

7.4 Impacts on natural and farming areas

The EMPr and SIA identify measures aimed at reducing the impact on farming and natural areas. These include:

Natural areas

- Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible.
- Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.
- All roads built for construction should have water diversion and erosion control structures present, especially in steep areas.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- Demarcate all areas to be cleared with construction tape or similar material. However, caution should be exercised to avoid using material that might entangle fauna.

Farming areas

- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences.
- All farm gates must be closed after passing through.
- Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site.
- The proponent should consider the option of establishing a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.

As indicated above, all of the affected landowners interviewed as part of the SIA indicated that they did not expect the disturbances to be as extensive as they turned out to be and felt that excessive areas of land were cleared / disturbed during the construction phase. In addition, farm gates damaged or left open, and fences were damaged. These impacts were often exacerbated by failure to and or delays by the contractor in reporting incidents, resulting in valuable time lost in rectifying the problem.

Based on the above it is recommended that more attention be provided to the planning and implementation of construction related activities to ensure that the impact footprint is minimised, and unnecessary disturbances are avoided. These measures should be clearly outlined in the EMPr.

Steps must also be taken to ensure that they are implemented on the ground. In this regard it would appear that the concerns related to extent of the disturbance and damage to farm infrastructure can be directly attributed to the actions of the contractors on the site. It is unclear if this is due to insufficient detail and or training provided to the

contractors prior to and during construction phase and or lack of effective oversight by the ECOs on the site.

As indicated above, a **Monitoring Committee (MC)** should be established. The MC should meet on a monthly basis to review construction related activities and ensure that the requirements of the EMPr are effectively implemented on the ground.

APPENDIX

O GEOTECHNICAL INPUT

PROPOSED DEVELOPMENT OF THE 147MW RIETKLOOF WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE NEAR MAITJIESFONTEIN, WESTERN CAPE PROVINCE

DESKTOP GEOTECHNICAL REPORT

NOVEMBER 2021

REVISION 01

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VERIFICATION PAGE	Qual-frm-026
	Rev 14

TITLE:
PROPOSED DEVELOPMENT OF THE 147MW RIETKLOOF WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE NEAR MAITJIESFONTEIN, WESTERN CAPE PROVINCE

JGA REF. NO.	DATE:	REPORT STATUS
5613	23/11/2021	Final

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SYNOPSIS

Desktop geotechnical investigation for the proposed Rietkloof wind energy Facility.

KEY WORDS:

Sandstone, shale, Mudstone, Foundations, Shallow, Bedrock, Resistivity.

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.

Verification	Capacity	Name	Signature	Date
By Author	Engineering Geologist	K Bulala Cand.Sci.Nat.	p.p.	23/11/2021
Checked by:	Senior Associate	T Speirs Pr.Sci.Nat	p.p.	23/11/2021
Authorised by:	Director Geotechnical	J Norris Pr.Eng		23/11/2021

Filename:	W:\Geotech\5613 - WSP Desktops (KB)\2. Technical Data\Reporting\Rietkloof\WEF\5613 Rietkloof WEF - Desktop Geotechnical Report DRAFT.docx

National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations 2014 (as amended) Requirements for Specialist Reports (Appendix 6)

Section in EIA Regulations 2014 (as amended)		Clause	Section in Report
Appendix 6	(1)	A specialist report prepared in terms of these Regulations must contain —	
	(a)	details of –	
		(i) the specialist who prepared the report; and	Verification Page
		(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae.	Appendix C
	(b)	A declaration that the person is independent in a form as may be specified by the competent authority;	Appendix C
	(c)	An indication of the scope of, and the purpose for which, the report was prepared;	1
	(cA)	An indication of the quality and age of base data used for the specialist report;	4, 5, 6, 11
	(cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Table 8-1, 9-1, 9-2
	(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
	(e)	A description of the methodology adopted in preparing the report or carrying out the specialised process; inclusive of equipment and modelling used;	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;	Appendix A Map 1,2,3,4, 5
	(g)	An indication of any areas to be avoided, including buffers;	Appendix A Map 1,2,3,4
	(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;	Appendix A Map 1,2,3,4,5
	(i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	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;	3, 4, 5, 6, 7
	(k)	Any mitigation measures for inclusion in the EMPr;	Table 8-1
	(l)	Any conditions for inclusion in the environmental authorization;	Table 8-1
	(m)	Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Table 8-1,
	(n)	A reasoned opinion –	
		(i) as to whether the proposed activity, activities or portions thereof should be authorized;	10
		(iA) regarding the acceptability of the proposed activity or activities; and	10
		(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures	Table 8-1

		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	None
	(q)	Any other information requested by the authority.	N/A
	(2)	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

PROPOSED DEVELOPMENT OF THE 147MW RIETKLOOF WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE NEAR MAITJIESFONTEIN, WESTERN CAPE PROVINCE

DESKTOP GEOTECHNICAL REPORT

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EXECUTIVE SUMMARY

This report presents the findings concluded from a desktop study level for the proposed Rietkloof Energy Facility situated in the Western Cape Province. The study area receives a relatively low mean annual precipitation of 264mm, with the warmest months being January and February. Various tributaries of the Roggeveld River, Groot River and Wilgehout River drain the study area. The northern portion of the study area is underlain by rock units of the Abrahamskraal (Pa) Formation. The southern portion is underlain by the Waterford (Pwa) Formation which is underlain by the Fort Brown Formation (Pf), the Tierberg Formation (Pt) and the Collingham (Pc) Formation respectively. The Abrahamskraal Formation form part of the Adelaide Subgroup, forming part of the Beaufort Group. The remaining formations form part of the greater Ecca Group. The Beaufort and Ecca Groups form part of the greater Karoo Supergroup.

Competent, founding conditions can be anticipated in shallow, slightly weathered bedrock, which will have to be assessed during the detailed investigation prior to construction. Colluvial deposits can be anticipated along hillslopes with alluvial deposits anticipated near drainage features. Six-fold features were identified in the study area. Regional borehole data indicates relatively low aquifer yields in the range of 0.1-0.5l/s. Based upon preliminary geological and geotechnical assessments; the desktop study indicates no fatal flaws. The impact of the development from a geotechnical perspective will be restricted to the removal and displacement of soil, boulders and bedrock. Based on the impact assessment matrix undertaken for this project, from a geotechnical perspective the impact of the Rietkloof WEF was found to be "**Negative medium impact - The anticipated impact will have negative effects and will require mitigation**." Based upon this desktop study the site, is considered suitable for the proposed construction of the Wind Energy Facility.

PROPOSED DEVELOPMENT OF THE 147MW RIETKLOOF WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE NEAR MAITJIESFONTEIN, WESTERN CAPE PROVINCE

DESKTOP GEOTECHNICAL REPORT

1 INTRODUCTION

This report presents the findings of a geotechnical desktop study undertaken by JG Afrika (Pty) Ltd, for the proposed 147MW Rietkloof wind energy facility (WEF) situated near Maitjiesfontein in the Western Cape Province. It is understood that a desktop level geotechnical report is required to supplement an environmental submission for a Basic Assessment (BA) report being undertaken by WSP. The proposed WEF is situated between the towns of Matjiesfontein and Sutherland in the Western Cape Province.

The Energy facility will consist of the following:

- Forty-seven (47No.) turbines, each turbine with a foundation of up to 25m in diameter and up to 4m in depth (area of 490m^2), compacted hard standing areas of 4500m^2 each (total of 211 500m^2).
- The hub height of each turbine will be up to 125m with a rotor diameter of up to 180m and blade length of 90m. The maximum upper tip height will be 215m
- The total foundation area of all 47 turbines is approximately 23 030 m^2.
- The area of electrical turbine transformers will be 10m x 10m per turbine.
- 147MW generation capacity, up to 147MW at the 132kV point of utility connection.
- Operations and maintenance (O&M) buildings will be in proximity of the substation. The O&M building includes operations, on site spares storage and workshop.
- One (1No.) substation
- Internal access roads
- The construction camp typical area will be approximately 10ha and onsite concrete batching plant of up to 1ha.
- The internal roads are no more than 9m wide and will cover an area of approximately 50ha.
- Approximately 4m high palisades or mesh fencing where required.
- Conservancy tanks with portable toilets during the construction phase.
- Area of internal onsite substation of 200m x 200m covering an area of 4ha. The onsite substation capacity will be 33kV and 132kV yards. The medium voltage collector system will comprise of cables (1kV up to and including 33kV) that will be run underground, except where a technical assessment suggests that overhead lines are applicable, in the facility connecting the turbines to the onsite substation.

1.1 Scope of works

The investigation seeks to give a desktop evaluation of the proposed study site. The objective of the study was to assess the geological and geotechnical conditions across the study area.

The desktop study involved a literature review and a review of topographic and geological maps. Consideration was given to, but not limited to the following from a desktop level:

- The influence of topography on site suitability.
- The envisaged geological and geotechnical influences on the competency of foundations for the construction of structures.
- Tectonic influences on overall stability, namely the presence of faulting, lineaments and preferred discontinuity orientations.
- Comments regarding likely founding conditions, geotechnical constraints, problem areas and overall site stability from a desktop level.
- Recommendations regarding requirements for subsequent detailed geotechnical investigations.

1.2 Terms of Reference

The appointment to proceed with the investigation is based upon JG Afrika's cost estimate entitled, "*Quotation for Geotechnical Desktop Studies for Proposed Wind Energy Facilities and Associated Electrical Infrastructure in the Western Cape*." dated the 26th May 2021. JG Afrika received the appointment via a sub-consultancy agreement letter referenced, *41103473-D05*, via email on the 20th of July 2021.

1.3 Specialist Credentials

Ms. Bulala is a qualified engineering geologist, having attained a Bachelor of Science Degree in Geology, from the University of Limpopo. She is registered as a Candidate Natural Scientist (Registration No. 116482). Ms. Bulala holds the position of Engineering Geologist at JG Afrika's Pietermaritzburg branch. She has experience in various fields of earth science and ground engineering, namely: engineering geology, geotechnical engineering, environmental geology and soil surveys. At present Ms. Bulala specializes in conducting foundation investigations and material investigations for dams, roads and renewable energy.

The report was reviewed by Mr. Tom Speirs. Mr Speirs is a qualified senior engineering geologist with over 30 years' experience. He is a registered Professional Natural Scientist (Registration No. 400104/94) in the field of geological science. He has undertaken geotechnical, geological and materials work throughout Southern Africa, East, West and Central Africa, Madagascar and eastern Australia. He has accumulated extensive experience, including in renewable energy projects in South Africa.

1.4 Assessment Methodology

The methodology entailed a literature review and a review of topographic and geological maps. Consideration was given to the terrain, geological, hydrogeology as well as expected geotechnical constraints.

2 ASSUMPTIONS, LIMITATIONS, UNCERTAINTIES - DISCLAIMER

The interpretation of the overall geotechnical conditions across the site is based upon a review of available information on the project area. Subsurface and geotechnical conditions have been inferred at a desktop level from available information, past experience in the project area and professional judgement. The information and interpretations are given as a guideline only and there is no guarantee that the information given is totally representative of the entire area in every respect. No responsibility will be accepted for consequences arising out of the fact that actual conditions vary from those inferred. The information must be verified by the undertaking of a detailed geotechnical site investigation.

3 SITE DESCRIPTION

3.1 Locality

The proposed Rietkloof WEF is situated approximately 15 km north of the town of Matjiesfontein. The site lies within the Komsberg Renewable Energy Development Zone (REDZ) located within the Cape Winelands District Municipality.

A Locality Plan indicating the site location is presented as **Map 1,** which is included in **Appendix A**.

JG Afrika has previous experience in the study area having conducted detailed geotechnical investigations for the Oya energy facility in 2020 and the Roggeveld Windfarm development in 2015. The Roggeveld Windfarm development site overlaps the proposed Rietkloof WEF site. This project comprised fifty-six proposed wind turbines located near District Road 2243. The Oya project comprised a solar photovoltaic farm and twelve wind turbines located approximately 50km north-west from Matjiesfontein.

JG Afrika also conducted a previous detailed geotechnical investigation for the stabilisation of the Verlatekloof Pass (2008) approximately 48km from the study area.

3.2 Land Use and Vegetation

The project application site for the proposed WEF is approximately 27 608 ha, while the total area of development assessed is approximately 85ha. The project application site incorporates the following farm portions:

- Portion 1 of Farm Barendskraal 76
- The Remainder of Farm Fortuin 74
- Portion 3 Farm Fortuin 74
- Portion 1 of Farm Hartjieskraal 77
- The Remainder of Farm Hartjieskraal 77

- The Remainder of Farm Nuwerus 284
- Portion 1 of Farm Rietkloof Annexe 88
- The Remainder of Farm Snyders Kloof 80
- Portion 1 of Farm Snyders Kloof 80
- Farm Vogelstruisfontein 81
- Remainder of Farm Wilgehout Fontein 87
- Portion 1 of Farm Ou Mure 74

From the environmental assessment it is understood that the study area was used for low intensity grazing but is no longer actively used for agricultural activities.

The regional biome within which the study site is located is classed as a Succulent Karoo Biome, with the presence of lowland succulent Karoo vegetation species.

A Site Plan indicating the layout of the proposed WEF development is presented as **Map 2,** which is included in **Appendix A**.

3.3 Climate

The study area is characterized by a dry climate with a "BWk" classification according to the Köppen-Geiger climate classification. Matjiesfontein receives a relatively low mean annual precipitation of 264 mm. The average lowest rainfall is received in September (14 mm) and the highest in March (27 mm), which is a seasonal variation of 14 mm.

The maximum midday temperatures for Matjiesfontein ranges from 30°C in January and February to 15.2°C in July. The minimum temperatures for Matjiesfontein ranges from 14.4°C in February to 3.8°C in July. The average temperatures vary during the year by 12.3°C. Table 3-1, summarizes the climatic conditions.

Table 3-1: Summary of Climatic Conditions, Matjiesfontein (information extracted from "Climate-Data.org")

Months	Average Rainfall (mm)	Temperature (°C)		
		Maximum	Minimum	Average
January	16	30.1	14	21.3
February	16	30.0	14.4	21.4
March	27	27.3	12.9	19.5
April	24	23.1	10.1	16.3
May	22	19.2	7.3	12.9
June	25	15.3	4.3	9.4
July	23	15.2	3.8	9.1
August	23	16.5	4.3	10.1
September	14	19.9	6.1	12.7

Months	Average Rainfall (mm)	Temperature (°C)		
		Maximum	Minimum	Average
October	23	23.7	8.7	15.8
November	28	25.9	10.4	17.7
December	23	28.6	12.7	20

3.4 Drainage and Topography

The study area is drained by non-perennial tributaries of Wilgehout River, Groot River and Roggeveld River. The tributaries form dendritic drainage patterns.

Slope aspect and drainage features are presented in **Map 3.1** and **Map 3.2** which is included in **Appendix A**.

The slope gradient map indicates that the turbines are located on gentle slope of 5.1° – 8.7°. The turbines are flanked by steep slopes of 16.4° – 22.5° on the southern portion of the site. The substation and the construction camps are located on flat terrain 1.6˚ slopes. The majority of the internal access roads are characterised by flat to gentle slope along the lower lying valley areas and steep terrain characterises the slope sides.

Spot heights indicate elevation values in the range of 1339m to 1422m above mean sea level were observed. The slope aspect map further highlights the relief difference with elevation values ranging between 844m to 1422 m above sea level.

4 GEOLOGY

According to the 1: 250 000 Geological Maps of Sutherland (3220) and Ladismith (3320) published by the Council for Geoscience, the northern portion of the study area is underlain by rock units of the Abrahamskraal (Pa) Formation. The southern portion is underlain by the Waterford (Pwa) Formation which is underlain by the Fort Brown Formation (Pf), the Laingsburg Formation (Pl), the Vischkuil (Pl), the Tierberg Formation (Pt) and the Collingham (Pc) Formation respectively. The Abrahamskraal Formation form part of the Adelaide Subgroup, forming part of the Beaufort Group. The remaining formations form part of the greater Ecca Group. The Beaufort and Ecca Groups form part of the greater Karoo Supergroup.

The Abrahamskraal Formation (Pa) is represented by grey and green mudstone, siltstone and subordinate sandstone. Thin chert beds are common on the lowermost red mudstones of the Abrahamskraal Formation. The Waterford Formation (Pwa) is represented by grey, mottled feldspathic sandstone, subordinate dark coloured shale and mudstone.

The Fort Brown Formation (Pf) is represented by dark coloured shale with thin siltstone and sandstone beds. The Tierberg Formation (Pt) is represented by dark grey shale and siltstone. The

Laingsburg Formation (Pl) is represented by sandstone, greywacke and siltstone. The Vischkuil Formation (Pv) is represented by arenanceous shale, siltstone and thin sandstone beds. The Collingham (Pc) is represented by siltstone, chert and sandstone with thin interbedded shale and yellow weathering mudstone/tuff.

The sedimentary rocks in the area have been acted upon by numerous tectonic forces resulting in fold structures. Based upon the geology map, six fold features are located within the WEF study area. The fold axes trend in an E-W direction and represent localized synclines and anticlines which forms part of the Cape Fold Belts.

A Geological Map is presented as **Map 4,** which is included in **Appendix A**.

5 HYDROGEOLOGY

The study area lies within the E22A, J11D and J11E catchment areas. The catchments receive mean annual precipitation of 251mm, 240mm and 188mm respectively.

According to the 1: 3 000 000 scaled Groundwater Harvest Potential Map of South Africa, Regional yields of sustainable groundwater abstraction rates, indicate that the study area lies in areas with values of 6000 - 10 000 m^3/km^2/annually.

Regional hydrogeological data indicate the aquifer type is classed as 'b2' which is a, fractured aquifer type. Regional borehole data indicate relatively low yields, estimated to be in the range of 0.1-0.5 l/s. Fractured aquifers (designation b) form as a result of discontinuities, such as faults, fractures and joints, in hard bedrock. These form the primary porosity conduits in which groundwater moves.

An extract of the regional Hydrogeological Map is presented as **Map 5,** which is included in **Appendix A**.

The structural geology in the study area is conducive to the formation of high-yielding aquifer formations. As such a detailed hydrogeological investigation for the proposed borehole water abstraction works, is recommended during the detailed design phase.

6 ENGINEERING GEOLOGY

The engineering geology refers to the engineering characteristics of natural earth material for founding structures and suitability for construction material purposes.

The study area is characterized by a Weinert N value of more than 10, meaning that the type of weathering is primarily by mechanical disintegration. Shallow residual soils are commonly granular and gravelly (Brink, 1983).

The study area is dominated by the Abrahamskraal Formation. Colluvial deposits can be anticipated along hillslopes with alluvial deposits anticipated near drainage features.

Based on previous investigations in the greater Roggeveld area, blocky, greyish-red mudstone with interbedded grey very fine to medium-grained quartzofeldspathic sandstone can be anticipated. Weathered, limestone layers of up to 1.5m in thickness may be present. Greenish-grey cherty layers, of a few centimetres to two metres thickness, may also be present in the Abrahamskraal formation. The chert and limestone layers possess potentially soluble properties.

Where material is required for the construction of roads and laydown areas, natural gravely or crushed sandstone bedrock can potentially be a suitable source. Consideration must be given to the presence of excessive pyrite and muscovite which can cause distress where sandstone is used as basecourse (Brink, 1983). In addition, where chemical stabilization is required the clay matrix of sandstones make them suitable for stabilization with lime (Brink, 1983). The occurrence, nature, material quality and quantity of sandstone and other potential construction material will have to be assessed during the detailed geotechnical investigation.

Mudrocks such as siltstone, mudstone and “mud-shales” are not considered suitable for use as construction material, due to their swelling characteristics, excessive absorption of water, poor engineering performance and lack of durability. Slope stability issues can arise in areas where closely intercalated sandstones and mudrock exist. When mudrocks slake or disintegrate the exposed sandstone layers are undercut, this can result in rockfalls (Brink, 1983). Based on previous investigations in the Roggeveld area, concave cave structures can be anticipated through erosion of the less-competent shale and mudstone bedrock beneath the hard sandstone beds when exposed to the elements.
Based on previous investigations in the Sutherland area (Verlatekloof Pass), the Abrahamskraal Formation is represented by maroon mudstone, greenish grey siltstone and olive grey sandstone. These sedimentary units are intercalated and display variable weathering, as described for the Formation.

7 GEOTECHNICAL APPRAISAL

Competent, founding conditions for the turbines, substation, crane pads and the construction camps are anticipated a relatively shallow depths in slightly weathered bedrock, which will have to be assessed during the detailed investigation stage of the project prior to construction.

Consideration can be given to the following foundation types for the turbines:

- Ballasted Foundations (concrete raft) – these foundations are suitable in areas where shallow bedrock conditions are encountered or in poor, non-cohesive soils, where helical or screw-in piles are not suitable. The limitation is that; ballasted foundations require additional design considerations on steep slopes, they are not suited to areas susceptible to settlement and areas underlain by expansiveness soil conditions.

- Driven Piles - these piles are suited to clay, gravel and dense sand where shallow groundwater conditions can be anticipated. The advantage is that they can be accurately positioned, no curing is required, and the cost of installation is relatively low (e.g Duktus pile).

- Spread Footings – The use of reinforced spread footings designed to resist the uplift and downward pressures. Footings can be dowelled into the bedrock to resist dynamic forces. Deep excavations will be required for the spread footings, excavation side walls will need to be battered back or supported. This should be assessed by the resident engineers on site during construction. All earthworks should be undertaken in accordance with SANS 1200 D. Disadvantages of using spread footing is the speed of construction as piles are quicker to install.

The proposed substation site is underlain by the Abrahamskraal Formation. The site lies on a flat slope with slope of 0-2˚ likely to be shallow transported soils. The site does not traverse and drainage features. Consideration can be given to the following foundation types for the substation, the construction camp sites and the crane pads:

- Normal Strip Footings

- Spread Footing

It is important to select the correct foundation type and optimize the design, as such a detailed and comprehensive geotechnical investigation is required this will be undertaken prior to construction and upon finalisation of the layout plan.

Trial pitting across the WEF site is recommended. For heavily loaded structures such as wind turbines (>300 kPa), rotary core drilling is mandatory in order to more accurately assess the bedrock conditions below the founding level.

The presence of uplift and downward forces in the form of wind loads must be taken into consideration during foundation design.

8 GEOTECHNICAL IMPACT ASSESSMENT

From a preliminary geological and geotechnical assessment, no fatal flaws have been identified.

8.1 Impact of the Project on the Geological Environment

The Karoo Supergroup is known for its fossil bearing sedimentary units which will have to be more accurately assessed by a palaeontologist. The removal of rock which contain these fossils will result in the destruction of these fossils.

The impact of the development from a geotechnical perspective will be restricted to the removal and displacement of soil, boulders and bedrock referred to in this report as “subsoils”. The levelling of areas to create building platforms will also result in the displacement and exposure of subsoils. The potential impact of the development on the terrain and geological environment, will be the increased potential for soil erosion, caused by construction activities and the removal of vegetation.

These impacts will have a negative visual impact on the environment, which in some cases can be remediated. The project requires extensive earthworks to meet the required horizontal and vertical alignments and curvatures for roads, so the aesthetic impact is significant.

The potential impact of the development on the terrain and geological environment, will be the increased potential for soil erosion, caused by construction activities and the removal of vegetation. Areas of concentrated surface flow can be anticipated at energy facilities, resulting in gradual erosion of unconsolidated soil, during the operational life of the facility. This can result in the creation of preferential drainage features, unless remediated through proper engineering design (i.e stormwater drainage).

Based on the impact assessment matrix undertaken for this project, from a geotechnical perspective the impact of the Rietkloof WEF was found to be “**Negative moderate impact - The anticipated impact will have negative effects and will require mitigation**.” The assessment impact assessment matrix is presented as Table 8-2. Table 8-1 summaries the impacts and the mitigation of the proposed development.

Areas with steep slope inclinations are not favoured for the energy developments due to the earthworks requirements and the potential need for advanced foundations. The study area is considered suitable for the proposed development provided that the recommendations presented in this report are adhered too and which need to be verified by more detailed geotechnical investigations during detailed design.

The impact assessment criteria developed by WSP is included in **Appendix B.**

Table 8-1: Impact and Mitigation Summary

PHASE	ASPECT	IMPACT	RECOMMENDED MITIGATION
Construction Phase	The displacement of natural earth material and overlying vegetation.	• Increase stormwater velocity. • Increase in soil and wind erosion due to clearing of vegetation. • Construction and earthmoving vehicles may displace soil. • Creation of drainage paths along access tracks. • Sedimentation of non-perennial features and excessive dust.	• Identify protected areas prior to construction. • Construction of temporary berms and drainage channels to divert surface water. • Minimize earthworks and fills. • Use existing road network and access tracks. • Rehabilitation of affected areas (such as revegetation, mechanical stabilization). • Correct engineering design and construction of gravel roads and water crossings. • Control stormwater flow
	Potential oil spillages from heavy plant.	• Potential groundwater and drainage feature contamination.	• Vehicle repairs to be undertaken in designated areas.
Operational Phase	Displacement of natural earth material during maintenance	• Increase in soil erosion. • Sedimentation of non-perennial features caused by soil erosion.	• Use of existing roads and tracks where possible. • Rehabilitation of affected areas (such as erosion control mats). • Correct engineering design and construction of roads and water crossings during maintenance. • Maintenance of stormwater system.
	Potential oil spillages from heavy plant.	• Potential groundwater and drainage feature contamination.	• Vehicle repairs to be undertaken in designated areas.

Decommissioning Phase	Disturb the geological environment	• Increase in soil and wind erosion due to clearance of structures. • Construction and earthmoving vehicles will displace the soil. • Creation of drainage paths. • Excessive sediments in non-perennial features.	• Use of temporary berms and drainage channels to divert surface water. • Minimize earthworks and demolish footprints. • Use of existing roads and tracks were feasible. • Rehabilitation of affected areas (such as revegetation). • Develop a chemical spill response plan. • Develop dust and demolition fly suppression plan. • Reinstate channelized drainage features.
	Potential oil spillages from heavy plant.	• Potential groundwater and drainage feature contamination.	• Vehicle repairs to be undertaken in designated areas.
Cumulative	None	None	None

Table 8-2: Geotechnical Impact Assessment Matrix

Project Name	Proposed Development of the 147MW Rietkloof Wind Energy Facility and Associated Infrastructure near Maitjiesfontein, Western Cape Province																			
Impact Assessment	Geotechnical																			
CONSTRUCTION																				
Impact number	**Aspect**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**							
						(M+)	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	**(M+)**	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	
Impact 1:	Subsoil Removal	Increase Soil Erosion	Construction	Negative	Moderate	4	2	3	3	5	**60**	**N3**	2	1	1	2	2	**12**	**N1**	
					Significance	**N3 - Moderate**							**N1 - Very Low**							
Impact 2:	Potential Oil Spillage	Ground and Surface Water Contamination	Construction	Negative	Moderate	4	3	5	5	4	**68**	**N4**	3	1	3	1	2	**16**	**N2**	
					Significance	**N4 - High**							**N2 - Low**							
OPERATIONAL																				
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**							
						(M+)	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+)**	**E+**	**R+**	**D)x**	**P=**	**S**		
Impact 1:	Displacement of natural material	Increase Soil Erosion	Operational	Negative	Moderate	3	2	3	4	4	**48**	**N3**	2	1	1	4	2	**16**	**N2**	
					Significance	**N3 - Moderate**							**N2 - Low**							
Impact 2:	Potential Oil Spillage	Ground and Surface Water Contamination	Operational	Negative	Moderate	3	2	5	5	3	**45**	**N3**	2	1	3	1	2	**14**	**N1**	
						N3 - Moderate							**N1 - Very Low**							
DECOMISSIONING																				

Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation (M+)	E+	R+	D)x	P=	S		Post-Mitigation (M+)	E+	R+	D)x	P=	S	
Impact 1:	Subsoil Removal	Increase Soil Erosion	Decommissioning	Negative	Moderate	4	2	3	3	5	**60**	**N3**	2	1	1	2	2	**12**	**N1**
					Significance	**N3 - Moderate**							**N1 - Very Low**						
Impact 2:	Potential Oil Spillage	Ground and Surface Water Contamination	Decommissioning	Negative	Moderate	4	3	5	5	4	**68**	**N4**	3	1	3	1	2	**16**	**N2**
					Significance	**N4 - High**							**N2 - Low**						
CUMULATIVE																			
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation (M+)**	**E+**	**R+**	**D)x**	**P=**	**S**		**Post-Mitigation (M+)**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Overall Cumulative Impact	The Construction of the Proposed WEF	Cumulative	Negative	Moderate	4	2	3	3	5	**60**	**N3**	2	1	3	3	2	**18**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						

9 GEOTECHNICAL COMPARATIVE ASSESSMENT

Design and layout alternatives were considered and assessed as part of this geotechnical report. These include alternatives for the substation and the laydown area locations. The various alternatives, as shown in Map 2 (Appendix A), are described below. The O&M building, including an on-site spares storage building, a workshop and an operations building will be located on the site identified for the construction laydown area. The BESS locations are not specified; however, they will be located adjacent to the substations.

Construction Camp Sites

Three (2No.) substation area alternatives were considered as follows:

- Construction Camp Site 1: Alternative 1 is located on The Remainder of Farm Nuwerus 284.
- Construction Camp Site 2: Alternative 2 is located on Portion 1 of Farm Rietkloof Annexe 88.
- Construction Camp Site 3: Alternative 3 is located on Remainder of Farm Wilgehout Fontein 87.

A geotechnical comparative assessment is provided in Table 9-1.

Table 9-1: Geotechnical Comparitive Assessment of Substation Alternatives

CONSTRUCTION CAMP SITES	
Alternative	**Geotechnical Comparison**
Construction Camp Site Alternative 1	• Alternatives 1 is underlain by Abrahamskraal Formation. • Alternative 2 is underlain by Collingham Formation. • Alternative 3 is underlain by Fort Brown which is underlain by Laingsburg Formation and Vischkuil. • All the alternatives lie on a flat slope of 0.0-1.6˚, likely to be shallow transported soils. • Alternatives 1 and 2 do not traverse any drainage features. Alternative 3 traverses a drainage feature. • Shallow foundations are anticipated at all alternatives. • Serviceability and access will be easy for all at they are adjacent an internal road and the R354.
Construction Camp Site Alternative 2	
Construction Camp Site Alternative 3	

From the above comparative assessment, alternatives 1 and 2 will have the same impact. Alternative 3 will require diversion of the drainage feature to avoid the environmental impact.

10 CONCLUSIONS AND RECOMMENDATIONS

The foregoing report presents the findings concluded from a desktop study undertaken for the proposed Rietkloof WEF. The site is anticipated to be underlain by shallow bedrock conditions. It is

recommended that the turbines be constructed on relatively flat slopes. It is recommended that the turbines be constructed on relatively flat to gentle terrain, open areas with maximum wind exposure.

No fatal flaws from a geotechnical perspective were identified during this desktop study. The impact of the WEF was found to be "**Negative moderate impact - The anticipated impact will have negative effects and will require mitigation.**"

Conclusions presented in this report will have to be more accurately confirmed during the detailed geotechnical investigation phase. The site from a desktop level geotechnical study is considered suitable for the proposed wind energy facility.

It recommended that a detailed geotechnical investigation be undertaken during the detailed design phase of the project. The detailed geotechnical investigation must entail the following:

- Profiling and sampling of exploratory trial pits to determine founding conditions for the turbine modules and substation.
- An investigation to determine the subgrade conditions for internal roads and a materials investigation (if required).
- Thermal resistivity and electrical resistivity geophysical testing for electrical design and ground earthing requirements.
- Groundwater sampling of existing boreholes to establish a baseline of the groundwater quality for construction purposes.
- Dynamic Probe Super Heavy (DPSH) tests and rotary core drilling will be required depending on the soil profiles and imposed loads of the structures.

11 REFERENCES

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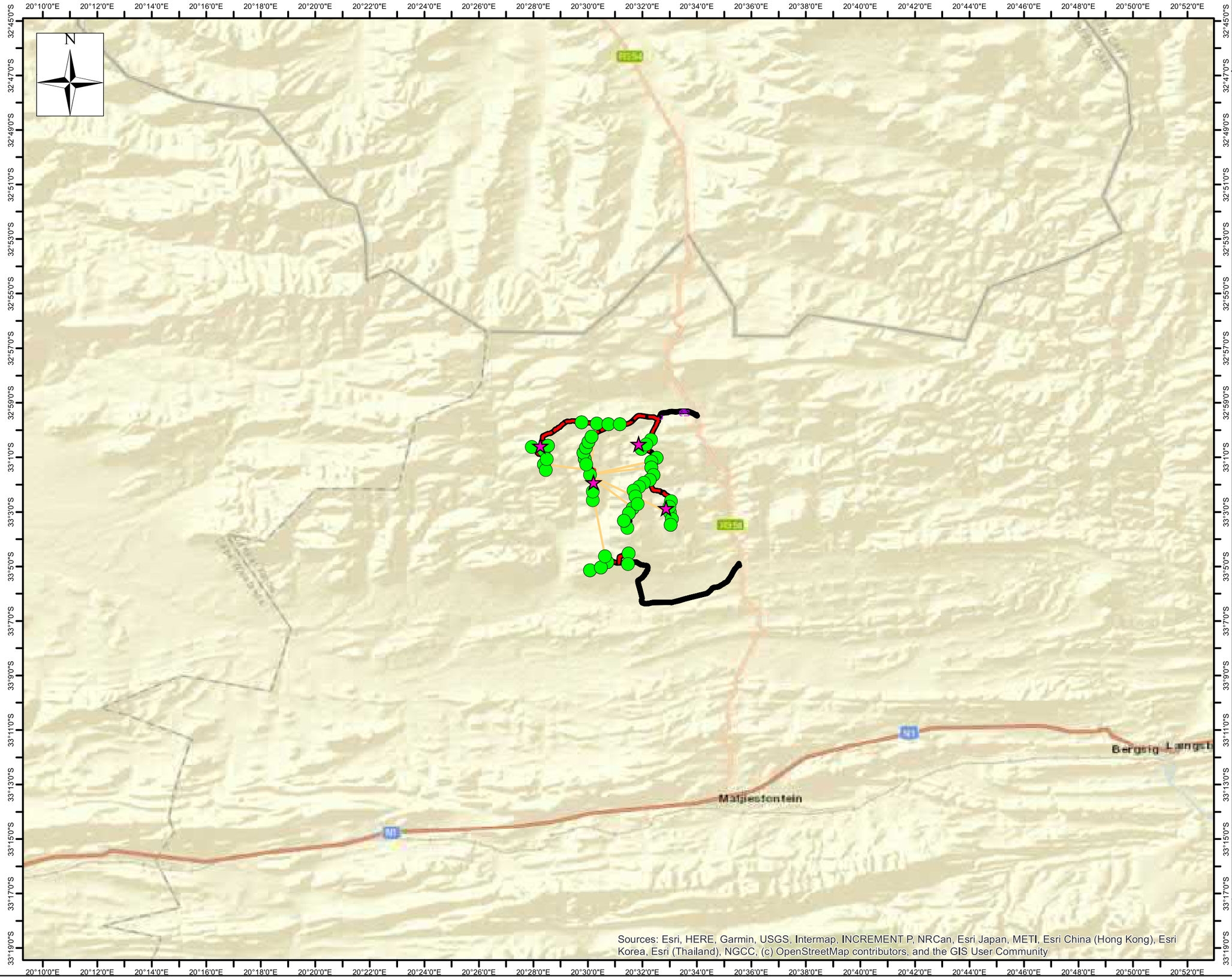
Appendix A: Figures

RIETKLOOF WEF GEOTECHNICAL DESKTOP STUDY: LOCALITY MAP (MAP 1)



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Legend

- Met masts
- Turbine positions
- 33kV Medium voltage cables
- 33kV OHL Route
- Hardstands
- Laydown Area
- Roads
- Substation and O&M Building
- Temporary Earth Works

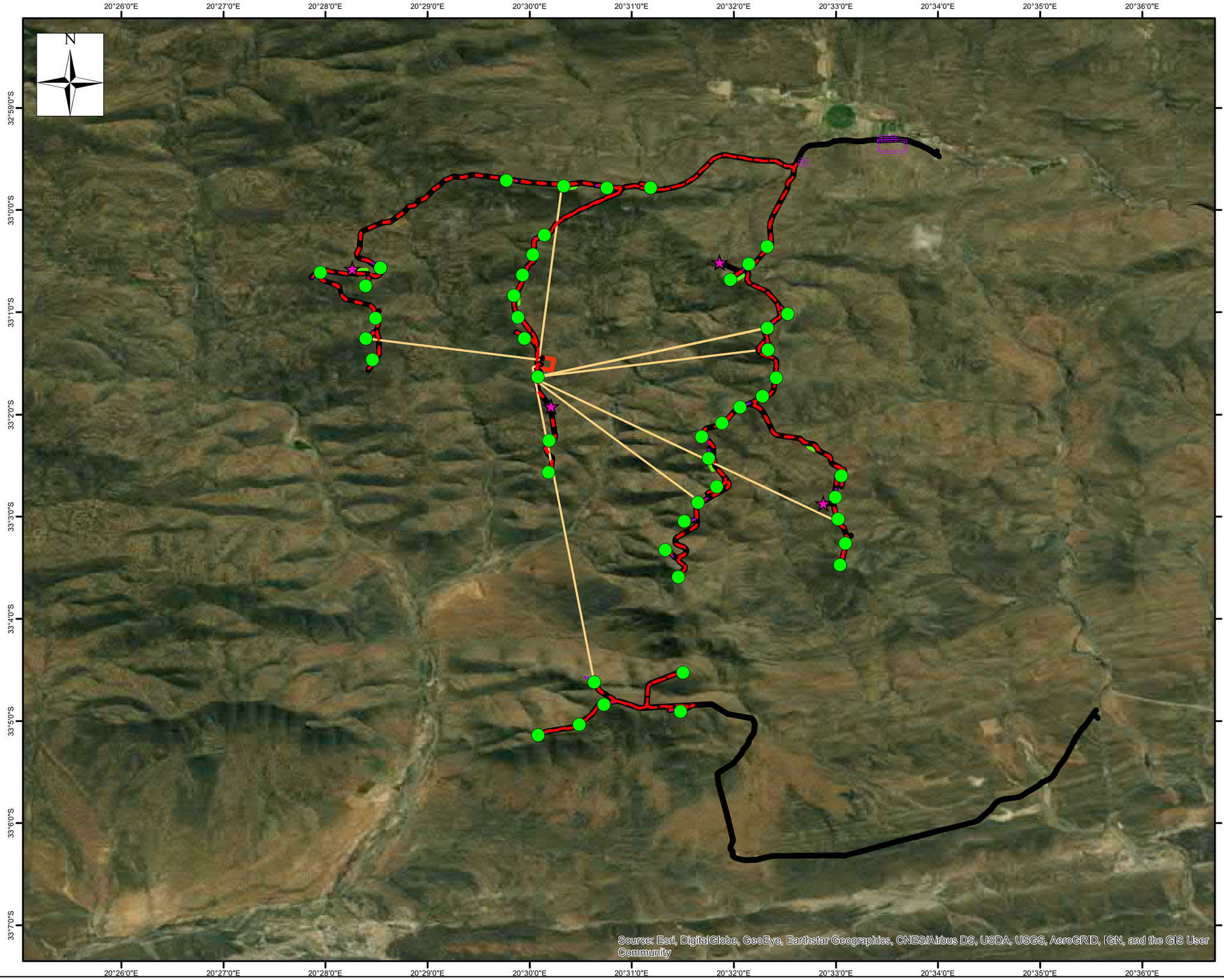
Kilometers

0 3.75 7.5 15

Map No.: 01

Scale (A3): 1:250 000

RIETKLOOF WEF GEOTECHNICAL DESKTOP STUDY: SITE MAP (MAP 2)



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- Temporary Earth Works

Kilometers
0 1 2 4

Map No.: 02

Scale (A3): 1:66 800

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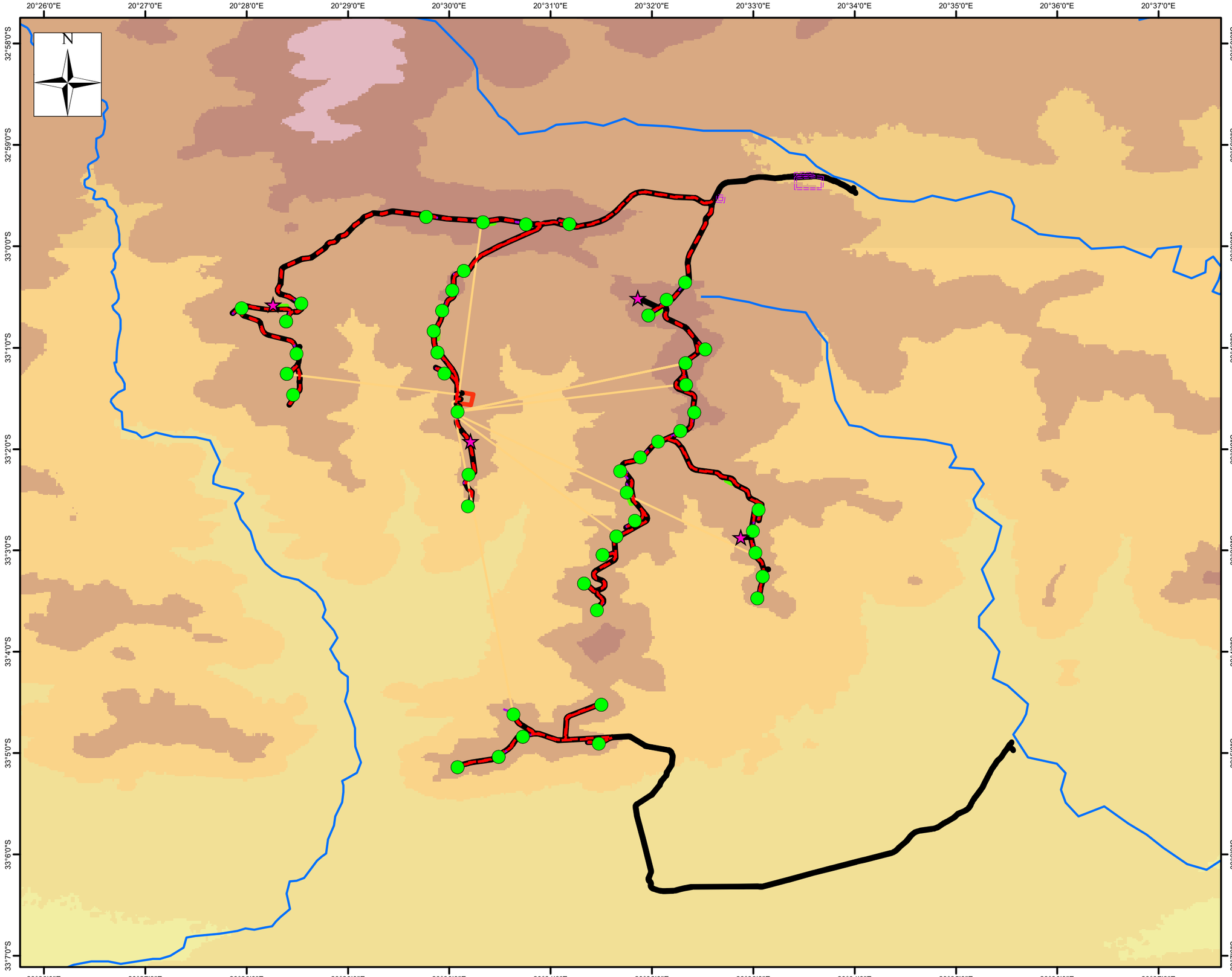
RIETKLOOF WEF GEOTECHNICAL DESKTOP STUDY: ELEVATION MAP (MAP 4)



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Legend

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- Hardstands
- Laydown Area
- Roads
- Substation and O&M Building
- Temporary Earth Works
- Perennial_Watercourses

Elevation

- 368 - 566
- 566 - 722
- 722 - 864
- 864 - 1 004
- 1 004 - 1 148
- 1 148 - 1 284
- 1 284 - 1 405
- 1 405 - 1 523
- 1 523 - 1 846

Kilometers
0 1 2 4

Map No.:	Scale (A3):
04	1:67 800

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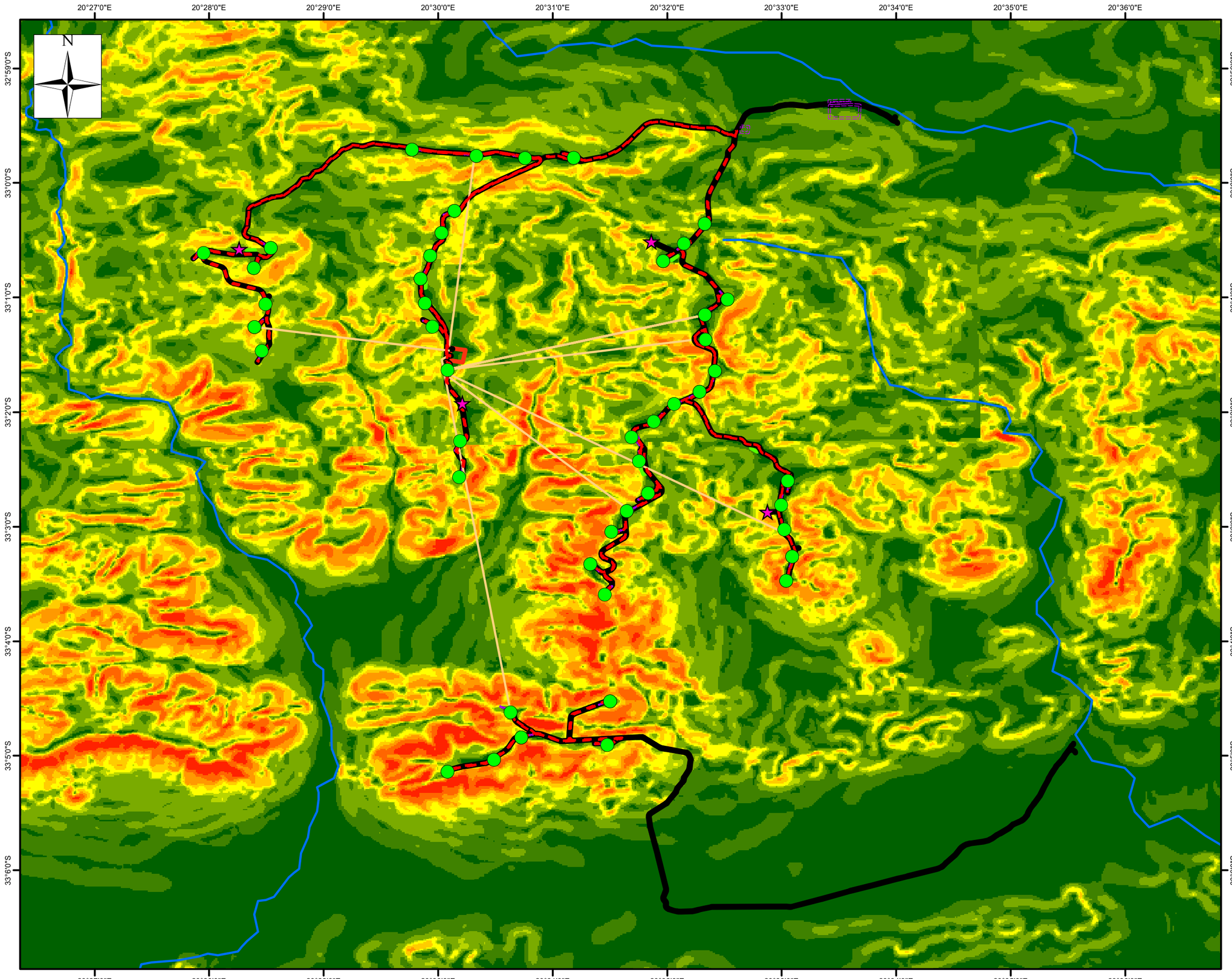
RIETKLOOF WEF GEOTECHNICAL DESKTOP STUDY: SLOPE MAP (MAP 3)



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Legend

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- Hardstands
- Laydown Area
- Roads
- Substation and O&M Building
- Temporary Earth Works
- Perennial_Watercourses

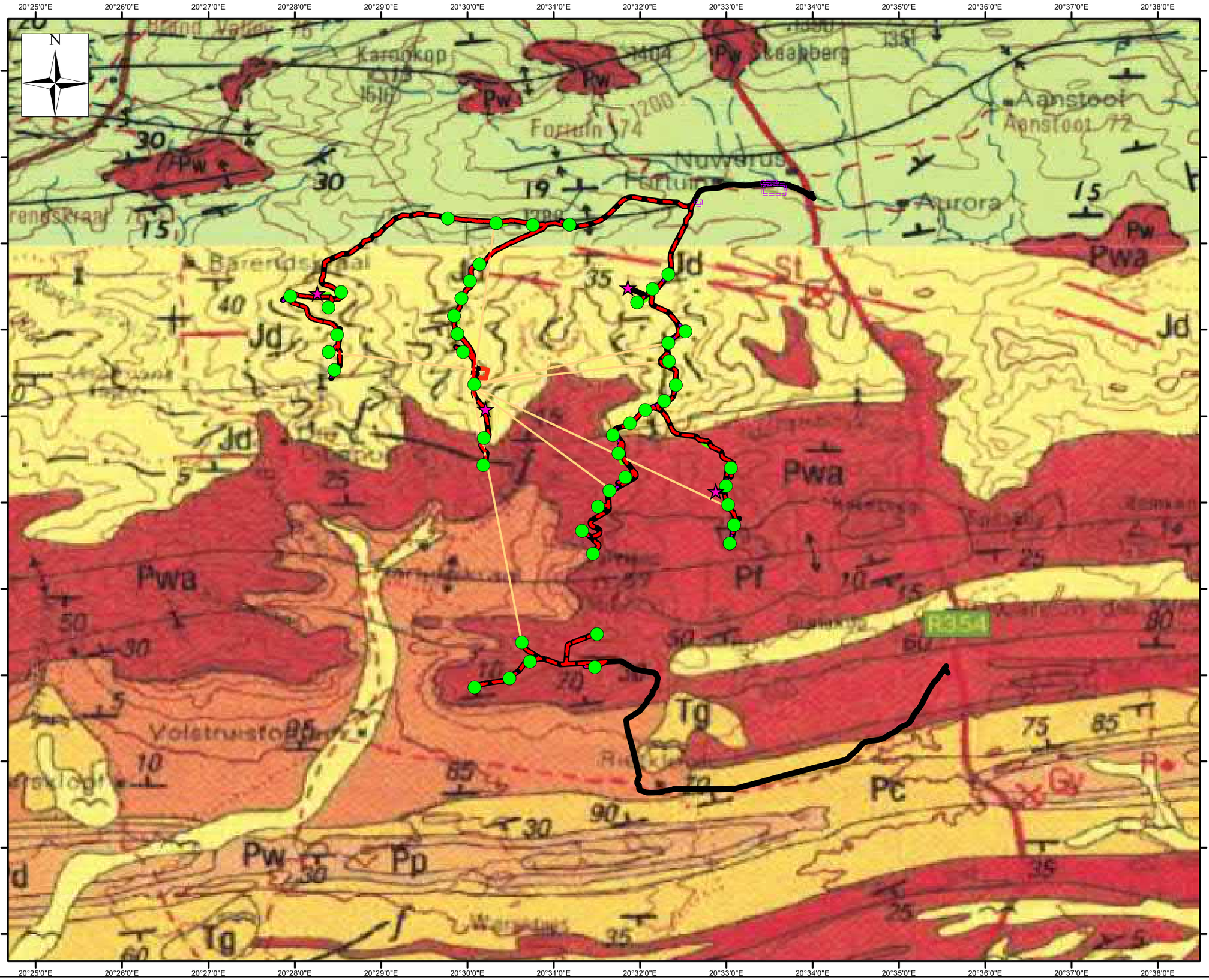
Slope

- 0.0 - 4.8
- 4.8 - 9.9
- 9.9 - 18.8
- 18.8 - 21.9
- 21.9 - 28.8
- 28.8 - 36.3
- 36.3 - 45.2
- 45.2 - 56.9
- 56.9 - 87.4

Kilometers
0 0.75 1.5 3

Map No.:	Scale (A3):
03	1:60 000

RIETKLOOF WEF GEOTECHNICAL DESKTOP STUDY: GEOLOGY MAP (MAP 5)



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Legend

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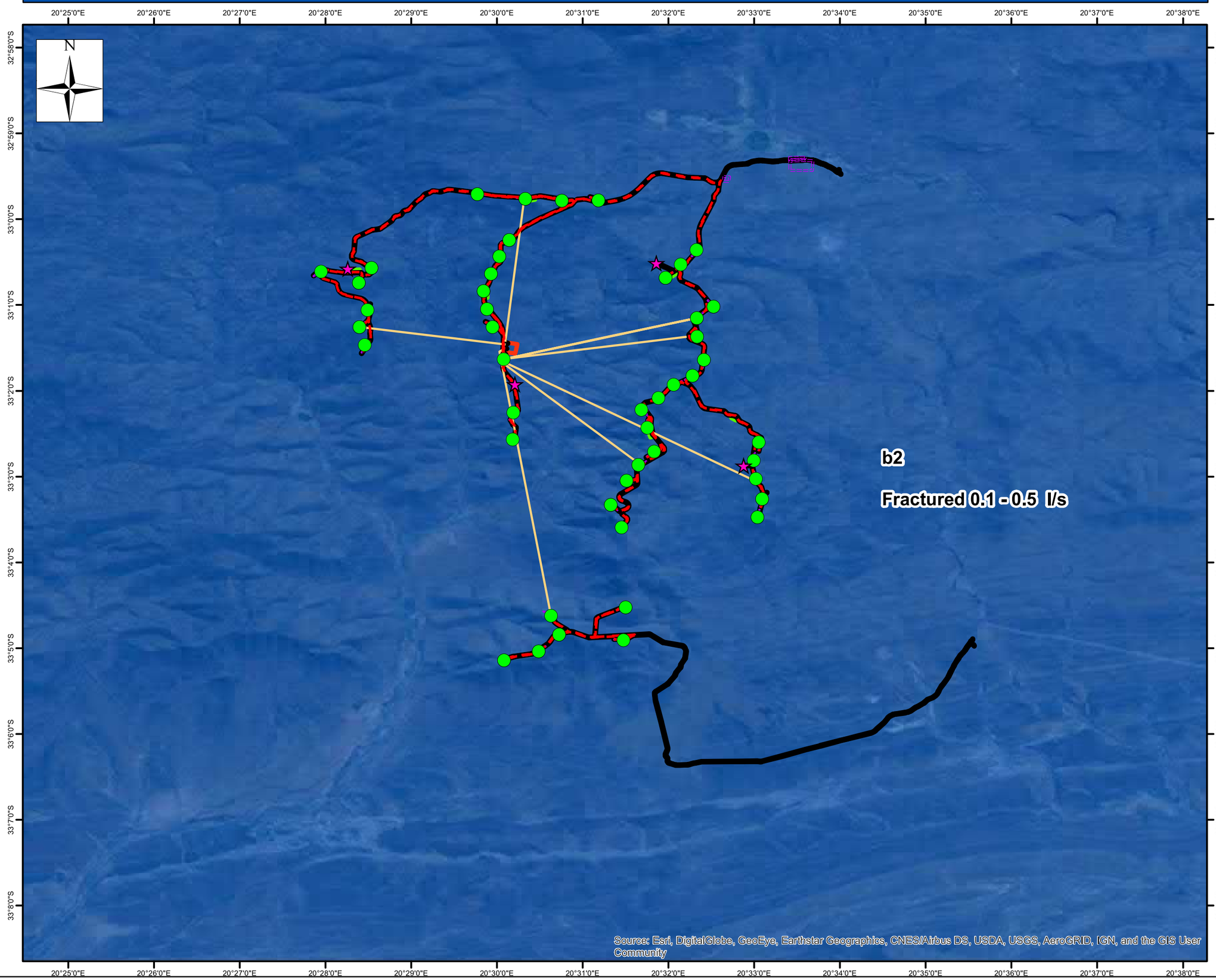
- Temporary Earth Works

Geology:
Pa - Mudstone, siltstone, sandstone, thin cherty beds (lowermost red mudstone)
Pw - dark grey shale, light grey weathering with cherty siltstone beds
Pwa - grey mottled feldspathic sandstone, subordinate dark coloured shale and sandstone
Pf - dark coloured shale with thin siltstone and sandstone beds
Pt - dark grey shale and siltstone
Pc - Siltstone, chert and sandstone with thin interbedded shale and yellow weathering mudstone/tuff
Jd - Dolerite

Kilometers
0 1.25 2.5 5

Map No.:	Scale (A3):
05	1:79 000

RIETKLOOF WEF GEOTECHNICAL DESKTOP STUDY: GEOHYDROLOGY MAP (MAP 6)



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- Temporary Earth Works

Kilometers

0 1.25 2.5 5

Map No.:	Scale (A3):
06	1:79 000

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Appendix B: WSP Impact Assessment Methodology

IMPACT ASSESSMENT METHODOLOGY

ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in **Table 0-1**.

Table 0-1: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

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CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 1** below.

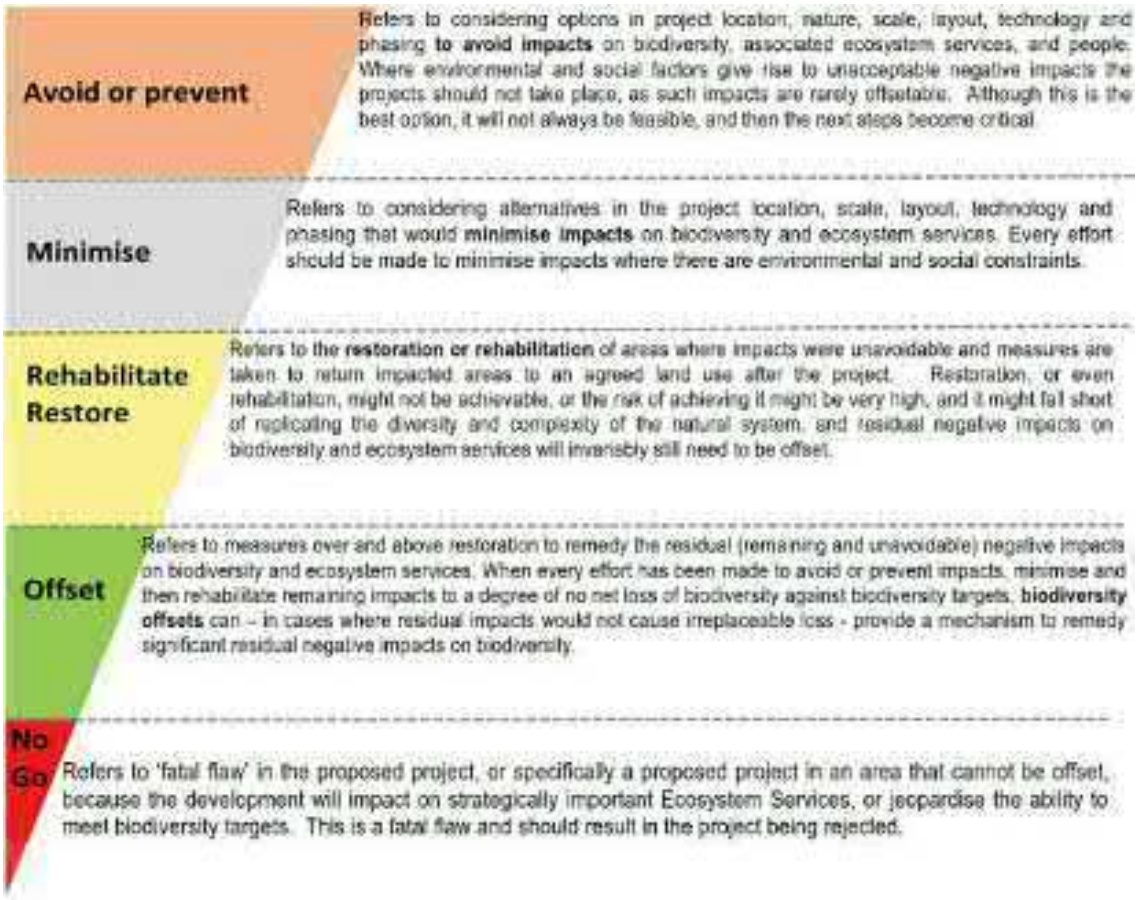


Figure 1: Mitigation Sequence/Hierarchy

Project Name	Proposed Development of the 147mw Rietkloof Wind Energy Facility and Associated Infrastructure near Maitjiesfontein, Western Cape Province
Impact Assessment	Geotechnical

CONSTRUCTION

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Subsoil Removal	Increase Soil Erosion	Construction	Negative	Moderate	4	2	3	3	5	**60**	**N3**	2	1	1	2	2	**12**	**N1**
					Significance	**N3 - Moderate**							**N1 - Very Low**						
Impact 2:	Potential Oil Spillage	Ground and Surface Water Contamination	Construction	Negative	Moderate	4	3	5	5	4	**68**	**N4**	3	1	3	1	2	**16**	**N2**
					Significance	**N4 - High**							**N2 - Low**						

OPERATIONAL

Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S		(M+	E+	R+	D)x	P=	S	
Impact 1:	Displacement of natural material	Increase Soil Erosion	Operational	Negative	Moderate	3	2	3	4	4	**48**	**N3**	2	1	1	4	2	**16**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						
Impact 2:	Potential Oil Spillage	Ground and Surface Water Contamination	Operational	Negative	Moderate	3	2	5	5	3	**45**	**N3**	2	1	3	1	2	**14**	**N1**
					I	**N3 - Moderate**							**N1 - Very Low**						

DECOMISSIONING

Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S		(M+	E+	R+	D)x	P=	S	
Impact 1:	Subsoil Removal	Increase Soil Erosion	Decommissioning	Negative	Moderate	4	2	3	3	5	**60**	**N3**	2	1	1	2	2	**12**	**N1**
					Significance	**N3 - Moderate**							**N1 - Very Low**						
Impact 2:	Potential Oil Spillage	Ground and Surface Water Contamination	Decommissioning	Negative	Moderate	4	3	5	5	4	**68**	**N4**	3	1	3	1	2	**16**	**N2**
					Significance	**N4 - High**							**N2 - Low**						

CUMULATIVE

Impact number	Receptor	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S		(M+	E+	R+	D)x	P=	S	
Impact 1:	Subsoil Removal	Increase Soil Erosion	Cumulative	Negative	Moderate	4	2	3	3	5	**60**	**N3**	2	1	3	3	2	**18**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						

Appendix C: Specialist's CV

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

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

PROJECT TITLE

Development of a 147MW Rietkloof Wind Energy Facility and Associated Infrastructure near Maitjiesfontein in the Western Cape Province

Kindly note the following:

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

Departmental Details

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

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

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

1. SPECIALIST INFORMATION

Specialist Company Name:	JG Afrika (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	1	Percentage Procurement recognition	
Specialist name:	Khuthadzo Bulala			
Specialist Qualifications:	BSc Hons Geology			
Professional affiliation/registration:	Cand Sci Nat			
Physical address:	06 Pin Oak Avenue, Hilton, Pietermaritzburg			
Postal address:	06 Pin Oak Avenue, Hilton, Pietermaritzburg			
Postal code:	3245	Cell:		
Telephone:	033 343 6700	Fax:	033 343 6701	
E-mail:	bulalak@jgafrika.com			

2. DECLARATION BY THE SPECIALIST

I, Khuthadzo Bulala, 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

JG Afrika (Pty) Ltd

Name of Company:

01/03/2021

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

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

Signature of the Specialist

JG Afrika (Pty) Ltd

Name of Company

01/09/2021

Date

COMMISSIONER OF OATHS
DAWN JANET BURGIN
9716/2 (R/O) KZN (PIETERMARITZBURG)
6 PIN OAK AVENUE, HILTON

Signature of the Commissioner of Oaths

01/09/2021

Date

KHUTHADZO BULALA

Profession	*Engineering Geologist*
Position in Firm	*Engineering Geologist*
Area of Specialisation	*Geotechnical Engineering, Engineering Geology*
Qualifications	*BSc (Hons) (Geology) Cand. Sci. Nat.*
Years of Experience	*5.5 Years*
Years with Firm	*5 years*

SUMMARY OF EXPERIENCE

Khuthadzo is currently an Engineering Geologist based in the Pietermaritzburg office. She was originally employed by the Lesotho Highlands Development Authority (LHDA) as a young professional to work with JG Afrika on site, working on the geotechnical investigation for Phase II of the Lesotho Highlands Water Project. At the completion of the contract with LHDA, she joined JG Afrika as a permanent employee. Through her time on site, she gained valuable experience in site investigations, from assisting with the supervision of the contractor, profiling and logging, analysis of in-situ and laboratory testing, and reporting. She has been involved with a number of small to large scaled geotechnical investigation in KwaZulu-Natal.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

Cand.Sci.Nat. - Registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) - Registration No 116482

EDUCATION

2007 – Matric – Mbilwi Secondary School
2011 – BSc (Geology) – University of Johannesburg, Johannesburg
2013 – BSc (Hons) (Geology) – University of Limpopo, Polokwane

SPECIFIC EXPERIENCE

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2017 -
Position – Engineering Geologist

Nkobongweni Water Scheme – Project manager responsible for the field investigation and report writing for the proposed water supply project. Client: Makhaotse Narasimulu and Associates (Pty) Ltd

Koup 1 & Koup 2 – Project manager responsible for the geotechnical desktop studies for the Koup 1 and Koup 2 wind energy facilities and their associated grid components. Client: Sivest SA (Pty) Ltd.

Mfulamuni Access Road – Project manager responsible for the field geotechnical investigation and reporting for the re-gravelling of four access roads in Mahlaba, Pomeroy. Client: ZVK Holdings (Pty) Ltd

Zwelisha Moyeni Waste-Water Treatment Works – Project manager responsible for the filed investigation and the report writing for the proposed WWTW extensions. Client: JG Afrika (Pty) Ltd Water Division

Hammersdale Waste-Water Treatment Works – Engineering Geologist responsible for the additional field investigation and the report writing for the proposed WWTW extensions. Client: eThekwini Municipality: Water and Sanitation Division

Emanzini Estate Geohydrology Assessment – Engineering Geologist responsible for the hydrocensus for the soak away pits feasibility at the proposed Mt Verde Estate. Client: Emanzini Private Reserve

Mt Verde Geohydrology Assessment – Engineering Geologist responsible for the hydrocensus and percolation tests for the soak away pits feasibility at the proposed Mt Verde Estate. Client: Venture Partners

Ntabamhlophe Tank – Project manager responsible for the field investigation and the report writing for the proposed tank. Client: JG Afrika Water Division

Kenhardt Solar PV Plant – Project manager responsible for the field investigation and the report writing for the proposed solar PV plant. Client: Scatec Solar South Africa.

Heidelberg Cemetery – Project manager and field geologist responsible for the investigation and and the report writing for the proposed existing Heidelberg cemetery extension. Client: Marang Environmental and Associates (Pty) Ltd

Cornubia Fills – Engineering geologist responsible for the field investigation and the report writing for the proposed cut and fill assessments for the Cornubia Boulevard Transit Mall development. Client: Smec

Kokstad CRU Contamination Study – Engineering geologist responsible for the contamination study for the Kokstad community residential units' phase 2 study. Client: Ingcweti Ace Technology

Mandalathi Hall – Project manager responsible for the geotechnical investigation and report writing for the proposed Mandalathi hall. Client: Dartingo Consulting Engineers (Pty) Ltd

Umgungundlovu Landfill Site – Engineering geologist responsible for the percussion drilling site supervision and the hydrocensus for the geohydrological assessment. Client: Séché South Africa

Gluckstaadt Water Supply Scheme – Engineering geologist responsible for the geotechnical investigation and report writing for bulk and reticulation pipeline routes, pump stations, reservoirs and water treatment works for the proposed development. Client: SiVEST

Agribusiness Development Agency Rabbitries – Project manager responsible for the geological investigation and report writing for five ADA Rabbitires development. Client: JG Afrika Agricultural Department. Client: JG Afrika Agricultural Department

Alfred Duma Cemetery – Engineering geologist responsible for writing the site selection desktop study report for eight sites in the Alfred Duma Municipality. Client: Ziphelele Planning and Environmental Consultancy

Eskom Radio Towers – Engineering geologist responsible for the field investigation and report writing for nine Eskom Towers in Eastern Cape. Client: Eskom

220 Murray Road – Project manager, responsible for managing field investigation (conducted by Muhammad Osman) and writing an infill geotechnical investigation report for a multi-story development in Hayfields. Client: Green Door Environmental

Giba Industrial Development – Engineering geologist responsible for the field investigation for Giba Industrial Development and assisted with the Geotech report. Client: Sultex Holdings (Pty) Ltd

Rietfontein Dam Geotechnical Investigation – Project manager, field geologist involved with the geotechnical investigations and reporting for the founding conditions and material investigation of the proposed Rietfontein Dam in Eastern Cape. Client: Calvus Properties Client:

Kirkwood Borrow pit and Retaining Walls – Engineering geologist involved in the geotechnical investigation and reporting for the borrow pit and retaining wall foundations of the proposed R336 Road Upgrade. Client: Royal Haskoning

83 West Street – Project manager, field geologist involved with the geotechnical investigations and report writing. Client: Private Developer

Eastwood Pedestrian Bridge – Project manager, field geologist involved with the geotechnical investigations and report writing. Client: High End Construction

N3 Quarry Logging – Geologist involved in the geotechnical logging of quarries between Durban and Pietermaritzburg, Client: South African National Road Agency Limited

N2 Kangela to Pongola Borrow Pit Geotechnical Investigations – Assisted with the geotechnical report, Client: South African National Road Agency Limited

N2 Kangela to Pongola Road Widening Geotechnical Investigations – Assisted with the geotechnical report, Client: South African National Road Agency Limited

Gowrie Farm Stand No.295 Geotechnical Investigations – Project manager, field geologist involved with the geotechnical investigations and report writing. Client: Delute Construction

45 Richard Carte Road – Geologist involved with the field investigations for the refurbishment of the warehouse. Client: T2 Design Lab

Darvil Sludge Dam – Geologist involved with the field investigations for the founding conditions, slope stability and materials investigations. Client: Umgeni Water

Acaciavale Landfill Closure Geotechnical Investigation- Geologist involved in the field investigation and the report writing. Client: Alfred Duma Municipality

Ntaba Ridge Plots Geotechnical Investigation- Project manager, field geologist involved in the geotechnical investigation at several plots. Involved in trial pitting, profiling and sampling and report writing.

Umhlatuze Cemetery Feasibility Study- Geologist involved in the project management, desktop study report, field investigation and the report writing. Client: uMhlatuze Municipality

Harry Gwala Irrigation Scheme – Client: Department of Rural Development and Land Reform

- Responsible for augering, soil profiling and sampling of the soils
- Assisted with the GIS for the various proposed sites
- Report writing for the project

Intaba Ridge Estate Landswop for Cemetery Geotech Investigation- Field geologist and involved in trial pitting, profiling and sampling.

Horseshoe, Mkhuphula and Nkungumathe Irrigation Scheme – Geologist involved in soil survey and report writing. Client: Department of Rural Development and Land Reform.

Geotechnical Investigations for Maryvale Housing- field geologist and involved in a shallow geotechnical investigation for a housing development. Client: eThekwini Municipality

Manzamnyama River Bridge Geotechnical Investigations – field geologist, involved in a deep geotechnical investigation for a new bridge. Client: Naidu Consulting

Cedara Petrol Filling Station Geotechnical Investigations- field geologist, involved in geotechnical investigations for various structures – Involved in trial pitting, profiling, percolation testing and sampling. Client: Barco Petroleum

Lesotho Highlands Water Project: Phase II (165m high Polihali Dam and Transfer Tunnel)- Assisted with the geotechnical reports for the Polihali Dam Polihali Transfer Tunnel. Client: Lesotho Highlands Development Authority

Mount Edge Combe Underpass Geotechnical Investigations- Involved in geotechnical logging and sampling. Client: Naidu Consulting

Lesotho Highlands Water Project: Phase II: Site geologist for one year based at the Polihali Dam and Transfer Tunnel site in Lesotho. Assisted with the geotechnical rotary core logging of boreholes drilled across the various proposed dam and transfer tunnel design components. Gained valuable experience in logging of the Lesotho Basalts. Client: Lesotho Highlands Development Authority

Lesotho Highlands Development Authority

Mar 2016-Aug 2016
Position – Engineering Geologist Intern

Lesotho Highlands Water Project: Phase II Engineering Geologist Intern at the Polihali Dam Site in Lesotho, seconded to JG Afrika, assisting supervising the LHDA Contract 4016, Polihali Dam and Transfer

Tunnel Geotechnical Investigation. Assisted with borehole logging, and supervision and administration of the rotary core drilling investigation. Client: Lesotho Highlands Development Authority

While seconded to JG Afrika:

Albert Falls: - field geologist involved in geotechnical investigations for a pipeline. Involved in trial pitting, profiling and sampling. Client: BVI Consulting Engineers

Umlazi Housing- field geologist involved in geotechnical investigations for various structures. Involved in trial
pitting, profiling and sampling. Client: BVI Consulting Engineers

South Coast National Route R61- Assistant field geologist involved in geotechnical investigations. Client: South African National Road Agency Limited

PERSONAL DETAILS

Nationality – South African
Date of Birth – 1990-03-30
Domicile – Thohoyandou, South Africa

Languages
English – Good
English - Very Good
Tshivenda - Very Good
Sesotho - Good
Setswana - Good
Sepedi - Good

UNIVERSITY OF LIMPOPO

WE,
THE UNDERSIGNED,
HEREBY CERTIFY THAT

BULALA KHUTHADZO
(201213617)

HAS BEEN AWARDED THE DEGREE

Bachelor of Science Honours

AT A CONGREGATION OF THE UNIVERSITY

Executive Dean

Registrar

Vice-Chancellor and Principal

24 MAY 2017

UNIVERSITY OF LIMPOPO: FORMERLY THE MEDICAL UNIVERSITY OF SOUTHERN AFRICA AND THE UNIVERSITY OF THE NORTH

T 34342

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Khuthadzo Bulala

Registration Number: 116482

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Geological Science (Candidate Natural Scientist)

Effective **9 November 2016** Expires **31 March 2022**

Chairperson

Chief Executive Officer

To verify this certificate scan this code

JAMES THOMAS MAXWELL (TOM) SPEIRS

Profession	*Geologist*
Position in Firm	*Senior Associate*
Area of Specialisation	*Geotechnical/ Engineering Geology*
Qualifications	*Pr.Sci.Nat., BSc*
Years of Experience	*35 Years*
Years with Firm	*32 Years*

SUMMARY OF EXPERIENCE

Tom Speirs has thirty-four years of experience in the fields of engineering geology, geotechnical and materials engineering. He has undertaken geotechnical, geological and materials work throughout Southern Africa, East, West and Central Africa, Madagascar and eastern Australia.

His responsibilities have included all phases of projects from preparing initial proposals and cost estimates through the review and investigation stages to the compilation of completion reports, as well as providing technical input during construction.

He currently manages the technical aspects of the geotechnical division in the Pietermaritzburg branch, including mentorship of subordinates, peer review and quality control.

His fields of expertise include road and dam geotechnical investigations, foundations, identification of construction material sources, slope stabilisation, engineering geological and land utilisation mapping.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

Pr Sci Nat- Registered with the South African Council for Natural Scientific Professions (SACNASP) - Registration No. 400104/94.

NHBRC Registered with the National Home Builders Registration Council (NHBRC) as a competent person (geotechnical). Registration No. 601708.

EDUCATION

1984 – Bachelor of Science – University of Natal

SPECIFIC EXPERIENCE

JG Afrika (Pty) Ltd

2014 to Date
Position - Senior Associate

Anadarko LNG Project - Geotechnical investigations for infrastructure development for the Anadarko liquified natural gas (LNG) project near Palma, Mozambique. Client: WBHO.

Usuthu Dam – Reconnaissance and co-ordination of geotechnical investigations for an off-channel storage dam near Nongoma. Client: RAWS Consulting Engineers

Moses Mabhida Road – Temporary support assessments of a rail embankment for the widening of Moses Mabhida Road in Pietermaritzburg. Client: SiVest.

Varies Geotechnical Investigations for Developments – including a multi-purpose sport s centre in Matatiele, pump-stations for the Mkhupula and Nkungumathe irrigations schemes, multi-storey residential blocks on a site with perched groundwater conditions at Berkshire Downs. Client: Various.

Various SANRAL projects - Co-ordinating and managing geotechnical and materials investigations on national roads projects, including National Route 2 Section 27 between Ballito and the Umvoti Toll Plaza, National Route 2 Sections 30, 31 and 32 between Kangela and Pongola. Slope stability assessments on National Route 2 Section 3 between Caledon and Riviersonderend. Client: SANRAL.

Rietvallei to Mamelodi - Conducting infill geotechnical investigations for the 1.2m diameter pipeline from Rietevallei to Bronberg Reservoir and the 1.4m diameter pipeline from Bronberg to Mamelodi. Client: Rand Water.

Grootgeluk Coal Mine - Geotechnical investigations for strategic coal stockpiles at the Grootgeluk Coal Mine, Lephalale. Client: Exxaro.

Main Road 7 Section 4 - Geotechnical assessment of fill instability on Main Road 7 Section 4, near Underberg. Client: Emzansi Engineers.

Maputo and Tembe River Dam Site Investigations - Reconnaissance of potential dam sites on the Maputo and Tembe Rivers in Maputo Province and the Monapo River in Nampula Province, Mozambique. Client: Conseng.

Maputsoe Urban Roads - Investigations to identify sources of construction materials for the upgrading of the Maputsoe Urban Roads in Lesotho. Client:

Stephen Dlamini Dam - *Ad hoc* investigations to identify potential dam and road construction materials for the construction of the Stephen Dlamini Dam, near Bulwer, KZN. Client: Ubambiswano Projects.

Polihali Dam and Polihali to Katse Transfer Tunnel - *Ad hoc* support on the geotechnical investigations for the Polihali Dam and Polihali to Katse Transfer Tunnel, forming part of the Phase 2 Lesotho Highlands Water Project. Client: LHDA.

Greater Paninkuku Dam, Cabhane Weir and Kilmon Dam - Geotechnical investigations for the proposed Greater Paninkuku Dam, Cabhane Weir and Kilmon Dam in KZN. Client: Ubambiswano Projects.

Mzimvubu Water Project - Detailed feasibility geotechnical investigations for the Laleni Dam, Tunnel and Hydropower Scheme, which forms part of the Mzimvubu Water Project in the Eastern Cape. Client: DWAF.

Matimba Power Station - Geotechnical stability investigations for the proposed raising and extension of an existing ash discard dump at the Matimba Power Station, near Lephalale, Limpopo. Client: RHDHV

Various - Geotechnical investigations for housing and commercial developments comprising single and multi-storey buildings, including a four-storey staff housing complex in the Estcourt Prison and the three-storey Hilton Life Hospital expansion. Client: Various.

Various - Geotechnical investigations for water and sewer reticulation, including the Mandlakazi Bulk Water Supply Scheme, the Mimosadale Water Supply Scheme, Impendle Village waste-water treatment works and outfall sewer, the tertiary pipelines and reservoirs forming part of the Metolong Dam Water Supply Programme in Lesotho. Client: Various

Various - Road construction materials assessments for the EN4 near Maputo in southern Mozambique and the EN1 between Muepane and Quissanga, northern Mozambique. Client: WBHO

2012 to 2014
Position – Associate

Mzimvubu Water Project - Geotechnical suitability assessments of three shortlisted dam sites on the Mzimvubu Water Project in the Eastern Cape. Subsequent feasibility level geotechnical investigations of the selected Ntabelanga dam site. Client: DWAF

Kalia Iron Ore Mine to Yomboyelli - Materials assessments for a 280km haul route from the Kalia Iron Ore Mine to Yomboyelli in Guinea. Client: WBHO.

Mapochs Mine - Geotechnical investigation of embankment distress and stability of Silt Paddocks 16 and 17 at the Mapochs Mine, near Roossenekal. Client: EVRAZ Highveld Steel & Vanadium..

Ubombo Sugar Mill and Big Bend Station - Geotechnical and materials investigations for the 16.5km railway line between the Ubombo Sugar Mill and Big Bend Station in Swaziland- Client: Swaziland Railways.

Noblesfontein Wind Power Plant - Geotechnical investigations for the proposed 75MW Noblesfontein Wind Power Plant near Victoria West in the Northern Cape. Client: Gestamp Wind.

Upington Airport Solar Project - Geotechnical investigation for the proposed 10MW PV power plant for the Upington Airport Solar Project. Client: Pele Green Energy

Jeffares & Green (Pty) Ltd

2008 to 2012
Position- Secondment to Bergstan Gauff Jeffares & Green Dikgatlhong Dam Project Joint Venture

Dikgatlhong Dam - Resident engineering geologist / materials engineer on the construction of the Dikgatlhong Dam in Botswana- a 4.6km long by 41m high zoned earth-fill dam with a full supply storage capacity of 400 million m^3. Duties included the evaluation of embankment foundations, foundation grouting, geological mapping, excavation classification, sourcing of construction materials, instrumentation, quality control and construction monitoring. Client: Botswana Department of Water Affairs.

Jeffares & Green (Pty) Ltd

2001 to 2008
Position- Associate

Water Pipeline between Benoni and Mamelodi - Geotechnical investigations for the duplication of the water pipeline between Benoni and Mamelodi, east of Pretoria. A significant proportion of the route is underlain by dolomite. Client: Rand Water.

Various - Geotechnical investigations for numerous residential and commercial developments in KZN, Client: Various.

Teekloof and Verlatekloof Passes - Rock slope stability analyses of the Teekloof and Verlatekloof passes in the Northern Cape, Client: Northern Cape Department of Transport.

Various - Reconnaissance and initial geotechnical investigations of potential dam sites for the Lesotho Lowlands Water Supply Scheme. Co-ordinated the geotechnical investigation of two weir sites and an off-channel storage dam on the Black Mfolozi River, near Nyokeni in northern KZN. Client: Various

Kembe Hydro-Electric Power Plant - Preliminary geotechnical investigations for the Kembe hydro-electric power plant in the Central African Republic.

Various - Geotechnical and materials investigations for the rehabilitation of National Route 2 Section from the Pongola River to Pongola town, the N6/8 near Bloemfontein, Main Road 19 between Bhunya and Sandlane in Swaziland and the construction of a new a mine haul road for QMM in eastern Madagascar, Client: SANRAL, Swaziland Roads Department, QMM.
Hlabisa / Thuni Dams - Geotechnical investigations for the Hlabisa Dam in northern KZN and the Thuni Dam in north eastern Botswana, Client: KZN DOT, Botswana Department of Water affairs.

Roads in the Shinyanga Region - Conducted materials investigations for roads in the Shinyanga region of Tanzania, including roads from Shinyanga to Jomu, Jomu to Isaka and Jomu to Nzega. Client: Grinaker-LTA.

MR235/1 between Nkangala and Hlabisa - Assistant Resident Engineer on the contract for the construction of MR235/1 between Nkangala and Hlabisa in northern KwaZulu-Natal. Duties included contract monitoring and administration, materials assessment and verification, slope stability assessments, co-ordination of laboratory testing and community liaison. Also undertook the geotechnical and materials investigations for MR235/2 between Hlabisa and Bazini Client: KZNDOT

Buhemba Mine - Tailings dam investigation for the Buhemba Mine in Tanzania, Client: Merrameta

Victoria Road in the Cape Peninsula - Slope stability assessments along Victoria Road in the Cape Peninsula, Client: PAWC

Jeffares & Green (Pty) Ltd

1999 to 2001
Position- Senior Engineering Geologist

Various - Geotechnical and materials investigations for the upgrading of the Kei Cuttings in the Eastern Cape, the road between Nhlangano and Sicunusa in Swaziland, the John Ross Highway between Empangeni and Richards Bay, P102 south of Pretoria, the N7 north of Cape Town, Victoria Road between Camps Bay and Llandudno, Khetha Road in Mpendle, R56 near Rietvlei in southern KZN, D81 in Swaziland and the road between Chiweta and Karonga in Northern Malawi. Conducted regional studies to locate potential gravel materials for road construction, either usable naturally or by means of blending, on the

Cape West Coast, the Stormberg region of the Eastern Cape and in northern KZN. Compiled a database of gravel road construction materials for the West Coast District. Client: Various.

Various - Geotechnical foundation assessments for buildings, commercial developments and bridges. Client: Various

Various - Geotechnical assessments of structural distress in buildings for insurance claim loss adjustments. Client: Mutual & Federal

Ramotswa Regional Landfill - Conducted the geotechnical investigations for the Ramotswa Regional Landfill in southern Botswana. Included a preliminary assessment to locate candidate sites, ranking, final selection and detailed investigation of the selected site. Client: Group Consult Botswana.

Gold Mines in the Geita and Musoma areas - Geotechnical investigations for infrastructure developments of gold mines in the Geita and Musoma areas of northern Tanzania. Duties included geotechnical assessments for access roads, processing plants, tailing dams and shaft stability. Client: Merrameta.

Coffey Geosciences (Pty) Ltd (Australia)

1998 to 1999
Position- Senior Engineering Geologist

Northside Storage Tunnel - Co-ordinated the geotechnical investigations and undertook core logging for the Northside Storage Tunnel in North Sydney.

Slope stability assessments in Sydney.

Geotechnical foundation assessments for building developments in Sydney.

Suitability assessment of materials for dam construction near Kempsey, NSW.

Stability assessment of rock face at McCaffery's Hill, Pyrmont and a latite rock cutting at Kiama.

Jeffares & Green (Pty) Ltd

1997 to 1998
Position- Senior Engineering Geologist

Hillendale Mine - Geotechnical investigations for the Hillendale Mine near Richards Bay, including assessments for internal roads, founding conditions for a primary processing plant and a residue disposal dam. Client: Knight Piesold.

Various - Feasibility assessments of potential construction material sources for the Platinum Highway between Rustenburg and the Botswana border. Materials investigation for the reconstruction of the N10, near Middleton in the Eastern Cape. Client: Platinum Toll Concession, SANRAL.

Various - Bridge foundation and quarry investigations for the N11 near Newcastle, northern KZN. Investigations for bridge foundations, approach roads and borrow pits near Francistown, Botswana. Client: SANRAL, Botswana DOT.

Various - Geotechnical foundation investigations for various building structures throughout South Africa and Botswana, including site classifications according to the National Home Builders Registration Council. Client: Various.

Knight Piesold (Pty) Ltd.

1996 to 1997
Position- Senior Engineering Geologist

Nhlangano to Lavumisa - Geotechnical and materials investigation for the upgrading of the 87km road between Nhlangano to Lavumisa in Swaziland. Client: Swaziland Roads Department

Various - Foundation investigations for schools, residential complexes and a water treatment plant in Gauteng and the North-West Province. Client: Various.

Mine Tailings Dams and a Discard Dump - Geotechnical investigations for mine tailings dams and a discard dump in Mphumalanga and KZN. Client: ERGO, Ingwe.

Proposed Dam Site at Masunga - Geotechnical investigation of a proposed dam site at Masunga, in the North-East District of Botswana. Site found to be geotechnically unsuitable. Then undertook the preliminary geotechnical investigation of the Ntimbale dam site, near Francistown, including the dam centre-line investigation, sourcing of construction materials and investigations for appurtenant works. Client: Botswana Department of Water Affairs

Jeffares & Green Inc.

1987 to 1996
Position- Engineering Geologist

Durban Southern Gateway - Undertook the monitoring and supervision of the geotechnical drilling contract on the Durban Southern Gateway project, including core logging and assessment of founding conditions for bridges and road embankments on deep estuarine sediments. Client: SANRAL

Various - Monitoring, stability and settlement analyses of embankments, including a number of road embankments and bridge approaches overlying deep, compressible estuarine and alluvial deposits along the KZN coast and in Gauteng. Client: SANRAL, KZN DOT, PPC Cement

South-Western Outfall Sewer - Contract supervision of piling for a pump station and bridge located on dolomite for the South-Western Outfall sewer, south of Johannesburg. Involved the on-site analysis of percussion drilling results to determine optimum pile founding depths and the monitoring of pile installations. Client: City of Johannesburg

Bulk Water Supply Scheme for Mpendle - Geotechnical feasibility investigations of potential dam sites for a proposed bulk water supply scheme for Mpendle, KZN. Included assessments of founding conditions and stability along dam centre lines and the sourcing of construction materials. Also, undertook geotechnical investigations of founding conditions for appurtenant works and the initial environmental impact assessment. Client: Umgeni Water

South West Outfall Sewer pipeline and the Roodepoort Outfall Sewer pipeline - Geotechnical investigations for the 2.2m diameter South West Outfall Sewer pipeline and the Roodepoort Outfall Sewer pipelines. Included specific investigations for pipe jacking beneath roads, railways and housing. Client: City of Johannesburg

water pipeline from Brakfontein (Halfway House) to Kwaggaspoort (Pretoria) - Geotechnical investigation for the 20km long 1.7m diameter water pipeline from Brakfontein (Halfway House) to Kwaggaspoort (Pretoria). Sections of the route underlain by dolomite. Client: Rand Water.

Various - Geotechnical investigations for structures, transit routes and buildings on problem soils, including expansive clays, collapsible sands compressible clays and silts. Client: Various.

Mzimkulu River Bridge - Undertook the geotechnical investigation for the 300m long Mzimkulu River bridge, which required founding at depths down to 55m. Client: SANRAL / KZN DOT

Various - Numerous foundation investigations throughout Southern Africa for townships, commercial developments, schools, office blocks, hospitals, factories and housing. Clint: Various.

Various - Aerial photographic interpretation for various roads, townships and engineering geological mapping projects. Undertook engineering geological and land utilization mapping of a 43 000 ha area at Rust de Winter in Limpopo Province and the environmentally sensitive Duku-Duku area in KZN. Client: SA Geological Survey

Various - The location and investigation of sources of materials for use in the construction of roads, townships, dams and brick making. Undertook reconnaissance of a 6000km² area in northern KZN to identify potential sources of road construction materials**.** Client: Various

Various - Geotechnical and materials investigations for numerous roads projects including national freeways, urban arterials, township and rural roads, entailing route assessments, identification of problem subgrades, condition evaluations of existing road pavements, slope stability analyses and sourcing of construction materials. Geotechnical testing and instrumentation for embankments, cuttings, tunnels and foundations. Supervision of numerous contracts for rotary core drilling, percussion drilling, in-situ testing, instrumentation and large diameter auger boring. Client: Various.

Various - Ad hoc tunnel mapping and rock mass characterisation for the Inanda-Wiggins Scheme. Portal stability assessments on a number of existing tunnels in the Mngeni valley of KZN. Client: Umgeni Water

1986 to 1987
Position- Assistant Resident Engineer.

Project Floor, near Naboomspruit (now Mookgophong), Limpopo Province. Contract for the dynamic consolidation of collapsing sands for sensitive structures. Duties included contract supervision, monitoring of oedometer testing and settlement analysis. Client: SA Defence Force

1985 to 1986
Position- Resident Geologist

Mpolweni Tunnel, Ulundi, KZN -Resident Geologist for 1½ years on the construction of the 3km long Mpolweni Tunnel. Construction was by drill-and-blast and the tunnel route transected basaltic lava, quartzite, tillite and dolerite dykes. Undertook the engineering geological face and long wall mapping, joint analysis, rock mass descriptions and classifications, convergence monitoring, support and excavation assessment. Client: Spoornet

CONTINUED PROFESSIONAL DEVELOPMENT

Courses

1987 - Road Infrastructure Course (NITRR).
1987 - Kaytech Geosynthetics
1992 - Waste Management Workshop
1994 - In-Situ Testing in Geotechnical Engineering (SAICE)
1996 Dolomite Seminar (SAIEG)
1996 - Workshop on Waste Aquifer Separation Principle (WASP)
1999 - A Short Workshop on Suggested Interpretation Techniques of Soil Movement with Emphasis on Heave and Collapse Conditions (SAIEG)
1999 - Risk of Collapse of Formations in Berea Reds (SAICE)
2001 - Ground Improvement (SAICE)
2002 - Engineering Geology for Developing Countries, 9th IAEG Congress.
2004 - Workshop on Compaction of Road Materials (SARF)
2005 - Workshop on soil Stabilisation (SARF)
2005 - Geosynthetics in Road Construction (GIGSA)
2008 - Introduction to Geosynthetics (SAICE)
2009 - Sustainable Development of Dams in South Africa (SANCOLD)
2010 - Basic Principles of Design, Construction and Evaluation of Small to Medium Dams, especially Embankment Dams (SANCOLD)
2015 - Eurocode 7 Geotechnical Design (SAICE)
2017 - Filtration and Drainage with Geosynthetics (Kaytech)

Published Papers

2009 - Schreiner, HD, Norris, JC, Speirs, T, Melvill, AL "Non-Erosion Filtration Tests for Dam Filter Design" SANCOLD Conference, November 2009.

PERSONAL DETAILS

Nationality – South African
Date of Birth – *1958/11/02*
Domicile – Pietermaritzburg, South Africa

Languages

English – Excellent
isiZulu – Very Good
Afrikaans – Good
Ndebele – Good
Seswati – Fair
Xhosa – Fair

Universitas Nataliensis

hoc scripto nos, Universitatis Nataliensis
Vice-Cancellarius, Registrarius, testamur

JAMES THOMAS RASKELL SPEIRS

Gradum Scientiae Baccalaurei

admisse

Vice-Cancellarius

Registrarius

a.d. VI Kal. Mai. MCMLXXXV

400104/94

South African Council for Natural Scientific Professions

This is to certify that

James Thomas Maxwell Speirs

has been registered as a Professional Natural Scientist
in terms of section 11 of the Natural Scientific Professions Act, 1993

SACNASP

1994/09/23
Pretoria

President

Registrar

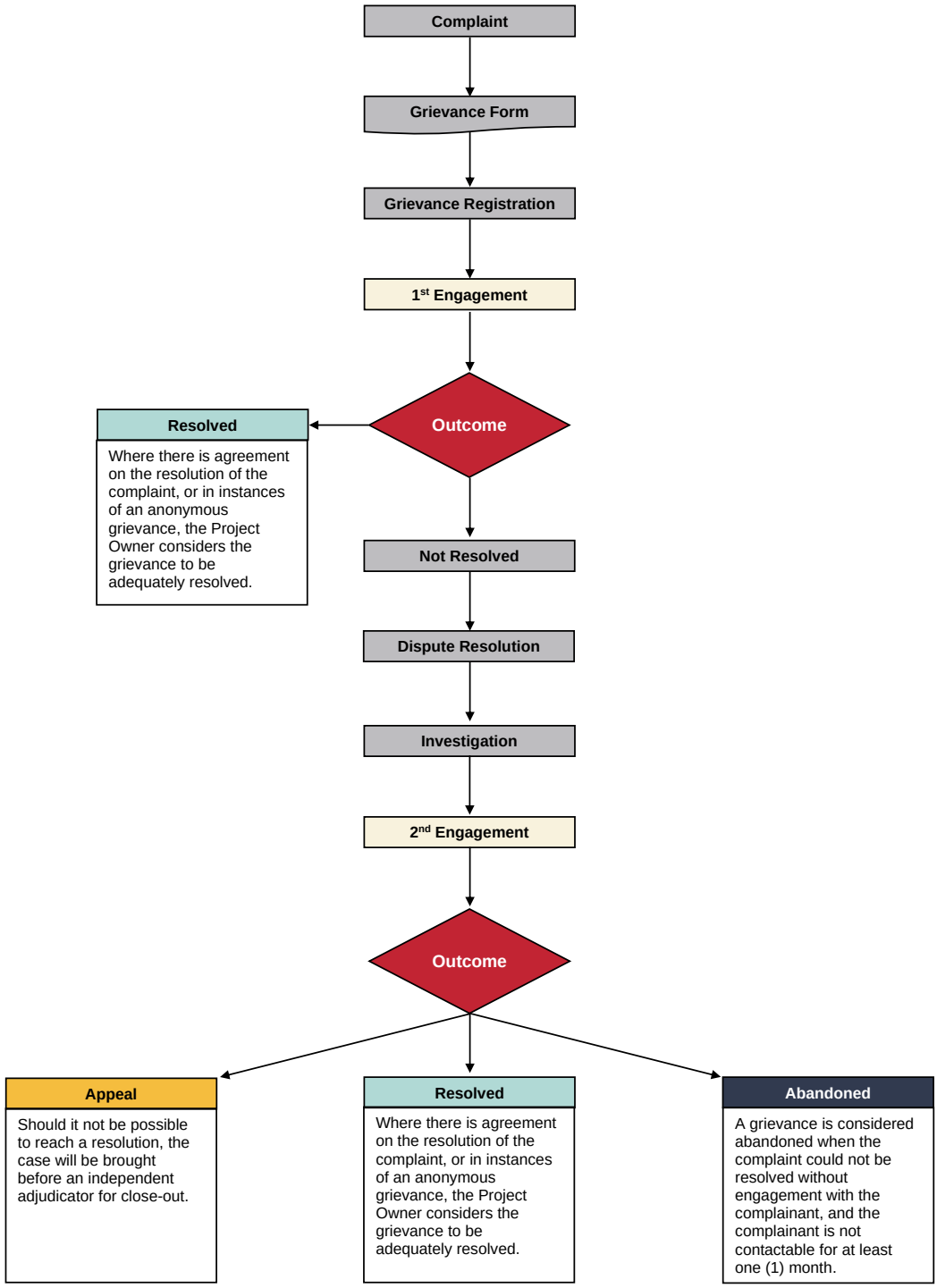
APPENDIX

P EXTERNAL STAKEHOLDER GRIEVANCE MECHANISM

Stakeholder Grievance Mechanism

The Project shall ensure that there an accessible grievance mechanism available to all external stakeholders, e.g., landowners, community members, or any other stakeholder impacted by the Project.

The mechanism shall follow the outline below:



The grievance mechanism shall include an escalation of external stakeholder grievances to the Project Shareholders to provide assurance that grievances are addressed timeously and adequately.

The Grievance Procedure, including the mechanisms for raising a grievance, shall be made project specific and be made available to external stakeholders.

Accessibility shall be ensured by the Project's Community Liaison Officers, for example through physical grievance boxes accessible in Laingsburg and Sutherland, online, or any other medium applicable and suitable to the Project.

APPENDIX

Q COMMUNITY HEALTH AND SAFETY PLAN

Community Health, Safety and Security Plan

The Project shall ensure that a project-specific Community Health, Safety and Security Plan (CHSSP) is developed and implemented throughout the which takes into account all potential impacts to communities in the project's area of influence, including security impacts. The plan shall apply to all project contractors and individuals.

While a project Security Management Plan shall be implemented on site, it is understood that this plan shall focus on the security of the Project, and project-associated resources.

Potential impacts on security in the community as a result of activities associated with the project, and the potential impacts of project security forces on the community must be managed appropriately.

The Project shall take cognisance of concerns raised by community stakeholders, including their experiences with other developments in the area as they pertain to potential damage to property, stock losses, and neglecting to manage farm gates appropriately.

In the compilation of the CHSSP, the aspects to be considered shall therefore include, at a minimum:

- Stock theft, poaching and damage to / loss of farm infrastructure, including gates, fences, solar panels, irrigation pipes, etc.
- Damage to roads (public and internal farm roads) related to construction traffic and transport of workers to and from site on a daily basis.
- Impact on water resources (water quality and availability).
- Impacts associated with influx and presence of construction workers, including, antisocial behaviour, gender violence, crime, alcohol and substance abuse and spread of diseases.
- Risks posed by behaviour of security personnel and abusive use of power.
- Safety and health risks posed by construction related activities, including the transport of materials and workers to site on daily basis and on-site construction activities.

Potential emergencies that may arise due to project activities must be included in the CHSSP, or the Project's emergency preparation and response plans.

Community complaints and concerns will be captured and addressed through the project's Grievance Mechanism, which shall be designed to provide a simple, fair and transparent process for all external parties to provide feedback and to raise grievances.

The CHSSP shall be compiled following stakeholder engagement, and shall be reviewed as required following changes in circumstances, project phases or following an incident which impacts, or could have reasonably impacted, the community.