

BRANDVALLEY WIND FARM (RF) (PTY) LTD
**BRANDVALLEY WIND ENERGY
FACILITY, NORTHERN AND WESTERN
CAPE PROVINCES (REF:
14/12/16/3/3/2/900)**
AMENDED ENVIRONMENTAL MANAGEMENT
PROGRAMME (EMPR)

19 MAY 2022

DRAFT





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ENERGY FACILITY,
NORTHERN AND
WESTERN CAPE
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14/12/16/3/3/2/900)
AMENDED ENVIRONMENTAL
MANAGEMENT PROGRAMME
(EMPR)
BRANDVALLEY WIND FARM (RF) (PTY) LTD




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QUALITY MANAGEMENT ¹

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This Amended Environmental Management Programme (Report) has been prepared by WSP Group Africa Proprietary Limited (WSP) on behalf and at the request of Brandvalley Wind Farm (RF) (Pty) Ltd (Client), to provide the Client with an understanding of the mitigation measures required for the proposed project.

Unless otherwise agreed by us in writing, we do not accept responsibility or legal liability to any person other than the Client for the contents of, or any omissions from, this Report.

To prepare this Report, we have reviewed only the documents and information provided to us by the Client or any third parties directed to provide information and documents to us by the Client. We have not reviewed any other documents in relation to this Report, except where otherwise indicated in the Report.

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LIST OF ACRONYMS / ABBREVIATIONS

BA	Basic Assessment
CAA	Civil Aviation Authorities
CITES	Convention of International Trade in Endangered Species
CLO	Community Liaison Officer
CSF	Co-ordinating Social Facilitator
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DFFE	Department of Forestry, Fisheries and the Environment
DENC	Department of Environment and Nature Conservation (Northern Cape)
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme report (this report)
ESCO	Environmental Site Officer
GWH	Giga-Watt Hours
HWC	Heritage Western Cape
I&AP	Interested and Affected Party
IEC	Independent Environmental Consultant
IEM	Integrated Environmental Management
IPP	Integrated Power Producers
KPI	Key Performance Indicator
MW	Mega-Watt
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
OHSA	Occupational Health and Safety Act
PC	Principal Contractor
PSC	Project Steering Committee
S&EIR	Scoping and Environmental impact assessment process
SAHRA	South African Heritage Resource Agency
SWMP	Storm Water Management Plan
WEF	Wind Energy Facility



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G	AGRICULTURAL WALKDOWN REPORT



- H** AVIFAUNA WALKDOWN REPORT
- I** ECOLOGY WALKDOWN REPORT
- J** VISUAL WALKDOWN REPORT
- K** HERITAGE WALKDOWN REPORT
- L** SURFACE WATER WALKDOWN REPORT
- M** BAT WALKDOWN REPORT
- N** SOCIAL REPORT
- O** GEOTECHNICAL REPORT
- P** EXTERNAL STAKEHOLDER GRIEVANCE MECHANISM
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1 INTRODUCTION

1.1 BACKGROUND

Brandvalley Wind Farm (Pty) Ltd proposes to develop the 140 megawatt (MW) Brandvalley Wind Energy Facility (WEF) between Matjiesfontein and Sutherland within the Northern and Western Cape Provinces. A Scoping and Environmental Impacts Assessment (S&EIA) process was undertaken 2016 by EOH Coastal & Environmental Services (EOH) (the independent Environmental Assessment Practitioner (EAP) at the time of undertaking the S&EIA process).

The proposed project formed part of the Fifth Bid Window submissions under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). **The Brandvalley WEF has been confirmed a Round 5 Preferred Bidder Project and is a confirmed Strategic Infrastructure Project in terms of the Infrastructure Development Act 9 (Act No.23 of 2014).**

The proposed Brandvalley WEF was originally granted Environmental Authorisation (EA) on 23 November 2016 (Ref: 14/12/16/3/3/2/900). The EA authorised 58 wind turbines of a maximum generating capacity of 140MW in total, with a hub height of 120m and the rotor diameter of 140m. The Appeals Directorate received appeals against the decision of the Department on 22 December 2016 and 06 January 2017. The grounds of appeal by the appellants were provided to the applicant, who submitted responding statements thereto on 25 and 26 January 2017. In a decision letter dated 28 July 2017 the appeal was dismissed, and the issued EA upheld.

The EA was amended on 14 February 2019 (Ref: 14/12/16/3/3/2/900/AM1) to include the following:

- Change of the contact details for the EA holder.
- Change of the technical specifications turbine to rotor diameter of up to 160m.
- Change of the technical specifications turbine to hub height from ground level up to 125m.
- Amendment of the wording for the technical specifications of the wind measuring masts, from: “4x120 m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase”, to “4x125 m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase (final height shall be the same as the hub height)”.
- Change of the technical specifications turbine to generation Capacity: 2 - 5.5 MW.

The Appeals Directorate received an appeal on 07 March 2019, on behalf of the three appellants, against the amendment decision taken by the Department. A copy of the appeal was provided to the applicant, who submitted a responding statement on 27 March 2019. On 12 April 2019, the appellants submitted an answering statement, and thereafter comments on the grounds of appeal were thereafter received from the Department on 12 April 2019. The appeal was dismissed in a decision document dated 07 August 2019, and the issued EA amendment upheld.

The EA was amended on 11 November 2021 (Ref: 14/12/16/3/3/2/900/AM2) to extend its validity for five (5) years. An appeal was lodged on 2 November 2021. All of the aspects raised in the appeal have been resolved or mitigated within this EMPr.

The EAs issued for Brandvalley WEF indicates that the EMPr submitted as part of the original EIA process is not approved and must be amended to include measures as dictated by the final site layout map and micro-siting; and the provisions of the EAs. Therefore, this EMPr (this Report) is an update of the original EMPr (dated September 2016) compiled as part of the S&EIA process for the proposed Brandvalley WEF.

This EMPr is updated to include, but not limited to the above-mentioned requirements as contained in the conditions of the EA. This EMPr will be made available for comments by registered Interested and Affected Parties (I&APs) for a 30-day comment period and the holder of EAs must consider such comments (Condition 16) in accordance with Regulations 39-44 of the EIA Regulations, 2014 (as amended). Once amended, the final EMPr must be submitted to the Department of Forestry, Fisheries and Environment (DFFE) for written approval prior to commencement of the activity.

It is important to note that subsequent to the EA issued and during the final layout development and micro-siting, several amendments have been made for the Brandvalley WEF project, this includes reducing the number of turbines from the authorised 58 to 32 turbine positions.

1.2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

The updates to the EMPr (this Report) are based on the original EMPr compiled in 2016 by EOH, and have been updated by the EAP, Babalwa Mqokeli, under the employ of WSP Group Africa (Pty) Ltd. **Table 1-1** Outlines the details of the EAP and their expertise. The CV's of the Consultant (EAP) and Project Manager are included in **Appendix A**.

Table 1-1: Details and Expertise of the EAP

	<u>CONSULTANT</u>
<u>Company:</u>	WSP Group Africa (Pty) Ltd
<u>Contact Person:</u>	Babalwa Mqokeli
<u>Physical Address</u>	1 st Floor, Pharos House, 70 Buckingham Terrace, Westville Durban, 3629
<u>Telephone:</u>	031 240 8804
<u>Fax:</u>	031 240 8804
<u>E-mail:</u>	Babalwa.mqokeli@wsp.com
<u>Years' Experience</u>	6
<u>Qualifications</u>	MSc Ecological Science, University of KwaZulu-Natal
<u>Professional Registration</u>	SACNASP (Pr. Sci. Nat. – Reg. No. 009863 - Environmental Science)
<u>EAP Expertise</u>	<p>Babalwa has 6 years of experience in environmental assessment and management, and over 1 year of experience as an ecological scientist intern. She is a registered Professional Natural Scientist (Pr. Sci. Nat.) in Environmental Science (Reg. No: 009863) with the South African Council of Natural Scientific Professions.</p> <p>Babalwa has experience in the management and integration of various types of environmental assessments, including the mining, industrial, agricultural and renewable energy sector. Her experience includes environmental screening mapping using ArcGIS. She has also been part of the team undertaking the National Wind and Solar Strategic Environmental Assessment work.</p>

1.3 ENVIRONMENTAL MANAGEMENT PROGRAMME STRUCTURE

Table 1-2 cross-references the sections within the Environmental Management Programme (EMPr) with the legislated requirements as per Appendix 4 of Government Notice Regulation (GNR) 982 (as amended).

Table 1-2: Legislation Requirements as detailed in Appendix 4 of GNR 326

<u>APPENDIX</u>	<u>LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982</u>	<u>RELEVANT REPORT SECTION</u>
<u>4</u>		
<u>(a)</u>	details of-	
	(i) the EAP who prepared the EMPr: and	Section 1.2

<u>APPENDIX 4</u>	<u>LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982</u>	<u>RELEVANT REPORT SECTION</u>
	<u>(ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;</u>	<u>Appendix A</u>
<u>(b)</u>	<u>a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;</u>	<u>Section 3</u>
<u>(c)</u>	<u>a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;</u>	<u>Figure 3-3</u> <u>Figure 5-2</u> <u>Figure 5-3</u> <u>Appendix B</u>
<u>(d)</u>	<u>A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-</u> <u>(i) planning and design;</u> <u>(ii) pre-construction activities;</u> <u>(iii) construction activities;</u> <u>(iv) rehabilitation of the environment after construction and where applicable post closure; and</u> <u>(v) where relevant, operation activities;</u>	<u>Section 4</u>
<u>(f)</u>	<u>a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to -</u> <u>(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;</u> <u>(ii) comply with any prescribed environmental management standards or practices;</u> <u>(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and</u> <u>(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable</u>	<u>Section 7</u>
<u>(g)</u>	<u>the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);</u>	<u>Section 7</u>
<u>(h)</u>	<u>the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);</u>	<u>Section 7</u>
<u>(i)</u>	<u>an indication of the persons who will be responsible for the implementation of the impact management actions;</u>	<u>Section 7</u>

APPENDIX 4	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 982	RELEVANT REPORT SECTION
(j)	<u>the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;</u>	<u>Section 7</u>
(k)	<u>the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);</u>	<u>Section 6,</u> <u>Section 7,</u> <u>Section 8</u>
(l)	<u>a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations</u>	<u>Section 6</u>
(m)	<u>an environmental awareness plan describing the manner in which-</u>	<u>Section 6</u>
	<u>(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and</u>	
	<u>(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and</u>	
(n)	<u>any specific information that may be required by the competent authority</u>	<u>Not Applicable</u>

1.4 APPLICABLE CONDITIONS OUTLINED IN ENVIRONMENTAL AUTHORISATION

For the purposes of demonstrating adherence to the requirements of the EA for the proposed Brandvalley WEF, **Table 1-3** cross references the sections within this updated EMPr Report as per the applicable EA conditions and DFFE requirements.

Table 1-3: Requirements as detailed in the Conditions of the EA (Ref Number: 14/12/16/3/3/2/900)

NO.	CONDITION	EMPR REFERENCE
14	<p>A copy of the final development layout map must be made available for comments by registered Interested and Affected Parties and the holder of this environmental authorisation must consider such comments. Once amended, the final development layout map must be submitted to the Department for written approval prior to commencement of the activity. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following :</p> <p>14.1 Cable routes (where they are not along internal roads);</p> <p>14.2 Position of wind turbines and associated infrastructure;</p> <p>14.3 Internal roads indicating width;</p> <p>14.4 Wetlands, drainage lines, rivers, stream and water crossing of roads and cables;</p>	<p>As part of the finalisation of the EMPr process a final development layout (compliant with the requirements of this condition) has been compiled and is included in Chapter 3 (Figure 3-3) of this EMPr and Appendix B of this EMPr.</p> <p>This EMPr and final development layout map is being released for a 30-day comment period (19 May 2022 to 21 June 2022), and comments received from I&APs will be incorporated into the Final EMPr for submission to the Department in order to comply with this condition.</p>

NO. CONDITION

EMPR REFERENCE

	<p>14.5 All sensitive features eg. Important Bird Areas, Critical Biodiversity Areas, Ecological Support Areas, heritage sites, wetlands, pans and drainage channels that will be affected by the facility and associated infrastructure;</p> <p>14.6 Substation(s) inverters and/or transformer(s) sites including their entire footprint;</p> <p>14.7 Connection routes (including pylon positions) to the distribution/transmission network;</p> <p>14.8 All existing infrastructure on the site, such as roads;</p> <p>14.9 Soil heaps (temporary for topsoil and subsoil and permanently for excess material);</p> <p>14.10 Buildings, including accommodation; and,</p> <p>14.11 All "no-go" and buffer areas.</p>
<p>15</p> <p>Furthermore, a shapefile of the approved development layout/footprint must be submitted to this Department within two months from the date of this decision. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the W63 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; .dbf; .prj; and, .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1 :10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title. The shape file must be submitted to:</p> <p>Postal Address:</p> <p>Department of Environmental Affairs Private Bag X447 Pretoria 0001</p> <p>Physical address:</p> <p>Department of Environmental Affairs Environment House</p> <p>Physical address :</p> <p>Department of Environmental Affairs Environmental Authorisation Reg. No. 14/12/161313121900 473 Steve Biko Arcadia</p>	<p>A shapefile of the approved final development layout , developed as part of this EMPr update, will be submitted to the Department as required post the approval of this EMPr and final layout.</p>

NO.	CONDITION	EMPR REFERENCE
	<p>Pretoria</p> <p>For Attention: Mr Muhammad Essop</p> <p>Integrated Environmental Authorisations</p> <p>Strategic Infrastructure Development's</p> <p>Telephone Number: (012) 399 9406</p> <p>Email Address: MEssop@environment.gov.za</p>	
16	<p>The Environmental Management Programme (EMPr) submitted as part of the EIAr is not approved and must be amended to include measures as dictated by the final site lay-out map and micro-siting; and the provisions of this environmental authorisation. registered interested and Affected Parties and the holder of this environmental authorisation must consider such comments. Once amended, the final EMPr must be submitted to the Department for written approval prior to commencement of the activity. Once approved the EMPr must be implemented and adhered to.</p>	<p>WSP has been commissioned to update the EMPr (compliant with the requirements of this condition) which will also be subject to review by I&APs for a period of 30 days (19 May 2022 to 21 June 2022) prior to being submitted to the DFFE for approval.</p> <p>Relevant specialists were commissioned, where recommendation measures proposed by the specialists have been included accordingly in the relevant sections.</p>
17	<p>The EMPr amendment must include the following:</p>	
17.1	<p>The requirements and conditions of this authorisation.</p>	<p>The EMPr has been updated to include the requirements of these conditions, measures included in the EIAr and relevant specialist assessments (refer to Chapter 7). Relevant specialist walkdowns were undertaken in fulfilment of certain conditions contained in this EA, as well as for the generation of the applicable listed plans.</p>
17.2	<p>All recommendations and mitigation measures recorded in the EIAr.</p>	
17.3	<p>All mitigation measures as listed in the specialist reports must be included in the EMPr and implemented.</p>	
17.4	<p>The final site layout map.</p>	<p>This EMPr amended to included an updated final layout Figure 3-3) and Appendix B. The environmental sensitivities identified during the EIA phase, informed by specialist assessments, as well as those identified during the specialist walkdown, were used to inform the final site layout developed in this EMPr.</p>
17.5	<p>An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien Species and ensure that the continuous monitoring and removal of alien species is undertaken.</p>	<p>An alien and invasive management plan, in line with this condition is included in Chapter 8 (Section 8.1) of this EMPr.</p>
17.6	<p>A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and be implemented prior to commencement of the construction phase.</p>	<p>A plant rescue and protection plan has been compiled, and is informed by the findings and identified listed and protected species and recommendations included in the Ecology & Biodiversity Walkdown undertaken for this project..</p> <p>Refer to Section 8.2 of this EMPr for this information..</p>

NO.	CONDITION	EMPR REFERENCE
17.7	A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	A re-vegetation and habitat rehabilitation plan, in line with this condition, is included Section 8.3 of this EMPr.
17.8	A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	Appendix C contains the traffic and transport management plan for the site access roads in line with this condition.
17.9	The construction and operational avifaunal monitoring plan that is in line with BirdLife South Africa/Endangered Wildlife Trust's most recent guideline.	The construction and operational avifaunal monitoring plan, considering Birdlife guidelines, is included in Appendix D .
17.10	A conservation management plan as required by SAHRA.	Appendix F contains the conservation management plan compiled for this project.
17.11	A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	A conceptual stormwater management plan (SWMP) is outlined in Section 8.4 of this EMPr and will be updated and/or built into the detailed engineering design SWMP.
17.12.	An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	An erosion management plan is included in Section 8.5 of this EMPr.
17.13.	An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	A hazardous substances leakage or spillage monitoring system is included in Section 8.6 of this EMPr.
17.14.	A fire management plan to be implemented during the construction and operational phases.	A fire management plan is included in Section 8.7 of this EMPr.
17.15.	Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from	A plan to protect hydrological features and sensitive areas is included in Section 8.8 of this EMPr.

NO.	CONDITION	EMPR REFERENCE
	construction impacts including the direct or indirect spillage of pollutants.	
17.16	An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	Refer to Figure 5-2 and Figure 5-3 (Chapter 5) of this EMPr for an environmental sensitivity map compiled during the EIA process.
17.17.	A map combining the final layout map superimposed (overlain) on the environmental sensitivity map. This map must reflect the proposed location of the turbine as stated in the EIAR and this authorisation.	Refer to Figure 5-2 and Figure 5-3 (Chapter 5) of this EMPr for a map combining the final layout map overlain onto the environmental sensitivity map. This map reflects amended turbine positions amended post the EA in developing the final layout map. A map detailing the location of the turbines as stated in the EIAR and this EA is included in Figure 3-2 .
36	A uniform 200m buffer applies to all identified bat 'no-go' areas. No turbines are to be located on the edge of the buffer	This is noted and has been complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3 , Figure 5-2 and Figure 5-3)
37	The results of the pre-construction bird monitoring assessment including all recommendations proposed by the reports dated September 2016, must inform the final layout and the construction schedule of the energy facility.	This is noted and has been complied with. A summary of the finding from the avifauna specialist walkdown is included in section 5 of this EMPr. Recommendations and measures of the of the 2016 study and 2021 specialist walkdown have been incorporated into this EMPr (Chapter 7). Compliance has also been demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3 , Figure 5-2 and Figure 5-3).
38	A construction and operation monitoring plan must be developed and be implemented to survey impacts resulting from the infrastructure installation on the bird communities, as well as continue to gather information on the bird communities present in the area and monitor the effectiveness of the mitigation measures for a minimum duration of at least three years during operation.	Birds and Bats Unlimited was commissioned to compile the required construction and operation monitoring plan (see Appendix D).
40	A bat monitoring program to determine the actual impacts on the bat community for a minimum of three years must be developed and be implemented. This must be done according to the latest SABAAP's guidelines.	Animalia Consulting was commissioned to compile the required bat monitoring plan (see Appendix E).
42	The facility must be designed in a manner such that infrastructure components that could be used as perching or roosting substrates by birds and bats must be prohibited.	This is noted and include in the design management measures, to be complied with during the detailed design phase.
44	Anti-collision devices such as bird flappers must be installed where power lines cross avifaunal corridors (e.g. grasslands, rivers, wetlands, and dams). The input of an avifaunal specialist must be obtained. For the fitting of the anti-collision devices onto specific sections of the line once the exact positions of the towers have been surveyed and pegged. Additional areas of high sensitivity	Birds and Bats Unlimited was commissioned to provide input into the final layout design, and this includes input into the location of anti-collision measures (see Section 5.4 and Chapter 7).

NO. CONDITION

EMPR REFERENCE

	along the preferred alignment must also be identified by the avifaunal specialist for the fitment of anti-collision devices. These devices must be according to Eskom’s Transmission and EWT’s Guidelines.	
45	A pre-construction walk through on the selected power line alignment and turbine positions by a bat specialist, avifaunal specialist and ecologist, must be conducted to ensure that the micro-siting of the turbines and power line has the least possible impact, there are no nests sites of priority species on or close to the construction corridor and all protected plant species impacted are identified.	An avifauna specialist, Birds and Bats Unlimited; bat specialist, Animalia Consultants; and ecology specialist, Trusted Partners were commissioned to complete the required pre-construction walk through. A summary of the findings of these specialist walkdowns is included in Chapter 5 of this EMPr.
46	The 'no-go' areas of the development property must be clearly demarcated and must be excluded from the final layout plan.	This is noted and has been complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3, Figure 5-2 and Figure 5-3)
47	All watercourses and associated wetlands are regarded as sensitive. All developments within 500m of watercourses must comply with National Water Act.	This is noted and will be complied with. A WULA application has been lodged with the DWS in order to comply with the National Water Act.
48	No powerline towers, substations and construction camps must be placed within the delineated water courses as well as their respective buffers without obtaining the required approvals. A 32m buffer must be applied along all identified watercourses and a 50m buffer must be applied along all identified wetlands. No substations, construction camps, temporary or permanent laydown areas or any activities associated with the development are to be located within the National Protected Areas Expansion Strategy focus area (NPAES).	This is noted and will be complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3, Figure 5-2 and Figure 5-3)
49	No substations, construction camps, temporary or permanent laydown areas or any activities associated with the development are to be located within the National Protected Areas Expansion Strategy focus area (NPAES).	This is noted and will be complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3, Figure 5-2 and Figure 5-3).
50	A pre-construction survey of the final development footprint must be conducted by a qualified floral specialist to identify protected species affected by the proposed development. Prior to the commencement of construction, a rescue and rehabilitation operation for these species which could survive translocation must be conducted.	Trusted Partners, ecology specialists, have undertaken the required pre-construction walk through (Appendix I). A summary of the findings of these specialist walkdown is included in Chapter 5 of this EMPr.
51	Before the clearing of the site, the appropriate permits must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal of plants listed in the National Forest Act and from the relevant provincial department for the destruction of species protected in terms of the Specific provincial legislation. Copies of the permits must be made available on request.	In the event that such permits are required, the EA holder commits to completing this in line with the condition requirements. The ecology walkdown recommended that a flora and fauna search and rescue (relocation) must be undertaken before commencement of vegetation clearing and should preferable be undertaken in the Spring season. A comprehensive list of species for which permits will be required, is provided in the ecology & biodiversity walkdown report compiled by Trusted

NO.	CONDITION	EMPR REFERENCE
		Partners. This measure has also been included in this EMPr.
56	No activities will be allowed to encroach into a water resource without a Water Use License being in place from the Department of Water and Sanitation.	This is noted and will be complied with. A WULA application has been lodged with the DWS in order to comply with the National Water Act.
59	Relevant permits must be obtained from relevant authorities for any removal or destruction of Threatened or Protected Species (TOPs).	The EA holder commits to completing this (in line with the condition requirements) pre-construction with support from Trusted Partners (ecological specialist). This will be finalised after preferred bidder stage and informed by the specialist walkdown assessment and species list compiled by Trusted Partners (Appendix I).
62	Bridge design must be such that it minimise impact to riparian areas with minimal alterations to water flow and must allow the movement of fauna and flora.	At this stage it is not anticipated that bridges will be necessary. However, Water Use Licence Associates (Pty) Ltd has been appointed by the EA holder to undertake the Water Use Licence (WUL) Applications. In the event that bridges are required, bridge designs will be required for WUL approval.
63	The final development area should be surveyed for Species suitable for search and rescue, which should be trans-located prior to the commencement of construction.	Trusted Partners was commissioned to complete the required pre-construction walk through (see Chapter 5 and Appendix I).
64	Electric fencing should not have any strands within 30cm of the ground, which should be sufficient to allow smaller mammals, reptiles and tortoises to pass through, but still remain effective as a security barrier.	This is noted and included as a measure in this EMPr for implementation.
65	Disturbed areas must be rehabilitated as soon as possible after construction with locally indigenous plants to enhance the conservation of existing natural vegetation on site.	This is noted and included as a measure in this EMPr for implementation.
66	Wetlands, rivers and river riparian areas must be treated as “no-go” areas and appropriately demarcated as such. No vehicles, machinery, personnel, construction material, fuel, oil, bitumen or waste must be allowed into these areas without the express permission of and supervision by the ECO, except for rehabilitation work in these areas.	This is noted and included as a measure in this EMPr for implementation.
67	Workers must be made aware of the importance of not destroying or damaging the vegetation along rivers and in wetland areas and this awareness must be promoted throughout the construction phase.	This is noted and included as a measure in this EMPr for implementation.
68	Freshwater ecosystems located in close proximity to the construction areas must be inspected on a regular basis by the ECO for signs of disturbance from construction activities. If signs of disturbance are noted, immediate action must be taken to remedy the situation and, if necessary, a freshwater ecologist must be consulted for advice on the most suitable remediation measures.	This is noted and included as a measure in this EMPr for implementation.

NO.	CONDITION	EMPR REFERENCE
69	No discharge of effluents or polluted water must be allowed into any rivers or wetland areas.	This is noted and included as a measure in this EMPr for implementation.
70	If construction areas are to be pumped of water (e.g. after rains), this water must be pumped into an appropriate settlement area, and not allowed to flow into any rivers or wetland areas.	This is noted and included as a measure in this EMPr for implementation.
71	Workers must be made aware of the importance of not polluting rivers or wetlands and of not undertaking activities that could result in such pollution, and this awareness must be promoted throughout the construction phase.	This is noted and included as a measure in this EMPr for implementation.
72	Freshwater ecosystems located in close proximity to the site must be inspected on a regular basis (but especially after rainfall) by the ECO for signs of sedimentation and pollution. If signs of sedimentation or pollution are noted, immediate action must be taken to remedy the situation and, if necessary, a freshwater ecologist must be consulted for advice on the most suitable remediation measures.	This is noted and included as a measure in this EMPr for implementation.
73	Access road Alternative 1 as described above is approved as the site access to the development area.	This is noted and will be confirmed in the final site layout plan.
74	Internal access roads and internal powerlines/cables that pass through the NPAES must be confined to existing roads and any upgrades must be limited to no more than 9m with a 30m clearly demarcated buffer zone.	This is noted and will be complied with. Compliance will be demonstrated within the final layout plan, overlain over an environmental sensitivities map.
76	All structures crossing streams must be located and constructed so that they do not decrease channel stability or increase water velocity.	This is noted and included as a measure in this EMPr for implementation.
77	A designated access to the site must be created and clearly marked to ensure safe entry and exit.	This is noted and included as a measure in this EMPr for implementation. Additionally, a Traffic Management Plan (Appendix C) has been prepared to enable the identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility.
78	Signage must be erected at appropriate points warning of turning traffic and the construction site	
79	Construction vehicles carrying materials to the site should avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	
80	Road borders should be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak.	
81	Roads must be designed so that changes to surface water runoff are avoided and erosion is not initiated.	

NO.	CONDITION	EMPR REFERENCE
82	All construction vehicles should adhere to a low-speed limit to avoid collisions with susceptible species such as snakes and tortoises.	
83	The potential noise impact must be re-evaluated should the layout be changed such that any wind turbines are located closer than 1,000m from a confirmed noise sensitive area.	None of the turbines in the updated layout are located closer than 1200m from the receptors.
84	Routine noise measurements must be conducted during the operation of the facility and a complaints register must be opened and made available to affected parties and to the Department on request.	This is noted and included as a measure in this EMPr for implementation.
85	Additional monitoring must be undertaken at wind turbine 52 and wind turbine 53 should any noise complaints be received. The noise investigation must be done by an independent acoustic consultant and if the noise level is found to be of unacceptable levels, noise mitigation measures should be implemented to cushion those that are affected.	This is noted and included as a measure in this EMPr for implementation.
86	The holder of this authorisation must ensure that the construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA must wear ear protection equipment.	This is noted and included as a measure in this EMPr for implementation.
87	The holder of this authorisation must ensure that all equipment and machinery are well maintained and equipped with silencers.	This is noted and included as a measure in this EMPr for implementation.
88	The holder of this authorisation must provide a prior warning to the community when a noisy activity eg. blasting is to take place.	This is noted and included as a measure in this EMPr for implementation.
89	Positions of turbines jeopardizing compliance with accepted noise levels should be revised during the micro-siting of the units in question and predicted noise levels re-modelled by the noise specialist, in order to ensure that the predicted noise levels are less than 45dB(A).	None of the turbines in the updated layout are located closer than 1200m from the receptors. The results of the Noise Impact Assessment indicate that the 24 hour 45 dB(A) limit for day/night operations will not be exceeded at any of the noise sensitive areas.
112	An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling and re-use options where appropriate.	This is noted. An integrated waste management plan will form part of the updated EMPr for implementation.
121	A 30m buffer must be applied around all identified archaeological sites.	This is noted and will be complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map.
125	All buffers and no-go areas stipulated in this report must be adhered to for both the facilities and all roads and powerlines.	This is noted and will be complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map.

NO.	CONDITION	EMPR REFERENCE
128	The final layout should be shown to the appointed archaeologist before implementation to confirm that all significant heritage resources have been adequately protected.	This is noted and will be complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3, Figure 5-2 and Figure 5-3). An Agricultural Assessment of the WEF Layout and adequacy of the EMPr was undertaken by Johann Lanz (see Chapter 5 and Appendix G).
129	The approved turbines must be placed in a manner to avoid all designated, "no-go" areas as well as its buffers.	This is noted and will be complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3, Figure 5-2 and Figure 5-3).
130	The final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by botanical and avifaunal specialists.	This is noted and will be complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3, Figure 5-2 and Figure 5-3). The final layout map was assessed by botanical and avifaunal specialists to determine sensitivities associated with the turbine positions (see Chapter 5, Appendix I and Appendix H).
131	Exclusion of sensitive ecological, heritage and paleontological areas from construction activities must inform micro siting of all development activities.	This is noted and will be complied with. Compliance is demonstrated within the final layout plan, overlain over an environmental sensitivities map (refer to Figure 3-3, Figure 5-2 and Figure 5-3).
132	Turbines must be positioned in such a way that shadow flicker does not affect any farm buildings.	The potential impacts resulting from shadow flicker were assessed in the previous VIA for the Brandvalley WEF and it was concluded that there are no buildings within 800m of a wind turbine and as such the proposed turbine layout is not expected to result in any flicker impacts affecting the identified receptors (Appendix J).

1.5 APPLICABLE DOCUMENTATION

The following documents are to be read in conjunction with the EMPr:

- Final Environmental Impact Assessment (EIA) Report for the Brandvalley WEF (2016);
- Draft Amendment Report for the Brandvalley WEF (Dated April 2022);
- EA issued on 23 November 2016 (Ref: 14/12/16/3/3/2/900) in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) and all subsequent amendments;
- The Brandvalley Environmental and Social Management System (ESMS) (to be compiled prior to project commencement);
- Management Plans included in **Appendices C to F**; and
- Specialist walkdown input included in **Appendices G to O**.

2 ENVIRONMENTAL LEGAL FRAMEWORK

2.1 SOUTH AFRICAN REGULATORY FRAMEWORK

Key legislation currently applicable to the design, construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:-

- The Constitution of the Republic of South Africa Act 108 of 1996;
- National Environmental Management Act 107 of 1998;
- National Environmental Management: Protected Areas Act 57 of 2003;
- National Environmental Management: Biodiversity Act 10 of 2004;
- National Forests Act 43 of 1983;
- National Water Act 36 of 1998;
- Conservation of Agricultural Resources Act 43 of 1983;
- National Veld and Forest Fire Act 101 of 1998;
- Hazardous Substances Act 15 of 1973;
- National Heritage Resources Act 25 of 1999;
- National Environmental Management: Air Quality Act 39 of 2004;
- National Environmental Management: Waste Management Act 59 of 2008;
- Mineral and Petroleum Resources Development Act 28 of 2002;
- Occupational Health and Safety Act 85 of 1993;
- Astronomy Geographic Advantage Act 21 of 2007;
- National Road Traffic Act 93 of 1996;
- Spatial Planning and Land Use Management Act 16 of 2013;
- Civil Aviation Act No. 13 of 2009: 13th Amendment of the Civil Aviation Regulations;
- Subdivision of Agricultural Land Act 70 of 1970; and
- All relevant provincial legislation, Municipal by-laws and ordinances.

The contractor shall establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes. The permitting currently applicable to this project are described in Section 2.2 of this report.

2.2 INTERNATIONAL REGULATORY FRAMEWORK

The objectives and applicability of the eight International Finance Corporation (IFC) Performance Standards (PS) are detailed in Table 2-1.

Table 2-1: Objectives and Applicability of the IFC PS's

<u>Reference</u>	<u>Requirements</u>	<u>Project Specific Applicability</u>
<u>Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts</u>		
<u>Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.</u>		
<u>Objectives:</u>		
– <u>To identify and evaluate environmental and social risks and impacts of the project.</u>		
– <u>To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, 5 and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.</u>		
– <u>To promote improved environmental and social performance of clients through the effective use of management systems.</u>		

Reference	Requirements	Project Specific Applicability
	<ul style="list-style-type: none"> – <u>To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.</u> – <u>To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.</u> 	
1.1	<u>Policy</u>	A formal ESMS will be compiled for the project prior to its commencement.
1.2	<u>Identification of Risks and Impacts</u>	
1.3	<u>Management Programmes</u>	
1.4	<u>Organisational Capacity and Competency</u>	
1.5	<u>Emergency Preparedness and Response</u>	
1.6	<u>Monitoring and Review</u>	
1.7	<u>Stakeholder Engagement</u>	
1.8	<u>External Communication and Grievance Mechanism</u>	
1.9	<u>Ongoing Reporting to Affected Communities</u>	
<u>Performance Standard 2: Labour and Working Conditions:</u>		
<u>Performance Standard 2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers</u>		
<u>Objectives:</u>		
<ul style="list-style-type: none"> – <u>To promote the fair treatment, non-discrimination, and equal opportunity of workers.</u> – <u>To establish, maintain, and improve the worker-management relationship.</u> – <u>To promote compliance with national employment and labour laws.</u> – <u>To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client’s supply chain.</u> – <u>To promote safe and healthy working conditions, and the health of workers.</u> – <u>To avoid the use of forced labour.</u> 		
2.1	<ul style="list-style-type: none"> – <u>Working Conditions and Management of Worker Relationship</u> – <u>Human Resources Policy and Management</u> – <u>Working Conditions and terms of Engagement</u> – <u>Workers organisation</u> – <u>Non- Discrimination and Equal Opportunity</u> – <u>Retrenchment</u> – <u>Grievance Mechanism</u> 	A formal ESMS will be compiled for the project prior to its commencement. Human resource and labour policies will be included in the ESMS.
2.2	<ul style="list-style-type: none"> – <u>Protecting the Workforce</u> – <u>Child Labour</u> – <u>Forced Labour</u> 	

Reference	Requirements	Project Specific Applicability
<u>2.3</u>	<u>Occupational health and Safety</u>	
<u>2.4</u>	<u>Workers Engaged by Third Parties</u>	
<u>2.5</u>	<u>Supply Chain</u>	
<u>Performance Standard 3: Resource Efficiency and Pollution Prevention</u>		
<p>Performance Standard 3 recognises that increased economic activity and urbanisation often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world.</p> <p>Objectives:</p> <ul style="list-style-type: none"> – <u>To avoid or minimise adverse impacts on human health and the environment by avoiding or minimising pollution from project activities.</u> – <u>To promote more sustainable use of resources, including energy and water.</u> – <u>To reduce project-related GHG emissions.</u> 		
<u>3.1</u>	<ul style="list-style-type: none"> – <u>Resource Efficiency</u> – <u>Greenhouse Gases</u> – <u>Water Consumption</u> 	<p><u>The only applicable and material resource efficiency issue is water consumption due to the arid nature of the region and general propensity for drought conditions in the country.</u></p>
<u>3.2</u>	<ul style="list-style-type: none"> – <u>Pollution Prevention</u> – <u>Air Emissions</u> – <u>Stormwater</u> – <u>Waste Management</u> – <u>Hazardous Materials Management</u> – <u>Pesticide use and Management</u> 	<p><u>The project is not greenhouse gas (GHG) emissions intensive and the detailed assessment and reporting of emissions is not required. This project, however, seeks to facilitate resource efficiency and pollution prevention by contributing to the South African green economy.</u></p> <p><u>Dust air pollution in the construction phase has been adequately addressed in the EMPr.</u></p> <p><u>The project will not result in the release of industrial effluents. Potential pollution associated with sanitary wastewater is low and mitigation measures have been included in the EMPr.</u></p> <p><u>Land contamination of the site from historical land use (i.e. low intensity agricultural / grazing) is not considered to be a cause for concern.</u></p> <p><u>The waste generation profile of the project is not complex. Waste mitigation and management measures have been included in EMPr.</u></p> <p><u>Hazardous materials are not a key issue; small quantities of construction materials (oil, grease, diesel fuel, cement etc.) and stored sanitary sewage in the operational phase are the only wastes expected to be associated with the project. The EMPr and emergency preparedness and response plan identifies these anticipated hazardous materials and recommends relevant mitigation and management measures.</u></p>
<u>Performance Standard 4: Community Health, Safety, and Security</u>		
<p>Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts.</p> <p>Objectives:</p> <ul style="list-style-type: none"> – <u>To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.</u> – <u>To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities</u> 		
<u>4.1</u>	– <u>Community Health and Safety</u>	

Reference	Requirements	Project Specific Applicability
	<ul style="list-style-type: none"> – <u>Infrastructure and Equipment Design and Safety</u> – <u>Hazardous Materials Management and Safety</u> – <u>Ecosystem Services</u> – <u>Community Exposure to Disease</u> – <u>Emergency Preparedness and Response</u> 	<p>The requirements included in PS 4 have been addressed in the BAR process and the development of the EMPr. The following plans have been included in the EMPr:</p> <ul style="list-style-type: none"> – <u>Emergency Response Plan (Section 8.12);</u> – <u>A Community Health Safety and Security Plan must be drafted for the project and adhered to and implemented by the Holder of the EA as well as any principal Contractors and sub-contractors. A draft Community Health, Safety and Security Guideline has been included in Appendix Q.</u>
4.2	<u>Security Personnel</u>	<ul style="list-style-type: none"> – <u>Transport Management Plan (Appendix C);</u> – <u>HIV Management Plan (Section 8.16); and</u> – <u>Security Policy (Section 8.14).</u>
<p><u>Performance Standard 5: Land Acquisition and Involuntary Resettlement</u></p>		
<p>Performance Standard 5 recognises that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> – <u>To avoid, and when avoidance is not possible, minimise displacement by exploring alternative project designs.</u> – <u>To avoid forced eviction.</u> – <u>To anticipate and avoid, or where avoidance is not possible, minimise adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.</u> – <u>To improve, or restore, the livelihoods and standards of living of displaced persons.</u> – <u>To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.</u> 		
5.1	<ul style="list-style-type: none"> – <u>Displacement</u> – <u>Physical Displacement</u> – <u>Economic Displacement</u> – <u>Private Sector Responsibilities under Government Managed Resettlement</u> 	<p>In terms of the land acquisition and involuntary settlement provisions in IFC PS 5, the development site is located on privately owned land that is utilised for the sole commercial agricultural use by the landowner. The project will restrict the future use of the land by the landowner through a lease agreement between the project SPV and the landowner.</p> <p>There is no involuntary physical or economic displacement or resettlement involved with this project.</p>
<p><u>Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources</u></p>		
<p>Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development.</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> – <u>To protect and conserve biodiversity.</u> – <u>To maintain the benefits from ecosystem services.</u> – <u>To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.</u> 		
6.1	<u>Protection and Conservation of Biodiversity</u>	<p>PS 6 is not deemed applicable.</p> <p>However, all aspects of biodiversity will be managed through the recommendations outlined by the specialists and the EMPr.</p>

<u>Reference</u>	<u>Requirements</u>	<u>Project Specific Applicability</u>
<u>Performance Standard 7: Indigenous People</u>		
<p>Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded.</p> <p>Objectives:</p> <ul style="list-style-type: none"> – <u>To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.</u> – <u>To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.</u> – <u>To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.</u> – <u>To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project’s life-cycle.</u> – <u>To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.</u> – <u>To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.</u> 		
<u>5.1</u>	<u>General</u> <ul style="list-style-type: none"> – <u>Avoidance of Adverse Impacts</u> – <u>Participation and Consent</u> 	<u>There are no identified indigenous people in South Africa. PS 7 is therefore not applicable.</u>
<u>5.2</u>	<u>Circumstances Requiring Free, Prior, and Informed Consent</u> <ul style="list-style-type: none"> – <u>Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use</u> – <u>Critical Cultural Heritage</u> – <u>Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use</u> 	
<u>5.3</u>	<u>Mitigation and Development Benefits</u>	
<u>5.4</u>	<u>Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues</u>	
<u>Performance Standard 8: Cultural Heritage</u>		
<p>Performance Standard 8 recognizes the importance of cultural heritage for current and future generations</p> <p>Objectives:</p> <ul style="list-style-type: none"> – <u>To protect cultural heritage from the adverse impacts of project activities and support its preservation.</u> – <u>To promote the equitable sharing of benefits from the use of cultural heritage.</u> 		
<u>8.1</u>	<u>Protection of Cultural Heritage in Project Design and Execution</u>	<u>A cultural heritage study was performed as part of the S&EIR process. The impact of the proposed development on the cultural heritage resources of the area after the implementation of mitigation</u>

<u>Reference</u>	<u>Requirements</u>	<u>Project Specific Applicability</u>
		<p>measures was assessed to be moderate overall, with the exception of the impact on the cultural landscape which was identified to be <u>very high</u>.</p> <p>A detailed cultural heritage walkdown was undertaken by CTS Heritage, the results of which have informed the development of the Final Layout Plan. A summary of the walkdown results is included in Section 5.7 and the full walkdown report is included in <u>Appendix K</u>.</p> <p>Chance find provisions have been included in the EMPr in Section 8.13. In term of the projects ESMS's requirements a Chance Find procedure will be implemented on site.</p> <p>A heritage conservation plan is included in <u>Appendix F</u>.</p> <p>The office of the regional land claims commissioner confirmed the absence of land claims against the property in terms of the Restitution of Land Rights Act (1994) during 2018.</p>

2.2.1 BRANDVALLEY ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

An ESMS shall be implemented by the project. The system is founded on the requirements of the Equator Principles, IFC Performance Standards, IFC EHS Guidelines, IFC Sector Guidelines and Good International Industry Practices which are applicable at the Project, as well as ensuring compliance with:

- The social safeguards of the European Investment Bank covering population movement, including involuntary resettlement.
- The International Labour Organization's Core Labour Standards and Basic Terms and Conditions of Work.
- The International Bill of Human Rights in line with the United Nations' Guiding Principles on Business and Human Rights safeguards.

Project policies include the following, but are not limited to these, in terms of environmental and social management:

- Environmental, Health, Safety and Social Policy
- Labour Policy
- Drug and Alcohol Policy
- Smoking Policy
- Code of Conduct

An environmental, health, safety, security and social specification outlines the expectations applicable to contractors, to ensure IFC PS benchmarks are met.

A project-specific stakeholder engagement plan shall be developed in terms of IFC PS 1. Internal and external grievance mechanisms shall be implemented, as per the project ESMS, throughout the lifecycle of the project.

The Community Health and Safety Plan shall be implemented as a component of the ESMS, as per IFC PS 1 and IFC PS 4, and shall prescribe mitigation measures for potential community impacts that may be associated with project activities. These mitigation measures would include measures identified by certain parties that have previously raised concerns in terms of security issues during construction and further into operation.

Independent monitoring of the effective implementation of the ESMS shall be undertaken in terms of an independent monitoring schedule as per the requirements of the projects' s ESMS. Both internal and external audits on the ESMS will be undertaken during the lifecycle of the project and as prescribed by the projects ESMS.

All the ESMS documents with the EA, EMPr and any other legislated permits will become the management system/tool for the project.

3 PROJECT DETAILS

3.1 PROJECT LOCATION

Brandvalley Wind Farm (Pty) Ltd proposes to develop a WEF on the border of the Northern Cape and Western Cape Provinces of South Africa (**Figure 3-1**). In the Northern Cape, the proposed project falls within the Karoo Hoogland Local Municipality, within the Namakwa District Municipality. In the Western Cape, the WEF falls within the Laingsburg Local Municipality, located within the Central Karoo District Municipality. The closest town within the Western Cape Province is Matjiesfontein, situated 30km south of the project area. Laingsburg is a further 30km east of Matjiesfontein, along the N1 national road in the Western Cape Province.

The project area can be accessed via the R354 that connects to the N1 between Matjiesfontein and Laingsburg. The R354 is the main arterial road providing access to the project area, where there are a number of existing local, untarred roads providing access within the project area. The proposed Brandvalley WEF falls across eleven (11) farm portions, provided in **Table 3-1** below. These land portions, collectively referred to as the project area for the Brandvalley WEF, are currently used for animal husbandry, game farming and agriculture, including grazing of sheep.

Table 3-1: Property portions of the proposed Brandvalley WEF

FARM NAME AND NUMBER	21-DIGIT SG CODE	MUNICIPALITY/ PROVINCE	SIZE (HA)
The Remainder of Barendskraal 76	C0430000000007600000	Laingsburg LM / Central Karoo DM / Western Cape	1,523.7
Portion 1 of Barendskraal 76	C0430000000007600001	Laingsburg LM / Central Karoo DM / Western Cape	2,828.6
The Remainder of Brandvalley 75	C0430000000007500000	Laingsburg LM / Central Karoo DM / Western Cape	1,981.9
Portion 1 of Brandvalley 75	C0430000000007500001	Laingsburg LM / Central Karoo DM / Western Cape	56.3
The Remainder of Fortuin 74	C0430000000007400000	Laingsburg LM / Central Karoo DM / Western Cape	2,454.98
Portion 3 Fortuin 74	C0430000000007400003	Laingsburg LM / Central Karoo	1,868.4
The Remainder of Kabeltouw 160	C01900000000016000000	Laingsburg LM / Central Karoo DM / Western Cape	1,082.8
The Remainder of Muishond Rivier 161	C01900000000016100000	Witzenberg (Ceres) LM/ Cape Winelands DM/ Western Cape	4,051.8
Portion 1 of Muishond Rivier 161	C01900000000016100001	Witzenberg (Ceres) LM/ Cape Winelands DM/ Western Cape	3391

Portion 1 of Fortuin 74 (Oumure)	C0430000000007400001	Laingsburg LM / Central Karoo DM / Western Cape	408.90
The Farm Rietfontein 197	C07200000000019700000	Karoo Hoogland LM/ Namakwa	5,873.6
Total hectares			25,521.98

3.2 PROJECT INFRASTRUCTURE

Brandvalley WEF will have an energy generation capacity (at point of grid feed-in) of up to 140 MW. The project description was amended during the EIA process to reduce the layout from 70 turbine positions to 58. The Brandvalley WEF received authorisation for 58 turbines, however subsequent to the EA and during the final layout development and micro-siting, the number of proposed turbines has been reduced to 32. This also includes several amendments, with regards to the turbine specifications, encompassed in the Part Two Amendment Process undertaken in conjunction with this EMP update.

The following is authorised for the WEF:

- 58 wind turbines with a maximum generating capacity of 140MW in total;
- Concrete foundations approximately 25m in diameter and 4m deep per turbine;
- 690V/33/kV transformer of 10m x 10m per hard standing area per turbine;
- Laydown areas of approximately 70m x 50m per turbine (total 20.3ha);
- Construction camp of 10ha and onsite batching plant of 1ha;
- 200m access road corridor to accommodate slight shift in alignments that are fully informed by the final detailed design of access road Alternative 1 and internal road network, up to 9m in width;
- Buildings;
- Overhead 33kV powerlines and underground cabling;
- Low voltage yard of the 33/132kV onsite substation Position Number 4. The total footprint of the 33/132kV onsite substation (including both high voltage (Eskom yard) and low voltage yards (IPP yard)) will be up to 200m x 200m;
- Lighting system;
- Fencing of the site construction camp; and
- 4x125 m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase (final height shall be the same as the hub height).

Figure 3-2 and Figure 3-3 illustrate the original 2016 layout and the final amended layout as informed by environmental sensitivities identified during the walkdowns.

It must be noted that the construction camp previously proposed will not be utilised. It is proposed that the existing Roggeveld WEF construction camp is utilised to eliminate the need for vegetation clearing a new area.

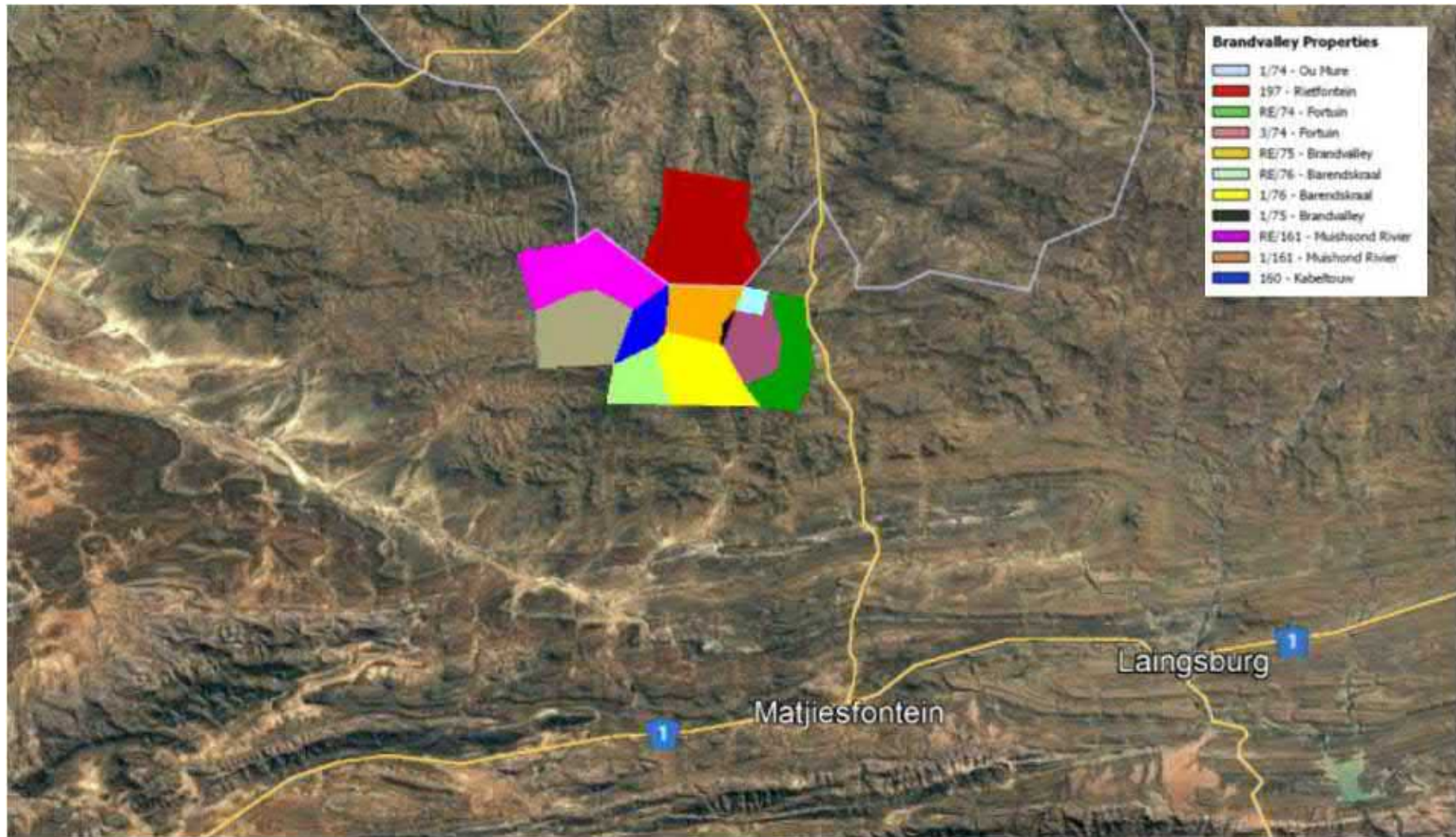


Figure 3-1: Locality map, indicating the different property portions relevant to this project

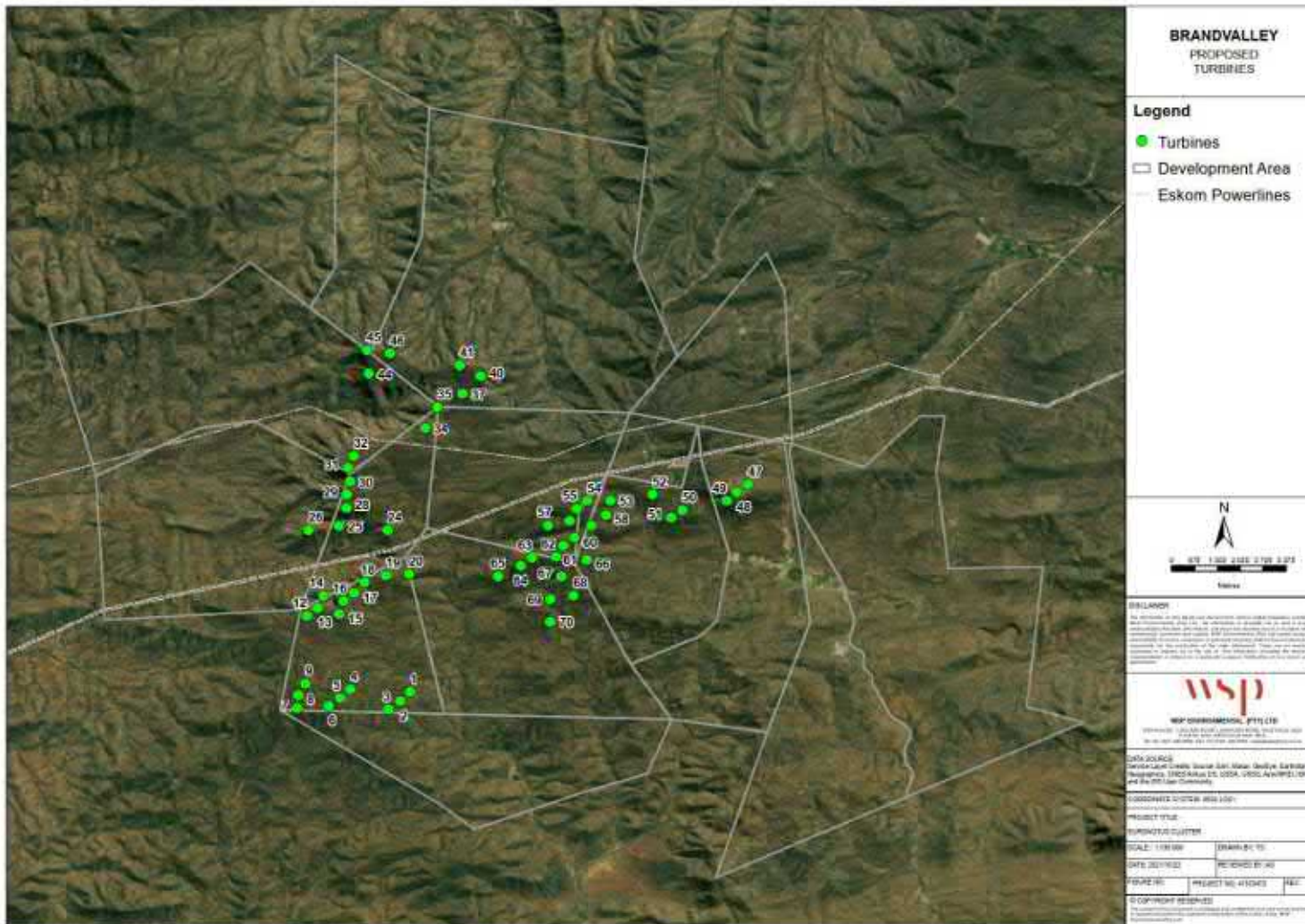


Figure 3-2: Position of the 58 Turbines which formed the Original Layout relevant to the November 2016 EA



Figure 3-3: Final layout including the 32 turbine positions for the Brandvalley WEF

3.3 PROPOSED PROJECT DEVELOPMENT ACTIVITIES

The following activities (**Table 3-2**) are expected during the life-cycle of the WEF and are likely to have positive or negative impacts on the environment.

Table 3-2: Summary of anticipated activities

Phase	Duration	Activities
Planning phase	Approximately two years	<ol style="list-style-type: none"> 1. Detailed geotechnical investigations to inform designs 2. Final site walkthroughs by specialists to inform micro-siting
Construction phase	18 to 24 months	<p>Site Establishment</p> <ol style="list-style-type: none"> 1. Setting out of construction area 2. Site camp establishment <ol style="list-style-type: none"> a. Clearing of vegetation where necessary. b. Levelling of camp area c. Import and placement of aggregates to form a free draining platform d. Delivery of office and welfare containers e. Electricity, sanitation and internet connections <p>3. Erection of temporary stock-proof fencing, where needed on the site, to separate stock from the construction area.</p>
		<p>Civil and Electrical Works</p> <ol style="list-style-type: none"> 1. Topsoil stripping and bulk earthworks (excavations and backfill) for roads, hardstanding and turbine foundations 2. Concrete works 3. Fixing reinforcement 4. Cable ducting, trenching and laying 5. Road and hardstanding construction (placement of aggregate layers) 6. Blasting (if hard rock present) 7. Pylon erection and electrical cable stringing 8. A combination of all the above activities, as they relate to the substation. This includes building construction works e.g. bricklaying, roofing, installation and testing of electrical equipment such as transformers and switchgear
		<p>Wind Turbine Assembly and Testing</p> <ol style="list-style-type: none"> 1. Delivery of turbine components 2. Assembly/ disassembly of the main crane 3. Assembly and erection of turbine 4. Internal fit-out of turbines 5. Testing and commissioning

Phase	Duration	Activities
		Overall Wind Farm Testing 1. Testing Site Rehabilitation 3. Remove all construction equipment. 4. Rehabilitation of temporarily disturbed areas as far as practical. 5. Removal of all construction related rubble, stockpiles and waste.
Operational phase	20 years	6. Operation of turbines within the WEF and low voltage grid connection infrastructure. 7. Maintenance
Decommissioning phase	Two years	Depending on the future use of the site

4 FINDINGS OF THE IMPACT ASSESSMENT - 2016

Table 4-1 provides a summary of the impacts that were identified in the 2016 EIA Report.

Table 4-1: Summary of Impacts

DESCRIPTION OF IMPACT	Overall Significance	
	Without Mitigation	With Mitigation
PLANNING AND DESIGN		
Agricultural Impacts		
Increase in erosion potential	Moderate -	Low -
Increase in renewable energy development in the local area on land use	Moderate -	Low -
Socio-economic Impacts		
Increase in renewable energy development in the local area	Low -	Low -
CONSTRUCTION PHASE		
Terrestrial Flora Impacts		
Impact on vegetation and listed plant species due to transformation within the development footprint.	High -	Moderate -
Soil erosion risk as a result of clearing and disturbance within the development footprint and adjacent	Moderate -	Low -
Terrestrial Fauna Impacts		
Direct faunal impacts due to the construction phase noise and physical disturbance	Moderate -	Moderate -
Agricultural Impacts		
Management of hazardous chemicals	Moderate -	Low -
Increased risk of fires from construction activities	High -	Low -
Loss of agricultural potential due to poor management of the soil stockpile	Moderate -	Low -
Soil profile disturbance and resultant decrease in soil agricultural capability	Very High -	Low -
Establishment of renewable energy infrastructure on agricultural land	Moderate -	Low -
Increase in erosion potential	Moderate -	Low -
Avifaunal Impacts		
Habitat loss associated with the construction phase	Low -	Low -
Disturbance and displacement associated with the construction phase	Low -	Low -
Bats Impacts		
Destruction of bat roosts due to earthworks and blasting	Moderate -	Low -
Loss of foraging habitat	Moderate -	Low -
Aquatic Impacts		
Loss of riparian systems and disturbance to alluvial water courses	Moderate -	Low -
Loss of wetlands and wetland function in the construction phase	Moderate -	Low -
Increase in sedimentation and erosion in the construction, operational and decommissioning phases	Moderate -	Low -
Impact on localised surface water quality	Moderate -	Low -
Impact on localised aquatic systems due to the storage of hazardous substances	Moderate -	Low -
Visual Impacts		
Visual impact of construction activity	Moderate -	Low -
Construction camp alternatives 1, 2 and 3	Low -	Low -
Noise Impacts		
Impact of construction increase in ambient noise levels	Low -	Low -
Palaeontology Impacts		
Disturbance, damage or destruction of fossil heritage within development footprint during the construction phase	Low -	Low -
Potential improved palaeontological database	Low -	High+
Heritage Impacts		
Destruction of precolonial / stone age material	Very High -	Moderate -
Destruction of Stone Walling Features and associated Historical Artefact Scatters	Very High -	Moderate -
Destruction of Graves (formal and informal burials)	Very High -	Moderate -
The Destruction of Homesteads / Farmhouse Complexes	Very High -	Moderate -
The impact of the construction of the proposed Brandvalley WEF on the cultural landscape	Very High -	Moderate -
Socio-economic Impacts		

DESCRIPTION OF IMPACT	Overall Significance	
	Without Mitigation	With Mitigation
Creation of employment and business opportunities during the construction phase	Low -	Moderate -
Technical advice for local farmers and municipalities	Low -	Moderate -
Impact of construction workers on local communities	Moderate -	Low -
Influx of job seekers	Low -	Low -
Risk to safety, livestock and farm infrastructure	Moderate -	Low -
Increased risk of grass fires	Moderate -	Low -
Impacts associated with construction vehicles	Moderate -	Low -
Impacts associated with loss of farmland	Moderate -	Low -
Potential impact on tourism	Low -	Low -
Traffic Impacts		
Traffic impact as a result of transportation of Concrete Towers	Low -	Low -
Traffic impact as a result of transportation of Steel Towers	Low -	Low -
OPERATIONAL PHASE		
Terrestrial Flora Impacts		
Following construction, the site will be highly vulnerable to soil erosion	Moderate -	Low -
Following construction, the site will be highly vulnerable to alien plant invasion	Moderate -	Low -
Terrestrial Fauna Impacts		
Faunal impacts due to operational activities of the wind farm such as noise, and human presence during maintenance activities.	Moderate -	Moderate -
Agricultural Impacts		
Increase in erosion potential	Moderate -	Low -
Establishment of renewable energy infrastructure on agricultural land	Moderate -	Low -
Establishment of new access roads	High -+	High +
Avifaunal Impacts		
Activities and/or presence of intrusive structures cause birds to permanently move away from infrastructure	Moderate -	Moderate -
Turbine collision mortality	Low -	Low -
Powerline collision mortality associated with the placement of 33kV Powerlines throughout the project site	Moderate -	Moderate -
Bat Impacts		
Bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration)	High -	Moderate -
Aquatic Impacts		
Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases	Moderate -	Low -
Visual Impacts		
Impact of the layout on sensitive visual receptors	High -	High -
The access road, including alternatives 1 and 2	Moderate -	Moderate -
Visual impact of the on-site substation	Moderate -	Moderate -
Shadow flicker	No impact	
Noise Impacts		
Impact of the operational noise on the surrounding environment	Low -	Low -
Palaeontology Impacts		
None		
Heritage Impacts		
None		
Socio-economic Impacts		
Creation of employment and business opportunities associated with the operational phase	Low +	Moderate +
Creation of an alternative income source for farmers, which in turn can assist to reduce and or prevent job losses in the farming sector	Low -+	Low -+
Benefits associated with the establishment of a Community Trust	Moderate +	High +
Promotion of clean, renewable energy	Moderate -	Moderate +
Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place	Moderate -	Moderate -
Potential impact of the WEF on local tourism	Low -	Low -
Potential visual impacts associated with access roads and construction camps (all alternative locations)	Low -	Low -
Traffic Impacts		
Traffic impact as a result of Operations	Low -	Low -
Traffic impact as a result of Maintenance	Low -	Low -
DECOMMISSIONING PHASE		
Terrestrial Flora Impacts		
Soil Erosion Risk Following Decommissioning will be high	Moderate -	Low -

DESCRIPTION OF IMPACT	Overall Significance	
	Without Mitigation	With Mitigation
Alien plant invasion will be highly likely within disturbed areas following decommissioning	Moderate -	Low -
Terrestrial Fauna Impacts		
Faunal Impacts due to Decommissioning Phase activities such as noise and disturbance due to the presence of construction staff and the operation of heavy machinery	Moderate -	Low -
Agricultural Impacts		
Decommissioning and removal of renewable energy infrastructure on agricultural land	Moderate -	Moderate -
Bat Impacts		
Loss of foraging habitat	Low -	Low -
Aquatic Impacts		
Loss of riparian systems and disturbance to alluvial water courses	Moderate -	Low -
Increase in sedimentation and erosion in the construction, operational and decommissioning phases	Moderate -	Low -
Impact on localised surface water quality	Moderate -	Low -
Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases	Moderate -	Low -
Visual Impacts		
Visual impact of decommissioning activity	Moderate -	Moderate -
Noise Impacts		
Impact of decommissioning increase in ambient noise levels	Low -	Low -
Palaeontology Impacts		
None		
Heritage Impacts		
None		
Socio-economic Impacts		
Social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income	Low -	Low -
Traffic Impacts		
Traffic impact as a result of transportation of Concrete Towers	Low -	Low -
Traffic impact as a result of transportation of Steel Towers	Low -	Low -
CUMULATIVE IMPACTS		
Terrestrial Flora and Fauna Impacts		
Impact on CBAs and Broad-Scale Ecological Processes due habitat loss and the presence and operation of the facility	High -	Moderate -
Agricultural Impacts		
Cumulative impact of renewable energy projects in the area on local land use	Moderate -	Moderate -
Overall cumulative Impacts	Low -	Low -
Avifaunal Impacts		
The combined impacts from other renewable energy developments within close proximity to the Brandvalley wind farm	Moderate -	Moderate -
Electrocution	Low -	Low -
Habitat Destruction	Low -	Low -
Displacement	Low -	Low -
Solar Array Collision	Moderate -	Low -
Wind Turbine Collision	Low -	Low -
Powerline Collision	Moderate -	Low -
Bat Impacts		
Cumulative bat mortalities due to direct blade impact or barotrauma during foraging (resident and migrating bats affected)	High -	Moderate -
Aquatic Impacts		
Overall cumulative impact	Moderate -	Low -
Visual Impacts		
Cumulative Visual impact	High -	High -
Noise Impacts		
Noise increase due to the development of multiple WEF in the same area	Low -	Low -
Heritage Impacts		
The construction of the proposed Brandvalley WEF and cumulative impacts on heritage resources:	Very High -	Moderate -
Paleontology Impacts		
Disturbance, damage or destruction of fossil heritage within development footprint during the construction phase of the WEF	Low -	Low -
Potential improved palaeontological database	Low +	High +
Socio-economic Impacts		

DESCRIPTION OF IMPACT	Overall Significance	
	Without Mitigation	With Mitigation
Cumulative visual impacts associated with the establishment of a number of WEFs on the on the areas rural sense of place and character of the landscape	Moderate -	Moderate -
The establishment of a number of renewable energy facilities in the KHLM and LLM will place pressure on local services, specifically medical, education and accommodation	Moderate -	Low -
The establishment of a number of renewable energy facilities in the KHLM and LLM will create employment, skills development and training opportunities, creation of downstream business opportunities	Moderate +	High +
NO-GO		
Agricultural Impacts		
Not constructing the WEF will result in no change in the current agricultural landscape.	Moderate +	Moderate +
Aquatic Impacts		
No-Development	Moderate -	Moderate -
Socio-economic Impacts		
The no-development option would result in the lost opportunity in terms of job and business creation and also the opportunity for South Africa to supplement is current energy needs with clean, renewable energy	Moderate -	Moderate +
Visual Impacts		
Impact on the Karoo's sense of place and its value to residents and visitors	High +	N/A

5 FINDINGS OF THE SPECIALIST WALKDOWNS – 2021

5.1 AGRICULTURAL

An Agricultural Assessment of the WEF Layout and adequacy of the EMPr was undertaken by Johann Lanz. It is noted that all land that is excluded from agricultural use by the proposed development is entirely unsuitable for crop production due to very significant climate constraints. This land is not considered preservation-worthy as agricultural production land. The proposed Brandvalley WEF is on land of extremely limited agricultural potential, that is only viable for low density grazing. Additionally, the footprint of the land that will be excluded as a result of the wind farm (i.e. exclusion of land from potential grazing) is insignificantly small in relation to the surface area of the affected farms. All agricultural activities will continue unaffectedly on all parts of the farm other than the insignificantly small development footprint.

The WEF layout is almost entirely on land of low agricultural sensitivity, with only a small part on medium sensitivity. The entire layout avoids any land that is rated as high or very high sensitivity, that is any land considered a higher priority in terms of its conservation for agricultural land use. The layout is therefore considered acceptable in terms of agricultural impact.

The final layout is considered acceptable in terms of agricultural impact.

The agricultural walkdown report is included in **Appendix G**.

5.2 TERRESTRIAL ECOLOGY & BIODIVERSITY

Several Species of Conservation Concern (SCC), in addition to those identified during the initial ecological assessments (2016), were identified during the 2021 walkdown undertaken by Trusted Partners. These floral species include *Antimima androsacea*, *Antimima loganii*, *Brunsvigia josephinae*, *Euryops sulcatus*, *Geissorhiza karooica*, *Indigofera hantamensis*, *Lotononis venosa*, *Romulea eburnean*, *Romulea hallii* and *Romulea syringodeoflora*. Fauna species of Conservation Concern typical of the vegetation and site include *Bunolagus monticularis* (Riverine Rabbit), *Felis nigripes* (Black-footed cat), *Psammobates tentorius veroxii* (Karoo Tent Tortoise) and *Aloeides thyra orientis* (Red copper).

Sensitive areas identified either during the initial ecological assessment and/or observed during the 2021 walkdown include the following (a summary of which is detailed in table 9 of the Terrestrial Ecology & Biodiversity Walkdown Report (**Annexure I**)):

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

The applicable recommendations made based on the findings of the walkdown, have been included in Section 5.11 below as well as included in the mitigation measures contained in Section 7 of this EMPr.

5.3 SURFACE WATER

A freshwater ecological assessment as part of the water use authorisation process for the proposed Brandvalley WEF was undertaken by Scientific Aquatic Services. Finding of the assessment indicate that a large drainage network of ephemeral watercourses, associated with the Groot, Roggeveld, Muishond and Wilgebos Rivers were identified as well as various Channelled Valley Bottom Wetlands. Most of these watercourses are considered to be in a largely natural to moderately modified ecological condition and of high ecological importance and sensitivity.

It is noted that only the access road crossings and trenching of cabling within these crossings will directly impact on the watercourses. All other proposed infrastructure, with the exception of some crane pads, construction camp², will be located outside of the delineated extent of the watercourses. Four (4) crane pads, and the construction camp are located within the 100 m GN509 Zone of Regulation (all located at least 53 m from a watercourse). Two (2) crane pads and the substation are located in the 500m GN509 Zone of Regulation (all located at least 90 m from a wetland). The proposed overhead collector powerlines will directly traverse watercourses, however, as far as feasible, all powerline support structures will be located at least 32 m from the delineated extent. It is important to note that the above findings related to the 58 turbine layout and this layout has since been reduced to 34 turbine position. Therefore, in terms of the final layout of 34 turbines, the above findings are applicable to only three of the six crane pads.

It is noted that no surface infrastructure components are located within any of the delineated watercourses, with the exception of road crossings, which entails the construction of new watercourse road crossings and upgrading of existing crossings.

It was determined that the proposed development will have a Negative Moderate to Low risk significance on the watercourses with implementation of mitigation measures. A direct negative risk to the watercourses is expected due to the upgrading of watercourse crossings and the upgrading of an extensive section of access road located adjacent to a channelled valley bottom wetland and the Groot River.

Based on the findings of the assessment, no fatal flaws from a freshwater resource management point of view were identified. With adherence to cogent, well-conceived and ecologically sensitive construction plans and the implementation of the mitigation measures provided in this report and provided that general good construction practice is adhered to, from a freshwater conservation perspective the proposed development is considered acceptable. Authorisation by means of a Water Use Licence Application (WULA) in terms of Sections 21 (a), (c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) must be obtained from the Department of Water and Sanitation (DWS).

The surface water report is included in **Appendix L**

5.4 BIRDS

Birds and Bats Unlimited was commissioned to undertake the Final Avian Re-assessment for turbines proposed for the Brandvalley wind energy development area. This entailed a short re-assessment of the priority raptors in May 2021 to determine if the receiving environment has changed, as well as to summarise the avian impacts of the previous avian assessment report compiled in 2016.

The final layout takes cognisance of the previous avian assessments as well as the results of the additional pre-construction monitoring. Eight turbine positions, have been removed from the original layout, to reduce environmental impacts and risk to Verreux's Eagles. Furthermore, this will avoid construction of significant lengths of site roads adjacent to watercourses.

To mitigate potential impacts on the Black Harrier, it is recommended that in the event the client has the opportunity to drop additional turbines from the layout in the future, that they should consider turbines B28, B29, B30, B31 and B32. If this compromises the energy yield of the wind farm, and these five turbines cannot be relocated, the following approach and mitigation hierarchy is recommended for this string of turbines:

- Erect them with striped-blade mitigation already installed; and
- Automatic shut-down on demand or curtailment at certain times of day or seasons when flights are numerous.
- If these mitigations are not possible then the mitigation hierarchy suggests a suitable set-aside to help safeguard and replace the eagles that may be killed. This should be undertaken as a last resort given that the first mitigations are considered more effective.

In an effort to further mitigate any impacts to priority birds, the avian re-assessment recommends the following:

² It must be noted that the site construction listed in this table will no longer be utilised. The existing construction camp at the Roggeveld WEF will be utilised instead

- Erecting the turbines with red-, or black-blade, mitigation (painted before installation) to increase turbine visibility for the eagles (May et al. 2020).
- The advantages of this mitigation are that:
 - raptors see best in colour;
 - ‘signal red’ is already approved by South African Civil Aviation for towers and other tall structures;
 - blade manufacturers such as Siemens and Vestas already produce painted blades in Europe; and
 - this mitigation has no running costs³.
- In addition, automatic shut-down on demand be installed with systems such as DT-Bird and Bioseco.
- The last accepted way of mitigating is to select a set-aside area to compensate for the eagles lost, by providing a safe area for breeding eagles near the wind farm, that cannot later be developed.

Mitigations during the construction phase should include avoiding the construction of roads or powerlines 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 in August-September when small vulnerable nestlings are present (Simmons 2005). For the Endangered Black Harriers found breeding on site, construction should be avoided in August-September-October.

Given the likelihood of avian fatalities the following additional mitigation measures are recommended:

- an additional 3-months of pre-construction monitoring be undertaken around the new eagle and harrier nests to determine their success or otherwise;
- all mitigations detailed above be implemented; and
- 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.

The Avifauna walkdown report is included in **Appendix H**

5.5 BATS

Animalia Consultants conducted an assessment of the turbine layout, including on-site verification, in relation to impacts on bats, for the proposed Brandvalley WEF. According to the verification assessment, the proposed turbine layout is in line with the bat sensitivity map as was applicable during the preconstruction guidelines that was in use during the EIA assessment and subsequent amendments. It also respects the current guideline criteria which requires turbine blade length to be outside the high sensitivity buffers, except for Turbines 20, 32, 49, 53 and 58. It is 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 verification assessment recommends that Turbines 20, 32, 49, 53 and 58 base centre points should be moved to be outside of the high bat sensitivity buffer.

A map of the bat sensitivity associated with the original turbine layout (58 turbines) for the proposed Brandvalley WEF is shown below.

It is important to note that the assessed final layout is acceptable from a bat sensitivity perspective if all conditions of the EA are complied with, an operational bat impact monitoring study is conducted for a minimum of 2 years, and Turbines 32, 49 and 58 are relocated outside of the high bat sensitivity buffer. Turbine positions 20 and 53 are not being used.

The Bat walkdown report is included in **Appendix M**

³ 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/

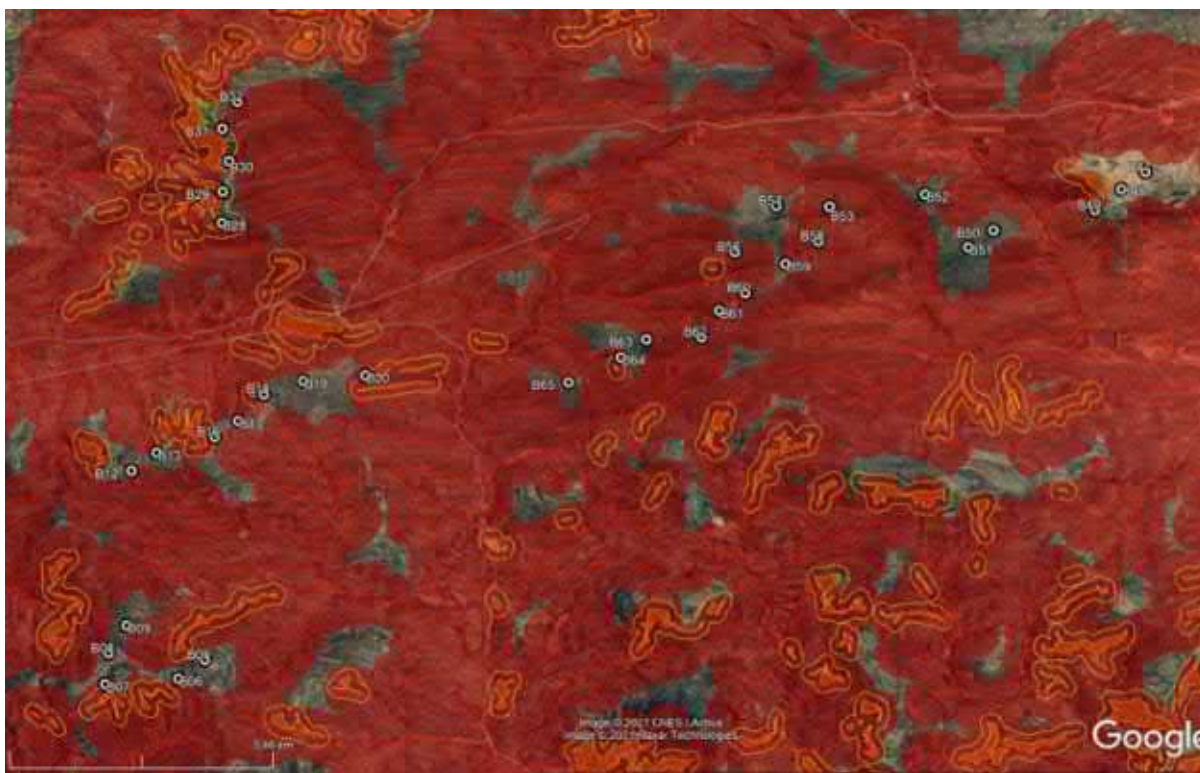


Figure 5-1: Bat sensitivity map of the Brandvalley site with proposed turbine layout

5.6 VISUAL

An assessment of the proposed layout changes for the proposed Brandvalley WEF from a visual perspective was undertaken by SiVEST. It has been established, via desktop assessment using Google Earth imagery, that although the landscape to the north of Brandvalley WEF is undergoing significant change as a result of the development of the Roggeveld WEF, there has been little change since 2018 in the baseline characteristics and the number of sensitive receptors across the remainder of the study area. As such, it is not anticipated that the final layout will result in any changes in the significance of the impacts identified in the 2016 VIA, nor will it result in any additional visual impacts.

Consideration was also given to the landscape and Flicker Themes of the National Environmental Screening Tool. According to the Screening Tool, a high sensitivity rating was applied to the project area, 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. However, the Screening Tool is very high level desktop study, and the results of the study must be viewed against factors affecting visual impact, including the presence of visual receptors, distance of receptors from the proposed development and the likely visibility of the development from the receptor locations.

The visibility and degree of likely exposure of the proposed development from the identified receptors was examined in detail in the original VIA for the Brandvalley WEF. Aside from the fact that most of the receptors are more than 5km from the nearest wind turbine, many of the receptors identified as being “highly exposed” to the proposed development are in fact homesteads located on farms that are within the project areas for other proposed WEF projects. In light of this, visual impacts of turbine development on the ridges will be reduced to some degree. Based on the findings of the original VIA as well recent field investigations conducted for another VIA in this area, 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 Brandvalley WEF and it was concluded that there are no buildings within 800m of a wind turbine and as such the proposed turbine layout is not expected to result in any flicker impacts affecting the identified receptors.

SiVEST's opinion is that the layout as proposed does not give rise to any additional impacts or exacerbate the impacts previously identified in the VIA for this development. According to the 2021 visual assessment, no additional mitigation measures or specialist input into the EMPr are deemed necessary. It is important to note that the site layout is deemed acceptable from a visual perspective. This is in view of the low level of human habitation and the relative absence of sensitive receptors in the area.

The visual walkdown report is included in **Appendix J**

5.7 HERITAGE

A more detailed archaeological assessment of the final layout of the proposed Brandvalley WEF project was conducted by CTS Heritage. The assessment entailed a detailed walkdown and micro-siting of the Final development footprint for the Brandvalley WEF between 24 and 28 July 2021 to determine what archaeological resources are likely to be impacted by the approved development. The final layout for the Brandvalley WEF avoids impacts to all known significant heritage resources within the development area.

It is noted that the palaeontological impact assessment (PIA) conducted for the project concluded that the majority of the Brandvalley project area is of low palaeontological sensitivity. Pending the potential discovery of substantial new fossil remains during construction, specialist palaeontological mitigation is not recommended for the Brandvalley WEF project. The EA condition to undertake a palaeontological walkdown during the construction phase is therefore not recommended.

The overall area is considered as having a medium to high heritage significance. Substation 1 (SS1) and Construction Camp 2 (CC2) situated on the Farm Fortuin 74 are the preferred options for the establishment of the substation and construction camp, respectively. However, if the preferred Substation option (SS1) Construction Camp 2 (CC2) are not feasible according to input from other studies conducted the appropriate mitigation measures should be followed with regards to the other substation and construction camp alternatives. It is recommended that a survey focusing on the area along the watercourse be conducted between Substation 2 (SS2) and Substation 4 (SS4) 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.

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. No obvious omissions were found during the survey of the Brandvalley 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 couple of isolated Later and Middle Stone Age sites were located, and the artefacts showed signs of retouch. 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.

According to the walkdown report, no impacts on significant heritage resources are anticipated; the Brandvalley WEF layout has been developed to avoid sites of significance previously recorded in 2016. The walkdown of the final layout revealed no new significant heritage resources that are likely to be impacted.

The heritage walkdown report is included in **Appendix K**

5.8 TRAFFIC

A Traffic Impact Assessment (TIA) was undertaken by JG Afrika as part of the amendment and update of the EMPr process for the proposed Brandvalley WEF. The TIA aimed to review the proposed traffic impacts and mitigations as assessed in the May 2016 TIA and to ensure that any traffic impacts associated with the final site layout are considered and mitigated accordingly.

It is noted that the preferred port of entry to the site is the Port of Saldanha. This route maximises the use of higher order routes, which are designed to handle / accommodate larger vehicles and minimise travelling through towns as far as possible. This was deemed important to minimise congestion and avoid disruptions to communities in these towns. The delivery company is advised to conduct a dry-run of the route to determine the practical suitability of the route for abnormal load travel.

The TIA notes that no capacity improvements are considered necessary based on the following:

- The site gains access of the R354, which is a Class 2 road designed to accommodate large traffic volumes.
- The only notable generated traffic would occur during the construction and decommissioning phases. The trips generated during these phases will only occur for short periods of time and the following mitigation measures are recommended for consideration:
 - The delivery of wind turbine components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods,
 - The use of mobile batching plants and any material sources in close proximity to the site would decrease the impact on the surrounding road network,
 - Staff and general trips should can outside of peak traffic periods,
 - Staff can be shuttled on scheduled busses to minimise the number of trips; and
 - Stagger the removal of turbines, foundations, crane pads etc during the decommissioning phase.

The development of the Brandvalley WEF is supported from a traffic engineering point of view, provided that the recommendations in the TIA report are adhered to and are read in conjunction with the road design and environmental reports completed for this site. The recommendation measures of the TIA and Traffic Management Plan (**Appendix C**) is incorporated into this EMPr for implementation.

5.9 SOCIAL

An EMPr Summary of key social issues and recommendations, based on a site visit to the study area, was undertaken by Tony Barbour Environmental Consulting, as part of the Social Impact Assessment for the Brandavley WEF. The site visit consisted of interview and discussions held with a number of landowners and community members affected by the proposed WEF and associated powerline. In addition, the affected landowners provided insight into their experience with the construction phase of other WEF's in the area. The Summary of key issues is also informed by other public meetings attended associated with other proposed Solar Energy Facilities (SEF), with inputs from landowners in the vicinity of an existing WEF. The issues raised in these previous meetings are considered to likely be relevant to the Brandvalley WEF due to its location within the Komsberg REDZ.

A number of interviewees highlighted the positive impacts that the ongoing construction of WEFs in the Komsberg REDZ have on the local economy in the area. These include the benefits that the construction activities have on the local hospitality, retail and services sector. It is noted that early, effective and on-going communication was highlighted as a key issue that needs to be implemented and/or addressed to manage impacts associated with the WEFs. Other impacts highlighted by the landowners affected by existing WEFs were attributed to extensive land clearance, damage to farm infrastructure such as gates and a concern on crime and security (although not directly linked to the WEFs). Other issues of concern included potential increases of Sexually Transmitted Diseases, unplanned pregnancies, reduced availability of accommodation for visitors and limited benefits to the local farming community. Impact on sense of place and visual impacts were also highlighted as potential issues for consideration and subsequent mitigation.

Based on the above, a number of recommendations have been made for inclusion in the planning and implementation of construction related activities, to minimise social impacts, impact footprint and avoid unnecessary disturbances. These measures have been incorporated into the EMPr and steps must be taken to ensure implementation on the ground.

The Social report is included in **Appendix N**.

5.10 DESKTOP GEOTECHNICAL

A geotechnical desktop level study was undertaken JG Afrika for the proposed Brandvalley WEF. The aim of the study was to assess the geological and geotechnical conditions across the study area, and to provide information on the topographical feasibility of the site for the proposed project, as well identify the geological and geotechnical influences and/or constraints on the construction structures.

According to the study the slope gradient map indicates that the turbines, the substation and the construction camp site are located on flat terrain. 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.

It is however noted that based on previous investigations in the greater Roggeveld area, the site is anticipated to be underlain by shallow bedrock conditions. Competent, founding conditions can be anticipated in shallow, slightly weathered bedrock conditions, which will have to be assessed during the detailed investigation prior to construction.

Recommendations, in terms of foundations types for the various infrastructure associated with the project is included in report for consideration by the Developer. No fatal flaws from a preliminary geotechnical perspective were identified during the desktop study. The impact will be restricted to the removal and displacement of soil, boulders and bedrock. 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. Additionally, the aesthetic impact is considered significant due to the required extensive earthworks associated with the project, to meet the required horizontal and vertical alignments and curvatures for roads, so the aesthetic impact is significant. The anticipated impact of the proposed project will have negative effects from a geotechnical perspective and will require mitigation. The mitigation measures suggested in the study have been incorporated into this EMPr.

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

The Geotechnical report is included in **Appendix O**

5.11 TURBINE/OTHER INFRASTRUCTURE POSITION SUMMARY

Subsequent to the EA issued and during the final layout development and micro-siting, amendments have been undertaken for the Brandvalley WEF project, including reducing the number of turbines from the authorised 58 to 32 turbine positions. **Table 5-1** provides a summary of the recommendations made as a result of the specialist walkdowns. Only those aspects and turbine positions where recommendations are applicable have been included. It can be noted that the following specialists made no specific recommendations pertaining to the 34 turbine positions in the Final Layout:

- Agriculture;
- Visual;
- Heritage;
- Traffic;
- Social; and
- Geotechnical.

Figure 5-2 and **Figure 5-3** illustrate the sensitivity map for the development area overlain by the Final site layout for the Brandvalley WEF. A3 versions of the maps have been included in **Appendix B**.

Table 5-1: Walkdown Summary of Recommendations

<u>TURBINE NUMBER / OTHER INFRASTRUCTURE</u>	<u>TERRESTRIAL ECOLOGY AND BIODIVERSITY</u>	<u>SURFACE WATER</u>	<u>BIRDS</u>	<u>BATS</u>
<u>T13</u>	<u>Located adjacent to Rocky Outcrops. The outcrops should be avoided as far as possibly during final surveying and pegging out.</u>			
<u>T20</u>				<u>Blades are intruding into the high bat sensitivity buffer. Turbine base centre point should be relocated outside of the high bat sensitivity buffer (243.8m). This turbine will be micro-sited in the event that turbines with a 180m rotor diameter are utilised.</u>
<u>T28</u>	<u>Located adjacent to Rocky Outcrops. The outcrops should be avoided as far as possibly during final surveying and pegging out.</u>		<u>Lies within the 3-km buffer of the Black Harrier nest, as well as within the numerous flight lines of the Verreaux's Eagles captured in 2016.</u>	
<u>T29</u>	<u>Located adjacent to Rocky Outcrops. The outcrops should be avoided as far as possibly during final surveying and pegging out.</u>	<u>Crane pads located within the 100 m GN509 ZoR (located approximately 94 m from a riparian watercourse.)</u>	<u>Lies within the 3-km buffer of the Black Harrier nest, as well as within the numerous flight lines of the Verreaux's Eagles captured in 2016.</u>	
<u>T30</u>			<u>Lies within the 3-km buffer of the Black Harrier nest, as well as within the numerous flight lines of the Verreaux's Eagles captured in 2016.</u>	
<u>T31</u>			<u>Lies within the 3-km buffer of the Black Harrier nest, as well as within the numerous flight lines of the Verreaux's Eagles captured in 2016.</u>	
<u>T32</u>			<u>Lies within the 3-km buffer of the Black Harrier nest, as well as within</u>	<u>Blades are intruding into the high bat sensitivity buffer. Turbine base centre point should be relocated outside of</u>

<u>TURBINE NUMBER / OTHER INFRASTRUCTURE</u>	<u>TERRESTRIAL ECOLOGY AND BIODIVERSITY</u>	<u>SURFACE WATER</u>	<u>BIRDS</u>	<u>BATS</u>
			the numerous flight lines of the <u>Verreaux's Eagles captured in 2016.</u>	the high bat sensitivity buffer (257.7m). This turbine will be micro-sited in the event that turbines with a 180m rotor diameter are utilised.
<u>T49</u>	<u>Located adjacent to Rocky Outcrops. The outcrops should be avoided as far as possibly during final surveying and pegging out.</u>	<u>Crane pads located within the 100 m GN509 ZoR (located approximately 68 m from a riparian watercourse.)</u>		<u>Blades are intruding into the high bat sensitivity buffer. Turbine base centre point should be relocated outside of the high bat sensitivity buffer (220). This turbine will be micro-sited in the event that turbines with a 180m rotor diameter are utilised.</u>
<u>T53</u>				<u>Blades are intruding into the high bat sensitivity buffer. Turbine base centre point should be relocated outside of the high bat sensitivity buffer (248.8m). This turbine will be micro-sited in the event that turbines with a 180m rotor diameter are utilised.</u>
<u>T54</u>		<u>Crane pads located within the 500 m GN509 ZoR (located approximately 370 m from a channelled valley bottom wetland)</u>		
<u>T58</u>				<u>Blades are intruding into the high bat sensitivity buffer. Turbine base centre point should be relocated outside of the high bat sensitivity buffer (258.7m). This turbine will be micro-sited in the event that turbines with a 180m rotor diameter are utilised.</u>
<u>T65</u>	<u>Located adjacent to Rocky Outcrops. The outcrops should be avoided as far as possibly during final surveying and pegging out.</u>			
<u>Powerline</u>	<u>Central (east-west) portion traverses</u>			

<u>TURBINE NUMBER / OTHER INFRASTRUCTURE</u>	<u>TERRESTRIAL ECOLOGY AND BIODIVERSITY</u>	<u>SURFACE WATER</u>	<u>BIRDS</u>	<u>BATS</u>
	seep area (8), with pylons in seep. Should be realigned. The overhead powerline also passes through An area having a high density of <i>Antimima androsacea</i> (SCC)(11), due care to be taken during construction to avoid impact to this species.			
Site camp/construction camp ⁴	A water transfer canal traverses proposed site camp (12). Not suitable as it may be prone to seasonal flooding.	Located 57m from an ephemeral tributary and 102 m from a channelled valley bottom wetland (both watercourses associated with the Roggeveld River System. Thus, located within the 100 m and 500 m GN509 ZoR.		
North-western access road (MR 8041- proposed to be upgraded)	North-western access road passes multiple times through and along seep area (18) multiple times. Access road should be realigned.	Located directly adjacent to the wetlands associated with the Groot River systems.		
Western access road (MR 6159 - proposed to be upgraded)	The western access road passes through and along a well-defined watercourse with large <i>Brunsvigia josephinae</i> population (19) present within the riparian vegetation and directly adjacent to the watercourse. The access road should be aligned as far from watercourse as possible and should not extend closer to watercourse than inner side of the existing access track.	Located directly adjacent to the wetlands associated with the Groot River systems.		
Broader Area	The species <i>Antimima androsacea</i> was found to occur at low densities			

⁴ It must be noted that the site construction listed in this table will no longer be utilised. The existing construction camp at the Roggeveld WEF will be utilised instead.

<u>TURBINE NUMBER / OTHER INFRASTRUCTURE</u>	<u>TERRESTRIAL ECOLOGY AND BIODIVERSITY</u>	<u>SURFACE WATER</u>	<u>BIRDS</u>	<u>BATS</u>
	throughout a broader area as indicated in Figure 6 of the Terrestrial Ecology & Biodiversity Walkdown Report (<u>Annexure I</u>)			
<u>Borehole</u>		<u>Locate 69m from an episodic drainage line (EDL). Thus, located within the 100 m GN509 ZoR.</u>		
<u>Substation</u>		<u>Located 90 m from a channelled valley bottom wetland associated with the Groot River system. Thus, located within the 500 m GN509 ZoR.</u>		
<u>Collector system – Option 1, 2 and 2</u>		<u>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.)</u>		

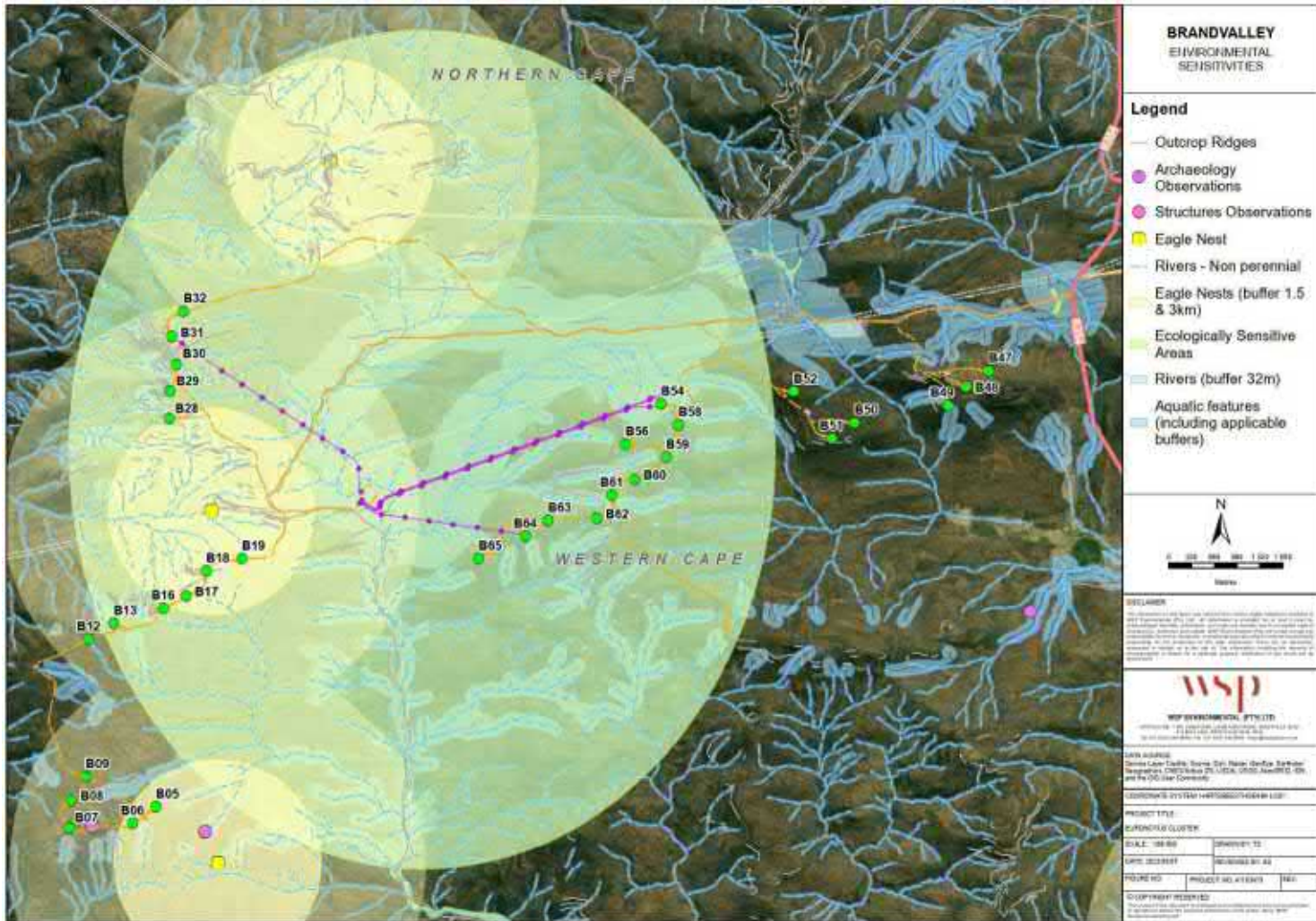


Figure 5-2: Environmental sensitivity map overlay over the Final Brandvalley WEF Layout

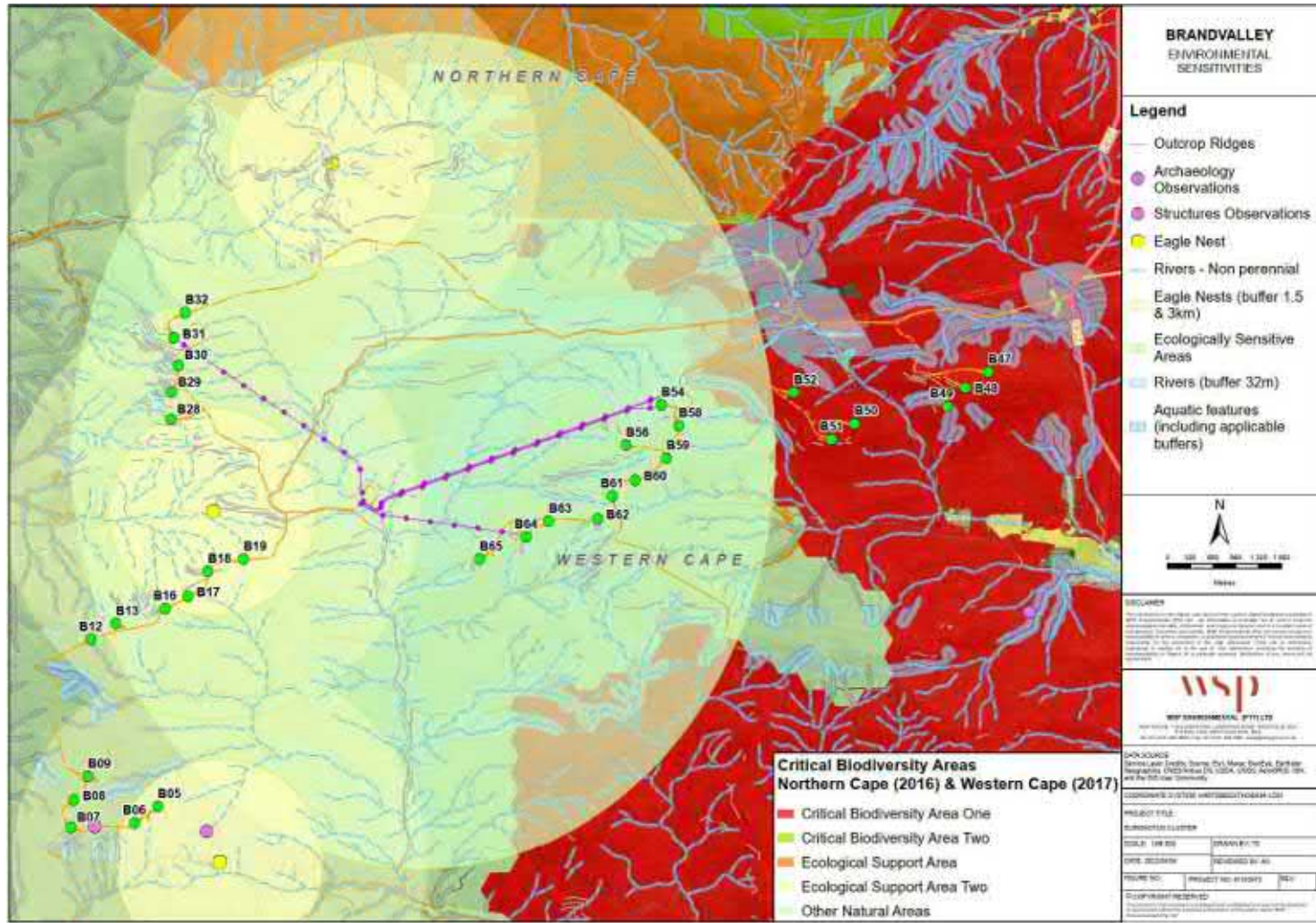


Figure 5-3: Environmental sensitivity map overlay over the Final Brandvalley WEF Layout (inclusive of CBAs)

6 IMPLEMENTATION OF THE EMPR

6.1 ORGANISATION, STRUCTURE AND RESPONSIBILITY

Formal responsibilities are necessary to ensure that key management measures/procedures are executed. Brandvalley Wind Farm (RF) (Pty) Ltd, the Holder of the EA, will be responsible for the overall control of the project site during the pre-construction, construction, operation, decommissioning and rehabilitation phases of the project. Brandvalley’s responsibilities will include the following:

- Appointing an independent environmental control officer (ECO) for the duration of the Construction phase and to notify the DFFE of their contact details, in line with Condition 21 of the EA;
- Being fully familiar with the EIA Report, EA conditions and the EMPr;
- Applying for an amendment of the EA from the DFFE in the event that the approved scope changes in line with the prevailing legislation;
- The overall implementation of the EMPr;
- Ensuring compliance, by all parties, and the imposition of penalties for noncompliance;
- Implementing corrective and preventive actions, where required;
- Preventing pollution and actions that will harm or may cause harm to the environment;
- Ensuring the activity does not commence within 30 days of the EA being issued;
- Notifying the DFFE within 14 days that construction activity will commence;
- Notifying the DFFE in writing within 24 hours if any condition in the EA cannot be or is not adhered to;
- Notifying the DFFE should minor changes to the layout be required (as confirmed by the Environmental Onsite Compliance Officer (ESCO) and ECO); and
- Notifying the DFFE 14 days prior to commencement of the operational phase.

Specific roles and responsibilities for the construction phase of this project are as defined in **Table 6-1** and indicated graphically in **Figure 6-1** below.

While the term ECO is referenced in Specialist Reports, the ECO is an independent function, reporting to the DFFE. The term used in this EMPr for the Permit Holder’s onsite compliance management function is Environmental Site Compliance Officer (ESCO).

Table 6-1: Roles and Responsibilities- Construction

<u>RESPONSIBLE PERSON</u>	<u>RESPONSIBILITIES</u>
<u>Holder of the EA</u>	<ul style="list-style-type: none"> - <u>The Holder of the EA shall take overall responsibility for the adherence to the EMPr and EA conditions.</u>
<u>Project Manager</u>	<ul style="list-style-type: none"> - <u>Ensure Brandvalley and the contractor(s) are aware of all specifications, legal constraints pertaining to the project specifically with regards to the environment;</u> - <u>Ensure that all stipulations within the EMPr and conditions of the environmental authorisation are communicated and adhered to by Brandvalley and its contractor(s);</u> - <u>Monitor the implementation of the EMPr and conditions of the environmental authorisation throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes; and</u> - <u>Be fully conversant with the BAR for the project, the conditions of EA and all relevant environmental legislation.</u>
<u>Site Manager</u>	<ul style="list-style-type: none"> - <u>Be fully conversant with the BAR, the conditions of EA and the EMPr;</u> - <u>Approve method statements (co-approval with ESCO);</u>

RESPONSIBLE PERSON RESPONSIBILITIES

	<ul style="list-style-type: none"> - <u>Provide support to the ESCO;</u> - <u>Be fully conversant with all relevant environmental legislation and ensure compliance thereof;</u> - <u>Be responsible for the implementation of the EMPr and conditions of the EA;</u> - <u>Ensure that audits are conducted to ensure compliance to the EMPr and conditions of the EA;</u> - <u>Liaise with the Project Manager or his delegate, the ECO and others on matters concerning the environment;</u> - <u>Prevent actions that will harm or may cause harm to the environment, and take steps to prevent pollution and unnecessary degradation onsite; and</u> - <u>Confine construction activities to demarcated areas.</u>
<p><u>Environmental Officer (EO)</u></p>	<ul style="list-style-type: none"> - <u>The EO must be appointed by the Contractor/ Project Manager and is responsible for managing the day-to-day onsite implementation of the EMPr, and for the compilation of weekly environmental monitoring reports. In addition, the EO must act as liaison and advisor on all environmental and related issues, seek advice from the ESCO and ECO when necessary, and ensure that any complaints received from I&APs are duly processed and addressed and that conflicts are resolved in an acceptable manner and timely manner. The EO shall be a full-time dedicated member of the Contractor’s team and must be approved by Brandvalley.</u> - <u>The following qualifications, qualities and experience are recommended for the individual appointed as the EO:</u> <ul style="list-style-type: none"> - <u>A relevant environmental diploma or degree in natural sciences, as well as experience in construction site monitoring, excluding health and safety;</u> - <u>A level-headed and firm person with above-average communication and negotiating skills. The ability to handle and address conflict management situations will be an advantage; and</u> - <u>Relevant experience in environmental site management and EMPr compliance monitoring.</u> - <u>The EO’s responsibilities include:</u> <ul style="list-style-type: none"> - <u>Monitoring, on a daily basis, environmental specifications on site and compliance with the conditions of the EA, environmental legislation and EMPr;</u> - <u>Keeping a register of compliance / non-compliance with the environmental specifications;</u> - <u>Identifying and assessing previously unforeseen, actual or potential impacts on the environment;</u> - <u>Ensuring that a brief weekly environmental monitoring report is submitted to the ESCO;</u> - <u>Conducting site inspections during the defect’s liability period, and bringing any environmental concerns to the attention of the ESCO and Contractor;</u> - <u>Advising the Contractor on the rectification of any pollution, contamination or damage to the construction site, rights of way and adjacent land;</u> - <u>Attending site meetings (scheduled and ad hoc);</u> - <u>Presenting the environmental awareness training course to all staff, Contractors and Sub contractors, and monitoring the environmental awareness training for all new personnel on-site, as undertaken by the Contractor;</u> - <u>Ensuring that a copy of the EA and the latest version of the EMPr are available on site at all times;</u> - <u>Ensuring that the Contractor is made aware of all applicable changes to the EMPr;</u> - <u>Assisting the Contractor in drafting environmental method statements and/or the Environmental Policy where such knowledge/expertise is lacking;</u>

RESPONSIBLE PERSON RESPONSIBILITIES

	<ul style="list-style-type: none"> - <u>Undertaking daily environmental monitoring to ensure the Contractor’s activities do not impact upon the receiving environment. Such monitoring shall include dust, noise and water monitoring; and</u> - <u>Maintaining the following on site:</u> <ul style="list-style-type: none"> ▪ <u>A weekly site diary.</u> ▪ <u>A non-conformance register (NCR).</u> ▪ <u>An I&AP communications register, and</u> ▪ <u>A register of audits.</u> - <u>The EO will remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is handed over to the Holder of the EA.</u>
<p><u>Environmental Onsite Compliance Officer (ESCO)</u></p>	<ul style="list-style-type: none"> - <u>A suitably qualified ESCO must be appointed by the Holder of the EA to monitor the project compliance onsite on a full time basis.</u> - <u>Responsibilities of the ESCO include:</u> <ul style="list-style-type: none"> - <u>Be fully conversant with the BAR, the conditions of EA and the EMPr;</u> - <u>Be fully conversant with all relevant environmental legislation and ensure compliance thereof;</u> - <u>Approve method statements (co-approval with Site Manager);</u> - <u>Remain employed until the completion of the construction activities; and</u> - <u>Report to the Project Manager, including all findings identified onsite.</u> - <u>In addition, the ESCO will:</u> <ul style="list-style-type: none"> - <u>Undertake monthly inspections of the site and surrounding areas to audit compliance with the EMPr and conditions of the environmental authorisation;</u> - <u>Take appropriate action if the specifications contained in the EMPr and conditions of the environmental authorisation are not followed;</u> - <u>Monitor and verify that environmental impacts are kept to a minimum, as far as possible; and</u> - <u>Ensure that activities onsite comply with all relevant environmental legislation.</u>
<p><u>ECO</u></p>	<ul style="list-style-type: none"> - <u>A suitably qualified external ECO must be appointed by the Holder of the EA to audit the project compliance in terms of the EMPr and conditions of the EA on a monthly basis, during the construction phase, in line with Condition 21 of the EA.</u> - <u>The costs of the ECO shall be borne by the Holder of the EA (proof of appointment must be maintained onsite).</u>
<p><u>Contractors, Staff and Service Providers</u></p>	<ul style="list-style-type: none"> - <u>Complying with the Holder of the EA’s environmental management specifications;</u> - <u>Be conversant with all EMPr and conditions of the EA, and ensure compliance thereto; and</u> - <u>Adhering to any environmental instructions issued by the Site Manager/Project Manager on the advice of the ECO.</u>

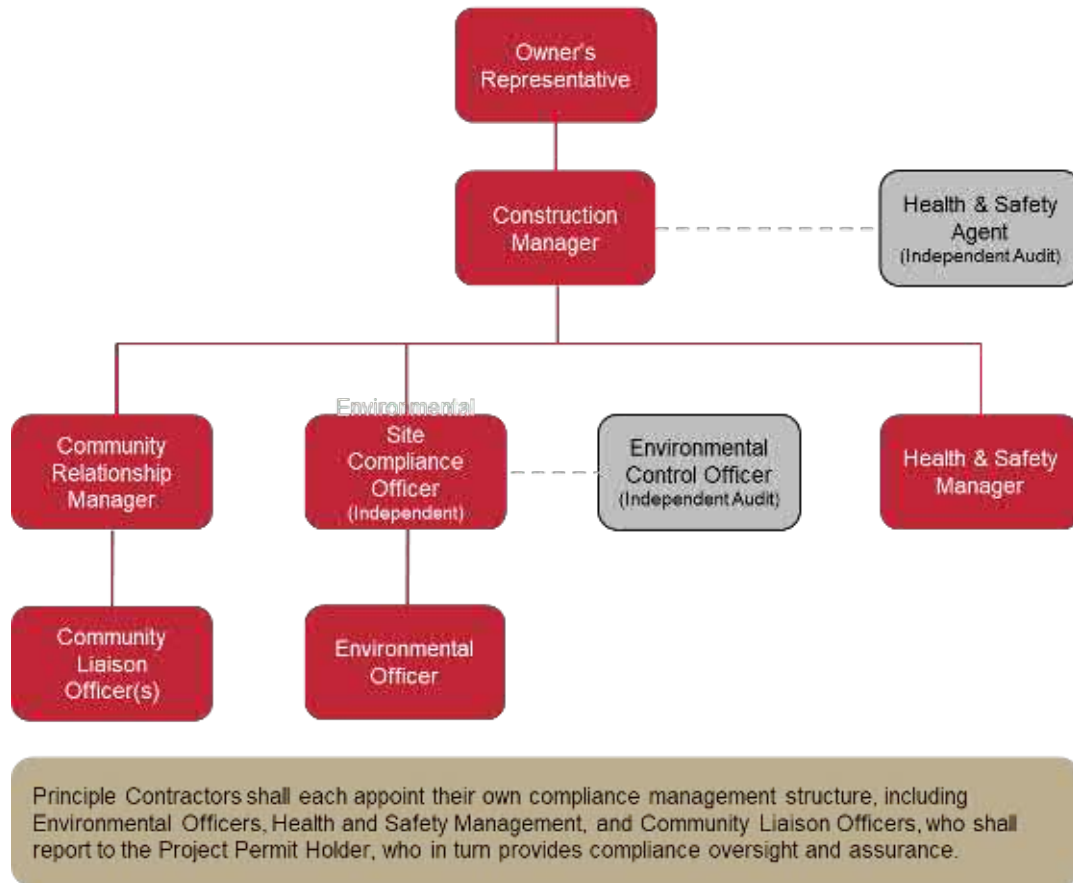


Figure 6-1: Project permit holder's management structure during construction.

6.2 REPORTING

6.2.1 METHOD STATEMENTS

Before the contractor begins each construction activity, the contractor shall give to the ECO and Project Manager a written Method Statement setting out the following:

- The type of construction activity;
- Locality where the activity will take place;
- Identification of impacts that might result from the activity;
- Identification of activities or aspects that may cause an impact;
- Methodology and/or specifications for impact prevention for each activity or aspect;
- Methodology and/or specifications for impact containment for each activity or aspect;
- Emergency/disaster incident and reaction procedures; and
- Treatment and continued maintenance of impacted environment.

The contractor must provide such information at least two weeks in advance of any or all construction activities for review and approval. Any changes made to the Method Statement after approval shall be given to the Project Manager for review and the ECO for approval.

The ECO and/or Project Manager may provide comment on the methodology and procedures proposed by the contractor, but shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems.

6.2.2 GOOD HOUSEKEEPING

The contractor shall undertake 'good housekeeping' practices during construction. This will help avoid disputes on responsibility and allow for the smooth-running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of weather to include the care for and preservation of the environment within which the site is situated.

6.2.3 RECORD KEEPING

The ESCO and the ECO will continuously monitor the contractor's adherence to the approved impact prevention procedures and the ESCO or ECO shall issue to the contractor a notice of non-compliance whenever transgressions are observed. This should be documented to record the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance shall be documented and reported to the Project Manager in the monthly report. These reports shall be made available to DFFE when requested. The Project Manager shall ensure that an electronic filing system identifying all documentation related to the EMPr is established. A list of reports likely to be generated during all phases of the Brandvalley Wind Farm Project is provided below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index:

- Final EIR;
- Final approved EMPr;
- EA from the DFFE and all subsequent amendments;
- Final design documents and diagrams issued to and by the Contractor;
- All communications detailing changes of design/scope that may have environmental implications;
- Daily, weekly and monthly site monitoring reports;
- Complaints register;
- Medical reports;
- Training manual;
- Training attendance registers;
- Incident and accident reports;
- Emergency preparedness and response plans;
- Electronic copies of all relevant environmental legislation;
- Permits and legal documents, including letters authorising specific personnel of their duties as part of emergency preparedness teams e.g. fire teams, etc;
- Crisis communication manual;
- Disciplinary procedures;
- Monthly site meeting minutes during construction;
- Copies of all relevant permits; and
- All Method Statements for all phases of the project.

6.2.4 DOCUMENT CONTROL

The Project Manager shall be responsible for establishing a procedure for electronic document control. The document control procedure should comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person;
- Every document should identify the personnel and their positions, who drafted and compiled the document, who reviewed and recommended approval, and who finally approved the document for distribution; and
- All documents should be dated, provided with a revision number and reference number, filed systematically, and retained for a two year period.

The contractor shall ensure that documents are periodically reviewed and revised, where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMP are performed. All documents shall be made available to the independent external auditor.

6.2.5 ENVIRONMENTAL AND HEALTH TRAINING AND AWARENESS

The ESCO and/or ECO must be conversant with all legislation pertaining to the environment applicable to this contract and must be appropriately trained in environmental management and must possess the skills necessary to impart environmental management skills to all personnel involved in the contract.

The contractor shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees. The environmental training should, as a minimum, include the following:

- The importance of conformance with all environmental policies;
- The significant environmental impacts, actual or potential, as a result of their work activities;
- The environmental benefits of improved personal performance;
- Their roles and responsibilities in achieving conformance with the EMP;
- The potential consequences of departure from specified operating procedures;
- The mitigation measures required to be implemented when carrying-out their work activities;
- The importance of not littering;
- The need to use water sparingly;
- Details of, and encouragement to, minimise the production of waste and re-use, recover and recycle waste where possible;
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered;
- The procedures which should be followed should a grave be encountered, or unearthed during the construction phase; and
- Details regarding fauna and flora of special concern, including protected/endangered plant and animal species, and the procedures to be followed should these be encountered during the construction phase.

In the case of permanent staff, the Contractor shall provide evidence that such induction courses have been presented. If required, the ESCO can assist with presenting these environmental induction courses. In the case of new staff (including contract labour) the Contractor shall inform the Project Manager when and how he intends concluding his environmental training obligations. Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. Environmental awareness training programmes should contain the following information:

- The names, positions and responsibilities of personnel to be trained;
- The framework for appropriate training plans;
- The summarised content of each training course; and
- A schedule for the presentation of the training courses.

The Contractor shall provide records to the ESCO of all records and documentation control requirements as set out in this EMPr. The training records shall verify each of the targeted personnel's training experience. The ESCO shall monitor the records and listed and undertake regular follow ups and be verified by the ECO.

6.2.6 EMERGENCY PREPAREDNESS

The Project Manager and or Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the life cycle of the project. Such activities may include, inter alia:

- Accidental discharges to water and land;
- Accidental exposure of employees to hazardous substances;
- Accidental veld or forest fires;
- Accidental spillage of hazardous substances; and
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans should include:

- Emergency organisation (manpower) and responsibilities, accountability and liability;
- A list of key personnel;
- Details of emergency services applicable to the various areas along the route that turbine components will need to be transported and for the site itself (e.g. the fire department, spill clean-up services, etc.);
- Internal and external communication plans, including prescribed reporting procedures where required by legislation;
- Actions to be taken in the event of different types of emergencies;
- Incident recording, progress reporting and remediation measures required to be implemented;
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release; and
- Training plans, testing exercises and schedules for effectiveness.

The contractor shall comply with the emergency preparedness and incident and accident reporting requirements, as required by the Occupational Health and Safety Act (OHSA, Act No. 85 of 1993) and the 2014 Construction Regulations (GN R 84), the NEMA (Act No 107 of 1998), the National Water Act (Act No. 36 of 1998) and the National Veld and Forest Fire Act (Act No. 101 of 1998) as amended and/or any other relevant legislation.

6.2.7 CORRECTIVE ACTION FOR NON-COMPLIANCE

Non-compliance with the specifications of the EMPr and/or conditions of the EA, both of which will be present on-site at all times, constitutes a breach of contract for which the Contractor may be liable to pay penalties to be determined by the ESCO, for approval by the ECO, and implementation by the Project Manager. The Contractor is deemed not to have complied with the EMPr if:

- There is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and haul/access roads;
- There is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site;
- Environmental damage ensues due to negligence;
- Construction activities take place outside the defined boundaries of the site; and/or
- The contractor fails to comply with corrective or other instructions issued by the Project Manager, ESCO and/or ECO within a specific time period.

The contractor shall act immediately when a notice of non-compliance is received and correct whatever was the cause for the issuing of the notice. The ECO's decision with regard to what is considered a violation, its seriousness and the action to be taken against the contractor shall be final. Failure to redress the cause shall be

reported to the relevant authority. The responsible provincial or national authorities shall ensure compliance and impose penalties relevant to the transgression as allowed for within its statutory powers.

COMPLAINTS REGISTER

The Contractor will ensure that a dedicated complaints register is kept on site at all times. The register will contain the details of the person who made the complaint, the nature of the complaint received, the date on which the complaint was made and the response noted with the date and action taken. The register will be kept in accordance with the requirements of the ECO. This record shall be submitted with the monthly reports and an oral report given at the monthly site meetings.

Please see the “Grievance Procedure” chapter (Chapter 15) for specific instructions regarding the different actions to be taken in the event of a grievance.

INSPECTIONS

Ongoing visual inspections will be conducted daily by the ESCO. The ESCO will spend the bulk of his/her time on site on the lookout for any unsafe acts and activities that transgress the requirements as specified in the EMPr. The ESCO compiles the site register and the ECO maintains the complaints register and any other records required in the environmental authorisation (the ESCO would also have input into this as well, as he/she would be site-based).

SPOT FINES

The ESCO and ECO shall be authorised to impose spot fines for any of the transgressions detailed below:

- Littering on site;
- Lighting of illegal fires on site;
- Any persons, vehicles or equipment related to the contractor’s operations found within the designated ‘no-go’ areas (especially for significant cultural resources such as nearby graves etc.);
- Creating dust or noise;
- Possession or use of intoxicating substances or weapons on site;
- Trapping, hunting or trading of fauna and / or plants on site;
- Any vehicles being driven in excess of designated speed limits;
- Unauthorised removal and/or damage to fauna, flora or cultural or heritage objects on site; and
- Urination and defecation anywhere other than using the toilet facilities that have been provided.

These activities, along with the appropriate guidelines to determining the fines, shall be agreed to by Brandvalley Wind Farm (Pty) Ltd, the Project Manager and the Contractor. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications and or legal obligations. Brandvalley Wind Farm (Pty) Ltd will inform the contractor of the contravention and the amount of the fine.

PENALTY FINES

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the Contractor shall be liable to pay a penalty fine. The following transgressions should be penalised:

- Hazardous chemical/oil spill;
- Damage to sensitive environments;
- Damage to cultural and historical sites;
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas;
- Uncontrolled/unmanaged erosion;
- Unauthorised blasting activities; and
- Violation of environmental authorisation conditions.

These activities, along with the appropriate guidelines to determining fines, shall be agreed to by Brandvalley Wind Farm (Pty) Ltd, the Project Manager and Contractor, and will be included within the final EMPr. In addition to penalties, the Project Manager has the power to remove from site any person who is in contravention of the EMPr, and if necessary, the engineer can suspend part of or all of the works, as required.

AUDITS

Where the monitoring data and the inspections highlight any problems, an internal audit will be initiated by the ECO. The purpose of the audit is to ascertain the source of the problem and to define what action shall be taken to rectify the problem and prevent its reoccurrence.

Audit reports shall conform to the requirements as per the 2014 EIA regulations, namely:

Environmental Audit Report

The environmental audit report must provide for recommendations regarding the need to amend the EMPr.

Objective of the environmental audit report

The objective of the environmental audit report is to-

- a. report on-
 - (i) the level of compliance with the conditions of the environmental authorisation and the EMPr, and where applicable, the closure plan; and
 - (ii) the extent to which the avoidance, management and mitigation measures provided for in the EMPr, and where applicable, the closure plan achieve the objectives and outcomes of the EMPr, and closure plan.
- b. identify and assess any new impacts and risks as a result of undertaking the activity;
- c. evaluate the effectiveness of the EMPr, and where applicable, the closure plan;
- d. identify shortcomings in the EMPr, and where applicable, the closure plan; and
- e. identify the need for any changes to the avoidance, management and mitigation measures provided for in the EMPr, and where applicable, the closure plan.

Content of environmental audit reports

An environmental audit report prepared in terms of these Regulations must contain-

- (a) details of-
 - (i) the independent person who prepared the environmental audit report; and
 - (ii) the expertise of independent person that compiled the environmental audit report;
- (b) a declaration that the independent auditor is independent in a form as may be specified by the competent authority;
- (c) an indication of the scope of, and the purpose for which, the environmental audit report was prepared;
- (d) a description of the methodology adopted in preparing the environmental audit report;
- (e) an indication of the ability of the EMPr, and where applicable, the closure plan to-
 - (i) sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis;
 - (ii) sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and
 - (iii) ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;
- (f). A description of any assumptions made, and any uncertainties or gaps in knowledge;
- (g). a description of any consultation process that was undertaken during the course of carrying out the environmental audit report;
- (j). a summary and copies of any comments that were received during any consultation process; and
- (k). any other information requested by the competent authority.

The frequency of environmental audits will be determined in the EA.

INCIDENT REPORTING AND REMEDY

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately notified of the incident (within 24 hours). The following information must be provided:

- The location;
- The nature of the load; and
- The status at the site of the accident itself (i.e. whether further leakage is still occurring, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

VERBAL INSTRUCTIONS

Verbal instructions are likely to be the most frequently used form of corrective action and are given in response to transgressions that are evident during routine site inspections by the ESCO and/or ECO. Verbal instructions are also used to create further awareness amongst employees as often transgressions are a function of ignorance rather than vindictiveness. Workers must obey verbal instructions through formally recording the actions taken to resolve the matter so that the instruction could be successfully finalised and recorded. Maximum allowable response time: two working days.

WRITTEN INSTRUCTIONS

Written instructions will be given following an audit. The written instructions will indicate the source or sources of the problems identified on site and propose solutions to those problems. The implementation of solutions will be assessed in a follow-up audit and further written instructions issued if required. Maximum allowable response time: four working days.

PUBLIC COMMUNICATION AND LIAISON WITH INTERESTED AND AFFECTED PARTIES

The contractor shall comply with the requirements for public consultation as required by the Constitution Act (Act No. 108 of 1996) and the NEMA (Act No. 107 of 1998). During the construction phase of the project, the contractor shall be responsible for erecting information boards, in the position, quantity, design and dimensions approved by the Project Manager. The information boards shall contain relevant information regarding the construction activity and the relevant contact details to assist persons who wish to submit complaints regarding construction activities.

6.3 REVIEW AND AMENDMENT OF THE EMPR

A formal management review needs to be conducted on a regular basis in which the audit reports written by the ECO based on frequent inspections and interactions with the ESCO, will be reviewed. The purpose of the review is to critically examine the effectiveness of the EMPr and its implementation and to decide on potential modifications to the EMPr as and when necessary. The process of management review is in keeping with the principle of continual improvement.

Amendments of the EMPr can be undertaken in terms of Sections 34-37 of the 2014 EIA Regulations. Any amendments requiring approval, shall be submitted to the DFFE as the competent authority.

7 ENVIRONMENTAL SPECIFICATIONS FOR THE PROJECT LIFE CYCLE

This Chapter of the EMPr outlines the environmental specifications which are required to be implemented for the design, construction, operation and rehabilitation phases by the various parties. The specifications contained herein are based on the mitigation measures recommended in the EIA Report. Please note that the DFFE requests that any suggested adaptive changes to the initial mitigation measures, be adopted within a maximum two (2) weeks from the date of the recommendation, unless where future time periods apply. Please note that this can only be affected once any impacts or specific mitigation measures requiring amendment or adaptation are identified. As such, these are likely to be more applicable to the construction and operational phase specification and management commitments, and as such will have to form part of the periodic revision of the EMPr.

Comprehensive environmental audits are to be undertaken periodically during the construction and operation phases, in order to verify compliance with the measures listed below, the recommendations contained within the EIA Report and all applicable environmental legislation. If compliance with any of these measures cannot be met, it will be the responsibility of the Contractor to motivate for this non-compliance.

In order to meet the commitments detailed within the EIA, Brandvalley developed environmental objectives and outcomes (targets). The necessary actions (mitigation measures), person responsible and timeframes were identified.

7.1 PLANNING AND DESIGN PHASE MITIGATION MEASURES

Table 7-1: Planning and design phase mitigation measures

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
1	Design of the WEF	Ensure the design of the WEF responds to the identified environmental sensitivities	The WEF design does not take into consideration the specialist recommendations and impact on sensitive features that could have been avoided	The final optimised layout must be submitted to DFFE for approval	The design fully responds to the recommendations of the specialists	<ul style="list-style-type: none"> Final layout submitted to DFFE for approval No monitoring required. 	Holder of the EA	Prior to commencement of construction
2			Habitat destruction from clearance of vegetation; Avifaunal mortality associated with 33kV power lines and turbine blades	<p>Leave 100m gap between successive turbines across saddles.</p> <p>At the saddle between the two Snydersberg plateaux and the col in the ridge between the Ou Mure and Fortuin farm valleys no turbines should be erected within 100 m of the lowest point in the saddle/col and overhead lines should have bird diverters of a type visible by day and night set at 2 m intervals along the line.</p> <p>Avoid elevated power lines across saddles and cols where possible. If not avoidable, all overhead 33kV power lines on saddles and cols away from the two abovementioned locations should have diverters at 5m intervals on the lines.</p>	Turbine <u>design and</u> placement takes into account the avifaunal sensitivities	<ul style="list-style-type: none"> Turbine, power line placement and diverter design follow the recommendations An additional 6-months of pre-construction monitoring be undertaken around the new eagle nest; 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 	Holder of the EA	Design phase, construction phase and post construction
		<u>Careful siting of the proposed turbines</u>	<u>Impacts to the Vulnerable and highly collision-prone species (Verreaux's Eagles and Black Harrier).</u>	<p><u>Birds & Bats Unlimited recommends the five turbines here (B28, B29, B30, B31, B32) be repositioned away from the nest, if at all possible. If these five turbines cannot be relocated, we recommend the following approach and mitigation hierarchy for this string of turbines:</u></p> <ul style="list-style-type: none"> <u>Erect them with striped-blade mitigation already installed and</u> <u>Automatic shut-down on demand or curtailment at certain times of day or seasons when flights are numerous.</u> <u>If these mitigations are not possible then the mitigation hierarchy suggests a suitable set-aside to help safe-guard and replace the eagles that may be killed. This should be undertaken as a last resort given that the first mitigations are considered more effective.</u> 				
			<u>The potential impact of the development on the terrain and geological environment</u>	<p><u>Undertake a detailed geotechnical investigation during the detailed design phase of the project. The detailed geotechnical investigation must entail the following:</u></p> <ul style="list-style-type: none"> <u>Profiling and sampling exploratory of trial pits to determine founding conditions for the turbine modules, substation and pylons.</u> <u>An investigation to determine the subgrade conditions for internal roads and a materials investigation (if required).</u> <u>Thermal resistivity and electrical resistivity geophysical testing for electrical design and ground earthing requirements.</u> <u>Groundwater sampling of existing boreholes to establish a baseline of the groundwater quality for construction purposes.</u> <u>Dynamic Probe Super Heavy (DPSH) tests and rotary core drilling may be required depending on the soil profiles and imposed loads of the structures.</u> 	The engineering design of the WEF and associated infrastructure takes into account the terrain and geological environment.	<ul style="list-style-type: none"> Detailed geotechnical evaluations to identify and/or verify geotechnical constraints 	Engineering Geologist, Holder of the EA	During the detailed design phase of the project.
3			<u>Bat mortality and impacts from turbine blade movement</u>	<u>The EIA layout and final site layout, developed as part of the EMPR update, avoid all high sensitive areas. Turbines must be sited and positioned during the optimisation process in accordance with specialist recommendations based on the 12-month pre-construction monitoring outcomes.</u>	WEF design is optimal to mitigate bat impacts	<ul style="list-style-type: none"> Zero turbines in high sensitive no-go zones. No monitoring required. 	Holder of the EA	Design phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p><u>Should a turbine with 180m rotor diameter be utilised, Turbine positions 20, 32, 49, 53 and 58 should be relocated outside of the high bat sensitivity buffer</u></p> <p><u>The design should be done in such a manner to reduce the need for blasting as far as possible.</u></p>				
4		<p><u>Loss of sensitive vegetation and fauna, loss of SCC as a result of vegetation clearances, Erosion impacts, Hydrological disturbance</u></p>	<p><u>A flora and fauna search and rescue (relocation) must be undertaken before commencement of vegetation clearing and should preferably be undertaken in the Spring season. A comprehensive list of 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 Acts and Ordinance(s) of the Ecology & Biodiversity Walkdown Report</u></p> <p><u>Before the clearing of the site, the appropriate permits must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal of plants listed in the National Forest Act and from the relevant provincial department for the destruction of species protected in terms of the Specific provincial legislation.</u></p> <p><u>Turbines 13, 28, 29, 49 and 65 are positioned adjacent to rocky outcrops; minor layout adjustments for these turbines' footprints should be implemented during final surveying and pegging out to avoid outcrops as far as possible.</u></p> <p><u>The western access road passes through and along a well-defined watercourse with large <i>Brunsvigia josephinae</i> population (19) present within the riparian vegetation and directly adjacent to the watercourse. The access road should be aligned as far from watercourse as possible and should not extend closer to watercourse than inner side of the existing access track.</u></p> <p><u>The species <i>Antimima androsacea</i> was found to occur at low densities throughout a broader area as indicated; due care to be taken during construction to avoid impact to this species.</u></p> <p><u>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.</u></p> <p><u>Should there be a need to remove and or a recommendation to transplant any protected species affected by the final optimised layout, the relevant permits must be obtained.</u></p> <p><u>The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas. The development footprint should not encroach into watercourses unless absolutely essential and where project activities are located in the watercourses. It must be ensured that the watercourse habitat is off-limits to construction vehicles and non-essential personnel.</u></p> <p><u>Access roads must preferably be routed next to existing routes to minimise erosion and overall biodiversity impacts on the area.</u></p> <p><u>Planning of temporary roads and access routes (if applicable) should avoid watercourses and be restricted to existing roads where possible.</u></p>	<p>The final layout avoids protected plant species <u>and outcrops</u> as far as possible.</p>	<ul style="list-style-type: none"> – Report documenting the findings of the <u>flora and fauna search rescue.</u> – Copies of the relevant permits/licences in terms of NEM:BA, <u>and WULA</u>, if required. 	<p>Independent Ecologist and the Holder of the EA</p>	<p>Prior to construction commencing</p>

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>No activities must be allowed to encroach into a water resource without a Water Use License being in place from the Department of Water and Sanitation.</p> <p>Any permanent roads should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.</p> <p>Development within the very high ecological sensitivity areas should proceed with caution with specific attention to avoiding impact on plant species of conservation concern that may be present.</p> <p>It is recommended that pre- construction monitoring of key fauna within the Snydersberg area be conducted to improve our understanding of the impacts of wind turbines on fauna and inform mitigation for future wind development in the country.</p> <p>Appropriate stormwater structures must be designed and implemented for all new infrastructure (e.g. roads, turbine bases etc.).</p> <p>Development on steep slopes should be avoided as much as possible and specific additional mitigation may be required where this cannot be avoided.</p> <p>Disturbance near drainage lines should be avoided and sensitive drainage areas near to the construction activities should be demarcated as no-go areas.</p> <p>Runoff management and erosion control should be integrated into the project design.</p> <p>Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible.</p>				
5		Increased erosion as a result of vegetation clearing and impact to surface water features	<p>Appropriate stormwater structures must be designed and implemented.</p> <p><u>Construction of temporary berms and drainage channels to divert surface water.</u></p> <p>All infrastructure situated on slopes must incorporate stormwater diversions.</p> <p>Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.</p> <p>Sediment traps may be necessary to prevent erosion and soil movement if there is topsoil or other waste heaps present during the wet season.</p>	Appropriate stormwater structures incorporated in design	— Final layout design. No monitoring required.	Holder of the EA	Prior to construction commencing
6		Loss of high potential agricultural land	Avoid developing on high potential agricultural land (like irrigated areas, croplands, etc.). If unavoidable, ensure that all development footprints are kept at a minimum.	Cultivated fields avoided as far as possible	— Final layout design. No monitoring required.	Holder of the EA	Prior to construction commencing
7		Irreparable damage to archaeological resources on-site	<p>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 post the final layout and further recommendations and mitigation measures be suggested if necessary.</p> <p>No turbines are to be located on Tafelkop or Spitskop</p>	Impacts to heritage features avoided or managed as per specialist recommendations	<p>— Final site layout.</p> <p>— No monitoring required.</p>	Holder of the EA	Prior to construction commencing
					<p>— Final site layout.</p> <p>— No monitoring required.</p>	Holder of the EA	Prior to construction commencing

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	
			<p>If any of the old farm buildings are intended for demolition a qualified and experienced professional (historical archaeologist / historical architect) must be consulted along with heritage Western Cape or SAHRA.</p> <p>Proposed access road upgrade affecting the rock shelter (BV_SA_RS1) and the stone packed dwelling (BV_SW15) in the Barendskloof valley to be diverted to between 20 m – 30 m either east or west of BV_SW15 owing to site being right next to the internal access road.</p> <p>A 30 m buffer be established around the stone packed walling feature (BV_SW1) and clearly demarcated to avoid any damage by the construction camp activities and other possibly negative human impact.</p> <p>Heritage 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.</p>	Impacts to heritage features avoided or managed as per specialist recommendations				
8		Social disruptions in terms of Noise and Shadow flicker	<p>Undertake noise modelling to inform the final site layout once the turbine model is confirmed.</p> <p>If the turbines are located within 800m of an existing occupied dwelling, mitigation measures will be required.</p> <p>The final route selection of the power lines and location of the substation should be informed by current location of farm dwellings on the site and the findings of the other specialist studies.</p> <p>The proposed establishment of suitably sited renewable energy facilities within the KHLM, LLM and WLM should be supported.</p>	Social impacts in terms of noise and shadow flicker managed	<ul style="list-style-type: none"> – Noise modelling undertaken 	Holder of the EA	Once turbine model and optimised layout is confirmed	
9	Social environment	Manage relationships with affected landowners and the community	Social impacts affecting landowners	The proponent should enter into an agreement with the landowners on whose property the WEF is located, whereby damages to farm property etc. during the construction phase that are proven to be associated with the construction activities for the WEF will be compensated for.	Clear communication channels established	<ul style="list-style-type: none"> – The agreement should be signed before the construction phase commence. – No monitoring required. 	Holder of the EA	Prior to commencement of construction
10		Uninformed community or miscommunication resulting in social impacts	<p>Establish a communication process.</p> <p>Appointment of Community Liaison Officers to manage communication with the local community.</p> <p><u>Implement the grievance procedure (see Chapter 15).</u></p>		<ul style="list-style-type: none"> – Communication plan and grievance policy in place. Community Liaison Officer appointed. 	Holder of the EA	Prior to commencement of construction	
11		Promote fair employment practices	Unfair employment practices resulting in social unrest and project disruption	<p><i>*This section is a recommendation only. The IPP Procurement Program under the authority of the Department of Energy deals extensively with social aspects of a renewable energy development.</i></p> <p>Without compromising construction and operation activities and schedules, local labour should be employed as far as possible.</p> <ul style="list-style-type: none"> – Develop a training programme to ensure that those successful in obtaining employment will be provided with the appropriate skills development and training. – Develop an employment policy to be implemented by all Contractors. 	Fair employment practises in place	<ul style="list-style-type: none"> – Employment policy in place. – No monitoring required. 	Holder of the EA	Prior to construction and throughout the project lifecycle
12	Securing required services and	Manage the securing of services and site establishment	Mismanagement during the construction phase	All required permits and approvals specified in Section 2.2 obtained and copies thereof and this EMPr made available to all relevant Contractors.	Compliance to all legislative requirements	<ul style="list-style-type: none"> – Copies of all approvals and permits available 	Holder of the EA	Prior to commencement of construction

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
	preparing for site establishment			<p>Assign roles and responsibilities in line with this EMPr</p> <p>The contractor shall submit to the Project Managers for review and to the ECO for approval, Method Statements and layout plans detailing the following:-</p> <ul style="list-style-type: none"> — Site access (including entry and exit points). — Access and haulage routes in line with a transport management plan. — Location of equipment storage areas (including storage areas for hazardous substances such as fuel and chemicals). — Construction offices and other structures (accommodation for staff, where required and considered appropriate). The site offices should not be placed in close proximity to steep areas. Preferred locations would be flat areas within the proposed project area. — Areas where construction vehicles will be serviced. — Security requirements (including temporary and permanent fencing, and lighting) and accommodation areas for security staff. — Areas where vegetation will be cleared. — The locality as well as the layout of the temporary waste storage facilities for litter, kitchen refuse, sewage and workshop-derived effluents. Waste storage facilities for sewage, grey water and workshop-derived effluents, where no formal facilities exist. — Provision of potable water and temporary ablution facilities. — Potential pollution hazards and mechanisms to manage these. — 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. — Particular reference in the site establishment plan shall be given to the management of sewage generated at the site offices, and on-site facilities for labour. Sanitary arrangements should be to the satisfaction of the ESCO and/or ECO, the local authorities and all applicable legal requirements. — The necessary ablution facilities for all his employees. These must be easily accessible (within 500m of any point of work), transportable and there should be a minimum of 1 toilet per 10 persons. — Detailed, electronic colour photographs shall be taken of the proposed site before any clearing may commence. These records are to be kept by the Project Manager for consultation during rehabilitation of the site. — As far as possible construction activities should be kept to a minimum in terms of space and time. 	Site establishment undertaken in line with the requirement of the EMPr	— Site layout plan and Method Statements reviewed by Project Manager and approved by ECO	Project Manager, ECO	At the conclusion of the design phase, prior to the construction phase commencing
13			Human consumption water not available, hydrological disturbance	All required permits and approvals to be obtained to secure potable water for human consumption.	Potable water sourced in accordance with the requirements of the NWA	— Water source secured	Project Manager	Prior to the construction phase commencing
14	Ecological	Manage the natural resources including fauna, flora and soil on site in order to sustain ecological activity on site as far as possible	Soil erosion, habitat loss, faunal disturbance and mortality, runaway fires	<p>A large proportion of the impact of the development stems from the access roads and the number of roads should be reduced to the minimum possible and routes should also be adjusted to avoid areas of high sensitivity as far as possible, as informed by a preconstruction walk-through survey.</p> <p>All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.</p>	<p>Open space management plan implemented; Pre-construction walk through conducted, sensitive areas demarcated;</p> <p>Erosion plan implemented and hydrological measures in place</p>	<p>— Entire site demarcated in terms of sensitivity;</p> <p>— Laydown areas determined and place in low sensitivity regions;</p> <p>— Once off monitoring by ECO prior to construction</p>	PM, PC, ECO	Design phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	
			<p>An Open Space Management plan should be developed for the site, which should include management of biodiversity within the affected areas, as well as that in the adjacent rangeland.</p> <p>Development on steep slopes should be avoided as much as possible and specific additional mitigation may be required where this cannot be avoided.</p> <p>Development within the Very High Sensitivity areas should proceed with caution with specific attention to avoiding impact on plant species of conservation concern that may be present.</p> <p>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.</p> <p>Pre-construction walk-through of the approved development footprint to ensure that sensitive habitats and species are be avoided where possible.</p> <p>Although the current wetlands are impacted upon by the present farming activities, dams and roads, the project could improve the situation by placing the upgraded structures within the crossing that won't impede the flows.</p> <p>It is also advised that an Environmental Control Officer, with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using selected species detailed in this report.</p> <p>Where new water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (reduce footprint as much as possible).</p> <p>Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.</p> <p>Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.</p>					
15	Agricultural	Manage soil and water fertility, quality, quantity and future land use	Loss of soil fertility, erosion, water pollution	<p>Appropriate stormwater structures must be designed and implemented.</p> <p>All infrastructure situated on slopes must incorporate stormwater diversions.</p> <p>Develop a Rehabilitation and Monitoring Plan to monitor stockpiles.</p>	Appropriate stormwater structures incorporated in final design, Key sensitive areas avoided	<ul style="list-style-type: none"> — All stormwater options reviewed and appropriate options selected prior to construction, — Stockpile method statements received and approved prior to construction; — Once off monitoring prior to construction by ECO 	PC, ECO	Design phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				Avoid developing on high potential agricultural land (like irrigated areas, croplands, etc.). If unavoidable, ensure that all development footprints are kept at a minimum.				
16	Bats & Birds	Plan for minimal bird and bat fatalities from the facility	Bird and bat fatalities	<p>Adhere to the sensitivity map during turbine placement. Blasting should be minimised and used only when necessary.</p> <p><u>Adhere to the EA conditions, including the application of a uniform 200m buffer to all identified bat 'no-go' (High bat sensitivity) areas. No turbines are to be located on the edge of the buffer</u></p> <p><u>The facility must be designed in a manner such that infrastructure components that could be used as perching or roosting substrates by birds and bats must be prohibited.</u></p> <p>Adhere to the sensitivity map.</p> <p>Apply proposed mitigations to any further layout revisions,</p> <p>Preferably attempt to avoid placement of turbines in Moderate sensitivity areas, where possible.</p> <p>Powerlines should avoid the two identified avifauna high sensitivity areas as far as possible.</p> <p>Where overhead 33kV powerlines are required, these should preferably not cross valleys and if they do so must have bird diverters at 5 m intervals along the line.</p> <p>An environmental control officer, with a brief that includes minimization of habitat destruction, should be appointed.</p> <p>Blades higher off ground</p> <p>Bury powerlines where possible.</p> <p>Minimize powerline crossing of valleys</p>	Turbine <u>design and</u> placement takes into account bat and bird sensitive areas	<ul style="list-style-type: none"> — Turbine placement takes into account bat <u>and bird</u> sensitivities, — Once off monitoring prior to construction commencing 	Holder of the EA	Design phase
17	Palaeontological	Manage paleontological planning to reduce potential future harm to this resource	Irreparable loss to paleontological resources	<p>The palaeontologist concerned with mitigation work will need a valid fossil collection permit from Heritage Western Cape (sites in the Western Cape) or SAHRA (sites in the Northern Cape) and any material collected would have to be curated in an approved depository (e.g. museum or university collection).</p> <p>All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).</p> <p>The Environmental Control Officer (ECO) and ESCO responsible for the WEF development should be made aware of the potential occurrence of scientifically-important fossil remains within the development footprint.</p>	Appropriate permits and qualifications obtained prior to work commencing, ECO and ESCO appointed and briefed	<ul style="list-style-type: none"> — All necessary permits obtained prior to construction commencing. 	Contractor, ECO	Design phase
18	Visual	Reduce visual impact of project	Visual impact from proximity to turbines	Due to access road 1 having a smaller footprint and viewshed, it should be the preferred access road option.	Appropriate siting of turbines	<ul style="list-style-type: none"> — Appropriate siting of turbines, 	Holder of the EA	Design phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>Substation alternative 1 should be the preferred alternative due to it having the smallest viewshed. However, they are all four rated equally using the assessment methodology and therefore the other three locations can also be constructed if substation 1 is not technically feasible.</p> <p>We recommend that if the turbine layout is adjusted and it is found that an occupied building is located within 800m of a wind turbine, then the potential for shadow flicker should be assessed. A building should not be affected for more than 30 hours per year, or for longer than 30 minutes in a day (Parsons Brinckerhoff, 2011).</p> <p><u>Pilot activated lights will be installed on the Brandvalley WEF site so as to decrease the red night light disturbance in terms of visual impacts.</u></p>		<p>— Once off monitoring by ECO prior to construction commencing</p>		
19	Traffic management	<p><u>Mitigate traffic related environmental Impacts</u></p> <p><u>Mitigate Site Access</u></p>	<p><u>Impact on the internal roads; road hazards</u></p> <p><u>Impact on the internal roads; road hazards and impact on landowners</u></p>	<p><u>Update the Brandvalley Traffic Management Plan (TMP) prior to the commencement of the construction phase, when detailed information regarding the delivery of components, traffic data and construction activities are available.</u></p> <p><u>Contractors and sub-contractors may only utilise demarcated access roads to access the Rietkloof WEF. The roads DR01475 and DR01483 cannot be utilised under any circumstances. The roads are clearly indicated in Figure 7-1.</u></p>	<p><u>Implementing pilot activated lighting for decrease in visual impacts during night.</u></p> <p><u>Identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility</u></p>	<p>— <u>Record of updated TMP</u></p> <p>— <u>Monitoring by ECO prior to construction</u></p>	<p><u>Holder of the EA; Contractor (haulage company)</u></p> <p><u>Holder of the EA; Contractor</u></p>	<p><u>Prior to the construction phase commencing</u></p> <p><u>Prior to the construction phase commencing</u></p>

7.2 CONSTRUCTION PHASE MITIGATION MEASURES

Table 7-2: Construction phase mitigation measures

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
20	Environmental training and awareness	All staff to be aware of environmental requirements	Staff not fully aware of the EMPr requirements could result in avoidable impacts to the environment	<p>The Contractor shall inform all staff of the need to be vigilant against any practice that will have a harmful effect on vegetation. This information shall form part of the Environmental Education Programme to be effected by the Contractor.</p> <p>All staff shall attend environmental awareness training.</p> <p>Proof of attendance for all staff members shall be submitted by the Contractor to the ESCO.</p> <p>Refresher courses for permanent staff members shall be attended on a regular basis as required by the ECO and Project Manager.</p> <p>All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.</p>	All staff members are aware of the EMPr requirements relevant to them	— Attendance registers	Contractor	All staff to attend once session of environmental awareness training before accessing the site
21	Habitat clearance	Manage impacts to fauna and flora	Loss of sensitive vegetation, loss of SCC, Erosion impacts, Hydrological disturbance	<p>The natural vegetation encountered on the site is to be left as intact as far as possible.</p> <p><u>A flora and fauna search and rescue (relocation) must be undertaken before commencement of vegetation clearing. A more comprehensive list of 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 of the Ordinance(s) of the Ecology & Biodiversity Walkdown Report (Appendix I).</u></p> <p>Keep removal of vegetation to a minimum. <u>All vegetation clearing must be done in a phased manner.</u></p> <p>Vegetation to be cleared on a needs basis to avoid large tracks of land laying bare for long periods of time</p> <p>All no-go areas as indicated in the sensitivity map included in the previous chapters, must be avoided, demarcated if works are proposed in close proximity.</p> <p>Ongoing re-vegetation of disturbed areas no longer used must be undertaken with indigenous species and in accordance with the instructions issued by the ECO.</p>	Impacts managed according to the recommendations of this EMPr	— Habitat clearances monitored by the ESCO where required.	Contractor, ESCO	At onset of construction phase and for the remainder of the phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>An approved Method Statement shall be in place prior to clearing the natural vegetation and soil. The plan shall contain a photographic record of the areas to be disturbed.</p> <p>The contractor shall be responsible for the re-establishment of vegetation all areas disturbed during construction, operation and decommissioning phases.</p> <p>Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.</p> <p>The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone expect landowners with the appropriate permits where required.</p> <p>A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.</p> <p>A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.</p> <p>All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.</p> <p>All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.</p> <p>All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.</p> <p>All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques</p> <p>All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.</p> <p>All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.</p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.</p> <p>Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.</p> <p>Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.</p> <p>Avoid impact to potential corridors such as the riparian corridors associated with the larger drainage lines within the facility area.</p> <p>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.</p> <p>Disturbance near to drainage lines should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas.</p> <p>During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.</p> <p>Dust suppression and erosion management should be an integrated component of the construction approach.</p> <p>Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible.</p> <p>Erosion management at the site should take place according to the Erosion and Rehabilitation Plan.</p> <p>If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards.</p> <p>If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.</p> <p>No dogs or cats should be allowed on site apart from that of the landowners.</p>				

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>No fires should be allowed within the site as there is a risk of runaway veld fires.</p> <p>No fuelwood collection should be allowed on-site.</p> <p>No unauthorized persons should be allowed onto the site and site access should be strictly controlled and vehicles which need to roam around the site should be accompanied by the ECO or security personnel.</p> <p>Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season.</p> <p>The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.</p> <p>Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.</p> <p>Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as Prosopis are already present in the area and are likely to increase rapidly if not controlled.</p> <p>Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.</p> <p>Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.</p> <p>Regular monitoring for erosion problems along the access roads and other cleared areas.</p> <p>Runoff management and erosion control should be integrated into the project design.</p>				
22	Alien invasive species		Establishment of alien invasive species	Any proclaimed weed or alien species that germinates during the contract period shall be managed according to the alien invasive management plan (see Chapter 8) in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) and Section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)) Removal of species should take place throughout the construction, operational, and maintenance phases.		— Regular monitoring by the ESCO	ESCO and ECO	During the construction phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				A strict monitoring plan must be implemented to prevent the additional spread and the continued removal of alien species, which were already present on site or that become established on areas that were disturbed during construction.				
23	Construction activities disturbing fauna		Impacts and or loss of sensitive fauna, loss of SCC.	During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible. Only necessary damage may be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat outside of the development footprint are not allowed.		<ul style="list-style-type: none"> – All permits obtained prior to construction commencing; – Monitoring weekly by the ESCO. 	ESCO	During the construction phase
24	Solid and liquid waste	Manage waste safely and in an environmentally friendly manner	Hazardous substance leakage, environmental contamination, health and safety implications	<p>The Contractor's intended methods for waste management and waste minimisation must be implemented at the outset of the contract, and approved by the ECO.</p> <p>All personnel shall be instructed to dispose of all waste in the proper manner. Contractors must also provide disposal records to prove that waste was not just dumped somewhere. These disposal certificates must be kept on file by the ESCO.</p> <p>No waste from construction or otherwise, may be disposed of or burned on site.</p> <p>Hazardous waste must be managed as per the Hazardous substances plan below (Chapter 9).</p> <p>All waste generated on site, must be removed from the site and disposed of at a licensed waste disposal site. In this regard, adequate litter drums or other suitable containers must be located on site to ensure that waste generated on site is disposed of in suitable and timeous manner.</p> <p>Where possible, some of the construction waste should be recycled.</p> <p>Solid waste shall be stored in a designated area within the site area in covered, tip proof drums for collection and final disposal or recycling.</p> <p>All refuse containers must be free of any holes and in good condition. A refuse control system shall be established for the collection and removal of refuse to the satisfaction of the ESCO and/or ECO.</p> <p>As far as possible, general waste (including paper, glass, plastics, aluminium, etc.) shall be sorted for recycling.</p> <p>Any water contaminated by cement shall not be allowed to flow freely into the environment. Instead, it must be contained and solids allowed to settle out. Thereafter, the solid material shall be disposed of to a landfill site with other solid waste.</p>	All waste managed according to approved Method Statement	<ul style="list-style-type: none"> – Method Statement for waste management approved 	Contractor, ESCO, ECO	At the onset and throughout the construction phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>Hazardous waste such as bitumen, oils, oily rags, paint tins, chemicals etc. shall be disposed of at a registered hazardous landfill site. Special care should be taken to avoid spillage of hazardous waste from entering the ground or contaminating water. In the event of the above occurring, the affected areas shall be promptly cleaned to the satisfaction of the ESCO/ ECO. Spill kits to be kept onsite.</p> <p>In the event of a substantial spill, the ECO and Project Manager shall be notified immediately to provide input as required to the corrective action.</p> <p>As far as possible, maintenance of machinery and vehicles on site should be avoided. Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery should be collected in a holding tank and returned to the supplier.</p> <p>The Contractor shall ensure that an emergency preparedness plan is in place for implementation in the case of a spill or substances which can be harmful to an individual or the receiving environment.</p> <p>All used filter materials should be stored in a secure bin for disposal off site. Hazardous waste shall not be stored or stockpiled in any area other than that designated on the construction site layout.</p> <p>Any contaminated soil should be removed and replaced. Soils contaminated by oils and lubricants should be collected and disposed of at a facility registered to accept contaminated materials.</p> <p>Washing of vehicles on the construction site should not be permitted as this is likely to result in release of hydrocarbon-contaminated wash water into the environment.</p> <p>Storage areas must be located more than 50 m away from the watercourse.</p>				
25	Litter		Environmental contamination from litter	<p>No littering by construction workers must be allowed.</p> <p>During the construction period, the facilities shall be maintained in a neat and tidy condition, and the site is to be kept free of litter. Fines shall be implemented for persons found littering.</p> <p>Clean-ups shall be undertaken if required</p> <p>Measures shall be taken by the Contractor to reduce the potential for litter and negligent behaviour with regard to the disposal of all refuse.</p>		— Monitoring reports from ESCO to report on litter	Contractor, ESCO, ECO	Monthly monitoring reports throughout the construction phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				At all places of work, the Contractor shall provide litter collection facilities for later safe disposal at registered waste disposal site.				
26	Safety	Ensure that all staff adhere to safety measures	Wildfire spread, vegetation and faunal damage and mortality; health incidents; OHS implications	<p>No open fires should be permitted on the site.</p> <p>Where fires are unavoidable, the Contractor shall ensure the management of fires emanating from construction camps and that education of the work force concerning management of fires is undertaken.</p> <p>The Contractor shall ensure that camp fires at construction sites are strictly controlled to ensure that no veld fires are caused. This is especially important where fires may affect sensitive habitats.</p> <p>Fires shall only be allowed in facilities or equipment specially constructed for this purpose and these must be located in areas that are sheltered from the prevailing winds.</p> <p>No smoking outside of designated smoking areas.</p> <p>Firefighting equipment must be present on site at all times.</p> <p>A firebreak shall be cleared and maintained around the perimeter of the camp and office sites at all times. The location of this firebreak shall be decided with input from a local botanist and the ECO.</p> <p>If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside</p> <p>Ensure that all personnel are aware of the fire risk and the need to extinguish cigarettes before disposal, in appropriate waste disposal container.</p> <p>The risk of fire is highest in the late summer and autumn months, during high wind velocities and dry periods. To avoid and manage fire risk the following steps should be implemented:</p> <p>Have on site fire-fighting equipment and ensure that all personnel are educated how to use it and procedures to be followed in the event of a fire.</p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	
			<p>Identify the relevant authorities and structures responsible for fighting fires in the area and shall liaise with them regarding procedures should a fire commence.</p> <p>Ensure that all the necessary telephone numbers etc. are posted at conspicuous and relevant locations in the event of an emergency.</p> <p>Should a contractor be found responsible for the outbreak of a fire, he shall be liable for any associated costs.</p> <p>No open fires shall be allowed on site for the purpose of cooking or warmth. Bona fide braai fires (such braai fires shall be limited to the traditional “month end” braais and not individual daily cooking fires) may be lit within the construction camp or site.</p> <p>The Contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire.</p> <p>The Contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire.</p> <p>The Contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.</p> <p>The Contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters. The Contractor shall pay the costs incurred by organisations called to put out fires started by himself/herself, his/her staff or any sub-contractor. The Contractor shall also pay the costs incurred to reinstate burnt areas as deemed necessary by the PM.</p> <p>Any work that requires the use of fire may only take place at that designated area and as approved by the PM. Fire-fighting equipment shall be available in these areas.</p> <p>The Contractor shall ensure that the telephone number of the local Fire and Emergency Service are displayed at the site offices.</p> <p>The Independent Contractor is to ascertain the fire requirements and shall submit a fire contingency plan Method Statement to the PM and ECO.</p>					
27	Topsoil	Manage soil to conserve fertile topsoil removed during	Topsoil will be required during the rehabilitation phase. By storing topsoil	Topsoil shall be removed from all areas where physical disturbance of the surface would occur and shall be stored and adequately protected.		— Erosion protection in place for exposed stockpiles, using either	Contractor and ESCO	At the onset and throughout the construction phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
		construction for reuse during the rehabilitation phase	removed during the construction phase for reuse will eliminate the need to import topsoil material which could contain invasive plant seeds.	<p>Topsoil is considered to be the natural soil covering, and to include all organic matter. Depth may vary at each site, and must be determined on a site-specific basis and removed accordingly. The areas to be cleared of topsoil shall include the storage areas and site camps.</p> <p>All topsoil stockpiles and windrows shall be maintained throughout the contract period in a weed-free condition. Weeds (only) appearing on the stockpiled topsoil shall be removed by hand and disposed of appropriately. The topsoil stockpiles shall be stored, shaped and sited in such a way that they do not interfere with the flow of water such that damming or erosion is caused, or itself be eroded through the action of water.</p> <p>Stockpiles of topsoil shall not exceed a height that is unstable, and if they are to be left for longer than 6 months shall be analysed and, if necessary, nutrient levels replenished before replacement.</p> <p>The Contractor shall ensure that minimal amounts of topsoil are lost due to erosion, either by wind or water. This can be facilitated through the grassing of topsoil stockpiles. Areas to be top-soiled and grassed shall be done so systematically to allow for quick cover and reduction in the chance of heavy topsoil losses due to unusual weather patterns.</p>	Topsoil and subsoil stockpiled and maintained weed-free	<p>natural vegetation growth (not weeds), or cloth sheeting;</p> <ul style="list-style-type: none"> ESCO monitoring weekly 		
28	Surface water features	Manage impacts to surface water features	Hydrological disturbance; environmental contamination	<p>The quality, quantity and flow direction of any surface water runoff shall be established prior to disturbing any area for construction purposes. Cognisance shall be taken of these aspects and incorporated into the planning of all construction activities.</p> <p>Before a site is developed or expanded, the effect on the drainage pattern as a result of this development or expansion shall be established.</p> <p><u>The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled.</u></p> <p><u>Wetlands, rivers and river riparian areas must be treated as "no-go" areas and appropriately demarcated as such, as required in the EA conditions. No vehicles, machinery, personnel, construction material, fuel, oil, bitumen or waste must be allowed into these areas without the express permission of and supervision by the ECO, except for rehabilitation work in these areas.</u></p> <p><u>Workers must be made aware of the importance of not destroying or damaging the vegetation along rivers and in wetland areas and this awareness must be promoted throughout the construction phase.</u></p> <p><u>Workers must be made aware of the importance of not polluting rivers or wetlands and of not undertaking activities that could result in such pollution, and this awareness must be promoted throughout the construction phase.</u></p>	Impacts to surface water features minimised	<ul style="list-style-type: none"> Method Statements approved. All required water rights obtained prior to commencement of construction No water pollution from construction activities, as determined by ESCO; <u>Regular inspection of nearby freshwater ecosystems by ESCO</u> Weekly monitoring by ESCO 	Project Manager, Contractor, ESCO and ECO	<p>At the onset and throughout the construction phase, as well as the operation phase.</p> <p>Rehabilitation in closure phase</p>

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p><u>Freshwater ecosystems located in close proximity to the construction areas must be inspected on a regular basis by the ECO for signs of disturbance and pollution from construction activities. If signs of disturbance, sedimentation or pollution are noted, immediate action must be taken to remedy the situation and, if necessary, a freshwater ecologist must be consulted for advice on the most suitable remediation measures.</u></p> <p>All construction camps, laydown areas, batching plants and storage areas must be more than 50m from any demarcated water courses</p> <p>Recognised water users/receivers must not be adversely affected by the expansion or re-development.</p> <p>No discharge of effluents or polluted water must be allowed into any rivers or wetland areas.</p> <p><u>If construction areas are to be pumped of water (e.g. after rains), this water must be pumped into an appropriate settlement area, and not allowed to flow into any rivers or wetland areas.</u></p> <p><u>Wetlands, rivers and river riparian areas must be treated as “no-go” areas and appropriately demarcated as such, as required in the EA conditions. No vehicles, machinery, personnel, construction material, fuel, oil, bitumen or waste must be allowed into these areas without the express permission of and supervision by the ECO, except for rehabilitation work in these areas.</u></p> <p>During construction the Contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas.</p> <p><u>All structures crossing streams must be located and constructed so that they do not decrease channel stability or increase water velocity.</u></p> <p>The Contractor shall submit in writing to the Project Manager and ECO his proposals for prevention, containment and rehabilitation measures against environmental damage of the identified water and drainage systems that occur on the site. Consideration shall be given to the placement of sedimentation ponds or barriers where the soils are of a dispersive nature, or where toxic fluids are used in the construction process. The sedimentation ponds must be large enough to contain runoff such that they function correctly under heavy rain conditions.</p> <p>Measures shall be put in place to protect the hill slopes on site against erosion as a precaution in areas affected by the exposing of unconsolidated soils during construction of the wind energy facility.</p>				

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			<p>Storage containers must be regularly inspected so as to prevent leaks.</p> <p>Weather forecasts from the South African Weather Bureau of up to 7 days in advance must be monitored on a weekly basis to avoid exposing soil or building works or materials during a storm event and appropriate action must be taken in advance to protect construction works should a storm event be forecasted.</p> <p>All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be more than 50m from any demarcated water courses.</p> <p>All solid waste collected must be disposed of at a registered waste disposal site. A certificate of disposal must be obtained and kept on file. The disposal of waste must be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.</p> <p>All hazardous chemicals as well as stockpiles should be stored on bunded surfaces and have facilities constructed to control runoff from these areas</p> <p><u>It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage.</u></p> <p>An incident/complaints register must be established and maintained on-site.</p> <p>Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.</p> <p>Any excavation, including those for cables, must be supervised by the ESCO and communicated to the ECO for verifying and confirmation. Disturbance of vegetation and topsoil must be kept to a practical minimum.</p> <p>Any spills must immediately receive the necessary clean-up action. If required, bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan).</p> <p>Any storage and disposal permits/approvals which may be required will be obtained, and the conditions attached to such permits and approvals must be complied with.</p>				

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			<p>Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility, <u>and all waste removed to an appropriate waste facility.</u></p> <p>Construction contractors must provide specific detailed waste management plans to deal with all waste streams.</p> <p>Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised.</p> <p>Construction machinery must be stored in an appropriately sealed area.</p> <p>Corrective action must be undertaken immediately if a complaint is received, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible and implementing preventive measures.</p> <p>Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.</p> <p>Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous waste.</p> <p>Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function.</p> <p>Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered.</p> <p>Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.</p> <p>Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction areas (prevent over-excavations and double handling)</p> <p>Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region</p> <p>In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.</p>				

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			<p>Install properly sized culverts with erosion protection measures at the present road / track crossings</p> <p>Manage grazing or exclude livestock from watercourses that are showing signs or erosion or bank instability.</p> <p>Oily water from bunds at the substation must be removed from site by licensed contractors.</p> <p>Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils.</p> <p>Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.</p> <p>Spilled cement or concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.</p> <p>Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50 m away from water courses. Limit the height of stockpiles as far as possible in order to reduce compaction.</p> <p>Storage areas must be located more than 50 m away from the watercourse.</p> <p>Strict control over the behaviour of construction workers.</p> <p>Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).</p> <p><u>In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss.</u></p> <p><u>During construction of the surface infrastructure within the 100 m/500m GN509 Zone of Regulation (but outside the watercourses), regular spraying of non-potable water or the use of chemical dust suppressants, that are approved for use near watercourses must be implemented to reduce dust and to ensure no smothering of vegetation within the watercourses occurs from excessive dust settling. It must be noted that specifics as to what type of dust</u></p>				

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			<p><u>suppressant (grey water vs. chemical dust suppressant) that will be utilised as part of the proposed development was not available at the time of assessment. Should this detail become available, it is recommended that the freshwater ecologist provide a statement on the suitability of the use of the proposed dust suppressant;</u></p> <p><u>The watercourses outside the construction footprint not having authorised road crossings must be considered as no-go areas. No construction vehicles, nor construction personnel or vehicles may traverse through these watercourses (except on approved road crossings);</u></p> <p><u>As far as possible, existing roads must be utilised to gain access to sites</u></p> <p><u>Contractor laydown areas, and material storage facilities to remain outside of the 100 m/500 m GN509 ZoR</u></p> <p><u>All vehicle re-fuelling is to take place outside of the 100 m/500 m GN509 ZoR;</u></p> <p><u>No vegetation may be removed from the 100 m/500 m GN509 ZoR surrounding the watercourse where no infrastructure is planned, as this provides a natural buffer zone around the watercourses which disperse surface runoff into the watercourses, and thus prevents sedimentation and erosion thereof.</u></p> <p><u>The reaches of the watercourses where no activities are planned to occur must be considered no-go areas. These no-go areas can be marked at a maximum distance of 5 m upstream and downstream of the proposed road upgrade crossing. This 5 m buffer area would allow for construction personal, vehicles (if applicable) to enter the watercourse crossing where the road is proposed to be upgraded</u></p> <p>Strict use and management of all hazardous materials used on site.</p> <p>Supply waste collection bins at construction equipment and construction crew camps.</p> <p>The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately banded, and stored in compliance with MSDS files, as defined by the SHE Representative / ECO.</p> <p>Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.</p> <p>Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.</p>				

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				<p>Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.</p> <p>Waste disposal records must be available for review at any time.</p> <p>Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc).</p>				
29	Excavation, hauling and placement	Manage erosion potential from excavations, spoil sites and stockpiles	Vegetation impacts and harm, hydrological disturbance, erosion increase	<p>The contractor shall provide the Project Manager and ECO with detailed plans of his intended construction processes prior to starting any excavations.</p> <p>The plans shall detail the number of personnel and plant to be used and the measures by which the impacts of pollution (noise, dust, litter, fuel, oil, sewage), erosion, vegetation destruction and deformation of landscape will be prevented, contained and rehabilitated. Particular attention shall also be given to the impact that such activities will have on the adjacent built environment, including nearby houses.</p> <p>The contractor shall demonstrate his “good housekeeping”, particularly with respect to closure at the end of every day so that the site is left in a safe condition from rainfall overnight or over periods when there is no construction activity.</p> <p><u>Minimize earthworks and fills.</u></p> <p><u>With regards to ground-breaking activities outside the delineated extent of a watercourse, but within the 100 m/500 m GN509 ZoR:</u></p> <ul style="list-style-type: none"> — • <u>During excavation activities, the topsoil and vegetation should be stockpiled separately from other material outside the delineated extent of the watercourses;</u> — • <u>Excavated materials should not be contaminated, and it should be ensured that the minimum surface area is taken up by any stockpiled materials. The mixture of the lower and upper layers of the excavated soil should be kept to a minimum, so as for later use as backfill material after construction has commenced;</u> — • <u>All exposed soils must be protected from wind using tarpaulins for the duration of the construction phase to prevent potential erosion and sedimentation of the watercourses;</u> — • <u>Suitable drainage should be insured along the crane pads and specifically the construction camp (associated with an existing furrow connected to natural watercourses), in order to ensure that water does not pond or drain in a concentrated manner into the nearby watercourses. This must be considered as part of the stormwater management plan and be overseen by a freshwater ecologist;</u> 	Construction Method Statements received and approved prior to construction commencing and adhered to	<ul style="list-style-type: none"> — Excavation Method Statements approved prior to excavation commencing; — Once off monitoring by ESCO 	Contractor, ESCO, Project Manager and ECO	At the onset and throughout the construction phase;

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				<ul style="list-style-type: none"> — • <u>Construction of the proposed surface infrastructure may result in disturbance to the natural buffer zone surrounding the watercourses which may result in the reduction of surface roughness. This can be mitigated by ensuring that no concentrated runoff from the surface infrastructure construction areas enter the watercourses by installing silt traps or placing haybales down gradient of the construction footprint (until suitable basal vegetation cover has been restored) to ensure no sediment laden or concentrated runoff generates from the construction footprint; and</u> — <u>It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction.</u> 				
			<p><u>Creation of drainage paths along access tracks, Sedimentation of non-perennial features and excessive dust.</u></p>	<p><u>Use existing road network and access tracks.</u></p> <p><u>Rehabilitation of affected areas (such as revegetation, mechanical stabilization).</u></p> <p><u>Correct engineering design and construction of gravel roads and water crossings.</u></p> <p><u>Control stormwater flow</u></p>				
30	Spoil sites		Hydrological disturbance; environmental contamination; soil erosion	<p>The Contractor shall be responsible for the safe siting, operation, maintenance and closure of any spoil site he uses during the contract period, including the defects notification period. This shall include existing spoil sites that are being re-entered. Before spoil sites may be used, proposals for their locality, intended method of operation, maintenance and rehabilitation shall be given to the Project Manager for review and ECO for approval.</p> <p>No spoil site shall be located within 500m of any watercourse. A photographic record shall be kept of all spoil sites for monitoring purposes. This includes before the site is used and after revegetation.</p> <p>The use of approved spoil sites for the disposal of hazardous or toxic wastes shall be prohibited. The same shall apply for the disposal of solid waste generated from the various camp establishments.</p> <p>Ideally, the storage of excavated material on site should be minimised to avoid unnecessary impacts to the local environment. As soon as practical after excavation, if not simultaneously, all excavated material that is not required for construction or rehabilitation shall be removed from the site for disposal at an appropriate location. This location must be agreed between the Holder of the EA, Project Manager and local municipal officials prior to initiation of excavation.</p>		<ul style="list-style-type: none"> — Zero spoil sites within 500m of drainage channels or water features for construction phase; — Monthly ECO monitoring 	Contractor, ESCO, Project Manager and ECO	At the onset and throughout the construction phase;
31	Stockpiles			The Contractor shall plan his activities so that excavated materials, in so far as possible, can be transported direct to and placed at the point where it is to		<ul style="list-style-type: none"> — Zero hydrological incidents from stockpiles sites within 500m of 		At the onset and throughout the construction phase;

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			Hydrological disturbance; environmental contamination; soil erosion	<p>be used. However, should temporary stockpiling become necessary, the areas for the stockpiling of excavated and imported material shall be indicated and demarcated on the site plan submitted in writing to the Project Manager and ECO for their approval, together with the Contractor's proposed measures for prevention, containment and rehabilitation against environmental damage. Care shall be taken to preserve all vegetation in the immediate area of these temporary stockpiles. During the life of the stockpiles the contractor shall at all times ensure that they are:</p> <ul style="list-style-type: none"> — Positioned and sloped to create the least visual impact; — Constructed and maintained so as to avoid erosion of the material, generation of dust and contamination of surrounding environment; and — Kept free from all alien/undesirable vegetation. <p><u>No stockpiling of topsoil is to take place within the recommended buffer zone around the watercourses (unless specified otherwise), and all stockpiles must be protected with a suitable geotextile to prevent sedimentation of the watercourses.</u></p>		<p>drainage channels or water features for construction phase;</p> <ul style="list-style-type: none"> — Monthly ECO monitoring 	Contractor, ESCO, Project Manager and ECO	rehabilitation at closure phase
32	Blasting	Reduce blasting risk and faunal disturbance	Health and safety considerations; faunal impacts	<p>Wherever blasting activity is required on the site the contractor shall rigorously adhere to the relevant statutes and regulations that control the use of explosives. In addition, the contractor shall, prior to any drilling of holes in preparation for blasting, supply a locality plan of the blast site on which shall be shown the zones of influence of the ground and air shock-waves and expected limits of fly-rock to the Project Manager for review and ESCO and ECO for approval.</p> <p>The plan shall show each dwelling, structure and service within the zones of influence and record all details of the dwellings/structures/services including existing positions, lengths and widths of cracks, as well as the condition of doors, windows, roofing, wells, boreholes etc. The contractor, alone, shall be responsible for any costs that can be attributed to blasting activities, including the collection of fly-rock from adjacent lands and fields. The submission of such a plan shall not in any way absolve the contractor from his responsibilities in this regard, but to ensure due regard was applied satisfactorily prior to blasting commencing.</p> <p>The Contractor shall also indicate to the Project Manager the manner in which he intends to advertise to the adjacent communities and/or road users the times and delays to be expected for each individual blast. The Contractor shall be responsible for obtaining all necessary permits required for blasting activities.</p>	Blasting Method Statement submitted and approved prior to blasting commencing	<ul style="list-style-type: none"> — Blasting plan submitted and approved prior to blasting commencing; once-off monitoring ECO and ESCO 	Contractor, ESCO, Project Manager and ECO	At the onset and throughout the construction phase;
33	Batching	Reduce pollution risk from batching	Health and safety considerations; faunal impacts; environmental contamination; hydrological disturbance	<p>Asphalt plants are considered scheduled processes listed in the second schedule to the Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965). Should the use of an asphalt plant be considered on site, the contractor shall be responsible to obtain the necessary permit from the DFFE, regardless of where they are sited.</p> <p>Crushing plants and concrete batching plants shall be subject to the requirements of the applicable industrial legislation that governs gas and dust emissions into the atmosphere. Such sites will be the subject of regular</p>	Batching plant managed according to approved Method Statement	<ul style="list-style-type: none"> — No environmental incidents; appropriate batching plant siting ; Blasting plan received and approved prior to activities commencing; monthly inspection ECO 	Project Manager, ECO and Contractor	At the onset and throughout the construction phase; rehabilitation once material sources are closed (rehabilitation phases)

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>inspections by the ECO and relative authorities during the life of the project. The Contractor shall provide plans that take into account such additional measures as concrete floors, bunded storage facilities and linings to drainage channels. All sites shall adhere to the following requirements:</p> <ul style="list-style-type: none"> — The batching activity shall be located in an area of low environmental sensitivity to be identified and approved by the ECO. — No batching activities shall occur on unprotected substratum of any kind (i.e. directly on the ground). — All wastewater and runoff from batching areas shall be strictly controlled, and cement-contaminated water shall be collected, stored and disposed of at a site approved by the ECO. Mixing trays shall be used at all mixing and supply points. — Contaminated water shall be disposed of at a waste disposal site approved by the ECO. — Effluent from concrete batch plants and crusher plants should be treated in a suitable designated sedimentation dam to the legally required standards to prevent surface and groundwater pollution. The designs of such a facility should be submitted to the ECO for approval. — Contaminated water storage facilities shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented. — Unused cement bags are to be stored so as not to be affected by rain or runoff events. — Used bags shall be disposed of by the Contractor in the appropriate manner. — Care shall be taken to collect contaminated wash-water resulting from cleaning activities of equipment and flushing of mixers, and dispose of it in a manner approved by the ECO. — Suitable screening and containment shall be in place to prevent wind-blown contamination associated with bulk cement silos, loading and batching. — All visible remains of excess concrete shall be physically removed on completion of the plaster or concrete pour section and disposed of. All excess aggregate shall also be removed. — Ultimate approval of these measures shall be from the relevant national authority, as shall approval of closure. The Project Manager will assist the contractor in his submissions to the relevant authority. 				
34	Spillages	Avoid or reduce site contamination	Hydrological disturbance; environmental contamination; soil erosion	<p>Streams, rivers and dams shall be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and tar or bituminous products. In the event of a spillage, the contractor shall be liable to arrange for professional service providers to clear the affected area.</p> <p>Responsibility for spill treatment lies with the contractor. The individual responsible for, or who discovers a hazardous waste spill must report the incident to his/her ESCO, ECO or to the Project Manager.</p> <p>The ESCO will assess the situation in consultation with the Project Manager and act as required. In all cases, the immediate response shall be to contain</p>	All hazardous substances managed according to approved Method Statement	<ul style="list-style-type: none"> — Zero contamination of wetlands, streams or drainage channels of any pollutant throughout construction phase; Weekly ESCO inspection 	ESCO, Contractor	Throughout all project phases

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>the spill. The exact treatment of polluted soil / water shall be determined by the contractor in consultation with the ESCO, ECO and the Project Manager. Areas cleared of hazardous waste shall be re-vegetated according to the Project Manager's instructions</p> <p>Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice will be sought for appropriate treatment and remedial procedures to be followed. The requirement for such input shall be agreed with the Project Manager. The costs of containment and rehabilitation shall be for the contractor's account, including the costs of specialist input.</p>				
35	Dust	Reduce dust liberation through pro-active management and planning	Floral and faunal impacts; Health and safety implications impact on SKA, SAAO and SALT	<p>Appropriate dust-suppression techniques as approved by the Project Manager and ECO shall be implemented on all exposed surfaces during periods of high wind. Such measures shall include; wet suppression, chemical stabilisation, use of wind fence covering surfaces with straw or chippings, and the re-vegetation of open areas.</p> <p>Water used for dust suppression must be applied in quantities small enough not to generate run-off and result in soil erosion.</p> <p>Mitigation actions such as the reduction of vehicle speed and proper signage shall also be implemented.</p> <p>Blasting must be restricted to periods of calm wind conditions to minimise the potential for dust dispersion.</p> <p>Vegetation cover should be maintained and vegetation cover only removed until such time as soil stripping is required.</p> <p>Exposed soil that has the potential for generating dust shall be re-vegetated or stabilised as soon as possible after construction work is completed, or kept damp until re-vegetation occurs.</p> <p>Excavation, handling and transport of topsoil and spoil shall be avoided during periods of excessive wind as far as possible.</p> <p>Adequate water carts shall be available on site to meet demands throughout the duration of the contract.</p> <p>The Contractor shall ensure that loose building materials and excavated material stockpiles are adequately protected against the wind by a covering of some description, such as canvas.</p> <p>Stockpiles may also be dampened to minimise dust generation.</p>	All approved Method Statements for vegetation clearing	<ul style="list-style-type: none"> — Less than 2 dust nuisance complaints per week; — Weekly ESCO monitoring; 	Contractor, ESCO and ECO	Throughout all project phases

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				Construction vehicles and machinery will be serviced on a monthly basis, with a major service every six months.				
				Construction vehicles and machinery shall be inspected for excessive emissions.				
36	Archaeological heritage and palaeontological sites	Promote conservation of heritage resources on-site	Loss of irreplaceable heritage features	<p>All resulting micro-sitting mitigation measures identified during the Brandvalley WEF heritage walkdown must be strictly adhered to.</p> <p>If the layout of the turbines, roads and other associated infrastructure proposed for the Northern Cape section of the development is altered, a heritage walk-down including a palaeontological walk-down must be conducted prior to construction.</p> <p>A Walk-Down report must be submitted to SAHRA for comment. No construction may commence without comments from SAHRA;</p> <p>If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted.</p> <p>If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Itumeleng Masiteng/Mimi Seetelo 012 320 8490), must be alerted immediately.</p> <p>A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings.</p> <p>If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required</p> <p>If an artefact on site is uncovered, work in the immediate vicinity shall be stopped immediately. The contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery thereof inform the Project Manager of such discovery.</p> <p>The South African Heritage Resources Agency (SAHRA) or Heritage Western Cape (HWC) shall be contacted and they will appoint an archaeological consultant to record the site and excavate if necessary. Work may only resume once clearance is given in writing by the archaeologist.</p> <p>No development should occur within 20 m – 30 m of these features (Stone Walling Features (BV_SW1 - BV_SW17) and associated Historical Artefact Scatters (BV_Hist1 – BV_Hist3). The features should be clearly demarcated before any development activities begin to avoid any negative impact. The</p>	Impacts to heritage resources managed and avoided as far as possible	<ul style="list-style-type: none"> – Zero damage to heritage resources throughout construction phase; – Monthly ECO monitoring; Contractor to provide a Method Statement of any work undertaken in close proximity to a heritage resource 	All parties, including construction crew and subcontractors	Throughout all project phases

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			<p>layout of any infrastructure should be reconsidered to preserve these heritage resources.</p> <p>The graveyard is already fenced off, however, the area should be clearly demarcated and the upgrade of the road be to the west or the road be diverted further away to avoid any possible negative impact to the graveyard.(Graves (formal and informal burials) (HV_G1 – BV_G2))</p> <p>No turbines are to be located on Tafelkop or Spitskop.</p> <p>During the construction phase all major clearance operations (e.g. for new access roads, turbine placements) and deeper (> 1 m) excavations should be monitored for fossil remains on an on-going basis by the ESCO</p> <p>Should substantial fossil remains - such as vertebrate bones and teeth, or petrified logs of fossil wood - be encountered at surface or exposed during construction, the ECO should safeguard these, preferably in situ. They should then alert the relevant provincial heritage management authority as soon as possible - i.e. Heritage Western Cape for the Western Cape (Contact details: Protea Assurance Building, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 086-142 142. Fax: 021-483 9842. Email: hwc@pgwc.gov.za) and SAHRA for the Northern Cape (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za).</p> <p>The occurrence of very rare tetrapod burrows and associated skeletal remains within the Abrahamskraal Formation along the Kabeltou Pass (Muishond Rivier 161) represents a highly sensitive area (outlined in green in Fig. 2 in the Paleontological Impact Assessment report), which lies within the Western Cape and outside the WEF development footprint, should not be disturbed.</p>					
37	Fossil site		Heritage impacts	Specialist palaeontological mitigation for this project is not deemed necessary or recommended. In the unlikely event of a fossil discovery the chance find procedure as detailed above must be implemented and the appropriate provincial authority notified.		<ul style="list-style-type: none"> Zero damage to fossil resources throughout construction phase; Monthly ECO monitoring 	All parties, including construction crew and subcontractors	Throughout all project phases
38	Graves and middens		Graves disturbed which could result in social impacts	If a grave or midden is uncovered on site, or discovered before the commencement of work, then all work in the immediate vicinity of the graves/middens shall be stopped and the Project Manager informed of the discovery. The Project Manager shall contact the ECO and HWC or SAHRA to determine the way forward.	Minimal damage to graves	<ul style="list-style-type: none"> Zero damage to graves and middens throughout construction phase; Monthly ECO monitoring 	All parties, including construction crew and subcontractors	Throughout all project phases
39	Erosion and agricultural	Reduce erosion potential on site	Erosion increase	<p>The following areas should also be regarded as being of high erosion risk:</p> <ul style="list-style-type: none"> Slopes > 20 degrees. Slopes with convergent sub-surface drainage (percolines). Road culverts. Cut and fill slopes in areas of slope instability or erodable geology. 	Erosion minimised and due care illustrated throughout project life cycle	<ul style="list-style-type: none"> All mitigation measures are to be implemented strictly and as far as possible; Efforts of implementation of these measures must be indicated; 	Contractor, ESCO and ECO	Throughout all project phases

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>The removal of the natural vegetation cover must be avoided and where this cannot be done, minimised.</p> <p>Agricultural drainage methods must be used in fill materials to remove water that could trigger slumping.</p> <p>Perched water tables must be identified early and adequate drainage for these trigger-points provided.</p> <p>The disturbance of the natural soil structure must be prevented and excavations planned carefully.</p> <p>The moving of heavy machinery into areas unnecessarily must be avoided.</p> <p>All fill material must be very well compacted and innovative use of geo-textile materials in the retention of soil fill areas made.</p> <p>Rainwater runoff from cut slopes must be prevented as far as possible.</p> <p>Sufficient storm water take off points must be created in such a way that water does not have an opportunity to gather momentum.</p> <p>Storm water ditches must contain structures that will reduce velocity of the run off</p> <p>The use of vegetated swales must be investigated in less steep areas.</p> <p>Particular care must also be taken to ensure that no existing infrastructure such as water and sewerage reticulation lines is damaged during construction activities.</p> <p>Machinery must be properly maintained to keep oil leaks in check.</p> <p>If a spill occurs on a permeable surface (e.g. Soil), a spill kit must be used to immediately reduce the potential spread of the spill.</p> <p>If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials.</p> <p>Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of hazardous chemicals to the</p>		<p>— Weekly monitoring ESCO unless a strong rainfall event occurs. Should this happen, the ECO should monitor thereafter as soon as possible.</p>		

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			<p>environment, and stored in adequate containers until appropriate disposal in a licenced landfill site.</p> <p>Ensure that all personnel are aware of the fire risk and the need to extinguish cigarettes before disposal, in appropriate waste disposal containers.</p> <p>Smoking will only be allowed in demarcated areas with easy access to firefighting equipment.</p> <p>Welding and other construction activities requiring open flames shall be done in a designated area containing firefighting equipment.</p> <p>The risk of fire is highest in the late summer and autumn months, during high wind velocities and dry periods. To avoid and manage fire risk the following steps should be implemented:</p> <p>Have on site fire-fighting equipment and ensure that all personnel are educated how to use it and procedures to be followed in the event of a fire</p> <p>Identify the relevant authorities and structures responsible for fighting fires in the area and shall liaise with them regarding procedures should a fire commence.</p> <p>Ensure that all the necessary telephone numbers (including local Farmers Association Fire Marshall) to use in a case of an emergency are displayed at conspicuous and relevant locations.</p> <p>No open fires shall be allowed on site for the purpose of cooking or warmth. Cooking fires must only be lit in designated cooking areas.</p> <p>The contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire.</p> <p>The contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire.</p> <p>The contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.</p> <p>The contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters.</p> <p>Any work that requires the use of fire may only take place within designated areas. Fire-fighting equipment shall be available in these areas.</p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			Develop and implement a Rehabilitation and Monitoring Plan to monitor rehabilitated areas.				
			Ensure that topsoil does not get buried by subsoil during stockpiling. Failure to comply may result in topsoil sterilisation.				
			Implement measures such as wind-breaks, swales and watering as required aiding the initial growth of primary vegetation.				
			Fertile topsoil must not be stockpiled for periods exceeding 12 months or exceeding 2m in height to avoid topsoil sterilization. If unavoidable, the appointed ECO must monitor topsoil stockpile fertility to avoid sterility of soils.				
			Topsoil may be supplemented with an indigenous seed mix.				
			The upper 15-20 cm of top soil must be stripped and stockpiled as topsoil where possible. It should be retained for re-spreading over disturbed surfaces during rehabilitation.				
			All other soil excavated will be stockpiled separately from topsoil as subsoil.				
			Ensure that topsoil does not get buried by subsoil during backfilling. Failure to comply may result in topsoil sterilisation.				
			An ECO must monitor all excavations to ensure backfilling with subsoil first and then topsoil afterwards takes place.				
			An ECO must monitor depth and cover of topsoil spreading during rehabilitation to ensure a 20cm depth in valleys. Rocky areas do not require topsoil but must be monitored by the ECO during rehabilitation.				
			Topsoil allocated for rehabilitation must not be mixed with other materials, such as building rubble, rock, subsoil, etc.				
			Topsoil stockpiles are to be handled only twice – once during clearing and stockpiling and once during rehabilitation/backfilling unless input is required as advised by the ECO.				
			Construction activities must only occur within the demarcated construction footprint.				
			The construction footprint must be approved by the landowner/occupier prior to commencement of construction activities.				

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>All run-off water from hard surface areas (e.g. roads, hardstands etc.) and construction impacted areas must be collected, channelled and disposed of in an appropriate manner.</p> <p>Anti-erosion features must be installed where required.</p> <p>Ensure that all cleared and impacted land is rehabilitated as soon as possible after construction with locally indigenous plants to enhance the conservation of existing natural vegetation on site.</p>				
40	<u>Agricultural land/activities</u>	<u>Minimise the exclusion of agricultural activities</u>	<u>Disruption to agricultural activities such as low density grazing</u>	<u>As far as possible restrict disturbance to the development footprint during construction and confine all activities to the demarcated areas only</u>	<u>Minimal exclusion of land from agricultural activities</u>	— <u>Monitor the construction activities by means of audits and ensure that all activities are undertaken within the demarcated areas.</u>	<u>ESCO, ECO, Contractor</u>	<u>Construction phase</u>
41	Birds	Reduce bird impacts from the construction activities	Clearance of vegetation, impacts birds through elevated collision risk and habitat destruction	<p>As far as possible construction activities should be kept to a minimum in terms of space and time.</p> <p>Avoid the construction of roads or powerlines within 500-m of active nests of Red Data species during the early breeding season. For Verreux's Eagles this is May-July and again in August-September when small vulnerable nestlings are present (Simmons 2005).</p> <p>During construction habitat destruction should be kept to a minimum, especially so in the valley bottoms and lower slopes where resources, and so bird numbers, are greatest. An ECO, with a brief that includes minimization of habitat destruction, should be appointed to manage this.</p> <p>Disturbance is inevitable during the construction period. As far as possible construction activities should be kept to a minimum in terms of space and time. Construction of sub-stations in the valleys, where in this region most birds occur, should as far as possible, be timed to avoid the main breeding season for local birds which is the period August to October inclusive.</p> <p>Construction of sub-stations in the valleys, where in this region most birds occur, should as far as possible, be timed to avoid the main breeding season for local birds which is the period August to October inclusive.</p> <p>At 1) the saddle between the two Snydersberg plateaux and 2) the col in the ridge between the Ou Mure and Fortuin farm valleys, no turbines should be erected within 100 m of the lowest point in the saddle/col and b) overhead lines should have bird diverters of a type visible by day and night set at 2 m intervals along the line.</p> <p>Away from these two localities, where overhead powerlines cross valleys, bird flight diverters should be placed on the line at a spacing of 5m.</p>	Manage vegetation clearing to minimise impacts on avifauna	<p>— Method Statement for vegetation clearing adhered to</p> <p>— <u>Site layout plan and Method Statements reviewed by Project Manager and approved by ESCO, with inputs from ECO</u></p>	ESCO, ECO Contractor, <u>Project Manager</u>	Construction phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				Lines across the two specified localities to have day-night diverters at 2 m intervals.				
				Lines across valleys to have diverters at 5 m intervals.				
42	Bats	Reduce bat fatalities from the construction activities	High faunal mortality and impacts from turbine blade movement	<p>Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles.</p> <p>Avoid areas of High bat sensitivity and their buffers as well as preferably avoid areas of Moderate bat sensitivity and their buffers.</p> <p>Adhere to the sensitivity maps.</p>	Appropriate siting of turbines as per the approved design;	<ul style="list-style-type: none"> – Turbine siting appropriate, as per bat specialist specification (contained here); – Feather, curtailment implemented at environmental conditions as specified by bat specialist report (contained here); – Weekly monitoring by ECO 	PC, ESCO, ECO	Siting during design phase, and for all of the construction and operation phases
43	Invasive alien plants	Maintenance management of existing invasive alien plants on site, management measures implemented to avoid increase or introductions of new species	Ecological impacts from greater fitness of exotic invasive species	Alien Invasive management plan approved and implemented (Chapter 8).	Implementation of Invasive Species Management Plan	<ul style="list-style-type: none"> – Clearing undertaken as required – Weekly monitoring by ESCO and monthly by ECO; 	ESCO, ESCO and Contractor	Construction, operation and rehabilitation phases
44	Noise and light	Manage on-site noise and light production to acceptable levels	Disturbance from excessive noise levels and excessive lighting	<p>No construction piling should occur at night. Piling should only occur during the daytime.</p> <p>All noise-making equipment shall be turned off when not in use.</p> <p>All equipment shall be kept in good working order.</p> <p>All equipment shall be operated within specifications and capacity (i.e. do not overload machines).</p> <p>The Contractor will familiarise himself or herself with, and adhere to, any local bylaws and regulations regarding the generation of noise.</p> <p>The Contractor will endeavour to keep noise generating activities associated with construction activities to a minimum.</p> <p>Modern low noise emission vehicles and equipment shall be favoured on site. The details of all construction machinery and vehicles must be determined prior to construction in order to identify potentially noisy machinery and to seek possible alternatives. These details will include the manufacturer, type and noise emission data of each machinery/vehicle and how many will be used at any time.</p>	Noise and lighting managed according to approved Method Statement	<ul style="list-style-type: none"> – Less than three noise complaints per month; – Appropriate blasting charge sizes used – No piling after sunset; weekly ESCO monitoring 	ESCO and ECO, Project Manager, Contractor	Construction and operation phases

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>The size of explosive charges used for blasting (if required) should be optimised so as to balance breaking capacity against minimising any vibration impact and fly-rock.</p> <p><u>Provide prior warning to the community when a noisy activity eg. blasting is to take place.</u></p> <p>Construction operations should only occur during daylight hours as far as possible.</p> <p>No construction piling should occur at night where possible. Piling should only occur during the day to take advantage of unstable atmospheric conditions.</p> <p>Construction staff should receive “noise sensitivity” training.</p> <p>An ambient noise survey should be conducted during the construction phase.</p> <p><u>Ensure that the construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA' must wear ear protection equipment.</u></p> <p>Night lighting of the construction sites should be minimised within requirements of safety and efficiency.</p> <p>Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations.</p> <p>If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards.</p>				
45	Pedestrian and vehicle safety	Ensure road safety	Road accidents from reckless driving	<p>The Contractor shall ensure that signage, which should be pictorial and in vernacular (where possible, otherwise in English and Afrikaans), is erected on all boundary fences warning against entering the construction area.</p> <p>Public awareness programmes shall be developed by the Contractor with the community to identify areas of particular risk and approaches to reduce risk.</p> <p>Traffic calming and speed control measures for access to construction sites shall be instigated in consultation with the local authorities.</p>	Safety measures in place throughout all phases	<ul style="list-style-type: none"> — Zero traffic incidents — zero damage to property, persons or animals from construction vehicles, transport trucks or project related vehicles — Weekly monitoring of the complaints log by the ESCO. Additionally, should accounts be communicated to the project team, this shall be captured in the complaints register and made note of that the compliance of this action has failed 	All parties, including staff and subcontractors	All project phases

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
46	Access roads	Reduce access road footprint as far as possible	Vegetation clearance for the access roads of the project	No access/haul roads other than those required for construction purposes shall be developed. As far as possible, existing roads shall be used for access/haulage purposes. All new temporary access/haul roads as approved by DFFE shall also be approved by the Contractor in consultation with the ESCO and ECO. Prior to the construction of new access/haul roads, topsoil shall be stripped and stockpiled as discussed under the stockpiling section.	Access road footprint minimised where possible	<ul style="list-style-type: none"> — Design takes into account the need to reduce access roads where possible; — No access roads created where not planned and approved prior to construction commencing; — Monthly monitoring by ECO 	All parties, including staff and subcontractors	All project phases
47	Landscape and visual	Reduce visual impact of the project	Visual impacts	<p>The Contractor shall ensure that construction activities are expedited in the construction phase reducing the temporal scale thereby reducing the visual exposure time.</p> <p>The Contractor shall write design and placement guidelines for structures and infrastructure i.e. signage, communication, lighting etc. for approval by the ECO and these must consider:</p> <ul style="list-style-type: none"> — Use of appropriate materials; — Massing, i.e. cluster activities where possible; — The Contractor shall ensure the establishment of appropriate setbacks/buffers from adjacent sensitive land uses, especially residential and tourism; — The Contractor with the approval of the Project Manager shall ensure that building structure has modest scale, height and form of simple rectangular nature; — The Contractor with the approval of the Project Manager shall ensure that structures to be as 'transparent' as possible to 'melt' / integrate into the landscape- make use of slender structures where appropriate; — Signage and temporary structures (toilet facilities etc), to be kept to a minimum (while still being sufficient); — New road construction should be minimised and existing roads used where possible. <p>The Contractor should maintain good housekeeping on site to avoid litter and minimise waste.</p> <p>Clearance of indigenous vegetation should be minimised and rehabilitation of cleared areas should start as soon as possible.</p> <p>Erosion risks should be assessed and minimised as erosion scarring can create areas of strong contrast which can be seen from long distances.</p> <p>Stockyards should be located in low visibility areas (e.g. valley between the ridges) and existing vegetation should be used to screen them from views.</p> <p>Night lighting of the construction sites should be minimised within requirements of safety and efficiency.</p>	Visual impacts associated with construction phase minimised	<ul style="list-style-type: none"> — Design and placement guidelines approved by project manager and ECO prior to construction commencing; — Night lighting only placed at necessary areas – as determined by the ECO; — Zero lighting and visual impact non-compliance reports per month, as determined by the ECO; 	Contractor, Project Manager, ECO and ESCO	All project phases

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>Fires and fire hazards need to be managed appropriately.</p> <p>Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided.</p> <p>Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations.</p> <p>The construction contractor should clearly demarcate construction areas so as to minimise site disturbance.</p> <p>Treat roads to reduce dust emissions.</p> <p>The site should be kept neat and tidy. Littering should be fined and the ECO should organise rubbish clean-ups on a regular basis.</p> <p>Construction Camp Alternative 1 should be the preferred option due to it having the smallest viewshed.</p>				
48	Transportation	Manage traffic flow on site such to minimise obstructions	Road condition, community safety impacts	<p>Transport of components will be arranged in conjunction with local traffic authorities to ensure safe transit and minimise disruption to normal traffic flow on these important roads. Turbine components may be transported at night when traffic volume on the roads is less. Traffic routes must be in accordance with the traffic management plan, as attached to this EMP.</p> <p>A Traffic Management Plan has been prepared to enable the identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility. The Traffic Management Plan should be updated prior to the commencement of the construction phase, when detailed information regarding the delivery of components, traffic data and construction activities are available. This Plan must be implemented and reviewed every four months or immediately after an incident, when corrective measures will be incorporated into the Plan.</p> <p><u>The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.</u></p>	A traffic management strategy developed and implemented throughout the construction and operation phases.	— Transport and Traffic Method Statement approved prior to commencement of construction and adhered to	Project Manager, ESCO, ECO Contractor	Throughout all project phases
49	Traffic – General	Manage traffic flow on site such to minimise obstructions	Road condition, community safety impacts	<p>Adequate traffic accommodation must be implemented during transportation of turbine component to the site.</p> <p>All relevant road traffic and other legislation must be adhered to when transporting abnormal loads to the site.</p>	A traffic management strategy developed and implemented throughout the construction and operation phases.	— Traffic management strategy reviewed and approved by ESCO and PM prior to vehicles arriving on site	Project Manager, ESCO, ECO, Contractor	Throughout all project phases

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>The Contractor shall ensure that all construction personnel and vehicles are clearly visible.</p> <p>The safety of both workers on site and road users is to be ensured at all times.</p> <p>All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.</p>				
50	Traffic – Compliance with traffic rules	Manage traffic flow on site such to minimise obstructions	Road condition, community safety impacts	<p>A Traffic Control Officer or Officers must be appointed.</p> <p>All construction vehicles and vehicles associated with the project must comply with the relevant traffic and transport licencing requirements.</p> <p>Operators and drivers must have the relevant licences / permits to operate the vehicles.</p> <p>All contractors and construction vehicles must comply with traffic rules on public and other roads within the project area.</p> <p>Where construction will obstruct existing access alternative temporary access routes must be provided.</p> <p>Arrangements for abnormal loads to be authorised by the relevant authorities, and the local population to be informed of routes and times of deliveries.</p> <p>A disciplinary procedure to address incidents of speeding or other traffic offences by site personnel and subcontractors, including the possibility of dismissal for repeat offences.</p> <p>Traffic safety procedures, transport routes and construction schedules intended to be applied during the construction phase must be in consultation with members of the local community, the local authority and affected landowners prior to the common concrete of construction activities. The scope of such engagement should include the designation of routes for construction vehicles, procedures for complaints and emergency procedures shall be concluded in consultation with local community members, affected land owners and local emergency and traffic authorities. In this regard, appropriate measures shall be taken to ensure that:</p> <ul style="list-style-type: none"> — The routes used by construction vehicles (as far as possible) avoid areas of high pedestrian traffic; — adequate signage is used to warn local community members of hazards (e.g. site access, construction vehicles turning); 	A traffic management strategy developed and implemented throughout the construction and operation phases	<ul style="list-style-type: none"> — Traffic management strategy reviewed and approved by ESCO and PM prior to vehicles arriving on site 	Project Manager, ESCO, Contractor	Throughout all project phases

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<ul style="list-style-type: none"> information dissemination and awareness is conducted to inform community members of increased traffic risks and appropriate precautionary measures; and Community members are aware of the Contractors' construction (and delivery) schedules. <p>Routes used must not deteriorate roads to the extent that they become unsafe or defunct, especially on dirt road sections or during high rainfall periods.</p> <p><u>Road borders should be regularly maintained to ensure that vegetation remains short and that they therefore serve as an effective firebreak.</u></p> <p><u>The road near the access point be kept clear of tall vegetation to allow for good sight lines.</u></p> <p><u>All access and internal roads should be investigated for their topographical suitability, i.e., feasibility for haulage trucks and especially abnormal loads to navigate and have sufficient height clearance for any Eskom lines, Telkom lines or similar.</u></p>				<u>During design phase, and for all of the construction and operation phases</u>
51	Traffic signage	Manage traffic flow on site such to minimise obstructions	Road condition, community safety impacts	<p>Traffic signage is to be securely erected at appropriate points (ensuring visibility) along all access roads, and public roads (in consultation with the relevant traffic authorities) to indicate the following:</p> <ul style="list-style-type: none"> Road hazards such as blind corners or loose gravel; appropriate speed limits; turning traffic; the Site access; routes to be used by construction vehicles, where appropriate; that caution should be taken by motorists or pedestrians; no-go areas for vehicles; and Any relevant traffic control information. 	A traffic management strategy developed and implemented throughout the construction and operation phases.	<ul style="list-style-type: none"> Traffic management strategy reviewed and approved by ESCO and PM prior to vehicles arriving on site 	PM; Proponent; PC	Throughout all project phases
52	Roads and road maintenance	Roads maintained sufficiently to allow for good safety conditions and all transport requirements	Road condition, community safety impacts	<p><u>It is recommended that the respective haulage company conducts a dry-run to determine the restrictions relevant to the haulage vehicle to be utilised. With some route's road signs may need to be moved, overhead cables may need to be raised and bellmouths may need temporary widening to accommodate abnormal loads. A dry-run will help establish relevant changes specific to the abnormal load truck used to deliver the components and materials.</u></p> <p>All access roads must be clearly demarcated and signs must clearly indicate those roads that may or may not be used by contractors or delivery vehicles, or members of the public.</p> <p><u>All bellmouths along the chosen site accesses to the wind turbine locations need to be in line with the required geometric standards to accommodate abnormal haulage vehicles. The exact location and upgrades of the internal access roads will need to be established at detailed design stage.</u></p>	A traffic management strategy developed and implemented throughout the construction and operation phases.	<ul style="list-style-type: none"> All roads clearly marked where appropriate; Zero traffic incidents per month as recorded in the complaints register; Less than three potholes on all access roads per month, as determined by ESCO; Weekly inspection by ESCO 	PM ; Holder of the EA ; PC	Throughout all project phases

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>Make use of existing roads and tracks where feasible, rather than creating new routes.</p> <p>Routes should not traverse slopes with gradients in excess of 8%. Where this is unavoidable the road surface must be stabilised using methods approved by the Project Manager.</p> <p>Avoid routes through drainage lines and riparian zones wherever possible. Where access through drainage lines and riparian zones is unavoidable, only one road is permitted, constructed perpendicular to the drainage line. Avoid roads that follow drainage lines within the floodplain.</p> <p>Allow for safe pedestrian crossing where necessary.</p> <p>All the necessary temporary road traffic signs should be erected to ensure safe traffic flow conditions</p> <p>Where temporary road closures are necessary the dates and durations of the closures must be signposted well in advance at the entrances and exits of the affected roads, and alternative routes clearly indicated.</p> <p>A procedure for reporting and addressing hazards, accidents and other emergency situations shall be implemented.</p> <p>Clean and make good any damage to private roads caused by the Contractor during the construction phase.</p> <p>Should any damage occur on private access roads these roads must be rehabilitated to a pre-construction state.</p> <p><u>The chosen access and circulation roads will have to be upgraded to suit abnormal load vehicle requirements. It needs to be ensured that if the access and circulation roads to the site are to remain as gravel roads, the routes need to be maintained during the additional loading experienced during the construction phase and be reinstated once construction is complete.</u></p> <p>Dust suppression on gravel roads and control of material being transported to and from the site must be managed to reduce the impact of dust to surrounding landowners.</p> <p>The provincial roads department must be informed of any damage to public roads that occurs as a result of use by construction traffic.</p> <p>Where possible, existing roads on Site shall be used as access roads.</p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	
			<p>Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage.</p> <p>Repair rutting and potholing and maintain stormwater control mechanisms.</p> <p>Spillages of materials on public roads must be cleaned up immediately after they have occurred.</p>					
53	Project Vehicles	Manage traffic flow on site such to minimise obstructions	Road condition, community safety impacts	<p>Enforce speed limits at all times on site roads. The movement of construction vehicles shall not be undertaken during peak morning and afternoon traffic times so as to avoid causing an impact on commuters. Materials and labour shall, as far as possible, be sourced locally in order to minimise transport related impacts and transport safety risks.</p> <p>Vehicles may not leave the designated roads and tracks, and turnaround points must be limited to specific sites.</p> <p>Restrictions on the times at which heavy vehicles are permitted to travel on public roads. As far as possible heavy traffic should avoid morning and evening peak traffic periods. Heavy vehicles should as far as possible travel on public roads only during weekdays. High volumes of heavy vehicles should be avoided on Saturday mornings, and no heavy vehicles should travel on public roads on Saturday afternoons, all day Sunday and on public holidays.</p> <p>Abnormal loads must, as far as possible, be scheduled to avoid peak hours, to minimise disruption to peak-hour traffic.</p> <p>The contractor must provide high-occupancy transport for as many of its workers as possible to reduce the number of peak-hour vehicle trips.</p>	Speed limits enforced at all times	<ul style="list-style-type: none"> Zero speed incidents on site; Weekly feedback from all parties from ESCO; Zero complaints register entries for speed on site 	PM ; Proponent ; PC	Throughout all project phases
		<u>Mitigate Site Access</u>	<u>Impact on the internal roads; road hazards and impact on landowners</u>	<u>Contractors and sub-contractors may only utilise demarcated access roads to access the Rietkloof WEF. The roads DR01475 and DR01483 cannot be utilised under any circumstances. The roads are clearly indicated in Figure 7-1.</u>	<u>Access enforced at all times</u>	<u>Monitoring by ECO prior to construction</u>	<u>Holder of the EA; Contractor</u>	<u>Prior to the construction phase commencing</u>
54	Vehicle maintenance	Maintain vehicles used on site to reduce noise and safety risks	Road condition, community safety impacts	<p>All vehicles and machinery used during the Project shall be regularly maintained and repaired where necessary.</p> <p>Passenger vehicles must be inspected on a regular basis to ensure that they are in good working order and are not overloaded.</p>	Vehicles repaired as per the approved Method Statement for vehicles management	<ul style="list-style-type: none"> Less than three non-compliant vehicles on site per week, as determined by ESCO; Weekly monitoring by ESCO; Zero breakdown incidents of any construction vehicle on site (from negligence and maintenance neglect) 	PC; ESCO; ECO	All project phases
55	Transportation of construction	Ensure haulage transported safely to and from site	Road condition, community safety impacts	Construction equipment and materials must be properly secured to / contained in the appropriate vehicle.	No road safety incidents	<ul style="list-style-type: none"> ESCO reporting 	PC; ESCO; ECO	All project phases

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
	equipment and vehicles			The weight bearing capacity of construction vehicles must be adhered to.				
56	Passenger Safety	Manage safety of all staff members while commuting on site	Road condition, community safety impacts	<p>The carrying capacity of passenger vehicles must be adhered to.</p> <p>No employee shall be transported on the back of open trucks.</p> <p>Assembly points for construction workers to be located in a safe area (reasonable distance from high volume traffic or danger zones).</p> <p>The contractor is to conduct vehicle and passenger safety training, emphasizing any risks/dangers of construction traffic and explain precautionary measures to be taken.</p>	No road safety incidents	<ul style="list-style-type: none"> Zero incidents of vehicles carrying more people than allowed, as determined by ESCO; Assembly points all located in safe locations, as determined by ESCO; Weekly inspection by ESCO. 	PC; ESCO; ECO	All project phases
57	Storm water	Manage surface water flow on site to reduce erosion and damage to property or persons during heavy rainfall	Erosion increase, environmental contamination, personnel safety considerations	Implement the storm water management plan (SWMP) included in Chapter 8.	SWMP provided and accepted prior to construction commencing; SWMP implemented	<ul style="list-style-type: none"> SWMP implemented; Monthly monitoring by ESCO 	PC; ESCO; ECO	All project phases
58	Search and rescue	Implement the findings from the ecology final site walkthrough	Clearing of vegetation may destroy certain SCC found on site	<p>If the ecologist recommends a search and rescue operation for plants of specific concern in light of the final site walkthrough, then a search and rescue plans to be compiled and approved</p> <p>The plant S & R plan Should be developed what's the objective of establishing which plants are to be harvested from the turbine laydown area, access roads and power lines in order to:</p> <ul style="list-style-type: none"> Collect important pioneer plants that can be transplanted, kept under nursery conditions and utilised for revegetation after construction as part of rehabilitation activities Collect and transplant, plant species of special concern that have a high conservation value or apply for destruction permits where transplanting will not be possible Locate on-site nursery where minimal construction disturbance will be experienced Utilize the topography of the site to take advantage of the protection and microclimate afforded by the surrounding hillocks and valleys <p>Livestock or wildlife is present on the property, it will be necessary to fence in the nursery area using a 1,2m high fence. A gate should be provided for vehicle access and deliveries</p>	<p>If recommended by the ecologist, plants search and rescue undertaken in line with the approved plan</p> <p>If recommended by the ecologist, plants search and rescue undertaken in line with the approved plan</p>	<ul style="list-style-type: none"> Search and rescue plan implemented; Monthly monitoring ESCO Search and rescue plan implemented; Monthly monitoring ESCO 	PC; ESCO, ECO	Prior to and throughout construction phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	
			<p>Where necessary, equip the nursery with its own designated water tank for irrigation purposes (a 2000 litre plastic reservoir on a tank stand will suffice).</p> <p>Install hose lines as required.</p> <p>Ensure that procured plants arrive at the nursery in a condition suitable to ensure successful growth.</p> <p>All harvested seeds and seedlings, as well as plants removed for transplanting, are the responsibility of the Contractor and must be kept under approved nursery conditions.</p> <p>For plants in containers held in the nursery, use 2 parts of topsoil that has been excavated from the site (to emulate site conditions) to 1 part of compost (produced from mulching the cleared vegetation, or a suitable commercial mulching solution).</p> <p>All specified species lifted from open ground must be retained in containers or bags as specified.</p> <p>Ensure that the nursery is properly equipped with the necessary implements, containers, fertilisers and other equipment necessary to function efficiently.</p> <p>All plants must be fully maintained by staff dedicated from the date of receipt until the end of the Rehabilitation Period. A horticulturalist must be consulted to assist with management of the nursery plants. This includes watering, weeding, fertilising, etc</p> <p>All plants must be regularly watered and fertiliser applied, as required.</p> <p>All plants must be protected against wind, frost and direct sunlight, until such time as they are fully acclimatised. Provide shade net or a shade house as required for this purpose.</p> <p>Plants held in the nursery for more than one year, must be replanted into larger containers.</p> <p>The Contractor will be held liable for the replacement of plants lost due to his negligence or mismanagement.</p>					
59	Open space	Manage open space	Habitat loss, faunal and floral demarcation	Open space areas should be kept as contiguous blocks of vegetation as far as possible and no additional barriers (except for approved roads and fences) should be constructed that may impede faunal movement.	Environmental awareness training completed and open space managed well	<ul style="list-style-type: none"> — Alien clearance plan conducted, — Search and rescue plan conducted 	PC; ESCO, ECO	All project phases

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>All open space areas must be kept alien and weed free.</p> <p>Only indigenous species from a list approved by the ECO may be used for any rehabilitation work in open space areas</p> <p>No waste should be disposed of in open space areas, including but not restricted to cigarette butts and uneaten foodstuffs (i.e. fruit cores and peels) that may attract scavengers. It is recommended that receptacles be placed strategically to minimise this, especially during the construction phase.</p> <p>A search and rescue operation must be undertaken by a qualified botanist/ horticulturalist if recommended by an ecologist prior to construction commencing and species of special concern identified within the development footprints transplanted to a refuge area.</p> <p>Vegetation cleared from development footprints must not be piled onto adjacent intact vegetation outside of the designated footprint, even for temporary storage.</p> <p>No collection of indigenous plants may be allowed on the property outside of those undertaken by the designated person(s).</p> <p>Employees should undergo environmental awareness training and be sensitised to the need to avoid disturbance to the indigenous vegetation outside the development footprints.</p> <p>Rehabilitation guidelines for the development as a whole must prioritise the use of indigenous grass, tree and shrub species are to be used in the soil stabilisation landscaping of the development once construction is completed, if required.</p> <p>The following is recommended for the conservation of wetland, river and dam habitat on the site:</p> <ul style="list-style-type: none"> — A buffer of 32 m from the channel edge to be kept free of hard standing surface, including for roads and cable crossings. — Any stormwater management features must be suitably designed and constructed to maintain stormwater flow to acceptable levels and minimise risk of erosion and scouring. — No storm-water runoff should be discharged directly into the drainage line/seep, where it could lead to erosion. — The exotic vegetation growing within the water courses and wetlands and/or buffers directly adjacent to the proposed development should be removed as soon as possible and these areas should be kept weed free. 		<ul style="list-style-type: none"> — Environmental training conducted — Weekly inspection by ESCO 		
60	Social		<p><u>Minimise disruption caused by influx of job seekers</u></p>	<p><u>A Grievance Mechanism is included in Section 9.13 and should be implemented as part of the Stakeholder Engagement Plan.</u></p>	<ul style="list-style-type: none"> — <u>Stakeholder Engagement Procedure</u> — <u>Complaints Register</u> 	EO	<u>Construction Phase</u>

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
	<ul style="list-style-type: none"> — <u>To ensure that the negative socio-economic impacts are mitigated and managed; and</u> — <u>To ensure that the positive economic impacts are enhanced</u> 		<p><u>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.</u></p> <p><u>The proponent should implement a —locals first policy, specifically with regards to unskilled and low skilled opportunities.</u></p> <p><u>The contractor must provide transport to and from the site on a daily basis for low and semi-skilled construction workers to effectively manage and monitor the movement of construction workers on and off the site.</u></p> <p><u>Where feasible, the contractors must make the necessary arrangements to transport workers from other local towns in the area, such as Worcester and Paarl, home over weekends. This will reduce the risk posed to local family structures and social networks in Laingsburg and Sutherland.</u></p>	<u>Mitigated and manage disruption cause by influx of</u>		<p><u>ESCO / ECO</u></p> <p><u>Contractor</u></p> <p><u>CLO</u></p>	
		<p><u>Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site</u></p>	<p><u>The applicant must enter into an agreement with the landowners on whose property the WEF is located, whereby damages to farm property etc. during the construction phase that are proven to be associated with the construction activities for the WEF will be compensated for.</u></p> <p><u>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.</u></p> <p><u>The movement of construction workers on the site should be confined to regulated areas.</u></p> <p><u>All landowners on and in the immediate vicinity of the site must be contacted to discuss timing of construction related activities in the vicinity for his cropping areas.</u></p> <p><u>The relevant owners must be consulted prior to the commencement of the construction phase to identify the location of the irrigation infrastructure so as to ensure that it is not damaged during the construction phase.</u></p> <p><u>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.</u></p> <p><u>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 ESCO / ECO involved in the existing projects can be improved. The ESCO /</u></p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p><u>ECO and CLP should liaise closely with each other throughout the construction phase.</u></p> <p><u>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.</u></p> <p><u>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.</u></p> <p><u>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.</u></p> <p><u>The applicant must enter into an agreement with the landowners on whose property the WEF is located, whereby damages to farm property etc. during the construction phase that are proven to be associated with the construction activities for the WEF will be compensated for.</u></p>				

7.3 OPERATION PHASE MITIGATION MEASURES

Table 7-3: Operation phase mitigation measures

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
61	Birds	Manage site so as to reduce bird fatalities	Avifaunal impacts and mortality	<p>Due to the potential fatalities of birds resulting from the proposed project, the developer shall take every precaution in reducing the number of these birds that die as a result of the wind turbines and associated infrastructure. The following mitigation measures should be used to reduce the number of mortalities:</p> <ul style="list-style-type: none"> — Intermittent lighting must be used if possible (i.e. if it does not contradict aviation regulations), as well as red light which is less attractive than white light. — Post-construction monitoring must be implemented in accordance with BirdLife South Africa / Endangered Wildlife Trust: Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in Southern Africa. This includes but not limited to; <ul style="list-style-type: none"> — Post construction monitoring should use similar methods as pre-construction monitoring to ensure comparability of results, but should also include the collection of mortality data. — Post-construction monitoring should start within 6 months of the turbines becoming operational and should span a period of at least 12 months — Post-construction monitoring by an independent specialist should take place for at least two years after operation has started. Reports regarding bird monitoring must be submitted to the provincial environmental department and DFFE on a quarterly basis. The report will assist all stakeholders in identifying potential and additional mitigation measures and to establish protocols for a bird-monitoring programme for wind energy development in South Africa. — The results of post-construction monitoring may highlight the need for additional mitigation measures that may need to be incorporated in the EMPr. — Monitoring for at least the first two years of operation should take place by an independent specialist. If high bird mortalities are recorded then the operator of the wind farm must investigate additional mitigation measures such as emitting broadcasts of a certain radio frequency to discourage birds from entering high collision areas. <p>The bird monitoring programme, shall be conducted according to AR Jenkins et al, 3rd Ed 2015), and include:</p> <p>A suitably qualified avifaunal specialist should supervise the monitoring programme, train the necessary observers, collate, analyse, report and publish data.</p> <p>The first step for the appointed specialist will be to identify the key information required in the protocol below. This will be best done through a</p>	Bird monitoring undertaken	<ul style="list-style-type: none"> — Monitoring implemented as per monitoring programme and guides; — Monthly ECO compliance inspections 	Holder of the EA	Throughout operation phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>short site visit, which will also serve to train the identified observers and generally iron out any teething problems with the methodologies.</p> <p>The bulk of the actual work involved should be done by trained observers, under the guidance and supervision of a qualified and experienced ornithologist. This role could be filled by a number of people or entities, but will need to be the same entity for the duration of the programme.</p> <p>The specialist could advise the developer on available options to source observers.</p> <p>The monitoring protocols that are available from Europe and the USA are mostly aimed at estimating population densities of small passerines in a relatively small study area. In southern Africa, the majority of priority species are large species that are relatively thinly distributed. Specific challenges in a local context are the following:</p> <p>Some priority species are sparsely distributed with large territories, e.g. many of the large raptors, vultures and cranes. These species could easily be missed during surveys.</p> <p>Some priority species are nomadic with fluctuating densities related to habitat conditions, particularly rainfall, e.g. bustards. To cover all possible conditions in the study area would require an effort which will be impractical, both in terms of resources and length of monitoring time.</p> <p>Limited availability of suitably experienced individuals that can do monitoring.</p> <p>The suggested monitoring protocol is an attempt to address the challenges listed above whilst still maintaining a measure of practical realism as to what is possible with limited resources so as to:</p> <ul style="list-style-type: none"> — Estimate an abundance index for all the priority species within the wind farm area as a baseline to measure potential displacement due to the construction and operation of the wind farm. — Estimate the risk of priority species colliding with the wind turbines by recording flight behaviour. The recommended method is vantage point observations. <p>The risk of collision mortalities can be mitigated by leaving a 100 m gap between successive turbines across saddles and avoidance of elevated powerlines across saddles and cols where possible</p> <p>If not avoidable all overhead 33 KV powerlines on these saddles and cols should have diverters at 5 m intervals on the lines.</p>				
62	Social		Social unrest	An accredited training and skills development programme aimed at maximising the opportunities for local workers to be employed in the low	Maintain a local first recruitment policy as far as	— Training program implemented,	Holder of the EA Construction phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
	Manage social unrest and maximise employment benefits of the projects		<p>and semi-skilled positions should be initiated prior to the initiation of the construction phase. In this regard the programme should be aimed at community members from Laingsburg and Sutherland. The programme should be developed in consultation with the KHLM and LLM and possibly the Department of Labour. The recommended targets of 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area.</p> <p>The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible.</p> <p>Before the construction phase commences the proponent should meet with representatives from the KHLM, LLM and WLM 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.</p> <p>The local authorities and relevant community representatives 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.</p> <p>Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Where feasible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.</p> <p>The contractor should liaise with the KHLM, LLM and WLM 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 contractors. These companies should be notified of the tender process and invited to bid for project-related work.</p> <p>Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.</p> <p>The KHLM, LLM and WLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.</p> <p>The proponent in consultation with the contractor should investigate the option of holding a workshop/s with local farmers and representatives from KHLM, LLM and WLM to discuss options for installing small-scale wind energy facilities and the technology and costs involved.</p>	possible, reduced social impact from development	— Recruitment committee commissioned and active		

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>The proponent should consider the implementation of an accredited training and skills development programme aimed at maximising to opportunity for local workers to be employed for the low and semi-skilled positions prior to the initiation of the construction phase. In this regard the programme should be aimed at community members from Laingsburg and Sutherland. The programme should be developed in consultation with the Department of Labour and the KMLM and LLM. The recommended targets are 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the current low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area.</p> <p>The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible.</p> <p>The proponent should establish a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the LLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers.;</p> <p>The proponent and the contractor(s) should, in consultation with representatives from the MF, 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 dismissed. All dismissals must comply with the South African labour legislation;</p> <p>The proponent and contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase.</p> <p>The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site.</p> <p>Where feasible, the contractors should make the necessary arrangements to transport workers from other local towns in the area, such as Worcester and Paarl, home over weekends. This will reduce the risk posed to local family structures and social networks in Laingsburg and Sutherland.</p> <p>No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site. 31. The proponent should implement a -locals first policy, specifically with regard to unskilled and low skilled opportunities. This locals first policy needs to be communicated widely when employment opportunities are advertised.</p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>The proponent should implement a policy that no employment will be available at the gate and or in Sutherland and Laingsburg (except for local residents).</p> <p>The proponent should enter into an agreement with the landowners on whose property the WEF is located, whereby damages to farm property etc. during the construction phase that are proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences.</p> <p>The movement of construction workers on the site should be confined to regulated areas.</p> <p>All landowners on and in the immediate vicinity of the site should be contacted to discuss timing of construction related activities in the vicinity for his cropping areas.</p> <p>Contractors appointed by the proponent should provide daily transport for workers to and from the site. This would reduce the potential risk of trespassing onto adjacent properties.</p> <p>Movement of vehicles should be confined to designated roads and construction workers must be informed of the need to keep farm gates closed.</p> <p>The relevant owners should be consulted prior to the commencement of the construction phase to identify the location of the irrigation infrastructure so as to ensure that it is not damaged during the construction phase.</p> <p>Damage to irrigation infrastructure caused by construction related activities should be repaired within 24 hours by the contractor;</p> <p>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.</p> <p>The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover losses and costs associated with fires caused by construction workers or construction related activities (see below).</p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>The Environmental Management Programme (EMPr) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.</p> <p>Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.</p> <p>Contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.</p> <p>No construction staff, with the exception of security staff, to be accommodated on site overnight.</p> <p>The proponent should enter into an agreement with the local farmers who potentially stand to be impacted by the proposed project, including WEF landowners and adjacent property owners, whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;</p> <p>Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;</p> <p>Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months.</p> <p>Contractor to provide adequate fire fighting equipment on-site.</p> <p>Contractor to provide fire-fighting training to selected construction staff.</p> <p>No construction staff, with the exception of security staff, to be accommodated on site overnight.</p> <p>per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire fighting costs borne by farmers and local authorities.</p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
			<p>As far as possible, the transport of components to the site along the N1, R354 and R356, should be planned to avoid weekends and holiday periods.</p> <p>Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis, adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.</p> <p>Steps must be taken to minimise the potential impact of dust generated by construction vehicles on the vegetable seed cropping operations on Fortuin. These include regular wetting of the section of road adjacent to the seed cropping area and strict enforcement of speed limits. The timing of the movement of construction vehicles should be discussed with Mr le Roux, the owner of Fortuin.</p> <p>All workers should receive training/ briefing on the reasons for and importance of closing farm gates and driving slowly.</p> <p>The contractor must ensure that damage caused by construction related traffic to local farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor.</p> <p>All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.</p> <p>The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of a soil study. In this regard high potential grazing and seed cropping areas should be avoided.</p> <p>The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowner.</p> <p>The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated areas and minimised where possible.</p> <p>An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;</p> <p>All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc. should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from a botanist with experience in arid regions.</p> <p>The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the</p>				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE									
			<p>rehabilitation programme should be drawn up the Environmental Consultants appointed to undertake the EIA.</p> <p>The implementation of the Rehabilitation Programme should be monitored by the ECO.</p> <p>All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas.</p> <p>EMP measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld.</p> <p>68. Disturbance footprints should be reduced to the minimum.</p>													
63	Bats	Minimise the impact on bats	Habitat destruction; poor rehabilitation	<p><u>Implement an operational (post construction) bat monitoring plan, in line with applicable guidelines, for a minimum of two years to determine long term impacts of the development, as well as assess and/or modify the effectiveness of the mitigation measures on bat communities.</u></p> <p>Utilise lights with wavelengths that attract less insects (low thermal/infrared signature).</p> <p>If not required for safety or security purposes, lights should be switched off when not in use or equipped with passive motion sensors.</p> <p>Employ mitigation measures as indicated in the table below, in order to reduce bat mortality. The times of implementation of mitigation measures is preliminarily recommended (considering more than 80% bat activity, normalised data) as follows:</p> <table border="1"> <thead> <tr> <th colspan="2">Terms of mitigation implementation</th> </tr> </thead> <tbody> <tr> <td>Spring peak activity (times to implement curtailment/ mitigation)</td> <td>Snydersberg: Month of October 21:00 – 02:00</td> </tr> <tr> <td>Environmental conditions in which to implement curtailment/ mitigation</td> <td>Below 5m/s measured at nacelle height Above 9°C</td> </tr> <tr> <td>Autumn peak activity (times to implement curtailment/ mitigation)</td> <td>SM4: 1 -15 March Sunset – 22:00</td> </tr> </tbody> </table>	Terms of mitigation implementation		Spring peak activity (times to implement curtailment/ mitigation)	Snydersberg: Month of October 21:00 – 02:00	Environmental conditions in which to implement curtailment/ mitigation	Below 5m/s measured at nacelle height Above 9°C	Autumn peak activity (times to implement curtailment/ mitigation)	SM4: 1 -15 March Sunset – 22:00	<p>Areas of disturbance minimized, <u>promote conservation of bat species</u></p>	<ul style="list-style-type: none"> No less than 90% of the disturbed areas revegetated after construction <u>Record of the implementation of the bat monitoring plan</u> 	PC; ECO; Bat Specialist	Throughout operational phase
Terms of mitigation implementation																
Spring peak activity (times to implement curtailment/ mitigation)	Snydersberg: Month of October 21:00 – 02:00															
Environmental conditions in which to implement curtailment/ mitigation	Below 5m/s measured at nacelle height Above 9°C															
Autumn peak activity (times to implement curtailment/ mitigation)	SM4: 1 -15 March Sunset – 22:00															

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES		OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				Environmental conditions in which to implement curtailment/ mitigation	Below 7m/s measured at nacelle height Above 17°C				
				Summer peak activity (times to implement curtailment/ mitigation)	Barendskraal NW: 1 December – 10 January 1 December – 15 January 20:00 – 01:00				
				Environmental conditions in which to implement curtailment/ mitigation	Below 9m/s measured at nacelle height Above 11°C				
64	Erosion	Manage on site soil to reduce erosion	Increased erosion	Vegetation of road verges and cut faces must be inspected and maintained on a regular basis. This is particularly important on steep slopes.	Road verges maintained	<ul style="list-style-type: none"> – Verges cut every two weeks for duration of summer and spring, winter and fall mowing once every two months; – Monthly monitoring by ECO 	Holder of the EA	Ongoing, throughout operation phase	
			Stormwater runoff must be controlled to manage erosion through appropriate measures.						
			Anti-erosion features must be installed where required.						
			Ensure that all cleared and impacted land is rehabilitated and re-vegetated.						
65	Ecological	Manage faunal and floral environmental on site respectfully to allow for least disturbance and greatest ecological viability	Habit destruction, faunal disturbance and mortality	Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	Erosion problems managed appropriately, invasive species controlled	<ul style="list-style-type: none"> – Development only in Ecological specialist sanctioned very high sensitivity areas; – Environmental induction prior to construction conducted and approved by PM and ECO; – Weekly monitoring by ECO 	Holder of the EA	Throughout planning phase	
			Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.						
			Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning.						
			Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.						
			Sediment traps may be necessary to prevent erosion and soil movement if there is topsoil or other waste heaps present during the wet season.						

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
66	Noise	Reduce noise levels during operation	Nuisance noise impacts, disturbance to fauna and people	<p>The noise impact from the wind turbine generators should be measured once off during the operational phase, to ensure that the impact is within the required legal limits.</p> <p>The noise impact from the wind turbine generators should be measured during the operational phase, to ensure that the impact is within the required legal limit.</p> <p>Wind turbine generators should be maintained to ensure the noise emissions are within the legal and design specifications.</p> <p>An ambient noise survey should be conducted at the noise sensitive receptors closest to the turbines during the operational phase</p> <p>Re-modelling of the noise impacts will need to be conducted on the final layout (when the final turbine is selected should the layout change).</p> <p>The noise impact from the wind turbine generators should be measured during the operational phase, to ensure that the impact is within the required legal limits.</p>	Noise kept within acceptable levels	<ul style="list-style-type: none"> – <u>Maintain a complaints register</u> – Less than three noise complaints per week; – monthly monitoring by ECO 	PC; ECO; <u>independent acoustic consultant</u>	Operation phase
67	Social	Manage the social impacts of the project	Social unrest, unfair employment practices	<p>Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community.</p> <p>Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.</p> <p>Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.</p> <p>Use the project to promote and increase the contribution of renewable energy to the national energy supply.</p> <p>The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project.</p> <p>The proponent, in consultation with the KHLM, LLM and WLM, should investigate the options for the establishment of a Community Development Trust (see below).</p>	Social impacts managed appropriately	<ul style="list-style-type: none"> – Manage the social impacts of the project to ensure fair employment and community benefit from the project, and to reduce social unrest risk 	Holder of the EA	Operation phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
				<p>The local landowners have entered into agreements with the applicant regarding revenue streams generated from wind turbines located on their properties.</p> <p>The KHLM, LLM and WLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the KHLM, LLM and WLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager.</p> <p>Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community;</p> <p>Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.</p> <p>Use the project to promote and increase the contribution of renewable energy to the national energy supply.</p> <p>Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.</p> <p>The final placement of wind turbines associated with the Brandvalley WEF should be discussed with the affected landowners, specifically Mr Le Roux, who is the only landowner that lives permanently in the area;</p> <p>The recommendations of the VIA should be implemented.</p>				
			<u>Visual impact at night</u>	<u>Pilot activated lights will be installed on the Brandvalley WEF site so as to decrease the red night light disturbance in terms of visual impacts.</u>	<u>Implementing pilot activated lighting for decrease in visual impacts during night.</u>			
68	Fire	Reduce fire risk on site	Runaway fire, habitat loss, health and safety impacts, loss of life, faunal mortality, air pollution	<p>Any requirements of the local Fire Protection Association must be adhered in consultation with the relevant landowners as per the requirements of the National Veld and Forest Fire legislation which may include:</p> <ul style="list-style-type: none"> – Formation of a Fire Protection Association (FPA); – Duty to prepare and maintain firebreaks; – Requirements for firebreaks; – Readiness for firefighting; – Actions to fight fires. 	Fires controlled on site	<ul style="list-style-type: none"> – Zero runaway fires; – Zero uncontrolled fires on site; – Zero unauthorised fires on site; – ESCO monitoring weekly 	PC, ESCO, ECO	Throughout operation phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE	
			<p>In areas other than designated development footprints within the Open Space area, a network of firebreaks must be maintained and overlap with any firebreaks managed by the landowners to ensure that fires are not able to spread over the development;</p> <p>All road reserves will serve as firebreak.</p> <p>All firebreaks must be maintained as required by the local Fire Chief.</p> <p>Firebreaks are to be positioned and prepared in such a way as to cause the least disturbance to soil and biodiversity. Firebreaks should be free from combustible material, e.g. pruning's and leaf litter.</p> <p>Ensure firefighting equipment is maintained and in good working order before the start of each fire season.</p> <p>Smoking outside of designated safe areas must not be permitted. Flicking of cigarette butts into adjacent vegetation will not be permitted.</p> <p>Suitable signage must be provided on site, including entrance warning of fire risk and warnings not to flick cigarette butts into vegetated areas.</p>					
69	Agricultural and erosion	Manage site to maintain soil quality, quantity and fertility as best as possible	Increased erosion from wind and surface water flow	<p>Stormwater runoff must be controlled to manage erosion through appropriate measures.</p> <p>Anti-erosion features must be installed where required.</p> <p>Ensure that all cleared and impacted land is rehabilitated and re-vegetated.</p> <p>Fencing of WEF infrastructure should be limited as far as possible to allow for maximum grazing and movement of livestock and game within the site.</p> <p>All alien plant re-growth must be monitored and should it occur these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.</p> <p>Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities</p> <p>Containment of all contaminated water by means of careful run-off management on the development site.</p> <p>Upon the completion of construction, the area will be cleared of potentially polluting materials.</p>	Appropriate stormwater structures maintained	— Rehabilitation initiated on cleared land within 5 working days of land remaining fallow	PC; PM; ECO, ESCO	For duration of operation phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	APPLICABLE DEVELOPMENT PHASE
70	Roads and road maintenance	Minimise the deterioration of the roads	Deterioration of the road due to operational phase traffic	The Holder of the EA and/or Facility Manager must undertake regular maintenance of gravel roads during the operational phase.	Limit the deterioration of surface road condition	— Road inspection	PM; ECO, ESCO For duration of operation phase

7.4 REHABILITATION PHASE

Table 7-4: Rehabilitation phase mitigation measures

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE	
71	Topsoil	Manage topsoil to reduce erosion and maintain soil fertility	Increased erosion	<p>A rehabilitation plan following construction involves primarily the following aspects:</p> <ul style="list-style-type: none"> — Soil stabilisation and remediation (composition, pH level, nutrients, etc.), — Re-vegetate using appropriate natural successional species. — Monitor: removal of aggressive indigenous plant, follow up on alien invasive plant species, successful establishment of re-vegetated areas. <p>Topsoil removed during construction must be stored on site for rehabilitation and re-vegetation. When construction is complete the topsoil must be spread over the disturbed site and covered with mulch. The soil must be stabilised using materials such as netting or geotextiles.</p> <p>During the operational and decommissioning phase, monitor culverts to see if erosion issues arise and if any erosion control is required.</p> <p>Rehabilitate disturbance areas as soon as construction in an area is completed.</p> <p>Since the plant material (grasses and herbs) removed from the site should be mixed into the topsoil and will supplement the organic nutrient content of the soil, no further soil conditioning in terms of fertilising is deemed necessary.</p> <p>After the stockpiled material has been removed, the site shall be re-instated to its original condition as far as possible. No foreign material generated / deposited during construction shall remain on site. Areas affected by stockpiling shall be landscaped, top soiled, grassed and maintained at the contractor's cost until clearance from the Project Manager is received. In all cases, the ECO shall approve the areas for stockpiling and disposal of construction rubble before any operation commences and shall approve their clause only when they have been satisfactorily rehabilitated.</p> <p><u>Construction rubble/silt removed from the construction area must be collected and disposed of at a suitable landfill site.</u></p>	Rehabilitation plan received and approved prior to operation phase ceasing. Rehabilitation plan implemented	<ul style="list-style-type: none"> — Topsoil replacement as per rehabilitation plan; — Weekly inspection by ESCO 	PC; ESCO; ECO	Throughout rehabilitation phase

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE
72	Revegetation	Manage revegetation to promote regrowth and rehabilitation of site as best as possible	Increased erosion; loss of faunal habitat; loss of SCC	<p>The species to be used for planting must be based on:</p> <ul style="list-style-type: none"> Successful growth of indigenous seed, sods and slips collected from the indigenous and riparian vegetation in the project area. Red List species, Species of Concern and protected species that have been collected. <p>The following procedures must be used for out planting of vegetation intended for rehabilitation:</p> <p>Plot preparation</p> <p>The plots will be prepared as follows:</p> <ul style="list-style-type: none"> Prior to rehabilitation of the site, all remnants of foreign debris shall be removed from the site Compacted soil shall be ripped to a depth of greater than 250mm The final prepared surface shall not be smooth but furrowed to follow the natural contours of the land. All plots will be covered with top soil. Topsoil will be manually spread evenly over the surface. Topsoil must be spread to the original depth and deeper where sufficient top soil remains All the plots will be mulched. The vegetation stripped, chipped and stockpiled during site preparation must be spread in a single layer across the plots as mulch. All plots will be treated with Nitrogen-fixing bacteria (important for legumes), Trichoderma sp. and mycorrhizal products as a natural form of soil remediation <p>Plant Preparation</p> <p>Plants must undergo a period of 'hardening-off' during which they have been exposed to full, direct sunlight and been under a reduced watering regime.</p> <p>The individual plants destined for each plot will be grouped into plot-specific, marked baskets, before they leave the nursery. Each plant will be labelled with an aluminium label, giving species code, and a specific numeral identifying the plot</p> <p>Before the out-planting commences, the equipment necessary for the proper handling and placing of all required materials shall be on hand, in good condition and to acceptable approved standards. Shrubs and trees</p> <ul style="list-style-type: none"> Planting should preferably be done during the rainy season (summer). Unless otherwise specified by the EO / ECO, excavate square holes of 800mm x 800mm x 800mm on average for trees and 500mm x 500mm x 500mm on average for shrubs. Backfill planting holes with excavated material / approved topsoil, thoroughly mixed with weed free manure or compost (per volume about one quarter of the plant hole), one cup of 2:3:2 fertiliser and an approved ant and termite poison. As much of the soil from container plants as possible must be retained around the roots of the plant during planting. The soil must cover all the roots and be well firmed down to a level equal to that of the surrounding in situ material. 	Rehabilitation conducted in accordance with rehabilitation Method Statement	<ul style="list-style-type: none"> Mitigation measures mentioned for this objective are to be implemented as described; Weekly monitoring by ESCO 	PC ; ESCO ; ECO	Throughout rehabilitation phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE
			<ul style="list-style-type: none"> — After planting, each plant must be well watered, adding more soil upon settlement if necessary. — Add mulch to the surface area of the bermed basin in order to sustain soil moisture. — Stake all trees using three weather resistant wooden or steel stakes anchored firmly into the ground. — Two of the three stakes are to be located on the windward side of the plant. Galvanised wire binding, — 3 mm thick, covered with a 20mm diameter plastic hosepipe must be tied tightly to the stakes, half to two thirds the height of the tree above the ground and looped around the trunk of the tree. — Place stakes at least 500mm apart and away from the stem and roots of the tree, so as not to damage the tree or its roots. — Thoroughly water plants as required until the plants are able to survive independently (i.e. depending on the rainfall). — A raised circular 200mm high subsoil berm, placed 500mm (shrubs) to 750mm (trees) from the plant's stem must be provided for the watering. Do not simply leave the excavated plant hole partially backfilled for this purpose – the berm must be raised above the natural soil level. — Water aloes and bulbs once directly after transplanting to settle the soil. — Remove stakes and wire binds over time as required, as plants become established. <p>Grassing using sods</p> <ul style="list-style-type: none"> — Sodding is defined as the laying of grass sods. — Sodding may be done at any time of the year. — The soil should be uniformly wet to a depth of at least 150mm before planting of grass sods. — Protect sods against drying out: keep these moist from the time of harvesting until final placement. — Rake or spike the plot area to give a loose surface to a depth of 100mm. — Lay two rows of sods in a straight line or following a contour, starting at the bottom of a slope, where possible. — Place the next two rows of sods in the same direction, 5 metres away, until the full area is covered with rows of sods. — Tightly butt sods together, taking care not to stretch or overlap sods. — Where a good fit cannot be obtained, the intervening spaces may be filled with parts of sods or topsoil. — After planting, water sods to prevent drying out. — Irrigate as required until the grass is able to survive independently (i.e. depending on the rainfall) <p>Grassing using Runners</p> <ul style="list-style-type: none"> — Plant grass runners evenly by hand or by mechanical means at a rate of at least 400 runners per hectare (i.e. at 250mm centres). — Use only fresh runners, avoiding grass runners that have been allowed to dry out. — Rake or spike the area to give a loose surface to a depth of 100mm. 				

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE
			<ul style="list-style-type: none"> — The soil should be uniformly wet to a depth of at least 150mm before planting of grass runners. — After planting, runners must be given copious amounts of water and, when sufficiently dry, must be rolled with a light agricultural roller and re-watered. — Irrigate as required until the grass is able to survive independently (i.e. depending on the rainfall). <p>Grassing using hand seeding</p> <ul style="list-style-type: none"> — All seed should be collected from the project area during vegetation clearing or neighbouring veld. — Seeding must be done during the summer when the germination rate is better. — The soil should be loose and uniformly wet to a depth specified by the EO/ECO, before any seeding commences. — Halve the seed and fertiliser mixture as specified and apply evenly in two immediate successive applications perpendicular to each other. — The seeded area must be raked over after seed application and well-watered. — Irrigate as required until the grass is able to survive independently (i.e. depending on the rainfall). <p>Maintenance</p> <p>Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers.</p> <ul style="list-style-type: none"> — If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access. — Delay the re-introduction of stock to all rehabilitation areas until an acceptable level of re-vegetation has been reached. Fencing may be used, or the area may be covered by branches. — Re-vegetation must match the vegetation type which previously existed, unless otherwise indicated in the Contract or specified by the EO/ECO. — Water all transplanted, planted and grassed areas as specified — Watering must commence and continue immediately after the seeds have germinated and growth begins. — Mow lawns regularly to a height of 50 mm above ground level. This promotes adequate coverage. — Mowing of veld grass is to take place once a year after the grass has shed its seed and not before the grass has fully grown: fire breaks are important — Check all plants for pests and diseases on a regular basis and treat the plants accordingly, using approved method and products as per manufacturers specifications. — Control weeds by means of extraction, cutting or other approved methods. — For planted areas that have failed to establish, replace plants with the same species as originally specified. The same species as originally specified must be used unless otherwise specified by the EO / ECO. — A minimum grass cover of 80% is required, and individual plants must be strong and healthy growers at the end of the Maintenance Period. 				

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE
				<ul style="list-style-type: none"> — In the case of sodding, acceptable cover entails that 100% cover is attained by the specified vegetation <p>It is recommended that the success of the rehabilitation exercise be monitored from the commencement date of rehabilitation activities and for a period of 18 months after the rehabilitation has been completed. The Environmental Control Officer will compile a monthly monitoring report including the following information:</p> <ul style="list-style-type: none"> — Establishment success (presence, percentage cover or absence) of plant cover per plot, supported by photo images. — Water used for irrigation. <p>Monitoring must be undertaken once a month for the first 6 months and then quarterly thereafter for 12 months or until rehabilitation has been deemed successful. Rehabilitation will be deemed successful once primary grass cover has been established, and there is no further requirement for management of alien species.</p> <p><u>All alien vegetation in the footprint area as well as immediate vicinity of the proposed wind farm development should be removed. Alien vegetation control should take place for a minimum period of two growing seasons after rehabilitation is completed.</u></p>				
73	Ecological	Manage faunal environmental on site respectfully to allow for least disturbance and greatest ecological viability	Habit destruction, faunal disturbance and mortality	<p>All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact.</p> <p>All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.</p> <p>There should be regular monitoring for erosion for at least 2 years after decommissioning by the applicant to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures.</p> <p>The recovery of the indigenous shrub layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.</p> <p>All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.</p> <p>Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned.</p> <p>All temporary roads no longer required shall be decommissioned and the land rehabilitated.</p>	Rehabilitation implemented and effective; Alien clearing plan implemented and effective	— Monthly monitoring by ECO	PC; PM; ECO	Throughout planning phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE	
			<p>All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact.</p> <p>Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning.</p> <p>The recovery of the indigenous shrub layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.</p> <p>There should be regular monitoring for erosion for at least 2 years after decommissioning by the applicant to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures.</p>					
74	Social	Manage the social impacts of the project	Social unrest, unfair employment practices	<p>All structures and infrastructure associated with the proposed facility that can no longer be used by farmers or Eskom/ other IPPs should be dismantled and transported off-site on decommissioning;</p> <p>The proponent should ensure that all retrenchments conform with South African Labour Law legislation, including provision of retrenchment packages where applicable, when the WEF is decommissioned;</p> <p>The proponent should investigate the option of establishing an Environmental Rehabilitation fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.</p> <p>should be addressed in the Integrated Development Planning process undertaken by the KHLM and LLM.</p> <p>The Western and Northern Cape Provincial Governments, in consultation with the KHLM, LLM and WLM and the proponents involved in the development renewable energy projects in the Komsberg REDZ, should consider establishing a Development Forum to co-ordinate and manage the development and operation of renewable energy projects in the Komsberg REDZ, with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would include identifying key needs, including capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be</p>	Thorough consultation with communities	<ul style="list-style-type: none"> – Negotiations entered into and mediation affected where social unrest occurs; – Weekly monitoring by Monitoring Forum ESCO 	Monitoring forum, PM, ECO	Throughout all project phases

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE	
			<p>employed during the construction and operational phases of the various proposed projects. These issues</p> <p>The proponent should ensure that all retrenchments conform with South African Labour Law legislation, including provision of retrenchment packages where applicable, when the WEF is decommissioned;</p> <p>All structures and infrastructure associated with the proposed facility that can no longer be used by farmers or Eskom/ other IPPs should be dismantled and transported off-site on decommissioning;</p> <p>The proponent should investigate the option of establishing an Environmental Rehabilitation fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.</p>					
75	Rehabilitation	Manage rehabilitation to ensure as much ecological functioning after the development as possible	Soil erosion, habitat loss	<p>Rehabilitation of disturbed and heavily impacted environments is closely linked to ecological successional theory (van Ardel & Aronson, 2005). Succession can be described as a change of species, or patterns of species abundance, over time. Directional, continuous and sequential patterns of colonisation by various species are indicators of successional stages of a particular environment. The first sequence of succession (e.g. after a disturbance) is the initial colonisation of an area of fast-growing, aggressive pioneering species, which are often short-lived, perennial species and grasses. These plant species are responsible for changing soil properties and creating micro-niches for further colonisation.</p> <p>The initial sequence of pioneer species is then followed by early and late successional species migrating into the area, resulting in a climax community.</p> <p>When considering the rehabilitation of an environment that has been disturbed, the “4 R” approach is often employed and includes:</p> <ul style="list-style-type: none"> – Restoration – Rehabilitation – Replacement or re-vegetation – Reservation (Conservation) <p>Methods to restore, rehabilitate and re-vegetate are suggested in the body of this report. It is important to note that these activities begin with soil stabilisation and soil preparation or remediation. Soil remediation includes activities such as improvements to soil stabilisation, soil structure and soil fertility.</p> <p>The success of rehabilitating the community/population within a designated area is dependent on the satisfactory establishment of the chosen plant species. To ensure that the process is optimised, the correct plant species in</p>	Revegetation and rehabilitation conducted in accordance with this plan	<ul style="list-style-type: none"> – Natural species used – No less than 80% vegetation cover (i.e. such as is natural and undisturbed adjacent to the project) after one year regrowth; – Monthly ESCO monitoring during rehabilitation, once every six month monitoring after the first year of rehabilitation. 	PC; ECO, ESCO	Throughout rehabilitation phase

REF ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE
			<p>the correct densities and combinations should be utilised. Monitoring of the rehabilitation process is imperative to ensure that aggressive plant species and herbivores are controlled and slopes/banks remain stable.</p> <p>The general aim of the implementation of a rehabilitation programme is to recreate a natural ecosystem. In this regard, the rehabilitation will be outlined in three phases, which would be required, namely:</p> <ul style="list-style-type: none"> — Soil stabilisation and remediation (composition, pH level, nutrients, etc.), — Re-vegetate using appropriate natural successional species. — Monitor: removal of aggressive indigenous plant, follow up on alien invasive plant species, successful establishment of re-vegetated areas. <p>Current natural state of vegetation</p> <p>The current state of the landscape, prior to construction is the reference point against which to assess rehabilitation success. The majority of the site is covered by natural or near to natural vegetation, having generally been disturbed to a small degree (i.e. roughly 99% intact). The majority of the development footprint falls within Central Mountain Shale Renosterveld, with no turbines within the Koedoesberge-Moordenaars Karoo which occurs in the low-lying areas. The Komsberg area is also a recognized centre of plant diversity and endemism and the majority of this diversity is associated with the high elevation areas of Central Mountain Shale Renosterveld (Clark et al. 2011). In addition, the sites of natural vegetation are located near river and drainage line edges, with elevated ecological sensitivity due to the potential presence of species of conservation concern. The majority of the site is currently free or has low abundance of alien species. There are however disturbed areas around farmsteads, old croplands and livestock watering points which harbour a variety of alien species. Mesquite, <i>Prosopis</i> spp. is common at most farmsteads and is a potential problem especially in lowlands habitats around the site and is a potentially significant invader as it can alter hydrological function under dense invasion. Other common invasive and indigenous weedy species observed at the site include <i>Bromus</i> spp., <i>Lolium</i> spp. <i>Avena fatua</i>, <i>Salsola kali</i>, <i>Dittrichia graveolens</i>, <i>Amsinckia retrorsa</i> and <i>Conyza bonariensis</i>.</p> <p>Based on the current state, re-vegetation required by the developer requires the Brandvalley Wind Energy Facility should keep removal of indigenous vegetation to a minimum. As the site is generally very well conserved and in-tact, preserving the status quo as far as possible is the aim of the rehabilitation plan. As such, the majority of the effort is to be aimed at controlling establishment and spread of invasive species of initial vegetation clearance and disturbance. The precise control is discussed in greater detail in the invasive species management plan.</p> <p>Soil stabilisation and remediation</p> <p>Topsoil removed during construction must be utilised in the nursery and stored on site for rehabilitation and re-vegetation. When construction is complete the topsoil must be spread over the disturbed site and covered with mulch. The soil must be stabilised using materials such as netting or geotextiles.</p> <p>Since the plant material (grasses and herbs) removed from the site should be mixed into the topsoil and supplements the organic nutrient content of the soil, no further soil conditioning in terms of fertilising is deemed necessary.</p>				

REF	ASPECT	OBJECTIVES	POTENTIAL IMPACT	MITIGATION MEASURES	OUTCOMES	INDICATOR AND MONITORING	RESPONSIBLE PERSON	DEVELOPMENT PHASE
				<p>Re-vegetation procedure</p> <p>These measures are to be adhered to for compliance with this plan.</p> <p>Rehabilitation Monitoring</p> <p>It is recommended that the success of the rehabilitation exercise be monitored from the commencement date of rehabilitation activities and for a period of 18 months after the rehabilitation has been completed.</p> <p>The ESCO will compile a monthly monitoring report including the following information:</p> <ul style="list-style-type: none"> — Establishment success (presence, percentage cover or absence) of plant cover per plot, supported by photo images. — Water used for irrigation. <p>Monitoring must be undertaken by the ESCO once a month for the first 6 months and then quarterly thereafter for 12 months or until rehabilitation has been deemed successful. Rehabilitation will be deemed successful once primary pioneer species have been established, and management of alien species is at a maintenance level. This level is determined by the need to only control plants that exist, and spread is contained</p>				
76	Agriculture	Prepare land use of site during rehabilitation phase to conform to expected future land use	Poor rehabilitation making land less useful for future land use	All impacted agricultural land should be rehabilitated for future agricultural use.	Land rehabilitated for future use	<ul style="list-style-type: none"> — Rehabilitation conducted as per EMP — Monthly ECO monitoring 	PC; ECO	Rehabilitation phase
77	Bats	Minimise the impact of decommissioning vehicles and staff during rehabilitation	Habit destruction; poor rehabilitation	Damaged areas not required after construction should be rehabilitated by an experienced vegetation succession specialist.	Areas of disturbance minimised	<ul style="list-style-type: none"> — No less than 90% of the disturbed areas revegetated after decommissioning 	PC; ECO	Throughout rehabilitation phase
78	Heritage	Manage heritage resources for least impact and conservation for future generations	Irreparable loss to heritage resources	Effective rehabilitation of the landscape after decommissioning (cultural landscape impact)	Appropriate planning for rehabilitation	<ul style="list-style-type: none"> — Professional used for rehabilitation, Once off monitoring 	PC; ECO	Design takes into account the correct siting and sensitivities mentioned here
79	Traffic Management	<u>Mitigate Site Access</u>	<u>Impact on the internal roads; road hazards and impact on landowners</u>	<u>Contractors and sub-contractors may only utilise demarcated access roads to access the Rietkloof WEF. The roads DR01475 and DR01483 cannot be utilised under any circumstances. The roads are clearly indicated in Figure 7-1.</u>	<u>Areas of disturbance minimised</u>	<ul style="list-style-type: none"> — <u>Monitoring by ECO prior to construction</u> 	<u>Holder of the EA; Contractor</u>	<u>Prior to the construction phase commencing</u>

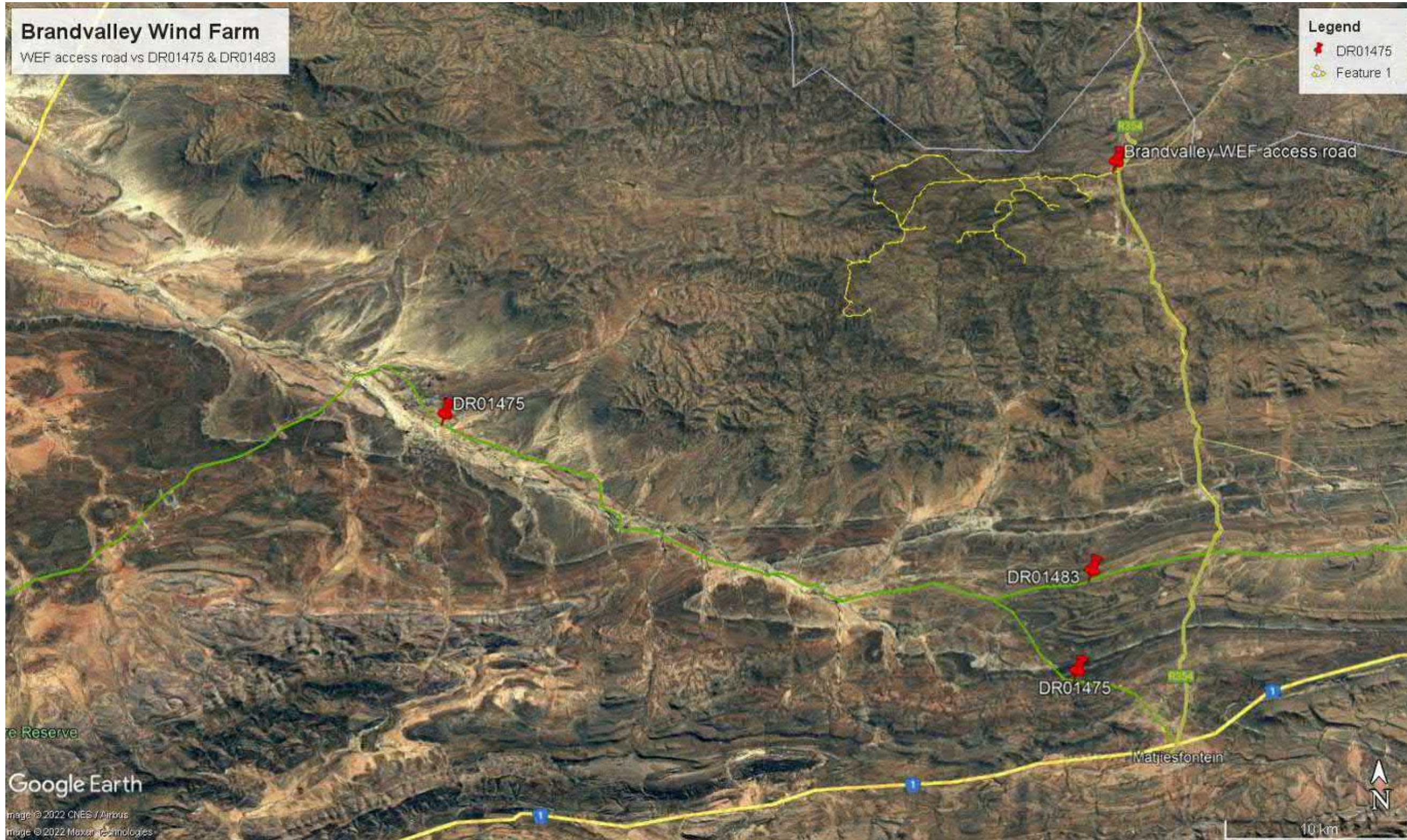


Figure 7-1: Location of permitted and non-permitted Access Roads

8 SPECIFIC MANAGEMENT PLANS

The DFFE requires that the EMPr amendment includes the following management plans, as indicated in the EA conditions:

- An Alien Invasive Management Plan (Section 8.1);
- A Plant Rescue and Protection Plan (Section 8.2);
- A Re-Vegetation and Habitat Rehabilitation Plan (Section 8.3);
- A Traffic Management Plan (Appendix C);
- A Construction and Operational Avifauna (Appendix D);
- A Bat Monitoring Plan (Appendix E);
- A Heritage Conservation Management Plan (Appendix F);
- A Stormwater Management Plan (Section 8.4);
- An Erosion Management Plan (Section 8.5);
- A Rehabilitation Management Plan (Section 8.3);
- Hazardous Substances Leakage or Spillage Monitoring System (8.6); and
- A Fire Management Plan (Section 8.7);
- Measures to Protect Hydrological Features (Section 8.8);
- A Waste Management Plan (Section 8.9).
- Open Space Management Plan (Section 8.10);
- Health and Safety Programme (Section 8.11)

The following additional management plans have also been compiled:

- Emergency Response Plan (Section 8.12);
- Chance Find Procedure (Section 8.13);
- Security Policy (Section 8.14); and
- COVID-19 (Section 8.15).
- HIV/AIDS Management Plan (Section 8.16);
- Grievance Mechanism (Section 9)

8.1 ALIEN INVASIVE MANAGEMENT PLAN

8.1.1 BACKGROUND AND LEGAL FRAMEWORK

The DFFE manages Invasive Alien Species under the National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA). In addition, there are regulations published in the Government Gazette on 1 August 2014, which stipulate categories for the classification of invasive potential (and thus risk), of the different known problem species in the country. These classes loosely model that of Henderson (2001), which provides the invasive status classification, as outlined in the Conservation of Agricultural Resources Act (No. 43 of 1983a). These plants can be classified as Category 1, 2 or 3 species, and as a ‘Declared Weed’ or ‘Declared Invader’ according to their level of invasiveness in South Africa. The description of the abovementioned classifications are:

- **Category 1a:** invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1a species include, for example, the yellow water lily (*Nuphar lutea*), yellow flag (*Iris pseudocorus*), bur cactus (*Opuntia salmiana*), hop wattle (*Acacia stricta*) and kangaroo wattle (*Acacia paradoxa*).

- **Category 1b:** Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway.
- **Category 2 plants:** (Commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread
- **Category 3 plants:** (Ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading there of, except within the floodline of watercourses and wetlands
- **Declared weed (category 1):** Prohibited on any land or water surface in South Africa, Must be controlled, or eradicated where possible (except in biological control reserves)
- **Declared invader (category 2):** Allowed only in demarcated areas under controlled conditions, Import of propagative material and trading allowed only by permit holders, Outside demarcated areas must be controlled, or eradicated where possible (except in biological reserves), Prohibited within 30 m of the 1:50 year floodline of watercourses or wetlands unless authorization obtained.
- **Declared invader (category 3):** No further plantings allowed (except with special permission), No trade of propagative material, Existing plants may remain but must be prevented from spreading, Prohibited within 30m or the 1:50 year floodline of watercourses or wetlands, or as directed by the executive officer.

It is essential that alien invasive species be removed from the study area. Following the Working for Water guidelines for effective alien vegetation removal (DWA, 2009), an alien removal programme should consist of the following three phases:

- 1 Initial control: Clearing and eradication of alien invasive stands so as to drastically reduce the existing population;
- 2 Follow-up control: Control of re-growth (including seedlings, root suckers and coppice growth); which should be conducted annually for the first 5 years.
- 3 Maintenance control: Sustain alien plant numbers with on-going annual monitoring for the life of the project, and if necessary implement additional control methods to avoid re-establishment of alien invasive stands.

8.1.2 POTENTIAL ALIEN INVASIVE PLANT SPECIES AT THE SITE

A few alien plant species were recorded on-site, which require management. These species are indicated in **Table 8-1**, with their common names and their risk classification.

Table 8-1: List of alien invasive species recorded at the site

SPECIES NAME	COMMON NAME	CLASSIFICATION
<i>Prosopis spp.</i>	Mesquite	1b species in Western Cape, category 3 in the Northern Cape.
<i>Bromus spp.</i>	<u>Cheat grass / ripgut</u>	Naturalised invader, not listed
<i>Lolium spp.</i>	<u>Perennial rye grass</u>	Naturalised invader, not listed
<i>Avena fatua</i>	<u>Wild Oat</u>	Naturalised invader, not listed
<i>Salsola kali</i>	<u>Tumbleweed</u>	1b
<i>Dittrichia graveolens</i>	<u>Stinkwort</u>	Naturalised invader, not listed
<i>Amsinckia retrorsa</i>	<u>Rigid fiddleneck</u>	Naturalised invader, not listed
<i>Conyza bonariensis</i>	<u>Hairy Fleabane / Horseweed</u>	Naturalised invader, not listed

*Classification according to the National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species List, 2014

8.1.3 GENERAL REQUIREMENTS

Cuttings must be burnt in an open clearing where the risk of spreading fire is minimal, in order to kill the seeds on the plants.

For these species, follow up clearing must be conducted every two months to remove upcoming seedlings. This is the Holder of the EA's responsibility.

In cases where large scale alien plant removal has been conducted, measures to stabilise the soil from wind and water erosion must be taken. Soils may be mulched and planted with indigenous pioneer species.

Continued ESCO/ECO monitoring throughout the life of the project will be required as the risk of alien plant species invasion is never eliminated.

8.1.4 WEED REMOVAL AS PART OF THE INITIAL CONTROL PROGRAMME

There are a number of possible methods which can be used to control alien invasive species; these include mechanical, chemical and biological control. The sections below outline possible techniques used in mechanical and chemical control methods. Table 6-2 (below) outlines specific management details for each of the alien invasive species identified on site.

As the species identified in the ecological report for this region include mainly grasses and herbs, mechanical clearing methods are limited in efficacy. Cut stump and frill treatments are also traditionally reserved for woody plant species, and as such are not applicable in the treatment of species found in this particular instance.

According to Todd (2011), mowing, fire, herbicide application and grazing are the four general categories of grass control in South Africa. Fire and mowing are difficult practically for control, as it means that natural vegetation will suffer if not applied correctly. Often, circumstances do not allow for successful physical control of the region, and the only available option is herbicide application. Due to the good condition of the study area, with mainly natural vegetation of similar height to that of the invasive grasses (i.e. roughly knee height), mowing and fire are not practical options. Especially in the light of fire tolerance and fire adapted grass species, such as *Avena spp.*, for which fire may actually increase the reproductive potential of the species. It is for this reason that chemical control is the primary suggested control method for invasive alien species in the study area. Fire and mowing are not discussed, as they are not regarded feasible for the existing land use and for the effective control of the herbs.

8.1.5 MECHANICAL CONTROL METHODS

Mechanical methods for alien plant removal may include felling, removing or burning invading alien plants. The following mechanical methods for felling are recommended:

- Hand pulling: Grip the young plant low down and pull out by hand (using gloves).
- Ring barking: Bark is removed to from the bottom of the stem to a height of 0.75-1.0 m to below ground level. Bush knives or hatchets can be used for debarking.
- Frill or Ring-bark: Using an axe or bush knife, angled cuts are made downward into the cambium layer through the bark in a ring; herbicide is applied into the cuts.
- Cut stump treatment: Stems should be cut as low as practical as stipulated on the herbicide label. Chemical herbicides are applied in diesel or water as recommended. Applications in diesel should be to the whole stump and exposed roots and in water to the cut area as recommended on the label.

8.1.6 CHEMICAL CONTROL METHODS

Chemical methods for alien plant removal include using a number of approved environmentally safe herbicides, which are applied to the leaves, stems or stumps of alien invader species (details of herbicides suitable for the various species are provided in **Table 8-2**). All alien control measures to be approved by the ECO prior to undertaking it.

Table 8-2: Summary of potential methods to be used for the removal of alien invasive species identified on the site

SPECIES NAME	HAND PULL OR HOE*	HERBICIDE
<i>Prosopis spp.</i>	Seedlings and saplings	<p>The chemical and mechanical control of Mesquite has been found to be unfeasible financially, as control costs outweigh property values (Zachariades, Hoffman & Roberts 2011). As such, biological control is suggested, under supervision of the Agricultural Research Council (ARC), employing approved insects. Should smaller populations occur on site, mechanical clearing of new growth, coupled with regular herbicidal treatment should continue until populations are at maintenance levels. Cut stump treatment with Picloram has been shown to be effective in SMALL populations in the past.</p> <p>— Basal Bark/Cut Stump Treatment</p> <p>The basal bark application of usually 'Garlon 600' mixed in diesel onto the bark from ground level to knee height all the way around the Stem, during the active growing season. Cut stump treatments on any size plant at any time of the year using similar herbicides are also useful.</p> <p>— Foliar (Overall) Spray Treatment</p> <p>Foliar sprays are best applied on dense thickets of seedlings less than 1.5 metres tall. The plants must be actively growing with a large area of foliage. A wetting agent must be added to the mix. Garlon, Grazon DS and Access are all herbicides that can be used.</p>
<i>Bromus spp.</i>	Seedlings or entire plant	<p>According to CABI (2016), a range of herbicide treatments has been successfully used for control of <i>B. diandrus</i> in South Africa: In cereals, pre-emergence applications of cyanazine + terbuthylazine, chlorsulfuron + terbuthylazine, and metribuzin (Dastgeib et al., 2003) or post-emergence applications of clethodim, haloxyfop (Nott, 2002); or sulfosulfuron (Agenbag and Crous, 1999). In legumes, post-emergence treatments fluazifop, quizalofop (le Roux et al., 1995) and simazine + paraquat (Leys and Plater, 1993).</p>
<i>Lolium spp.</i>	Seedlings or entire plant	<p>Foliar application during the active growing season of tepraloxymid (cyclohexanone) 50 g / L (Aramo[®] herbicide).</p>
<i>Avena fatua</i>	Seedlings or entire plant	<p>Pre-emergent soil application of Pyroxasulfone (Pyrazole) 850 g/kg (Sakura[®] herbicide). Care must be taken to not spray soil outside of the edges of current infestations, and to reduce spray drift and unintended exposure to other plants.</p>
<i>Salsola kali</i>	Seedlings or entire plant	<p>Nicosulfuron (sulfonyl urea) 750 g/kg (Accent[®]) as foliar spray, post-emergence. Contains 720 g / l dimethenamid-P (Frontier[®] Optima) for pre-emergence application. Care must be taken to not spray soil outside of the edges of current infestations, and to reduce spray drift and unintended exposure to other plants.</p>
<i>Dittrichia graveolens</i>	Seedlings or entire plant	<p>The salt formulation of triclopyr (Garlon 3A[®]) in a post-emergence, foliar spray application while plants are still young. Waxes on mature leaves create uptake problems, and as such earlier control efforts will be more effective. For Stinkwort, this is generally just before or at the time of bolting. Triclopyr is selective and relatively safe on grasses and may be also be used. Glyphosate (Roundup Pro) may also be used.</p>
<i>Amsinckia retrorsa</i>	Seedlings or entire plant	<p>Glyphosate (Round-Up Biactive[®], Weedmaster Duo[®] (360 g/L); Metsulfuron-methyl (Brush-Off[®], Associate[®] (600 g/Kg)) or Metsulfuron-methyl + glyphosate (Trounce[®], Cut-Out[®] (various formulations), applied during the active growing season. Different application rates are suggested for different size target plant. Further reading available at http://dpipwe.tas.gov.au/invasive-species-site/Pages/Amsinckia-Herbicides-for-Control.aspx</p>



<i>Conyza bonariensis</i>	Entire plant	MCPA® and Sargomil Gold 600®, or paraquat and glyphosate based products (though resistance has been shown). Treat plants using foliar spray soon after bolting.
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*Avoid mechanically clearing during dry periods or when plants are desiccated, in particular tumbleweed. This is primarily due to the seed dispersal mechanisms for most grasses and tumbleweed being through desiccation and wind-blow dispersal. Control should be focussed on new growth using chemical means, as more uptake will occur and greater absorption will lead to greater efficacy.

8.1.7 VISUAL MANUAL FOR ALIEN INVASIVE PLANT SPECIES IDENTIFICATION



The following plates provide a guide to the alien invasive plant species potentially found within the WEF site. Each species is described in terms of how it looks, timing of flowering and/or fruiting.

PROSOPIS SPP. (Mesquite)

Scientific name	<i>P. glandulosa</i> var. <i>torreyana</i> (honey mesquite) and <i>P. velutina</i> (velvet mesquite)
Common name(s)	Mesquite
Description	<i>Prosopis glandulosa</i> exhibits drooping branches with feathery foliage and straight, paired spines. The species can grow up to 15 m, at a medium growth rate.
Leaves	Leaves are deciduous, twice compound, bright-green and feathery, with leaflets up to 5cm long and 7cm wide.
Flowers	Flowers have pale, yellow, elongated spikes with straight, yellow seedpods.
Fruits	Fruit display a long, yellowish brown pod at maturity, somewhat flattened and with slight constrictions between the seeds.
	
Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Cut stump and herbicide Biological control (should only be conducted in cooperation with the department of agriculture).



Pictures source: Wikipedia, 2016).

BROMUS SPP. (Ripgut)

Scientific name	<i>Bromus diandrus</i>
Common name(s)	Ripgut
Description	<i>B. diandrus</i> is an annual tufted grass with unbranched culms, occurring throughout much of the western cape, and southern part of the Northern Cape, flowering from September to January.
Leaves	Great brome leaves are rough, hairy, dull and often have visible purple stripes along the leaf veins. The leaf sheath is tubular, the ligule is prominent and membranous, and the stems are hairy
Flowers	Flowers are a loose, nodding panicle with long stalked spikelets
Fruits	
	
Source: T. Rebelo, iSpot.co.za (2015)	Source: S. Navie, Biosecurity Queensland (2016)
Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages

LOLIUM SPP. (Perennial rye grass)

Scientific name	<i>Lolium perenne</i>
Common name(s)	Perennial ryegrass
Description	The plant is a low-growing, tufted, hairless grass, with a bunching growth habit.
Leaves	The leaves are dark green, smooth and glossy on the lower surface, with untoothed parallel sides and prominent parallel veins on the upper surface. The leaves are folded lengthwise in bud or rolled (<i>Lolium multiflorum</i>), and has an overall flat appearance. Leaf sheaths at the base are usually tinged pink and hairless. Stems grow up to 90 cm. (Wikipedia, 2016)

Flowers	The inflorescence is unbranched, with spikelets on alternating sides edgewise-on to the stem. The anthers are pale yellow. Perennial ryegrass has a fibrous root system, with thick main roots and thinner lateral branches. Roots are usually arbuscular mycorrhizal. (Wikipedia, 2016)
Fruits	
	
Source: www.horsedvm.com, 2016	Source: S. Navie, Biosecurity Queensland 2016
Proposed control methods	
Seedlings	Hand pull or hoe over small areas. Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages

AVENA FATUA (wild oat)

Scientific name	<i>Avena fatua</i>
Common name(s)	Wild oat
Description	<i>A. fatua</i> is an annual tufted grass with erect culms, varying from 25 to 120 cm. (CABI, 2016)
Leaves	Leaf blades are dark green, up to 40 cm long and with a membranous ligule, which is 1 to 6 mm long and often irregularly toothed. Sheaths are smooth or slightly hairy, especially in younger plants. (CABI, 2016)
Flowers	The inflorescence of <i>A. fatua</i> is a loose, open panicle with 2 to 3-flowered pedicelled spikelets. (CABI, 2016)
Fruits	Grains are 6 to 8 mm long.



Source: S. Navie, Biosecurity Queensland (2016)



Source: S. Navie, Biosecurity Queensland (2016)

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages

SALSOLA KALI (common saltwort)

Scientific name	<i>Salsola kali</i>
Common name(s)	Common saltwort
Description	<i>S. kali</i> is a low herb, 5-50 cm tall, papillose to hispid or, occasionally, glabrous. Stems are erect to ascending, branching from the base (CABI, 2016).
Leaves	Leaves are alternate with linear blades, roughly 1-2 mm wide, fleshy, usually not swollen at base, apex acuminate, forming a firm spine, 1-1.5-2.2 mm long. (CABI, 2016)
Flowers	“Flowers with bracteoles free or becoming connate and adnate to perianth base; perianth segments with comparatively narrow wing, or in lower flowers occasionally wingless, with weak or firm, acute apex, glabrous; fruiting perianth 4-6(-8) mm diameter” (CABI, 2016)
Fruits	“Inflorescences interrupted at maturity, usually 1-flower per axil of bract; bracts alternate, not imbricate at maturity, reflexed, not distinctly swollen at base, apex narrowing into subulate spine” (CABI, 2016).



Source: www.invasives.org.za, 2016



Source: Eattheweeds.com, 2016

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages

DITTRICHIA GRAVEOLENS (Stinkwort)

Scientific name	<i>Dittrichia graveolens</i>
Common name(s)	Stinkwort
Description	<i>Dittrichia graveolens</i> is a branching subshrub, growing to 130 cm tall, with a pungent smell. (Wikipedia, 2016)
Leaves	Leaves are long and narrow, pointed at each end, with small teeth along the edges and glandular hairs on the surfaces (Wikipedia, 2016).
Flowers	One plant can produce numerous yellow flower heads
Fruits	with as many as 16 ray florets and 40 disc florets (Wikipedia, 2016).





Source: mundaringps.wa.edu.au (2016)



Source: Wikipedia (2016)

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages

AMSINCKIA RETRORSA (Rough Fiddleneck)

Scientific name	<i>Amsinckia retrorsa</i>
Common name(s)	Rough fiddleneck
Description	Rigid fiddleneck is a colorful annual and weed. Plants have erect, simple to few-branched stems from 10- 100 cm high. The stems are covered with long, spreading, stiff hairs with and undercoat of shorter, softer hairs that point downwards. (http://science.halleyhosting.com/ , 2016)
Leaves	The leaves are linear to linear-oblong in shape, measuring up to 12 cm long and up to 1 cm wide. The herbage of the leaves is similar to that of the stems, but the hairs may be more appressed. The basal leaves are more numerous and crowded, while those of the stems are more widely spaced and are reduced in size. (http://science.halleyhosting.com/ , 2016)
Flowers	The inflorescence consists of a scorpioid spike which uncoils and elongates with age. The 5 sepals are generally equal in size and shape and measure from 5-12 mm long. Individual sepals are linear to linear-lanceolate in shape and measure from 7-10 mm long. The corolla consists of a tube from 5-8 mm long that is barely exerted from the calyx while the limbs or lobes of the corolla range from 1.5-5 mm long. The corolla is typically orange or orange-yellow with reddish markings in the open throat. (http://science.halleyhosting.com/ , 2016)
Fruits	
	
Source: www.tss.oregonstate.edu , 2016	Source: malagaes.oregonstate.edu , 2016
Proposed control methods	
Seedlings	Hand pull or hoe over small areas

	Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages

CONYZA BONARIENSIS (Hairy fleabane)

Scientific name	<i>Conyza bonariensis</i>
Common name(s)	Hairy fleabane
Description	“ <i>C. bonariensis</i> is an erect annual with one or more stems from a basal rosette, up to 60 cm or occasionally 100 cm in height. All parts of the plant are finely pubescent and greyish in colour.” (CABI, 2016)
Leaves	“Leaves linear to oblanceolate, mostly about 5 mm wide, entire, but often wavy-edged, with very short or hooked hairs less than 0.5 mm long.” (CABI, 2016)
Flowers	The inflorescence has long branches resulting in an almost corymbose effect, with most flowering heads about the same level. Individual flower heads are greyish-green, 4-5 mm diameter when fresh (broader in pressed specimens) with cream-coloured disc florets and no ray florets. (CABI, 2016)
Fruits	



Source: iSpot.co.za, 2016



Source: www.roundthebend.org.au, 2016

Proposed control methods	
Seedlings	Hand pull or hoe over small areas Foliar spray
Mature or large plants	Foliar spray Mowing at selective growth stages

8.1.8 MONITORING

Due to their persistent nature and prodigious seeding and reproduction, invasive alien plants require coordinated, consistent monitoring and control efforts. For this project, where invasive species are likely to mainly be located along already disturbed regions such as farmsteads, roads, cattle feedstock's, pens, and farm dams, the monitoring efforts should be focussed on these areas. This is especially important as the majority of the project region is currently under good, natural veld with little invasion. Monitoring should be conducted by the ECO (contractually), and ESCO (incidentally, or on an ad-hoc basis). The ESCO and ECO should

familiarise himself/herself with the identification of the species mentioned above, and be able to identify them in-field. Should any doubt exist, a professional botanist should be consulted.

The ESCO shall survey all high priority regions (disturbed areas) every two weeks throughout the construction phase, and include in his/her monthly report finding from these surveys. The objective will be to identify the presence of absence of target species on-site, and to identify the efficacy and ongoing clearance control offered by the methods mentioned above. New occurrences of problem species must be noted for clearance, and included in the clearing teams' objective for clearing to commence within two weeks of positive identification.

During the operation phase, monitoring may be relaxed to a once every six months event, where surveys for all disturbed regions (i.e. all regions cleared and frequented by the construction efforts) is to be conducted. Findings shall be captured yearly and included in the rehabilitation reporting. Reports should be made available upon request.

8.1.9 GENERAL CONTROL EFFORTS

In general, control efforts must:

- Avoid fire as a clearing / control method;
- Avoid mowing as a clearing / control method;
- All biocontrol measures must be conducted in consultation with the Plant Protection Research Institute (DoA – Pretoria), or another recognised IAP control organisation, in order to ensure the correct agent is being employed, and the region isn't at risk.
- A clearing roster must be drawn up by the ESCO and approved by the Project Manager prior to clearing commencing, in order to allow for a work schedule for all invasive species occurrences on-site. This roster will be updated as clearing occurs and new instances are observed. This roster will be used to track progress and act as proof of clearing conducted and can be verified by the ECO;
- All clearance activities to be described in a Method Statement for approval by the ECO;
- Prioritise small populations over large populations;
- Prioritise less dense infestations to denser infestations;
- Ensure clearing of fringes of existing populations prior to the clearing of the centre (i.e. outside inward, not inwards to the outside clearing);
- Ensure all control teams are equipped with the appropriate Protective wear and do not conduct work without them on;
- Apply herbicide to plants at new growth, as opposed to mature plants (this improves uptake);
- Ensure the correct herbicide is selected for each species, and the correct dosage is used. Dosage must at all times follow that of the label;
- Ensure the correct clearing method is selected and used for each species;
- Clearing must be conducted every three months for herbaceous species, and once every six months for Mesquite. Once maintenance levels have been achieved, clearance may occur annually or as required for the duration of the operation phase.
- Should these clearing methods above prove ineffectual, a professional clearing organisation or botanist (Working for Water, or the City of Cape Town invasive Species Unit or similar) must be approached for a species-specific management plan, to be followed for each species.

8.2 PLANT AND RESCUE PROTECTION PLAN (INCLUDING FAUNA)

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures, in addition to the mitigation measures included in the EMPr, to reduce the impact of the development of the

Brandvalley WEF on listed and protected plant species and their habitats, and to provide guidance on search and rescue of species of conservation concern.

8.2.1 RELEVANT ASPECTS OF THE SITE

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 hectares was noted to be present in the broader area within or near project component footprints. This 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.

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*.

Mitigation and management measures include, but are not limited to the following:

- Vegetation clearing must only commence after a walk down has been conducted by a suitably qualified person and the necessary permits obtained.
- A flora and fauna search and rescue (relocation) must be undertaken before commencement of vegetation clearing and should preferably be undertaken in the Spring season. A comprehensive list of 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 Acts and Ordinance(s) of the Ecology & Biodiversity Walkdown Report. 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).
- The relevant permits will be applied for prior to undertaking any activities that could impact on Threatened and Protected Species.
- Scattered *Brunsvigia josephinae* sub-population, which is listed as Vulnerable, will require search and rescue.
- Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
- Vegetation removal must be limited to the construction site and must be removed only as it becomes necessary rather than removing all the vegetation throughout the site at once
- Materials must not be delivered to the site prematurely which could result in additional areas being cleared or affected.
- No vegetation to be used for firewood.
- Gathering of firewood, fruit, medicinal plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO.
- Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas.
- All natural areas impacted during construction must be rehabilitated with locally indigenous plant species or grassed accordingly.
- A buffer zone must be established in areas where construction will not take place to ensure that construction activities do not extend into these areas.
- The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation.
- Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation in the soil. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.

8.3 RE-VEGETATION AND HABITAT REHABILITATION PLAN

Re-vegetating and rehabilitating the site once constructed through a comprehensive landscaping effort will benefit the potential faunal species that may find refuge on the site, and promote ecological function and connectivity on site. Linked to this, is the creation, preservation and maintenance of tracts of natural and ornamental vegetation in all stages of ecological succession, interconnected by corridors or green belts for escape, foraging, breeding and exploratory movements. In terms of the scope of the construction activities, landscaping and rehabilitation will be minimal; many instances will require clean-up activities together with planting ground stabilizing vegetation. If extensive rehabilitation is required then the approved site EMPr will be addressed for further assistance. The Rehabilitation and Landscaping Plan will focus on the following areas:

- Road verges during and after road construction is completed;
- Stormwater soak away features and landscaped areas;
- The transformed portions of the site not developed must be rehabilitated by planting indigenous plant species occurring in the area.
- Areas where pockets of alien invasive species have been removed.
- A list of indigenous plants used during rehabilitation must be approved by the ECO prior to commencement of rehabilitation activities.

8.3.1 VEGETATION

The re-vegetation process will not only focus on the rehabilitation of the road verges but also on all exposed soil, transformed areas and areas where alien invasive species have been removed within the site. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.

Re-vegetation Procedures

According to the national vegetation map (Mucina & Rutherford, 2006) the vast majority of the power line routes are within the Central Mountain Shale Renosterveld vegetation, while only a small area around the Komsberg substation falls within the Koedoesberge-Moordenaars Karoo vegetation type.

Central Mountain Shale Renosterveld

All plants collected from this vegetation type prior to construction must be transplanted in similar environments onsite in the Rehabilitation Phase. In addition, a seeding programme must be initiated in order to promote growth, as this region has slow expected growth rates. The approach should rather be to avoid impacting this vegetation type in preference, so disturbance should be kept to a minimum.

Koedoesberge-Moordenaars Karoo

All plants collected from this vegetation type prior to construction must be transplanted in similar environments onsite in the Rehabilitation Phase. The following is required:

- Spread stockpiled subsoil to an average depth of 1m
- Spread stockpiled topsoil to a minimum depth of 10cm
- Avoid impacting any large bush clumps.

Out-planting Procedures

<u>Plot preparation</u>	The plots will be prepared as follows: 1. Prior to rehabilitation of the site, all remnants of foreign debris shall be removed from the site. 2. All plots will be covered first with 1m deep subsoil and then with topsoil (minimum of 10cm deep). Soils will be manually spread evenly over the surface. Topsoil must be spread to the original depth (10cm), and deeper where sufficient top soil remains.
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	3. As topsoil will contain all cleared vegetation, no additional treatment will be required.
<u>Plant Preparation</u>	<p>Plants must undergo a period of ‘hardening-off’ during which they have been exposed to full, direct sunlight and been under a reduced watering regime. The individual plants destined for each plot will be grouped into plot-specific, marked baskets, before they leave the nursery. Each plant will be labelled with an aluminium label, giving species code, and a specific numeral identifying the plot. Before the out-planting commences, the equipment necessary for the proper handling and placing of all required materials shall be on hand, in good condition and to acceptable approved standards.</p> <ul style="list-style-type: none"> — Planting should preferably be done during the rainy season. — Unless otherwise specified by the ESCO / ECO, excavate square holes of 800mm x 800mm x 800mm on average for trees and 500mm x 500mm x 500mm on average for shrubs. — Backfill planting holes with topsoil. As much of the soil from container plants as possible must be retained around the roots of the plant during planting. — The soil must cover all the roots and be well firmed down to a level equal to that of the surrounding in situ material — After planting, each plant must be well watered, adding more soil upon settlement if necessary. — Stake all trees and tall aloes using three weather resistant wooden or steel stakes anchored firmly into the ground. Two of the three stakes are to be located on the windward side of the plant. Galvanised wire binding, 3 mm thick, covered with a 20mm diameter plastic hosepipe must be tied tightly to the stakes, half to two thirds the height of the tree above the ground and looped around the trunk of the tree. — Place stakes at least 500mm apart and away from the stem and roots of the tree, so as not to damage the tree or its roots. — Thoroughly water plants as required until the plants are able to survive independently (i.e. depending on the rainfall). — A raised circular 200mm high subsoil berm, placed 500mm (shrubs) to 750mm (trees) from the plant’s stem must be provided for the watering. Do not simply leave the excavated plant hole partially backfilled for this purpose – the berm must be raised above the natural soil level. — Water aloes and bulbs once directly after transplanting to settle the soil — Remove stakes and wire binds over time as required, as plants become established.
<u>Seeding</u>	<ul style="list-style-type: none"> — A professional botanist knowledgeable regarding this vegetation type should conduct a seed collection exercise during early summer, in order to enrich the seed bank of the existing topsoil. This is necessary as out-planting is typically not very successful, with high mortality expected. An additional seed bank will assist in restoring the area, including sowing for a larger variety of species than that planted. — Sow seed into topsoil prior to spreading, in order to mix throughout the layer — Addition of a mulch layer may assist with the survival of the seedlings — Reseeding after the 1st year may be required in order to promote further succession of native species; — For rehabilitation to be successful, the final vegetation covers should resemble composition and density of non-disturbed vegetation (prior to construction), with invasive species at maintenance levels;
<u>Maintenance</u>	<ul style="list-style-type: none"> — Water all transplanted plants as specified. — Watering must commence and continue immediately after transplanted. — Check all plants for pests and diseases on a regular basis and treat the plants accordingly, using approved method and products as per manufacturers specifications.

	<ul style="list-style-type: none"> — Once revegetated, areas should be protected from trampling and soil erosion, as well as unauthorised personnel, vehicles and construction equipment; — Should areas be converted to grazing, consultation with the landowner is necessary to come to terms regarding the exclusion of the plot for a while, to allow for plant to mature prior to grazing commencing. Plots should be isolated for at least 2 years, as slow growth is expected in this area. — Isolated areas are to be fenced off. Fencing shall be removed once the area is deemed sufficiently rehabilitated. — Control weeds by means of extraction, cutting or other approved methods. — For planted areas that have failed to establish, replace plants with the same species as originally specified. The same species as originally specified must be used unless otherwise specified by the ESCO / ECO.
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In order to rehabilitate transformed and invaded areas, the following landscaping techniques will be employed:

- Clearing of vegetation should take place in accordance with the construction programme, instead of exposing large tracts of land simultaneously.
- Clearing of invaded areas should be undertaken as per the Alien Management Plan;
- No re-useable topsoil should be removed from the site.
- Sods used in re-vegetation should be obtained directly from the veld, but not from the sensitive areas on site. Veld sods shall contain at least a 50 mm topsoil layer and the roots shall be minimally disturbed. They shall be obtained either from the near vicinity of the site from an area selected by the Project Manager or ECO, or from areas of the proposed development site that are earmarked for development. The soil shall be compatible with that removed from the area to be re-vegetated and shall not have been compacted by heavy machinery.
- Indigenous seeds may be harvested for purposes of re-vegetation in areas that are free of alien invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites;
- The stockpiled vegetation from the clearing operations should be reduced to mulch;
- Indigenous plant material must be kept separate from alien material. The indigenous vegetative material shall be reduced by either mechanically means (chipper) or by hand- axing to sticks no longer than 100 mm. The chipped material should be mixed with the topsoil at a ratio not exceeding 1:1;
- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants;
- No harvesting of vegetation may be done outside the area to be disturbed by construction activities;
- Mulches shall be collected in such a manner as to restrict the loss of seed;
- Brush-cut mulch shall be stored for as short a period as possible, and seed released from stockpiles shall be collected for use in the rehabilitation process.
- Re-vegetated areas should be monitored every 3 months for the first 12 months and every 6 months thereafter;
- Re-vegetated areas showing inadequate surface coverage (less than 30% within 9 months after re-vegetation) should be intensely managed to improve scratcher-vegetation;
- All seeded, planted or sodded grass areas and all shrubs or trees planted are to be irrigated at regular intervals;
- Where herbicides are used to clear vegetation, species-specific chemicals should be applied to individual plants only. General spraying should be strictly prohibited;
- All horticultural activities should meet the following requirements:
 - o Activities must be limited to the building environs and certain landscaped areas;
 - o fertiliser, pesticide and herbicide use should be strictly controlled;
- Invertebrate pests should be controlled using the least environmentally damaging insecticides. Pyrethroids and Phenylpyrazoles are preferable to Acetylcholines. Insecticides that are specific to the pest (species specific) should be favoured. The lowest effective dosages must be applied. Supplier's advice should be sought. Fungal pathogens should be used in preference to chemical insecticides; and no dumping of any materials in undeveloped open areas and buffer strips (biological corridors) should be permitted. Activities in the surrounding open undeveloped areas must be strictly regulated.

8.3.2 WEEDS AND ALIEN VEGETATION

- The Contractor will be responsible for controlling any alien invasive species. The Contractor shall ensure that all weeds and alien invasive species are removed.
- Alien management should be as per recommendation of the Alien Management Plan.
- Ongoing monitoring must be undertaken for erosion and establishment of alien invasive plant species.
- If during the establishment period, non-indigenous weeds or other non-indigenous plants are present in the planted areas, such vegetation shall be removed by hand
- The areas where alien vegetation must be removed:
 - Areas within the demarcated wider development footprint
 - If alien vegetation is currently used by people such as farm workers etc. for fire wood, then the vegetation may be left for this purpose.

8.3.3 SOIL STABILISATION & STOCKPILING

As several of the routes and access roads required for the construction of the power lines traverse steep slopes, exposed regions will remain vulnerable to erosion for the entire lifespan of the proposed development. As such, the following mechanisms and mitigation measures are to be employed for the construction and operation phases, in order to minimise this concern.

Control Structures:

The use of fibre rolls should be investigated for linear erosion control on each side of the access roads specifically, as this has been identified as one area where significant erosion may occur. Fibre rolls are composed of hessian bag material, straw or other suitable natural fibre material formed and compressed into a tubular shape. These structures, when placed into small dug depressions of 5cm deep and staked down with wooden stakes or dowel sticks, may allow for erosion control in regions of moderate rainfall. These materials are relatively inert, low cost, moderately biodegradable and allow water to pass through, while silt is held back. Placing these structured in short succession (2-5m apart) in very steep areas may assist in reducing the runoff and erosion experienced during rainfall events. An alternative to fibre rolls by the use of short (25cm tall), geotextile silt-fences, staked every three metres, placed on each side along access roads, for the length of the roads. These nets will capture windblown and waterborne soil up to knee height, and reduce wind and water erosion.

Monitoring:

As a basis for monitoring, it is essential to ensure that the erosion and sediment control measures are properly installed, well maintained and functioning as intended on a daily basis. A timely response by the contractor to any noted deficiencies is highly important to prevent, minimise and control erosion, as well as demonstrating due diligence in compliance with regulatory requirements. A regular inspection program should be planned and implemented to determine when erosion control measures need maintenance and/or repair. Documentation of all inspections should be kept on site throughout the construction phase and at a minimum up to one year after the operation phase commences. To monitor, the ECO shall:

- Identify personnel: Names and contact information of project members assigned to each task.
- A communication protocol should also be developed to ensure effective reporting and compliance.
- Obtain construction drawings detailing the erosion and sediment controls installed, which must be updated through the construction period, and once at the commencement of the operational phase.
- High risk areas (such as areas with greatest gradient) should be identified on these drawings and routinely evaluated.
- Conduct visual inspections of the erosion control mechanisms, to indicate regions where measures any have failed and are in need of repair, or where installation was unsatisfactory and requires redoing.
- Should a large storm event be anticipated, monitoring should commence as soon as possible and damage repaired prior to the event, if possible.

- All damaged erosion control measures should be repaired and/or replacement within 48 hours of the inspection.

Monitoring frequency shall be:

- On a weekly basis;
- After every rainfall event;
- Daily during extended rainfall periods.

Mitigation measures:

- Soil stockpiles during the construction phase should be placed in such a manner that natural drainage pattern is not disrupted (i.e. no stockpiles should be located in or adjacent to any seepage or drainage areas);
- Topsoil stockpiles older than six months should be enriched prior to use in rehabilitation activities to ensure the effectiveness of the topsoil;
- No imported soil material should be used on the property, unless it can be ensured that it is free of exotic and alien vegetation seeds;
- Where necessary, appropriate dust suppression techniques should be employed, such as regular watering of exposed areas and stockpiles;
- It is recommended that exposed areas of soil be stabilised as soon as possible, either through appropriate surfacing (e.g. roads) or through landscaping (e.g. servitudes, etc.); and
- It is recommended that topsoil be stockpiled separately to subsoil for use as the final soil layer during rehabilitation.
- The natural topography of the site should, as far as possible, be maintained during and after construction (i.e. indiscriminate levelling or elevating of the site should be avoided);
- Where any additional slope elevation has occurred this must be levelled and contoured to reduce the slope as well as erosion potential while un-vegetated.
- In the case of surface wash-away or wind erosion, the Contractor shall implement remedial measures as soon as possible in order to prevent further erosion;
- Appropriate erosion control/ soil stabilisation measures are to be implemented;
- During construction the Contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas.
- Any runnels or erosion channels developed during the construction period or during the vegetation establishment period shall be backfilled and compacted by the Contractor, and the areas restored to a proper condition;
- Installing silt fences wherever surface runoff is likely to occur;
- Additional stabilisation of cleared areas to prevent and control erosion must be actively managed. The method of stabilisation should be determined in consultation with the ECO and Project Manager. The following methods (or a combination) may be considered, depending on the specific conditions of the site:
 - Brushcut packing
 - Mulch or chip cover
 - Straw stabilising (at the rate of one bale/m² and rotated into the top 100mm of the completed earthworks)
 - Watering
 - Planting / sodding
 - Hand seeding
 - Hydroseeding
 - Soil binders and anti-erosion compounds
 - Mechanical cover or packing structures:
 - Geofabric

- Hessian cover
 - Armourflex
 - Log / pole fencing
 - Retaining walls
- Traffic and movement over stabilised areas is to be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the ECO; Anti-erosion compounds, consisting of an organic or inorganic material, may be employed to bind soil particles together. Products used must be proven able to suppress dust and erosion; and
 - Areas to be landscaped that have been compacted to the development activity must be ripped and seeded.
 - Wind screening and stormwater control should be undertaken to prevent soil loss from the site.
 - All erosion control mechanisms need to be regularly maintained.
 - Retention of vegetation where possible to avoid soil erosion
 - Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.
 - Re-vegetation of disturbed surfaces should occur immediately after the construction activities are completed.
 - No impediment to the natural water flow other than approved erosion control works is permitted.

8.3.4 MONITORING

A monitoring programme shall be put in place not only to ensure compliance with the approved site EMPr throughout the construction phase, but also to monitor any environmental issues and impacts which require attention over the vegetation establishment phase, post construction.

An ECO must be appointed to ensure compliance with the EMPr and to carry out monitoring activities, which may be required on an annual or biannual basis for the lifespan of the wind farm.

8.4 STORM WATER MANAGEMENT PLAN

8.4.1 INTRODUCTION

Storm water includes any surface run-off and flows resulting from precipitation, drainage or other sources. A Storm Water Management Plan (SWMP) is implemented during the construction and operation of a facility and it ensures compliance with applicable regulations and prevent off site migration of contaminated storm water or increased soil erosion. This chapter provides a conceptual SWMP with measures to manage stormwater flow that will be adopted during the construction and operation of the Brandvalley wind farm. This plan will be built into the detailed engineering design SWMP to be developed to include the construction of design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. In addition, drainage measures will be designed to promote the dissipation of storm water run-off and appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.

The plan will ensure that the storm water is channeled in a controlled manner from the existing and new infrastructure such as roads, turbine platforms and the electrical substation towards the natural drainage lines, to avoid water logging, pollution or erosion.

The SWMP should consist of the following:

- Adoption of gravel roads and not asphalt roads in order to guarantee natural drainage through the gravel.
- Adoption of proper drainages along the gravel roads of the steepest portions of the wind farm in order to channel storm water away, as shown in the following typical drainage works.

- Design an appropriate site preparation of the substation area with adequate slopes and side water outlets to disperse storm water which can runoff from the asphalt paved areas.
- Adopt a storm water abatement system in the area of the electrical substation, where the storm water may get in contact with debris or oil traces. This is done as an environmental precaution, as the risk of storm water pollution is negligible. The transformer is in fact equipped with double seal oil containment and the paved surface which can be driven by vehicles will be kept to minimum. Depending on Eskom's standard design protocol, the storm water drained from the substation could be collected in a decantation basin and is the purified by possible traces of oil prior to being reintroduced into the environment.
- Suitable drainage should be ensured along the crane pads and specifically the construction camp (associated with an existing furrow connected to natural watercourses), in order to ensure that water does not pond or drain in a concentrated manner into the nearby watercourses. This must be considered as part of the stormwater management plan and be overseen by a freshwater ecologist.

The engineering of the drainage works will be done during the project planning phase as described in Chapter 7.1. This conceptual SWMP must be read in conjunction stormwater and erosion management measures included in Chapter 7, as well as the erosion management plan outlined in Section 8.5 below. Precaution measures will be adopted during the detailed layout definition in order to avoid soil erosion, these may include, *inter alia*:

- Avoid alteration of the existing natural drainage lines during construction phase as far as feasibly possible, by adopting a buffer from both sides of each natural drainage line in order to avoid construction works close to the drainages.
- Use of existing crossings for cables lay down.
- Construction of temporary berms and drainage channels to divert surface water.
- Correct engineering design and construction of gravel roads and water crossings.
- Removal of vegetation only essential for construction and prevent disturbance to the adjoining natural vegetation cover.
- Placement of energy dissipation structures to control water flow prior to being released to the natural environment, consequently minimising the erosion potential.

8.4.2 MANAGEMENT REQUIREMENTS

Management of the stormwater infrastructure include, but not limited to:

- Stormwater runoff from the road crossings should be monitored (by the Operation and Maintenance (O&M) Manager) during operations, to ensure it does not result in erosion of the watercourses. Stormwater should be allowed to diffusely spread across the landscape, by ensuring adequate surface roughness in the watercourse (through vegetation and rocky areas). This can include routine surveys of the infrastructure in order to ensure structural integrity.
- Maintenance of stormwater system, including drainage structures along roads within the project area.

Typically, storm water run-off contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. (Table 8-3). In order to reduce the need for storm water treatment, the following should be applied:

- Storm water should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge.
- Surface run-off from process areas or potential sources of contamination should be prevented.
- Where this approach is not practical, run-off from process and storage areas should be segregated from potentially less contaminated run-off.
- Run-off from areas without potential sources of contamination should be minimised (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds).
- Oil-water separators and grease traps should be installed and maintained as appropriate at refuelling facilities, workshops, parking areas, fuel storage and containment areas.
- Sludge from drains or treatment systems may contain elevated levels of pollutants and should be disposed of in compliance with local regulatory requirements

Table 8-3: Major sources of common storm water pollutants

COMMON CONSTITUENTS	MAJOR SOURCES RELATED TO URBAN LAND USE
Sediment and Particulates	Construction, winter road sanding, vehicle emissions, pavement wear
Hydrocarbons (PAH's)	Spills, leaks, dumping, vehicle emissions, asphalt breakdown, wood preservatives
Pathogens (Bacteria, Viruses)	Illicit connection of septic systems to storm sewers, poor housekeeping (animal faeces, bird faeces from rooftops)
Nutrients (N, P)	Illicit connection of septic systems to storm sewers, detergents (car washing), lawn fertilizers
Cadmium	Tire wear, insecticides, wood preservatives
Zinc	Galvanized building materials, tire wear, motor oil, grease
Lead	Motor oil, lubricants, batteries, bearing wear, paint, vehicle exhaust
Copper	Wear of moving engine parts, metal plating, fungicides and insecticides
Copper	Wear of moving engine parts, metal plating, fungicides and insecticides
Nickel	Vehicle exhaust, lubricants, metal plating, wear of moving parts
Chromium	Metal plating, wear of moving parts
Iron	Steel structures, rusting automobile bodies
PCBs	Leaks from electrical transformers, spraying of highway right of ways, catalyst in tire construction

8.4.3 DESIGN SPECIFICATION FOR STORM WATER MANAGEMENT

Storm water will naturally drain through the gravel access roads. In addition, in the steepest areas roads should be equipped with side drainages and culverts in order to channel the storm water in a controlled manner to the nearest natural drainage line. The outlets and the culverts should be planned and designed in such a way that water will not gather velocity and cause erosion.

Considering the locations of the turbines and the limited dimension of the foundation footprint, foundations will not require permanent drainages as such only temporary drainage works allowing water runoff during construction will be required. Typical examples of the side outlets and of the drainage works (culverts) are provided in **Figure 8-1** and **Figure 8-2** below.

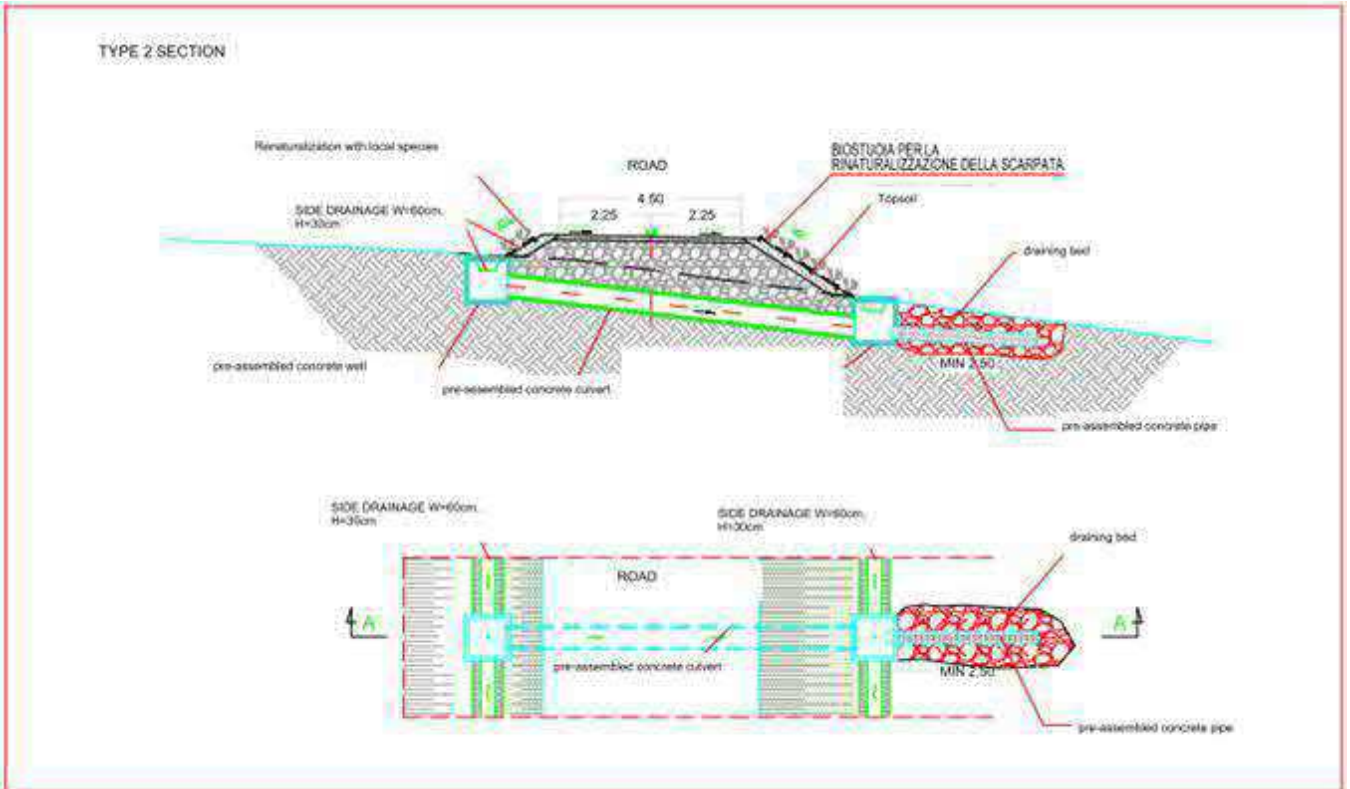
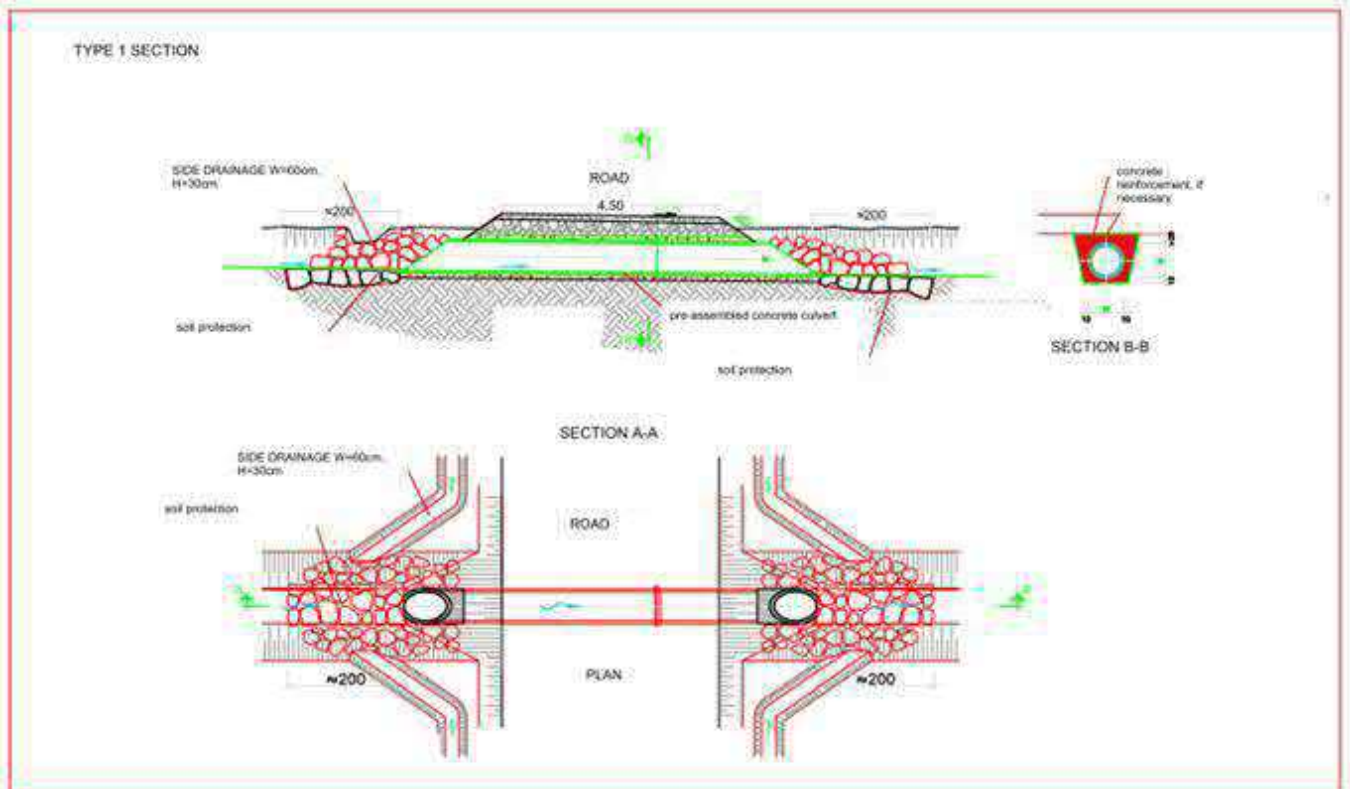


Figure 8-1: Typical drainage works for gravel road

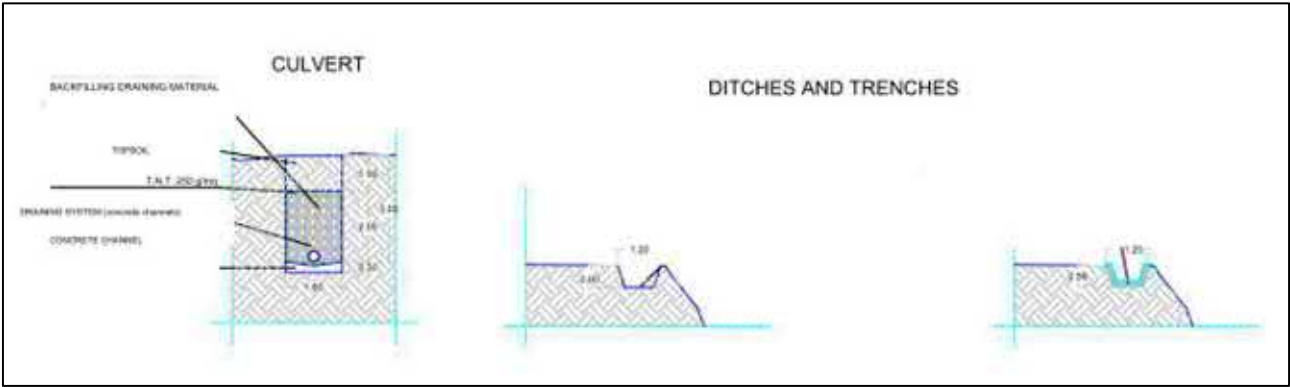


Figure 8-2: Typical culverts and trenches conveying the storm water to the drainage

An appropriate site preparation of the substation area with adequate slopes and side water outlets to disperse storm water will be designed, as per **Figure 8-3**. The storm water abatement system will be provided, consisting in:

- A drainage sump where the water is collected by gravity and receives a first separation
- A separation pit where the water is separated from oil and debris through decantation and separation
- Final filter before discharge into the nearest natural drainage line.

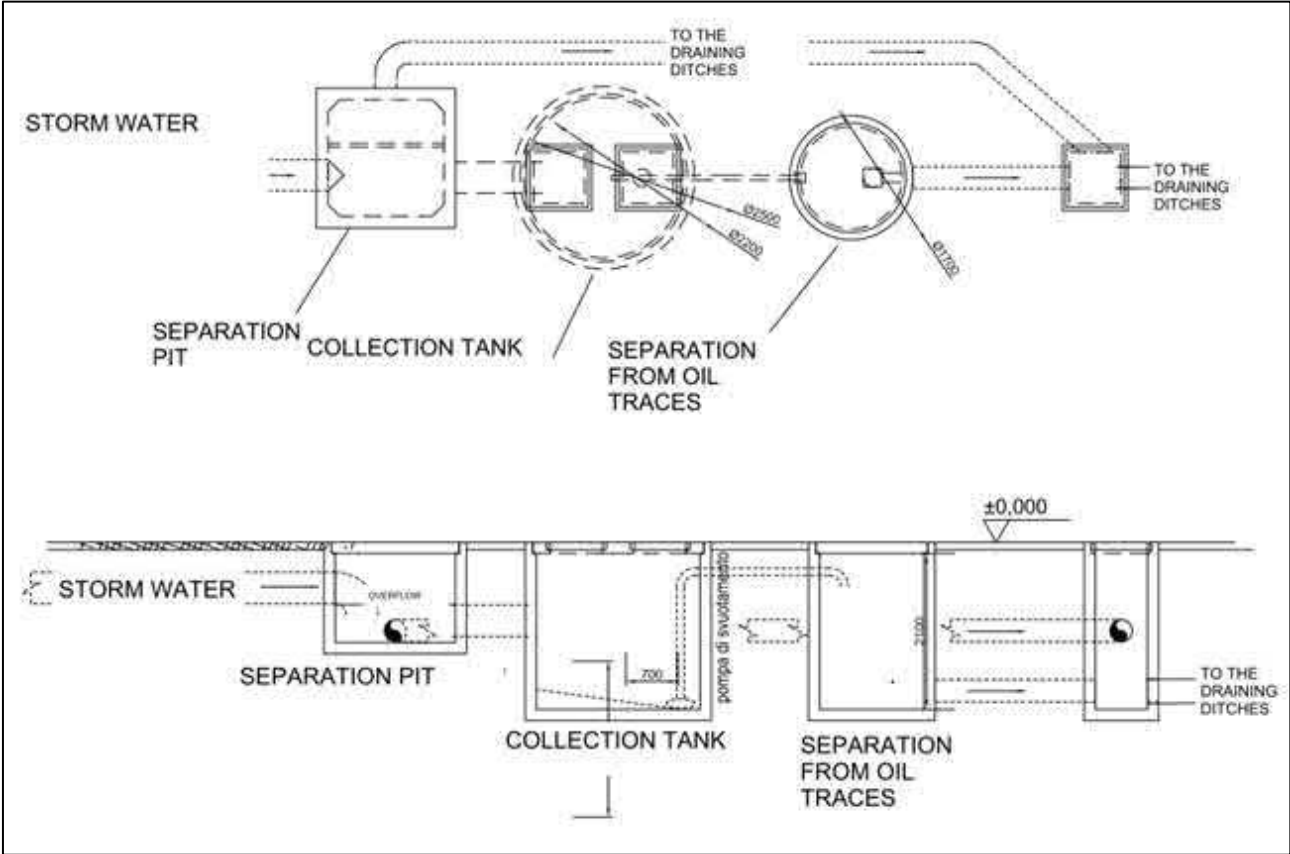


Figure 8-3: Contaminated storm water abatement system

The oil-filled electrical transformer will be equipped by an oil containment basin (normally a concrete basin) so that, in case of a spill, the oil remains contained within the spill containment area without contamination of the ground. This completely eliminates the likelihood of storm water contamination from hydrocarbon spills from electrical transformers.

8.5 EROSION MANAGEMENT PLAN

8.5.1 PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. The Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

- A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and is likely to be accelerated by construction-related activities;
- An outline of general methods to monitor, manage and rehabilitate erosion prone areas, ensuring that all erosion resulting from all phases of the development is addressed.

This erosion management plan and the revegetation and rehabilitation plan are closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

8.5.2 EROSION AND SEDIMENT CONTROL PRINCIPLES

The goal of erosion control during and after construction within the study area should be to:

- Protect the land surface from erosion;
- Intercept and safely direct run-off water from undisturbed upslope areas through the study area without allowing it to cause erosion within the site or become contaminated with sediment;
- Progressively re-vegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

8.5.3 GENERAL EROSION CONTROL

The Contractor should take all reasonable measures to prevent soil erosion resulting from the construction activities as well as to prevent the restriction or increase in the flow of storm water caused by the presence of temporary / permanent works. Erosion prevention measures must be implemented to the satisfaction of the Engineer and the ECO. Areas affected by construction related activities must be monitored regularly for evidence of erosion. Areas particularly susceptible to erosion include areas stripped of topsoil and soil stockpiles and steep slopes (gradients > 6 %). Where evidence of erosion appears, the construction of contour berms, cut-off drains or planting of grass sods may be necessary. Where soil erosion does occur, the Contractor shall reinstate such areas and areas damaged by the erosion, at his own cost and to the satisfaction of the Engineer and ECO.

8.5.4 PREVENTATIVE MEASURES

- The Contractor is to provide a method statement on erosion control showing clearly how cleared surfaces and stormwater will be managed on site during construction and rehabilitation;
- A monitoring plan for the development and the immediate zone of influence should be implemented to prevent erosion and incision;
- Sheet runoff from access roads should be slowed down by the strategic placement of berms;
- As far as possible, all construction activities should occur in the low flow season, during the drier summer months;
- Wind screening and stormwater control will be undertaken to prevent soil loss from the study site;
- All erosion control mechanisms will be regularly maintained;
- Re-vegetation of disturbed surfaces will occur immediately after the construction activities are completed;

- In the case of existing surface wash-away and wind erosion, the Contractor shall implement remedial measures as soon as possible in order to prevent further erosion;
 - During construction, the Contractor shall protect areas susceptible to erosion by installing necessary temporary and permanent drainage works as soon as possible and by taking other measures necessary to prevent the surface water from being concentrated in streams and from scouring the slopes, banks or other areas
 - Traffic and movement over stabilised areas is to be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the ECO.
-

8.5.5 EROSION AND SEDIMENT CONTROL MEASURES

- Re-vegetate areas that have been disturbed as soon as possible;
 - Cut and fill slopes must be made stable and be re-vegetated as soon as possible during the construction phase;
 - Newly formed terraces within the facility must be vegetated in order to stabilise the soil;
 - Where erosion and/or sedimentation, whether on or off the site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the ECO;
 - Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the ECO and at the expense of the Contractor;
 - If the Site is closed for a period exceeding 5 days, the Contractor, in consultation with the ECO, shall carry out the following checklist procedure:
 - Excavated and filled slopes and stockpiles are at a stable angle and capable of accommodating normal expected water flows;
 - Re-vegetated areas have a watering schedule and the supply to such areas is secured.
-

8.6 HAZARDOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM

The special mitigation measures pertaining to the hazardous substance bunding and monitoring have been included in the construction and operation measures, contained in Chapter 7 of this report. However, in general, the contractor shall be responsible for the implementation of hazardous substance management measures, as detailed below. The Project Manager shall ensure effective and accurate implementation of hazardous substance management, the ECO shall ensure compliance monitoring with below specifications and reporting thereon. The timeframe shall be the duration of the construction phase.

8.6.1 TRAINING

Ensure that all personnel that use or handle hazardous material are trained prior to use and/or exposure:

- In the use and potential dangers of the materials.
 - To understand what a Materials Safety Data Sheet (MSDS) is, and be able to interpret the information thereon.
 - On emergency response procedures required to counter the nature and hazards of an accidental release.
 - The handling and storage practices, for all containers with which they will come into contact.
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8.6.2 MATERIAL TYPES

- Use materials with low life cycle impact.
- Use materials with low embodied energy (i.e. materials that require less total energy to extract, manufacture, transport, construct, maintain and dispose of).

- Reduce materials containing volatile organic compounds and formaldehyde.
 - Avoid xylene and toluene solvents in paints, glues and carpets as well as polyurethane.
 - Where possible use water based paint.
 - Do not use chlorofluorocarbons (CFCs), polychlorinated biphenyl (PCBs), persistent organic pollutants (POPs) (in pesticides), ozone depleting substances (ODSs) and materials containing asbestos.
-

8.6.3 CONTROL PLANNING FOR HAZARDOUS MATERIALS ON SITE

- Document the types and quantities of hazardous materials present on the proposed project site, including the following information:
 - Name and description (e.g. composition of a mixture) of the hazardous material.
 - Classification (e.g. code, class or division) of the hazardous material.
 - Regulatory reporting threshold quantity of the hazardous material.
 - Quantity of hazardous material used per month.
 - Characteristic(s) that make(s) the hazardous material hazardous (e.g. flammability, toxicity, etc.).
 - Analysis of potential spill and release scenarios using available industry statistics on spills and accidents where available.
 - Analysis of the potential for uncontrolled reactions such as fire and explosions.
 - Analysis of potential consequences based on the physical geographical characteristics of the site, including aspects such as its distance to settlements, water resources, and other environmentally sensitive areas.
 - Identify locations of hazardous materials and associated activities on an emergency plan site map.
 - Detail the availability of specific personal protective equipment and training needed to respond to an emergency.
 - Detail availability of spill response equipment sufficient to handle at least initial stages of a spill and a list of external resources for equipment and personnel, if necessary, to supplement internal resources
-

8.6.4 UNCONTROLLED RELEASES

- Prevent uncontrolled releases of hazardous material to the environment or uncontrolled reactions that might result in fire or explosion using engineering controls (containment, automatic alarms, and shut-off systems) commensurate with the nature of the hazard.
- Implement management controls (procedures, inspections, communications, training, and drills) to address residual risks that have not been prevented and controlled through engineering measures.
- Store all hazardous (reactive, flammable, corrosive and toxic) materials in clearly identified, fit-for-purpose containers or vessels.
- Clean any accidental spills immediately, and treat the spilled material and use cleaning products as hazardous waste.
- Describe response activities in the event of a spill, release, or other chemical emergency in an incident report that must include, inter alia:
 - Internal and external notification procedures.
 - Specific responsibilities of individuals or groups.
 - Decision process for assessing severity of the release, and determining appropriate actions.
 - Facility evacuation routes.
 - Post-event activities such as clean-up and disposal, incident investigation, employee re-entry, and restoration of spill response equipment.

8.6.5 REACTION, FIRE AND EXPLOSION PREVENTION

Reactive, flammable, and explosive materials must be managed to avoid uncontrolled reactions or conditions resulting in fire or explosion. Such prevention practices include:

- Storage of incompatible materials (acids, bases, flammables, oxidizers, reactive chemicals) in separate areas, and with containment facilities separating material storage areas.
- Provision of material-specific storage for extremely hazardous or reactive materials.
- Use of flame arresting devices on vents from flammable storage containers.
- Storage of hazardous materials in an area of the facility separated from the main construction activities.

8.6.6 PLANNING COORDINATION

Procedures should be prepared for:

- Informing the public and emergency response agencies.
- Documenting first aid and emergency medical treatment.
- Taking emergency response actions.
- Reviewing and updating the emergency response plan to reflect changes and ensuring that the employees are informed of such changes.
- Using, inspecting, resting and maintaining the emergency response equipment.

8.6.7 STORAGE OF HAZARDOUS MATERIALS

- Locate chemicals stored in drums in areas with a secondary containment capacity of at least 25% of the maximum stored quantity of chemicals.
- Drum stack heights must not exceed two drum heights on pallets. All defective pallets must be replaced immediately. A minimum space of 80 cm must be left open between stacks and 100cm between stacks and a wall.
- Chemical products must be secured when not needed to prevent tampering and vandalism.
- Provide warning notices, fire-fighting facilities and protection from weather damage.
- Keep products in their original containers unless they are not re-sealable, with all stored products and containers being labelled, and original labels and MSDS retained.
- Store acetylene, propane, and oxygen cylinders in dedicated areas where they will be protected from collision or ignition sources.
- Label containers so that the hazard nature of the material is clear.
- Ensure compliance with all national, regional and local legislation with regard to the storage, transport and use of hydrocarbons, chemicals, solvents, explosives and any other harmful and hazardous substances and materials.
- The Contractor must provide proof to the Project Manager that, if required, the relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials must be clearly displayed on the storage facility or containment structure.
- Petrochemicals, oils and identified hazardous substances must only be stored under controlled conditions. All hazardous materials (e.g. bitumen binders) must be stored in a secured, appointed area that is fenced and has restricted entry. Storage of bituminous products must only be in suitable containers approved by the Project Manager.
- Keep a record of all hazardous substances stored on site for submission to the ESCO and for verification to the ECO.
- Store all hazardous substances in secure, safe and weatherproof facilities, underlain by a bunded concrete slab to protect against soil and water pollution.

- Inspect all hazardous substances and equipment on a daily basis to ensure that spillages occur. This includes monitoring of construction vehicles and machinery and ensuring the availability of drip trays.
 - Any spillage hazardous material storage area must be attended to immediately. Spill kits must be easily available in this area and all relevant personnel trained on the spill clean-up. Any contaminated material must be disposed of at a designated waste facility.
-

8.6.8 HANDLING OF HAZARDOUS MATERIALS

- Ensure that personnel who handle hazardous substances have been educated and trained in terms of the correct handling, use and disposal thereof.
 - Empty containers in which hazardous substances were kept are to be treated as hazardous waste. Such containers must not be reused for any purpose.
 - Obtain Material Safety Data Sheets (MSDS) for all hazardous chemical formulations before use and all materials must be handled according to the instructions.
 - In response to and in addition to the information contained on the MSDS the following must also be determined:
 - What personal protective equipment (PPE) is required.
 - What emergency actions may be needed (i.e. first aid, firefighting media, etc.).
 - The weight of the container so that proper personnel and/or equipment will be utilised during handling.
 - Access and egress routes.
 - Containers holding flammable materials to be grounded during transfers of contents.
-

8.6.9 TRANSPORT OF HAZARDOUS MATERIALS

- Provide for controlled loading/unloading areas, underlain by an impervious paving or PVC sheet to protect against soil and water pollution.
 - All hazardous waste containers designated for off-site transport to be secured and labelled with the contents and associated hazards, be properly loaded and be accompanied by a shipping paper (i.e. manifest) describing the loads and its associated hazards.
 - Transporters of hazardous materials must ensure that:
 - The vehicle is suitable and registered for the purpose it is being used.
 - The vehicle displays clear markings in English indicating the nature of the materials being carried, what to do in the event of an emergency, and an emergency telephone number (24 hour) of a responsible person who can provide advice in the event of an emergency.
 - A minimum set of equipment necessary to attend to any spillage or leakage problems should be provided in the transporting vehicle and the transport team trained on how to use it.
-

8.6.10 FLAMMABLE LIQUIDS

- No combustible material (e.g. wood, rags, paper, carton boxes) are to be kept in the presence of flammable liquids.
- ‘No Open Flames’ and ‘No Smoking’ symbolic signs are to be displayed in the vicinity of the flammable liquid storage areas. Flammable liquids are to be issued only on a need-to-use basis and strict control is to be exercised to ensure that persons do not draw more than what is needed for the specific job.
- An adequate number and type of fire-fighting equipment is to be available in the close vicinity of the flammable liquid store.
- Flammable liquid stores are to be equipped with approved flameproof electrical equipment.
- Flammable liquid containers in the flammable liquid stores are to be clearly marked/labelled as to their contents. They are to be provided with earthed drip trays.

- Locations are to display MSDS information and handling/storage instructions. MSDSs are to be available for all flammable/hazardous products at the location where such substances are present.
- The number of 200 litre drums containing flammable liquids is to be kept to a minimum and the position is to be strictly controlled. The necessary signs should be visible at these storage areas.
- Flammable liquid tanks are to be properly earthed in order to prevent static electricity accumulating.
- Drainage points on flammable liquid tanks are to be provided with threaded caps or blanking plates.
- Bund walls are to surround storage tanks containing flammable liquids and these must be able to contain the entire volume of the contents plus 10% in case of spillage.
- Adequate precautions must be taken, such as wearing relevant protective equipment when handling substances.

8.7 FIRE MANAGEMENT PLAN

The Contractor shall take all the necessary precautions to ensure that fires are not started as a consequence of his activities on site. The Contractor, sub-contractors and all employees are expected to be conscious of fire risks. The Contractor shall hold fire prevention talks with staff to create an awareness of the risks of fire. Regular reminders to his staff on this issue are required.

8.7.1 FIRE PREVENTION

- A fire officer is to be appointed by the contractor;
- “No-smoking” signs to be placed in areas used for storage of oil and fuel;
- Basic firefighting equipment shall be readily available on site;
- Employees shall be made aware of the procedures in the event of a fire;
- Smoking shall only be permitted in designated smoking areas. Fire extinguishers will be available in these areas at all times;
- Prevention of runaway fires by keeping vegetation short in working areas;
- Ensure that no fires are lit close to the natural bush or plantations;

8.7.2 FIRE CONTROL

- The Contractor shall take all the necessary precautions to ensure that fires are not started as a result of his activities on site. If any fires occur the Fire Department of the nearest municipality should be notified;
- All fires must be prohibited on site and only designated cooking areas will be allowed where fire-fighting equipment is available;
- Any fires that occur shall be reported to the ECO immediately who will then liaise with the local Fire Protection Agency;
- Fires and fire hazards need to be managed appropriately. Smoking should only be allowed in a designated area where a fire hydrant is available;
- The Contractor shall appoint a Fire Officer who shall be responsible for ensuring immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedures to be followed;
- The Contractor shall forward the name of the Fire Officer to the ECO for his approval within 7 days of being on site;
- The Contractor shall ensure that there is basic firefighting equipment available on site at all times. This shall include at least rubber beaters when working in urban open spaces and natural areas, and at least one fire extinguisher of the appropriate type when welding or other “hot” activities are undertaken;
- The Contractor shall be liable for any expenses incurred by any organisations called to assist with fighting fires that were started as a result of his activities or personnel, and for any cost relating to the rehabilitation of burnt areas, or consequential damages.

8.7.3 EMERGENCY PROCEDURES

- The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it;
- If any fires occur the Fire Department of the nearest municipality should be notified;
- Any fires that occur shall be reported to the ECO immediately who will liaise with the local Fire Protection Agency;
- The Contractor shall ensure that his employees are aware of the procedures to be followed in the event of a fire.
- Fire extinguishers to be serviced by an accredited service provider on an annual basis.

8.8 PROTECTION OF HYDROLOGICAL FEATURES AND SENSITIVE AREAS

The following measures will be used to protect hydrological features (streams, rivers, pans, wetlands, dams and catchment) and other environmentally sensitive areas from impacts associated with construction. These measures must be read in conjunction with those contained in Chapter 7 as they relate to surface water management.

8.8.1 WATER USE

- Water may not be sourced from the river for any purposes during the construction process.
- The Contractor shall not permit his employees to make use of any natural water sources for the purposes of swimming, personal washing and the washing of machinery or clothes.
- Where possible all wash water will be recycled for use, as wash water again or for dust suppression where applicable.

8.8.2 PROTECTION FROM DIRECT OR INDIRECT SPILLAGE OF POLLUTANTS

Streams, rivers, underground water and dams will be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, wash water, organic materials and bituminous products.

- Potential pollutants of any kind and in any form shall be kept, stored, and used in such a manner that any escape can be contained and that the water table and surface water is not endangered. Water containing such pollutants as chemicals, washing detergents, sewerage, fuels, paints and solvents and hydrocarbons shall be contained and discharged into an impermeable storage facility for removal from the site or for recycling; This particularly applies to runoff from fuel depots/workshops/truck washing areas;
- Wash down areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. The Contractor shall notify the ECO immediately of any pollution incidents on Site;
- As part of the Pollution Control Method Statement, the Contractor shall submit a plan to the ECO detailing how the contaminated water will be managed on site;
- No maintenance, including emergency maintenance, of plant can take place within 50m of any hydrological features;
- No toilets will be erected within 50m of any hydrological features;
- If the Site is closed for a period exceeding 5 days, the Contractor, in consultation with the ECO, shall carry out the following checklist procedure:
 - Hazardous fuel stores are secure;
 - Cement and materials stores are secure;
 - Toilets are empty and secured;
 - Refuse bins are empty and secured;

- Bunding is clean and treated with appropriate material that will absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage;
- Drip trays are empty & secure.

8.8.3 MEASURES TO PROTECT SURFACE WATER FEATURES FROM STORMWATER RUNOFF

There are various drainage lines and other watercourses within the proposed development area.

Although the project area receives low levels of rainfall per annum, the rain events can be short and intense. By increasing the hardened surfaces within the project area through gravel road construction and laydown areas, it could impact surface water features through increased runoff during these rainfall events.

Once the location of the hardstanding's are confirmed, the runoff can be determined. This will inform the specific storm water infrastructure to be used to manage runoff. The design of the road and crane pads should include measures to ensure that water runoff from gravel roads should are not directly channelled towards drainage lines by including measures to dissipate the runoff to reduce velocity and thereby risk of erosion. Ongoing monitoring of storm water control features shall be undertaken during the operational phase.

8.9 WASTE MANAGEMENT PLAN

The development of a Waste Management Plan (WMP) for the proposed Brandvalley WEF is required to promote sustainable waste management during the life cycle of the project. The objective of the plan is to ensure that effective methods are implemented with regards to storage, handling, transportation and disposal of waste generated as a result of the project.

The Project Manager shall ensure effective implementation of the WMP, in conjunction with the measures indicated in Chapter 7 of this EMPr, However, a detailed waste management method statement must be developed by the Contractor prior to commencement of construction.

8.9.1 WASTE HIERARCHY

A waste is any solid, liquid or contained gaseous material that is being discarded by, disposal, recycling, burning or incineration. Waste management options for a particular waste need to be considered according to the Waste Management Hierarchy (Figure 8-4) which reflects the relative sustainability of each of the options. One of the key principles underlying the waste management hierarchy is to ensure that waste is dealt with as high up the waste hierarchy as possible. Since all waste disposal options have some impact on the environment, the only way to avoid impact is not to produce waste in the first place, and waste reduction is therefore at the top of the hierarchy. Re-use, followed by recovery techniques (recycling, composting and generating energy from waste) follow, while disposal to landfill or by incineration (the worst options) are at the bottom of the hierarchy.

In deciding on the most appropriate disposal route, both environmental and economic costs and benefits need to be considered. This decision must be reached taking into account all the costs and impacts associated with waste disposal, including those associated with the movement of waste.

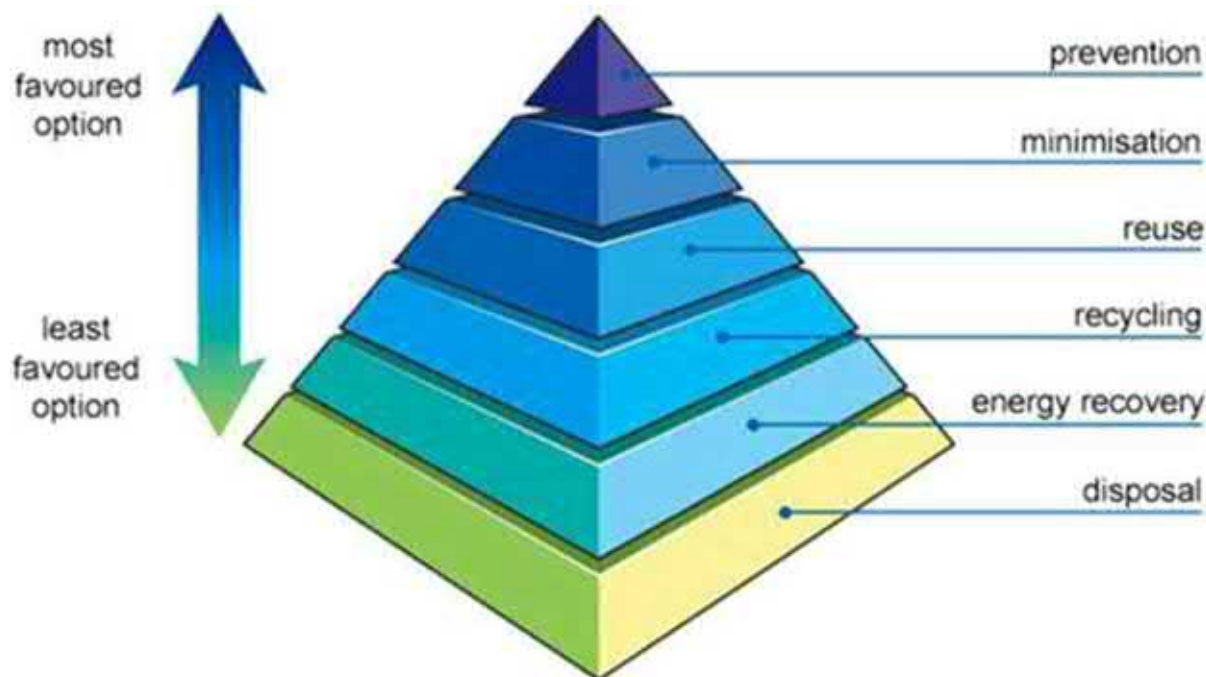


Figure 8-4: Waste Hierarchy

8.9.2 PROJECT STAGES

The purpose of this section is to assess the construction, operational processes of the proposed Brandvalley WEF in order to identify short comings, like raw materials procurement, infrastructure, employee training, health and safety, transportation, storage, compliance with legislative requirements, emergency preparedness and waste streams arising from an operation and its related activities, as well as the current waste management practices per waste stream. The assessment serves as the baseline against which any problem areas or gaps in waste management practises, process technology and environmental authorisations are identified and against which future performance objectives, activities and targets can be set.

The project stages are described below with the waste generation and management methods described in the corresponding tables below them including:

- Details on how waste will be managed during the construction and operational phases taking into consideration the waste management hierarchy;
- Details of the procedure for the separation of non-recyclable and recyclable waste;
- Details of the management of non-recyclable waste i.e. how waste will be stored on site during construction and operational phases, including the frequency for the removal of waste from the site and an indication of the landfill site where it will be disposed;
- Details for the management of recyclable waste e.g. the type of waste materials that will be recycled on site and the details pertaining to the offloading, sorting, handling, storage and collection procedures for the waste types (e.g. compaction and bailing, breaking of glass etc.); and
- The frequency for the removal of waste from the proposed development to where it will be finally managed must be included.

Waste Management at the project site will be undertaken in line with the EMPr to consider the correct disposal of general and hazardous waste generated on the project. Table 8-4 describes the different waste products that the proposed project will produce, as well as the various options to dispose of them. Waste will mainly be generated during the construction phase. During operation, contractors are only on the site for limited amount of time as and when maintenance is required.

Table 8-4: Waste Management Options

<u>WASTE</u>	<u>TYPE OF WASTE</u>	<u>MANAGEMENT OPTIONS</u>
<u>Hydrocarbons (Contaminated soil)</u>	<u>Hazardous</u>	<p><u>Fuel and oil spillages can be a source of contamination of water sources and the soil. Management options include:</u></p> <ul style="list-style-type: none"> – <u>Using spill kits to clean any spillages;</u> – <u>Ensure storage facilities are maintained and meet industry regulations;</u> – <u>Transportation and storage of fuel must be regulated and correctly managed according to the EMPr;</u> – <u>Waste generated along servitude to be taken to the contractor laydown area at the end of each day;</u> – <u>Co-ordinate waste removal with the removal of waste from the contractor laydown area; and</u> – <u>All hazardous waste is to be disposed of at a registered hazardous landfill (safe disposal certificates must be obtained).</u>
<u>Contaminated Personal Protective Equipment (PPE)</u>	<u>Hazardous</u>	<p><u>PPE can be contaminated during handling of hydrocarbons. Management options include:</u></p> <ul style="list-style-type: none"> – <u>Store contaminated PPE in hazardous waste skips along the servitude;</u> – <u>Waste generated along servitude to be taken to the contractor laydown area at the end of each day;</u> – <u>Co-ordinate waste removal with the removal of waste from the contractor laydown area ; and</u> – <u>Ensure contaminated PPE is disposed of at a registered hazardous landfill (safe disposal certificates must be obtained).</u>
<u>General waste</u>	<u>General</u>	<p><u>General waste (inorganic matter) can be disposed of as per normal and form part of the municipal waste management system. Management options include:</u></p> <ul style="list-style-type: none"> – <u>Ensure waste is stored securely in refuse bins;</u> – <u>Waste generated along servitude to be taken to the contractor laydown area at the end of each day; and</u> – <u>Co-ordinate waste removal with the general removal of waste from the contractor laydown area .</u>
<u>Food waste</u>	<u>General</u>	<p><u>Food waste is generated as site personnel take their meals on the construction site. Management options include:</u></p> <ul style="list-style-type: none"> – <u>Store any waste and packaging into a labelled food waste bin;</u> – <u>Waste generated along servitude to be taken to the contractor laydown area at the end of each day;</u> – <u>Co-ordinate waste removal with the removal of waste from the contractor laydown area; and</u> – <u>Co-ordinate waste removal with the general removal of waste.</u>

8.9.3 WASTE MANAGEMENT ROLES AND RESPONSIBILITIES

In order to facilitate effective waste management, the relevant authorities, roles and responsibilities shall be defined, documented and communicated within, and through implementation of, the WMP. Management shall provide resources essential to the implementation and control of the WMP, including human resources, technology, and financial resources.

The different role players in the waste management process include:

- Site manager;
- EO;
- Contractor during construction;
- Waste contractors; and
- Staff.

Table 8-5 provides an overview of the roles and responsibilities of individuals on site related to construction and operational activities.

Table 8-5: Roles and Responsibilities

<u>ROLE PLAYER</u>	<u>RESPONSIBILITIES</u>
<u>Developer Project Manager</u>	<ul style="list-style-type: none"> – <u>Implement WMP authorised by DFFE;</u> – <u>Review and authorise updates to the WMP;</u> – <u>Ensure resource allocation for implementation of the WMP requirements;</u> – <u>Ensure that WMP requirements are integrated into project plans, work method statements, tender and contract documents;</u> – <u>Ensure necessary support to the Internal EO for implementation of the WMP; and</u> – <u>Participate in incident investigations (as required).</u>
<u>Developer ECO</u>	<ul style="list-style-type: none"> – <u>Update the WMP where necessary;</u> – <u>Ensure that WMP requirements are implemented on the site during construction;</u> – <u>Ensure communication of WMP requirements to relevant contractor and sub-contractor personnel;</u> – <u>Facilitate environmental induction of all project staff and either deliver or coordinate delivery of all such training that would be required for the effective implementation of the WMP. This includes identifying additional project training requirements and implementing the training programme;</u> – <u>Ensure maintenance of site document control requirements;</u> – <u>Ensure that contractors use the appropriate disposal methods and facilities;</u> – <u>Maintain training records for all project personnel including contractors;</u> – <u>Maintain environmental incidents and complaints register for construction;</u> – <u>Report significant incidents internally and externally as required by law and the conditions of EA upon receipt;</u> – <u>Investigate incidents and recommend corrective and preventative actions;</u> – <u>Undertake environmental system reviews, site inspections, audits and other verification activities to assure that the WMP implementation is at an optimal level;</u> – <u>Participate in environmental performance verification activities to verify the level of compliance with the WMP in delivering the legal and environmental obligations;</u> – <u>Provide support and advice to the contractor and all sub-contractors in the implementation of WMP procedures and corrective actions; and</u> – <u>Ensure that contractors use the appropriate disposal methods and facilities.</u>
<u>Waste contractors</u>	<ul style="list-style-type: none"> – <u>Adhere to WMP requirements;</u> – <u>Ensure all waste contractors are appropriately certified as waste transporters;</u> – <u>Use the appropriate disposal methods and licensed facilities;</u> – <u>Provide the required waste manifests and safe disposal certificates; and</u> – <u>Ensure that personnel are appropriately trained in waste handling and transporting.</u>
<u>Contractor</u>	<ul style="list-style-type: none"> – <u>Attend WMP training; and</u> – <u>Follow WMP requirements including waste separation and recycling appropriately.</u>

8.9.4 TRAINING

Ensure that all personnel are provided training and awareness regarding waste management. The training should, as a minimum, include the following:

- The importance of hazardous waste minimisation, management and disposal;
- Prohibit the mixing of general waste with hazardous waste;
- Prohibit littering, and the significant environmental impacts, actual or potential, as a result of littering and improper storage and/or disposal of waste; and
- Cleaning of areas where hazardous waste spills have occurred and dispose of the hazardous material appropriately. Key personnel must be trained on handling spillages.

8.9.5 WASTE STORAGE

- The EO and Project Manager must ensure that all Contractors have a detailed waste management method for the storage and handling of all wastes specific to their activities.
- A dedicated waste management team must be appointed to ensure effective waste management on site.
- Designated waste areas must be established on site for the storage of all waste streams prior to be collected for disposal by the relevant waste contractors. This area must be suitable and pose potential for environmental contamination/pollution (located away from water resources).
- An adequate number of labelled or colour coded waste bins must be placed at the construction site areas during construction activities in order to minimise littering. The bins must be removed from the site on a regular basis for disposal at a registered or licensed disposal facility.
- Prohibit the mixing of general waste with hazardous waste. Should general waste be mixed with hazardous waste, it should be considered hazardous waste.
- Hazardous waste must be stored in covered waste receptacles located in bunded hard surfaced areas as per the requirements outlined in relevant legislation.
- Frequent monitoring and maintenance of septic tanks and portable toilets must be undertaken by the respective construction contractors and appointed contractor respectively.
- Waste recycling must be encouraged, and separate waste receptacles for recyclable material must be provided.
- Prohibit littering and burning of waste onsite.
- Storage of waste on site must be undertaken in line with applicable Regulations and best practice guidelines.

8.9.6 WASTE DISPOSAL

- All waste collection and disposal must be undertaken by a licenced/registered waste contractor, and information pertaining to the licensing of the contractor must be provided to the waste management team.
- The waste contractor must provide information on the recycling and disposal site, and issue applicable waste manifests for waste collection for disposal. All waste must be disposed of at a licenced facility.
- Retain records such as waybills and waste manifests associated with waste removal, transportation and disposal (safe disposal certificates).

8.10 OPEN SPACE MANAGEMENT PLAN

8.10.1 DEFINING OPEN SPACE

For the purposes of this Management Plan, Open Space areas include all areas impacted by construction activities including all approved buffers.

8.10.2 OBJECTIVES OF THE OPEN SPACE MANAGEMENT PLAN

The objective of the Open Space Management Plan is to minimise impacts to sensitive ecology located in areas deemed as Open Space and to promote rehabilitation within these areas. Ecology and habitats can be lost through the incorrect placement of infrastructure within these areas. Other impacts on Open Space resulting from development can be health and safety concerns relating to poor sanitation, environmental harm from poor waste management and the disturbance of fauna and flora including the loss of habitat and species of special concern. The management measures described below aim to mitigate these impacts and preserve the Open Space areas.

8.10.3 OPEN SPACE MANAGEMENT MEASURES

The following management measures will ensure the correct and sustainable management of Open Space areas relevant to the proposed project:

Ecological Open Space Management

- A search and rescue operation must be undertaken by a qualified botanist/ horticulturalist prior to commencement of construction. All Species of Conservation Concern (SCC) identified within the development footprints must be transplanted to a refuge area where possible.
- No collection of indigenous plants may be allowed on the property outside of those undertaken by the designated person(s).
- Employees should undergo environmental awareness training and be sensitized to the need to avoid disturbance to the indigenous vegetation outside the development footprints.
- All recommendations of the Alien Vegetation, Rehabilitation, Fire and Flora and Fauna Management Plans are applicable to Open Space Areas
- Routes should also be adjusted within their corridors to avoid areas of high sensitivity, as far as possible, as informed by a preconstruction walk-through survey.
- Minimise development footprint within the Very High sensitivity parts of the site.
- Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.
- Avoid impact to potential corridors such as the riparian corridors associated with the larger drainage lines within the facility area.
- 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.
- The applicant must consider reducing the development footprint to avoid or minimise the clearance of vegetation and habitat disturbance.
- Cleared vegetation must not be piled onto adjacent intact vegetation outside of the designated footprint, even for temporary storage.
- Rehabilitation guidelines for the development as a whole must prioritise the use of indigenous grass, tree and shrub species are to be used in the soil stabilisation landscaping of the development once construction is completed, if required.

Site Management

- The contractor shall establish all project infrastructure as per the agreed site layout plan in a manner that does not adversely affect the environment.

- The contractor shall submit a method statement for site clearance for approval by the ECO in consultation with the Project Manager and ESCO. Site establishment shall take place in an orderly manner and all required amenities shall be installed prior to the main workforce moving onto site
- The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.
- Safe drinking water for human consumption shall be available at convenient locations on site. All water used on site must be taken from a legal source and comply with the recognised standards for potable and other uses.
- The contractor shall provide adequate facilities for his staff so that they are not encouraged to supplement their comforts on site by accessing what can be taken from the natural surroundings.
- The contractor shall ensure that energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.
- The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at a municipal registered landfill. These bins must be equipped with animal proof lids to ensure the contents are not accessible to wild or domestic animals. A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement (i.e. how and where he intends to dispose of the waste) with regard to waste management. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt on site.
- ECO to assist in siting of structures and supervise any bush clearing for the construction camp. Construction camp should be fenced to avoid sprawl.
- Open space areas should be kept as contiguous blocks of vegetation as far as possible and no additional barriers (except for approved roads and fences) should be constructed that may impede faunal movement;
- All open space areas must be kept alien and weed free;
- Only indigenous species from a list approved by the Environmental Control Officer (ECO) may be used for any rehabilitation work in open space areas;
- No waste should be disposed of in open space areas, including but not restricted to cigarette butts and uneaten foodstuffs (i.e. fruit cores and peels) that may attract scavengers. It is recommended that receptacles be placed strategically to minimise this, especially during the construction phase.

8.11 HEALTH AND SAFETY PROGRAMME

This section provides measures for a conceptual health and safety to manage potential hazards associated with the site activities, and avoid and/or prevent accidents from the construction activities and operations on site. A detailed health and safety programme to be developed by the Contractors in consultation with the relevant safety, Health and Environmental (SHE) Officer/s. The programme will be developed prior to the commencement of construction works and must be fully conversant with all relevant environmental and health and safety legislation applicable to the project.

The following measures are suggested for consideration in the compilation of the health and safety programme/plan:

- The Contractor/s must develop a health and safety plan prior to commencement of construction, and this plan must adhere to the prescriptions of the relevant health and safety legislation and standards;
- The Contractor/s must familiarise himself and his employees with the contents of the plan;
- Contractors must comply with the relevant statutory requirements, including the Occupational Health and Safety Act (OHSAct), Act 85 of 1993;
- Potentially hazardous areas must be clearly demarcated on site;
- A comprehensive first aid kit must be available on site at all times;
- Appropriate Personal Protective Equipment (PPE) must be worn by construction personnel on site. This includes the wearing of safety helmets, safety boots, safety glasses, hearing protection, safety reflective jackets, dust masks etc;

- PPE signs must be erected on site at the areas where it is required, and personnel not wearing the appropriate PPE required in the relevant areas must not be allowed access to those areas;
- Adequate and mandatory safety precautions relating to all aspects of construction must be implemented by the Contractor/s on site. All personnel must be trained regarding basic site safety procedures;
- Safety measures must be communicated to all personnel on site;
- Regular maintenance of turbines and all other infrastructure must be undertaken to ensure optimal functioning and reducing the potential of hazards and safety issues. This includes regular inspections of all infrastructure associated with the turbines.

8.12 EMERGENCY RESPONSE PLAN

The Holder of the EA will provide appropriate resources to respond to process upset, accidental, and emergency situations for operations and activities during construction, operation and decommissioning phases. The procedures will include plans for addressing training, resources, responsibilities, communication and all other aspects required to effectively respond to emergencies associated with their respective hazards.

All operations/ activities associated with the project will require site-specific emergency response plans to mitigate impacts, which meet or exceed all applicable regulations.

The objectives of this plan are as follows:

- Protect the communities and the environment through the development of emergency response strategies and capabilities;
- Set out the framework for hazard identification to define procedures for response to the situations including the development of contingency measures;
- Structure a process for rapid and efficient response to and manage emergency situations during the construction, operational and decommissioning phases of the project; and
- Assign responsibilities for responding to emergency situations.

The Emergency Response Plan must take the incident procedures referred to in Section 30 of the NEMA into account.

8.12.1 ROLES AND RESPONSIBILITY

With respect to this plan, the Holder of the EA has the responsibility to:

- Provide emergency response services and to structure and coordinate emergency response procedures for the project;
- Ensure that specific emergency responsibilities allocated to them are organised and undertaken; and
- Ensure that employees and contractor third parties are trained and aware of all required emergency procedures.

8.12.2 EMERGENCY COMMUNICATIONS AND COORDINATION PLAN

In an emergency where there is an immediate threat to communities, personnel or the environment, the Project Manager will be notified immediately. The Project Manager will dispatch the Emergency Response Coordinator who will determine the appropriate plan of action depending on the severity of the emergency, the people affected, and the need to evacuate.

If there is a developing emergency or unusual situation, where an emergency is not imminent, but could occur if no action is taken, the Project Manager (or if the Project Manager is absent the Environmental Manager) is to be informed immediately. Once the emergency or unusual situation has been managed, the correct incident/near miss must be reported to the General Manager.

If an emergency poses a direct threat to communities in the area, the Environmental Officer and/or Social Officer will advise persons in the vicinity of the emergency to evacuate due to the potential risk. The appropriate

government authorities will immediately be notified of such an emergency evacuation. The Emergency Response Coordinator will be tasked with responding to the potential risk. Should the emergency be such that it can be managed by the Holder of the EA, equipment and personnel will be deployed to the maximum extent necessary, so as to prevent/minimise potential risks.

8.12.3 RESPONSE TO INCIDENTS

An incident is any occurrence that has caused, or has the potential to cause, an unexpected negative impact on people, the environment or property (or a combination thereof). It also includes any significant departure from standard operating procedures. The reporting and investigation of all potential and actual incidents that could have a detrimental impact on human health, the natural environment or property is required so that remedial and preventive steps can be taken to reduce the potential or actual impacts because of all such incidents.

Any incident must immediately be reported to the relevant authorities and all the necessary documentation must be completed and submitted to the relevant authorities within the prescribed timeframes.

The actions resulting from any formal or informal investigations will be used to update the EMPr.

8.12.4 VERIFICATION

An environmental emergency response system will be developed for the execution of emergency drills that will include the following, inter alia:

- Fire Drills;
- Emergency Evacuation Drills; and
- Medical and Environmental Drills.

Reporting and monitoring requirements for the plan will include:

- Monthly inspections and audits;
- Quarterly reporting of accidents/ incidents;
- Reporting at the time of the incident and monthly spill reporting developed by the Environmental and Quality, Health and Safety departments;
- Bi-annual emergency response drills; and
- Annual reporting on training.

Emergency response drills and reporting will be maintained by the Project Manager and will provide information regarding required revisions to training or the emergency response actions. Each incident reported will be reviewed and investigated upon occurring. Actions will be identified where possible to improve the site's overall response to emergencies. Updates/revisions that are necessary to protect worker or community health and safety will be implemented immediately after approval by the General Manager. On a bi-annual basis, Key Performance Indicators (KPIs) will be compared against past-performance and analysed for trends to determine if there are areas for improvement. Changes because of the trend analysis and identified areas for improvement will be implemented following the project's change management system as required.

This plan will be amended periodically considering operational changes, learning experienced during its implementation and other activities that can affect the risk profiles

8.13 CHANCE FIND PROVISIONS

The following procedural guidelines must be considered if previously unknown heritage resources are exposed or found during the construction of the Brandvalley WEF project area.

IDENTIFICATION AND EXPOSURE

Archaeological resources may be identified during construction or accidentally exposed. The initial procedure when such sites are found aim to avoid further damage. The following steps and reporting structure must be observed in all instances:

- 1 Stop all work in the area to avoid damaging the feature;
- 2 Do not further disturb any heritage resource that you may encounter;
- 3 The identifier must immediately inform his/her supervisor of the discovery;
- 4 The supervisor must ensure that the site is secured and control access;
- 5 The supervisor must then inform the relevant ESCO / ECO;
- 6 The ESCO / ECO shall contact the SAHRA and HWC and appoint an archaeological consultant to record the site and excavate if necessary; and
- 7 Work may only resume once clearance is given in writing by the archaeologist and SAHRA.

GRAVES AND MIDDENS:

If a grave or midden is uncovered on site, the following steps and reporting structure must be observed in all instances:

- 1 Stop all work in the area to avoid damaging the feature;
- 2 Do not further disturb any heritage resource that you may encounter;
- 3 The identifier must immediately inform his/her supervisor of the discovery;
- 4 The supervisor must ensure that the site is secured and control access;
- 5 The supervisor must then inform the relevant ESCO / ECO;
- 6 The ESCO / ECO must contact SAHRA, the National Monuments Council (NMC) and the South African Police Service (SAPS);
- 7 In the case of graves, arrangements shall be made for an undertaker to carry out exhumation and reburial in consultation with SAPS after a permit has been obtained from SAHRA to do so;
- 8 The undertaker will, together with the NMC, be responsible for attempts to contact family of the deceased and for the site where the exhumed remains can be re-interred; and
- 9 Work may only resume once clearance is given in writing by the NMC.

PALAEONTOLOGICAL SITES

- 1 Should any fossil remains, such as vertebrate bones, teeth or petrified wood, be found or exposed anywhere within the project area, the following steps and reporting structure must be observed in all instances:
- 2 Stop all work in the area to avoid damaging the feature;
- 3 Do not further disturb any heritage resource that you may encounter;
- 4 The identifier must immediately inform his/her supervisor of the discovery;
- 5 The supervisor must ensure that the site is secured and control access;
- 6 The supervisor must then inform the relevant ESCO / ECO;
- 7 The ESCO / ECO shall contact the SAHRA and HWC and appoint a palaeontological consultant to record the site and excavate if necessary; and
- 8 Work may only resume once clearance is given in writing by the palaeontologist and SAHRA/HWCA.

8.14 SECURITY POLICY

A generic high-level security policy has been compiled for the drafting of this EMPr. Should the project be developed further, a site-specific policy will be produced.

This procedure shall be applicable to all staff working within the Brandvalley WEF to comply with the relevant regulations and international standards.

Brandvalley's overarching objective is to protect the people and assets in a way that minimises conflict and respects the human rights of its diverse stakeholders, avoids creating or worsening conflict and address security threats in as peaceful a way as possible. Brandvalley have adapted the IFC Performance Standards and supporting World Bank Group Environmental, Health and Safety Guidelines as the overarching standards

associated with human rights, labour force management, vulnerable groups and stakeholder engagement to guide it towards achievement of appropriately high levels of environmental and social performance throughout the Project's life cycle.

A security company must be employed to guard the site and monitor access and must be registered with the Private Security Industry Regulatory Authority (PSIRA). The company should be utilised for the project life-cycle, alternatively different companies can be used for the construction, operations and decommissioning phases. The choice is at the discretion of the Holder of the EA.

The following guiding principles have been developed for site security:

- All access roads shall be gated to restrict access to the general public. Gates will be required to be kept locked when construction is occurring or when turbine maintenance is not occurring.
- The Contractor, prior to arriving on site, will assess any risks posed by its security arrangements to people within and outside the Project site.
- No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel).
- The Operations and Maintenance Building ("O&M building") shall be locked at all times when Project personnel are not inside.
- The security arrangements must take account of the principles of proportionality and good international practice in relation to hiring, rules of conduct, training, equipping, and monitoring of security;
- The contractor and Holder of the EA:
 - is required to make reasonable inquiries to ensure that those providing security are not implicated in past abuses; and
 - Ensure that the security company is adequately trained in the use of force and appropriate conduct, and they act within the applicable law.
- A grievance mechanism for affected communities shall be provided to express any concerns about security arrangements.

Brandvalley have adapted the United Nations Basic Principles on the use of Force and Firearms and Voluntary Principles on Security and Human Rights.

8.15 COVID-19

Due to the dynamic nature of the COVID-19 pandemic, associated regulations and best practice guidelines, Project Contractors shall be required to implement compliant COVID-19 management plans, which are to be revised as required to ensure ongoing compliance.

8.16 HIV/AIDS MANAGEMENT PLAN

Should the project be developed, an HIV/AIDS plan will be developed, however for input into this EMP, a generic and high-level management plan has been compiled.

8.16.1 OBJECTIVES OF THIS PLAN

The overall objectives of the HIV/AIDS management plan are:

- Create awareness around HIV/AIDS amongst onsite personnel;
- Mitigate and manage the spread of HIV/AIDS onsite; and
- Provide support for staff who have HIV/AIDS

8.16.2 GUIDING PRINCIPLES

- 1 **Non-discrimination:** The respect of human rights and dignity of persons infected or affected by HIV/ AIDS requires equality between individuals living with HIV/AIDS and those without. No employee will be discriminated against on the basis of his or her real or perceived HIV positive status. This includes access to training and promotion.
- 2 **Job Security:** Employees with HIV infection or AIDS will not be dismissed on the grounds of their status. Persons with AIDS-related illnesses should be able to work for as long as medically fit in available, appropriate work (reasonable accommodation).
- 3 **Confidentiality :** All persons with HIV or AIDS have the legal right to privacy. No employee or applicant for a job shall be required to disclose HIV-related personal information. Nor should co-workers be obliged to reveal such information about fellow workers. Company management and medical staff as well as union leaders and officials are bound by strict confidentiality about a person's status.
- 4 **Voluntary Counselling and Testing (VCT) :** No HIV/AIDS testing will be required for job applicants or for persons already in employment. Individuals are encouraged to know their HIV status through testing. Testing must be voluntary, confidential and with the informed and written consent of the person concerned. Professional pre- and post-testing counselling services must be available.
- 5 **Treatment and Care :** Workers infected with HIV and suffering from AIDS and their dependents are entitled to the same health services as those with other diseases. Treatment with antiretroviral drugs must be available when VCT is advocated. Dependents of workers who have died from AIDS or AIDS-related diseases must have access to the same care as those who have died from other diseases or industrial accidents.
- 6 **Gender Equality :** The gender dimensions of the epidemic are recognised by the social partners. Gender discrimination at the workplace is ruled out. Sexual harassment and the exploitation of dependency of women is an offence.
- 7 **Occupational Health and Safety :** The work environment must be healthy and safe. Tools which bear the danger of injuries such as cuts should not be shared between workers. In case of accidents which involve blood and body fluid emissions, first aid must be exercised with the use of protective barriers, such as gloves and masks, which prevent direct contact with blood or other body fluids.
- 8 **Prevention and Behaviour Change :** Employees with HIV and AIDS shall not be unfairly discriminated against in the allocation of employee benefits. With regard to sick leave, HIV and AIDS related illness will be treated no different from other chronic or life threatening conditions. Health and social security schemes run by the company shall give the same benefits to those with HIV and AIDS as to any other worker. The same applies to separation allowance, retirement schemes and pension benefits.
- 9 **Prevention and Behaviour Change :** HIV infection is preventable. The parties will promote prevention efforts at the workplace, within families and in the wider community. Because it is within the power of each individual to avoid HIV infection, it is expected that employees take responsibility of their own health. They are urged to avoid risky behaviour such as unprotected sexual intercourse and the injection of drugs through shared needles.

8.16.3 IMPLEMENTAION

The plan will be implemented onsite through the following:

- 1 This HIV/AIDS management plan shall be made known and explained to all employees through the distribution of the text as a brochure in the appropriate languages and through meetings.
- 2 The implementation of this plan includes information and education activities aimed at communicating correct information about HIV/AIDS and eradicating myths in order to eliminate stigma and discrimination.
- 3 Brandvalley will organise and if necessary and appropriate with the participation of health professionals, regular awareness and prevention programmes about HIV/AIDS during working time.
- 4 As condoms and femidoms are an effective barrier to sexually transmitted infections and HIV transmission, condoms and femidoms will be made available at no cost on the construction site.
- 5 Meetings, information and training activities should be included in an action programme with an implementation plan for a defined period of time. This should include material to be acquired or produced. The company should make provisions in its budgetary process to include the cost of activities and materials.
- 6 Disputes or grievances arising from the application of the principles of this policy and its implementation are dealt with by the HIV/AIDS Committee and/or in established dispute resolution or grievance procedures.

9 GRIEVANCE MECHANISM

9.1.1 GRIEVANCE MECHANISM - EXTERNAL

An external grievance mechanism is a tool used to address affected communities' concerns and complaints and is an important pillar of the stakeholder engagement process, since it creates opportunities for companies and communities to identify problems and discover solutions together. The Project proponent can benefit from understanding community concerns and complaints and addressing them through all stages of project development.

Where it is anticipated that a new project will involve ongoing risk and adverse impacts on surrounding communities, the project proponent is required to establish a grievance mechanism to receive and facilitate resolution of the affected communities' concerns and complaints about the proponent's environmental and social performance. The grievance mechanism should be scaled to risks and adverse impacts of the project, address concerns promptly, use an understandable and transparent process that is culturally appropriate and readily accessible to all segments of the affected communities, and do so at no cost to communities and without retribution. The mechanism should not impede access to judicial and administrative remedies.

The grievance mechanism described in this section includes both complaints and grievances (hereinafter referred to only as 'grievances') raised by stakeholders.

PURPOSE

The grievance mechanism describes the way the Proponent and community can work together to find solutions to grievances.

OBJECTIVES

The objectives of the grievance mechanism include:

- To be respectful of complainant culture, values, traditions and views;
- To resolve grievances at the local level and in a timely manner;
- To identify the root causes of grievances and address systemic issues;
- To provide a process that is dialogue based, with the complainant and the Proponent cooperating in the investigation, discussion, resolution and announcement of the grievance and result;
- To ensure fair, equitable and consistent outcomes to resolve grievances;
- To enhance and continuously improve the ability of the Proponent to fairly address community concerns.

SCOPE AND RESPONSIBLE PARTIES

A grievance mechanism is primarily for the community to raise relevant concerns about the Project / Proponent's activities and is to be implemented throughout the life cycle of the Project (i.e. throughout assessment, construction, and implementation phases).

WSP will only be involved in the stakeholder engagement and grievance management process for the assessment phase. The Project proponent and the Contractor will be responsible for implementation of the grievance mechanism throughout the construction phase. Once established, the Project infrastructure is to be handed over to Eskom for operation and maintenance, who will be responsible for managing grievances in line with their existing complaint handling process (not covered herein).

GRIEVANCE REDRESS PROCEDURE

This grievance mechanism sets out the following steps to be taken to resolve grievances during the assessment process:

1. **Register grievance**

- A grievance can be submitted in a written letter, e-mail, fax, or raised verbally in person or via telephone.
- Grievances raised during the assessment process are to be submitted to the EAP via the details provided as per the stakeholder engagement notifications. The EAP will notify the Proponent of the grievance.
- In the event that a complaint is raised verbally, the responsible person must obtain the approval of the complainant as to the documented complaint (by way of signature of the Receipt of Grievance Form). Should the complainant have literacy issues, the responsible person may request that a third party (friend / relative of complainant) is available to verify / approve the contents of the documented complaint to the satisfaction of the complainant.
- The submission should include the nature of the grievance, the date when it occurred and the name and contact details of the complainant.
- Grievances will be accepted anonymously or through a third party (e.g. unions, NGOs, local authorities, community representatives, etc.).
- Individuals have the right to request that their name be kept confidential throughout the grievance process.
- As men and women may communicate their grievances differently, and also have different types of grievances, the complainant may request that their grievance is processed by a female / male representative. In the event that such a request is made, the Proponent, as far as reasonably practicable, will accommodate this request.

2. **Within a Week (7 days) of receiving the grievance the Proponent will:**

- Enter the grievance into the Proponent's records that track grievances;
- Assess the grievance according to specific criteria and if necessary, develop an appropriate approach for the particular grievance;
- Provide a written acknowledgement of the grievance including the name of the responsible person to contact about progress, an explanation of the steps that will be taken to investigate, discuss and resolve the grievance, and an anticipated timetable for processing the grievance.

3. **Processing the Grievance:**

The responsible person will:

- Identify the parties involved;
- Clarify issues and concerns raised by the grievance through direct dialogue;
- Classify the grievance in terms of seriousness according to the gravity of the allegation, the potential impact on an individual's or a group's welfare and safety, or the public profile of the issue;
- Convene a staff group with expertise relative to the grievance;
- Determine the method for resolving the grievance – the most common approaches, not excluding others, will be:
 - i. The Proponent proposes a solution;
 - ii. The Proponent and aggrieved party decide together the solution;
 - iii. The Proponent and aggrieved party defer to a third party for mediation / arbitration.
- Gather views of other stakeholders, including those of the Proponent and if necessary, an agreed neutral technical opinion;
- Determine initial options that parties have considered and explore various approaches for settlement;
- Conduct the process as agreed;

- Close the grievances by signing the Complaint Close-Out Form (i.e. that the grievance has been resolved satisfactory to both parties).
- The Proponent may “close” the grievance even if the complainant is not satisfied with the outcome. This option can be pursued by the Proponent in the case that the complainant is unable to substantiate a grievance, or if there is an obvious speculative or fraudulent attempt. In such situations, the Proponent’s efforts to investigate the grievance and to arrive at a conclusion will be well documented and the complainant advised of the situation. The Proponent (or contractors working for the Proponent) will not dismiss grievances based on a cursory review and close them in their grievance record unless the complainant has been notified and had the opportunity to provide supplementary information / evidence;
- Keep a record that tracks the progress and communications for each grievance.

4. Processing Timeline

- The Proponent will aim to bring the grievance to a resolution within 30 days of receiving the grievance. The grievance shall be acknowledged within 7 days by the responsible person, and responded to within 30 days. If the matter takes longer than 30 days to resolve, the complainant will be informed through dialogue and in writing, of the reason for the delay, any advances or difficulties encountered and the anticipated new resolution date.

While the general principles for grievance redress during construction are as above, a project-specific external stakeholder grievance mechanism shall be implemented, and shall comply with the arrangements outlined in **Appendix P**.

9.1.2 GRIEVANCE MECHANISM - INTERNAL

The Proponent will establish a Grievance Mechanism that will set out the process for workers to communicate their grievances. The grievance mechanism will be available to workers of the Proponent, Contractors and subcontractors.

A Code of Conduct will set out practice measures that the construction workers will have to adhere to, to ensure a positive relationship is built and maintained with the landowners and local communities.

10 CONCLUSION

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets-out the environmental and social objectives and outcomes, which would be required to avoid or minimise the negative impacts and maximise the positive benefits of the Brandvalley Wind Farm Project as detailed in the 2016 EIR and specialist reports as well as the 2021 specialist walkdown input. The EMPr could thus change based on adaptive management, and if managed correctly, lead to a successful implementation of the project.

Further guidance should also be taken from any conditions contained in the EA, if the project is granted approval. These DFFE conditions must be incorporated into the final EMPr.

All attempts should be made to have this EMPr available, as part of any tender documentation, so that the engineers and contractors are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these.

11 REFERENCES

- Aronson J., Clewell A.F., Blignaut J.N. & Milton S.J. 2006: Ecological restoration: A new frontier for nature conservation and economics [online]. Available from [http://repository.up.ac.za/bitstream/handle/2263/5809/Aronson_Ecological\(2006\).pdf?sequence=1](http://repository.up.ac.za/bitstream/handle/2263/5809/Aronson_Ecological(2006).pdf?sequence=1) [Accessed 18.05.2016].
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- Sowler S. and Stoffberg S. 2012. South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments. Wildlife & Energy Programme of the Endangered Wildlife Trust. Todd S. 2011. Options for Invasive Grass Management in the Nieuwoudtville Wildflower Reserve [online]. Prepared for Indigo Development and Change. Available from <http://www.indigo-dc.org/documents/Options%20for%20Invasive%20Grasses.pdf> [Accessed 18.05.2016].

APPENDIX

A

CV OF EAP





ASHLEA STRONG, MEM, EAP

Principal Consultant (Environmental Services), Environment & Energy



Years with the firm

7

Years of experience

17

Professional qualifications

CEAPSA

Areas of expertise

Auditing

Energy

Environmental Control

Health & Safety

Infrastructure

Mining

SEIR

Training

Waste Management

CAREER SUMMARY

Ashlea is a Principal Consultant with 17 years' experience in the environmental field. Work has principally consisted of ESIA's and compliance auditing. Sectorial experience includes conventional and renewable power generation, power transmission and distribution as well as mining. Ashlea has project managed South African Renewable Energy Projects including two 150MW concentrated solar power (CSP) ESIA's, one 100MW CAPS ESIA, five 75MW PV ESIA's and three 140MW Wind Energy Facility ESIA's.

Ashlea has extensive experience with the power sector ESIA's having been involved in over 20 power sector related ESIA's for both government and private sector clients. Her projects include amongst others two coal-fired power stations, a pebble bed modular reactor, nine solar power facilities, three wind energy facilities, three gas turbine plants (both open and closed cycle) and numerous transmission (400kV and 765kV) and distribution (132kV) powerlines.

Ashlea holds a Masters in Environmental Management; a BTech (Nature Conservation), and a National Diploma (Nature Conservation); She is also a Registered Environmental Assessment Practitioner.

EDUCATION

Masters in Environmental Management, University of the Free State, South Africa	2006
B Tech, Nature Conservation, Technikon SA, South Africa	2001
National Diploma in Nature Conservation, Technikon SA, South Africa	1999

ADDITIONAL TRAINING

Conduct outcomes based assessment (NQF Level 5), South African Qualifications Authority (SAQA)	2009
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PROFESSIONAL MEMBERSHIPS

Registered Environmental Assessment Practitioner (Registration Number: 2019/1005)	2020
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PROFESSIONAL EXPERIENCE

Energy Sector

- Maralla East and West Wind Energy Facilities (2019). Compilation of two Part 2 Amendment Process for the changes in technical scope of the Wind Energy Facilities near Sutherland in the Northern and Western Cape, South Africa. Client: BioTherm Energies (Pty) Ltd.
- Ruigtevallei 132kV Powerline (2019): Project Manager. Compilation of a Part 2 Amendment Process for the deviation of the Ruigtevallei – Dreunberg 132 kV powerline near Gariiep in the Free State, South Africa. Client: Eskom Holdings SOC Limited.
- BioTherm Round 4 Lenders Technical Advisor (2018). Project Manager – Environmental. Environmental monitoring of the construction of the Konkoonsies II and Aggeneys Photovoltaic Solar Plants against the IFC Performance Standards. Client: Nedbank



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Principal Consultant (Environmental Services), Environment & Energy

- Nakonde and Mpika Wind Energy Projects (2018): Project Manager. This project involves the compilation of two Environmental Project Briefs for the establishment of meteorological masts at the Proposed Nakonde and Mpika Wind Project Sites in Zambia. Client: Globeleq
- Rietkloof Wind Energy Facility Project (2018): Project Director. Compilation of a Basic Assessment and Environmental Management Programme for a 140MW Wind Energy Facility, Matjiesfontein, Western Cape. Client: G7 Renewable Energies
- Mozambique – Zambia Interconnector Powerline (2018): Project Manager. This project involved the compilation of the Environmental and Social Impact Assessment and Environmental and Social Management Plan for a 300km 400kV powerline between Tete, in Mozambique, and Chipata, in Zambia. Client: Southern African Power Pool (SAPP).
- Ankerlig – Koeberg 132kV powerline walkdown (2017): Project Manager. This project involved the compilation of a Construction and Operation Environmental Management Plans for the Ankerlig – Koeberg 132kV powerline. Client: Eskom Holdings SOC Limited.
- Gwanda 100MW Solar Project (2018): Project Manager. This project involved the high-level review of the Environmental Impact Assessment for a 100MW Photovoltaic (PV) Solar Project near the town of Gwanda, Matebeleland South Province of Zimbabwe against relevant legislation and international standards. Client: WSP | Parsons Brinckerhoff
- Southern Energy Coal Fired Power Station (2016): Project Manager. This project involved the high-level review of the Environmental Impact Assessment for the Southern Energy Coal Fired Power Station near Hwange in Zimbabwe against relevant legislation and standards. Client: WSP | Parsons Brinckerhoff.
- Proposed Solar and Wind Projects located in the Northern and Western Cape Provinces (2015) Project Manager. This project involved the compilation of 15 Environmental Impact Assessments and Environmental Management Plans for 2 Solar and 2 Wind energy Projects near Aggenys and Sutherland respectively. Client: BioTherm Energy (Pty) Ltd.
- Proposed Solar Park, Northern Cape Province, South Africa (2012): Strategic Environmental Advisor. This project involved the provision of process expertise for the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Solar Park in the Northern Cape Province. Client: Central Energy Fund (CEF).
- Proposed Tabor - Nzhelele 400kV Transmission Lines and associated infrastructure, Limpopo Province, South Africa (2012): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 100km 400kV powerline between Louis Trichardt and Musina in the Limpopo Province. Client: Eskom Transmission.
- Retrofitting of the existing Electrostatic Precipitators with Fabric Filter Plants at Units 2, 3 and 4 at the Grootvlei Power Station, South Africa (2012): Project Manager. This project involved the compilation of a Basic Assessment Report and Environmental Management Plan for the proposed retrofitting of the existing Electrostatic Precipitators with Fabric Filter Plants at the Grootvlei Power Station. Client: Eskom Holdings SOC Limited.
- Proposed Mulilo Coal Fired Power Station and associated infrastructure as well as associated power lines and substations, Musina, Limpopo, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Mulilo Coal Fired Power Station and associated infrastructure as well as associated power lines and substations in the Musina area of the Limpopo Province. Client: Parsons Brinckerhoff Africa and Mulilo Power.



- Pebble Bed Modular Reactor Demonstration Plant and Associated Infrastructure, Western Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Pebble Bed Modular Reactor Demonstration Plant and Associated Infrastructure in the Western Cape Province. Client: Eskom Generation.
- Proposed Bantamsklip – Kappa 765 kV Transmission Lines and associated infrastructure, Western and Northern Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for four 260km 765kV powerlines between the Bantamsklip Nuclear Power Station Site and the proposed new Kappa Substation in the Karoo, Western Cape Province. Client: Eskom Transmissions.
- Proposed Bantamsklip – Bacchus, Bacchus - Kappa and Bacchus – Muldersvlei 400 kV Transmission Lines and associated infrastructure, Western and Northern Cape, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a number of 400kV powerlines between the Bantamsklip Nuclear Power Station Site and a number of substations, including Bacchus, Kappa and Muldersvlei, in the Western Cape Province. Client: Eskom Transmission.
- Westgate – Tarlton – Kromdraai 132 kV Sub-Transmission line and associated infrastructure, Gauteng, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the Westgate – Tarlton – Kromdraai 132 kV Sub-Transmission line and associated infrastructure in the Gauteng Province. Client: Eskom Distribution – Central region.
- Environmental Scoping Study for the proposed new distribution line and substation for Eskom, Dundonald, Mpumalanga (also involved in the Public Participation Process), Mpumalanga, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 132kV powerline as well as a new substation in the Tarlton area of Gauteng.
- The proposed new 132 kV sub-transmission line between the Dinaledi and GaRankuwa substations for Eskom, GaRankuwa, North West, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 132kV powerline between the Dinaledi and GaRankuwa substations in the GaRankuwa area of the North West Province. Client: Eskom Distribution.
- Expansion of the Transmission powerline network and associated infrastructure between the Perseus substation and the Beta substation, Free State, South Africa (2008): Project Manager. This project involved the compilation of an alignment specific construction Environmental Management Plan for the 13km 765kV Perseus Beta Turn-ins. Eskom Transmission
- Tarlton – Kromdraai 132 kV Sub-Transmission line and associated infrastructure, Gauteng, South Africa (2008): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for a 132kV powerline as well as a new substation in the Tarlton area of Gauteng. Client: Eskom Distribution – Central Region.
- Basic Assessment for the proposed Watershed – Mmabatho 88kV Power line. North West, South Africa (2008): Project Manager. This project involved the compilation of a Basic Assessment and Environmental Management Plan for a new 88kV powerline near Mmabatho in the North West Province. Client: Eskom Distribution – Central Region.



ASHLEA STRONG, MEM, EAP

Principal Consultant (Environmental Services), Environment & Energy

- Proposed Watershed – Mmabatho 88kV Power line. North West, South Africa (2007): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the Watershed – Mmabatho 88kV Power line in the North West Province. Client: Eskom Distribution – Central Region.
- Proposed Combined Cycle Gas Turbine Plant and Associated Infrastructure near Majuba, Mpumalanga, South Africa (2007): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Combined Cycle Gas Turbine Plant and Associated Infrastructure near Majuba in the Mpumalanga Province. Client: Eskom Holdings SOC Limited.
- Proposed Capacity Increase of the Atlantis OCGT Plant and Associated Infrastructure, Western Cape, South Africa (2006): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Capacity Increase of the Atlantis OCGT Plant and Associated Infrastructure in the Western Cape Province. Client: Eskom Generation.
- Proposed Concentrated Solar Thermal Plant in the Northern Cape, South Africa (2006): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Concentrated Solar Thermal Plant near Upington in the Northern Cape Province. Client: Eskom Holdings SOC Limited.
- Proposed Underground Coal Gasification plant, Eskom, Mpumalanga, South Africa (2006): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Underground Coal Gasification plant near the Majuba Power Station in the Mpumalanga Province. Client: Eskom Holdings SOC Limited.
- Proposed new Coal-fired Power Station in the Lephalale Area for Eskom, Limpopo, South Africa (2005): Project Manager. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed new Coal-fired Power Station in the Lephalale Area in the Limpopo Province. Client: Eskom Generation.
- Proposed Open Cycle. Gas Turbine Power Station at Atlantis for Eskom, Western Cape, South Africa (2005): Environmental Consultant. This project involved the compilation of an Environmental Impact Assessment and Environmental Management Plan for the proposed Open Cycle. Gas Turbine Power Station at Atlantis in the Western Cape Province. Client: Eskom Generation.
- Borrow pits required for the Medupi Coal Fired Power Station, Limpopo, South Africa (2008): Project Manager. This project involved the compilation of Environmental Management plans as part of the applications for Mining Permits for borrow pits required for the Medupi Coal Fired Power Station in the Limpopo Province. Client: Eskom Generation.
- Borrow pits required for the Ingula Pumped Storage Scheme, KwaZulu-Natal, South Africa (2008): Project Manager. This project involved the compilation of Environmental Management plans as part of the applications for Mining Permits for borrow pits required for the Ingula Pumped Storage Scheme in the Kwa-Zulu Natal Province. Client: Eskom Generation.
- Proposed continuous Ashing at Majuba Power Station, Mpumalanga, South Africa (2012): Project Manager. This project entailed the compilation Environmental Impact Assessment and Waste Management License Application for the proposed continuous ashing project at the Majuba Power Station in Mpumalanga. Client: Eskom Holdings SOC Limited.
- Proposed continuous Ashing at Tutuka Power Station, Mpumalanga, South Africa (2012): Project Manager. This project entailed the compilation Environmental



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Impact Assessment and Waste Management License Application for the proposed continuous ashing project at the Tutuka Power Station in Mpumalanga. Client: Eskom Holdings SOC Limited.

- Proposed extension of Ash Dams at Hendrina Power Station, Mpumalanga, South Africa (2011): Project Manager. This project entailed the compilation Environmental Impact Assessment and Waste Management License Application for the proposed extension of the ash dams at the Hendrina Power Station in Mpumalanga. Client: Hendrina Power Station.

**Environmental Assessment
Practitioners Association
of South Africa**



Registration No. 2019/1005

Herewith certifies that

Ashlea-Robyn Strong

is registered as an

Environmental Assessment Practitioner

***Registered in accordance with the prescribed criteria of Regulation 15. (1)
of the Section 24H Registration Authority Regulations
(Regulation No. 849, Gazette No. 40154 of 22 July 2016, of the
National Environmental Management Act (NEMA), Act No. 107 of 1998, as
amended).***

Effective: 01 March 2021

Expires: 28 February 2022

Chairperson

Registrar



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HIERMEE WORD VERKLAAR DAT DIE / THIS IS TO CERTIFY THAT THE

Magister in Omgewingsbestuur
Magister in Environmental Management

TOEGEKENIS AAN
HAS BEEN CONFERRED UPON

ASHLEA-ROBYN STRONG

Met effek vanaf / with effect from
1 Februarie / February 2006

NADAT AAN DIE STATUTE EN REGULASIES VAN
DIE UNIVERSITEIT VOLDGEN IS, AS BEWYS
DAARVAN PLAAS ONS ONS ONDERSKEIE
HANDTEKENINGE EN DIE SEEL VAN DIE
UNIVERSITEIT HIEROENDER.

IN ACCORDANCE WITH THE STATUTES AND
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TURES AND THE SEAL OF THE
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VICE-CHANCELLOR


DEKAAN/DEAN


REGISTRATEUR/REGISTRAR

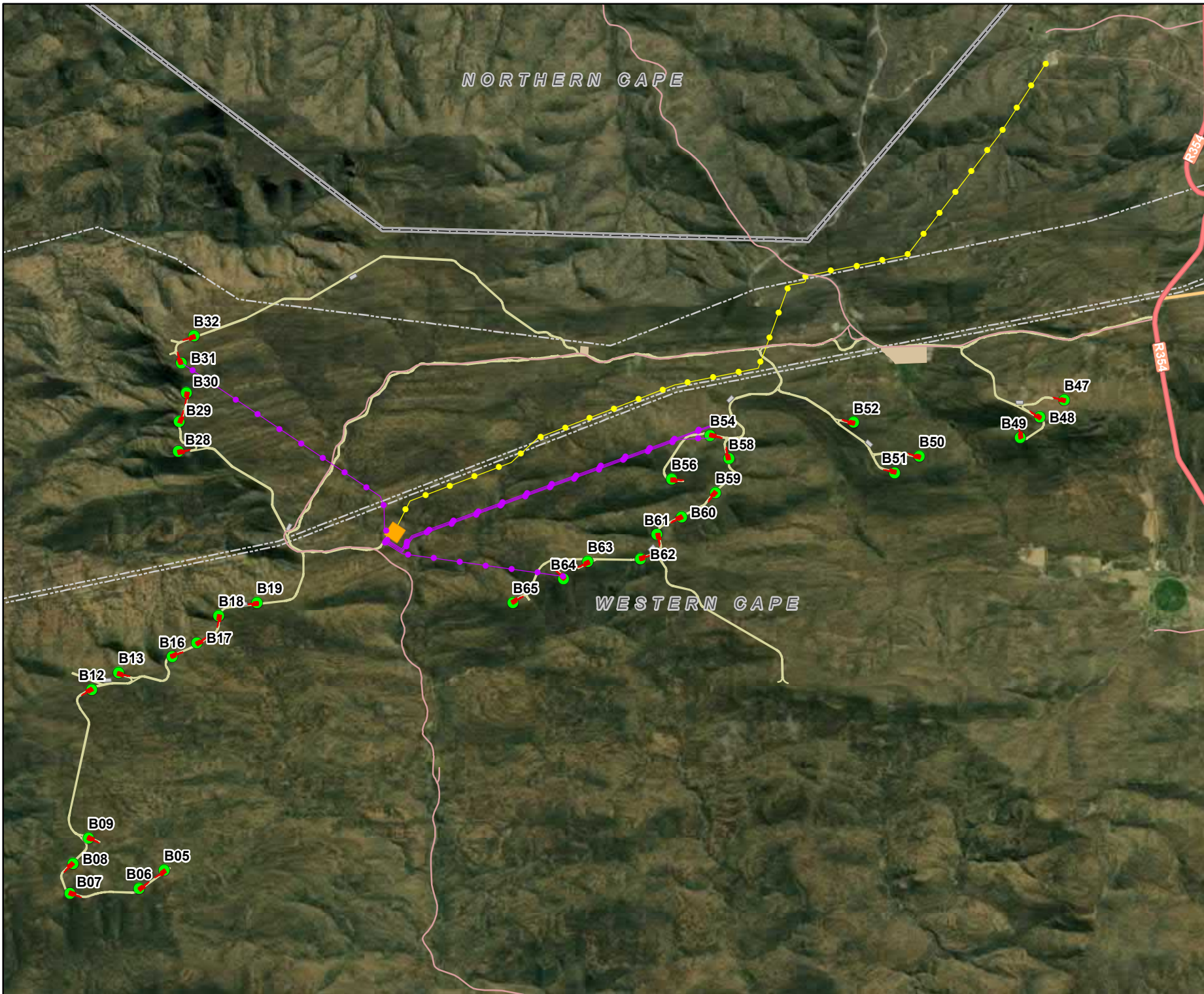
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APPENDIX

B

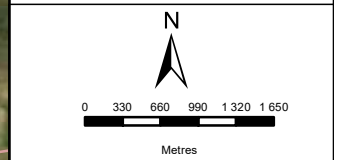
A3 MAPS





BRANDVALLEY PROPOSED LAYOUT

- ### Legend
- Brandvalley Substation
 - Brandvalley 33kV Powerlines
 - Brandvalley 132kV Powerline
 - Hardstands
 - Laydown Area
 - Temporary Earthworks
 - Provincial Boundary
 - Turbines
 - Proposed Access Roads
 - Eskom Powerlines



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COORDINATE SYSTEM: HARTEBEESTHOEK94 LO21

PROJECT TITLE:
 EURONOTUS CLUSTER

SCALE: 1:86 000 **DRAWN BY:** TS

DATE: 2022/02/18 **REVIEWED BY:** AS

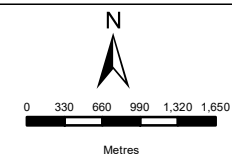
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BRANDVALLEY ENVIRONMENTAL SENSITIVITIES

Legend

- Outcrop Ridges
- Archaeology Observations
- Structures Observations
- Eagle Nest
- - - Rivers - Non perennial
- Eagle Nests (buffer 1.5 & 3km)
- Ecologically Sensitive Areas
- Rivers (buffer 32m)
- Aquatic features (including applicable buffers)



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COORDINATE SYSTEM: HARTEBEESTHOEK94 LO21

PROJECT TITLE:

EURONOTUS CLUSTER

SCALE: 1:86,000

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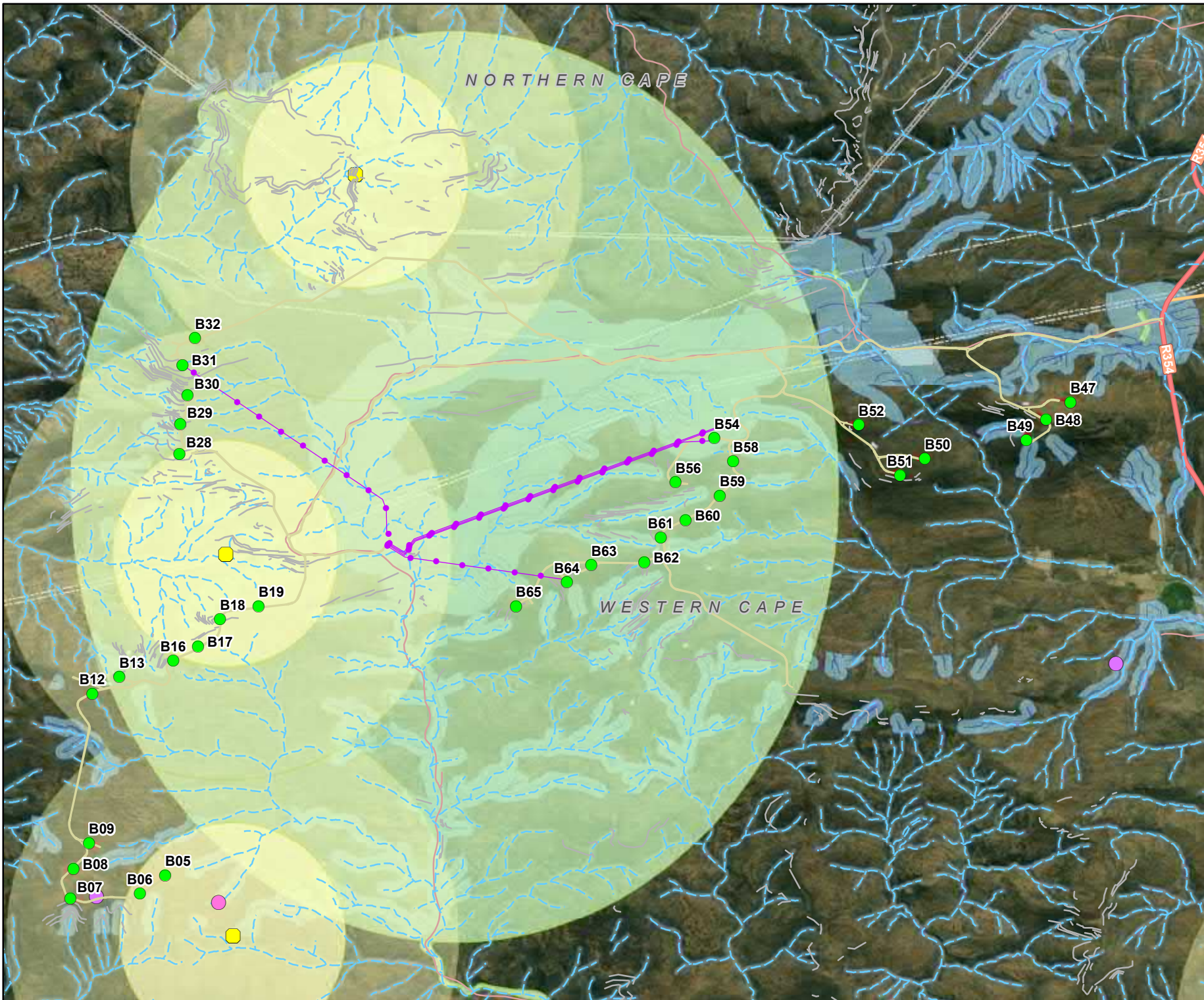
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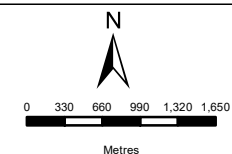
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**BRANDVALLEY
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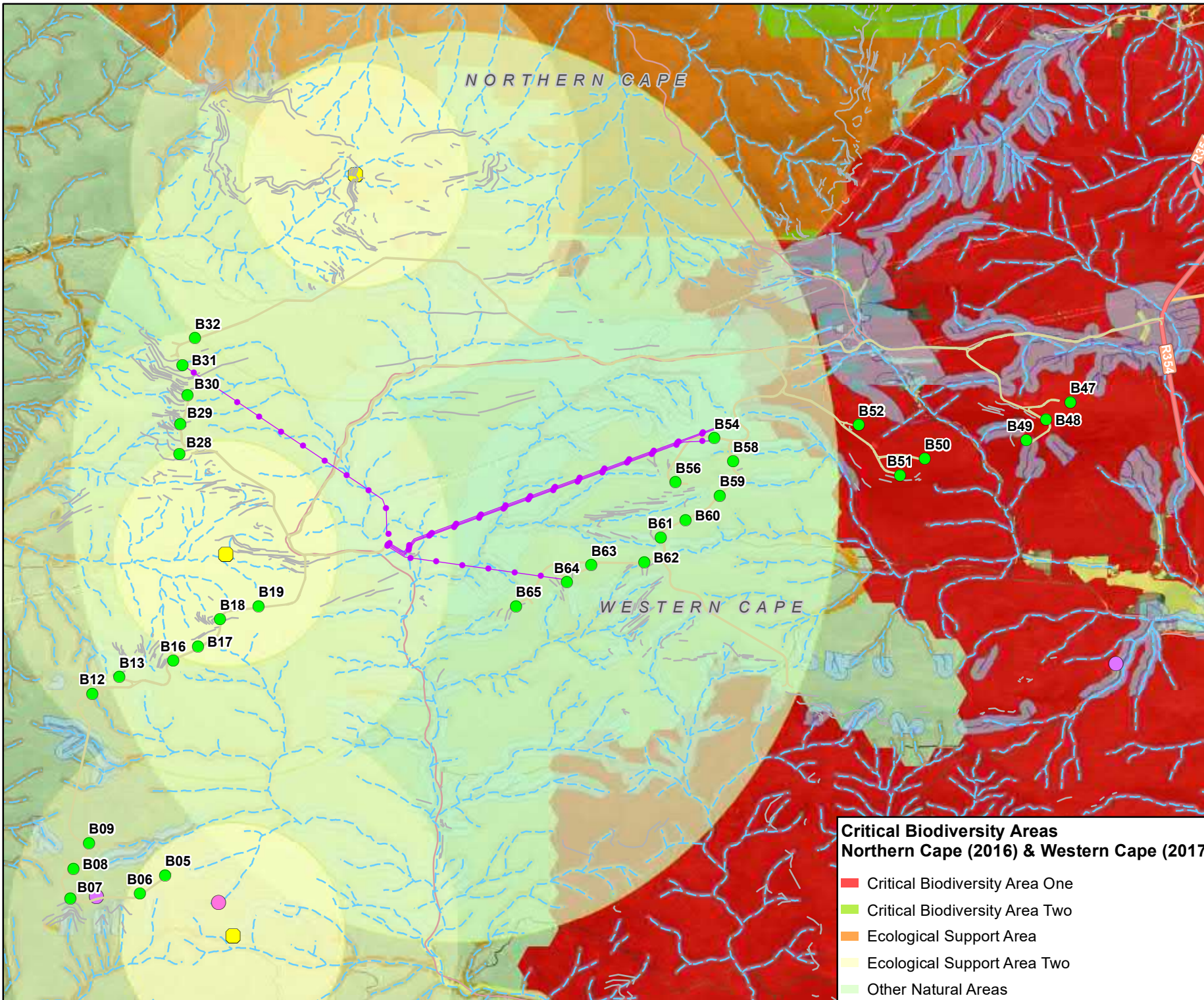
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**Critical Biodiversity Areas
Northern Cape (2016) & Western Cape (2017)**

- Critical Biodiversity Area One
- Critical Biodiversity Area Two
- Ecological Support Area
- Ecological Support Area Two
- Other Natural Areas



APPENDIX

C

TRANSPORT MANAGEMENT PLAN





**BRANDVALLEY WIND ENERGY FACILITY
TRANSPORT IMPACT ASSESSMENT**

September 2021
REVISION 0

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SYNOPSIS

Preparation of the Transport Impact Assessment for the proposed Brandvalley Wind Energy Facility located on the border of the Western Cape and Northern Cape Provinces. The assessment pertains to all relevant traffic and transportation engineering aspects of the facility.

KEY WORDS:




Wind Energy Facility, Transport Impact Assessment

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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
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BRANDVALLEY WIND ENERGY FACILITY TRANSPORT IMPACT ASSESSMENT

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ANNEXURES

ANNEXURE A: IMPACT ASSESSMENT METHODOLOGY

1 INTRODUCTION & SCOPE OF WORK

1.1 Terms of reference

WSP appointed JG Afrika Pty (Ltd) to provide an updated Transport Impact Assessment (TIA) for the Brandvalley Wind Energy Facility (WEF) as part of the amendment and update of the Environmental Management Process (EMPr).

On the 23rd of November 2016, the Applicant (Brandvalley Wind Farm (Pty) Ltd) obtained authorisation from the Department of Environmental Affairs (DEA) to establish a 140 MW Wind Energy Facility within the Karoo Hoogland, Witzenberg and Laingsburg Local Municipalities in the Northern and Western Cape Provinces. It must be noted that the above authorisation does not include the approval of the site layout and environmental management process as these project aspects are expected to change over time until the site is ready for construction.

The following Transport Impact Assessment (TIA) forms part of the EMPr and aims to review the proposed traffic impacts and mitigations as assessed in the May 2016 Transport Impact Assessment conducted by Aurecon. This study will ensure that any traffic impacts associated with the final site layout are considered and mitigated accordingly.

The 140MW WEF is located approximately 25km north of Matjiesfontein, on the border of the Western Cape and Northern Cape provinces. The location of the proposed WEF is shown in **Figure 1.1** below.

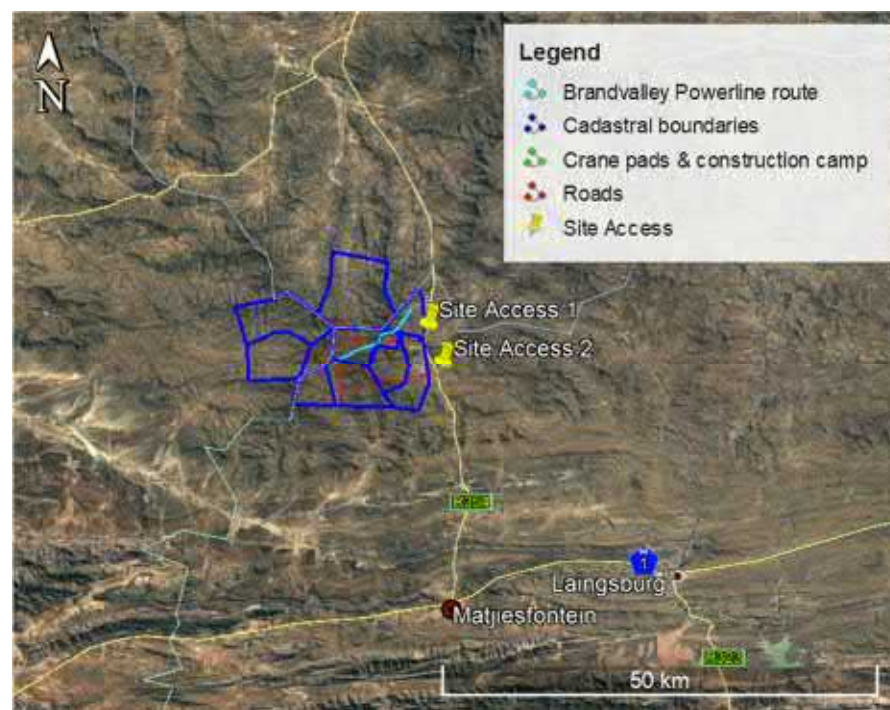


Figure 1-1: Locality Map

1.2 Scope of work

The aim of the TIA is to determine the transport impact of the development on the existing transport network during the construction, operation, and decommissioning phases of the development.

The report will deal with the items listed below and focuses on the surrounding road network that may be impacted by construction and maintenance of the site:

Traffic and Route Assessment

- Trip generation and potential traffic impact
- Possible haul routes between port of entry / manufacturing location and sites in regards of
- National route
- Local route
- Site access route (internal roads)
- Road limitations due to abnormal loads
- Construction and maintenance (operational) vehicle trips
- Generated vehicles trips
- Abnormal load trips
- Access requirements
- Investigation of the impact of the development traffic generated during construction and operation.

Access and Internal Roads Assessment

- Assessment of proposed access points including:
- Feasible location of access points
- Motorised and non-motorised access requirements
- Queuing analysis and stacking requirements if required
- Access geometry
- Sight distances and required access spacing
- High-level input into the proposed internal roads on site
- High-level input into the internal circulation of trucks and proposed roads layout

1.3 Approach and Methodology

The report deals with the traffic impact on the surrounding road network in the vicinity of the site during the construction of the access roads, construction and installation of the turbines and during maintenance.

This transport study includes the following tasks:

Project Assessment

- Overview of project background information including the previous TIA, location maps, component specs and any resulting abnormal loads to be transported
- Research of all available documentation and information relevant to the proposed windfarm and substations

Traffic and Route Assessment

- Trip generation and potential traffic impact
- Possible haul routes between port of entry / manufacturing location and sites in regards of
 - National route
 - Local route
 - Site access route (internal roads)
 - Road limitations due to abnormal loads
- Estimation of construction and maintenance (operational) vehicle trips
 - Generated vehicles trips
 - Abnormal load trips
 - Access requirements
- Investigation of the impact of the development traffic generated during construction and operation.

Access and Internal Roads Assessment

- Assessment of the proposed access points including:
 - Feasible location of access points
 - Motorised and non-motorised access requirements
 - Queuing analysis and stacking requirements if required
 - Access geometry
 - Sight distances and required access spacing
 - Comments on internal circulation requirements and observations

Report (Documentation and Figures)

- Reporting on all findings and preparation of the report.

1.4 General assumptions

The following assumptions were made:

- According to the Eskom Specifications for Power Transformers, the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000mm, total maximum width 4 300mm and total maximum length 10 500mm.
- Maximum vertical height clearances along the haulage route is 5.2 m for abnormal loads.
- The imported elements will be transported from the most feasible port of entry, which is deemed to be Port of Saldanha.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.
- The decommissioning phase will have similar transport impact as the construction phase.

1.5 Source of information

Information used in a transport study includes:

- Project information provided by the Client
- Google Earth. kmz provided by the Client
- Google Earth Satellite Imagery
- Chief surveyor general website
- TRH11, Dimensional and mass limitations and other requirements for abnormal loads, August 2009
- The Technical Recommendations for Highways (TRH 11): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads”, 2000
- National Road Traffic Act, Act 93 of 1996
- National Department of Transport (NDoT), Manual for Traffic Impact Studies, October 2005
- Department of Transport (DoT), Geometric Design of Rural Roads, 1988
- SANS 10280/NRS 041-1:2008 Overhead Power Lines for Conditions Prevailing in South Africa
- Manual for Traffic Impact Studies, Department of Transport, 1995
- TRH26 South African Road Classification and Access Management Manual, COTO
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1), COTO, August 2012
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 2), COTO, February 2014

2 SITE DESCRIPTION

2.1 General

It is proposed to develop the Brandvalley 140 MW WEF approximately 25km north of Matjiesfontein on the border of the Western Cape and Northern Cape provinces. The site is aimed to accommodate the following infrastructure:

- 58 wind turbines with an individual energy generation capacity of between 2 and 5.5 MW each. The wind turbine diameter is proposed to be 160m with a hub height of 125m.
- Concrete foundations approximately 25m in diameter and 4m deep per turbine,
- 690V/33kV transformer of 10m x 10m per hard standing area per turbine,
- Laydown areas of approximately 70m x 50m per turbine (total 20.3ha),
- Construction camp of 10ha and onsite batching plant of 1ha,
- 200m access road corridor,
- Internal road network up to 9m in width,
- Buildings,
- Overhead 33kV powerlines and underground cabling,
- Low voltage yard of the 33/132kV onsite substation Position Number 4 with footprint up to 200m x 200m,
- Lighting system,
- Fencing of the site construction camp; and
- 4 x 125m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.

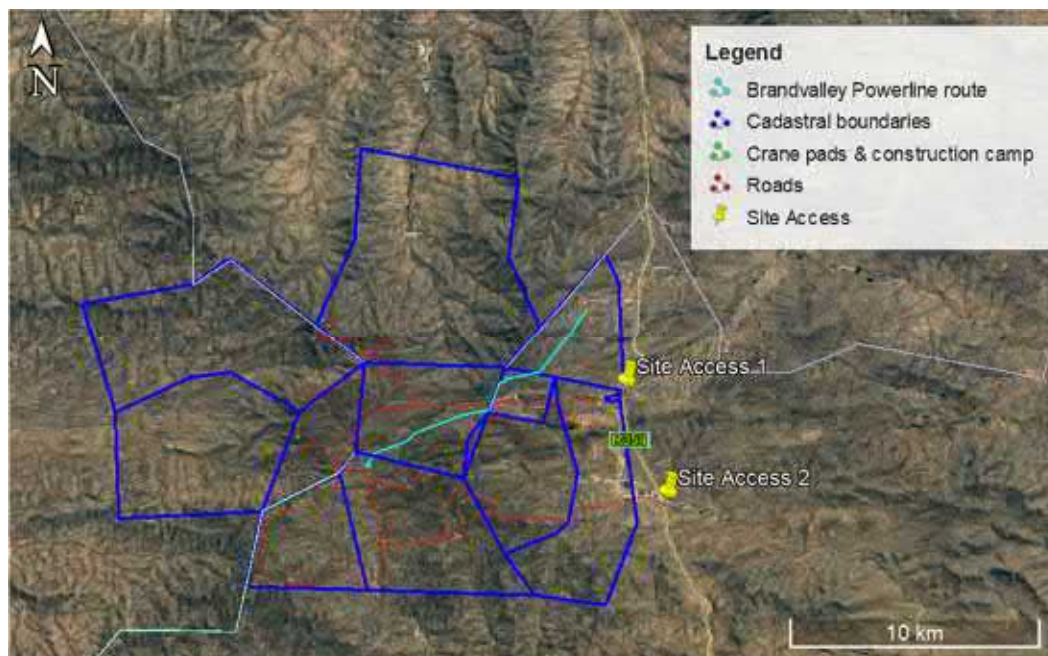


Figure 2-1: The site

3 TRANSPORTATION ROUTES

3.1 Site access points

The proposed site layout considers two site access points connecting to the R354 located at the eastern end of the site. The site is accessed via existing minor provincial roads, namely OP08042 and OP08044. As the site is being accessed via existing access points, access spacing restrictions are not envisaged. It should, however, be noted that road upgrades may be required along the existing access roads to accommodate abnormal vehicles expected to deliver components to the site.

The R354 is a Class 2 minor arterial route running in a south-north direction from Matjiesfontein to the R356 in the Northern Cape. The road is a surfaced single carriage way with one lane per direction.

3.2 Port of entry

It is assumed that the blades and nacelle components will be imported to South Africa via the Port of Saldanha. The Port of Saldanha is South Africa's largest natural anchorage and port with the deepest water. It is located 60 nautical miles northwest of Cape Town (Longitude 170 58' E and Latitude 330 02' S) and is operated by Transnet National Ports Authority.

Depending on the type of turbine and tower, the tower sections can either be imported, or alternatively be manufactured locally. There are several types of towers available on the market, i.e., concrete, steel or hybrid concrete-steel towers. Within South Africa, steel towers can be sourced from Atlantis or Port Elizabeth, and concrete towers can be manufactured on site or sourced from the Cape Town area.

3.2.1 Main route for the transportation of the wind turbine components

Based on experience with similar projects as well as input from the previous transport investigation, the possible ports of entry include Port of Saldanha (approximately 364 km from the site), Port of Cape Town (approximately 267km from the site) or the Port of Ngqura (approximately 614km from the site).

The following aspects were considered about the above routes:

1. Port of Saldanha (approximately 364 km from the site):

This is the second shortest route. The route comprises of high order routes surrounded by rural developments and farm properties and passes through Ceres and Moorreesburg. The density of these two towns is lower than the Cape Town area of route option 2.

2. Port of Cape Town (approximately 267km from the site):

This route provides the shortest distance to the site and comprises entirely of high order routes from the port of entry to the site. However, sections of the route passes through highly developed areas (e.g., Cape Town, Paarl, Worcester etc). Due to this aspect, disruption of traffic due to the abnormal load traffic is expected along these built-up areas.



Figure 3-1: Route from the port of Cape Town to the Site

3. Port of Ngqura (approximately 614km from the site):

This route has the longest distance to the site. It comprises of majority high order routes. It passes through some small towns with low densities. Not much congestion is expected.

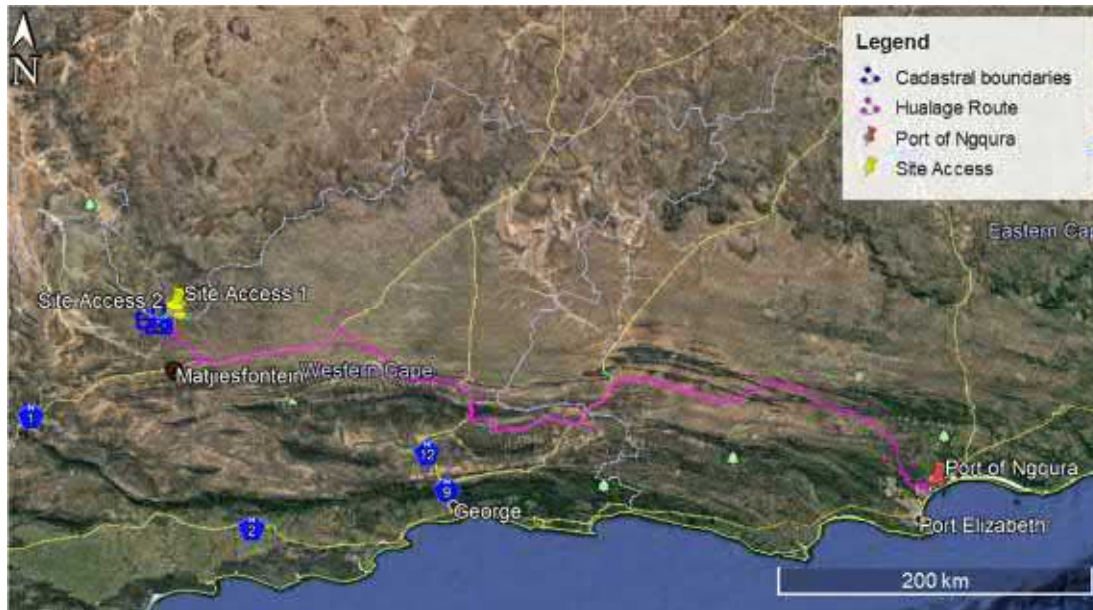


Figure 3-2: Route from the Port of Ngqura to the site

3.2.2 Preferred port of entry

The preferred port of entry to the site is the Port of Saldanha. This route maximises the use of higher order routes, which are designed to handle / accommodate larger vehicles and minimise travelling through towns as far as possible. This was deemed important to minimise congestion and avoid disruptions to communities in these towns.

The delivery company is advised to conduct a dry-run of the route to determine the practical suitability of the route for abnormal load travel.



Figure 3-3: Preferred Route from the Port of Saldanha to the site

4 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TRANSPORT STUDY

4.1 Selected Candidate Turbine

The possible range of wind turbines varies largely with various wind turbine manufacturers operating worldwide. The exact wind turbines to be used on-site have not been finalised yet. For this study, a turbine with a maximum hub height of 125m and a blade length of up to 80m is assumed for the assessment.

In general, each turbine unit consists of a tower, a nacelle (final weight dependent on the supplier and whether the nacelle has gears or not), and rotor blades. It is assumed that all turbine parts will be imported and shipped via the Port of Sadhana.

4.2 Transportation requirements

4.2.1 Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions and mass on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996):

- Length: 22m for an interlink, 18.5m for truck and trailer, and 13.5m for a single unit truck,
- Width: 2.6m,
- Height: 4.3m measured from the ground. Possible height of load – 2.7m,
- Weight: Gross vehicle mass of 56t resulting in a payload of approximately 30t,
- Axle unit limitations: 18t for dual and 24t for triple-axle units, and
- Axle load limitation: 7.7t on the front axle and 9t on single or rear axles,

Any dimension/mass exceeding the above will be classified as an Abnormal Load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

4.2.2 Further Guideline Documentation

The Technical Recommendations for Highways (TRH 11): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and other Events on Public Roads” outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed concerning the damaging effect on road pavements, bridges, and culverts.

The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

4.3 Permitting – General Rules

The limits recommended in TRH 11 serve as a guide to the Permit Issuing Authorities. Each Administration has the right to refuse a permit application or modify the conditions to grant a permit. It is understood that:

- a. A permit is issued at the sole discretion of the Issuing Authority. The Issuing Authority may refuse a permit because of the condition of the road, the culverts, and bridges, the nature of road traffic, excessive heavy traffic during specific periods, or for any other reason.
- b. A permit can be withdrawn if the vehicle is inspected and found unfit for operation.
- c. During specific periods, such as school holidays or long weekends, an embargo may be placed on the issuing of permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

4.3.1 Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the vehicle capacity as rated by the manufacturer,
- the load which may be carried by the tyres,
- the damaging effect on pavements,
- the structural capacity on bridges and culverts,
- the power of the prime mover(s),
- the load imposed by the driving axles, and
- the load imposed by the steering axles.

4.3.2 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all vehicle loads must, as far as possible, conform to the legal dimensions. Permits are only considered for indivisible loads (i.e., loads that cannot be divided into two or more loads for transport on public roads, without disproportionate effort, expense, or risk of damage). Each of the characteristics below has legally permissible limits on what is allowed under the permit.

- Width
- Height
- Length
- Front Overhang
- Rear Overhang
- Front Load Projection
- Rear Load Projection

- Wheelbase
- Turning Radius
- Stability of Loaded Vehicles

4.4 Transporting Wind Turbine Components

Wind turbine components can be transported in several ways with different truck/trailer combinations and configurations. The travel arrangements and logistics will be investigated when the transporting contractor and the plant hire companies apply for the necessary permits from the Permit Issuing Authorities.

4.4.1 Nacelle

The heaviest component of a wind turbine is the nacelle (i.e., approximately 100 tons depending on the manufacturer and design of the unit). Combined with road-based transport, a total vehicle mass of approximately 145 000kg for a 100-ton unit can be expected. Based on the weight limitations, route clearances and permits will be required for transporting the nacelle by road-based transport (see an example of road-based transportation below). The unit will require a minimum height clearance of 5.1 metres.



Figure 4-1:Transporting the Nacelle (Dvorak, 2010)

4.4.2 Blades

A wind turbine's blades are the longest and most vulnerable components and must be protected during shipment. Manufacturers are actively improving on blade designs with blade lengths that go beyond 100m. Blades need to be transported on an extendible blade transport trailer or in a rigid container with rear steerable dollies. Blades can be transported individually, in pairs, or threes, although different manufacturers have different packaging methods for transporting the blades. The transport vehicle typically exceeds the dimensional limitation (length) of 22 metres and will only be allowed under permit, provided the trailer is fitted with steerable rear axles or dollies.



Figure 4-2: Blade transport (Froese, 2019)

For this study, turbine blades of a maximum length of 80 metres have been assessed. Due to this abnormal length, special attention needs to be given to route planning, especially to suitable turning radii and adequate sweep clearance. Therefore, vegetation or road signage may have to be removed before transport. Once transported to the site, the blades need to be carefully stored in their respective laydown areas before being installed onto the rotary hub.

4.4.3 Tower Sections

Tower sections generally consist of sections of around 20 metres in length. The number of tower sections required depends on the selected hub height and type of tower section (i.e., tubular steel, hybrid steel/concrete tower, etc.). For a hub height of 125 metres, a maximum of 7 tower sections is required. Each tower section is transported separately on a low-bed trailer. Depending on the trailer configuration and height when loaded, some of these components may not meet the dimensional limitations (height and width) but will be permitted under certain permit conditions.



Figure 4-3:Transporting the Tower Sections (Montiea, 2014)

4.4.4 Turbine Hub and Rotary Units

Turbine Hub need to be transported separately, due to their significant weights. A hub unit weighs around 45 tons.



Figure 4-4:Transporting the rotor hub (Richardstransport, n.d.)

4.5 Transporting Cranes, Mobile Cranes and other Components

Crane technology has developed rapidly, and several different heavy lifting options are available on the market. Costs involved to hire cranes tend to vary and should be compared beforehand. For this assessment, some possible crane options are outlined as follows.

4.5.1 Examples of Cranes for Assembly and Erection on Site

Option 1: Crawler Crane and Assembly Crane

The main lift crane capable of performing the required lifts (i.e., lifting the tower sections into position, lifting the nacelle to the hub height and lifting the rotor and blades into place) needs to be similar to the Liebherr Crawler Crane LR1750 with an SL8HS (Main Boom and Auxiliary Jib) configuration. A smaller 200-ton Liebherr Mobile Crane LTM 1200-5.1 is also required to lift the components and assist in the assembly of the crawler crane at each turbine location.

- **Crawler Crane LR1750 with the SL8HS boom system (Main Lifting Crane):**

The Crawler Crane will be transported to the site in components and the heaviest load will be the superstructure and crawler centre section (83 tons). The gross combination mass (truck, trailer, and load) will be approximately 133 000 kg. The boom sections, counterweights and other equipment will be transported on conventional tri-axle trailers and then assembled on site. It will require several truckloads of components to be delivered for assembly of the Crawler Crane before it can be mobilised to perform the heavy lifts.



Figure 4-5: Crawler Crane used to assemble turbine (Liebherr, 2017)

- **Mobile Crane LTM 1200-5.1 (Assembly Crane):**

The Liebherr LTM 1200-5.1 crane is a 5-axle vehicle with rubber tyres, which will travel to site on its own. However, the counterweights will be transported on conventional tri-axle trailers and then

assembled on site. The assembly crane is required to assemble the main lift crane as well as assist in the installation of the wind turbine components.

Option 2: GTK 1100 Crane & Assembly Crane

For the single wind turbine at Coega, the GTK 1100 hydraulic crane was used (see example in Figure 3 6). The GTK 1100 was designed to lift ultra-heavy loads to extreme heights and its potential lies in being deployed on facilities such as wind farms.



Figure 4-6: Cranes at work

- **Hydraulic GTK 1100 Crane**

A key benefit of the GTK 1100 is its quick set-up due to the vertical rigging of the self-erecting tower and it can be operational in four to six hours. The crane has a small footprint of 18x18m (including the boom set-up) for a restricted job site area and its self-levelling function results in minimal ground preparation. In addition, the crane can operate at these heights with very heavy loads of up to 100 tons without a counterweight. The GTK 1100 can be transported on four truckloads including two abnormal trailers (for the Boom and Crane).

- **Mobile Crane LTM 1200-5.1 (Assembly Crane):**

As above - a smaller 200-ton Liebherr Mobile Crane LTM 1200-5.1 is also required to lift the components and assist in the assembly of the hydraulic crane at each turbine location.

4.5.2 Cranes at the Port of Entry

Most shipping vessels importing the turbine components will be equipped with on-board cranes to do all the safe off-loading of the wind turbine components to the abnormal transport vehicles, parked adjacent to the shipping vessels.



Figure 4-7: Cranes at Port of Entry

The imported turbine components may be transported from the Port of Entry to the nearby turbine laydown area. Mobile cranes will be required at these turbine laydown areas to position the respective components at their temporary storage location.

4.6 Transporting Other Material and Equipment

In addition to transporting the specialised lifting equipment, the normal Civil Engineering construction materials and equipment will need to be brought to the site (e.g., sand, stone, cement, gravel for road building purposes, excavators, trucks, graders, compaction equipment, cement mixers, transformers in the substation, cabling, transmission pylons etc.). Other components, such as electrical cables, pylons, and substation transformers, will also be transported to site during construction. The transport of these items will generally be conducted with normal heavy loads vehicles.

5 IDENTIFICATION OF TRAFFIC IMPACT

5.1 Activities with potential traffic impact

The traffic expected to be generated by the proposed WEF can be divided into three phases outlined as follows.

5.1.1 Construction phase

The construction phase includes the transportation of people, construction materials and equipment to the site. This phase also includes the construction of roads, excavation of turbine footings, trenching for electrical cables and other ancillary construction works that will temporarily generate the largest amount of traffic.

The exact traffic to be generated during the construction phase cannot be determined until project planning and haulage logistics has been determined. However, for the purposes of assessing traffic impact, the major traffic contributors can be estimated to help advise on mitigation measures.

The following activities with trip generation estimates is assumed for the study:

1. **Material delivery:** This includes heavy vehicles for the transport of building materials such as reinforced concrete materials for foundations, gravel material for roadworks, brickwork material for buildings, fencing material, etc. The major trip generation activities are assumed to result from the construction of turbine foundations and road material delivery.
 - Heavy vehicles (reinforced concrete materials): 60 trips per turbine (i.e., 3 480 trips for 58 turbines)
 - Heavy vehicle (road layer works): 90 trips per turbine (i.e., 5 220 trips for 58 turbines)

The above would result in a total of 8 700 heavy vehicle trips for the full site construction.

Based on a 18-24 month estimated construction period, with \pm 235 annual average working days (five-day work week), an estimated maximum of 27 daily trips can be assumed for material delivery. This results in 7 peak hour estimated trips (a 4-hr delivery window/day is assumed).

Vehicle trips from material delivery vary depending on the construction task/program, fuel supply arrangements, as well as distance from the material source to the site. Project planning can be used to reduce material delivery during peak hours.

2. **Wind turbine component delivery:** This includes delivery of wind turbine components (i.e., blades, nacelle, turbine hub, and tower sections).

The blades, nacelle and turbine hub are expected to be transported by abnormal loads. These are expected to be shipped for the nearest port of entry (i.e., Port of Saldanha Bay). As the worst-case scenario, it will be assumed that the turbine blades will each be delivered separately.

The wind turbine towers can be manufactured locally. Steel towers can be sourced from Atlantis or Port Elizabeth, and concrete towers can be manufactured on site or sourced from Cape town. As the worst-case scenario, it will be assumed that the towers will be sourced from a manufacturer and delivered on site.

- Abnormal loads (turbine components): 12 trips per turbine (i.e., 696 total trips for 58 turbines)

The abnormal load trips are highly depended on project planning and abnormal load permitting. These trips are not necessarily concentrated to the peak hours. The number of peak hour vehicle trips generated by abnormal load vehicles is thus unknown at this stage.

3. **Construction machinery:** Cranes for turbine assembly, heavy vehicles required for earthworks and roadworks. These vehicles are expected to have negligible traffic impact as they will arrive on site in preparation for construction. Once on site, these vehicles will produce internal site traffic with minimal effect on the external road network.
4. **Site personnel and workers:** Based on previous experience as well as the previously approved TIA for the site, the personnel during construction are envisaged to be between 250 to 350 persons. It is further assumed that 15% of the staff will comprise of skilled personnel (i.e., engineers, land surveyors, project managers etc.). The personnel will most likely reside in Sutherland, Matjiesfontein or Laingsburg as the closest communities.

Based on traffic station data sourced from the Western Cape Government Road Network Information System, there are no taxis or Busses running along the R354 running east of the site. It is recommended that the majority of construction personnel be transported to and from site by means of busses.

Busses have an average 60 passenger capacity and assuming the skilled personnel will travel by means of passenger vehicles the following trips are assumed:

- with a maximum of 297 persons expected to travel by bus, approximately 5 (five) bus trips are assumed.
- for the skilled personnel a maximum of 53 trips is expected. It is further assumed that 50% of the trips will occur during the peak hour.

Depending on the construction schedule an estimated of 32 peak hour site personnel trips is assumed for the purposes of this assessment.

Based on the above 39 peak hour trips can be assumed for the site excluding abnormal load vehicle trips. Due to permitting restrictions it can be assumed that less than 50 peak hour trips will be generated by the site. According to the Traffic Impact Assessment Manual TMH 16 Vol 1, traffic impact assessments are warranted if vehicle trips exceed 50 peak hour vehicles. It can therefore be assumed that trips less than this are deemed to have a negligible impact on the traffic capacity of the surrounding road infrastructure.

5.1.2 Operation and maintenance phase

The operation and maintenance phase include the operation and maintenance of the WEF. The envisaged site traffic would be limited to a few light vehicles, transporting approximately 20 employees per day.

The maintenance or replacement of wind turbine components would require a crane and abnormal vehicles. Although abnormal load vehicles would be required, the maintenance or replacement of components can be staggered, and the transportation of the components would therefore take place over a short period of time, presumably delivered in one day. Furthermore, traffic disruptions can be minimised by transporting the components during off-peak hours. This phase is therefore expected to generate minimal traffic.

5.1.3 Decommissioning phase

The decommissioning phase includes, but is not limited to, the dismantling of wind turbine components (blades, nacelle and tower), removal of electrical systems and substation, dismantling and removal of the operations and maintenance buildings, removal of wind turbine pads and removal of access/ service roads.

The decommissioning phase will generate construction related traffic including transportation of people, construction materials, water and equipment (abnormal trucks transporting turbine components). It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.

5.1.4 Cumulative impacts

According to the Traffic Impact Assessment Manual TMH 16 Vol 1, road network capacity related impacts are considered only if a site generates more than 50 peak hour trips. It is also acknowledged that developments have an impact on the wider road network however, due to the limitations of the Traffic Impact Assessment Methodology, the assessment of wider impacts is addressed by means of master planning. Since the site is not envisaged to generate more than 50 peak hour trips the cumulative impacts considered in this study are discussed below only to help inform the master planning processes conducted by the relevant transport regulating authority.

To assess the cumulative impact, it will be assumed that all wind farms within 50km currently proposed and/or approved, would be constructed at the same time. It must be noted that this is a conservative approach.

5.1.4.1 During Construction

The total estimated construction peak hour trips are summarised in **Table 5-1**. It must however be noted that this is a conservative estimate, and the likelihood of occurrence is considered low due to the following:

- these projects would be subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom.
- even if all wind farms are constructed and decommissioned on the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

Table 5-1: Estimated Cumulative construction trips

Developments with access routes along R354 within 50km from site	Megawatt	Estimated peak hour construction traffic (excluding abnormal loads)
Gunstfontein WEF	200	56
Hidden Valley WEF (Karusa, Soetwater)	140 each	78
Roggeveld WEF	140	39
Komsberg West Wind Energy Facility.	275	77
Esizayo WEF	140	39
Brandvalley WEF	140	39
Rietkloof WEF	147	30
Karreebosch WEF	140	35
Maralla East and West WEF	140 each	78
Total peak hour trips		471

5.1.4.2 During Operation

The total estimated operational peak hour trips are summarised in **Table 5-2**. It must, however, be noted that these trips will not necessarily occur during the peak hour and the access roads connect to a higher order road (i.e., R354) which is designed to accommodate high traffic volumes.

Table 5-2: Estimated Cumulative operational phase trips

Developments with access routes along R354 within 50km from site	Megawatt	Estimated daily operational traffic
Gunstfontein WEF	200	29
Hidden Valley WEF (Karusa, Soetwater)	140 each	40
Roggeveld WEF	140	20
Komsberg West Wind Energy Facility.	275	40
Esizayo WEF	140	20
Brandvalley WEF	140	20
Rietkloof WEF	147	21
Karreebosch WEF	140	20
Maralla East and West WEF	140 each	40
Total daily trips		250

5.1.4.3 Decommissioning Stage

It is expected that the decommissioning phase will generate the same impact as that of the construction phase.

6 ASSESSMENT OF TRAFFIC RELATED ENVIRONMENTAL IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

6.1 Potential Impact (Construction Phase or Decommissioning Phase)

The decommissioning phase will generate construction related traffic including transportation of people, construction materials, water and equipment (abnormal trucks transporting turbine components). It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.

Nature of the impact

- Noise and dust pollution associated potential traffic congestion

Table 6-1: Impact Assessment Table (Construction Phase)

Impact number	Aspect	Description	Stage	Character		Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Traffic	Dust and noise pollution due to traffic	Construction/ Decommissioning	Negative	Moderate	3	1	3	2	5	45	N3	2	1	3	2	3	24	N2
Significance						N3 - Moderate							N2 - Low						

Proposed mitigation measures

1. The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
2. Dust suppression of gravel roads during the construction phase, as required.
3. Regular maintenance of gravel roads is required by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase.
4. The use of mobile batch plants and quarries near the site would decrease traffic on the surrounding road network.
5. Staff and general trips should occur outside of peak traffic periods as far as possible.

6.2 Potential Impact (Operation Phase)

Nature of the impact

- Noise and dust pollution associated potential traffic congestion

Table 6-2: Potential Impact (Operation Phase)

Impact number	Receptor	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:	Traffic	Dust and noise pollution due to traffic	Operational	Negative	Very High	2	1	3	4	3	30	N2	1	1	3	4	2	18	N2
Significance						N2 - Low							N2 - Low						

Proposed mitigation measures

- Consider scheduling shift changes to occur during off peak hours.
- Regular maintenance of gravel roads is required by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase.

6.3 Potential cumulative Impact (Construction Phase or Decommissioning Phase)

The cumulative impact assumes that all wind farms within 50km currently proposed and/or approved, would be constructed at the same time. It must be noted that this is a conservative approach.

Nature of the impact

- Noise and dust pollution associated potential traffic

Table 6-3: Potential cumulative Impact (Construction Phase or Decommissioning Phase)

Impact number	Receptor	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:	Traffic	Dust and noise pollution due to traffic	Cumulative	Negative	Moderate	5	3	3	2	5	65	N4	3	2	3	2	4	40	N3
Significance						N4 - High							N3 - Moderate						

Proposed mitigation measures

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of gravel roads during the construction phase, as required.
- Regular maintenance of gravel roads is required by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase.
- The use of mobile batch plants and quarries near the site would decrease traffic on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods as far as possible.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Access and internal circulation

- For the access points, it is recommended that the road near the access point be kept clear of tall vegetation to allow for good sight lines.
- It needs to be noted that all access and internal roads should be investigated for their topographical suitability, i.e., feasibility for haulage trucks and especially abnormal loads to navigate and have sufficient height clearance for any Eskom lines, Telkom lines or similar.
- All bellmouths along the chosen site accesses to the wind turbine locations need to be in line with the required geometric standards to accommodate abnormal haulage vehicles. The exact location and upgrades of the internal access roads will need to be established at detailed design stage.
- The chosen access and circulation roads will have to be upgraded to suit abnormal load vehicle requirements. It needs to be ensured that if the access and circulation roads to the site are to remain as gravel roads, the routes need to be maintained during the additional loading experienced during the construction phase and be reinstated once construction is complete.

7.2 Haulage routes for wind turbine components

- The proposed haulage route is outlined in Section 3.2. The route was chosen as the preferred route because it provides the shortest route to the wind farm site, utilises higher order routes as far as possible and minimises travelling through towns.
- It is recommended that the respective haulage company conducts a dry-run to determine the restrictions relevant to the haulage vehicle to be utilised. With some route's road signs may need to be moved, overhead cables may need to be raised and bellmouths may need temporary widening to accommodate abnormal loads. A dry-run will help establish relevant changes specific to the abnormal load truck used to deliver the components and materials.

7.3 Traffic impact

- No capacity improvements are considered necessary based on the following:
 - The site gains access of the R354, which is a Class 2 road designed to accommodate large traffic volumes.
 - The only notable generated traffic would occur during the construction and decommissioning phases. The trips generated during these phases will only occur for short periods of time and the following mitigation measures are recommended for consideration:
 - i. The delivery of wind turbine components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods,

- ii. The use of mobile batching plants and any material sources in close proximity to the site would decrease the impact on the surrounding road network,
- iii. Staff and general trips should can outside of peak traffic periods,
- iv. Staff can be shuttled on scheduled busses to minimise the number of trips; and
- v. Stagger the removal of turbines, foundations, crane pads etc during the decommissioning phase.

7.4 Assessment of traffic related environmental Impacts and Identification of Management Actions

- i. This phase includes the construction of the Facility, including construction of the roads, excavations, trenching and ancillary construction works. This phase will temporarily generate the most development traffic.

The nature of environmental impact expected with construction traffic is noise and dust pollution. It is estimated that the construction traffic will have a moderate significance rating pre mitigation and a low significance rating post mitigation.

Proposed mitigation measures

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
 - Dust suppression of gravel roads during the construction phase, as required.
 - Regular maintenance of gravel roads is required by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase.
 - The use of mobile batch plants and quarries near the site would decrease traffic on the surrounding road network.
 - Staff and general trips should occur outside of peak traffic periods as far as possible.
- ii. The operation and maintenance phase include the operation and maintenance of the WEF

The nature of environmental impact expected with operational traffic is noise and dust pollution. It is estimated that the operational traffic will have a low significance rating pre mitigation and post mitigation.

Proposed mitigation measures

- Consider scheduling shift changes to occur during off peak hours.
- Regular maintenance of gravel roads is required by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase.

- iii. The decommissioning phase will generate construction related traffic including transportation of people, construction materials, water and equipment (abnormal trucks transporting turbine components). It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.
- iv. The cumulative impact assumes that all wind farms within 50km currently proposed and/or approved, would be constructed at the same time. It must be noted that this is a conservative approach.

The nature of environmental impact expected is noise and dust pollution. It is estimated that the construction traffic will have a high significance rating pre mitigation and a moderate significance rating post mitigation.

The mitigation measures proposed for the construction phase are proposed for the cumulative impacts during the construction stage.

8 SUMMARY

The aim of this study was to investigate all traffic and transportation related matters pertaining to the proposed Brandvalley 140 MW WEF approximately 25km north of Matjiesfontein on the border of the Western Cape and Northern Cape provinces.

The development of this wind energy facility is supported from a traffic engineering point of view, provided that the recommendations in this report are adhered to and are read in conjunction with the road design and environmental reports completed for this site.

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Annexure A - 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 direct¹, indirect², secondary³ as well as cumulative⁴ 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 criteria⁵ presented in **Table 10_1**.

Table 10_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

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.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
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
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 10_1** below.

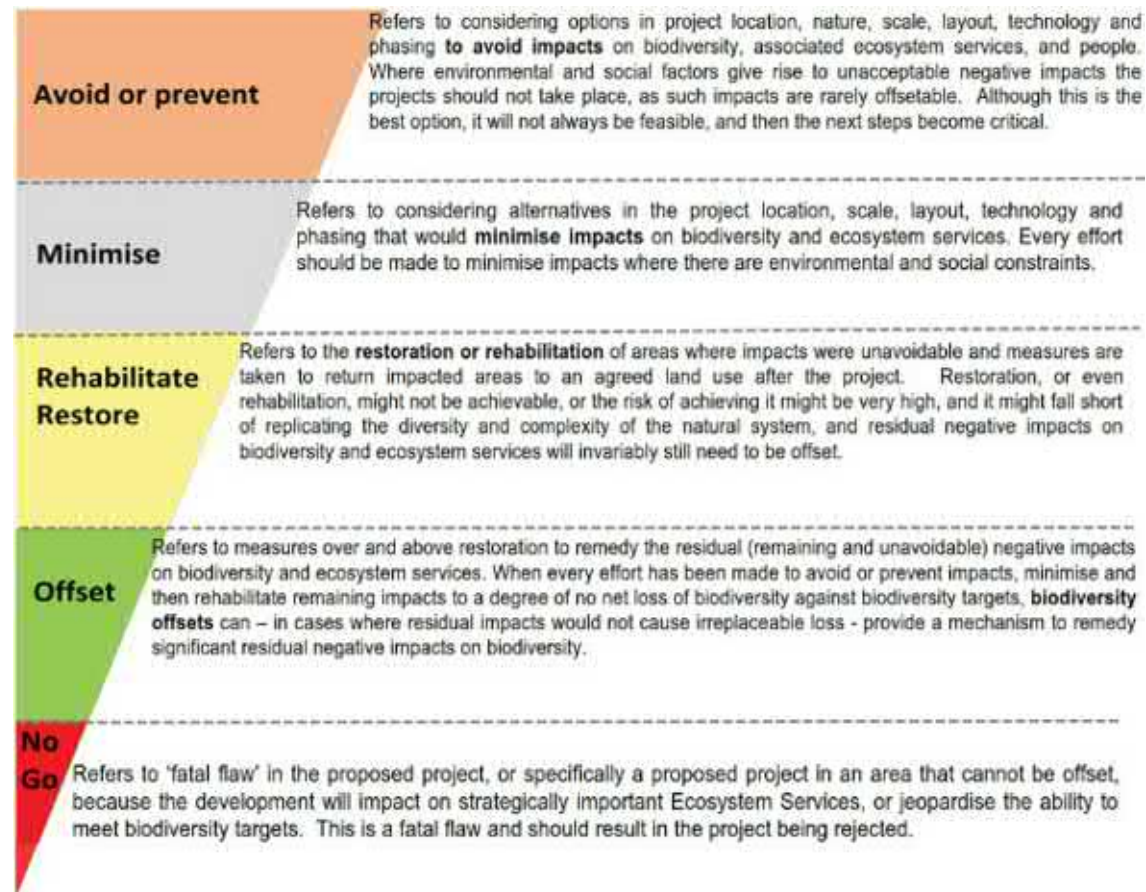


Figure 10_1: Mitigation Sequence/Hierarchy



BRANDVALLEY WIND ENERGY FACILITY TRANSPORT MANAGEMENT PLAN

September 2021
REVISION 0

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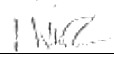

Wind Energy Facility, Transport Management Plan

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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.



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BRANDVALLEY WIND ENERGY FACILITY TRANSPORT MANAGEMENT PLAN

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1 INTRODUCTION

WSP appointed JG Afrika PTY (Ltd) to provide a Transport Management Plan (TMP) for the Brandvalley Wind Energy Facility (WEF) as part of the amendment and update of the Environmental Management Process (EMPr).

It is proposed to establish a 140MW WEF to be located approximately 25km north of Matjiesfontein, on the border of the Western Cape and Northern Cape Provinces. The location of the proposed WEF is shown in **Figure 1.1** below.



Figure 1-1: Locality Map

2 PURPOSE OF THE TRAFFIC MANAGEMENT PLAN

A Traffic Management Plan is required to ensure that the trips generated by the construction and operational activities associated with the proposed facility are mitigated as far as possible to:

- reduce the traffic impact on the surrounding road network,
- reduce potential conflicts that may result from the development traffic and the general traffic/public; and
- to identify potential routes for vehicles travelling to the site, particularly heavy and abnormal load vehicles.

This Traffic Management Plan has been prepared to enable the identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility.

3 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply:

- This TMP is based on the project information provided by the Client.
- Maximum vertical height clearances along the haulage route are at least 5.2m to be able to accommodate abnormal loads.
- The imported elements will be transported from the most feasible port of entry, which is deemed to be the Port of Saldanha.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction will be sourced locally as far as possible.

4 SOURCE OF INFORMATION

Information used in a transport study includes:

- Project information provided by the Client
- Google Earth. kmz provided by the Client
- Google Earth Satellite Imagery
- Chief surveyor general website
- TRH11, Dimensional and mass limitations and other requirements for abnormal loads, August 2009
- The Technical Recommendations for Highways (TRH 11): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads”, 2000
- National Road Traffic Act, Act 93 of 1996
- National Department of Transport (NDoT), Manual for Traffic Impact Studies, October 2005
- Department of Transport (DoT), Geometric Design of Rural Roads, 1988
- SANS 10280/NRS 041-1:2008 Overhead Power Lines for Conditions Prevailing in South Africa

- Manual for Traffic Impact Studies, Department of Transport, 1995
- TRH26 South African Road Classification and Access Management Manual, COTO
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1), COTO, August 2012
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 2), COTO, February 2014

5 SITE DESCRIPTION

5.1 General

It is proposed to develop the Brandvalley 140 MW WEF approximately 25km north of Matjiesfontein on the border of the Western Cape and Northern Cape Provinces. The proposed site will accommodate the following infrastructure:

- 58 wind turbines with an individual energy generation capacity of between 2 and 5.5 MW each. The wind turbine diameter is proposed to be 160m with a hub height of 125m.
- Concrete foundations approximately 25m in diameter and 4m deep per turbine,
- 690V/33kV transformer of 10m x 10m per hard standing area per turbine,
- Laydown areas of approximately 70m x 50m per turbine (total 20.3ha),
- Construction camp of 10ha and onsite batching plant of 1ha,
- 200m access road corridor,
- Internal road network up to 9m in width,
- Buildings,
- Overhead 33kV powerlines and underground cabling,
- Low voltage yard of the 33/132kV onsite substation Position Number 4 with footprint up to 200m x 200m,
- Lighting system,
- Fencing of the site construction camp; and
- 4 x 125m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.

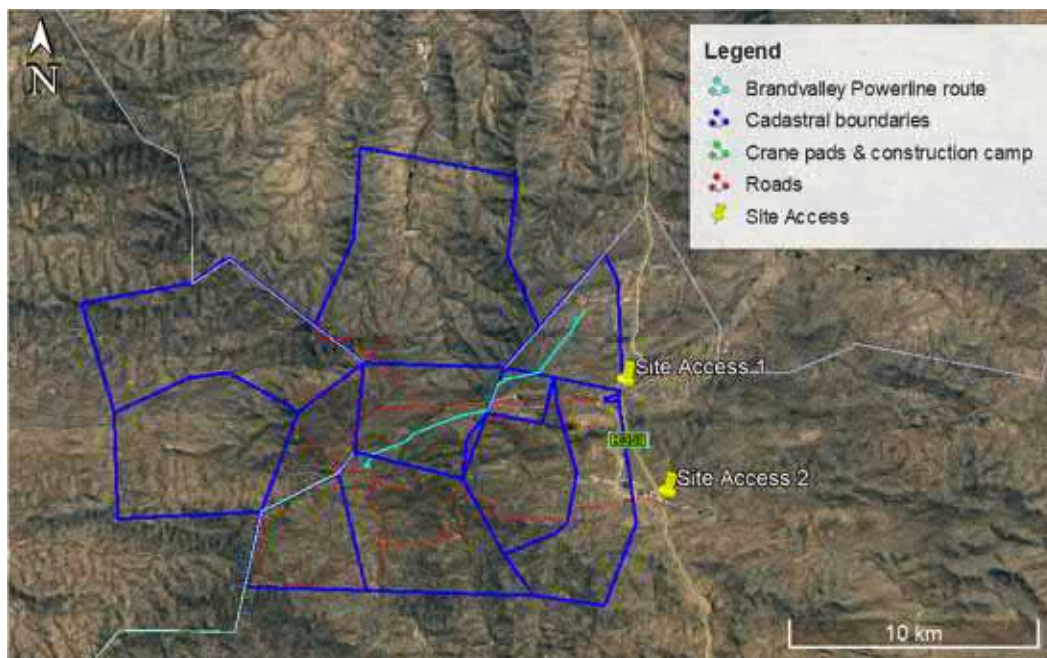


Figure 5-1: The Proposed Site

6 TRANSPORTATION ROUTES

Components will be transported to site using appropriate National and Provincial routes. It is expected that the turbine blades, nacelle and turbine hub will be transported by abnormal loads. Material delivery and site personnel travel will generally be conducted via normal load traffic. Lifting equipment and counter weights are required to off-load and assemble the components.

The transportation of abnormal load equipment and components require abnormal load permits as the dimension exceed the permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996).

6.1 Site access points

The proposed site layout considers two site access points connecting to the R354 located at the eastern end of the site. The site is accessed via existing minor provincial roads, namely OP08042 and OP08044. As the site is being accessed via existing access points, access spacing restrictions are not envisaged. It should, however, be noted that road upgrades may be required along the existing access roads to accommodate abnormal vehicles expected to deliver components to the site.

The R354 is a Class 2 Minor Arterial road running in a south-north direction from Matjiesfontein to the R356 in the Northern Cape. The road is a surfaced single carriageway with one lane per direction.

6.2 Port of entry

It is assumed that the blades and nacelle components will be imported to South Africa via the Port of Saldanha. The Port of Saldanha is South Africa's largest natural anchorage and port with the deepest water. It is located 60 nautical miles northwest of Cape Town (Longitude 170 58' E and Latitude 330 02' S) and is operated by Transnet National Ports Authority.

Depending on the type of turbine and tower, the tower sections can either be imported, or alternatively be manufactured locally. There are several types of towers available on the market, i.e., concrete, steel or hybrid concrete-steel towers. Within South Africa, steel towers can be sourced from Atlantis or Port Elizabeth, and concrete towers can be manufactured on site or sourced from the Cape Town area.

6.2.1 Main route for the transportation of the wind turbine components

Based on experience with similar projects as well as input from the previous transport investigation, the possible ports of entry include Port of Saldanha (approximately 364 km from the site), Port of Cape Town (approximately 267km from the site) or the Port of Ngqura (approximately 614km from the site).

The following aspects were considered about the above routes:

1. Port of Saldanha (approximately 364 km from the site):
This is the second shortest route. The route comprises of high order routes surrounded by rural developments and farm properties and passes through Ceres and Moorreesburg. The density of these two towns is lower than the Cape Town area of route option 2.
2. Port of Cape Town (approximately 267km from the site):
This route provides the shortest distance to the site and comprises entirely of high order routes from the port of entry to the site. However, sections of the route passes through highly developed areas (e.g., Cape Town, Paarl, Worcester etc). Due to this aspect, disruption of traffic due to the abnormal load traffic is expected along these built-up areas.



Figure 6-1: Route from the port of Cape Town to the Site

3. Port of Ngqura (approximately 614km from the site):
This route has the longest distance to the site. It comprises of majority high order routes. It passes through some small towns with low densities. Not much congestion is expected.

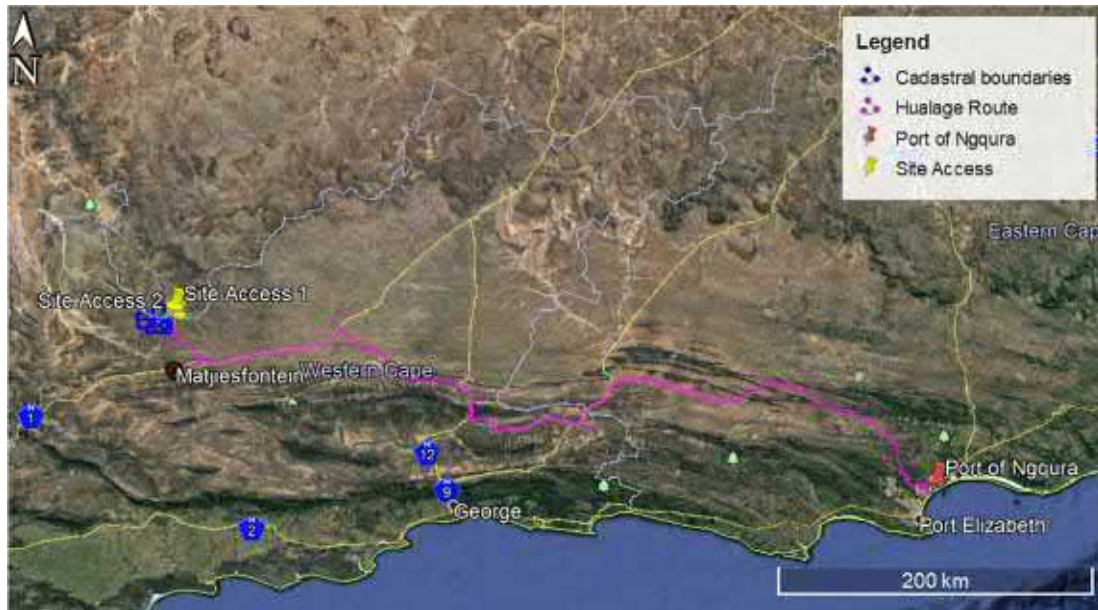


Figure 6-2: Route from the Port of Ngqura to the site

6.2.2 Preferred port of entry

The preferred port of entry to the site is the Port of Saldanha. This route maximises the use of higher order routes, which are designed to handle / accommodate larger vehicles and minimise travelling through towns as far as possible. This was deemed important to minimise congestion and avoid disruptions to communities in these towns.

The delivery company is advised to conduct a dry-run of the route to determine the practical suitability of the route for abnormal load travel.



Figure 6-3: Preferred Route from the Port of Saldanha to the site

6.3 Main Route for the Transportation of Materials, Plant and People to the proposed site

It is envisaged that the workforce will most likely reside in Sutherland, Matjiesfontein, Touws River or Laingsburg as the closest communities. These towns connect to the site via the N1 and the R354. Due to a lack of public transport near the site it is recommended that the majority of construction personnel be transported to and from the site by means of busses or minibus taxis. This will reduce the number of trips bound for the site.

Building materials will most likely be sourced from Worcester approximately 160km from the site or alternatively from Cape Town approximately 260 km from the site. A significant reduction in heavy vehicle trips can be achieved by using mobile batch plants. In addition to this, temporary construction material stockpile yards could be commissioned on vacant land near the proposed site. Delivery of materials to the mobile batch plant and the stockpile yard could be staggered to minimise traffic disruptions.



Figure 6-4: Envisaged Material delivery route

7 TRAFFIC MANAGEMENT PLAN

This Traffic Management Plan has been prepared in respect of the planning phase of the proposed facility. The Traffic Management Plan should be updated prior to the commencement of the construction phase, when detailed information regarding the delivery of components, traffic data and construction activities are available. A designated personnel member of the Contractor's team will be the custodian of the plan and the custodian will ensure that all personnel and subcontractors are trained to ensure compliance. The requirements of the Traffic Management Plan shall apply to all construction personnel and subcontractors appointed to provide vehicles, machinery or drivers. The Plan needs to be reviewed every four months or immediately after an incident, when corrective measures will be incorporated into the Plan.

Prior to the commencement of the operational phase, the plan should be updated to include the operational traffic requirements. A copy should be kept at the facility. A designated employee will ensure that the plan is enforced and will make sure that the Plan is available to all relevant personnel and external maintenance/repair teams. The Plan will be reviewed every annually or immediately after an incident, when corrective measures will be incorporated into the Plan.

7.1 Preliminary Transport Requirements

It is expected that the highest trip generator will be the construction and decommissioning phase. Abnormal load trips are limited to turbine blades, nacelle, turbine hub and lifting equipment. Staggered delivery and transporting components outside of the peak traffic periods (peak traffic periods for rural areas are assumed to be 6:30am – 8am and 4pm-6pm) will assist in mitigating the impact on the surrounding road network.

Construction traffic will include vehicles for deliveries, removal of materials and construction staff. Construction activities such as delivery of material or removal of soil can also be staggered or transported in off-peak hours. Based on a 18-24 month estimated construction period, an estimated 7 peak hour material delivery trips, 32 peak hour site personnel trips, and 12 abnormal load trips per turbine are expected to be generated by the site.

Traffic during the operational phase will be low as trips will only be for occasional maintenance requirements and staff trips (i.e., 20 employees per day).

The construction phase and decommissioning phase are expected to generate similar trips.

Proposed mitigation measures

- The delivery of components and construction materials to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- The use of batch plants (if required) and quarries near the site would decrease the impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods as far as possible.

- During construction Staff shuttle transport can be made available.

7.2 Transport Coordinator

It is recommended that a transport coordinator (or similar designation) be appointed to ensure compliance of the TMP. The coordinator shall make all the necessary arrangements to maintain the required traffic measures for the duration of the construction period.

7.3 Stakeholder Engagement

Interested and affected parties informed of all transport activities taking place that may affect them or require approval e.g. local community, the local authorities e.g. law enforcement and affected landowners.

Stakeholder engagement should address and provide information to stakeholders regarding general construction activities, construction vehicles routes, projected timelines, procedures for complaints and emergency procedures.

7.4 Licensing

All construction vehicles shall have the necessary licences, a valid roadworthy certificate and shall comply with the relevant traffic and transport licencing requirements (such as abnormal loads or hazardous materials).

All drivers of vehicles shall have the requisite licences to operate any vehicle (or machinery) operated by them on site or on any public roads. A professional driving permit (PrDP) is required if any of the following vehicles are operated:

- Goods vehicles, (more than 3 500 kg).
- Breakdown vehicles.
- Buses (any bus).
- Minibus taxis (more than 3 500 kg), transporting 12 or more people, including the driver.
- Vehicles used to transport people for payment.
- Goods vehicle carrying dangerous goods (more than 3 500 kg).
- Road tank vehicles for petroleum-based flammable liquids.
- Motor vehicles transporting 12 or more people, including the driver.

7.5 Construction Staff

All staff shall be transported safely to site in appropriate vehicles. Staff shall not be allowed to be transported to site on the back of open trucks. Passenger vehicles shall not exceed the carrying capacity of the vehicle.

Collections/Drop-off points for staff shall be located at a safe distance from traffic and construction activities. Roads and areas used by construction vehicles shall, as far as possible be avoided by all personnel. Designated pedestrian pathways shall be demarcated where appropriate.

All staff shall receive the appropriate site safety induction training. Drivers shall be adequately trained in the identification and avoidance of road hazards, vehicle maintenance and care and safety requirements. All staff shall be informed of the construction site risks and training shall include appropriate precautionary measures required to be undertaken to facilitate safe and efficient traffic management (e.g. understanding signage, crossing roadways and utilising designated pedestrian pathways, reporting incidents).

7.6 Inspection of all Routes

A dry run of all routes is to be undertaken to identify any areas to avoid or obstacles that might disrupt the movement of the construction vehicles. All issues affecting the movement of construction vehicles are to be addressed immediately by the Contractor and relevant stakeholders e.g. law enforcement, relevant roads department and authorities.

7.7 Maintenance of vehicles

All vehicles and construction plant shall be regularly maintained, repaired when necessary and inspected on a regular basis to ensure that the vehicles are in good working order. Construction and passenger vehicles shall be monitored to ensure that vehicles are not overloaded.

7.8 Maintenance of roads

The Contractor shall maintain the road used by construction vehicles, repairing any damage caused by construction traffic to the surrounding road network. Where gravel roads are used, the roads shall be maintained, and dust control measures shall be implemented to avoid dust pollution.

Road verges at the site shall be regularly maintained to ensure that vegetation remains short and that the roads serve as an effective firebreak.

7.9 Signage

Signage, in accordance with the South African Road Traffic Signs Manual, will be required to be conspicuously placed at appropriate locations along all access roads, the internal roads to the site and public roads used by construction vehicles (in consultation with the relevant traffic authorities) to indicate the following:

- all road and pedestrian hazards;
- site access
- site offices
- wayfinding signs on internal roads e.g. parking, toilets, emergency assembly point
- crossing points;
- speed limits;
- turning traffic;
- dedicated routes for construction vehicles and staff
- no-go areas
- any traffic control information which may be relevant to the construction activity at the time.

It is recommended that flagmen be implemented when high volumes of construction traffic are expected to help direct the traffic, thus ensuring the safe movement of the vehicles and reducing the potential conflicts.

7.10 Speed limit

All drivers operating vehicles shall comply with the posted speed limits (or the maximum allowable speed as per the permit for abnormal load vehicles) on public roads as well as a proposed 30km/h speed limit within the construction site and access roads.

The failure to adhere to the prescribed speed limits is an offence and disciplinary action may be taken by the Contractor.

7.11 Abnormal Loads

Abnormal loads will be transported to site as per the following:

7.11.1 Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996):

- Length: 22m for an interlink, 18.5m for truck and trailer and 13.5m for a single unit truck
- Width: 2.6m
- Height: 4.3m measured from the ground. Possible height of load – 2.7m.
- Weight: Gross vehicle mass of 56t resulting in a payload of approximately 30t
- Axle unit limitations: 18t for dual and 24t for triple-axle units
- Axle load limitation: 7.7t on front axle and 9t on single or rear axles

Any dimension / mass outside the above will be classified as an Abnormal Load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

7.11.2 Further Guideline Documentation

The Technical Recommendations for Highways (TRH 11): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads” outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts.

The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass

distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

7.11.3 Permitting – General Rules

The limits recommended in TRH 11 are intended to serve as a guide to the Permit Issuing Authorities. It must be noted that each Administration has the right to refuse a permit application or to modify the conditions under which a permit is granted. It is understood that:

- a) A permit is issued at the sole discretion of the Issuing Authority. The permit may be refused because of the condition of the road, the culverts and bridges, the nature of other traffic on the road, abnormally heavy traffic during certain periods or for any other reason.
- b) A permit can be withdrawn if the vehicle upon inspection is found in any way not fit to be operated.
- c) During certain periods, such as school holidays or long weekends an embargo may be placed on the issuing of permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

7.11.4 Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the capacity of the vehicles as rated by the manufacturer;
- the load which may be carried by the tyres;
- the damaging effect on pavements;
- the structural capacity on bridges and culverts;
- the power of the prime mover(s);
- the load imposed by the driving axles and
- the load imposed by the steering axles.

7.11.5 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e. loads that cannot, without disproportionate effort, expense or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit.

- Width
- Height
- Length
- Front Overhang
- Rear Overhang
- Front Load Projection

- Rear Load Projection
- Wheelbase
- Turning Radius
- Stability of Loaded Vehicles

7.11.6 Preferred Abnormal load route

The preferred route should be surveyed to identify problem areas e.g. intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that the delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the Contractor, who will modify the road and intersections to accommodate abnormal vehicles. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

Any low hanging overhead lines (lower than 5.1m) e.g. Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 General

It is proposed to establish a 140MW WEF to be located approximately 25km north of Matjiesfontein, on the border of the Western Cape and Northern Cape Provinces.

8.2 Components

In general, each turbine unit consists of a tower, a nacelle (final weight dependent on the supplier and whether the nacelle has gears or not), and rotor blades. It is assumed that all turbine parts will be imported and shipped via the Port of Saldanha.

8.3 Traffic Management Plan

- This TMP has been prepared to enable the identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility
- The Traffic Management Plan has been prepared in respect of the planning phase of the proposed facility. The Traffic Management Plan should be updated prior to the commencement of the construction phase and the operational phase.
- The potential transport impacts imposed by the construction traffic are temporary, short term in nature, and can be mitigated to an acceptable level.

Mitigation measures include:

- ✓ The delivery of components and construction materials to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- ✓ using a mobile batch plant as well as temporary construction material stockpile yards near the proposed site.
- ✓ Transporting site personnel to and from the site by means of busses or minibus taxis. This will reduce the number of trips bound for the site.
- The operation and maintenance phase include the operation and maintenance of the WEF. The envisaged site traffic would be limited to a few light vehicles, transporting approximately 20 employees per day.

The maintenance or replacement of wind turbine components would require a crane and abnormal vehicles. Although abnormal load vehicles would be required, the maintenance or replacement of components can be staggered, and the transportation of the components would therefore take place over a short period of time, presumably delivered in one day.

Furthermore, traffic disruptions can be minimised by transporting the components during off-peak hours. This phase is therefore expected to generate minimal traffic.

- For abnormal load vehicles, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, to ensure that the vehicle can access the site.

8.4 Access Road

- The proposed access roads to the site are located off the R354, located to the east of the site.
- The typical traffic conditions in the area are that of light traffic volumes. It is however still recommended to mitigate any potential traffic impacts as much as possible.
- It is recommended that new access points be located at a minimum of 5 km from access points along the R354. This distance is measured between the centre lines of the access points.

8.5 Haulage routes for wind turbine components

- The proposed haulage route is outlined in Section 6. The route was chosen as the preferred route because it provides the shortest route to the wind farm site, utilises higher order routes as far as possible and minimises travelling through towns.
- It is recommended that the respective haulage company conducts a dry-run to determine the restrictions relevant to the haulage vehicle to be utilised. With some route's road signs may need to be moved, overhead cables may need to be raised and bellmouths may need temporary widening to accommodate abnormal loads. A dry-run will help establish relevant changes specific to the abnormal load truck used to deliver the components and materials.

8.6 Preferred Route for Materials, Plant and Labour

- It is envisaged that the majority of materials, will be sourced from Worcester approximately 160km from the site or alternatively from Cape Town approximately 260 km from the site. The route utilises the N1 and R354 to access the site.
- It is envisaged that the workforce will most likely reside in Sutherland, Matjiesfontein, Touws River or Laingsburg as the closest communities. The travel routes from these towns to the site include the N1 and the R354. These are higher order routes as such geometric limitations are not envisaged.

APPENDIX

D

AVIFAUNA CONSTRUCTION AND OPERATION MONITORING PLAN



Priority Bird Monitoring and Management Programme for the Euronotus Wind Farm Cluster



© RE Simmons

Prepared for



Prepared by:



1 INTRODUCTION

The Euronotus cluster of wind farms, proposed for the rugged Roggeveld mountains north of Matjiesfontein, straddles the Northern and Western Capes, and comprise three, separate, wind farm developments by Red Rocket (Pty) Ltd. These are (from north to south):

- (i) Kareebosch wind farm (60 turbines)
- (ii) Brandvalley wind farm (34 turbines)
- (iii) Rietkloof wind farm (34 turbines)

Red Rocket have proposed and gained Environmental Authorisations (EA) for all three wind farms. This highland area is relatively sensitive in that it holds breeding pairs of two highly collision-prone species, namely:

- **Verreaux's Eagle** *Aquila verreauxii*, a *Vulnerable* Red Data species in South Africa.
- **Black Harrier** *Circus maurus*, an *Endangered* Red Data species globally.

The original 60 turbines of 160-m hub height (HH) proposed by the developer may be reduced to 33 turbines each as they may produce up to 7MW each (from 2.5MW to 5.5MW) in the final layout.

The avian pre-construction sensitivity was first determined for each farm in 2016 (African Insights 2016a,b,c) and re-evaluated by Birds and Bats Unlimited (BBU) in a May 2021 site visit (Birds & Bats Unlimited 2021a,b,c). Due to the sensitivity of the Rietkloof WEF alone, two more avian surveys over six months are planned (July 2021: Birds & Bats Unlimited 2021d) and a final survey in November 2021. The other two WEFs (Brandvalley and Karreebosch) do not warrant these extra visits.

A total of four active Verreaux's Eagle (VE) nests were located in the Euronotus cluster, two of them were newly discovered by BBU in 2020 and 2021:

- **VE nest 1** – 1.5-km south of Kareebosch WEF, and 1.3-km north of the Roggeveld WEF.
- **VE nest 5** – 3.0-km west of Rietkloof WEF.
- **VE nest 6 [new]** – 280-m south of Rietkloof WEF.
- **VE nest 7 [new]** – in northern part of Brandvalley WEF.

A total of two inactive Black Harrier nests were located in this area, both of them suspected in previous site visits (African Insights 2016):

- **BH nest 1** (Jenkins nest) – inactive in northern part of Brandvalley WEF.
- **BH nest 2** (Williams nest) – pair present 4.9-km west of the Rietkloof WEF.

This document lays out a Management Plan for the monitoring of, and mitigation for (where necessary), the Verreaux's Eagles in the Euronotus cluster of wind farms to reduce impacts.

1.1 CONSULTANT'S DECLARATION of INDEPENDENCE

Dr Rob Simmons and Marlei Martins of Birds & Bats Unlimited are independent consultants to Red Rocket (Pty) Ltd. They have no business, financial, personal, or other interest in the activity, application, or appeal in respect of which they were appointed, other than fair remuneration for work performed in connection with the activity, application, or appeal. There are no circumstances that compromise the objectivity of these specialists performing such work.

1.2 QUALIFICATIONS of SPECIALIST CONSULTANTS

Dr Rob Simmons, of Birds & Bats Unlimited Environmental Consultants (<http://www.birds-and-bats-unlimited.com/>) was approached to undertake the specialist avifaunal management plan to determine possible impacts and appropriate mitigations at the Euronotus Cluster of renewable energy facilities, Western Cape. Dr Simmons is an ecologist and ornithologist, with 30 years' experience in avian research and impact assessment work. He has published over 110 peer-reviewed papers and two books, (see <http://www.fitzpatrick.uct.ac.za/fitz/staff/research/simmons> for details).

He was the State Ornithologist for Namibia's Ministry of Environment for 14-years and has undertaken more than 50 avian impact assessments in Angola, Namibia, South Africa, and Lesotho. He also undertakes long-term research from the FitzPatrick Institute, UCT, on threatened species (raptors, flamingos, and terns) and the impacts of domestic cats on wildlife. He supervises PhD students studying the ecology of threatened raptors (harriers and vultures) and statistical approaches to recording avian impacts at wind farms.

Marlei Martins, co-director of Birds & Bats Unlimited, has 10 years' consultancy experience in avian wind and solar farm impacts as well as environmental issues, and has been employed by several consultancy companies throughout South Africa because of her expertise in these fields. She has published papers on her observations including a new species of raptor to South Africa (<http://www.birds-and-bats-unlimited.com/>).

1.3 TERMS of REFERENCE

The Terms of Reference for the Verreaux's Eagle and Black Harrier Management Plan for the Euronotus cluster of wind farms are to:

- Compile a monitoring and management plan for the breeding Verreaux's Eagles and Black Harriers within the Euronotus WEF site.
- This is designed such that any adverse impacts on the harriers and eagles in terms of (i) displacement or (ii) deaths from the turbines or related infrastructure can be detected timeously.
- Any impacts can be mitigated in an adaptive management strategy within a few weeks of occurring.

2 STUDY AREA and OBJECTIVES

The Euronotus cluster of wind energy facilities (WEFs) lie 30-km north of Matjiesfontein in the Roggeveldberg; a north-south lying mountain range rising to about 1 500-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°C in summer to 0.9°C 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 Baboon, Klipspringer, Red Rock Hare, Mountain Rhebok, and a raptor component reported on below.

An Environmental Management Plan must satisfy the following aims (SANBI 2020):

- Outline mitigation measures and environmental specifications which must be implemented for the planning, construction, rehabilitation, and operation phases of the projects to minimise the extent of environmental impacts.
- To manage environmental impacts associated with the wind energy facilities.
- To ensure that the construction, operational, and decommissioning phases do not result in undue, or reasonably avoidable adverse, environmental impacts and ensure that any potential environmental benefits are enhanced.
- To identify roles and responsibilities for the implementation of the measures.
- To propose mechanisms for monitoring compliance and preventing long-term or permanent environmental degradation.
- To facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the EIA process.

2.1 SUMMARY of VERREAUX'S EAGLE NESTS in the EURONOTUS CLUSTER

From surveys in 2013-2016, (African Insights) followed by a re-appraisal in 2020 and 2021 by Birds & Bats Unlimited (BBU) covering all three wind farms (Kareebosch, Brandvalley and Rietkloof) we were able to locate and monitor **four Verreaux's Eagle nest sites** on cliff faces and **two (one active and one inactive) Black Harrier nests** in wetter areas in the otherwise arid Karoo veld.

All the nest locations are shown in Figure 1 in relation to the proposed turbine layout. All flight activity were given in previous reports and will not be repeated here. Nest numbers are based on original numbers given by African Insights and are not continuous.

❖ *VE nest No 1 (Kareebosch WEF)*

This nest was discovered by African Insights in their original surveys and lies at the edge of the Roggeveld wind farm (not part of the Euronotus cluster) and the southern end of the Kareebosch WEF. This is not known to have been active in either 2013, or during our monitoring surveys, possibly due to drought conditions present from 2013-2016.



Photo 1: Verreaux's Eagle nest No 1 lies at the south end of the Kareebosch WEF and has never been recorded as active (breeding started) but was attended by a pair of eagles in 2020/2021. This nest was located at S32.867250° E20.503600° and a smaller, alternate, nest occurs within 100-m of it.

VE nest No 5 (Rietkloof WEF)

This Verreaux's Eagle nest was discovered by African Insights (2013) and is visible on a cliff face from the R354 tar road. It lies 3-km east of the Rietkloof wind farm on the farm Hartjieskraal. The nest has always been attended by a pair of eagles, but no nestling was evident in 2021.



Photo 2: VE nest No 5 visible from the R354 tar road and occurring on the farm Hartjieskraal, 3-km east of the Rietkloof WEF. This nest area comprises three alternate nests, all found on different portions of the same cliff S33.036550° E20.582367°. Two of the three nests are shown below.



❖ **VE nest No 6 (Rietkloof WEF)**

This Verreaux's Eagle nest was discovered by BBU in July 2021 and comprises three alternate nests on a steep cliff face at S33.084949° E20.441105° in the furthest south-west corner of the Rietkloof WEF.

This nest is one of the most problematic discoveries as it lies within a few hundred metres of proposed turbines.

Drone footage of the cliff face in July 2021 revealed a perched adult but no eagles sitting on eggs at any of the three nest structures. High aerial activity was recorded here in July 2021 and additional mitigations are required for the proposed turbines that lie a few hundred metres from this new nest.



Photo 3: VE nest No. 6 comprises three different structures on the same steep cliff at S33.084875° E20.441221° a few hundred metres south of the Rietkloof WEF.

The circled nest left, shows whitewash (faeces) on the rock face behind it indicating that it may have been used in the previous breeding season.

The second nest, below, is difficult to see, and shows no whitewash.



❖ **VE nest No 7 (Rietkloof WEF)**

This nest was discovered in May 2020 when the area was used as a Control site for the Roggeveld WEF by BBU in our assessment. It lies within the northern section of Brandvalley wind farm. No breeding activity has been recorded here despite birds roosting within 100-m of the nest in 2021 (bottom photo).



Photo 4: Nest No 7 – arrow shows the undiscovered nest neatly tucked into the rock face and easily overlooked. It was discovered in May 2020 by BBU.

This nest is located at S 32.933397° E20.434472° and no other alternate nests were present. The adult (left) was only revealed by drone flight below the cliff in July 2021.

These four eagle nests require close attention and monitoring, and the protocol for that is laid out below.

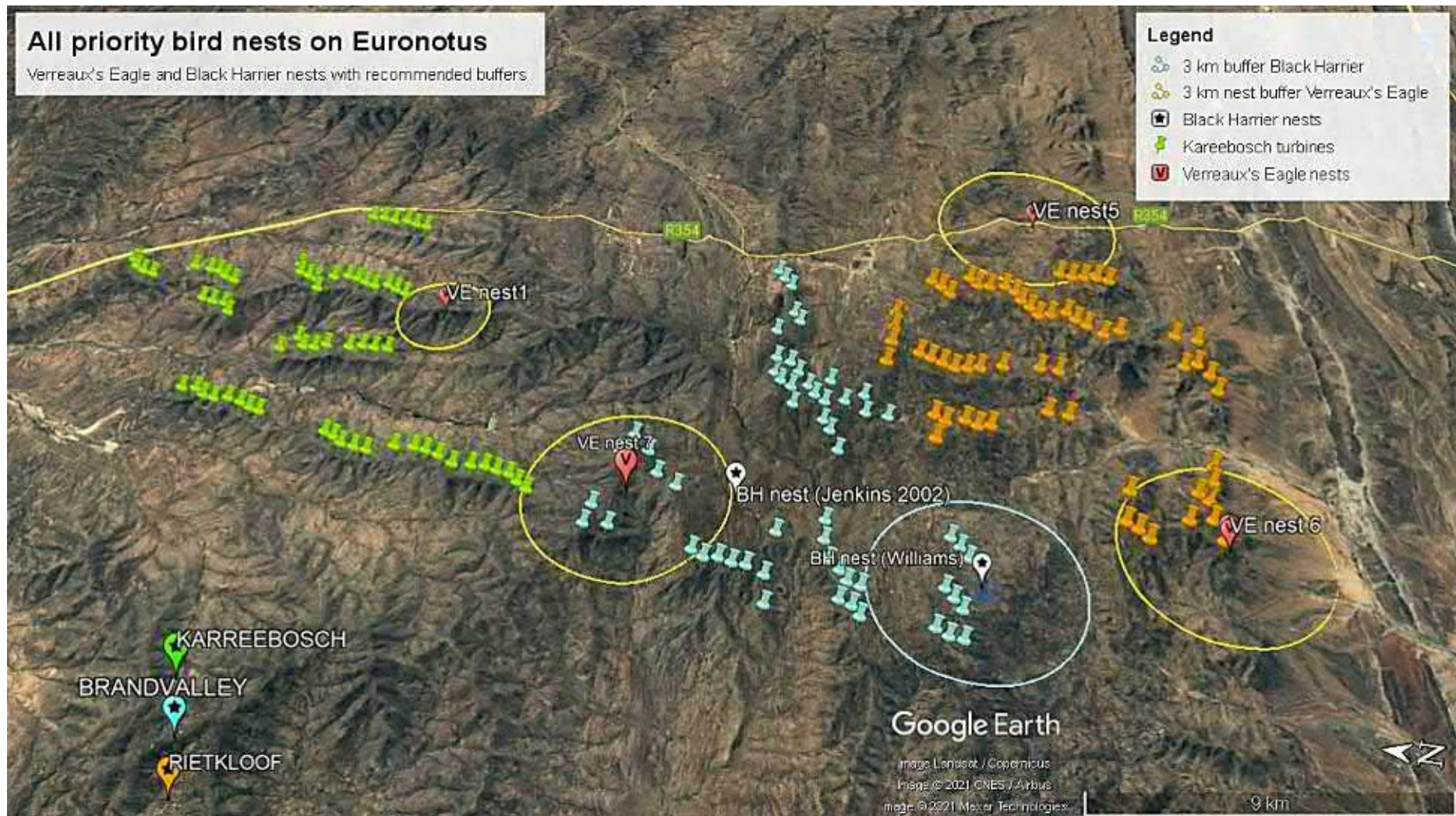


Figure 1: All (4) Verreux's Eagle (= red balloons) and (2) Black Harrier nests (= white balloons) in the Euronotus cluster, with their recommended Birdlife buffers of 3-km. The authorised turbine design may be less than the 60 turbines (= green, blue, and orange pins), shown here and may be reduced to 33 for each wind farm. No buffer is shown for the BH (Jenkins 2002) nest as no activity has been recorded at this nest in 2020 or 2021.

2.2 SUMMARY of BLACK HARRIER NESTS in the EURONOTUS CLUSTER

As *Endangered* Red Data species highly susceptible to collision with turbines, Black Harriers also require special attention (Simmons et al. 2020). Two nest sites are known within the Brandvalley wind farm.

❖ *BH nest No 1 (Williams nest – Brandvalley WEF)*

This Black Harrier nest area was discovered in 2016 during surveys by African Insights (2016). It is located on the southern border of the Brandvalley WEF.

The nest was re-visited by BBU in both July and August 2021. A Black Harrier pair were recorded in July, and a new nest, with no eggs, was found in August (Photo 5). This nest requires monitoring as laid out below.



Photos 5 a+b: Black Harrier Nest No 1. The nest on Brandvalley was suspected by African Insight in 2013 but remained undiscovered.

In July 2021 a Black Harrier pair were recorded at S33.024364° E20.416442° in juncus vegetation within Karoo scrub.

The nest (left) was found complete, but without eggs, in August 2021 by BBU.

It is possible that it was depredated by a terrestrial predator as the male remained in the area. The outcome remains unknown, and the area will be monitored again in our November 2021 surveys in case the pair decide to breed again.



Photos 6 and 7: Black Harrier nest No 2 – this second nest site on Brandvalley was found by Avisense in 2010 during initial field work but was not investigated by African Insights (2013). No birds were recorded here when we visited in May 2020 and July 2021. It appears ideal habitat however, with juncus vegetation (below) in a drainage line within Karoo scrub. This nest area must be surveyed according to recommendations in Birdlife’s Black Harrier guidelines (Simmons et al. 2020).



3 MONITORING PROGRAMME

Given that, by April 2021, 22 Verreaux's Eagles (VE) fatalities had been recorded at all South African wind farms (S Ralston-Paton and M Murgatroyd unpubl data), the monitoring (and mitigation of impacts) at wind farms for this *Vulnerable* species is of the highest priority.

Equally important is the monitoring of globally *Endangered* Black Harriers because of their susceptibility to wind farms (Simmons et al. 2020) and due to its very small global population of just over 1000 individuals, the population is highly sensitivity to additive fatalities from wind farm (Cervantes Peralta et al. in press).

In the Euronotus cluster of wind farms in the Roggeveld environment, four active Verreaux's Eagle nests are present as described above and their positions relative to the WEF shown in Figure 1. From previous experience with eagle nests and monitoring programmes across South Africa we recommend the optimal timing of visits to the VE nests as per 3.1 below.

All observations must be undertaken by qualified ornithologists familiar with raptors and, eagles in particular.

3.1 TIMING of SITE VISITS

- **Winter** – egg-laying (May-June) three full field days must be spent observing all possible nests at the start of eagle breeding, to determine nest activity and collect some adult flight data. Nests must not be visited or approached closer than 150-m.
- **Spring** – small young (September-October) three full days must be spent observing the young on the nests and visiting other eagle sites to determine activity/success of these nests.
- **Summer** – (November-December) three full days to record the first flights of fledged youngsters at active and successful nest.
- **Late Summer** – (January-February) three full days to record extended juvenile flights to determine if they venture near any turbines.

For each site visit, an Interim Report must follow which details:

- (i) the activity **status of the nest** (active/inactive) and stage (eggs, nestling, success/failure);
- (ii) the **flight paths** of adult eagles (and juveniles when they are airborne);
- (iii) special attention must be made for **flights near spinning turbines** (avoidance behaviour, attraction to, or impact by the blades); and
- (iv) report any **deaths** detailing time, turbine number, behaviour, identity of the adult or juvenile, resident or floater. These must be accompanied by photographs of the carcass *in situ*, with GPS point clearly marked.

As per the BARESG guidelines a **carcass monitoring programme** should be simultaneously instituted to systematically record all avian deaths (not just eagles) over 12-24 months. This must follow guidelines laid out in the Wind Farm guidelines (Jenkins et al. 2015).

We understand that Luke Strugnell (Ecological Logistics) is undertaking these surveys for the Roggeveld wind farm, and we are happy to liaise with him over protocols, timing, and avian collision-victim identifications.

4 MANAGEMENT and MITIGATION PROGRAMME

4.1 LAND-OWNER MANAGEMENT

The Management and Mitigation Programme must be adaptive, with a fast response time, if it is found that eagles (or other Red Data species) are being killed. This applies to both the wind farm *and* the landowner's management practices.

If the latter is not included then it renders redundant all observations, data capture, identification of risk areas, discussions with the developer, and the subsequent efforts by Red Rocket to reduce impacts by micro-siting turbines or reducing numbers of turbines.

Thus, site and nest inspections must detail any suspected interference. That is, the sudden loss of an adult/adults, and/or the disappearance of the nest, or its contents, must be reported immediately.

Given the importance of safe-guarding all nests we suggest that the **Lease Agreement** – and the Environmental Authorisation – must have a clause to formalise the non-interference of adult eagles (i.e., shooting, poisoning, persecution, etc) and the nests, and/or their contents. The landowner must be made fully aware of this clause, and there must be consequences if it is broken.

To ensure compliance we further suggest that the Contractual Agreement with the landowner is put on hold, and they do not receive remuneration for a period to be determined by the developer if the evidence is overwhelming that eagle interference, or death, has occurred.

Given that such evidence is hard to prove we suggest that, as part of the management programme, trail cameras (camera-traps) are mounted at the Verreaux's nests, or nearby, to ensure that if interference occurs, it is captured on camera.

For our part, to reduce disturbance during surveys, we plan to use a small light-weight drone (DJI Mavic-mini drone) to check nests. This has been employed successfully at some Witberg eagle nests and has not disturbed the breeding eagles there unnecessarily.

4.2 WIND-FARM MANAGEMENT

The main goal of the wind farm Management Plan is to proactively seek solutions as soon as:

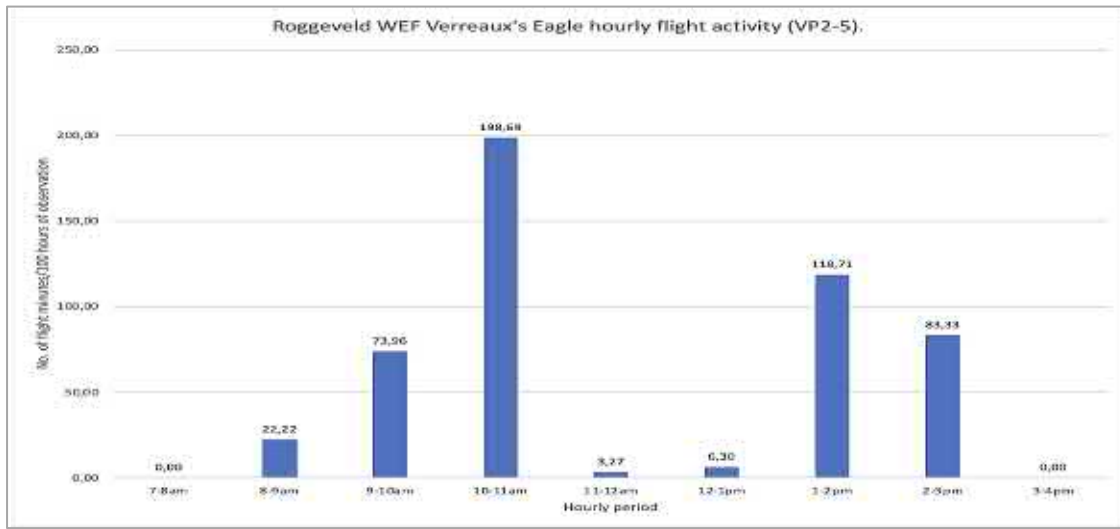
- (i) short term issues occur – such as eagle fatalities, due to impacts with turbines; or
- (ii) long-term issues are detected – such as the displacement of eagles or other species over several years.

To this end we suggest:

- Regular and systematic carcass searching must be implemented across the full site as laid out in the Best Practise guidelines (Jenkins et al. 2015).
Given that over **20 Verreaux's Eagles** and eight **Black Harriers** have been killed by South African wind farms to April 2021 (S Ralston Paton in litt) and this Euronotus site has four Verreaux's Eagle nests, and possibly two Black Harrier nests, it is important that live-bird surveys and carcass-searching should be undertaken for at least 24 months.
- Given the relatively small number of turbines (34 on Rietkloof and Brandvalley given the revised layout) we suggest that all turbines are surveyed by carcass-searching teams on a 2-weekly basis, year-round.

The tiers of mitigation to avoid large raptor impacts are:

- (i) the shutting down of certain turbines at certain times of day to avoid the most frequent flight times and flight areas of the Verreaux's Eagles (Figure 2). This is designed to be used if the turbines are operational prior to other forms of mitigation being enacted
- (ii) an observer-lead Shut down on Demand (SDOD) team on site.
- (iii) BBU had recommended coloured (black or red) blade mitigation as the second-tier mitigation of choice. This may be possible for the Euronotus Cluster given that blades have not been manufactured.
- (iv) The last mitigation recommended is the use of shut-down on demand technology (e.g., DT-Bird and Bioseco). This technology analyses the form and flight path of birds heading towards operational turbines and shuts down the turbine if the species is identified as a *Threatened* or collision-prone species.



WINTER (May-Jun-Jul)														
Hours	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	20:00-6:00
Operation and Risk	Night	Dawn											Dusk	Night

SPRING, SUMMER, AUTUMN (Aug-Sep-Oct-Nov-Dec-Jan-Feb-Mar-Apr)														
Hours	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00	20:00-6:00
Operation and Risk	Dawn													Night

Figure 2: A summary of the hours when turbines can be operational (green), and should not be operational (red), based on seasonal and hourly flight times of Verreaux's Eagles in the Roggeveld WEF during the construction phase (top bar graph) and in Beaufort West (Davies 1994). This represents the first tier of mitigation prior to observer-lead SDOD on site.

4.3 PROGRAMME in case of EAGLE or HARRIER FATALITIES

Given the multiple tiers of mitigation to be put in place arising from our records and analysis of the behaviour of the eagles and the harriers, fatalities are not expected. However, experience has shown that even WEFs with no record of eagles passing through the farm during pre-construction surveys, can experience fatalities (Ralston Paton and Murgatroyd in prep).

Thus, the adaptive response recommended for Red Rocket (Pty) Ltd is to:

- (i) Investigate, over 12 months, which turbines are responsible for more than one eagle or harrier death.
- (ii) Investigate weather conditions at the times of the deaths.
- (iii) Investigate the time and seasons when most eagle and harrier deaths occur. This has been found to peak in August, from the 22 deaths recorded by Ralston Paton and Murgatroyd (in prep) and in October-November from the 6 Black Harrier deaths recorded at Jeffreys Bay WEF (Simmons et al. 2020).
- (iv) If patterns emerge from a statistical assessment of the factors involved, then additional mitigation measures are recommended – in the form of shut-down-on-demand (SDOD). This method shuts down individual problem turbines at specified times of day, in specified seasons when and weather conditions.

As an example:

- if turbine WTG(n) is found to have caused the deaths of two Verreaux's Eagles over a 12-month period at the Witberg WEF, and
- most other deaths at other turbines within the Witberg WEF (and other WEFs in South Africa) have occurred between 10:00 and 13:00,
- mainly in the month of August,
- during windy and misty conditions, then

we recommend that WTG(n) is shut down temporarily from 10:00 to 13:00 on any August day in which misty but windy conditions prevail.

At all other times the turbine can function as normal.

We recommend that Red Rocket (Pty) Ltd, in conjunction with Birdlife South Africa (and their fatality data), jointly employ a statistician to analyse all Verreaux's Eagle and Black Harrier deaths, the conditions under which fatalities occurred, and look for significant patterns in terms of weather, topography, time of day, and season.

These analyses can assist in reducing VE and BH impacts at other WEFs by automatically shutting down when all these conditions occur.

5 CONCLUSIONS

Eagles and Black Harriers can be affected in several ways by the construction, operation, or de-commissioning of wind farms by:

- (i) direct mortality; or
- (ii) displacement by disturbance caused by the wind farm; or
- (iii) changes in habitat, or displacement from hunting grounds in the wind farm.

One effect we expect to see is a reduction in the frequency of breeding or the success of breeding if the wind farm has direct (fatality) or indirect (displacement) effects (Walker et al. 2005, Wilson et al. 2017, Watson et al. 2018).

Thus, the carcass monitoring programme, in conjunction with the Verreaux's Eagle and Black Harrier nest monitoring, is important to determine if deaths coincide with reductions in productivity or nest use.

Here we have given an adaptive management plan to monitor the eagle and harrier nests and the breeding outcomes, at the same time as assessing any fatalities.

Should deaths occur (which are not expected given the multiple tiers of mitigation) then we recommend that statistical analyses of biotic and abiotic factors be undertaken – of all fatalities of Verreaux's Eagles and Black Harriers from all wind farms around South Africa – to determine if patterns occur that will assist mitigation by temporarily shutting down problem turbines at such times.

Given that landowner attitudes towards eagles are often negative in a Karoo setting, the landowner must also understand that persecution of the eagles will have consequences. Remote nest monitoring through trail camera installations will assist in reducing the likelihood of this and surveying the eagle and harrier nests with small drones will also assist in reducing stress from the nest monitoring work.

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Birds & Bats Unlimited

Dated: 29 October 2021

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APPENDIX

E BAT MONITORING PLAN



BAT MONITORING PROGRAMME FOR THE OPERATIONAL PHASE

1. Purpose

At present there is no credible knowledge concerning how South African bats are affected by the installation and operation of wind energy turbines. Therefore, a post-construction bat monitoring study is required. The purpose of this document is provide the principles for bat monitoring during the operational phase of the wind energy facility. This document therefore serves as a framework.

2. Aim of Monitoring

The aim of post-construction bat monitoring would be to analyse changes in bat activity patterns, determine fatality at sites where impacts are predicted following installation and the operation of the turbines and provide additional information on mitigation.

If the negative impact of the turbines is significant enough to have impacted the ability of the bat population to survive, reproduce, or be affected significantly in their local distribution or abundance, this puts the population of bats at risk. This in turn runs the risk of infringing the National Environmental Management: Biodiversity Act 10 of 2004, unless mitigation is implemented.

The first two years of wind farm operation is the vital period in which to collect post-construction data as this is when any change in bat activity and mortalities are most likely to occur.

3. Monitoring Protocol

The bat monitoring protocol and exact methodology to be implemented, shall be detailed in a Method Statement prepared by the bat specialist for approval by the ECO prior to commencement of the operational phase.

4. Adaptive management approach

A precautionary and adaptive mitigation management approach must be adopted based on the results and certainty of results of the post – construction bat monitoring program. Mitigation management and mortality surveys may possibly be altered significantly as technological advancements can cause other methodologies to be more favourable.

5. Carcass Search Team and Landowner Consultation

Before the carcass search commences and before a carcass search team is appointed, the Landowners/ Farmers must be consulted. The consultation should outline the methods of the carcass searches. Details, e.g. frequency of searches, contact/responsible persons, access control, etc. must be discussed and agreed with the Landowners/ Farmers. To ensure the safety of Landowners/ Farmers it is also recommended that a background check is done on all employees/ members of the carcass search team before they are appointed and that proof of this is kept. The carcass search team should be introduced to the Landowners/ Farmers. Landowners/ Farmers should at all times be kept informed of the whereabouts of the carcass search team. All relevant EMPr conditions, e.g. no hunting/ killing of animals, no fires on site, no camping on site, etc. will apply to the carcass search team. They must therefore be inducted to the Wind Farm and made aware of all rules, regulations and code of conduct. Landowner Requirements agreed upon will be signed and form part of this Report.

This document may be updated as and when required.

APPENDIX

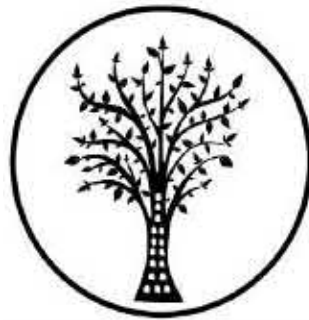
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HERITAGE CONSERVATION
MANAGEMENT PLAN



HERITAGE CONSERVATION MANAGEMENT PLAN

for the approved Brandvalley WEF near Matjiesfontein in the
Western and Northern Cape



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Prepared by CTS Heritage

December 2021



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1. INTRODUCTION

Brandvalley 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 Laingsburg, on the border of the Northern Cape Province and the Western Cape Province in South Africa. The authorised WEF is located in the Karoo Hoogland, the Witzenberg (Ceres) and the Laingsburg Local Municipalities, which fall within the Namakwa, the Cape Winelands and the Central Karoo District Municipalities, respectively. It comprises of up to 58 turbines, with a generating capacity of between 1.5MW and 4MW each.

The Brandvalley Wind Energy Facility (WEF) is proposed on the border of the Northern Cape and Western Cape along the R354 road which connects Matjiesfontein to Sutherland. This project is the third phase (Phase 3) of a series of projects which started in 2011 with the proposed establishment of the Roggeveld Wind Energy Facility (CaseID 473). The original Roggeveld WEF project was broken down into smaller WEFs in 2013. The first of these was the Roggeveld Wind Farm Phase 1 (CaseID 4503). This was followed by the Karreebosch Wind Energy Project (Roggeveld Phase 2) (CaseID 6884) in 2014/2015. The proposed Brandvalley and Rietkloof WEFs are Phases 3 and 4 of the original project although the extent of the farms affected by the various developments have changed since the inception of the project.

The authorised Brandvalley Wind Energy Facility (WEF) falls within both the Western Cape and the Northern Cape and as such, falls under the jurisdiction of two separate Heritage Authorities. Heritage Western Cape (HWC) is the authority with the competence to manage heritage resources in the Western Cape and the National Authority, the South African Heritage Resources Agency (SAHRA) manages heritage resources in the Northern Cape.

On 2 September 2016, SAHRA issued a Final Comment on the Brandvalley WEF development in terms of section 38(8) of the NHRA. In this comment, SAHRA endorsed and supported the recommendations made in the Heritage Impact Assessment and made a number of recommendations (see attached Annexure A). SAHRA's Final Comment stated:

- If the layout of the turbines, roads and other associated infrastructure proposed for the Northern Cape section of the development is altered, a heritage walk-down including a palaeontological walk-down must be conducted prior to construction. A Walk-Down report must be submitted to SAHRA for comment. No construction may commence without comments from SAHRA;



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- It is noted that Turbine 42 has now been excluded from the proposed revised layout. Previously issued comments noted an indirect impact on palaeontological resources, as Turbine 42 would have been located approximately 100m from plant stem casts or burrows (Loc 194). As this turbine has been removed, the impact should decrease, however careful monitoring of the area near Loc 194 during the construction of the access roads must be conducted by the ECO for any additional plant stem casts or burrows;
- If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Itumeleng Masiteng/Mimi Seetelo 012 320 8490), must be alerted immediately. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required.
- SAHRA must be informed if the Environmental Authorisation for the project is granted and the relevant documents should be uploaded to the case file.

On 20 October 2016, HWC issued a Final Comment on the Brandvalley WEF development in terms of section 38(8) of the NHRA. and made a number of recommendations (see attached Annexure B). HWC's Final Comment stated:

The Committee supports the recommendations of the HIA, subject to the following conditions:

- The 20-30 metre buffers proposed in the archaeological specialist study for archaeological sites (BV SA1, BV SA2, BV SA3, BV SA4, BV SA5, BV SAZ, BV SW2, BV SW16), graveyard (BVGI) and built environment sites (BV HS3, BV HS5 and BV SW12) should be implemented and respected throughout the lifetime of the project, unless mitigation measures are undertaken in terms of a workplan;
- 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 highly sensitive palaeontological area (very rare tetrapod i.e. terrestrial vertebrate) burrows and associated skeletal remains within the Abrahamskraal Formation along the

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Kabeltou Pass (Muishond Rivier 161) in the northwest of the study area should be regarded as a no-go area at all times;

- 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 and must monitor all major surface clearance and deeper (>1m) excavations for fossil material (bones, teeth, petrified wood etc.) in the construction phase; The ECO must report as mentioned 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 Brandvalley WEF on 23 November 2016. 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

<i>EA Requirements</i>	<i>Implementation</i>
A conservation management plan as required by SAHRA	This report
A 30m buffer must be applied around all identified archaeological sites	Adhered to in the final layout
After initial vegetation clearance has taken place but before the ground is levelled for construction, a professional palaeontologist must undertake a walkthrough and document any identified paleontological findings. The survey/walkthrough must be conducted as per the South African Heritage Resources Agency (SAHRA) requirements.	At construction
Should any archaeological sites, artefacts, paleontological fossils	During construction



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or graves be exposed during construction work, work in the immediate vicinity of the find must be stopped, SAHRA must be informed and the services of an accredited heritage professional obtained for an assessment of the heritage resources to be made	
Construction managers/foremen must be informed before construction starts on the possible types of heritage sites and cultural material that may be encountered and the procedures to follow when they find sites.	At construction
All buffers and no-go areas stipulated in this report must be adhered to for both the facilities and all roads and powerlines.	During construction
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) should be kept out of the buffer zones.	During construction
The final layout should be shown to the appointed archaeologist before implementation to confirm that all significant heritage resources have been adequately protected.	This report satisfies this requirement

1.1 Location of Site

The Brandvalley WEF is nearly 30km 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 via Brandvalley and Fortuin farms or via Barendskraal farm when driving up through the kloofs on the southwestern end of the area. The Snydersberg is a prominent landmark in the northwestern area.

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1.2 Ownership and responsibility for site

Landowners

Land Owners	Farm Name	Telephone	Email
Mooi Nooientjies Trust c/o Christo Matthee	Portion 1 of Barendskraal 76	021 883 2919	christom@vodamail.co.za
Ou Mure Boerdery (Pty) Ltd c/o Hendrik Lourens van der Westhuizen	The Remainder of Barendskraal 76	021 880 0860	polla@temowp.co.za
Standvastigheid Familie trust c/o Francois Conradie	Remainder of Farm Brandvailey 75,	023 551 1817	fdconradie@roggeveld.co.za
A D V Le Roux Family Trust c/o Esti Le Roux	Portion 1 of Farm Brandvalley 75,	023 004 0138	fortuin@roggeveld.co.za
	Remainder of Farm Fortuin 74		
	Portion 3 of Farm Fortuin 74		
Kabeltouw Trust c/o Cornelius von der Heyden	Remainder of Farm Kabettouw 160	023 347 7577	cornix@telkomsa.net
	Portion 1 of Farm Muishond Rivier 161		
Vander Vyver (CJ) Trust	Remainder of Farm Muishond Rivier 161	083 381 7281	dvdv@lantic.net
	Portion 1 of Farm Fortuin 74 (Ou Mure)		
JJ le Roux Familie Trust	Farm Rietfontein 197	023 004 0230	klipfontein@breede.co.za

Environmental Authorisation (EA) Holder

The EA Holder would be the Project Company, Brandvalley Wind Farm (Pty) Ltd, who, through the EA acquires the right to develop the project (considering all other permits and consents have been acquired from all other relevant competent authorities). The Project Company does not however own the land on which it intends to develop. Although the landowners benefit from the revenues generated by the Project Company and therefore by extension the EA, they do not form part of the Project Company's management structure. The benefit therefore remains financial/commercial rather than organisational.

Implementation of EA

The person responsible for the implementation of the conditions in the EA would be the contractors during the construction phase. However, any non-compliance would fall onto Brandvalley Wind Farm (Pty) Ltd as the holder of the EA. All non-compliance would be audited by an independent ECO which



would be appointed by Brandvalley Wind Farm (Pty) Ltd. Brandvalley Wind Farm (Pty) Ltd would operate the facility. For decommissioning, the responsible parties would again be the contractors and audited by ECO but overall compliance would fall on Brandvalley Wind Farm (Pty) Ltd.

Heritage Authorities

The area proposed for development is located in the Western and Northern Cape.

All impacts to heritage resources in the Western Cape are managed by Heritage Western Cape. Any impacts to heritage resources are subject to the recommendations and best practice processes established by Heritage Western Cape (HWC) for archaeology, palaeontology, the cultural landscape and other kinds of heritage resources.

All impacts to archaeological and palaeontological heritage resources in the Northern Cape are managed by the South African Heritage Resources Agency (SAHRA). Any impacts to archaeological and palaeontological heritage resources in the Northern Cape are subject to the recommendations and best practice processes established by SAHRA for archaeology, palaeontology, the cultural landscape and other kinds of heritage resources.

All impacts to built environment heritage resources in the Northern Cape are managed by the Northern Cape Heritage Resources Authority (NCHRA), previously called Ngwao Boswa jwa Kapa Bokone. Any impacts to built environment heritage resources are subject to the recommendations and best practice processes established by the NCHRA for the built environment.

Although the project description notes that the Brandvalley WEF development is located in both the Northern and western Cape, the maps indicate that all of the proposed infrastructure is located in the Western Cape. As such, in the section below, we only refer to Heritage Western Cape with regard to Site Management.

1.3 Site Description

The Brandvalley WEF is nearly 30km 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 via Brandvalley and Fortuin farms or via Barendskraal farm when driving up through the kloofs on the southwestern end of the area. The

Snydersberg is a prominent landmark in the northwestern area.

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.

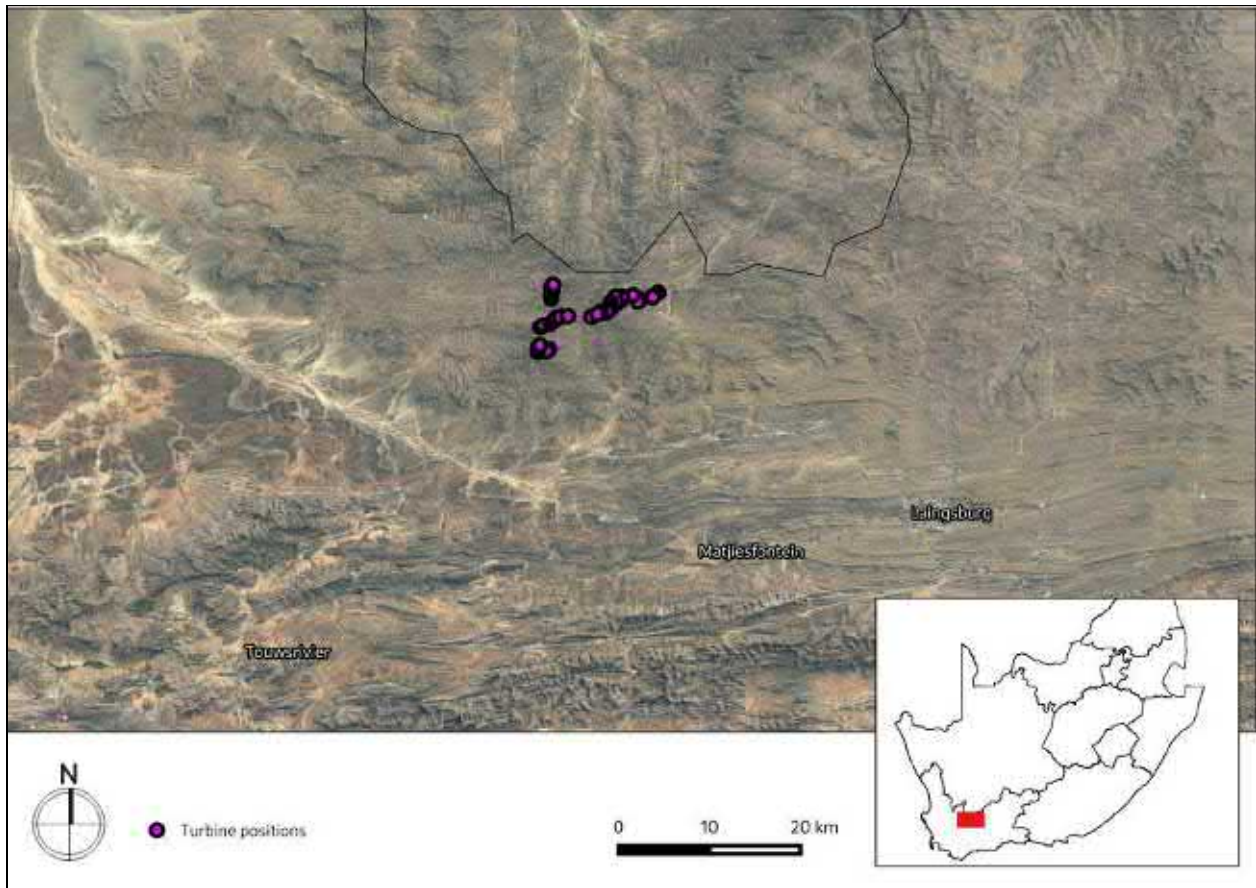


Figure 1: Location of Site

1.4 Statement of Site significance

General points on significance

The cultural significance of a site determines the appropriateness and extent to which protection measures are required. The value or importance of the site to society in general, to specific past and present groups, and to posterity, includes:

- Spiritual/social value - the traditional and consistent use of a site for religious, spiritual or social purposes, even if the religious use no longer continues
- Aesthetic/artistic value - the recognition by scholars and the general public that a cultural site represents a high point of creative achievement
- Historic value - the achievements and knowledge of the past as vehicles for enlightening the present and future
- Scientific/research value - the site, or feature within the site, providing a source of knowledge that is unobtainable elsewhere

Since cultural significance can be interpreted differently by different people, and evaluations can change with time and circumstances, it is important to assess the significance of a site in terms of:

- The importance of a particular site in relation to other sites so as to decide on the appropriate level of management
- Ascertaining what all these values are so as not to inadvertently damage one value that a site has, while preserving another.

Details of the grading system used are provided in section 3 of the NHRA. In addition, the system outlined in Heritage Western Cape's Guideline for Grading: Implications and Management was used.

As per this system, heritage significance is indicated on a sliding scale:

- Grade I - National Significance
- Grade II - Regional/Provincial Significance
- Grade IIIA - High Local Significance
- Grade IIIB - Moderate Local Significance
- Grade IIIC - Low Local Significance
- NCW - Not Conservation-Worthy

Significance of Heritage Resources

The area proposed for the Brandvalley WEF is located immediately adjacent to the proposed Karreebosch and Rietkloof WEFs and is located within a REDZ area. A number of heritage resources located within the Brandvalley WEF development area were identified through the initial Heritage Impact Assessment process for the Brandvalley WEF (Booth, 2016) and the subsequent walkdown of the final layout for the Brandvalley WEF (September 2021). All of the identified heritage resources have been graded in terms of the provisions of section 3 of the National Heritage Resources Act and the HWC Guide on the Implications of Grading (2016). As such, the grading methodology is not repeated here. These resources are listed below in Table 1 in Appendix 2.

While not exhaustive, the list of known heritage resources located within the Rietkloof WEF development area provides insight into the nature and significance of the heritage resources common in the broader area.

As per the intentions of the NHRA, the grading of a heritage resource is indicative of its cultural significance and therefore informs its management and conservation strategies.

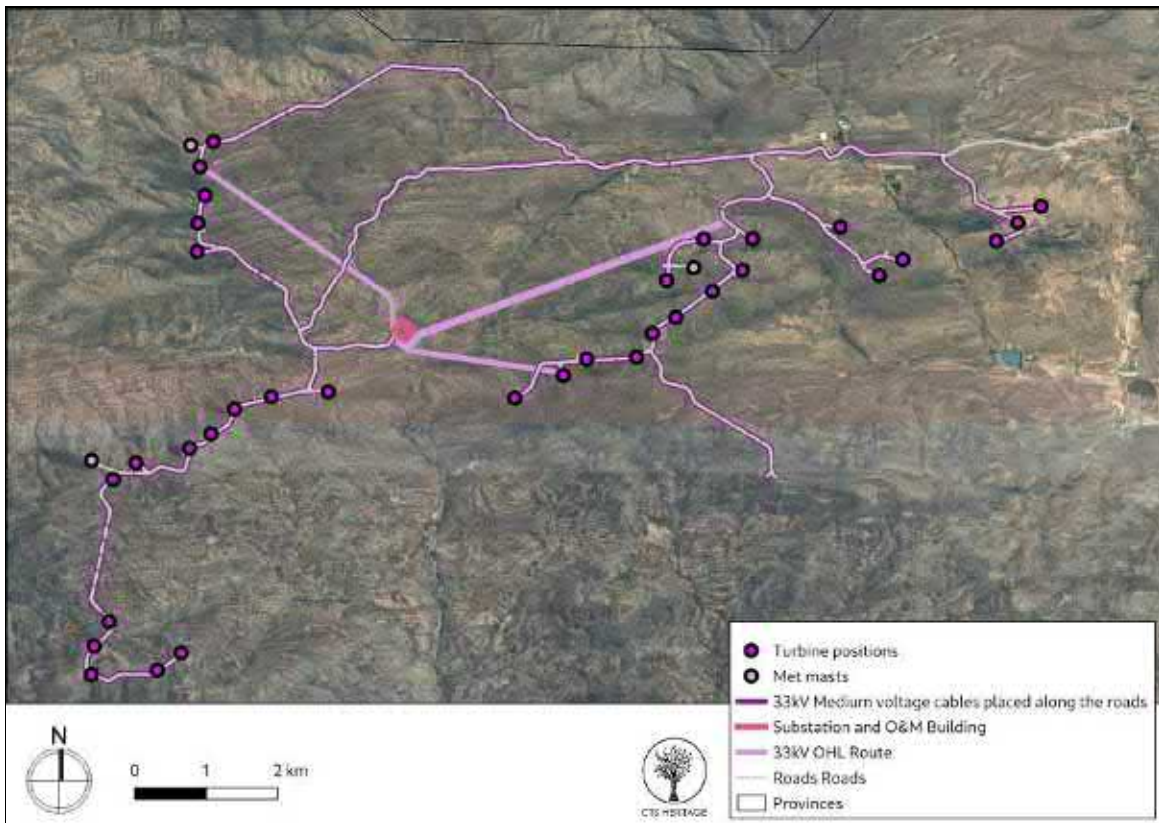


Figure 2: Final WEF Layout

1.5 Objectives of Management Plan

The purpose of this management plan is to guide the activities affecting the heritage resources to retain their significance by conserving it for future generations. A management plan is a living document in the sense that it can be updated as the situation changes and should therefore be reviewed regularly.

This management plan identifies:

- **what needs to be managed** - by surveying and recording the archaeological site in detail and summarising information on the location of sites and what they comprise;
- **who will manage the heritage resources** - by listing the people who have interests in the place and might be involved in its management;
- **the significance of the heritage** in relation to other local, provincial and national sites because the plan is designed to retain this significance;
- **key issues that must be addressed** to retain the significance through consultation with stakeholders;
- **the goals, objectives and strategies** for management and how they will be implemented; and
- **a documentation and monitoring plan** for the ruins so that any changes can be detected and the steps that have been taken can be documented.

1.6 Revision of Plan

The management plan should be reviewed every 5 years and revised as required, or as necessary when circumstances require it. Any revisions must be submitted to HWC and SAHRA for approval.

2. RECORDING AND RESEARCH

2.1 Objectives of Recording and Research

Thorough recording of archaeological sites allows site managers and heritage authorities to manage and identify the changes taking place at a site over time. The heritage resources located within this development have been previously recorded through the Heritage Impact Assessment conducted for the Brandvalley WEF (Booth, 2016) and through the Heritage Walk Down reports conducted for the Brandvalley WEF (CTS Heritage, 2021). It is anticipated that proposed clearance of vegetation and excavation associated with the construction of the turbines and their associated infrastructure may reveal additional heritage resources that are currently hidden by the vegetation and surface soil.

The heritage resources identified within this site retain potential for further academic study and as such, must be conserved with this in mind. Further academic investigation could provide insight into the evolution of settlement of the Karoo that has not yet been thoroughly documented.

Detailed research on the intangible heritage resources of the study area has not been done as this falls outside the requirements of the approvals process. Notwithstanding these risks and limitations, the potential intangible resources, identified through the review of other reports and historical literature on the area, are likely to exist in the landscape, and should be explored within a different research context to determine their full significance in terms of the NHRA.

2.2 Background context

The creation of the Komsberg REDZ, and the ensuing applications for WEFs in this area has resulted in several HIAs having been compiled for the region since 2010. All these reports have addressed the region's archaeological and palaeontological heritage, and some have assessed the rural cultural landscape as well (see the Reference List in Section 7).

2.2.1 Palaeontological Background

According to the SAHRIS Palaeosensitivity Map, the area proposed for development is underlain by sediments that are of very high palaeontological sensitivity.

The Palaeontological assessment completed for the Brandvalley WEF by Almond (2016) notes that "The Brandvalley WEF study area lies in the mountainous Klein-Roggeveldberge region and is underlain by several formations of potentially fossil-bearing sedimentary rocks (Fig. 4). The majority of the bedrocks are of Late Palaeozoic age (Middle Permian) and belong to the Karoo Supergroup which is internationally famous for its rich fossil record.

Palaeontological field assessment of the Brandvalley WEF study area shows that in this portion of the south-western Karoo:

- Waterford Formation (Upper Ecca Group) deltaic bedrocks have small outcrop areas crossing the central part of the study area. These small areas lie largely outside the main development footprint and are generally fossil-poor, apart from low-diversity trace fossil assemblages. However, isolated blocks and rare logs of well-preserved petrified wood recorded from this formation just to the south of the study area (Rietkloof WEF project area) are of high scientific and conservation value and similar material might also be present in the Brandvalley WEF study area.
- Abrahamskraal Formation (Lower Beaufort Group) fluvial bedrocks underlying the great majority of the study area are generally considered to be of high palaeontological sensitivity. However, in this area of the south-western Karoo they are generally fossil-poor, apart from occasional horizons with plant debris or low-diversity trace fossils. A few examples of large tetrapod (i.e. terrestrial vertebrate) burrows as well as disarticulated skeletal remains (dispersed bones, teeth) recorded from these beds during the present field assessment are of considerable scientific interest but are very rare indeed.
- 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 and elsewhere locally contain numerous clasts of petrified wood reworked from the Karoo Supergroup (probably Waterford Formation).

The overall impact significance of the construction phase of the proposed wind energy project is assessed as LOW (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 as well as (2) the extensive superficial sediment cover overlying most potentially-fossiliferous bedrocks within the Brandvalley WEF study area. This assessment applies to the wind turbines, laydown areas, access roads, substations, construction camps including a batching plant area, 33kV powerlines and associated WEF infrastructure within the study area. A comparable low impact significance is inferred for all project infrastructure alternatives and layout options under consideration, including different options for routing of access roads, turbine layouts and siting of construction camps and substations.”

Almond (2016) also notes that “The great majority of the Brandvalley 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 occurrence of very rare tetrapod (i.e. terrestrial vertebrate) burrows and associated skeletal remains within the Abrahamskraal Formation along the Kabeltou Pass (Muishond Rivier 161) is a notable exception. This highly sensitive area (outlined in green in Fig. 2), which lies within the Western Cape and outside the WEF development footprint, should not be disturbed. Highly sensitive “no-go” areas within the proposed development footprint itself have not been identified in this study. Pending the potential discovery of substantial new fossil remains during construction, specialist palaeontological mitigation is not recommended for the Brandvalley WEF project..”

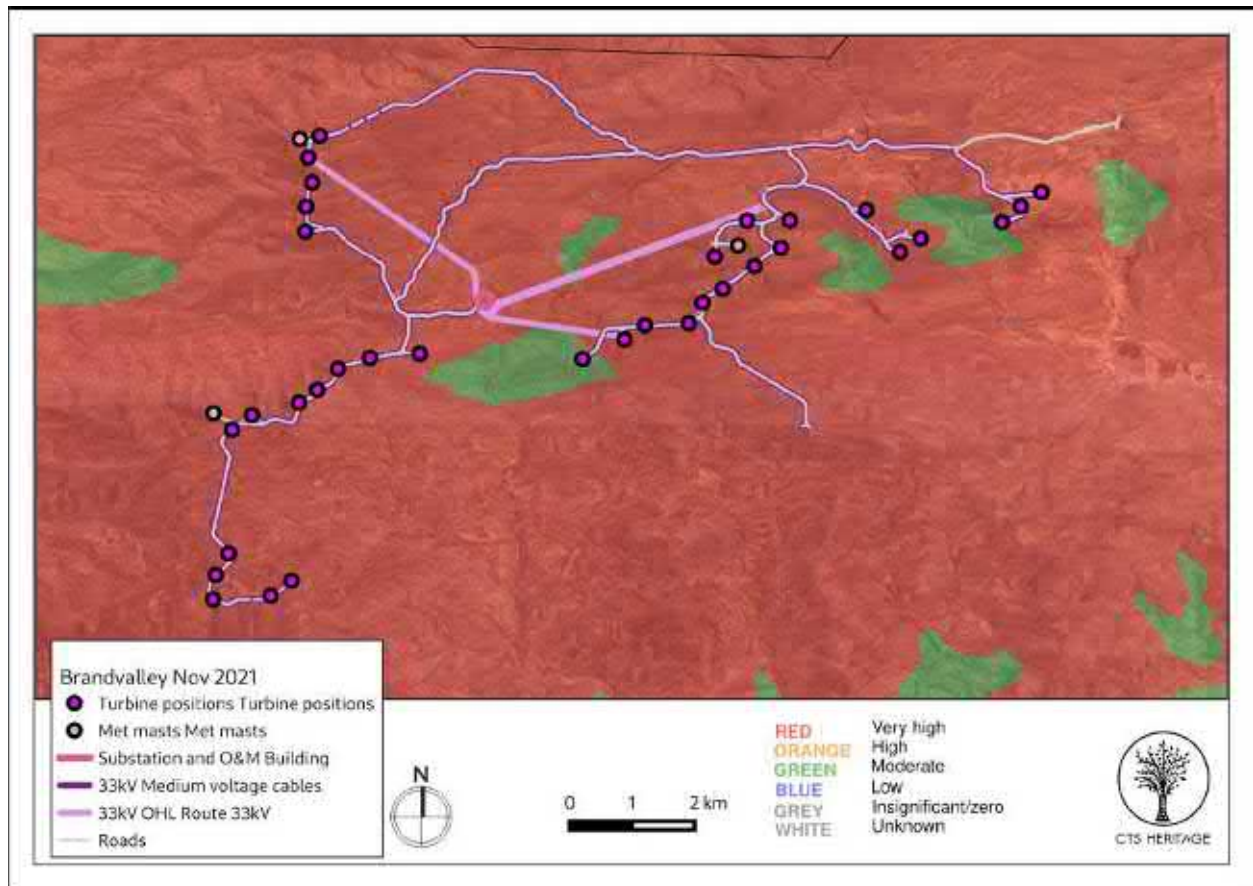


Figure 3.1: Palaeosensitivity Map. Indicating Moderate to High fossil sensitivity underlying the study area for the Rietkloof WEF

2.2.2 Archaeological Background

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

The area proposed for development is located approximately 30km north of Matjiesfontein and is in 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 Karreebosch 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.

Similar findings 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.”

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.

2.2.3 Cultural Landscapes and Living Heritage Background

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

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

Other cultural landscape research for HIAs in the area have noted the possible impacts and made recommendations on cultural landscapes for each of their study areas. Predominantly, it is the negative impacts to the sense of wilderness that has been indicated as the greatest likely outcome of these developments (Hart and Webely 2011, 2013). The clustering of several proposed WEFs in this area is considered to progressively and more negatively erode the cultural landscape (Hart and Webley 2013). Significant built environment features are variable across the landscape, and while some clusters of heritage buildings exist (Hart and Webley 2013), largely, there are few conservation-worthy buildings, and places of celebrated heritage significance are limited (Hart and Webley 2011; Hart and Kendrick 2014). The remoteness of the area is noted, and the low visitor numbers also considered (Hart and Webley 2013; Booth 2016). Where gradings have been proposed for the cultural landscape, these vary between Grade II and IIIa (Hart and Kendrick 2014; Booth 2016). The changes to the character of the landscape, and negative impacts on sense of place and aesthetic value which result from WEF developments – and compounded by cumulative impacts –



are seen to be largely unmitigatable, with only the effective rehabilitation of the landscape after decommissioning serving as effective remedial action (Booth 2016).

The SEA for wind and solar photovoltaic energy in South Africa (DEA 2015) does not consider intangible heritage resources, identifying only areas with material remains and previously identified natural and cultural heritage sites or protected areas, such as Karoopoort, Matjiesfontein and Touw Local Nature Reserve, as cultural landscapes in the Komsberg REDZ. There has been limited investigation into the living heritage of the area and intangible resources attached to the landscape, such as language or oral history. Mitigation recommended for the impact of development on cultural landscapes in the Komsberg area is also limited to adjusting buffers and consideration of viewshed analysis, which considers only tangible heritage resources' and visual impacts.

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

2.3 Heritage Resources Identified

Similar findings to those made for the Rietkloof WEF and the Karreebosch WEF were made by Booth in HIA completed for the Brandvalley WEF HIA (2016). Booth (2016) notes that the Brandvalley 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.



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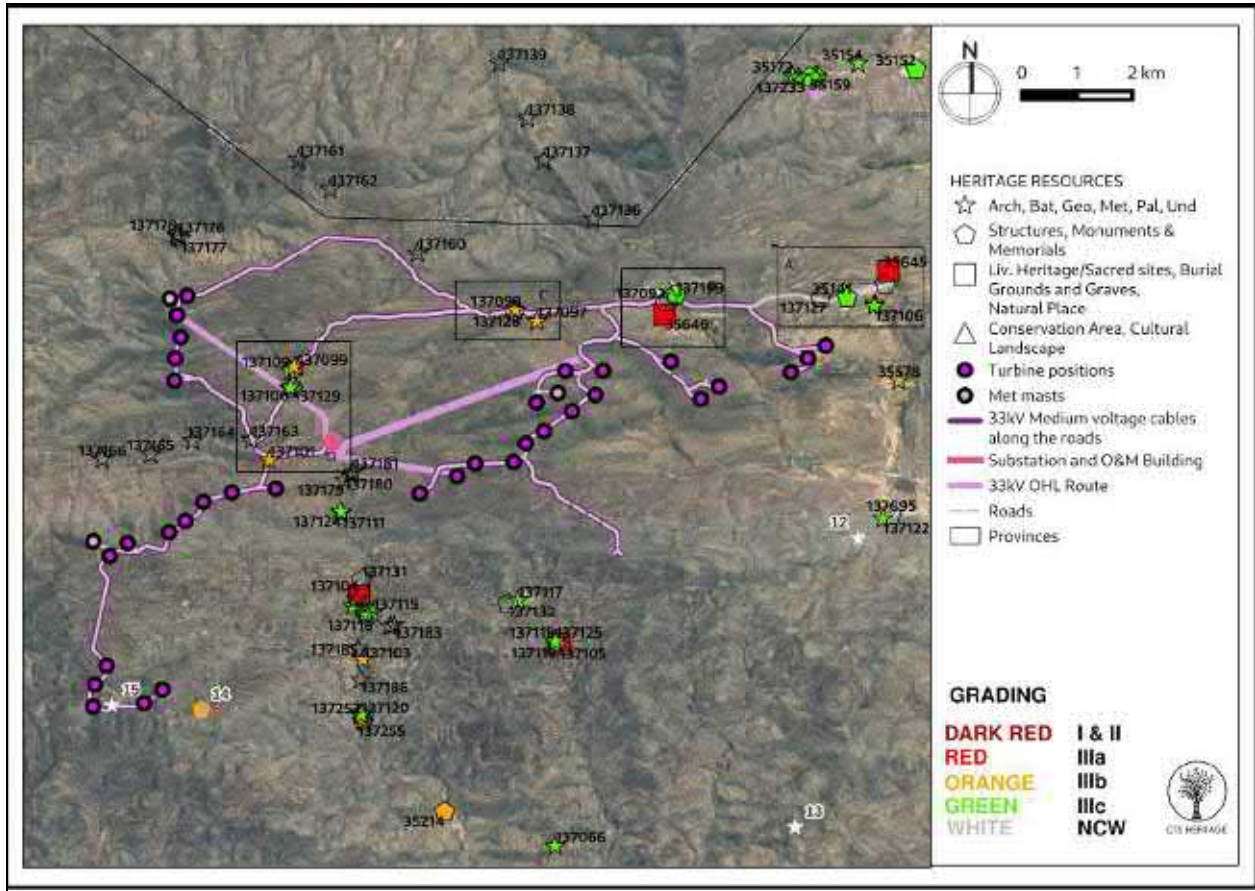


Figure 4.1. Map of all known heritage resources located within the Brandvalley WEF Development area



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Figure 3.1. Heritage Resources Map. Inset A



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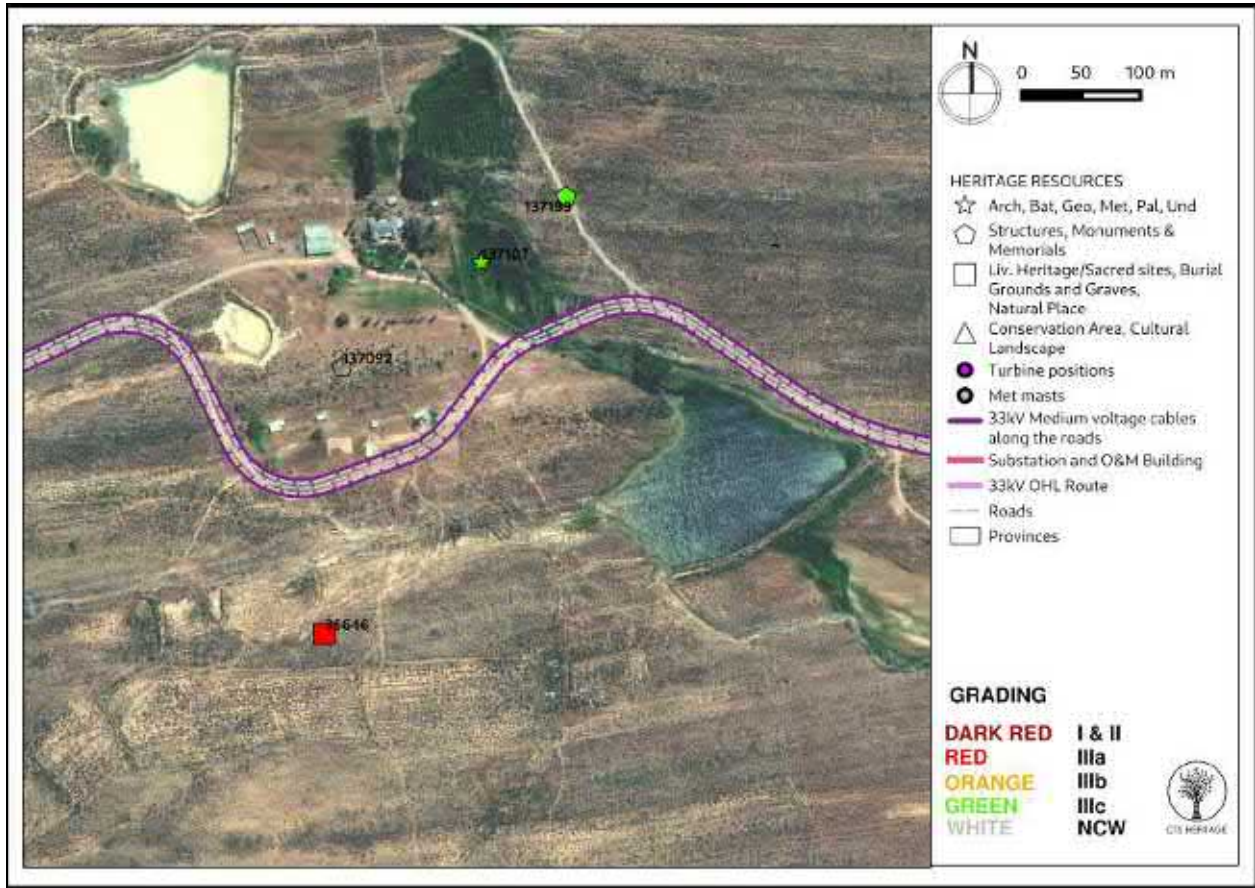


Figure 3.2. Heritage Resources Map. Inset B



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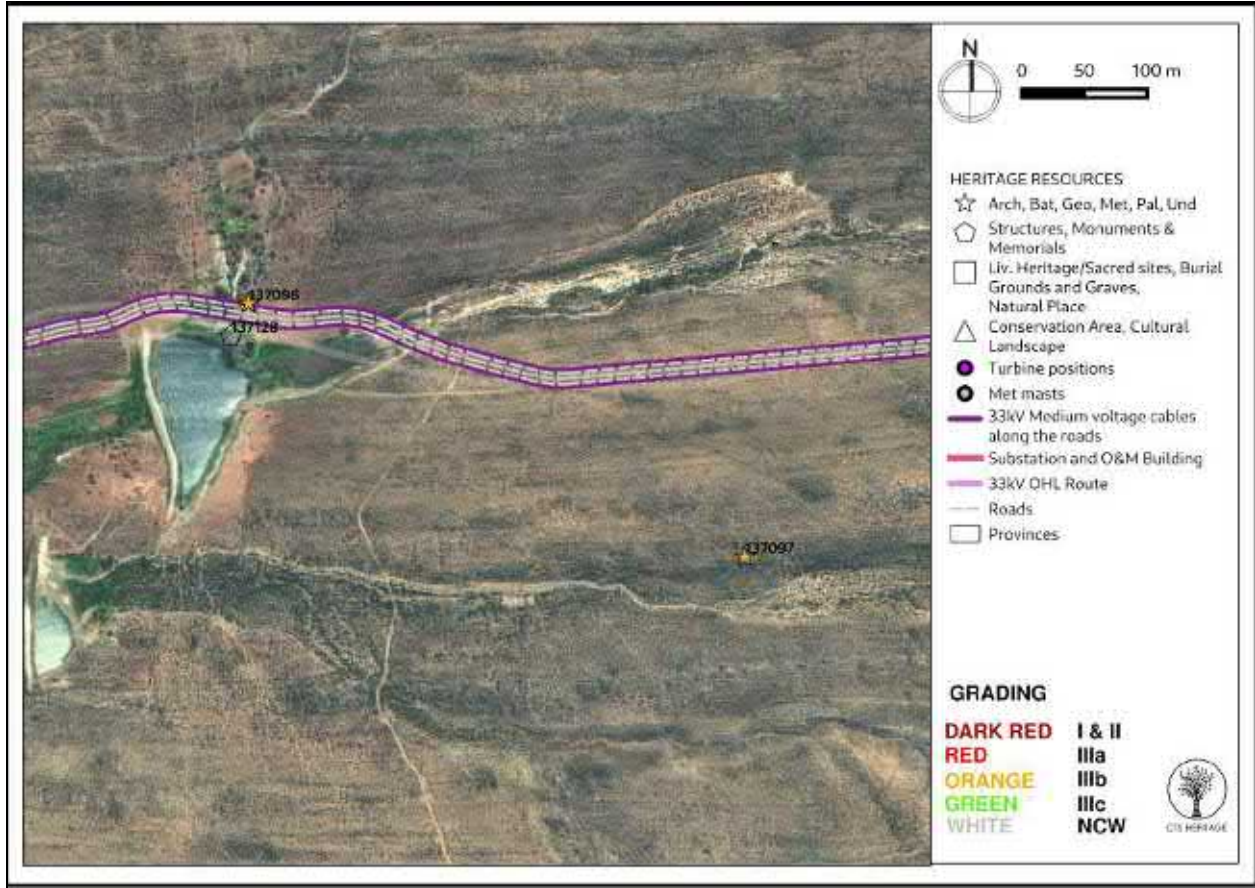


Figure 3.3. Heritage Resources Map. Inset C



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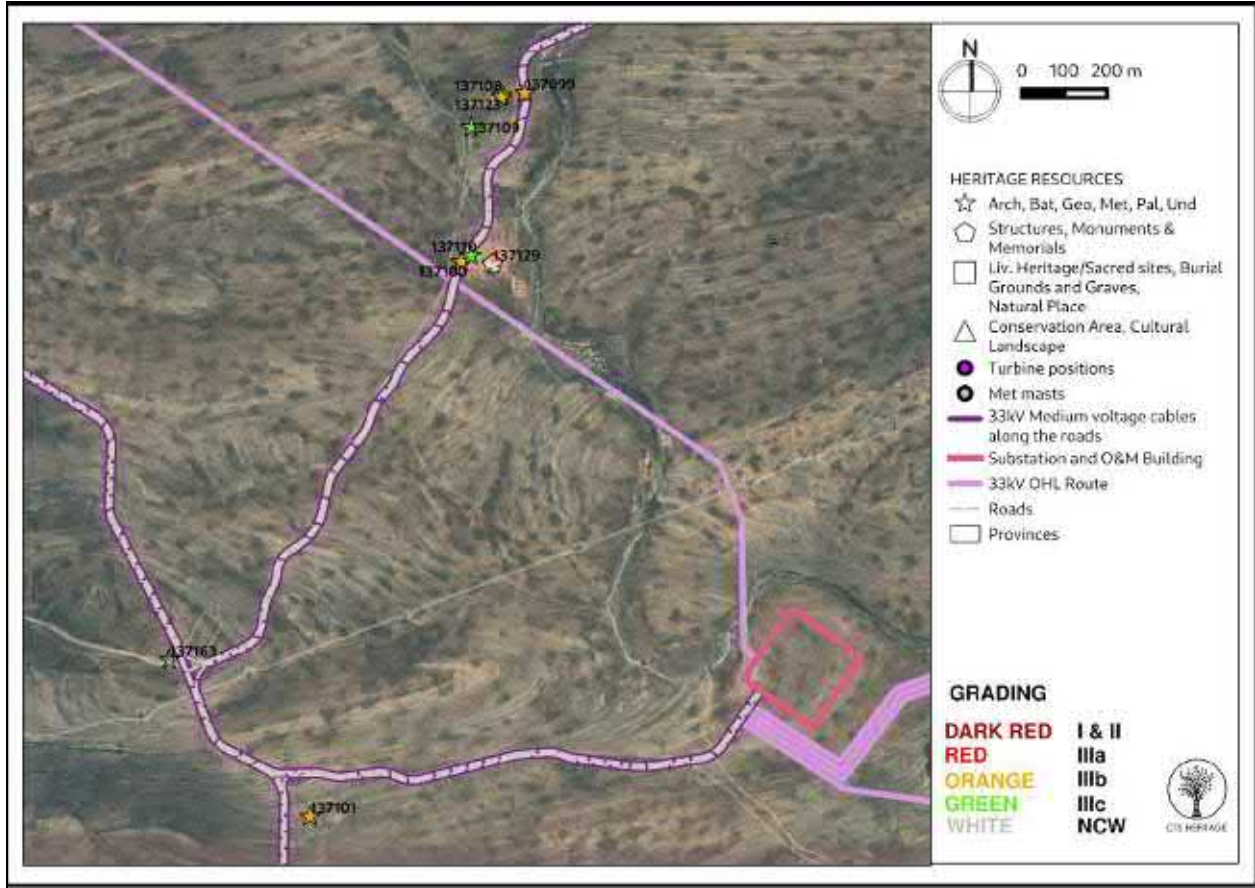


Figure 3.4. Heritage Resources Map. Inset D

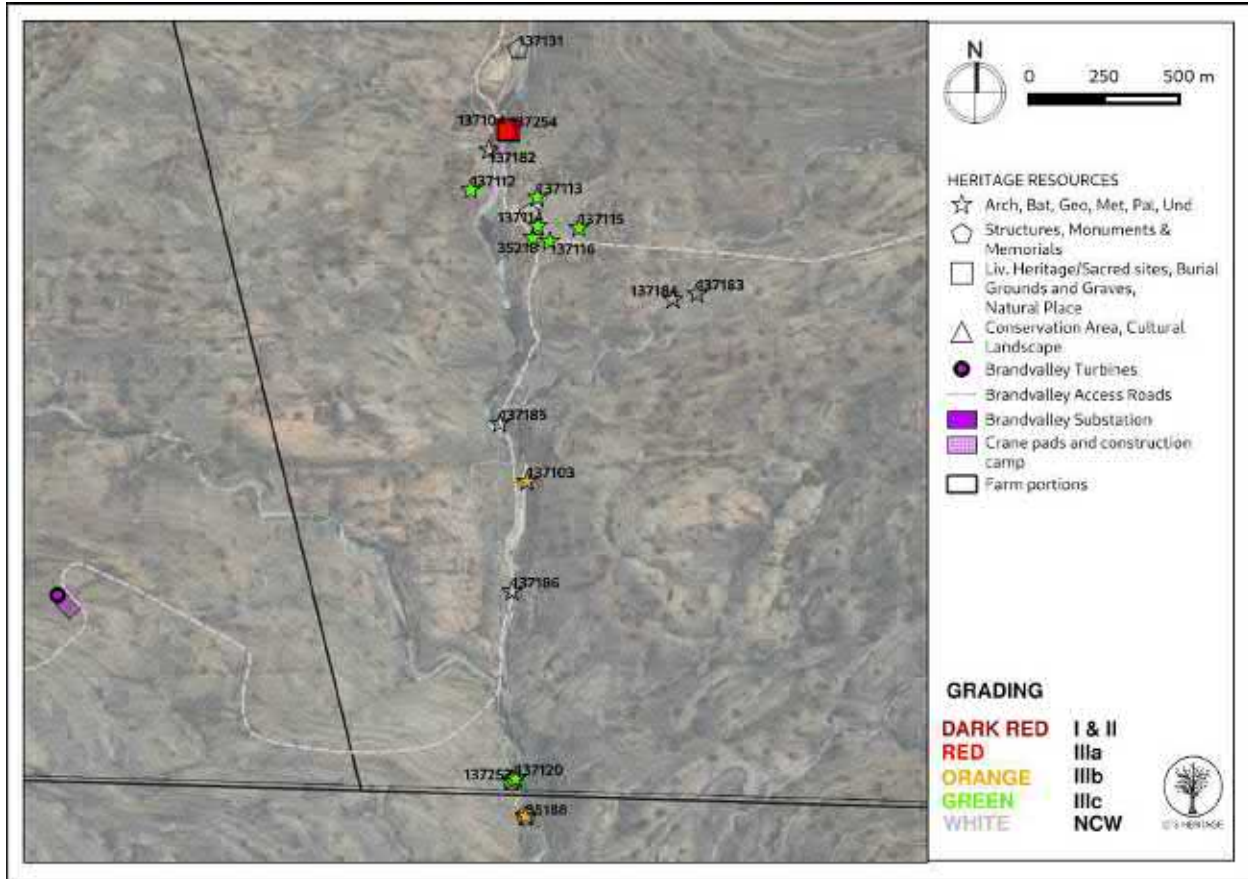


Figure 3.5. Heritage Resources Map. Inset E

3. SITE MANAGEMENT

Although the project description notes that the Brandvalley WEF development is located in both the Northern and western Cape, the maps indicate that all of the proposed infrastructure is located in the Western Cape. As such, in the section below, we only refer to Heritage Western Cape with regard to Site Management.

3.1 Objectives of site management

The objectives of the heritage management plan for the Brandvalley WEF are to ensure that the heritage resources identified within the area proposed for the WEF development are properly conserved and any further impacts to these heritage resources are appropriately managed.

The Heritage Management Plan identifies the steps required for the appropriate management of these heritage resources including:

- Regular monitoring of the physical integrity of the identified heritage resources

- Details regarding procedures and processes to follow in the event of negative impact to identified or new heritage resources during the construction or operational phases of the development
- Mitigation of potential impacts resulting from the construction, operational and decommissioning phases to the identified heritage resources

3.2 Potential Impacts to identified heritage resources

A. Construction Phase

- *Palaeontology*

At present, the final layout does impact known palaeontological heritage resources of significance. The construction of any infrastructure that requires excavation into bedrock here may have **high** impacts to fossil resources. Almond (2016) 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.” No impact other than that described above is anticipated, however it is recommended that the Chance Fossil Finds Procedure is implemented.

- *Archaeology*

The final layout does not impact any known archaeological heritage resources of significance. Low significance Stone Age archaeology is very common in this area, with a number of low significance single isolated artefacts found in the development footprint. The preponderance of archaeological remains in the study area are the remains of built structures, likely of historic age, but some possibly pre-colonial. These structures are predominantly easy to identify and fairly robust, however the final layout avoids any impact to significant archaeological heritage.

- *Burial Grounds and Graves*

Some possible burial grounds and graves were identified by Booth (2016) within the broader study area; however, none are anticipated to be impacted by the development in the final layout. The recommendations pertaining to the management of impact to these resources are included below. However, unknown or unmarked burial grounds and graves remain at risk during the construction phase and are likely to be subject to **very high** direct impacts without mitigation. Should any burial grounds or graves be accidentally uncovered during this phase, HWC must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- *Built Environment*

The final layout does not impact any known structures directly. The significance of the built environment is moderate in this area, and it is likely that the significance of impacts to the built

environment will be **low** provided that structures are avoided sufficiently not to cause structural damage to them.

- ***Cultural Landscapes***

Impacts to the cultural landscape are likely through the introduction of new, industrial, and disproportionately large elements into the largely uninhabited and only marginally transformed cultural landscape. The turbines themselves, as well as the laydown areas, crane pads, construction camps, substations and access roads all serve to erode the aesthetic and scenic qualities of the cultural landscape. These new intrusions also represent a dramatically new way of using, interacting with and shaping the landscape in an area that has, until now, largely resisted or been impervious to, efforts to transform it.

- ***Intangible Heritage***

Impacts to intangible heritage resources are predominantly indirect in nature, given that the resource is largely intangible. As such, no direct impacts are anticipated during the construction phase.

B. Operational Phase

- ***Palaeontology***

Operational activities will not impact any known palaeontological heritage resources and impacts are unlikely during the operational phase. Should any palaeontological heritage be accidentally uncovered during this phase, the Chance Fossil Finds Procedure must be implemented.

- ***Archaeology***

Operational activities will not impact any known archaeological heritage resources of significance and impacts are unlikely during the operational phase. Should any archaeological resources be accidentally uncovered during this phase, HWC must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Burial Grounds and Graves***

Operational activities will not impact any known burial grounds and impacts are unlikely during the operational phase. Should any burial grounds or graves be accidentally uncovered during this phase, HWC must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Built Environment***

Operational activities will not impact any known structures directly and impacts are unlikely during the operational phase. 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.

- ***Cultural Landscapes***

Impacts to the cultural landscape will be continuous throughout the operational phase as a result of the construction of the turbines along highly visible ridge lines as well as the presence of roads and associated infrastructure in the landscape. Contextual impacts will be experienced during all phases but are most problematic during the operational phase, and will be ongoing for the operational lifetime of the facility.

- ***Intangible Heritage***

Impacts to sites of living heritage will be continuous throughout the operational phase as a result of vehicles and personnel on site for maintenance, and the presence of roads, turbines and associated infrastructure in the landscape.

C. Decommissioning Phase

- ***Palaeontology***

Infrastructure removal should not impact any known palaeontological heritage resources and impacts are unlikely during the decommissioning phase. Should any palaeontological heritage be accidentally uncovered during this phase, the Chance Fossil Finds Procedure must be implemented.

- ***Archaeology***

Infrastructure removal should not impact any known archaeological heritage resources of significance and impacts are unlikely during the decommissioning phase. Should any archaeological resources be accidentally uncovered during this phase, HWC must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Burial Grounds and Graves***

Infrastructure removal should not impact any known burial grounds or graves and impacts are unlikely during the decommissioning phase. Should any burial grounds or graves be accidentally uncovered during this phase, HWC must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Built Environment***

Infrastructure removal should not impact any known structures directly and impacts are unlikely during the decommissioning phase. 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.

- ***Cultural Landscapes***

Impacts to significant cultural landscapes will be continuous throughout the decommissioning phase as a result of vehicles and personnel on site for turbine dismantling and removal, and the remnants of access roads, and locations of turbines and associated infrastructure in the landscape. It should be noted, however, that any resulting impacts will be of a short duration. Mitigation should only be to ensure that existing roads are used, and no previously undisturbed areas should be subject to disturbance.

- ***Intangible Heritage***

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

3.3 Conservation and management requirements

Mitigation measures to reduce the anticipated negative impacts to heritage resources and the cultural landscape were documented in the Heritage Impact Assessments completed by Booth (2016), the Palaeontology Impact Assessment completed by Almond (2016) and the Heritage Walkdown Report completed by CTS Heritage (2021). All of these specific mitigation interventions have been accommodated in the final layout of the development:

The following recommendations from HWC are still applicable:

- The 20-30 metre buffers proposed in the archaeological specialist study for archaeological sites (BV SAI, BV SA2, BV SA3, BV SA4, BV SA5, BV SAZ, BV SW2, BV SW16), graveyard (BVGI) and built environment sites (BV HS3, BV HS5 and BV SW12) should be implemented and respected throughout the lifetime of the project, unless mitigation measures are undertaken in terms of a workplan;
- 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 highly sensitive palaeontological area (very rare tetrapod i.e. terrestrial vertebrate)



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burrows and associated skeletal remains within the Abrahamskraal Formation along the Kabeltou Pass (Muishond Rivier 161) in the northwest of the study area should be regarded as a no-go area at all times;

- 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 and must monitor all major surface clearance and deeper (>1m) excavations for fossil material (bones, teeth, petrified wood etc.) in the construction phase; The ECO must report as mentioned 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.

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).

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4. MONITORING

Although the project description notes that the Brandvalley WEF development is located in both the Northern and western Cape, the maps indicate that all of the proposed infrastructure is located in the Western Cape. As such, in the section below, we only refer to Heritage Western Cape with regard to Site Management.

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			
Exclusion of sensitive ecological, heritage, archaeological 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 negatively or threaten any of the	ECO	No unplanned impact or unplanned impact halted within 4 hours	Bi-Annual Site Inspection and



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 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 and minutes of relevant meetings



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<p>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.</p>	<p>Site Manager</p>	<p>Section 34 permit application to HWC</p>	<p>Permit issued in terms of section 34 from the relevant heritage authority or correspondence in this regard.</p>
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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 5000m². 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 HWC in 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 9103)
<https://sahris.sahra.org.za/cases/brandvalley-wind-energy-facility-0>

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**



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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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APPENDICES

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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;

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- * 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 be 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;



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- * 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.

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* 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



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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/>

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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
35578	GK056	Gamma Kappa 056	Artefacts	-32,966667	20,55	Grade IIIb
35188	ROG024	Roggeveld 024	Ruin > 100 years	-33,022167	20,445861	Grade IIIb
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
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
137199	KWF-014	KAREEBOSCH WIND FARM	Building	-32,952639	20,506639	
137200	KWF-015	KAREEBOSCH WIND FARM	Building	-32,953139	20,539944	
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	
137065	RFWE-007	RIETKLOOF WIND ENERGY	Stone walling	-33,009861	20,483528	Grade IIIc
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

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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	

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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	
137136	BWE-047	Brandvalley Wind Energy	Deposit			
137137	BWE-048	Brandvalley Wind Energy	Deposit			
137138	BWE-049	Brandvalley Wind Energy	Deposit			
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	
	012	Brandvalley 012	Chert, hornfels, quartzite flakes	-32.99232	20.5421	NCW
	014	Brandvalley 014	Farmers trap, corrugated sheet, wire, wooden post	-33.02031	20.41447	Grade IIIb
	015	Brandvalley 015	Chert flake prominent dorsal scars	-33.01957	20.39709	NCW

CTS Heritage

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CTS HERITAGE

APPENDIX 3:
Chance Fossil Finds Procedure

APPENDIX

G

AGRICULTURAL WALKDOWN
REPORT



**BRANDVALLEY 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 Brandvalley 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.

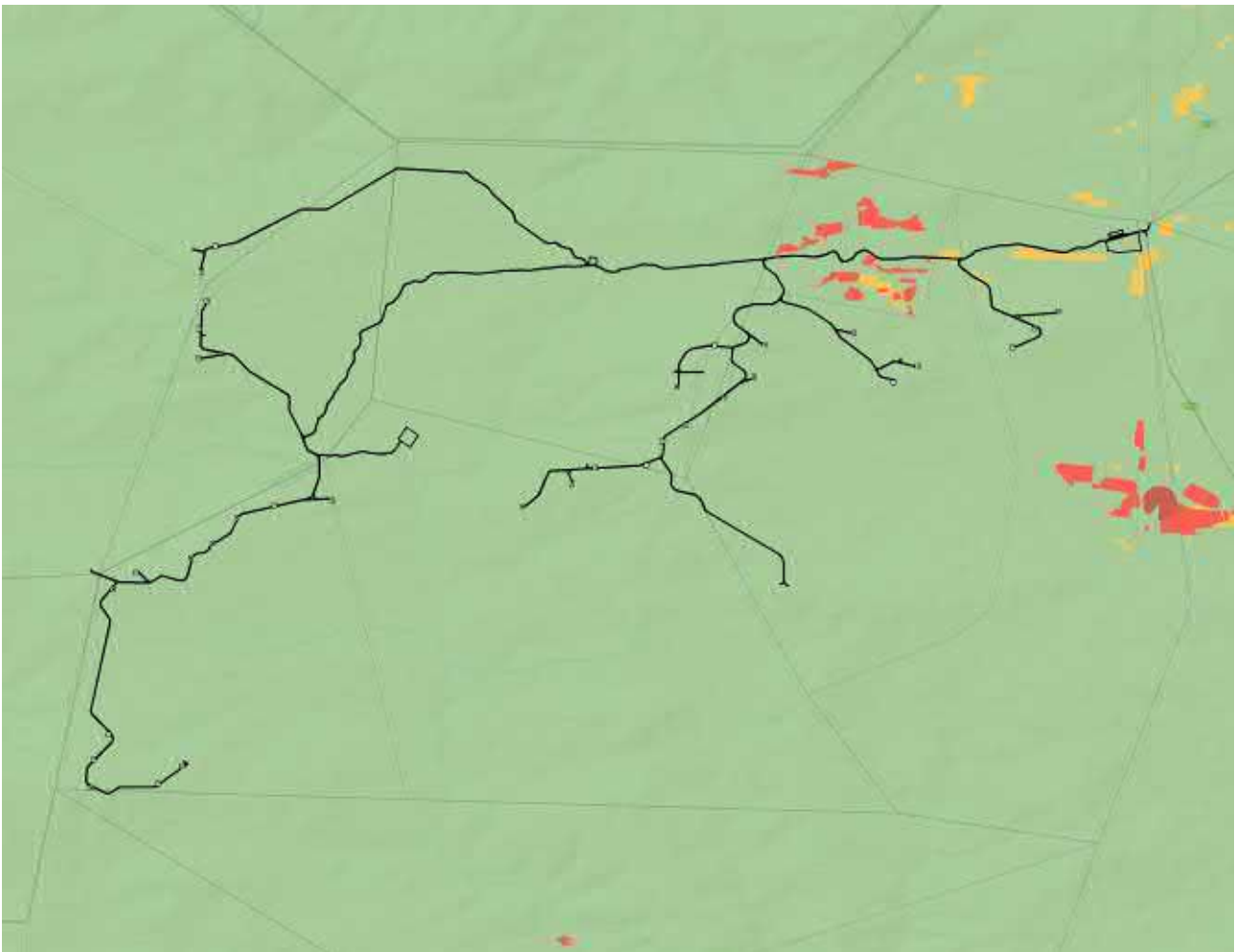


Figure 1. The proposed layout of the facility overlaid on agricultural sensitivity, as given by the screening tool (green = low; yellow = medium; red = high; dark red = very high).

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 Brandvalley 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.

A handwritten signature in black ink, appearing to read 'J. Lanz', with a long horizontal stroke extending to the left.

Johann Lanz (Pr. Sci. Nat.)

APPENDIX

H

AVIFAUNA WALKDOWN REPORT



***Final Avian Re-Assessment and Part 2 Amendment for the
BRANDVALLEY WIND ENERGY DEVELOPMENT AREA, ROGGEVELD***



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1 SUMMARY

This study contains a re-appraisal of the impacts and mitigations suggested for the proposed Brandvalley Wind Energy Facility by Brandvalley Wind Energy Facility (Pty) Limited. It is also a part 2 amendment given that the number of turbines, their dimensions and their locations have been altered from that authorised. 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. We incorporate findings from November 2021 also. The primary aims are to determine if the receiving environment has changed, to summarise the avian impacts of the previous avian assessment report and determine if the impacts will change due to the modifications to the turbines.

The number of turbines will be decreased from 58 to 34 turbines, and the footprint has been reduced accordingly (Figure 1). The original pre-construction monitoring by African Insights (2016), for Brandvalley (the central farm in the Euronotus cluster) covered a total 20 days in the development site itself, across four seasons, in the period April 2015 to February 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 few birds at the time, but seven Priority species were recorded, of which three are *Endangered* species: Black Harrier *Circus maurus*, Martial Eagle *Polemaetus bellicosus*, Ludwig's Bustard *Neotis ludwigii*, and a *Vulnerable* Verreaux's Eagle *Aquila Verreauxii* pair. Raptors made up the remainder of the Priority species.

African Insights' report did not report Passage Rates or flight heights but recorded Priority bird flights and observation hours. We, thus, reconstructed Passage Rates to quantitatively compare their 2016 findings with our 2021 surveys. The activity of eagles in 2016 was relatively high with Verreaux's Eagle Passage Rate of 0.11 eagles per hour (~ 1 flight/day), while all Priority Species had a Passage Rate of 0.15 birds per hour. Despite the numerous eagle flights, no nest was located in 2016.

Our short surveys in May 2021 revealed an active Verreaux's Eagle nest (No. 7) that had been missed in the 2016 monitoring at the Snydersberg. The medium-high eagle Passage Rates in 2016 were focussed around the area where the nest was located by BBU in May 2020, but, despite this, no High-risk area was flagged there.

Given the discovery of the Verreaux's Eagle nest the guidelines for this species (Ralston Paton 2017) recommend a 3-km buffer around active eagle nests on site. However, African Insights made no recommendations regarding eagle nests as they found none. Birds & Bats Unlimited (BBU) recommends, in line with the present eagle guidelines, a 3-km buffer. Red Rocket have accounted for this by removing 8 turbines from the 3 km buffer, reducing potential impacts to the breeding eagles here.

Two inactive Black Harrier nests were discovered at a late stage (November 2021) to be active (Williams nest in the southern section of the WEF) or have a pair in attendance (Jenkins' nest, centrally placed). The recommended 3 km buffers overlap several proposed turbines in both areas and we recommend two forms of mitigation.

- If turbine positions can be dropped with the 41% reduction in turbines, then we would recommend that B28, B29, B30, B31, B32 be re-located to the east.
- These possible turbines would reduce impacts to both the Black Harriers and the Verreaux's Eagles that are known to forage down this ridge

BBU understands that this is a late recommendation and may not be possible. Thus an additional form of mitigation, for these turbines and any that kill more than one *Endangered* or *Vulnerable* species per year, would be either observer-lead Shut down on demand (SDOD) or the addition of automated SDOD of the problem turbines. This can be Bioseco, or DT-bird, or a suitable alternative.



The increase in hub height from 120m to 125 m and the increase in blade length is predicted to increase avian fatalities from the literature and our own modelling of South African fatality data. The increase, however, will account for an additional 3 birds/turbine/year and with the 41% reduction in turbine numbers there will be an overall reduction in the number of birds killed per year. Thus, the increase in turbine dimensions is more than compensated for by the reduced numbers of turbines.

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.

This avian assessment suggests that overall lower impacts are expected by the reduction in turbine numbers, but we caution that if some turbine positions could be dropped within the 3-km buffer of the newly active (Jenkins) Black Harrier nest then impacts for both the eagles and harriers can be further reduced.



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 Verreux'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** Kommas + Kommas (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: BRANDVALLEY 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:

5 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

5 December 2021

Date

Signature of the Commissioner of Oaths

Date



3 TERMS of REFERENCE

The Terms of Reference 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 increased and the numbers decreased from 58 to 34 (41% reduction) thus the ToR includes:

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

Table 1: Authorised (approved) versus new specifications for the Brandvalley Wind Energy Facility (WEF), October 2021.

	NEW Specs for ALL WEFS	Approved for BV WEF
Turbine Generation Capacity	7 MW	Not specified (140MW – with 58 turbines)
Hub Height	125m	Up to 125m
Rotor Diameter	180m	Up to 160 m
Blade Length	90m	Up to 80 m
Max upper tip height	215m	Not specified

3.1 STUDY AREA

The proposed Brandvalley 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°C in summer to 0.9°C 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 Baboon, Klipspringer, Red Rock Hare, Mountain Rhebok and a raptor component reported on below.



3.2 BACKGROUND

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

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

This is especially 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:

- 58 turbines reduced to 34 turbines (41% reduction);
- Reduced footprint size with turbines re-located away from the Verreaux's Eagle nest.

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 58 turbines as defined earlier (African Insights 2016) is shown in Figure 1.

4 METHODS

- This report compares data from 2016 when monitoring 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 spent surveying the site from vantage points (VPs) on Brandvalley in 2016 was 288-hours from six VPs (African Insights 2016).
- We estimated Passage Rates from the number of flights depicted in Figures 8 and 9 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 the breeding season 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).



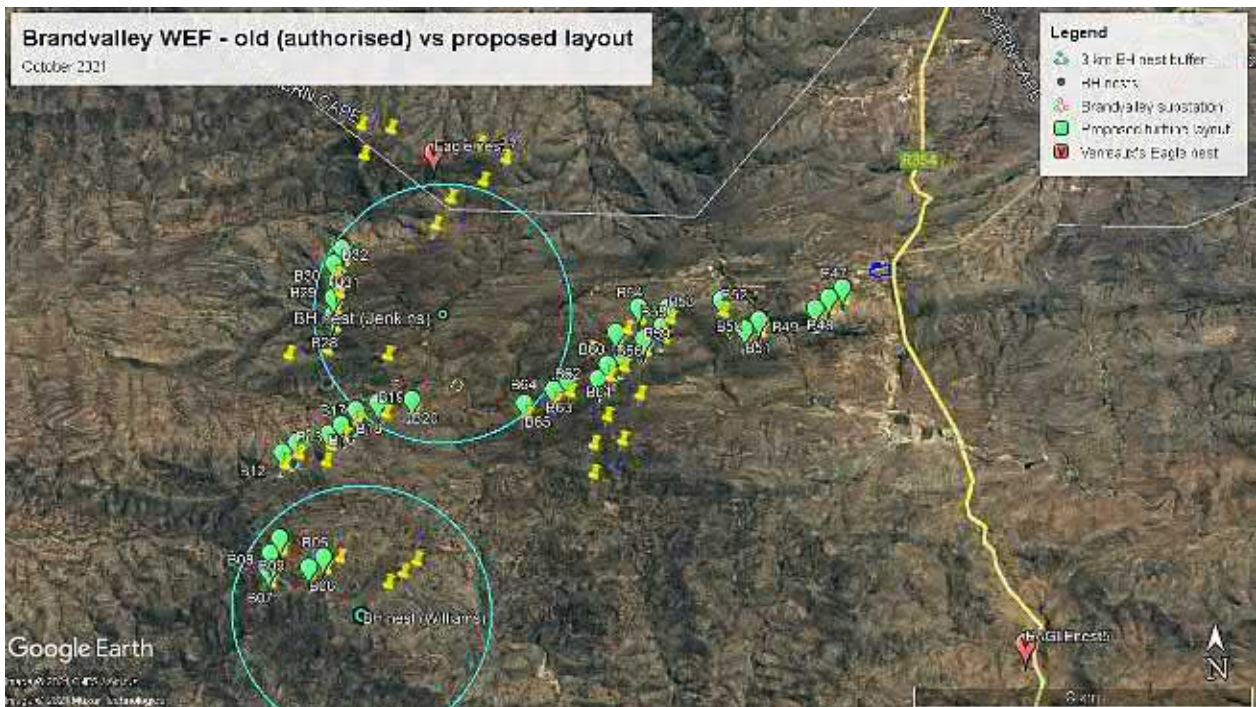


Figure 1: The 34 proposed turbine positions (green pins) vs the 58 authorised positions (yellow pins) in the Brandvalley wind farm in the Roggeveld mountains, October 2021 layout. Blue circles are the 3-km nest buffers for the newly active Black Harrier nests on site.

5 SUMMARY of FINDINGS of ORIGINAL EIA REPORT

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

- Four site visits, spanning all four seasons, were undertaken in 2015/2016.
- From six Vantage Points, 288-hours of observation were undertaken to record Priority species.
- Seven Priority species were recorded in that time (Table 1).
- Red Data Black Harrier, Martial Eagle, Verreaux's Eagle, and a Ludwig's Bustard were found on site.
- No Verreaux's Eagle nests were found but medium Passage Rates (0.11 eagles/hour) for the species were recorded in 2016.
- In the high use area in the north-west (Snydersberg), the Verreaux's Eagle Passage Rates were 27 flights in 96 hours (12-hours x 4 seasons x 2 VPs) or 0.28 eagles/hour. This is approximately three eagle flights/day.
- The Passage Rate for the remaining Priority species (Booted Eagle, Jackal Buzzard, Pale Chanting Goshawk, Steppe Buzzard, excluding the Rock Kestrel) was estimated at 0.15 birds/hour.



Table 1: Seven Priority Red Data species identified in the avian EIA report for Brandvalley 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
Black Harrier	Endangered	Moderate	High	low	High	Not reported
Ludwig's Bustard	Endangered	Low	Moderate	Low	Medium	Not reported
Martial Eagle	Endangered	Low	High	High	High	Not reported
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 Indication as to whether the population is a core, or marginal, one, relative to the main population.

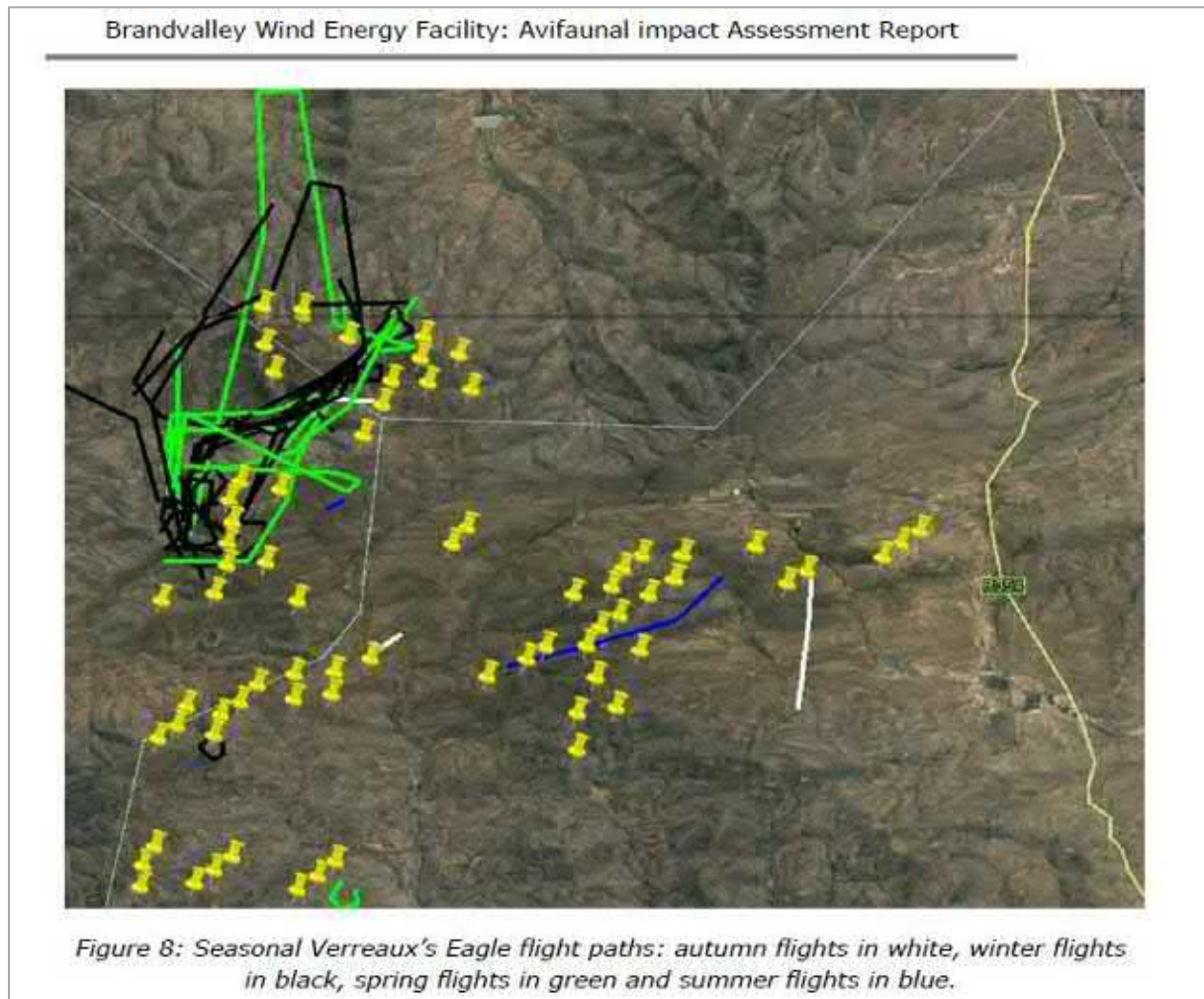


Figure 2: Screenshot from African Insights' Brandvalley Report (2016) of Verreaux's Eagle flights recorded in 2015/16 over 288-hours over four seasons. The Passage Rate for this species, estimated from 33 flights in 288-hours, is ~0.11 eagle flights/hour. Note that 82% of these (27/33) were associated with the area where the Verreaux's nest was found by Birds & Bats Unlimited (BBU) in 2021. The Passage Rates from the two VPs here comprising ~27 flights in 96 hours (12-h x 4 seasons x 2 VPs =) was ~0.28 eagles/hour.



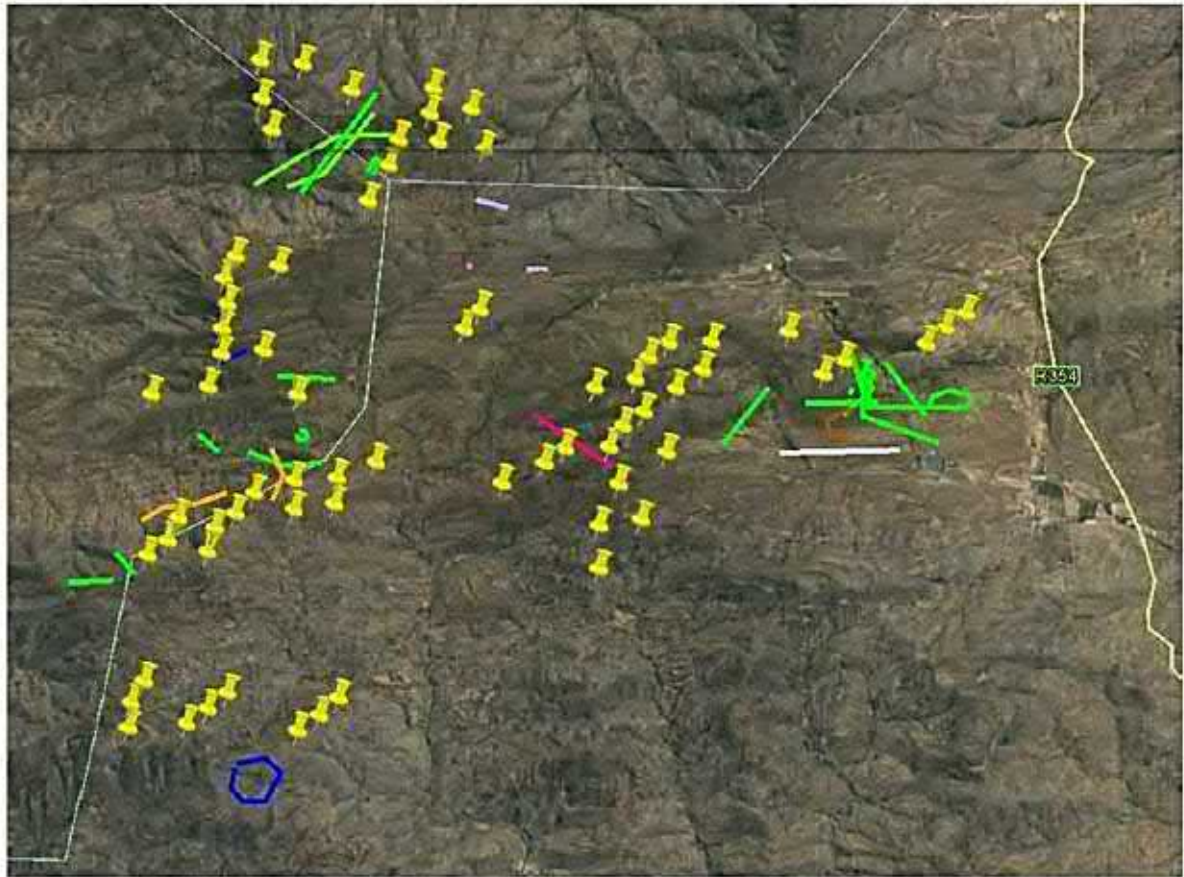


Figure 9: All season flight paths of raptors other than Verreaux's Eagles. Legend: Black Harrier - blue; Rock Kestrel - green; Booted Eagle - orange; Pale chanting Goshawk - grey; Martial Eagle - pink; Jackal Buzzard - brown; Steppe Buzzard - white.

Figure 3: Screenshot from African Insights' Brandvalley Report (2016) of all raptor flights (other than Verreaux's Eagles) recorded over four seasons in 2015/16 over 288-hours. The Passage Rates estimated for these seven species is approximately 57 flights in 288-hours, or 0.20 flights/hour. Excluding the Rock Kestrel (not a Priority species) the Passage Rate was 0.15 birds/hour.

6 RESULTS from the 2021 SITE VISIT

The six days Birds & Bats Unlimited spent in the Euronotus cluster (two days on the Brandvalley site itself) were devoted to surveying the wind farm area to record eagles in flight, and to check for possible nest sites.

6.1 VERREAUX'S EAGLES

The most important findings in our reassessment of the Brandvalley site in 2021 was the discovery of a previously unrecorded Verreaux's Eagle nest in the north-western corner of the wind farm (Figure 4 and Photo 1), and the discovery of two previously inactive Black Harrier nests

The eagle nest was first located in May 2020 when the area was surveyed as a Control site for an adjacent wind farm (Birds & Bats Unlimited 2020).

The nesting cliff supported a well-protected eagle nest and, in May 2021, during the first drone flight a roosting adult was found perched 100-m from this nest (Photo 1). This indicates that the site is active and not merely a historical site. Below (point 6.1.1) we compare the Passage Rates from 2021 and 2016 around this nest.



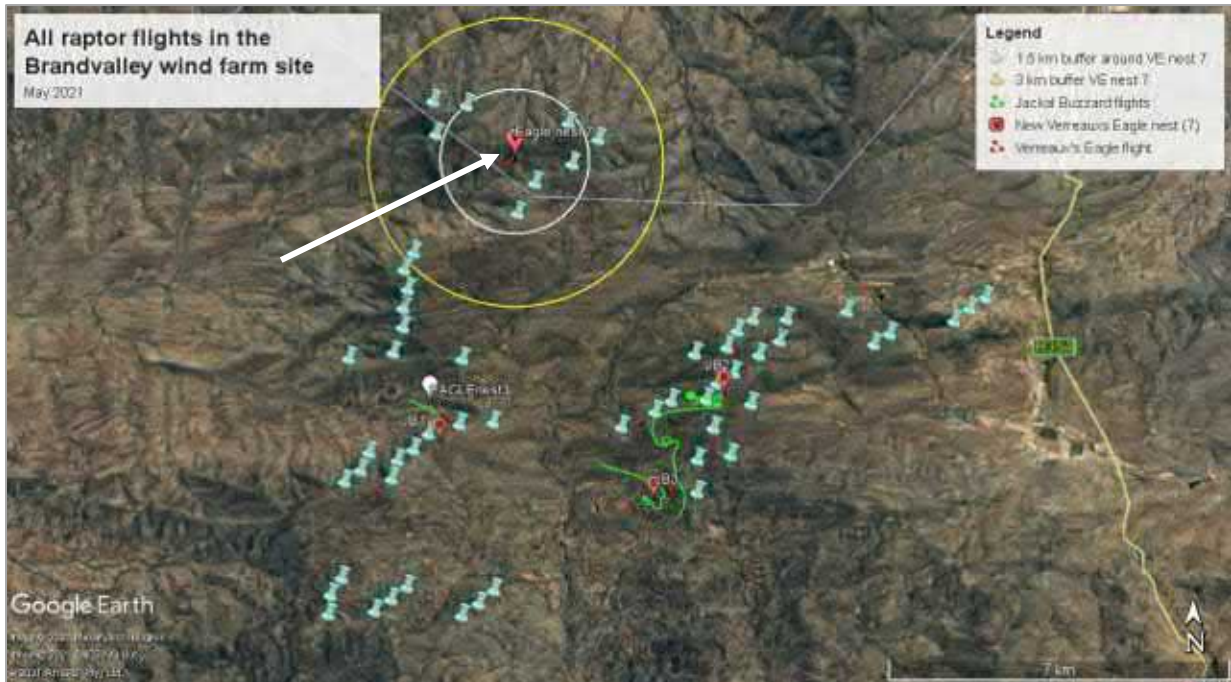


Figure 4: All raptor flights (= red and green lines) over the proposed Brandvalley wind farm (turbines = blue pins) recorded in May 2021 in 18.1-hours. Verreaux's Eagles were one of two Priority species present (with Jackal Buzzard) and the Passage Rates here, based on four flights in 18.1-hours, was 0.22 birds/hour. This compared with Passage Rates in 2016 of 0.15 Priority birds/hour but from seven species. The over-looked eagle nest was present in the north-west corner (= New VE nest no. 7) at S32°56'0.23" E20°26'4.10" (white arrow). The orange circle represents a 3-km nest buffer; white = 1.5-km buffer.



Photo 1: The Verreaux’s Eagle nests (No. 7) discovered by BBU in the north-west corner of the Brandvalley site in May 2020. A roosting adult eagle was photographed in drone footage (inset) in May 2021, indicating that the nest site is active.

6.1.1 PASSAGE RATES COMPARED OVER THE PROPOSED STUDY SITE

In May 2021 we tallied up a total of 56 hours of observations throughout the three development sites in the Euronotus cluster. In the two days spent on the Brandvalley Wind Farm itself we used the same VPs used by African Insights but undertook fewer hours on site (18.1-hours) as this is a re-assessment of the findings, not a full EIA.

- We recorded only one Verreaux’s Eagle flight on Brandvalley in that time giving a Passage Rate of 0.06 eagles/hour for the site.
- This compares with 0.11 eagles/hour recorded by African Insights in 2015/16 on Brandvalley – a two-fold higher rate in 2016.
- The eagle Passage Rates in 2016 for the Snydersberg nest area alone (inset Figure 6) were much higher from the two Vantage points (African Insights 2016). We estimated 27 flights in 96-hours (2 VPs x 4 seasons x 12-hours) for a Passage Rate of 0.28 eagles/hour.
- For all Priority species on Brandvalley in 2021 the Passage Rate (0.22 birds/hour) was higher than that recorded in 2016 by African Insights (0.15 birds/hour).
- All 2021 flights are shown in Figure 4.



Figure 6: The new Verreaux’s Eagle nest (no. 7, red balloon) on the Brandvalley Wind Farm in relation to the authorised turbines (= blue pins) and two possible buffers. The yellow circle represents a 3-km nest buffer (recommended by Birds & Bats Unlimited) and the white circle a 1.5-km buffer. The larger buffer encompasses eight turbines. These have now been relocated away from this nest by Red Rocket, to decrease impacts to the eagles from the spinning turbines.

Inset: Verreaux’s Eagle flight lines recorded in 2016 (African Insights) in this area. Approximately 27 flights were recorded (giving a medium-high Passage Rate of 0.28 eagles/hour or about three eagle/day). The white star (inset) gives the approximate location of the new VE nest 7. Orange polygons highlight the six turbines that lie directly in the path of eagle flights (inset), and we recommend that these are relocated if at all possible.

Passage Rates around the newly discovered VE nest (no. 7) were very low in 2021, with only one short flight recorded. However, in 2016 numerous flights were recorded (Figure 6 inset) which we conservatively estimate at 27 (in 96-hours: African Insights 2016).

The previous specialists/authors were puzzled by the high number of flights in 2016, noting that the cliff faces here on the Snydersberg plateau appeared “too short, and of the wrong shape” to hold an eagle nest (page 15). Oddly, they did not designate this area as High-risk despite the large number of flights.



This number of eagle flights suggests that there is high risk to the eagles here, and the hierarchy of mitigations required are treated below.

6.2 BLACK HARRIERS

Two previously inactive Black Harriers nest sites were known in Brandvalley from African Insights' 2016 surveys – and in 2021, following good rains, both were active.

- In the southern sections of the WEF site, the “Williams” Black Harrier nest was found to contain a single egg in November 2021 (Photo 3).
- In November 2021 a Black Harrier pair were disturbed from the “Jenkins” Black Harrier nest in the central sections, but no nest was located. However, it is highly likely that this nest was also active given that the pair alarm-called at both the BBU observer and a pair of Pied Crows soaring overhead. Both are sure signs that they had an investment (eggs or chicks) to defend (RE Simmons pers obs.).



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

These nests pose a challenge for the Developers.

The Birdlife South Africa Black Harrier guidelines (Simmons et al. 2020) recommend a 3-5-km buffer around the nests and, within the 3-km “No-go” buffer, several turbines occur, particularly the centrally placed “Jenkins” Black Harrier nest (Figure 7).

For the “Williams” nest in the south, several turbines occur within 3-km, but the bird observed appeared to forage mainly to the east, away from the turbines in the west.





Figure 7: The new Black Harrier nest “BH nest (Jenkins)” (= blue dot, white arrow) within the Brandvalley Wind Farm in relation to the proposed turbines (= blue pins) and 3-km nest buffer (= blue circle) recommended by Birdlife South Africa’s Black Harrier guidelines. This buffer encompasses seven turbines, and we recommend that those to the west (B28, B29, B30, B31, B32) are relocated, if at all possible. The harriers here flew most often in a north-west direction in November 2021, towards these proposed turbines. This area is also used by the foraging Verreaux’s Eagles from the new nest to the north (see Figure 6), so it would benefit both Red Data species in the area if they could be re-located.

6.3 EFFECTS of INCREASES in TURBINE DIMENSIONS and REDUCTION in NUMBERS

The authorised and proposed turbines will change as follows

- A total of 58 (authorised) turbines will be reduced to a (proposed) 34 turbines (41% reduction).
- All authorised turbines had a hub height up to 125-m and that will remain the same (no increase).
- However, the remaining (authorised) 58 turbines are (proposed) to increase blade lengths from 80-m (proposed) to 90-m (13% increase).

Given that the reduction in the number of turbines (41%) is more than 3-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 graphics below indicate that:

- avian fatalities increase exponentially as hub height is increased (Figure 8a); but
- the exponential increase flattens out when South African data are added to the USA graph (Figure 8b).

By reading what is predicted at the 120-m and 125-m hub heights we can see (Figure 8b) that the expected fatalities differ by about three birds (16 VS 19).

The same cannot be done for blade length given that this metric has not been modelled by either Loss et al (2013) or by Ralston et al. (2017).



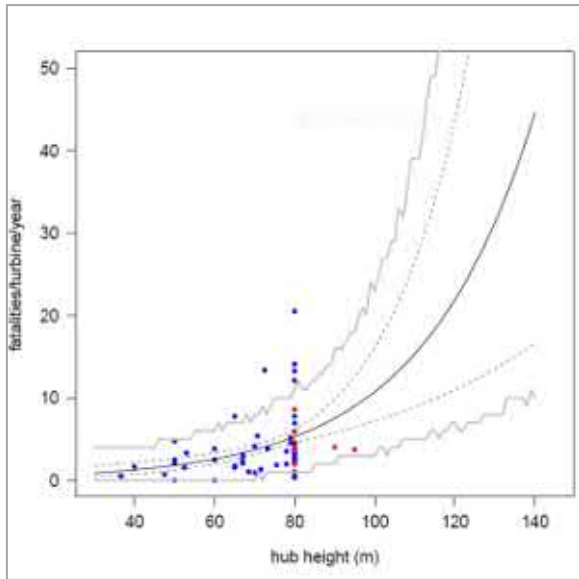


Figure 8a: Prediction intervals from bootstrapping analyses (jagged line) based on North American hub height/fatality data (Loss et al. 2013 = blue data points) to determine if South African data (= Red Data points) fall within 95% confidence intervals. All seven data points fall within the confidence intervals.

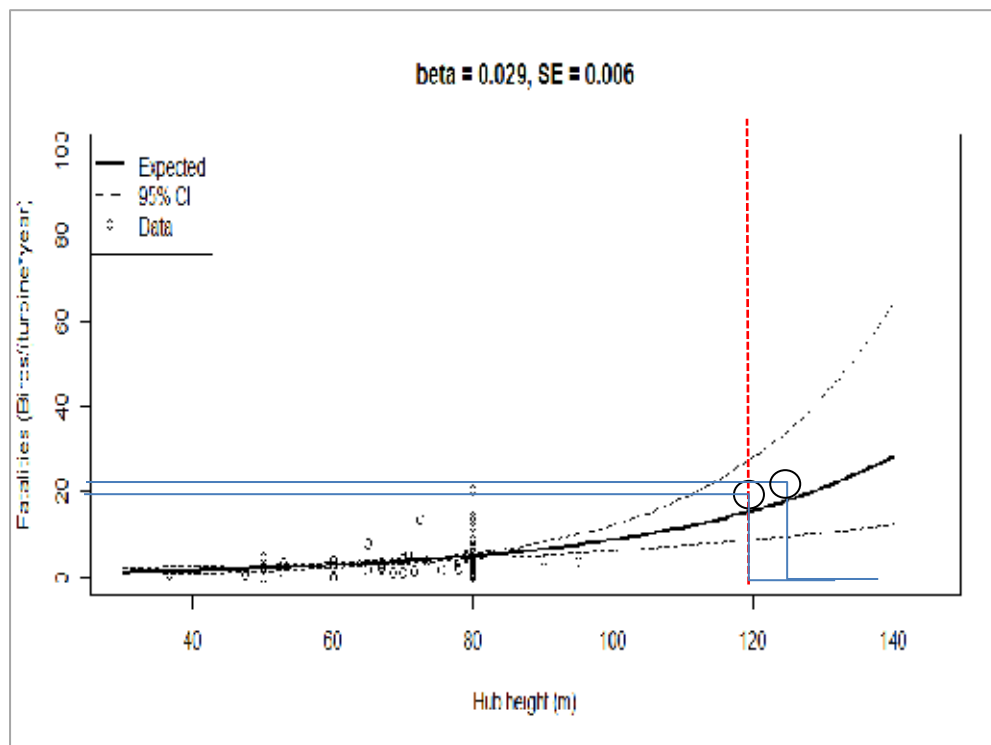


Figure 8b: Modelled data combining avian fatalities from the USA (Loss et al. 2013) and from South Africa (Ralston-Paton et al. 2017) and their relation to hub height. The South African data (n = 7 farms) include two with hub heights of 90-m and 95-m. The combined data and 95% confidence limits predict 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/year) according to this assessment. We were not able to model the fatalities due to an increase in blade length, but we assume they will be similar to that predicted here.

This means that, with a decrease in the number of turbines (from 58 to 34), the following fatalities are expected:

- 58 turbines of 120-m hub height are predicted to kill 58 x 16 birds = 928 fatalities (from Figure 8b).
- 34 turbines of 125-m hub height are predicted to kill 34 x 19 birds = 661 fatalities (from Figure 8b).

Thus, the fewer, larger, turbines are expected to kill 267 fewer birds and, therefore, the Significance of the predicted impacts will be lower. The above calculation is simplified using 58 turbines of 120-m hub height. The actual number of fatalities will be lower and, thus, even fewer fatalities are predicted for the proposed authorised turbines.



7 MITIGATIONS

The discoveries of the new Verreaux's Eagle nest (no. 7) as well as the newly active Black Harrier nests ("Jenkins" and "Williams") creates a challenge for the developers as Red Rocket (Pty) Limited – without any previous knowledge of Red Data species here – have already selected positions for turbines in this area.

- For the newly discovered **Verreaux's Eagle nest** Red Rocket have already relocated all (eight) turbines due to fall within the recommended 3-km buffer (Figure 6). This will substantially reduce the impact within this area.
- For the **Black Harrier nest**, seven turbines are planned for the area within the 3-km buffer created around the central Black Harrier nest (Figure 7) and given that the pair most often foraged to the north-west (November 2021 data) the turbines to the west may create impacts.
- Birds & Bats Unlimited recommends the five turbines here (B28, B29, B30, B31, B32) be repositioned away from the nest, if at all possible. We understand that this request comes very late, given the late breeding start of this Black Harrier nest.
- Since (58-34 =) 24 turbine positions are due to be dropped we request that these five turbines are included in those that are dropped, if at all possible.

We note that should Red Rocket be able to drop these five turbines it will simultaneously reduce the likelihood of Verreaux's Eagles impacting operational turbines here, as they appear to lie directly on the eagle flight lines captured in 2016 (inset in Figure 6). We have highlighted these turbines with a red arrow in Figure 6.

If these five turbines cannot be relocated, we recommend the following approach and mitigation hierarchy for this string of turbines:

- Erect them with striped-blade mitigation already installed (Appendix 1); *and*
- Automatic shut-down on demand or curtailment at certain times of day or seasons when flights are numerous.
- If these mitigations are not possible then the mitigation hierarchy suggests a suitable set-aside to help safeguard and replace the eagles that may be killed. This should be undertaken as a last resort given that the first mitigations are considered more effective.

We understand that these are difficult decisions to be made, given the late notice and discovery of the *Vulnerable* Verreaux's Eagle nest, and the active *Endangered* Black Harrier nest, but Red Rocket (Pty) Limited and Birds & Bats Unlimited must try to minimise the impacts to these vulnerable and highly collision-prone species.

8 CONCLUSIONS

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

Our May 2021 monitoring revealed that:

- Passage Rates of the Priority birds at 0.22 birds/hour were two-fold higher for all Priority birds in 2021 than 2016.
- However, Passage Rates for the Red Data Verreaux's Eagles were lower in 2021 (0.06 vs 0.11 birds/hour) than the relatively high Passage Rates recorded in 2016 (African Insights 2016).
- The discovery of a Verreaux's Eagle nest site (VE nest no. 7) on the Snydersberg (in May 2020), with an adult eagle in attendance in May 2021, throws up numerous challenges. We doubt this is a recently built nest area given the size of the structure.



- African Insights (2016) recorded high eagle activity in this nest area (~ 0.28 eagles/hour, or ~ 3 flights/day) but were unable to find any nests and, thus, failed to highlight it as a high-risk area. This was an oversight.

Birds & Bats Unlimited recommended a 3-km buffer around the Verreaux's Eagle nest (no. 7) based on existing recommendations in the Verreaux's Eagle guidelines (Ralston 2017). This requires that eight proposed turbines will need to be relocated to avoid fatalities in this area. This has been complied with by Red Rocket (Pty) Limited.

We, additionally, appeal to the Developer to either:

- (i) Consider re-locating the five turbines (B28-B32) as they lie within the 3-km buffer of the "Williams" Black Harrier nest, as well as within the numerous flight lines of the Verreaux's Eagles captured in 2016.

If these mitigations cannot be enacted the mitigation hierarchy recommends:

- (i) Erecting the turbines with striped, red- or black-blade mitigation (painted before installation) to increase turbine visibility for the eagles (May et al. 2020, Appendix 1).
- (ii) The advantages of this mitigation are that:
 - (a) raptors and humans see striped blades more clearly than unmarked white blades;
 - (b) 'signal red' is already approved by the South African Civil Aviation for towers and other tall structures;
 - (c) blade manufacturers (such as Siemens and Vestas) already produce painted blades in Europe; and
 - (d) 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) In addition, automatic shut-down on demand be installed with systems such as DT-Bird and Bioseco.
- (iv) The last accepted way of mitigating is to select a set-aside area to compensate for the eagles lost, by providing a safe area for breeding eagles near the wind farm, that cannot later be developed.

Mitigations during the construction phase should include avoiding the construction of roads or powerlines 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 in August-September when small vulnerable nestlings are present (Simmons 2005). For the *Endangered* Black Harriers found breeding on site, construction should be avoided in August-September-October.

We suggest that the Brandvalley Wind Farm proceeds with caution given the likelihood of avian fatalities, and:

- (i) an additional 3-months of pre-construction monitoring be undertaken around the new eagle and harrier nests to determine their success or otherwise;
- (ii) all mitigations 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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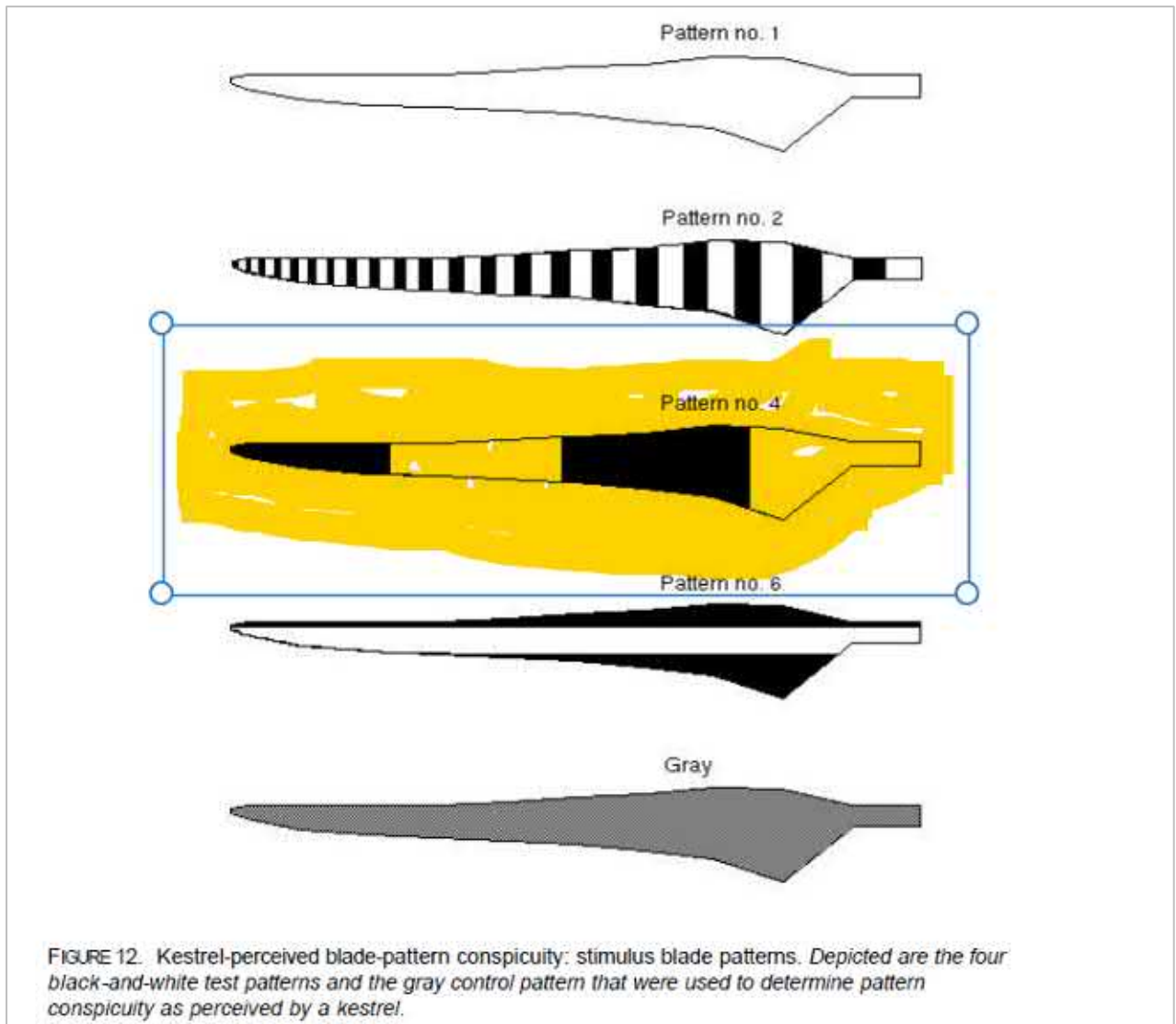
5 December 2021



10 APPENDIX 1:

Striped patterns on blades tested for conspicuousness by Mclsaac (2001) on raptors and human observers.

For both raptors and humans, **pattern No. 4** was perceived best of all. The white blade was amongst the *least* conspicuous of the spinning blades tested.



APPENDIX



ECOLOGY WALKDOWN REPORT





TrustedPartners

ESG RISK MANAGEMENT AND IMPACT ADVISERS

Project N#: TP210521-01

TERRESTRIAL ECOLOGY & BIODIVERSITY WALKDOWN REPORT BRANDVALLEY WIND ENERGY PROJECT

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Profiting your Investment Portfolio through ESG Risk and Impact Management

1 Report Release Notice

Report Status	Date	Authorised
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Reviewed	2021/10/07	Malcolme Logie
Final Report	2021/11/07	Malcolme Logie
Revised Report (Revised Layout)	2021/11/20	Malcolme Logie

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2 Revision Tracker

Date	Section	Revision
2021/11/20	Site Locality	Replaced Figure 1 Revised Layout
2021/11/20	Project Description	Updated the amount of turbine on the project site
2021/11/20	Walkdown Conclusions and Recommendations	Ensure the correct turbine numbers are mentioned
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 Areas identified and WEF infrastructure	Replaced Figure 6 Revised Layout

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6 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 (<i>now DFFE, see below</i>)
DENC	Northern Cape Department of Environmental Affairs and Nature Conservation
DFFE	The Department of Environmental Affairs was renamed the <u>Department of Forestry and Fisheries and the Environment</u> (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

7 Definitions

Area of Influence	<p>Area of Influence WB OP 4.01, Annex A, para. 6:</p> <p>“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.”</p> <p>A single project may have more than one AOI, for example different environmental and social aspects will/may have different AOI</p>
Alien Invasive Species (AIS)	<p>An alien species whose introduction and/or spread threaten biological diversity (Convention on Biological Diversity). Note: “<i>Alien invasive species</i>” is considered to be equivalent to “<i>invasive alien species</i>”. 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).</p>
Area of Occupancy (AOO)	<p>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.</p>
Biodiversity	<p>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.</p>
Boundary	<p>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.</p>
Catchment	<p>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.</p>
Connectivity	<p>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.</p>
Corridors	<p>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.</p>
Critically Endangered (CR)	<p>A category on the IUCN Red List of Threatened Species which indicates a taxon is considered to be facing an <u>extremely high risk of extinction in the wild</u> (IUCN).</p>
Data Deficient (DD)	<p>A <u>taxon is Data Deficient</u> 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).</p>
Degraded Habitat/Land	<p>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</p>

	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)	<u>Endangered terrestrial ecosystems</u> have lost significant amounts (more than 60 % lost) of their original natural habitat, so their functioning is compromised. <u>A taxon (species)</u> 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 <u>a very high risk</u> of extinction in the wild (<u>IUCN</u>).
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 Threatened 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 processes.
Exotic	Non-indigenous; introduced from elsewhere, may also be a <i>weed</i> or alien <i>invasive</i> 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 (<i>Bern Convention 1979</i>). A species or lower taxon living within its natural range (past or present) including the area which it can reach and occupy <u>using its natural dispersal systems</u> (<i>modified after the Convention on Biological Diversity</i>)
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 <u>ecosystems</u> 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 <u>taxon (species)</u> 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 “ <i>background ecological system</i> ” of a landscape with a high degree of connectivity.
Near Threatened (NT)	A <u>taxon (species)</u> 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)	<u>Vulnerable terrestrial ecosystems</u> 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 <u>taxon (species)</u> 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.

8 Introduction

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

The Brand Valley Wind Energy Facility walkdown has been undertaken in fulfilment of specific conditions contained in the environmental authorisation (Reg. No. 14/12/16/3/3/2/900) dated November 23, 2016 and subsequent amendments issued by Department of Environmental Affairs for the project, as follows:

- Conditions 45: *A pre-construction walk through of the approved powerline alignment and turbine positions by ...an ecologist, must be conducted to ensure that the micro-siting of the turbines, pylons and powerline alignment have the least possible ... and all protected plant species impacted are identified.*
- Condition 50: *A pre-construction survey of the final development footprint must be conducted by a qualified floral specialist to identify protected species affected by the proposed development. Prior to the commencement of construction. a rescue and rehabilitation operation for these species which could survive translocation must be conducted.*
- Conditions 129: *The approved turbines must be placed in a manner to avoid all designated, "no-go" areas as well as its buffers.*
- Conditions 130: *The final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by botanical ... specialists.*
- Conditions 131: *Exclusion of sensitive ecological ... areas from construction activities must inform micro siting of all development activities.*

No environmental authorisation has been obtained for the 132kV powerline; hence it is not included in this reporting.

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.

9 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.

9.1 Data sources and references

A comprehensive list of references, including data sources is provided in [Section 14](#). 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.

9.2 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;

10 Project Description

The Brandvalley Wind Farm is a 140MW WEF located within the Karoo Hoogland Local Municipality (Namakwa District Municipality) in the Northern Cape and the Laingsburg Local Municipality (Central Karoo District Municipality) in the Western Cape. It must be noted that the Karreebosch 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:

- 34 wind turbines with a maximum generating capacity of 140MW;
- Transformer hard standing area per turbine;
- Construction camp and Laydown areas;
- Access roads;
- Overhead 33kV powerlines and underground cabling;
- Low voltage substation;
- 4 x 125m tall wind measuring lattice masts.

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

Project : Euronotus

Layout - Topographic Locality Map

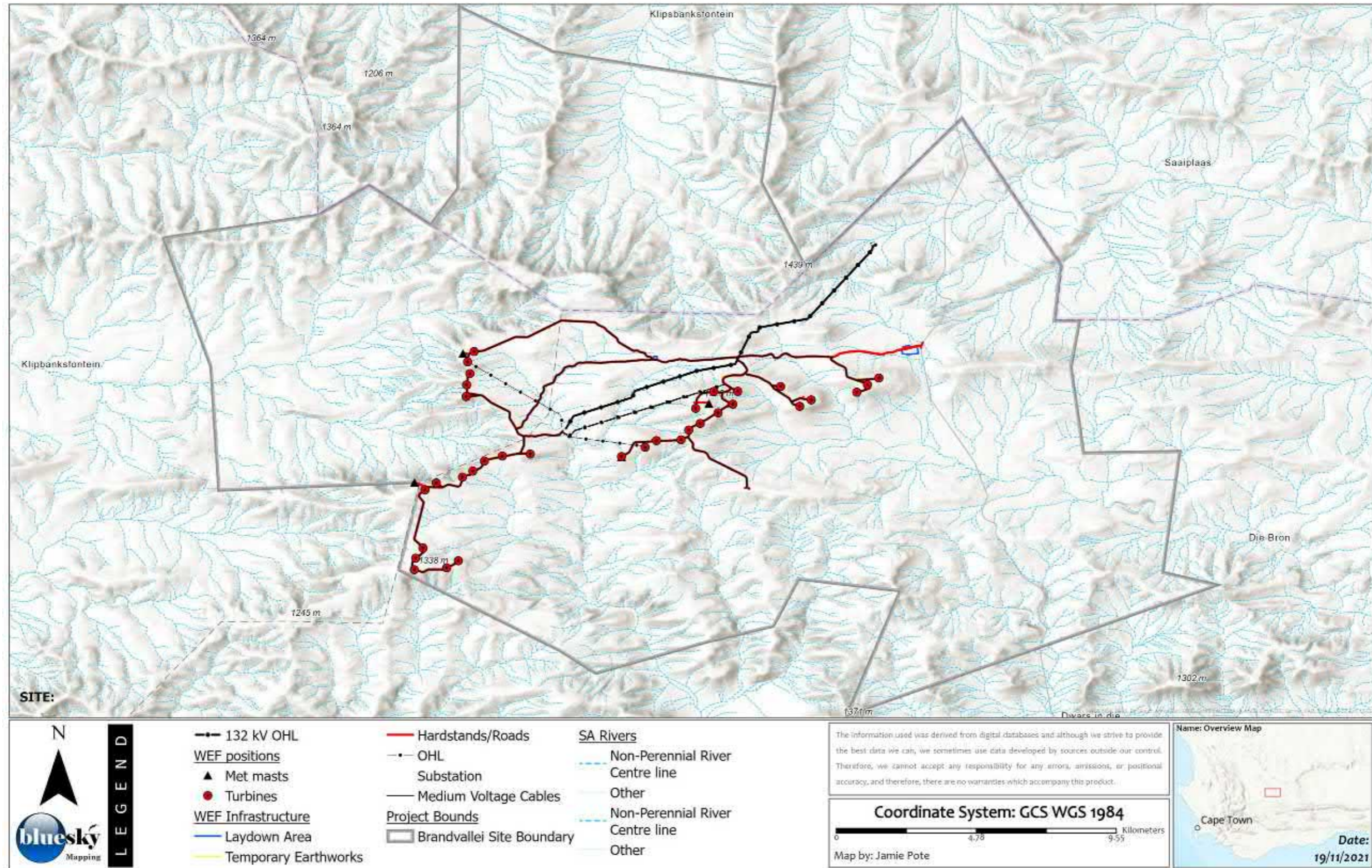
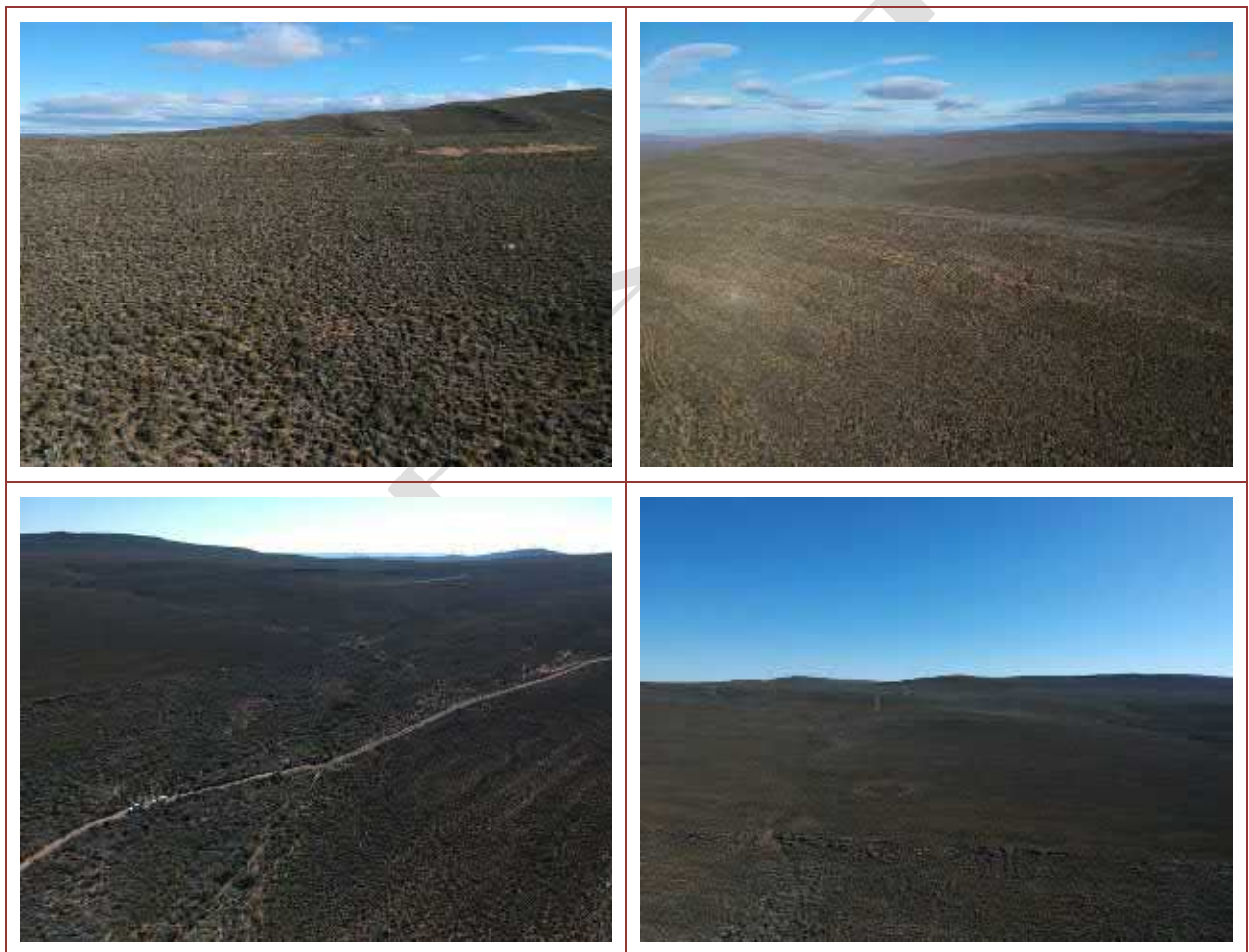


Figure 1: Site Locality

11 General Terrestrial Biodiversity

11.1 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)

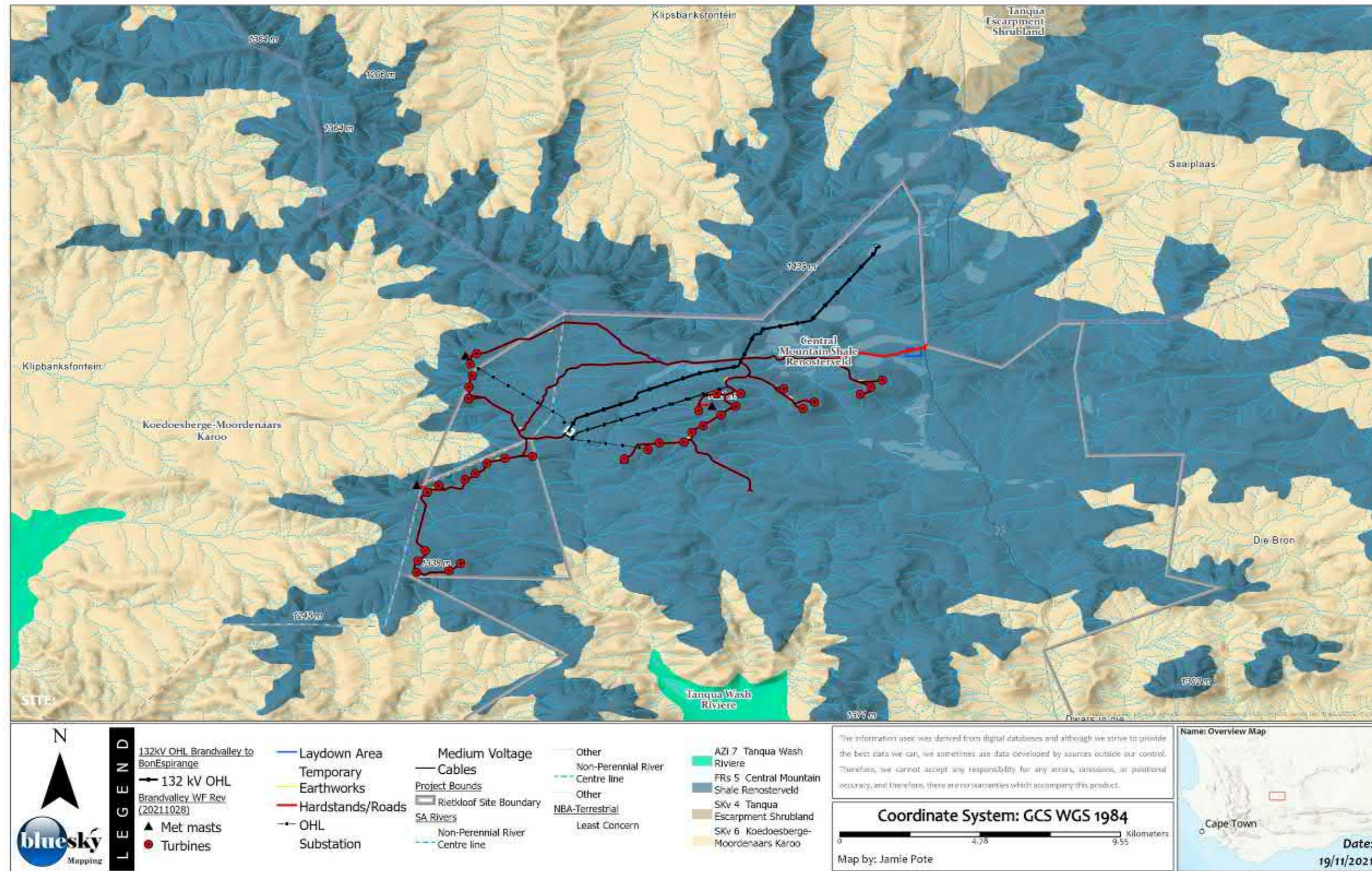


Figure 2: Regional Vegetation Units

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 Karoo* 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.

Table 1: Central Mountain Shale Renosterveld

Growth Form	Description/Species
Geophytic herbs	<i>Bulbine asphodeloides</i> , <i>Drimia intricata</i> , <i>Othonna auriculifolia</i> , <i>Oxalis obtusa</i> . Succulent
Grasses	<i>Ehrharta calycina</i> , <i>Karoochloa purpurea</i> , <i>Merxmullera stricta</i>
Herbs	<i>Crassula deceptor</i> , <i>C. muscosa</i> , <i>C. tomentosa</i> var. <i>glabrifolia</i> , <i>Senecio radicans</i> , <i>Dianthus caespitosus</i> subsp. <i>caespitosus</i> , <i>Heliophila pendula</i> , <i>Lepidium desertorum</i> , <i>Osteospermum acanthospermum</i> , <i>Senecio hastatus</i> .
Low shrubs	<i>Elytropappus rhinocerotis</i> (d), <i>Amphiglossa tomentosa</i> , <i>Asparagus capensis</i> var. <i>capensis</i> , <i>Chrysocoma ciliata</i> , <i>C. oblongifolia</i> , <i>Diospyros austro-africana</i> , <i>Eriocephalus africanus</i> var. <i>africanus</i> , <i>E. ericoides</i> subsp. <i>ericoides</i> , <i>E. eximius</i> , <i>E. grandiflorus</i> , <i>E. microphyllus</i> var. <i>pubescens</i> , <i>E. pauperimus</i> , <i>E. purpureus</i> , <i>Euryops imbricatus</i> , <i>Exomis microphylla</i> , <i>Felicia filifolia</i> subsp. <i>filifolia</i> , <i>F. muricata</i> subsp. <i>muricata</i> , <i>F. ovata</i> , <i>Galenia africana</i> , <i>Helichrysum dregeanum</i> , <i>H. lucilioides</i> , <i>Hermannia multiflora</i> , <i>Lessertia fruticosa</i> , <i>Lycium cinereum</i> , <i>Nenax microphylla</i> , <i>Pelargonium abrotanifolium</i> , <i>Pentzia incana</i> , <i>Pteronia ambrariifolia</i> , <i>P. glauca</i> , <i>P. glomerata</i> , <i>P. incana</i> , <i>P. sordida</i> , <i>Rosenia glandulosa</i> , <i>R. humilis</i> , <i>R. oppositifolia</i> , <i>Selago albida</i> , <i>Tripteris sinuata</i> , <i>Zygophyllum spinosum</i> .
Succulent Shrubs	<i>Delosperma subincanum</i> , <i>Drosanthemum lique</i> , <i>Euphorbia stolonifera</i> , <i>Trichodiadema barbatum</i> , <i>Tylecodon reticulatus</i> subsp. <i>reticulatus</i> , <i>T. wallichii</i> subsp. <i>wallichii</i> . Woody Climber: <i>Asparagus aethiopicus</i>
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	<i>Not Protected</i>
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. <i>It does not appear to have any endemic species.</i>

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

Growth Form	Description/Species
	<i>Ursinia nana</i> , <i>Zaluzianskya inflata</i> , <i>Z. peduncularis</i>
Semiparasitic shrub	<i>Thesium lineatum</i>
Herbaceous climber	<i>Fockea sinuata</i>
Semi parasitic epiphytic shrub	<i>Viscum capense</i>
Parasitic herb	<i>Hyobanche glabrata</i>
Woody climber	<i>Asparagus fasciculatus</i> , <i>A. racemosus</i> , <i>A. retrofractus</i> , <i>Microlooma sagittatum</i>
Biogeographically Important Taxa	(^{GKB} Great Karoo basin endemic, ^{RH} Roggeveld-Hantam endemic, ^S Southern distribution limit, ^W Western distribution limit) <ul style="list-style-type: none"> ▪ Succulent Shrubs: <i>Deilanthus peersii</i>^W, <i>Hereroa crassa</i>^{GKB}, <i>Pleiospilos nelii</i>^{GKB}, <i>Rhinephyllum graniforme</i>^{GKB}, <i>Ruschia crassa</i>^{GKB}, <i>R. perfoliata</i>. ▪ Low Shrubs: <i>Felicia lasiocarpa</i>^{GKB}, <i>Sericocoma pungens</i>^S. ▪ Herbs: <i>Helichrysum cerastioides</i> var. <i>aurosicum</i>^W, <i>Ifloga molluginoides</i>^S. ▪ Geophytic Herbs: <i>Brunsvigia comptonii</i>^S, <i>Drimia karooica</i>^W. ▪ Succulent Herbs: <i>Aloe longistyla</i>^W, <i>Crassula hemisphaerica</i>^W, <i>Pectinaria longipes</i> subsp. <i>longipes</i>^{RH}, <i>Piarranthus comptus</i>^{GKB}, <i>Quaqua parviflora</i> subsp. <i>gracilis</i>^{RH}, <i>Tridentea parvipuncta</i> subsp. <i>parvipuncta</i>^{GKB}.
Endemic Taxa	<ul style="list-style-type: none"> ▪ Succulent Shrubs: <i>Antimima karroidea</i>, <i>A. loganii</i>, <i>Calamophyllum teretiusculum</i>, <i>Cerochlamys gemina</i>, <i>Drosanthemum comptonii</i>, <i>Ruschia karrooica</i>, <i>Tanquana archeri</i>, <i>Trichodiadema hallii</i>, <i>Tylecodon faucium</i>. ▪ Low Shrub: <i>Pelargonium stipulaceum</i> subsp. <i>ovato-stipulatum</i>. ▪ Semiparasitic Shrub: <i>Thesium marlothii</i>. ▪ Geophytic Herbs: <i>Lachenalia comptonii</i>, <i>Strumaria undulata</i>. ▪ Succulent Herbs: <i>Haworthia nortieri</i> var. <i>pehlemanniae</i>.
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	<i>Not Protected</i>
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