viewpoint 4b • looking north-west from the gate near Witduin farmhouse • distance 1.95km

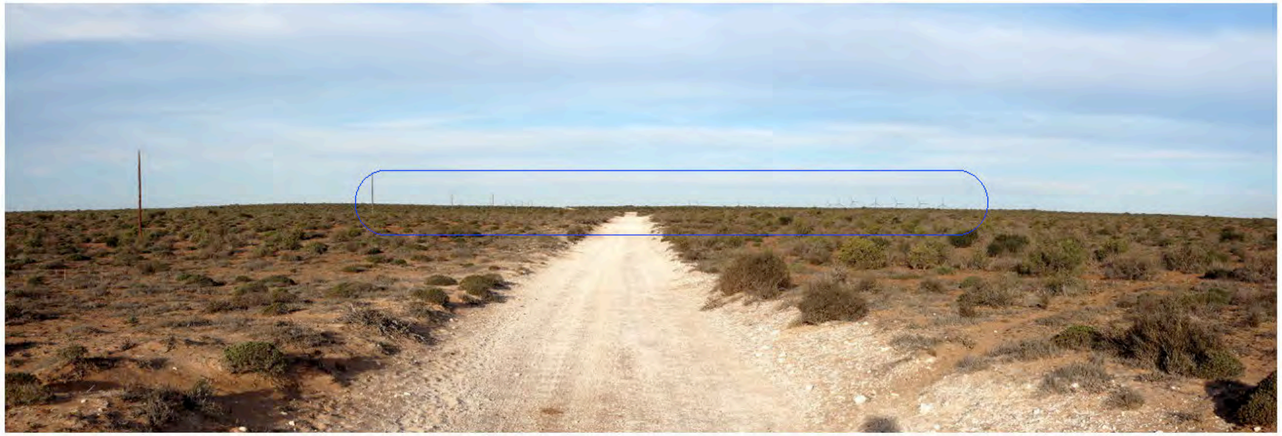
viewpoint 5 • looking north from the gate to Namaqualand National Park • distance 13.2km

Plate 3: Viewpoint Panoramas

viewpoint 7 • looking south-east from the road to Vaalkol Farmstead • distance 5.3km

viewpoint 8 • looking east from the road near Sonnekwa Farmstead • distance 6.6km

Plate 4: Viewpoint Panoramas



viewpoint 9 • looking east from the road near Rooivlei Farmstead • distance 12.4km

viewpoint 11 • looking east from road near Rooivlei Farmstead • distance 16.5km

Plate 5: Viewpoint Panoramas

viewpoint 13 • looking east from the Komaggas road near Steenvlei and Hondevlei Farmsteads • distance 21.1km

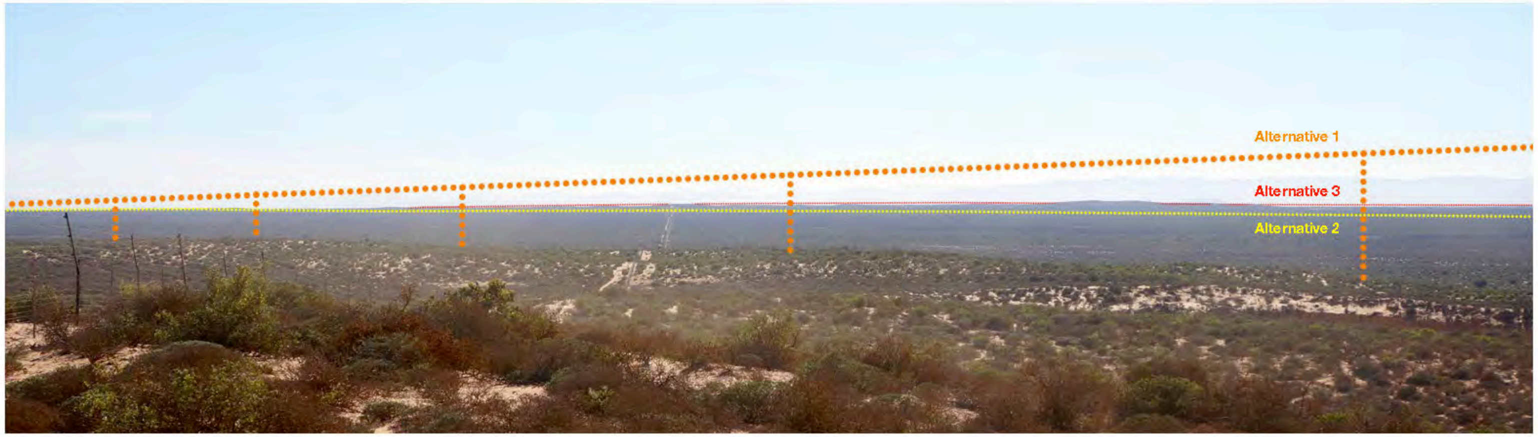
viewpoint 14 • looking east from the Komaggas road near Lewies se Duin • distance 17.0km

Plate 6: Viewpoint Panoramas

viewpoint 15 • looking east from the Komaggas road at proposed powerline crossing • distance 14.8km

Plate 7: Viewpoint Panoramas

viewpoint 12 • looking south from the Gromis SubStation road



viewpoint 15 • looking north-east from the Komaggas road at proposed powerline crossing

Plate 8: Viewpoint Panoramas – Powerline Alternatives

CURRICULUM VITAE

Bernard Oberholzer Landscape Architect + Environmental Planner (BOLA)

Qualifications:
Bachelor of Architecture (UCT 1970), Master of Landscape Architecture (U. of Pennsylvania 1975)

Professional registration/membership:
Professional member of the SA Council for the Landscape Architectural Profession (SACLAP), reg. no. 87018.
Fellow of the Institute of Landscape Architects of South Africa.
B-BBEE Status: Level 4.

Bernard has 40 years experience as a professional landscape architect, specialising in, environmental planning, coastal planning, urban landscape design and visual assessments.

He is currently an independent consultant, and was for 7 years the Convenor of the Master of Landscape Architecture Programme at UCT.

He has presented papers on *Visual and Aesthetic Assessment Techniques*, and provides specialist services as a reviewer of visual impact studies prepared by other firms.

He is the author of *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes*, prepared with the CSIR for the Dept. of Environmental and Development Planning, Provincial Government of the Western Cape, 2005.

Bernard has been involved in numerous land use suitability studies and visual assessments for a wide range of projects, and serves as a member of the Stanford Heritage Committee.

Quinton Lawson Architect

Qualifications:
Bachelor of Architecture (Univ. of Natal 1977)

Professional registration/membership:
Professional member of the SA Council for the Architectural Profession (SACAP), reg. no. 3686.
Member of the Cape Institute for Architects and SA Institute of Architects.

Quinton has practiced as a professional architect since 1978, specialising in architectural and urban design, environmental design and computer visualisation.

He is one of the founding partners of Meirelles Lawson Architects formed in 1988, initially specialising in economic and sustainable housing. He has been a senior partner at MLB Architecture and Urban Design, with specialist expertise in visual modelling and design solutions.

In the past he has been a visiting lecturer at UCT teaching a post-graduate course on Computer Techniques in Landscape Architecture, including visualisation and visual assessment techniques.

Together with BOLA, Quinton has been involved in numerous visual impact assessments over a number of years, and previously served on the Impact Assessment Review Committee of Heritage Western Cape.

A selected list of projects on which Bernard and Quinton have worked is given below.

Selected Infrastructure / Renewable Energy Projects

Visual Guidelines for Communication Masts: Design Manual prepared for Cape Metropolitan Council, 1998. (BOLA)

Portnet Iron-ore Harbour Extensions, Saldanha: Visual and Scenic Impact Assessment, prepared for SRK Consulting, 2000. (BOLA & MLB)

Wind Farm near Darling, Western Cape: Visual Impact Assessment, for Environmental Evaluation Unit UCT, 2001 (BOLA & MLB)

Pechiney Aluminium Smelter, Coega, Port Elizabeth: Visual Impact Assessment prepared for CSIR, 2002. (BOLA & MLB)

Port of Cape Town Container Terminal: Visual Impact Assessment, prepared for CSIR, 2002. (BOLA & MLB)

Proposed Fisantekraal Wastewater Treatment Works and Pipeline: Visual Impact Assessment, for SRK and City of Cape Town, 2003. (BOLA & MLB)

Proposed Power Plant at Oranjemund, Namibia: Visual Impact Assessment, preparea for CSIR and NamPower, 2004. (BOLA & MLB)

Proposed Regional Waste Site in Kalbaskraal / Atlantis area: Visual Impact Assessment for CCA Environmental on behalf of City of Cape Town, 2005. (BOLA & MLB)

Overstrand Landscape Heritage Survey: Landscape Character Analysis, and Visual/ Heritage Guidelines, for Winter and Baumann on behalf of the Overstrand Municipality, 2008. (BOLA)

Proposed Solar Power Plant near Touwsrivier: Visual Scoping Report and Visual Impact Assessment for the EEU (UCT), on behalf of Concentrix Solar, 2010. (BOLA & MLB)

Proposed Renewable Energy Facilities in the Western and Northern Cape: Visual Baseline Study and Visual Impact Assessment for ERM (Cape Town), on behalf of Mainstream SA, 2010. (BOLA & MLB).

Proposed Wind Energy Facilities in the Western and Northern Cape by G7 Renewable Energies: for ERM Southern Africa, 2010. (BOLA & MLB).

Proposed Solar Power Farms in the Northern Cape and Free State: Visual impact assessment for ERM Southern Africa, on behalf of Intikon Energy, 2010. (BOLA & MLB).

Proposed Wind Farm at Kerrie Fontein, near Darling: Visual baseline and visual impact assessment for Environmental Evaluation Unit, UCT, on behalf of the Oelsner Group, 2011. (BOLA & MLB).

Proposed Wave Energy Converter, Hermanus: Visual impact assessment prepared for Anchor Environmental Consultants cc, on behalf of Abagold Ltd. (BOLA).

Proposed Photovoltaic Power Plants at De Aar and Skelfontein, Northern Cape: Visual baseline studies, for CCA Environmental (Pty) Ltd on behalf of RVA, 2012. (BOLA and MLB).

Proposed Solar Photovoltaic Power Plants at Genoegsaam, Eastern Cape, and Graspan, Northern Cape. Visual impact assessment prepared for ERM on behalf of Solaire Direct, 2012. (BOLA and MLB).

Proposed Solar Photovoltaic Power Plants at Melkvlei Northern Cape, and Ruimte, Free State. Visual baseline studies prepared for ERM on behalf of Solar Reserve, 2012. (BOLA and MLB).

Proposed Upgrade of National Road N7, Clanwilliam to Vanrynsdorp, Western Cape. Visual Impact assessment prepared for SiVest on behalf of SANRAL, 2012. (BOLA and MLB).

Proposed Upgrade of Electrical Infrastructure, Goedverwacht Mission Village, Piketberg, Western Cape. Visual Impact assessment prepared for SiVest on behalf of Eskom, 2013. (BOLA and MLB).

Proposed Upgrade of Kwaggaskloof Powerline near Worcester, Western Cape. Visual impact assessment prepared for SiVest on behalf of Eskom, 2013. (BOLA and MLB).

Proposed Road upgrades and Harbour Bridge for Port Louis, Mauritius. Visual impact assessment prepared for CCA Environmental on behalf of the Road Development Authority of Mauritius, 2013. (BOLA and MLB).

Heritage and Scenic Resources of the Western Cape: An Inventory and Policy Framework. Prepared for Setplan as part of the PSDF review for the Provincial Government of the Western Cape, 2013. (BOLA and Sarah Winter).

Proposed Concentrated Solar Thermal Plants (CSP) near Upington, Northern Cape Province. Visual impact assessment prepared for Savannah Environmental on behalf of Abengoa Solar Power South Africa, 2014. (BOLA and MLB).

Proposed Eskom Longdown Substation, Theewaterskloof, Western Cape. Visual impact assessment prepared for SiVest on behalf of Eskom Distribution, 2014. (BOLA and MLB).

National Wind and Solar PV SEA: Landscape Assessment, for the CSIR on behalf of the Dept. of Environmental Affairs, to identify areas best suited for the rollout of wind and solar PV energy projects based on visual/scenic resources within 8 focus areas of South Africa. 2014. (MLB and BOLA).

National Electricity Grid Infrastructure SEA: Visual Assessment for the CSIR on behalf of Eskom and the Dept. of Environmental Affairs, to identify suitable corridors for future transmission lines. Visual specialist study on scenic and heritage resources, and related visual sensitivity within 5 selected corridors across the country. 2015. (MLB and BOLA).

Proposed Ibhubesi Gas Pipeline and Gas Receiving Facility, West Coast. Visual impact assessment prepared for CCA Environmental. 2015.

Proposed Wind Energy Facility, Komsberg, Western and Northern Cape. Visual baseline study and visual impact assessment prepared for Arcus. 2015. (BOLA and MLB).

Proposed Wind Energy Facility, near Murraysburg, Western and Northern Cape. Visual impact assessment prepared for Arcus. 2015. (BOLA and MLB).

Proposed Wind Energy Facility, near Noupoort, Northern Cape. Visual baseline study prepared for Arcus. 2016. (BOLA and MLB).

Strategic Environmental Assessment for Shale Gas Development in South Africa, Karoo focus area. Visual, Aesthetic and Scenic Resources chapter, for the CSIR, on behalf of Dept. of Environmental Affairs. 2016. (BOLA and MLB).

Strategic Environmental Assessment for the SKA Telescope, near Canarvon, Northern Cape. Scenic resource mapping and visual assessment, for CSIR, on behalf of Dept. of Environmental Affairs. 2016. (BOLA and MLB).

Scoping and Environmental Impact Assessment for the proposed Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape

UPDATED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

APPENDIX L:

Heritage Impact Assessment Report (including Palaeontology)

HERITAGE IMPACT ASSESSMENT

SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED KAP VLEY WIND ENERGY FACILITY, NAMAKWALAND MAGISTERIAL DISTRICT, NORTHERN CAPE PROVINCE: EIA PHASE REPORT

SAHRA Case No.: 11654

Required under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999).

Report for:

CSIR – Environmental Management Services
P.O. Box 320, Stellenbosch, 7599
Tel: 021 888 2495
Email: mlevendal@csir.co.za

On behalf of:

juwi Renewable Energies (Pty) Ltd

Dr Jayson Orton
ASHA Consulting (Pty) Ltd
40 Brassie Street, Lakeside, 7945
Tel: (021) 788 8425 | 083 272 3225
Email: jayson@asha-consulting.co.za

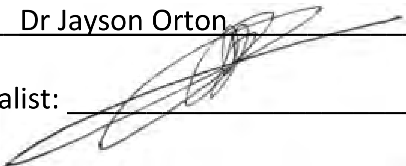
1st draft: 12 September 2017
2nd draft: 27 January 2018
Final report: 17 March 2018

Specialist declaration

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

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

Name of Specialist: Dr Jayson Orton

Signature of the specialist: 

Date: 27 January 2018

EXECUTIVE SUMMARY

ASHA Consulting (Pty) Ltd was appointed by juwi Renewable Energies (Pty) Ltd to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of the Kap Vley Wind Energy Facility (WEF) near Komaggas, Northern Cape. The centre of the proposed WEF would be at approximately S29° 51’ 20” E17° 22’ 20”.

The study area is one with strongly variable topography characterised by quartzite ridges with climbing and falling dunes surrounding them. The dunes and hill slopes are largely vegetated but some open deflating areas occur. The turbines and other infrastructure will be placed largely on the ridgelines and intervening high ground with only the access roads leading from the lowlands onto the hills.

The survey revealed many archaeological sites, mostly Stone Age but also some historical sites, as well as two graveyards. The cultural landscape is weakly developed and relates to small stock farming. However, the Kamaggas Farm landscape is associated with living heritage in that it is used for traditional small stock herding and the gathering of wild products. All recorded archaeological sites have been avoided by the final layout but it is likely that at least some new sites would be found during a follow-up survey.

Overall, the potential impacts are considered to be generally manageable and, from a heritage point of view, the development may proceed. The nature of the archaeological sites seen during the survey suggests that any new sites that might be impacted would not be any different in terms of cultural significance and mitigation requirements from the sites reported here.

The only project alternatives available for assessment were the access roads. While neither will result in any impacts, the northern one, option 1, is slightly favoured because Option 2 runs in close proximity to heritage resources.

Because the impacts to heritage resources are manageable, it is recommended that the proposed Kap Vley Wind Energy Facility should be authorised. This should be subject to the following conditions which must be incorporated into the Environmental Authorisation:

- All significant archaeological sites identified must be protected from harm. Where necessary to effect this, sites should be cordoned off;
- The graveyards at PAN2017/001 (waypoint 1376) and PAN2017/003 (waypoint 1378) must be cordoned off as necessary, avoided and protected;
- The historical sites at PAN2017/002 (waypoint 1377), PAN2017/004 (waypoint 1399), PAN2017/005 (waypoint 1413) and KOM2017/001 (waypoint 1420) must be cordoned off if necessary, protected and avoided;
- Roads must be designed in such a way as to minimise cut and fill operations in order to reduce landscape scarring;
- The final approved layout should be subjected to a pre-construction walk-down survey to identify any further sites that may require mitigation;
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

Glossary

Background scatter: Artefacts whose spatial position is conditioned more by natural forces than by human agency.

Dorbank: A layer of very hard sand that has been cemented by only minimally soluble materials.

Early Stone Age: Period of the Stone Age extending approximately between 2 million and 200 000 years ago.

Handaxe: A bifacially flaked, pointed stone tool type typical of the Early Stone Age.

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

Hominid: a group consisting of all modern and extinct great apes (i.e. gorillas, chimpanzees, orangutans and humans) and their ancestors.

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

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

Pleistocene: The geological period beginning approximately 2.5 million years ago and preceding the Holocene.

Abbreviations

APHP: Association of Professional Heritage Practitioners

ASAPA: Association of Southern African Professional Archaeologists

BAR: Basic Assessment Report

CCS: cryptocrystalline silica

CSIR: Council for Scientific and Industrial Research

CRM: Cultural Resources Management

EA: Environmental Authorisation

ECO: Environmental Control Officer

EIA: Environmental Impact Assessment

ESA: Early Stone Age

GPS: global positioning system

HIA: Heritage Impact Assessment

LMS: London Missionary Society

LSA: Later Stone Age

MSA: Middle Stone Age

NBKB: Ngwao-Boswa Ya Kapa Bokoni

NEMA: National Environmental Management Act (No. 107 of 1998)

NHRA: National Heritage Resources Act (No. 25) of 1999

PPP: Public Participation Process

SAHRA: South African Heritage Resources Agency

SAHRIS: South African Heritage Resources Information System

WEF: Wind Energy Facility

Acknowledgements

Dr Lita Webley assisted with the desktop research presented in Section 5 of this report.

Compliance with Appendix 6 of the 2014 EIA Regulations

Requirements of Appendix 6 – GN R326 (7 April 2017)	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.4 Appendix 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iii (Preliminary Section of this report)
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3
(cA) an indication of the quality and age of base data used for the specialist report;	Sections 3 and 6
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 6, 7 and 8
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying alternatives;	Section 1.1.1, Section 6, 8 and Appendix 2,
g) an identification of any areas to be avoided, including buffers;	Section 10
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Appendix 2
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 3.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6
k) any mitigation measures for inclusion in the EMPr;	Section 9 and 10
l) any conditions for inclusion in the environmental authorisation;	Section 13
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity and activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 12 and 13
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a, see Section 3.6
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a
2. Where a government notice gazetted by the Minister provides for any protocol of minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	n/a

Contents

1. INTRODUCTION

ASHA Consulting (Pty) Ltd was appointed by juwi Renewable Energies (Pty) Ltd to conduct an assessment of the potential impacts to heritage resources that might occur through the proposed development of the Kap Vley Wind Energy Facility (WEF) near Komaggas, Northern Cape (Figure 1). The centre of the proposed WEF would be at approximately S29° 51’ 20” E17° 22’ 20”.

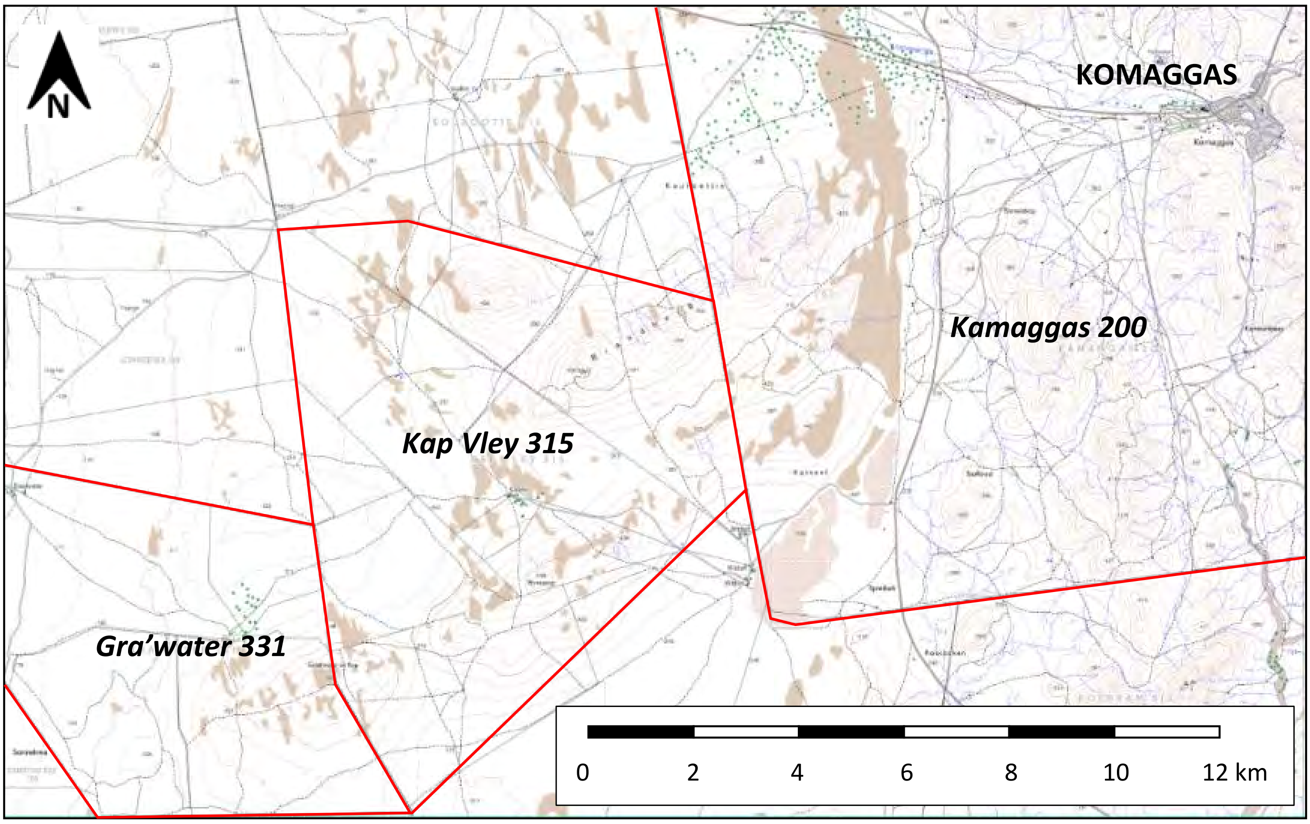


Figure 1: *Extract from 1:50 000 topographic map 2917CD showing the location of the site. The three highlighted farms (red polygons and labels) will host turbines. Source: Chief Directorate: National Geo-Spatial Information. Website: wwwi.ngi.gov.za.*

1.1. Project description

It is proposed to construct a maximum of 45 turbines along the ridges in the study area. The turbines would be between 80 m and 150 m high depending on the model chosen for installation and have a rotor diameter of 100 m to 160 m. The total generation capacity of the facility would be between 50 MW and 300 MW. Each turbine would require a 25 m by 25 m foundation and a 1.0 ha crane platform. The turbines would be linked by a road network totalling some 37 km in length. The roads would generally be 5 m wide, but in places a width of up to 15 m would be required to allow for vehicles passing and for the maximum width of cut and fill areas. Two access points linking to existing public roads are proposed with Option 1 being from the north and Option 2 from the southeast. The turbines would also be linked by electrical cabling, to be lain underground where feasible. An on-site 22/33 kV to 132 kV collector substation with a footprint of 2.3 ha would also be required, along with a communications tower of up to 32 m high. An operations and maintenance building of 1 ha would include, among other things, offices, a workshop, water storage, accommodation and ablution facilities. Both of these structures would be fenced with a 5 m high fence.

A construction camp and several laydown areas totalling 13 ha would be required and a concrete batching plant of 0.25 ha would also be installed for the construction period.

It is noted that an initial WEF layout that excluded the ancillary infrastructure was supplied for the Scoping Phase. This was substantially altered after the scoping findings of the various specialists and finalised with laydown areas and other infrastructure added. This final layout is depicted in Figure 2.

Table 1 lists the farm portions that will host the proposed development.

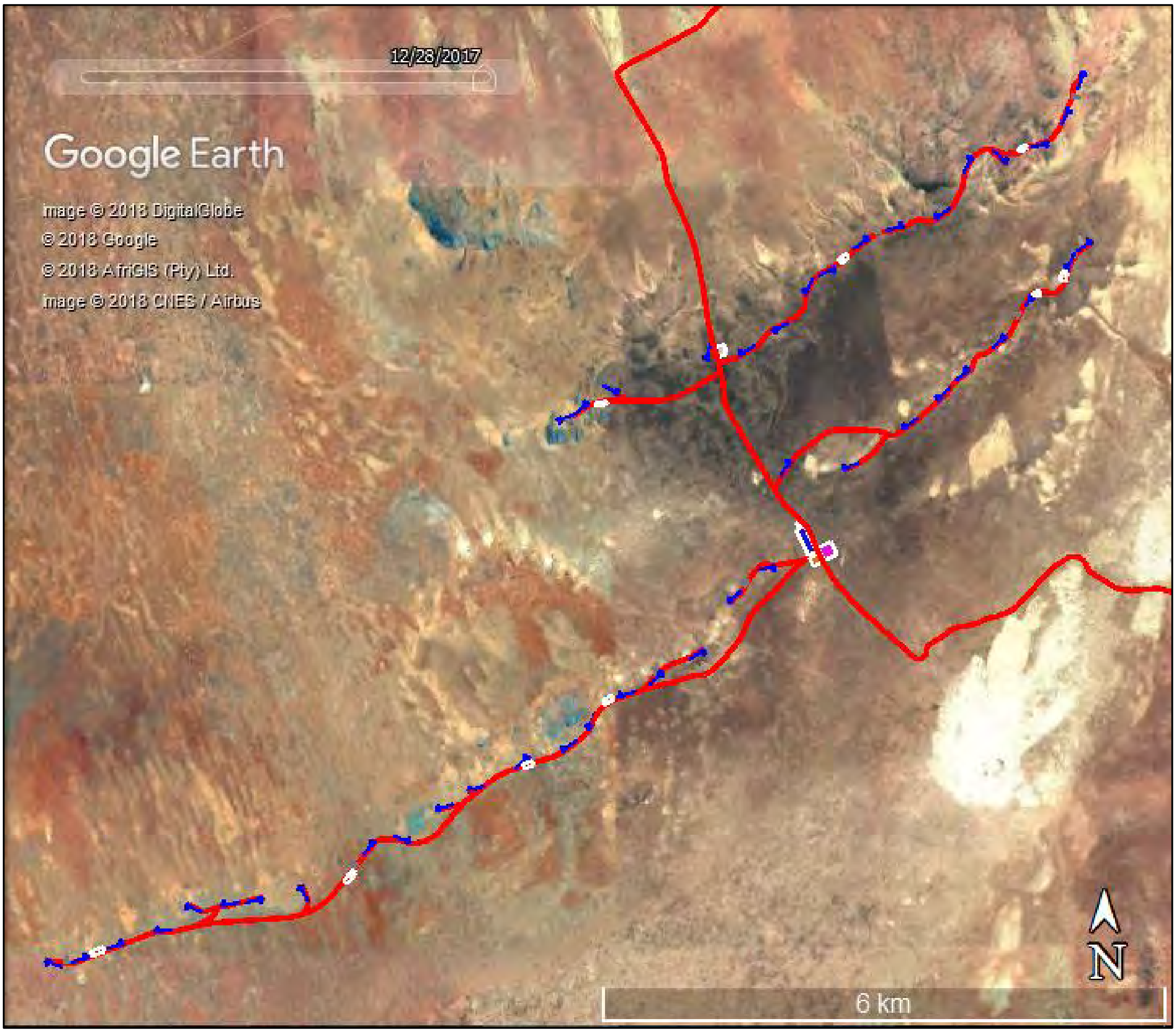


Figure 2: *Aerial view of the study area showing the proposed turbine positions and their platforms (blue) and the proposed road layout (red lines). Ancillary infrastructure is shown by small coloured polygons outlined in white.*

1.1.1. Aspects of the project relevant to the heritage study

All aspects of the proposed development are relevant since excavations for foundations may impact on archaeological and/or palaeontological remains, while the above-ground aspects create potential visual (contextual) impacts to the cultural landscape and any significant heritage sites that might be visually sensitive.

Table 1: *List of properties associated with the proposed Kap Vley WEF.*

Property	**Size**	**Infrastructure**
Kamaggas 200/remainder of Portion 5	59 817.3613 ha	WEF and related infrastructure
Kapvlei 315/remainder	1152.5039 ha	WEF and related infrastructure
Kapvlei 315/portion 1	1842.0192 ha	WEF and related infrastructure
Kapvlei 315/portion 2	1339.5867 ha	WEF and related infrastructure
Kapvlei 315/portion 3	931.2434 ha	WEF and related infrastructure
Gra'water 331/remainder	4163.9133 ha	WEF and related infrastructure
Kourootjie 316/remainder	5784.4775 ha*	Northern access road (Option 1)
Platvley 314/portion 3	46.2342 ha	Southern access road (Option 2)

* This value was calculated from the 6740 morgen 102 square roods shown on the title deed.

1.2. Terms of reference

ASHA Consulting (Pty) Ltd was requested by the CSIR to prepare a Heritage Impact Assessment (HIA) for the proposed Kap Vley WEF EIA that would meet the requirements of the relevant heritage authorities. The HIA should:

- Include a desktop research component;
- Include a fieldwork component (to be carried out during the scoping phase); and
- Adhere to the requirements of Appendix 6 of the 2014 Environmental Impact Assessment (EIA) regulations.

In addition to the above, the following ToR has been provided by the CSIR:

- Adhere to the requirements of specialist studies as outlined in Appendix 6 of the 2014 NEMA EIA Regulations, as amended;
- Assess the no-go alternative very explicitly in the impact assessment section. Please note that the DEA considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads and internal cables is allowed in the 'no-go' areas. Should your definition of the 'no-go' area differ from the DEA definition; this must be clearly indicated in your assessment. You are also requested to indicate the 'no-go' area's buffer.
- Assess cumulative impacts by identifying other wind and solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 50 km of the proposed Kap Vley WEF project) that have been approved (i.e. positive EA has been issued) or the EIA is currently underway. In addition, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following:

• Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.
• The cumulative impacts significance rating must also inform the need and desirability of the proposed development.
• A cumulative impact environmental statement on whether the proposed development must proceed.

- Provide a detailed description of your methodology, as well as indicate the locations and descriptions of turbine positions, and all other associated infrastructures that you have assessed and are recommending for authorisations.
- Provide a detailed description of all limitations to your studies. Your specialist studies must be conducted in the appropriate season and providing that as a limitation, will not be accepted by DEA.
- Describe the existing area to be directly affected by the proposed project in terms of its current cultural, historical, and archaeological characteristics and the general sensitivity of these components to change;
- Undertake a detailed field examination of the project site to identify archaeological sites and heritage features (e.g. stone age artefacts, graves etc.) within or in the region of the development area;
- Describe the type and location of known archaeological sites in the study area, and characterize all heritage items that may be affected by the proposed project;
- Prepare and undertake a desktop study on the palaeontology of the proposed project area. Describe the existing area to be directly affected by the proposed project in terms of its current palaeontological characteristics and the general sensitivity of these components to change;
- Describe the type and location of known palaeontological sites and features in the study area, and characterize all heritage items that may be affected by the proposed project;
- Record sites of palaeontological and archaeological relevance if present (photos, maps, aerial or satellite images, GPS co-ordinates, and stratigraphic columns);
- Describe the baseline environment and determine the status quo in relation to the specialist study;
- Evaluate the potential for occurrence of archaeological features within the study area and at the turbine sites;
- Identify if any permits are required from the relevant Heritage Authority, in terms of the NHRA, for the proposed project activities;
- Identification of issues and potential direct, indirect and cumulative heritage impacts, which are to be considered in combination with any additional relevant issues that may be raised through the PPP;
- Identify and assess potential direct, indirect and cumulative impacts of the proposed project on the palaeontological, archaeological heritage features, and cultural and historical components for the construction, operational and decommissioning phases of the project. Use the CSIR methodology to determine the significance of potential impacts;
- Assess all alternatives, including the no-go alternative;
- Assessment cumulative impacts by identifying other REFs such as wind and solar and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 50 km of the proposed WEF). These include projects that have been approved (i.e. positive EA has been issued), have been constructed or projects for which an Application for Environmental Authorisation has been

lodged with the Competent Authority (see Table 6.1 in Chapter 6 of this report for a list of projects);
- Provide recommendations and suggest appropriate mitigation measures (if required), for the recording, sampling and dating of any archaeological sites that could potentially be destroyed as a result of the proposed project;
- Provide recommendations regarding archaeological heritage management on site, including conservation measures to ensure that the impacts are avoided or limited;
- Provide input to the EMPr, including mitigation measures and monitoring requirements for all phases of the proposed development to ensure that the impacts on the archaeology and palaeontology are avoided or limited;
- Identify any rehabilitation measures that can be reasonably applied with the completion of the construction works;
- Provide a detailed archaeology sensitivity map of the site and identify any no-go areas from a cultural, historical and archaeological perspective;
- Provide a description of any assumptions, uncertainties, limitations and gaps in knowledge;
- Provide a description of the relevant legal context and requirements; and
- Incorporate and address issues and concerns raised during the Scoping and EIA phases where they are relevant to the specialist's area of expertise.

1.3. Scope and purpose of the report

An HIA is a means of identifying any significant heritage resources before development begins so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This HIA report aims to fulfil the requirements of the heritage authorities such that a comment can be issued for consideration by the National Department of Environmental Affairs (DEA) who will review the EIA and grant or withhold authorisation. The HIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation should this be granted.

1.4. The author

Dr Jayson Orton has an MA (UCT, 2004) and a D.Phil (Oxford, UK, 2013), both in archaeology, and has been conducting HIAs and archaeological specialist studies in South Africa (primarily in the Western Cape and Northern Cape provinces) since 2004 (please see Curriculum Vitae included as Appendix 1). He has also conducted research on aspects of the Later Stone Age in these provinces and published widely on the topic. He is an accredited heritage practitioner with the Association of Professional Heritage Practitioners (APHP; Member #43) and also holds archaeological accreditation with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233) as follows:

- Principal Investigator: Stone Age, Shell Middens & Grave Relocation; and
- Field Director: Colonial Period & Rock Art.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follow:

- Structures: "any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith";
- Palaeontological material: "any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace";
- Archaeological material: a) "material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures"; b) "rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation"; c) "wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation"; and d) "features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found";
- Grave: "means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place"; and
- Public monuments and memorials: "all monuments and memorials a) "erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value; some of these speak directly to cultural landscapes.

Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. This report fulfils that requirement.

Under the National Environmental Management Act (No. 107 of 1998; NEMA), as amended, the project is subject to an EIA. Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape; for built environment and cultural landscapes) and the South African Heritage Resources Agency (SAHRA; for archaeology and palaeontology) are required to provide comment on the proposed project in order to facilitate final decision making by the DEA.

3. METHODS

3.1. Literature survey and information sources

A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:50 000 map and historical aerial images were sourced from the Chief Directorate: National Geo-Spatial Information. A specialist palaeontological study was conducted at the scoping stage and used to inform the HIA.

3.2. Field survey

The original layout was subjected to a detailed foot survey on 14th to 17th August 2017. This was during late winter/early spring but in this generally dry area the season made no difference to the survey because ground visibility is much the same throughout the year. During the survey the positions of finds were recorded on a hand-held GPS receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

3.3. Impact assessment

For consistency among specialists, the impact assessment was conducted through application of a scale supplied by the CSIR.

3.4. Grading

Section 7 of the NHRA provides for the grading of heritage resources into those of National (Grade 1), Provincial (Grade 2) and Local (Grade 3) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade 1 and 2 resources are intended to be managed by the national and provincial heritage resources authorities, while Grade 3 resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. SAHRA (2007) has formulated its own system[1] for use in provinces where it has commenting authority. In this system sites of high local significance are given Grade IIIA (with the implication that the site should be preserved in its entirety) and Grade IIIB (with the implication that part of the

[1] The system is intended for use on archaeological and palaeontological sites only.

site could be mitigated and part preserved as appropriate) while sites of lesser significance are referred to as having 'General Protection' and rated with an A (GPA; high/medium significance, requires mitigation), B (GPB; medium significance, requires recording) or C (GPC; low significance, requires no further action).

3.5. Assumptions and limitations

The study is carried out at the surface only and hence any completely buried archaeological sites will not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. Because of the great distances that had to be walked to access the remote parts of the study area, it was not possible to survey more widely than the original project footprint. It should be noted that the original layout has changed substantially and that the present report is thus limited by the fact that sections of the project footprint have not been subjected to a ground survey.

Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts within approximately 50 km of the study area. The existing and proposed developments that were taken into consideration for cumulative impacts are mapped in Figure 3 and include:

- At least five wind energy facilities;
- At least eight solar energy facilities; and
- One power line project.

***Figure 3:** Aerial view of the region around the site showing other renewable energy projects proposed for development in the area. The single power line project runs from north to south between the project site and the coastline.*

3.6. Consultation processes undertaken

The NHRA requires consultation as part of an HIA but, since the present study falls within the context of an EIA which includes a public participation process (PPP), no dedicated consultation was undertaken as part of the HIA. Interested and affected parties would have the opportunity to provide comment on the heritage aspects of the project during the PPP undertaken as part of the Scoping and EIA phases of the project.

4. PHYSICAL ENVIRONMENTAL CONTEXT

4.1. Site context

The site is located in a relatively remote area to the west of the village of Komaggas and to the southeast of Kleinzee. Turbine positions lie between about 7 km and 21 km from Komaggas and between about 30 km and 38 km from Kleinzee. The study area and surrounds are largely used for small stock grazing and the only infrastructure present consists of sparsely distributed farm houses, farm tracks and fences and a number of stock posts within the Komaggas Reserve. Roads in the immediate area are all gravelled.

4.2. Site description

The site is strongly variable from place to place. The proposed turbines would be situated on areas of high ground – both sandy and rocky – that protrude from the generally sandy and flat coastal plain. While the surrounding coastal plain is generally between about 200 m and 300 m above sea level, the hills in the study area rise to between 400 m and 500 m. The underlying geology is quartzite and the high-lying areas host fynbos vegetation. The sides of the hills tend to be sandy and, in places, large dunes have formed on the sides of and on top of the ridges. Some of these dunes have deflated to expose bedrock. In other areas the ridges are rocky and coated in gravel and small rocky koppies sometimes stand proud of the surroundings. Figures 4 to 12 show a series of views across the site.

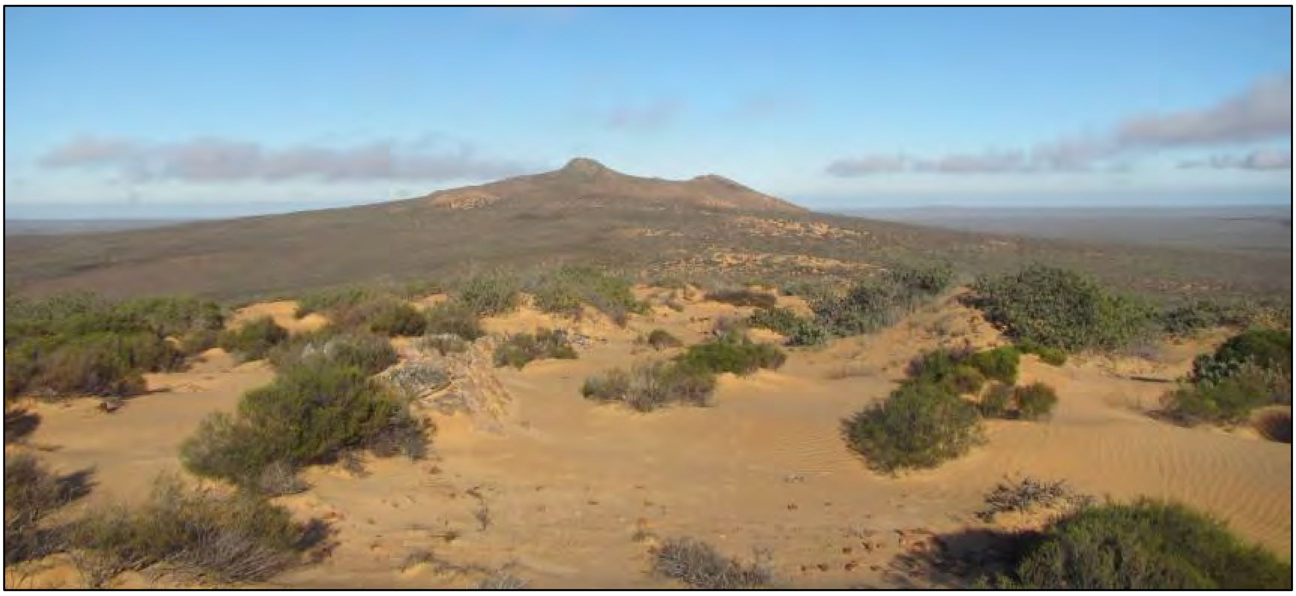


Figure 4: *View towards the southwest along the ridge towards Byneskop in the background.*

Figure 5: *View towards the south-southwest from the north-eastern part of the study area. Byneskop lies in the background at far right.*

Figure 6: *View towards the southwest across the central part of the study area.*

Figure 7: *View across some of the sandy deflation areas in the south-eastern part of the study area.*

Figure 8: *View across some of the sandy deflation areas in the eastern part of the study area.*

Figure 9: *Example of a rocky outcrop in the north-eastern part of the study area.*

Figure 10: *Example of a rocky outcrop in the northern part of the study area.*

Figure 11: *View across some of the high ground in the northern part of the study area.*

Figure 12: *View across some of the high ground in the central part of the study area.*

5. ARCHAEOLOGICAL AND HISTORICAL CONTEXT

This section of the report contains the desktop study and establishes what is already known about heritage resources in the vicinity of the study area. What was found during the field survey as presented below may then be compared with what is already known in order to gain an improved understanding of the significance of the newly reported resources.

5.1. Archaeological aspects

Early Stone Age (ESA) materials in Namaqualand are known mostly from near-coastal contexts and, owing to the contexts in which they are found, are often associated with Middle Stone Age (MSA) artefacts. Halkett (2002) reported a large scatter of artefacts from Kleinzee, while Orton and Webley (2012b) found ESA and MSA artefacts associated with fossil bones on the high ground just northeast of Kleinzee. Much further south, in Western Cape, Orton (2017) found extensive scatters of ESA material at the interface of the dorbank and aeolian cover sands, and Hart and Halkett (1994) excavated an ESA sample from alongside a quarried silcrete outcrop. To the north of

Kleinsee, Orton and Halkett (2006) described an extensive silcrete outcrop with evidence of quarrying and including scatters of ESA and MSA artefacts. Further inland, and not far south of the present study area, Morris and Webley (2004) reported scatters of ESA artefacts, including handaxes, amongst sand dunes on the coastal plain and around pans.

Middle Stone Age (MSA) material is generally more commonly reported, but further inland tends to occur as isolated artefacts or as very ephemeral scatters. To the northwest of Komaggas Dreyer (2002) reported MSA artefacts on quartzite and hornfels associated with river gravel about 1 km from the Buffels River. Van Pletzen-Vos & Rust (2011) found MSA quartz artefacts on the western and northern outskirts of Komaggas. Howieson's Poort-type implements belonging to the MSA were found in Keurbos Cave some 15km north-east of Garies (Webley 1992), while Orton and Halkett (2005) found similar material associated with shell in the dunefield northeast of Koingnaas. The relationship between the shell and artefacts, however, might have been spurious. Webley (1984) also reported MSA implements, from excavations at the small rock shelter of Wolfkraal close to Kharkams in the Kamiesberg. Near the town of Garies in central Namaqualand, Webley & Halkett (2010) reported on a MSA factory site on Swartkop, an outcrop of dark, fine-grained rock which appears to have been targeted by prehistoric populations. Closer to the coast Halkett and Hart (1997) and Jerardino *et al.* (1992) reported scatters of MSA artefacts from north of Kleinsee and at the Groen River Mouth respectively.

Later Stone Age (LSA) material is substantially more common and has been reported throughout Namaqualand, but with the coast clearly having been the most densely occupied (Dewar 2008; Orton 2012). There one finds many thousands of shell middens and scatters, some of them preserving rich assemblages of cultural materials and food remains. While these focus on the area within about 2 km to 3 km of the coast, shell scatters are known from along the Buffels River up to 10 km inland (Orton & Webley 2012b). Almost all sites are open sites with just one coastal rock shelter known to contain LSA deposits (Webley 1992. 2002). Inland the best sites tend to be rock shelters with the majority of other sites being relatively ephemeral open artefact scatters. Most work in the inland region has been done by Webley (1986, 1992, 2007) with a focus on rock shelters. Although not common, rock art has been recorded at various locations in the central part of Namaqualand (Orton 2013; Morris & Webley 2004). Orton (2013) ascribes the geometric rock art designs to Khoekhoe herders. Just to the south of the present study area, in the Namaqualand National Park, both representational and geometric rock art sites were recorded (Morris & Webley 2004).

The last 2000 years are especially important for archaeological research in Namaqualand. Archaeological sites with pottery, post-dating 2000 years ago are reported from a number of sites and are believed to be associated with the introduction of herding and/or pastoralism to the region some 2000 years ago. The region is known to be important in terms of the beginnings of herding, but the details of how it happened are still highly contested (Orton 2015). The archaeology supports the historic information that pastoralist groups (the ancestors of the Little Namaqua Khoekhoen) were occupying this area at and before the time of colonial contact.

Other work in the Komaggas area has been limited. Deacon (2004) worked immediately to the west of the Komaggas communal lands and reported no archaeological sites. He did, however, note the presence of stockposts, presumably those of the residents of Komaggas. Magoma's (2016) linear survey passing west of the study area surprisingly yielded only isolated artefacts, while immediately west again Orton and Webley (2012a) found large numbers of LSA sites spread across the landscape.

5.2. Historical aspects and the built environment

Historically, we know that the interior of Namaqualand was occupied by the Little Namaqua, a Khoekhoen pastoralist tribal group. They herded sheep and cattle and lived in temporary encampments of mat houses. They are known to have moved seasonally with their livestock and historical reports indicate that they may have followed a transhumance cycle further south in the Kamiesberg area, but also probably around Komaggas (Webley 1992).

Since the Little Namaqua had no clearly defined territorial boundaries, it was easy for the colonial Trekboers to settle in the area. The earliest loan farms were granted after 1750 and some were located on the Groen and Doorn Rivers. The Little Namaqua were eventually forced to settle at mission stations which became the centres for the so-called "communal reserves" such as Leliefontein, Steinkopf, Komaggas, Concordia and the Richtersveld.

The earliest references to Komaggas (Camaggas) are in Gordon and date to 1779. Komaggas (also spelt Kamaggas in some early maps[2]) received a Certificate of Occupation on 9 November 1843, granting the Cloete family the right of occupation on the land. Various interpretations have been given for the name Komaggas, which is a Nama word interpreted as "Beeswater" by Burger (1986) although Nienaber & Raper (1977) are of the opinion that it means "The place which is brown".

The fountain was the main source of water of the Nama kaptein kXurib. There are various oral accounts of the relationship between Ryk Jasper Cloete (Bregman 2010) and the Nama kaptein, with Bregman (2010) suggesting that he married the captain's daughter, thereby acquiring the land. Sharp (1994) points out that the early history of the Komaggas land is contested. Jasper Cloete utilized land up to the Orange River to graze his stock. The land became the mission station of the London Missionary Society (LMS) in 1829 and was subsequently surveyed in 1831. It became a station of the Rhenish Missionary Society in 1843 and then the N.G. Church from 1936 (Raper n.d.).

Bregman (2010) provides a list of the farms surrounding and in the vicinity of Komaggas, including the date that they were first registered. Farms to the west of Komaggas were granted to colonists under quitrent title only after 1855, and Bregman notes that this was a direct result of the copper industry as mining companies sought leases in the surrounding areas. The waterless plains between the Swartlintjies and Buffels Rivers were left open as Crown Land. Although much of the land surrounding Komaggas was privately owned after 1915, pastoralists were still able to access grazing lands outside of the reserve because the farms were not completely fenced and access was gained at specific points. However, they had no formal title to the land. In 1925 diamonds were discovered on the farm Oubeep, south of Port Nolloth, and in 1926 at Kleyne Zee, both by Jack Carstens. Mining at what became the town of Kleinzee started in 1927 (Rebelo 2003). Much of the coastline was then taken up by mining companies and access for grazing was closed.

6. FINDINGS OF THE HERITAGE STUDY

This section describes the heritage resources recorded in the study area during the course of the project. Table 2 lists the finds, while they are mapped in Appendix 2.

[2] Note that in the present report "Komaggas" refers to the town and "Kamaggas" to Farm Kamaggas 200.

Table 2: *List of heritage sites recorded during the field survey. Archaeological and historical sites are given names following the system that has been in use in the area for some years*[3]*. Background scatter and very ephemeral occurrences are not regarded as sites and thus ae not named.*

Waypoint	**Site name**	**GPS co-ordinate**	**Description**	**Significance (grade)** **Mitigation**
1376	PAN2017/001	S29 52 22.8 E17 23 37.0	A set of 9 graves marked only by head and foot stones. Aligned east west with 7 in a single row and 2 forming a second row. Very close to the access road (about 3 m away).	High (IIIA) **Avoid**
1377	PAN2017/002	S29 52 05.9 E17 23 34.1	A house foundation that looks early 20th century but, according to historical literature, is likely late 19th century. It was built of locally made sun-dried mud bricks with straw added to them. A cement floor appears to have been cast inside the house at a later date. Also front steps added. There is also an outdoor over made in a drum. Very light scatter of glass, ceramics and metal fragments over wider area. Most seems to be 20th century but occasional pieces may be late 19th century. There are a number of mature Eucalyptus sp. trees in the vicinity.	Medium-low (GPB) **Avoid**
1382		S29 52 04.9 E17 23 32.7	Small square stone feature (1x2 m) near house ruin.	Low (GPC)
1383		S29 52 04.2 E17 23 34.5	Large pepper tree and a pile of 20th century rubble. Ephemeral glass, ceramic and metal scatter extends over this area (looks like mostly 20th C).	Low (GPC)
1378	PAN2017/003	S29 52 08.7 E17 23 30.6	Farm graveyard with 21 graves in it, 4 of them marked only by head and foot stones (3 of the latter were children). Surnames and dates of death for the other 17 graves are listed in Appendix 3. There are a number of mature Eucalyptus sp. trees alongside the graveyard.	High (IIIA) **Avoid**
1379	---	S29 51 33.4 E17 22 53.2	Small rectangular stone feature (1x2 m) on top of ridge. Seems highly unlikely to be a grave, especially given the scatter alongside (waypoint 1380) which suggests some other activity at this location.	Low (GPC)
1380	---	S29 51 33.7 E17 22 53.5	Very light scatter of ceramic (plate, cup) and metal fragments.	Low (GPC)
1381	---	S29 50 45.4 E17 24 24.9	Low density quartz scatter on ridge.	Low (GPC)
1384	KAP2017/001	S29 52 15.8 E17 21 44.3	A moderate density LSA artefact scatter in a deflation hollow with quartz, cryptocrystalline silica (CCS) and silcrete. Artefacts seen included a CCS adze and a quartzite hammer stone. The hollow gives the impression that there might be buried material here too.	Low-medium (GPA) **4 hours**
1385	KAP2017/002	S29 52 31.9 E17 21 19.6	Low density LSA scatter of quartz artefacts in a sandy area between rocky outcrops.	Medium (GPA) **3 days**
1386		S29 52 32.5 E17 21 18.4	Low density LSA scatter of quartz artefacts in a sandy area between rocky outcrops.	

[3] E.g. KAP2017/001 = 1st site recorded on Kapvlei in 2017. PAN = Panvlei, KOM = Komaggas, GRW = Gra'water

Waypoint	Site name	GPS co-ordinate	Description	Significance (grade) **Mitigation**
1387		S29 52 33.0 E17 21 17.2	Low density LSA scatter of quartz artefacts in a sandy area between rocky outcrops.	
1388		S29 52 34.6 E17 21 16.0	High density LSA scatter of quartz artefacts in a sandy area between rocky outcrops.	
1389		S29 52 34.1 E17 21 14.7	Very high density LSA scatter of quartz artefacts in a sandy area below a rock shelter. This spot is effectively the talus scatter for the rock shelter. (Elevation at about 430 m.)	
1390		S29 52 33.6 E17 21 14.2	A small rock shelter with no deposit in it but with a bee hive in a hole in the rear wall. There are a few artefacts on the rocky floor. Also some historical/recent graffiti chipped into the back wall: "BS", "CI?" and "D???".	
1391		S29 52 34.4 E17 21 14.4	Very high density LSA scatter of quartz artefacts in a sandy area below a rock shelter. This is another spot on the talus scatter for the rock shelter and a CCS segment was seen here.	
1392	KAP2017/003	S29 52 35.8 E17 21 15.1	A moderate density quartz scatter in a sandy patch below the rocky ledge (one level below the talus scatter of waypoints 1388, 1389 and 1391. Uncertain to what degree this is 'spillage' from above or a separate scatter.	Low-medium (GPA) **4 hours**
1393	KAP2017/004	S29 53 09.1 E17 20 09.7	LSA scatter located around 3 sides of a rocky outcrop. It includes quartz, ostrich eggshell and a piece of marine shell (*C. granatina*).	Medium (GPA) **1 day**
1394		S29 53 08.6 E17 20 08.8		
1395	KAP2017/005	S29 53 09.1 E17 20 07.6	A moderate density quartz scatter in a sandy deflation hollow about 30 m downslope (towards the southwest) of waypoints 1393 and 1394. It also has silcrete and a quartzite hammer stone present.	Low-medium (GPA) **4 hours**
1396	GRW2017/001	S29 53 37.9 E17 18 41.0	A moderate density quartz scatter in a sandy deflation hollow.	Low-medium (GPA) **4 hours**
1397	GRW2017/002	S29 53 39.2 E17 18 44.2	A low density quartz scatter in a sandy deflation hollow.	Low (GPC)
1398	KAP2017/006	S29 53 24.3 E17 19 32.2	A moderate to high density quartz scatter in a sandy deflation hollow.	Low-medium (GPA) **4 hours**
1399	PAN2017/004	S29 52 35.8 E17 23 35.5	Stone foundations with cement floors and pepper trees. There is also a widespread, very low density scatter of glass and ceramics scattered all over the area. There are also a few marine shells. Several mature Eucalyptus sp. trees occur in the vicinity.	Low-medium (GPB) **Avoid**
1413	PAN2017/005	S29 52 25.6 E17 23 32.9	A stone foundation with a later cement floor and two pepper trees. It looks 20th century but historical literature suggests it may be late 19th century. Also an ephemeral scatter of glass, ceramics and marine shell in the wider area. There is also a small ash and artefact dump about 20 m to the north.	Low-medium (GPB) **Avoid**
1414	KAP2017/007	S29 50 30.1 E17 21 48.8	A low density quartz scatter around a rock outcrop on the summit of a mountain. (Elevation at about 490 m.)	Low (GPC)

Waypoint	Site name	GPS co-ordinate	Description	Significance (grade) **Mitigation**
1415	KAP2017/008	S29 50 31.1 E17 21 45.8	A dense quartz scatter in a saddle between two rocky koppies. The substrate is quite sandy but has very fine gravel present throughout the site. (Elevation at about 490 m.)	Medium (GPA) **1 day**
1416	KAP2017/009	S29 50 28.5 E17 21 45.9	A small, sandy deflation hollow with a scatter of quartz artefacts in it.	Low-medium (GPA) **2 hours**
1417	---	S29 49 44.0 E17 20 47.0	A widespread, low density background quartz scatter among natural quartz gravel on the hilltops in this area.	Low (GPC)
1418	---	S29 49 45.0 E17 20 27.7	A low density background scatter of quartz artefacts among natural quartz gravel over a wide area on the hilltops.	Low (GPC)
1419	---	S29 49 41.1 E17 20 55.4	A low density quartz scatter on a dune between rocky ridges at the northern foot of a mountain.	Low (GPC)
1420	KOM2017/001	S29 49 46.1 E17 23 10.2	A stone farm boundary beacon that is likely to be historic.	Low (GPB) **Avoid**
1421	KOM2017/002	S29 49 59.9 E17 24 24.5	A low density quartz scatter in front of a rocky outcrop.	Low (GPC)
1422	KAP2017/010	S29 51 03.0 E17 23 04.3	A very small, low density quartz scatter in a deflation hollow.	Low (GPC)
1423	---	S29 52 26.7 E17 23 39.8	A well excavated into the substrate but lined with concrete rings in the upper few meters. Appears to be dry. Uncertain if an older well that has been modified, but seems far more likely to be relatively recent (maybe mid-20th century). Looks to have modern rubbish in it (possibly beer bottles). Also a wind pump located here.	---
1444	---	S29 48 57.3 E17 24 31.3	A quartz outcrop with a light background scatter of artefacts of mixed age around it.	Low (GPC)
1445	---	S29 49 05.0 E17 25 29.4	A very widespread and ephemeral background quartz scatter on red sand on the plains.	Low (GPC)

6.1. Palaeontology

Although the SAHRIS Palaeosensitivity map indicates low sensitivity throughout the study area (Figure 13), a brief desktop review of the palaeontological potential for the project was requested by the client and is included as Appendix 4 of the present report. Pether (2017) notes that the hills are of quartzites and schists of the Springbok Formation and are entirely unfossiliferous. The slopes around the hills are mantled by aeolian sand, talus, colluvium and ephemeral stream deposits, all of which are considered to have low fossil bone potential. The surface sands around the hills are similarly considered to have low sensitivity because of the likely sparseness of fossils. Bones would most likely occur on the surface of the buried dorbank layer and might be associated with archaeological material (in which case they would be protected as archaeology). Such material is virtually impossible to find unless the surficial sands have been removed. Nevertheless, if any fossils were found they would likely be of scientific significance because of their rarity and the generally limited palaeontological knowledge of this area.

Figure 13: *Extract from the SAHRIS Palaeosensitivity map showing the broader area to be of low palaeontological sensitivity (blue shading) but with areas of zero sensitivity (grey shading) where granite and quartzite crop out.*

6.2. Archaeology

The archaeological finds reported here were all recorded along the original layout during the scoping phase of the project. They thus reflect the range of sites that occur in the area rather than those within the project footprint currently under assessment.

It is notable that the vast majority of deflation hollows have very few, if any, artefacts in them. A good number of hollows were found to contain two or three artefacts and were not recorded. In general the hollows were deflating which showed that buried archaeology was highly unlikely. Some of the hollows may have formed quite recently. However, in a few instances the fine-grained surface deposits suggested accretion of sand and the chance of subsurface materials being present. KAP2017/001 (waypoint 1384) is an example of such a deflation where part of the site was sandy and part deflated to bedrock but the artefacts were concentrated in the sandy area (Figure 14). KAP2017/006 was another deflation hollow but with many more artefacts visible on the surface (Figure 15). Although not as dense as many other deflation hollows in Namaqualand, this site was the densest of those recorded during the survey.

Figure 14: *View of KAP2017/001 (waypoint 1384). Most artefacts were found in the sandy part at the back.*

Figure 15: *View of KAP2017/006 (waypoint 1398). This was the densest deflation hollow in the study area.*

KAP2017/002 was the most impressive Stone Age archaeological site recorded during the survey. Although only a small area had a very dense scatter of artefacts, the entire site measured some 60 m by 180 m. The dense part of the site (Figure 16) lay just below a small rock shelter that was devoid of archaeology, possibly due to the bee's nest it contained. The remainder of the scatter extended down a sandy gulley between the main rocky hill of Byneskop and a parallel subsidiary ridge to the southeast. Most of the area visible in Figure 17 has artefact scatter over it in varying densities. Several other smaller artefact scatters were located along the sandy ridgeline in the south-western part of the study area but many were very small and/or low density. They were generally in deflations.

Figure 16: *Stone artefacts lying on the surface at KAP2017/002 (waypoint 189). The vast majority were in quartz.*

Figure 17: *View towards the west showing the location of the KAP2017/002 rock shelter (waypoint 1390, red arrow) and the densest artefact scatter (waypoints 1389 & 1391, yellow dashed line).*

A surprising aspect of the archaeology in the study area was the presence of a series of artefact scatters near the summit of the highest hills in the northern part of the study area. In a number of areas these scatters were best thought of as background scatters of mixed age and were associated with quartz gravel. However, one sandy area, in a saddle between rocky summits, contained three artefact scatters, one located in a small deflation hollow (KAP2017/009, waypoint 1416; Figure 18), another was low density and at the foot of a koppie (KAP2017/007, waypoint 1414), while the third was an extensive and quite dense scatter (KAP2017/008, waypoint 1415; Figure 19).

Figure 18: *View of the small deflation hollow and artefact scatter at KAP2017/009 (waypoint 1416).*

Figure 19: *View towards the east across KAP2017/008 (waypoint 1415).*

6.3. Graves

Two graveyards were recorded along the southern access road to the study area. One was unfenced and comprised of nine graves marked only by stone head and foot stones (PAN2017/001; waypoint 1376). The graves were in two rows about 3 m off the current access track (Figure 20). The second one is a formal, fenced farm graveyard (PAN2017/003; waypoint 1378) close to one of the ruins. It has 21 graves in it, four of which are marked only by stone head and foot stones. The remaining 17 graves are formal graves. A few mature Eucalyptus trees stand alongside the graveyard (Figure 21). The graveyard was used between 1916 and 1990 (Appendix 3).

Figure 20: *View towards the north across the nine graves in the informal graveyard alongside the current access track at PAN2017/001*

Figure 21: *View towards the north across the formal, fenced graveyard at PAN2017/003 (waypoint 1378).*

(waypoint 1376).

Another farm graveyard occurs at the Kap Vley farm house to the west of the proposed layout but it was not visited because it is far away from the project footprint and will not be affected in any way.

6.4. Built environment

The only formal structure visible in the vicinity of the study area was the Kapvlei farmhouse located some 1.6 km from the nearest turbines. Due to time constraints, it was not visited, but the photograph in Figure 22 (provided by the noise specialist on the project team) shows that it is a simple, probably early-mid-20th century structure. Historical aerial photography shows that an established complex was present there in 1964. The earliest topographic map (1:250 000) dates to 1961 and does not show farm complexes. The second edition from 1972 labels this complex as Kapvlei. Nevertheless, based on the 1964 historical aerial photograph (Figure 23), the complex is likely to contain structures greater than 60 years of age.

Figure 22: *View of the front of the Kapvlei farmhouse. The overall form and the presence of steel-framed windows are typical of early-mid-20th century structures in the region. Photo provided by Morné de Jager (noise specialist on the project team).*

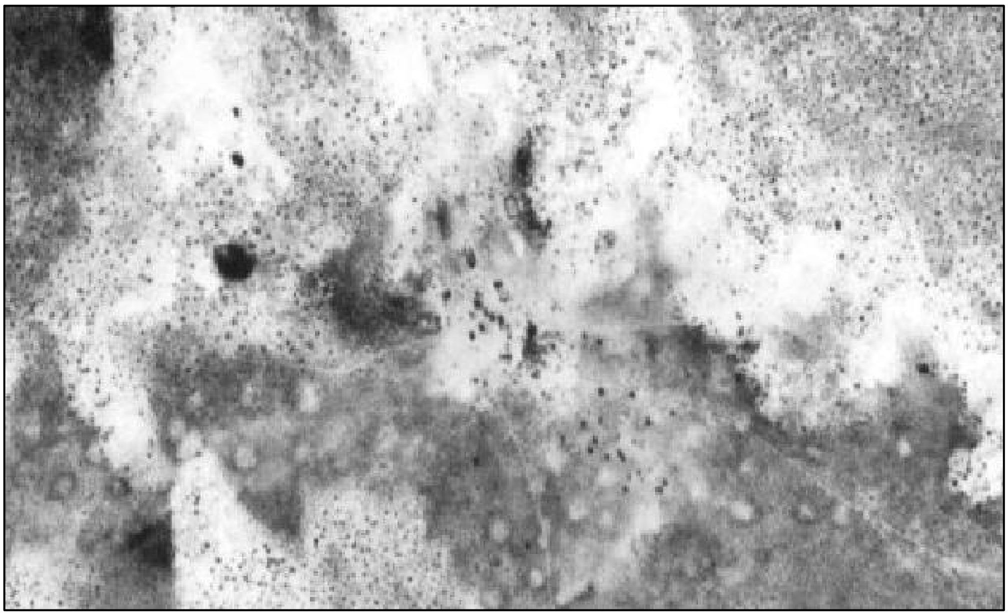


Figure 23: *Aerial view of the Kapvlei farm complex (mid-picture) dating to 1964 (Job 525, strip 33, photograph 2546). Although the structures are not clearly definable, their presence at this location is obvious by the meeting of all the roads there.*

6.5. The cultural landscape and its relationship to intangible heritage

The NHRA does not protect intangible heritage itself, but places associated with intangible heritage are protected. The Komaggas area contains many small stock posts which are actively used on a seasonal basis by members of the community who practice herding. Because this way of life has been ongoing for so long it is regarded as intangible heritage and the stock posts, although recent, are the physical manifestations of that heritage. They are also one of the primary components of the local cultural landscape, especially on the farm Kamaggas, and hence these two aspects are considered together in this section of the HIA.

Historical maps and aerial photography allow for an examination of how the cultural landscape has changed over time because they indicate human land use. Two key elements of historic land use are relevant here. The first is the presence of the area of dunes known as 'Witduin' (Figure 24). This area has long been known as a source of fresh water. The Reverend W.J. Conradie, writing of his experiences in Namaqualand between 1886 and 1895 provides the following description of the Witduin area as translated by Schaeffer (2008):

> The white dune, which has a surface area of some thousands of square yards, lies like an island of white beaches amid the pastel red sands surrounding it. Water can be found by digging anywhere in this white sand, which belongs to the mission at Kamaggas, but none is to be found in the surrounding red sands.

Maps from the late 19th/early 20th centuries indicate the dunes as a water source and it is evident that many roads and tracks converge on this area (Figures 25 & 26). The farm buildings (now the ruins at waypoints 1377 and 1413) on the northern part of Platvley were built close to the dunes because of the availability of water. W.J. Conradie again (Schaeffer 2008), referring to Mr Kotze's farm Witduin:

> His farm is completely devoid of water, which is why he has to live on the absolute edge of it next to the white dune, whence he obtains water by paying for the use of it.

A relatively modern well (perhaps mid-20th century) and a wind pump were noted in this area – the well was dry (waypoint 1423). A quick walk into the Witduin area showed that much Stone Age archaeology was present along with a light scattering of historical artefacts[4] which suggests a long term availability of water here in the past. A large stone beacon (green circle on Figures 27 & 28) and a small coppice of palm trees (blue circle on Figures 25 & 26) were also seen and both of these may indicate wells now covered over with sand. Palm trees were frequently planted alongside wells in the past. A farm worker on Kaplvlei commented that he knew there was a buried well in the dunes but was not able to provide further information.

[4] The archaeological sites seen are not listed or described in this report since they are not relevant to the study. They do, however, provide some background context for this discussion. They are likely only a small sample of what is there and a proper survey would be required to properly record them.

Figure 24: *View towards the southeast towards Witduin from the sandy ridge in the south-eastern part of the study area. The gum tree woodlot near the Platvley ruins is visible in the centre. The well and wind pump are alongside the woodlot (waypoint 1423).*

Figure 25: *Map BML. 68.c.7 (664) (D) Namaqualand. Compiled by the Intelligence Department. Undated but probably late 19th century. Plat Vley was registered in 1894 (but surveyed in 1866) and is shown on the map, while Kap Vley was surveyed in 1906 and is not shown. There are no farms between the Komaggas Institutional lands and the coast. "Witduin Strong Springs" is marked (red arrow).*

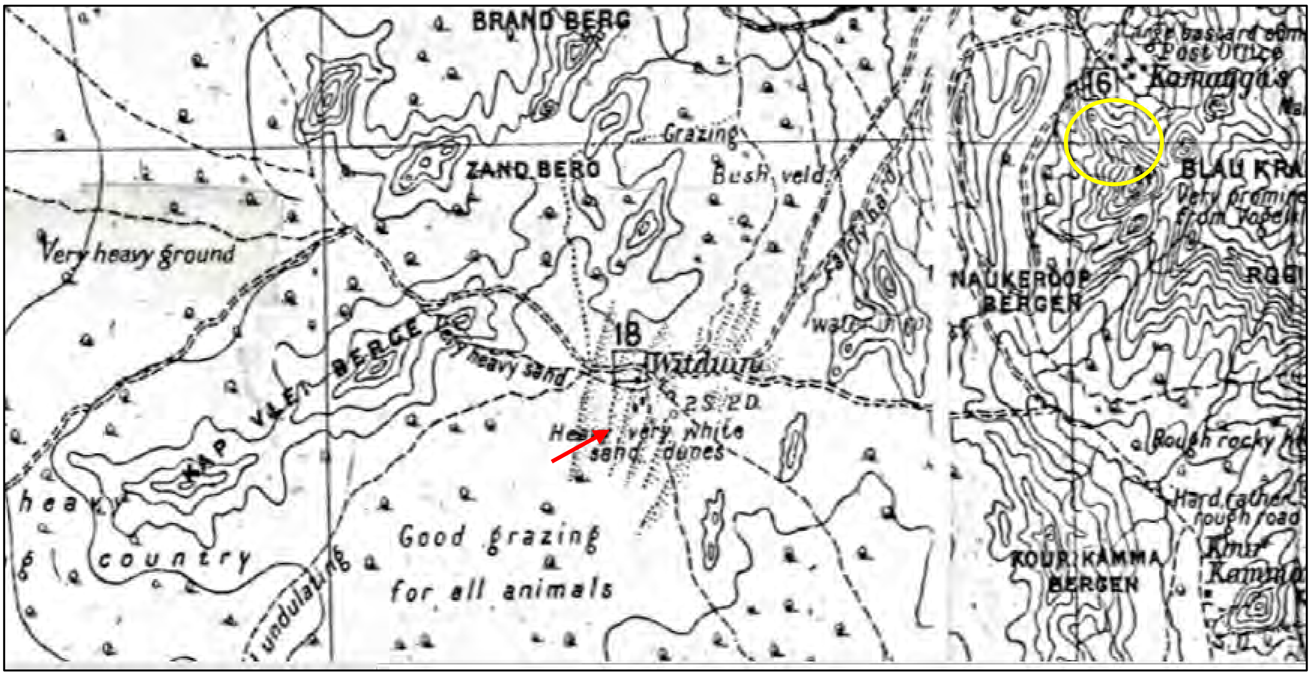


Figure 26: *Extract from 1:250 000 Map B174 Port Nolloth & O'Okiep of the war office July 1907. The map shows a number of roads which converge on the source of water at Witduin, in the southern section of the Kommagas communal lands. The rectangle number 18 (arrowed) is described in the key as: "Unlimited good water. 2 wooden troughs 12' long. Buckets required." Komaggas, at number 16 (yellow circle), is labelled "1 spring, 2 dams, Good cultivation. 1 store."*

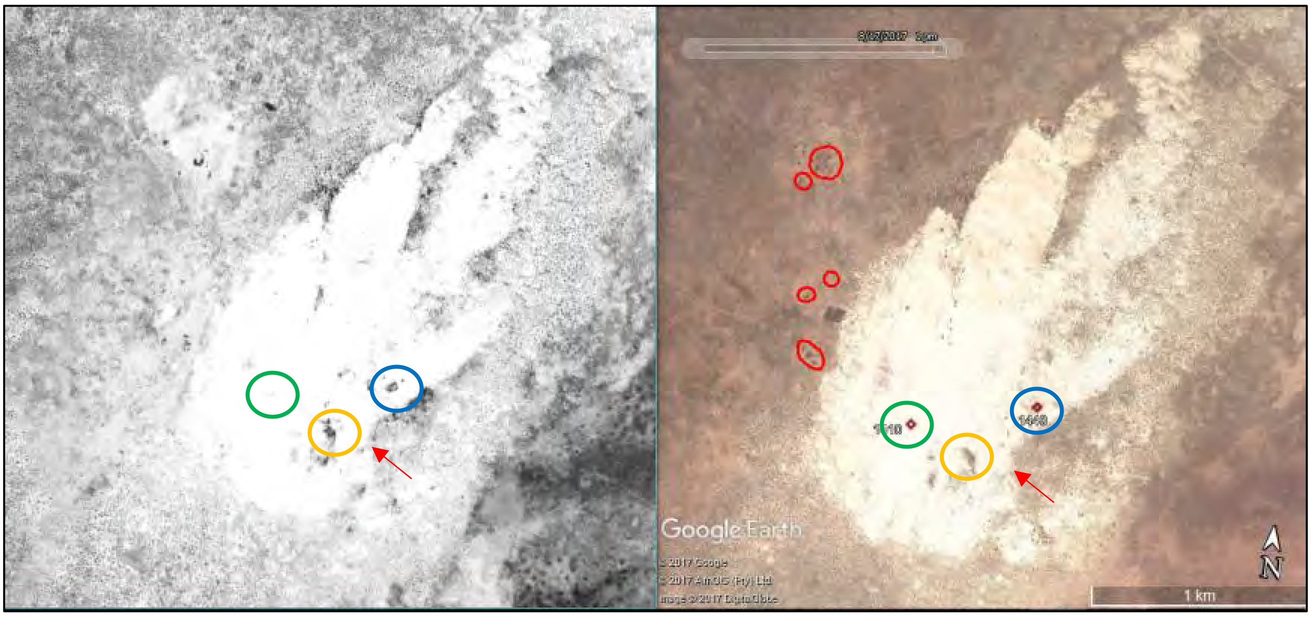


Figure 27: *Historical (1964; Job 525, strip 33, photograph 2546) and modern (2011; Google Earth) aerial photographs of area known as Witduin. Red circles on modern image: Platvley farm complexes and graves, green circle: stone beacon, blue circle: coppice of palm trees, yellow circle: another historical feature not visited.*

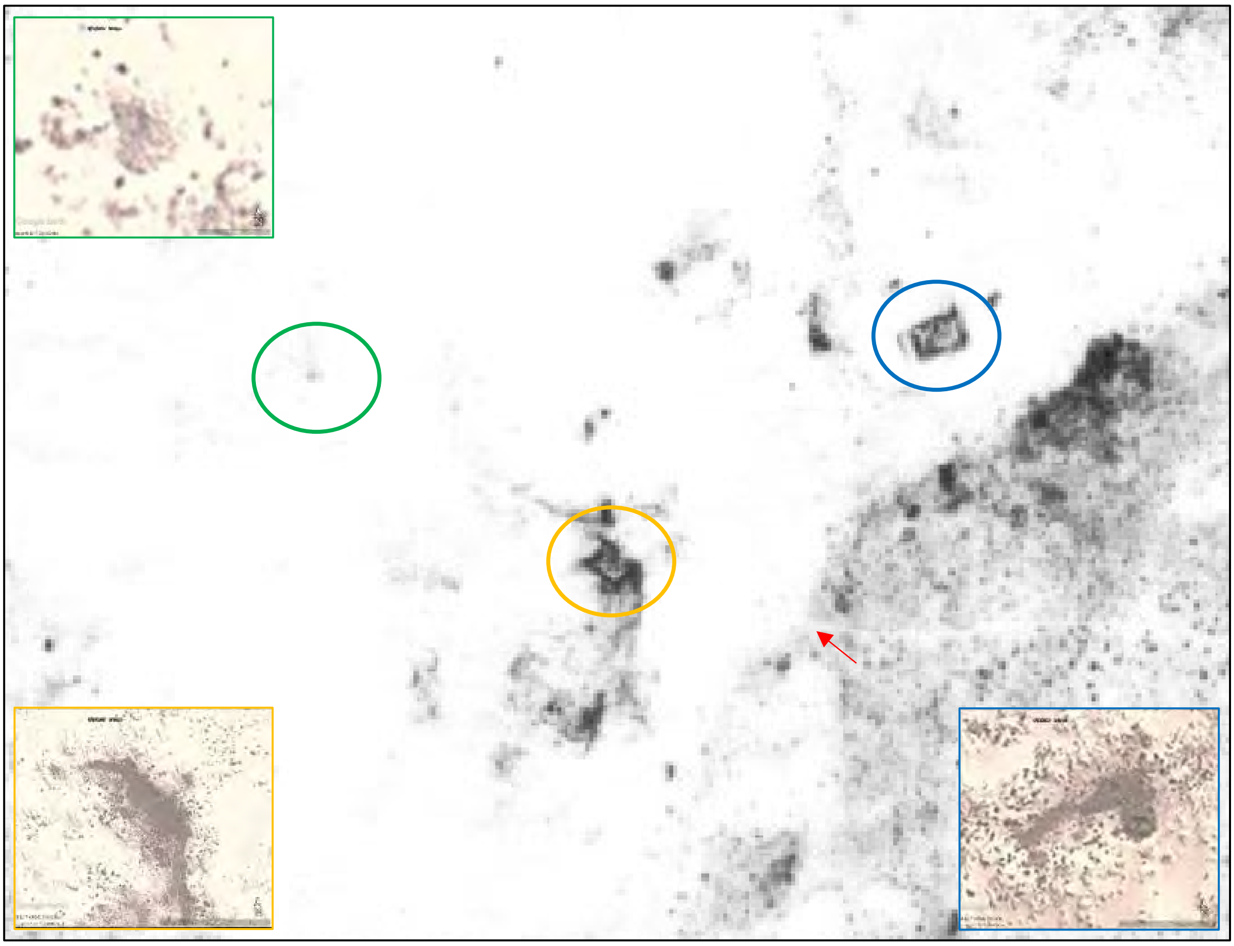


Figure 28: *Enlargement of the historical image above showing relevant details. Insets (modern aerial views: the rectangular features have lost their shape to some degree but the stone beacon (green) is clearly visible on modern aerial photography.*

The second important aspect of the cultural landscape ties back to the relationship between the landscape and intangible heritage. An LMS mission station was set up at Komaggas in 1829 and in later years the area became one of the so-called "coloured reserves". The existence of the reserve meant that the traditional pattern of land use could continue. This use has led to the construction of the many small stock posts that occur in the area. It is directly relevant to the present study that a number of these stock posts occur along the western margin of Kamaggas (Figure 29). These are mostly used on a seasonal basis depending on the grazing and watering needs of the livestock. Evidence of grazing (livestock spoor and droppings) was found everywhere in the study area with the Kamaggas land seemingly more heavily used for this purpose than the private land. Many items useful in day to day life (e.g. edible and medicinal plants, building materials) would have been sourced from the environment and a large body of traditional knowledge must have been built up over the years. The entirety of the Kamaggas property can thus be regarded as being associated with intangible heritage, although the traditional land use in question was undoubtedly practiced over a substantially larger area in earlier times.

Figure 29: *View of one of the stock posts associated with intangible heritage (traditional herding practices) in the western part of Kamaggas 200.*

Another small aspect of intangible heritage relates to the hill called Byneskop which lies within the farm Kap Vley. The earliest map identifying the koppie as Byneskop is the 1972 2nd Edition 1:250 000 topographic map, while in 1907 the entire ridge was labelled as 'Kap Vlei Berge' (Figure 26). This earlier name is also reflected on the 1961 1st Edition 1:250 000 topographic map. Mr G.J.E. Coetzee, when interviewed in 1978, related that there were many bees' nests in the koppie which were difficult to collect. The "Hottentots" collected honey there, which they mixed with "*bierklei*" to make honey beer. He noted that in the drought of 1896, many bees died but those in Byneskop survived, as some of the bees' nests had never been removed (Burger 1986). This koppie, interestingly, hosts the most significant archaeological site in the study area and it is right in front of a bee's nest (waypoints 1385-1391).

The 1907 map refers to 'Brandberg' in the north of the study area and 'Zandberg' in the centre. The former name is used on South Africa's topographic maps, but the latter seems to have been abandoned.

While the landscape is almost entirely natural in appearance, farm tracks, fences, sporadic gum trees and other minor anthropogenic interventions result in a limited cultural layer. However, the association with traditional land use and herding practices is the more important aspect here. While the facility would obviously be highly visible from the western parts of the Kamaggas farm, it is unlikely that any change in traditional land use practices would result. A slightly smaller amount of land would be available for such practices though.

6.6. Summary of heritage resources

A number of archaeological sites were located along the alignments of the proposed roads and turbines. All of them are scatters of artefacts in varying density and contained only stone artefacts. A graveyard and some associated building foundations were also found along the access road with a second graveyard present some 500 m further south. The only other important aspect of heritage is the cultural landscape, especially as a place associated with living heritage, although the lowlands are slightly more important in this regard since they are more intensively used. Visual impacts relate directly to the cultural landscape which is relatively poorly developed.

6.7. Statement of significance and provisional grading

Section 38(3)(b) of the NHRA requires an assessment of the significance of all heritage resources. In terms of Section 2(vi), ''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Palaeontological resources are likely to be of medium to high cultural significance at the local level, largely because of their scarcity. However, because they are likely to be found in isolated contexts, individual fossils would only be worthy of provisional grading of GPA or GPB.

The archaeological resources are deemed to have medium cultural significance at the local level for their scientific value, although a number of individual sites are ascribed lower significance ratings (see Table 2). The most important sites can be assigned a provisional grading of GPA or possibly, in the case of KAP2017/002, IIIB.

Graves are deemed to have high cultural significance for their social value and should always be regarded as provisional IIIA[5] resources.

The cultural landscape and its ongoing association with intangible heritage are deemed to have at least medium significance at the local level.

7. ISSUES, RISKS AND IMPACTS

7.1. Summary of issues identified during the Scoping Phase

The potential heritage issues identified during the scoping phase of this EIA process include:

- The destruction or disturbance of palaeontological materials (isolated fossils);
- The destruction or disturbance of archaeological sites and their immediate contexts;
- The destruction or disturbance of graves and their immediate contexts;
- The destruction or disturbance of built heritage resources; and
- Visual intrusion into the cultural landscape which might erode its association with intangible heritage.

These issues were identified based on fieldwork, while the existence of a third graveyard in the area was made known to the author by a farm worker. It is well away from the project area and of no further relevance.

Comments received from SAHRA

The pending HIA must assess all heritage resources as defined in section 3(2) of the National Heritage Resources Act, Act 25 of 1999 (NHRA) and the report must comply with section 38(3) of

[5] Note that the SAHRA grading system is intended for use with archaeological and palaeontological resources only but that graves are essentially archaeological in nature and the scheme can thus accommodate them.

the NHRA. The Archaeological and Palaeontological components of the HIA must comply with the SAHRA 2006 Minimum Standards for Archaeological and Palaeontological Components of Impact Assessments and the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments. Additionally, the Visual Impact of the proposed development on heritage resources and any comments provided by the public regarding heritage resources must be taken into consideration.

Response: These requirements from SAHRA have been adhered to in this HIA. Comments received by the public regarding heritage resources during the review of the Draft EIA Report will be taken into consideration.

7.2. Identification of potential impacts/risks

Impacts to built heritage resources will not occur and are not considered further during the EIA phase. All other identified heritage resource types may be impacted at all phases of the development except for palaeontological resources which should not be affected during the operational phase.

The potential impacts identified during the EIA assessment are:

Construction Phase

- Potential direct and indirect impacts to palaeontological resources;
- Potential direct and indirect impacts to archaeological resources;
- Potential direct and indirect impacts to graves; and
- Potential direct impacts to the cultural landscape and disruption of traditional activities.

Operational Phase

- Potential direct impacts to the cultural landscape and disruption of traditional activities.

Decommissioning Phase

- Potential direct and indirect impacts to palaeontological resources;
- Potential direct and indirect impacts to archaeological resources;
- Potential direct and indirect impacts to graves; and
- Potential direct impacts to the cultural landscape and disruption of traditional activities.

Cumulative impacts

- Potential impacts to palaeontological resources;
- Potential impacts to archaeological resources;
- Potential impacts to graves; and
- Potential impacts to the cultural landscape and disruption of traditional activities.

8. IMPACT ASSESSMENT

Both direct (destruction through the proposed project activities) and indirect (destruction through unintended consequences or deviations from the authorised work and footprint, and through visual intrusion into a sensitive area) impacts may occur during the construction, operation and decommissioning of the proposed WEF. These are addressed here per project phase with summaries of the impact assessments contained in Tables 3 to 6.

8.1. Limits of acceptable change

8.1.1. Palaeontology

Although they may not need to be rescued, destruction of any isolated palaeontological finds without reporting would be unacceptable.

8.1.2. Archaeology

Any unmitigated damage or destruction to an archaeological site is deemed to be unacceptable because of the potential to lose scientific information.

8.1.3. Graves

Any damage or destruction of known graves is considered unacceptable. Chance finds of unmarked graves would require emergency exhumation and, if this is carried out successfully, the impact would be considered acceptable.

8.1.4. Cultural landscape and its relationship to intangible heritage

Limits of acceptable change are difficult to define for impacts to the cultural landscape. However, if the proposed WEF were to strongly dominate and disrupt the cultural landscape then that would be considered unacceptable. If it were to take up so much land that traditional land use practices were negatively impacted then that would also be considered unacceptable.

8.2. Direct impacts: Construction Phase

8.2.1. Potential impacts to palaeontology

Negative impacts may occur through damage to or direct destruction of fossils that might be unearthed during construction. The chances of this happening, however, are deemed to be very low. As such, the significance before mitigation is considered to be low (Table 3). With mitigation a rating of very low is assigned. Because no fossils are known in the study area and, owing to the geological context, none will be visible on the surface, mitigation will be limited to the reporting of any chance finds that are made during construction. Such finds are more likely to be made on the low lands than on the mountains.

8.2.2. Potential Impacts to archaeological sites

Negative impacts may occur through damage to or direct destruction of archaeological sites during construction. Vegetation clearing, road building and the excavation of foundation holes may all result in impacts. It seems that most significant sites are associated with rocky ridges and, occasionally, deflations. These features are largely avoided by the current layout which means that the impact probability is rated as unlikely. The impacts are assessed to be of moderate significance before mitigation but, because mitigation would be easy to accomplish successfully, the significance after mitigation would be reduced to very low (Table 3). Where sites cannot be avoided through alterations to the project layout, mitigation would entail recording the culturally significant sites and conducting excavations to collect samples of the stone artefacts. These collections would form a permanent record that can be studied by future researchers if needs be.

8.2.3. Potential impacts to graves

Negative impacts may occur through damage to or direct destruction of graves that are uncovered accidentally during the construction period. Aside from the single fenced graveyard known to occur about 50 m from the southern access road, no graves are known to be located within the study area. Any graves that are uncovered would be chance finds. The probability of this happening is considered to be extremely unlikely with the result that the impact significance is rated as very low (Table 3). Although mitigation measures would certainly be required in the event that a grave is uncovered during construction, the rating cannot be further reduced with mitigation. Mitigation would entail the reporting of chance finds and ensuring that the appropriate course of action is followed. Furthermore, the informal graveyard in the southeast should be treated as a no-go area. It is away from the development footprint but the Environmental Control Officer (ECO) should be aware of its existence and ensure that the relevant section of farm track is never used by construction vehicles.

8.2.4. Potential impacts to the cultural landscape and disruption of traditional activities

The presence of the turbines and related infrastructure that leads to contextual impacts. No heritage resources are physically destroyed but the landscape takes on a new appearance through the addition of an 'electrical layer'. This change to the landscape may result in alterations to traditional practices and a slight reduction in the land available for grazing and other traditional activities. While the latter aspect is not expected to suffer significant impacts, the visual intrusion into the landscape is expected to be substantial, although the cultural landscape is not considered to be of high heritage significance. Mitigation of visual impacts is not feasible for turbines and other measures, while necessary, will only result in small improvements to the overall situation. As such, the significance of the impacts both before and after mitigation is expected to be moderate (Table 3). Mitigation would include designing the facility so as to minimise cut and fill operations, minimising the overall development footprint and minimising the amount of fencing placed in communal land that is used for traditional practices such as herding and the collection of natural products.

8.3. Indirect impacts: Construction Phase

8.3.1. Potential impacts to palaeontology

Indirect impacts to palaeontological resources would occur in the same manner as direct impacts but the probability of such impacts occurring is deemed to be even less. Because fossils are all likely to be buried and sparsely distributed, unintended impacts are highly unlikely to happen when, for example, a vehicle drives outside of the authorised project footprint. Impact significance both before and after mitigation would likely be very low (Table 3). Mitigation would again involve reporting of chance finds.

8.3.2. Potential Impacts to archaeological sites

Indirect impacts to archaeological sites, through damage or direct destruction, are relatively unlikely to happen but, because sites are known to exist close to the project footprint there is a possibility. The impacts are likely to be of lesser consequence because total destruction is very unlikely. The impact significance before mitigation is likely to be low (Table 3). Such impacts are seldom noticed but, should they be reported and mitigation effected to rescue whatever remains of the site, then the impact significance could be reduced to very low. Mitigation would be as described in Section 8.1.2.

8.3.3. Potential impacts to graves

Because graves tend to be located some way below the surface, the probability of any being revealed through indirect impacts is extremely unlikely. The significance before mitigation would be very low and this cannot be further reduced with mitigation (Table 3). As with direct impacts, any graves found by chance should be reported so that the appropriate course of action may be followed.

8.4. Direct impacts: Operational Phase

No direct impacts to palaeontology, archaeology or graves are expected during this phase since the planned project will have been constructed and all intended disturbance will have been finalised.

8.4.1. Potential impacts to the cultural landscape and disruption of traditional activities

These impacts are essentially the same as described for the construction phase but, because construction activity will have ceased, it is likely that there will be slightly less visual intrusion on the landscape and land close to the facility would once more be available to herders and others to continue their traditional practices. Impacts remain very likely to happen (with the visual intrusion of the turbines into the cultural landscape being the greatest contributor here) and the significance would be moderate before mitigation (Table 4). There is no feasible mitigation that can be applied to reduce the significance at this stage aside from keeping the amount of traffic on site to a minimum.

8.5. Direct impacts: Decommissioning Phase

8.5.1. Potential impacts to palaeontology

Negative impacts may occur through damage to or direct destruction of fossils that might be unearthed during removal of foundations and rehabilitation work, especially in the vicinity of road cuttings and if topsoil is obtained from previously undisturbed areas. The probability of this happening, however, is deemed to be extremely unlikely. As such, the significance before mitigation is considered to be very low (Table 5). This rating cannot be further reduced but mitigation would entail the reporting of any chance finds.

8.5.2. Potential Impacts to archaeological sites

Negative impacts may occur through damage to or direct destruction of archaeological sites during removal of foundations and rehabilitation work, especially in the vicinity of road cuttings and if topsoil is obtained from previously undisturbed areas. The impacts are likely to be of moderate significance before mitigation because of the unlikely probability but, because mitigation would be easy to accomplish successfully, the significance after mitigation would be reduced to very low

(Table 5). Where sites cannot be avoided during rehabilitation, mitigation would entail recording the culturally significant sites and conducting excavations to collect samples of the stone artefacts. These collections would form a permanent record that can be studied by future researchers if needs be.

8.5.3. Potential impacts to graves

Negative impacts may occur through damage to or direct destruction of graves that are uncovered accidentally during decommissioning and rehabilitation, especially if topsoil is obtained from previously undisturbed areas. Aside from the graveyard close to the southern access road, no graves are known to be located within the study area. Any graves that are uncovered would be chance finds. The probability of this happening is considered to be extremely unlikely with the result that the impact significance is rated as very low (Table 5). Although mitigation measures would certainly be required in the event that a grave is uncovered during rehabilitation (for example of topsoil is obtained from a previously undisturbed area), the rating cannot be further reduced with mitigation. Mitigation would entail the reporting of chance finds and ensuring that the appropriate course of action is followed. Furthermore, the known graveyards in the southeast should be cordoned off and treated as no-go areas. The informal graveyard alongside the existing road is especially sensitive given its proximity to the road.

8.5.4. Potential impacts to the cultural landscape and the disruption of traditional activities

The presence of the infrastructure and equipment in the landscape leads to contextual impacts. No heritage resources are physically destroyed but the landscape takes on a new appearance when large machinery is on site. This change to the landscape may result in alterations to traditional practices and a slight reduction in the land available for grazing, although these impacts would be short term. While the latter aspect is not expected to suffer significant impacts, the visual intrusion into the landscape is expected to be substantial. Mitigation of visual impacts is not feasible. However, because the activity would be short term and the large wind turbine towers would be removed, the significance of the impacts both before and after mitigation is expected to be low (Table 5). Mitigation would entail ensuring effective rehabilitation such that minimal landscape scarring remains and grazing land is returned to the people in the shortest time possible.

8.6. Indirect impacts: Decommissioning Phase

8.6.1. Potential impacts to palaeontology

Indirect impacts to palaeontological resources would occur in the same manner as direct impacts but the probability of such impacts occurring is deemed to be even less. Because fossils are all likely to be buried and sparsely distributed, unintended impacts are highly unlikely to happen when, for example, a vehicle drives outside of the authorised project footprint or topsoil is obtained for rehabilitation. Impact significance both before and after mitigation would likely be very low (Table 5). Mitigation would again involve reporting of chance finds.

8.6.2. Potential Impacts to archaeological sites

Indirect impacts to archaeological sites, through damage or direct destruction, are relatively unlikely to happen but, because sites are known to exist close to the project footprint there is a possibility. Indirect impacts are likely to be of lesser consequence because total destruction is very unlikely. The impact significance before mitigation is likely to be low (Table 5). Such impacts are seldom noticed but, should they be reported and mitigation effected to rescue whatever remains of the site, then the impact significance could be reduced to very low. Mitigation would be as described in Section 8.1.2.

8.6.3. Potential impacts to graves

Because graves tend to be located some way below the surface, the probability of any being revealed through indirect impacts is extremely unlikely. The significance before mitigation would be very low and this cannot be further reduced with mitigation (Table 5). As with direct impacts, any graves found by chance should be reported so that the appropriate course of action may be followed.

8.7. Cumulative impacts

Cumulative impacts are very difficult to evaluate in this area because very little is known about the palaeontology and archaeology of the area and no other large developments are proposed in a similar setting and there are no other known (to this author) threats to areas associated with traditional land use practices. It should be noted that while other WEFs have been proposed, they are closer to the coast. The palaeontological and archaeological records there are very different to those in the inland areas. The areas closer to the coast are far richer in terms of both the number of archaeological sites present and their contents.

8.7.1. Potential impacts to palaeontology

Because of the likely very sparse distribution of fossils and the lack of other large developments in the immediate vicinity (projects are planned in the coastal zone where the palaeontological record is very different), cumulative impacts to palaeontological resources are very unlikely to be of concern with the potential impact significance being very low (Table 6). Because of the very low likelihood of impacts, mitigation will make little difference overall. Mitigation would be as above.

8.7.2. Potential impacts to archaeology

Archaeological sites tend to be quite rare in the area but with rocky hills more likely to harbour them. Again, there are no other large scale developments planned in the immediate area and cumulative impacts are again very unlikely to be of concern. The areas where other facilities are proposed are either further inland where archaeology is generally rarely encountered or at the coast where the record is very different owing to its domination by far richer shell middens. Impact significance is very low with mitigation likely to not have much effect on this rating (Table 6). Mitigation would be as described above.

8.7.3. Potential impacts to graves

Graves are likely to be very sparsely distributed through the broader area and, because they are so rarely encountered, cumulative impacts will likely be of very low significance (Table 6). Because formal graveyards are always likely to be avoided and mitigation of unmarked chance finds cannot be planned, the cumulative impact significance is likely to be very low.

8.7.4. Potential impacts to the cultural landscape and the disruption of traditional activities

Once more, with no other similar large developments in the immediate vicinity, it is not expected that highly significant cumulative cultural landscape impacts would occur (Table 6). Most importantly, there are no other developments planned that would take up land associated with traditional land uses as is the case on Kamaggas. Other proposed WEFs in the broader area would result in a cumulative impact to the broader landscape but owing to the very limited anthropogenic modification of the landscape and the fact that it is largely in private or corporate hands the overall cumulative impact significance is rated as moderate. Mitigation cannot hide the visual intrusion of wind turbines but can ensure minimal landscape scarring. However, the impacts after mitigation are likely to still be moderate.

Table 3: *Impact assessment summary table – Construction Phase impacts.*

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION PHASE (Direct impacts)													
Clearing of vegetation and excavation of foundations	Destruction or disturbance of palaeontological materials	Negative	Site	Permanent	Moderate	Very unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Reporting of chance finds.	Low	Very low	5	Medium
	Destruction or disturbance of archaeological materials	Negative	Site	Permanent	Severe	Unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Avoidance. • Remain in authorised footprint. • Reporting of chance finds. • Excavation and sampling of affected archaeological sites.	Moderate	Very low	5	High
	Destruction or disturbance of graves	Negative	Site	Permanent	Extreme	Extremely unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Avoidance. • Remain in authorised footprint. • Reporting of chance finds. • Exhumation.	Very low	Very low	5	High
All activities	Visual intrusion into cultural landscape & disruption of traditional activities	Negative	Local	Long term	Substantial	Very likely	Moderate (some landscape scarring likely to remain)	High (heritage resources are unique)	• Minimise landscape scarring from cut and fill operations. • Minimise overall footprint. • Minimise fencing in	Moderate	Moderate	3	High

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability: Without mitigation /management	Significance of impact/risk = consequence x probability: With mitigation /management (residual risk/impact)	Ranking of impact/risk	Confidence level
									communal lands.				
CONSTRUCTION PHASE (Indirect impacts)													
Any activities occurring outside of authorised footprint	Destruction or disturbance of palaeontological materials	Negative	Site	Permanent	Moderate	Extremely unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Reporting of chance finds.	Very low	Very low	5	Medium
	Destruction or disturbance of archaeological materials	Negative	Site	Permanent	Substantial	Very unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Remain in authorised footprint. • Reporting of chance finds. • Excavation and sampling of affected archaeological sites.	Low	Very low	5	High
	Destruction or disturbance of graves	Negative	Site	Permanent	Extreme	Extremely unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Remain in authorised footprint. • Reporting of chance finds. • Exhumation.	Very low	Very low	5	High

Table 4: *Impact assessment summary table – Operation Phase impacts.*

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
OPERATION PHASE (Direct impacts)													
Existence of facility in landscape	Visual intrusion into the cultural landscape	Negative	Loca l	Long term	Substantial	Very likely	Moderate (some landscape scarring likely to remain)	High (heritage resources are unique)	• Keep traffic on site to a minimum.	Moderate	Moderate	3	High

Table 5: *Impact assessment summary table – Decommissioning Phase impacts.*

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
DECOMISSIONING PHASE (Direct impacts)													
Removal of facility and rehabilitation of site	Destruction or disturbance of palaeontological materials	Negative	Site	Permanent	Moderate	Extremely unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Reporting of chance finds.	Very low	Very low	5	Medium
	Destruction or disturbance of archaeological materials	Negative	Site	Permanent	Severe	Unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Avoidance. • Remain in authorised footprint. • Reporting of chance finds. • Excavation and sampling of affected archaeological sites.	Moderate	Very low	5	High
	Destruction or disturbance of graves	Negative	Site	Permanent	Extreme	Extremely unlikely	No (resources cannot be recreated)	High (heritage resources are unique)	• Avoidance. • Remain in authorised footprint. • Reporting of chance finds. • Exhumation.	Very low	Very low	5	High
All activities	Visual intrusion into cultural landscape & disruption of traditional activities	Negative	Local	Short term	Moderate	Very likely	Moderate (some landscape scarring likely to remain)	High (heritage resources are unique)	• Ensure effective rehabilitation.	Low	Low	4	High
DECOMISSIONING PHASE (Indirect impacts)													

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
Any activities occurring outside of authorised footprint	Destruction or disturbance of palaeontological materials	Negative	Site	Perma nent	Moderate	Extremely unlikely	Non-reversible (resources cannot be recreated)	High (heritage resources are unique)	• Remain in authorised footprint. • Reporting of chance finds.	Very low	Very low	5	Medium
	Destruction or disturbance of archaeological materials	Negative	Site	Perma nent	Substantial	Very unlikely	Non-reversible (resources cannot be recreated)	High (heritage resources are unique)	• Remain in authorised footprint. • Reporting of chance finds. • Excavation and sampling of affected archaeological sites.	Low	Very low	5	High
	Destruction or disturbance of graves	Negative	Site	Perma nent	Extreme	Extremely unlikely	Non-reversible (resources cannot be recreated)	High (heritage resources are unique)	• Remain in authorised footprint. • Reporting of chance finds. • Exhumation.	Very low	Very low	5	High

Table 6: *Impact assessment summary table – Cumulative impacts*

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability: Without mitigation /management	Significance of impact/risk = consequence x probability: With mitigation /management (residual risk/impact)	Ranking of impact/risk	Confidence level
CUMULATIVE IMPACTS (Direct impacts)													
All activities	Destruction or disturbance of palaeontological materials	Negative	Site	Permanent	Slight	Very unlikely	Non-reversible (resources cannot be recreated)	High (heritage resources are unique)	• Reporting of chance finds.	Very Low	Very low	5	Medium
	Destruction or disturbance of archaeological materials	Negative	Site	Permanent	Slight	Very unlikely	Non-reversible (resources cannot be recreated)	High (heritage resources are unique)	• Avoidance. • Remain in authorised footprint. • Reporting of chance finds. • Excavation and sampling of affected archaeological sites.	Very Low	Very low	5	Medium
	Destruction or disturbance of graves	Negative	Site	Permanent	Slight	Extremely unlikely	Non-reversible (resources cannot be recreated)	High (heritage resources are unique)	• Avoidance. • Remain in authorised footprint. • Reporting of chance finds. • Exhumation.	Very Low	Very low	5	High
	Visual intrusion into the cultural landscape	Negative	Local	Long term	Substa ntial	Very likely	Non-reversible (resources cannot be recreated)	High (heritage resources are unique)	• Minimise landscape scarring from cut and fill operations. • Minimise overall footprint. • Minimise fencing in communal lands.	Moderate	Moderate	3	High

9. LEGISLATIVE AND PERMIT REQUIREMENTS

Once the impact assessment process has been completed there are no legal requirements in terms of the NHRA that need to be met by the developer, aside from compliance with all heritage-related conditions stipulated in the Environmental Authorisation (EA) for the project, should this be granted.

These conditions would include the mitigation of any archaeological sites found to occur within the approved development footprint. This mitigation would need to be conducted under the terms of a permit issued by SAHRA in terms of S.35 of the NHRA. This permit would be issued in the name of the archaeologist appointed to do the work and is not the responsibility of the developer. The purpose of this permit application is to allow the heritage authority the opportunity to ensure that a suitably qualified practitioner carries out the mitigation and that an appropriate methodology for the sites has been proposed. It is then the responsibility of the appointed archaeologist to fulfil the conditions of this permit and submit a permit report for consideration by SAHRA. The comment on this report would need to be issued prior to the commencement of development. It is important that the developer ensures that mitigation is carried out well in advance (at least six months) of the proposed construction commencement date so as to avoid any delays.

10. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

10.1. Mitigation requirements

Although several archaeological sites were identified to have cultural significance, all of these have been avoided by the revised project layout. As such, no archaeological mitigation measures are currently required. However, because there is a likelihood of there being other archaeological sites in the area, a walk-down survey of the final approved layout will need to be conducted prior to construction. Any sites found during this survey and that require mitigation would need to be mitigated well in advance (at least six months) of the commencement of construction in order to allow time in case there are further requirements that need to be met (for example radiocarbon dating or further work on any sites that revealed even more significant material than was evident from the surface). The need for a walk-down survey and potentially also archaeological mitigation must be incorporated in the Environmental Management Programme (EMPr) and the appointed ECO should ensure that the timing as stipulated above is met.

10.2. Monitoring requirements

Many archaeological and historical sites will be preserved *in situ* with the development being constructed in close proximity to them. These sites may need to be cordoned off during development in order to make them easily visible to the drivers of construction vehicles. The ECO should decide on site, taking into consideration the local topography and distance between sites and project footprint, which sites need to be cordoned off and which not. Nevertheless, the important sites have been identified as likely needing protection or not in Table 7. They should be cordoned off along the boundaries provided in this report, since these already include buffer zones of approximately 30 m from the edge of the sites. The ECO should ensure that these sites are cordoned off in advance of the development commencing (the mitigation archaeologist could be called on to assist with this if needed) and regular (weekly) monitoring should be carried out by the ECO to ensure that the cordoned off areas remain free of disturbance. Should any disturbance become evident then it may be necessary to consult an archaeologist to decide whether the site has been badly compromised and whether excavations should be carried out to rescue any remaining *in situ* material.

Table 7: *List of sites requiring protection.*

Sites likely requiring cordoning off	Sites likely to be safe without any demarcation
KAP2017/001 (waypoint 1384)	KAP2017/006 (waypoint 1398)
KAP2017/002 (waypoints 1385-91)	KAP2017/008 (waypoint 1415)
KAP2017/003 (waypoint 1392)	KAP2017/009 (waypoint 1416; likely to be safe)
KAP2017/004 (waypoints 1393-94)	PAN2017/001 (waypoint 1376 – graveyard)
KAP2017/005 (waypoint 1395)	PAN2017/003 (waypoint 1378 – graveyard; already fenced)
GRW2017/001 (waypoint 1396)	PAN2017/002 (waypoint 1377)
KOM2017/001 (waypoint 1420)	PAN2017/004 (waypoint 1399)
	PAN2017/005 (waypoint 1413)

11. EVALUATION OF IMPACTS RELATIVE TO SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development.

There are two aspects to consider here. The impacts to archaeological resources and that to the cultural landscape (which is associated with living heritage).

Although impacts to archaeological resources are as yet unexpected from the current layout, a walk-down survey may reveal a different picture. Nevertheless, such sites can be easily mitigated and the material curated for future research. The loss of data incurred by moving the material to a museum is relatively small, especially because the sites have only stone artefacts present on them. These impacts are thus clearly less significant than the provision of electricity to the people of South Africa.

The impacts to the cultural landscape are two-fold. First, there is the visual intrusion of wind turbines in an otherwise rural (or even largely natural) landscape and, second, there is the potential loss of land to traditional land uses (herding and collection of natural materials) to the people of Komaggas. The provision of electricity outweighs the cultural value of the landscape and, because only a very small proportion of the Kamaggas farm will be lost to traditional activities it is likely that this would still be outweighed by the provision of electricity. Furthermore, the municipality, on behalf of and in consultation with the community, has agreed to the facility being built if it receives authorisation.

12. CONCLUSIONS

The HIA has shown that, although there are several types of heritage present in and around the study area, only two are of concern in that significant impacts are more likely to occur. Archaeological sites comprised only of scatters of stone artefacts are present in a number of areas close to the proposed layout and will require *in situ* conservation. Further survey of the final approved layout may well reveal further sites that will require excavation to mitigate the impacts to them. The landscape and its link with traditional land uses will also be impacted and it will be necessary to ensure that only minimal loss of land takes place within the Kamaggas farm area. The other aspects of heritage also considered but which will not be meaningfully affected, either through distance from the proposed development or because of the very low likelihood of impacts occurring, are palaeontology, graves and the built environment.

With mitigation the impact significance can always be reduced to very low, except in the case of the landscape impacts which will remain at the moderate level after mitigation. Importantly, however, the Nama Khoi municipality on behalf of the Komaggas community has agreed to a part of the proposed development occurring on their communal land, should it receive Environmental Authorisation.

Overall, the potential impacts are considered to be generally manageable and, from a heritage point of view, the development may proceed. The nature of the archaeological sites seen during the survey suggests that any new sites that might be impacted would not be any different in terms of cultural significance and mitigation requirements from the sites reported here. It is likely that at least some new sites would be found.

The only project alternatives available for assessment are the access roads. While neither will result in any impacts, the northern one, option 1, is slightly favoured because Option 2 runs in close proximity to heritage resources.

13. RECOMMENDATIONS

Because the impacts to heritage resources are manageable, it is recommended that the proposed Kap Vley Wind Energy Facility should be authorised. This should be subject to the following conditions which must be incorporated into the Environmental Authorisation (should it be granted):

- All significant archaeological sites identified must be protected from harm. Where necessary to effect this, sites should be cordoned off;
- The graveyards at PAN2017/001 (waypoint 1376) and PAN2017/003 (waypoint 1378) must be cordoned off as necessary, avoided and protected;
- The historical sites at PAN2017/002 (waypoint 1377), PAN2017/004 (waypoint 1399), PAN2017/005 (waypoint 1413) and KOM2017/001 (waypoint 1420) must be cordoned off if necessary, protected and avoided;
- Roads must be designed in such a way as to minimise cut and fill operations in order to reduce landscape scarring;

- The final approved layout should be subjected to a pre-construction walk-down survey to identify any further sites that may require mitigation;
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

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APPENDIX 1 – Curriculum Vitae

Curriculum Vitae

Jayson David John Orton

ARCHAEOLOGIST AND HERITAGE CONSULTANT

Contact Details and personal information:

Address: 40 Brassie Street, Lakeside, 7945
Telephone: (021) 788 8425
Cell Phone: 083 272 3225
Email: jayson@asha-consulting.co.za

Birth date and place: 22 June 1976, Cape Town, South Africa
Citizenship: South African
ID no: 760622 522 4085
Driver's License: Code 08
Marital Status: Married to Carol Orton
Languages spoken: English and Afrikaans

Education:

SA College High School Matric 1994
University of Cape Town B.A. (Archaeology, Environmental & Geographical Science) 1997
University of Cape Town B.A. (Honours) (Archaeology)* 1998
University of Cape Town M.A. (Archaeology) 2004
University of Oxford D.Phil. (Archaeology) 2013

*Frank Schweitzer memorial book prize for an outstanding student and the degree in the First Class.

Employment History:

Spatial Archaeology Research Unit, UCT	Research assistant	Jan 1996 – Dec 1998
Department of Archaeology, UCT	Field archaeologist	Jan 1998 – Dec 1998
UCT Archaeology Contracts Office	Field archaeologist	Jan 1999 – May 2004
UCT Archaeology Contracts Office	Heritage & archaeological consultant	Jun 2004 – May 2012
School of Archaeology, University of Oxford	Undergraduate Tutor	Oct 2008 – Dec 2008
ACO Associates cc	Associate, Heritage & archaeological consultant	Jan 2011 – Dec 2013
ASHA Consulting (Pty) Ltd	Director, Heritage & archaeological consultant	Jan 2014 –

Professional Accreditation:

Association of Southern African Professional Archaeologists (ASAPA) membership number: 233
CRM Section member with the following accreditation:

- Principal Investigator: Coastal shell middens (awarded 2007)
  Stone Age archaeology (awarded 2007)
  Grave relocation (awarded 2014)
- Field Director: Rock art (awarded 2007)
  Colonial period archaeology (awarded 2007)

Association of Professional Heritage Practitioners (APHP) membership number: 43

- Accredited Professional Heritage Practitioner

➢ *Memberships and affiliations:*

South African Archaeological Society Council member	2004 – 2016
Assoc. Southern African Professional Archaeologists (ASAPA) member	2006 –
UCT Department of Archaeology Research Associate	2013 –
Heritage Western Cape APM Committee member	2013 –
UNISA Department of Archaeology and Anthropology Research Fellow	2014 –
Fish Hoek Valley Historical Association	2014 –
Kalk Bay Historical Association	2016 –
Association of Professional Heritage Practitioners member	2016 –

Fieldwork and project experience:

Extensive fieldwork and experience as both Field Director and Principle Investigator throughout the Western and Northern Cape, and also in the western parts of the Free State and Eastern Cape as follows:

Feasibility studies:

- Heritage feasibility studies examining all aspects of heritage from the desktop

Phase 1 surveys and impact assessments:

- Project types
  - Notification of Intent to Develop applications (for Heritage Western Cape)
  - Desktop-based Letter of Exemption (for the South African Heritage Resources Agency)
  - Heritage Impact Assessments (largely in the Environmental Impact Assessment or Basic Assessment context under NEMA and Section 38(8) of the NHRA, but also self-standing assessments under Section 38(1) of the NHRA)
  - Archaeological specialist studies
  - Phase 1 archaeological test excavations in historical and prehistoric sites
  - Archaeological research projects
- Development types
  - Mining and borrow pits
  - Roads (new and upgrades)
  - Residential, commercial and industrial development
  - Dams and pipe lines
  - Power lines and substations
  - Renewable energy facilities (wind energy, solar energy and hydro-electric facilities)

Phase 2 mitigation and research excavations:

- ESA open sites
  - Duinefontein, Gouda, Namaqualand
- MSA rock shelters
  - Fish Hoek, Yzerfontein, Cederberg, Namaqualand
- MSA open sites
  - Swartland, Bushmanland, Namaqualand
- LSA rock shelters
  - Cederberg, Namaqualand, Bushmanland
- LSA open sites (inland)
  - Swartland, Franschhoek, Namaqualand, Bushmanland
- LSA coastal shell middens
  - Melkbosstrand, Yzerfontein, Saldanha Bay, Paternoster, Dwarskersbos, Infanta, Knysna, Namaqualand
- LSA burials
  - Melkbosstrand, Saldanha Bay, Namaqualand, Knysna
- Historical sites
  - Franschhoek (farmstead and well), Waterfront (fort, dump and well), Noordhoek (cottage), variety of small excavations in central Cape Town and surrounding suburbs
- Historic burial grounds
  - Green Point (Prestwich Street), V&A Waterfront (Marina Residential), Paarl

Awards:

Western Cape Government Cultural Affairs Awards 2015/2016: Best Heritage Project.

APPENDIX 2 – Mapping

In the maps that follow the various lines and symbols used are as follows:

Red lines: road and facility layout;
Royal blue: turbines and platforms;
Light grey rectangles: laydown areas;
Coloured rectangles: ancillary infrastructure;
Light blue lines: survey tracks;
Red numbered symbols: finds with waypoint number (please see Table 1 for site names);
Red circles/polygons: outlines of significant archaeological sites requiring conservation of mitigation (including 30 m buffers); and
Green circles/polygons: outlines of insignificant archaeological sites (including 30 m buffers).

Note that while the 'Witduin' area was briefly visited to determine whether sites were present in the area, these are not shown on the maps because they were not properly recorded and are away from the proposed WEF layout. The dunes are considered sensitive because they do appear to contain many sites.

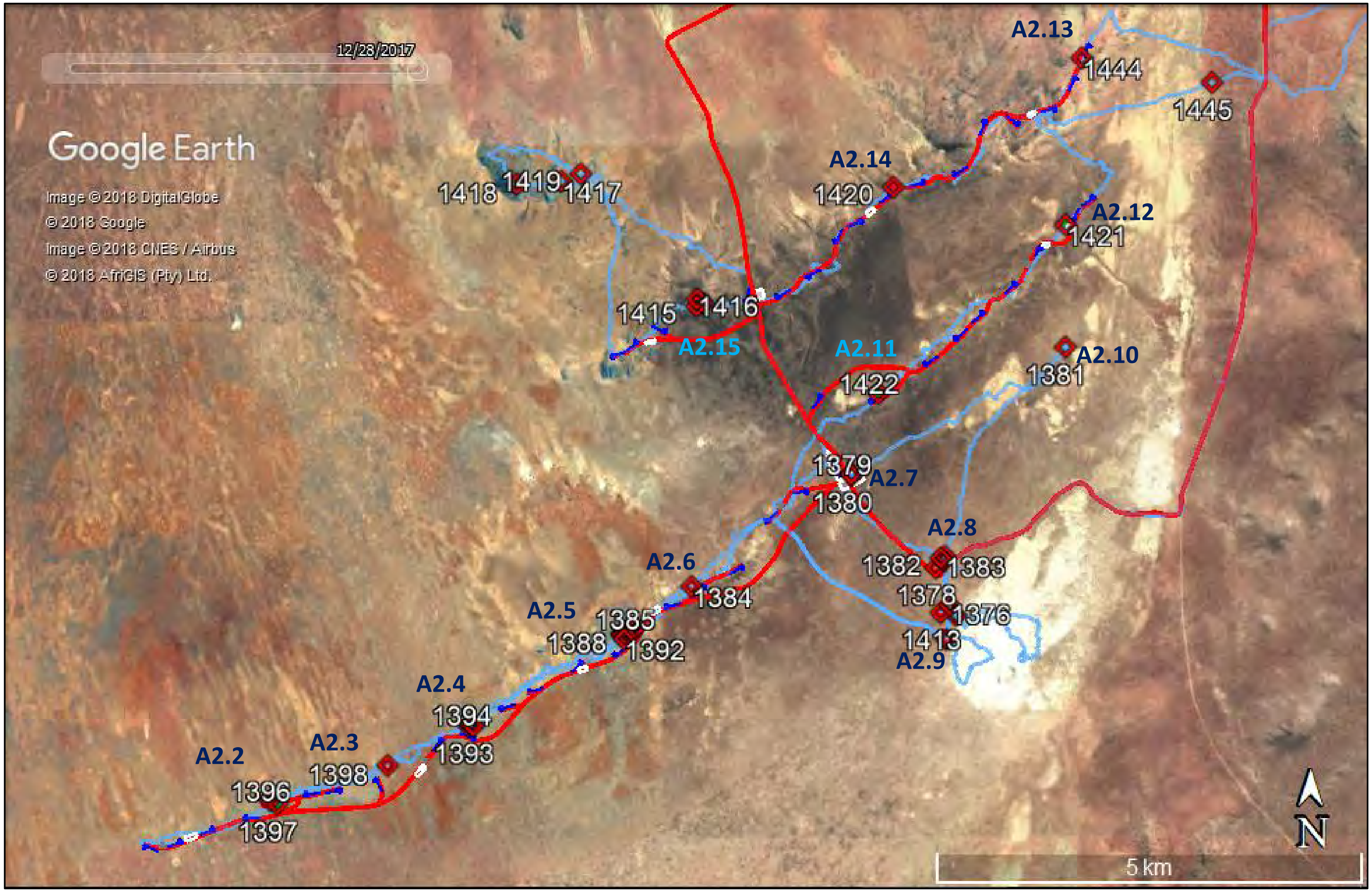

Figure A2.1: *Map of the entire project. Enlargements of areas with finds are labelled on the map in blue and reproduced below.*

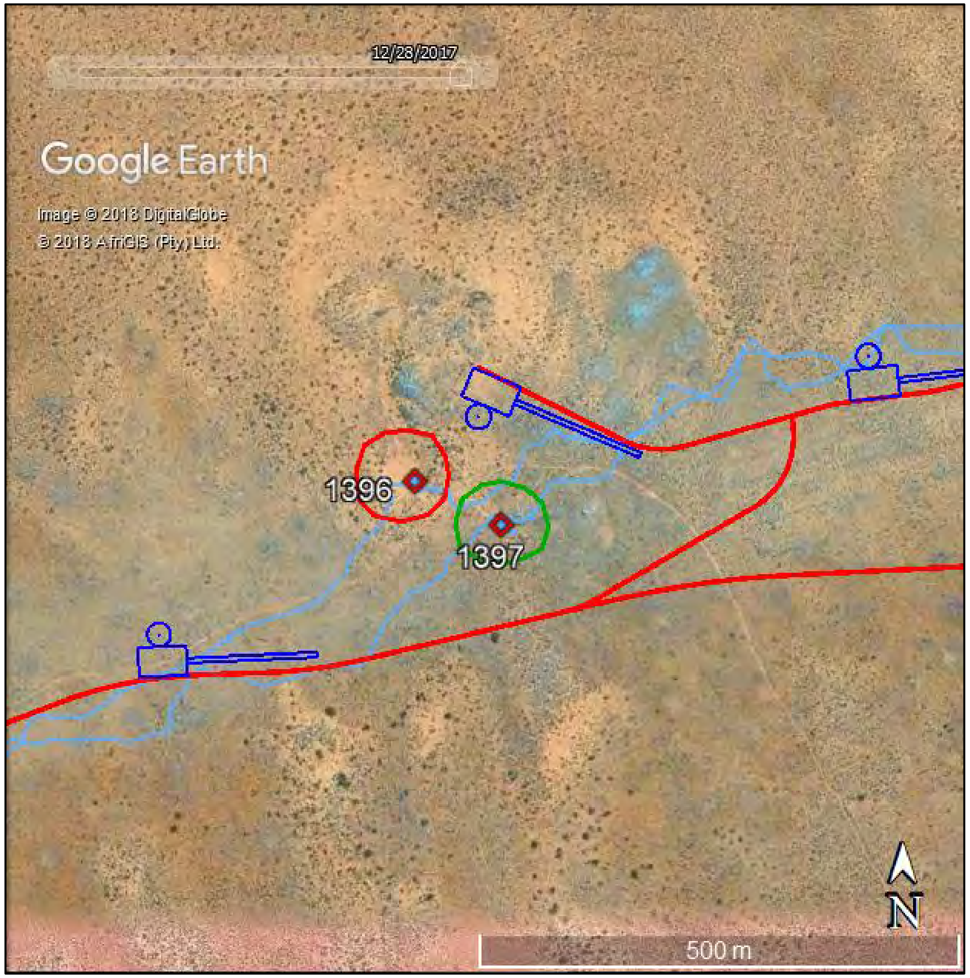

Figure A2.2: *Map showing finds.*

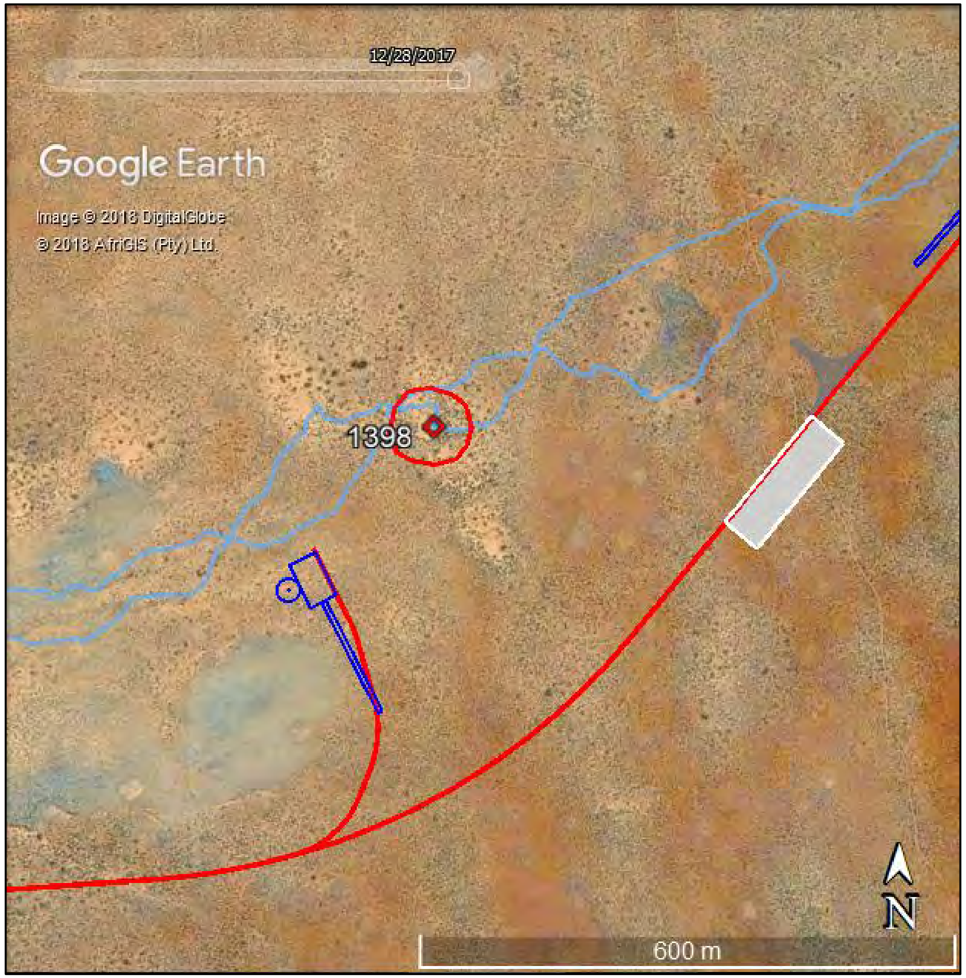

Figure A2.3: *Map showing finds.*

__Figure A2.4:__ Map showing finds.

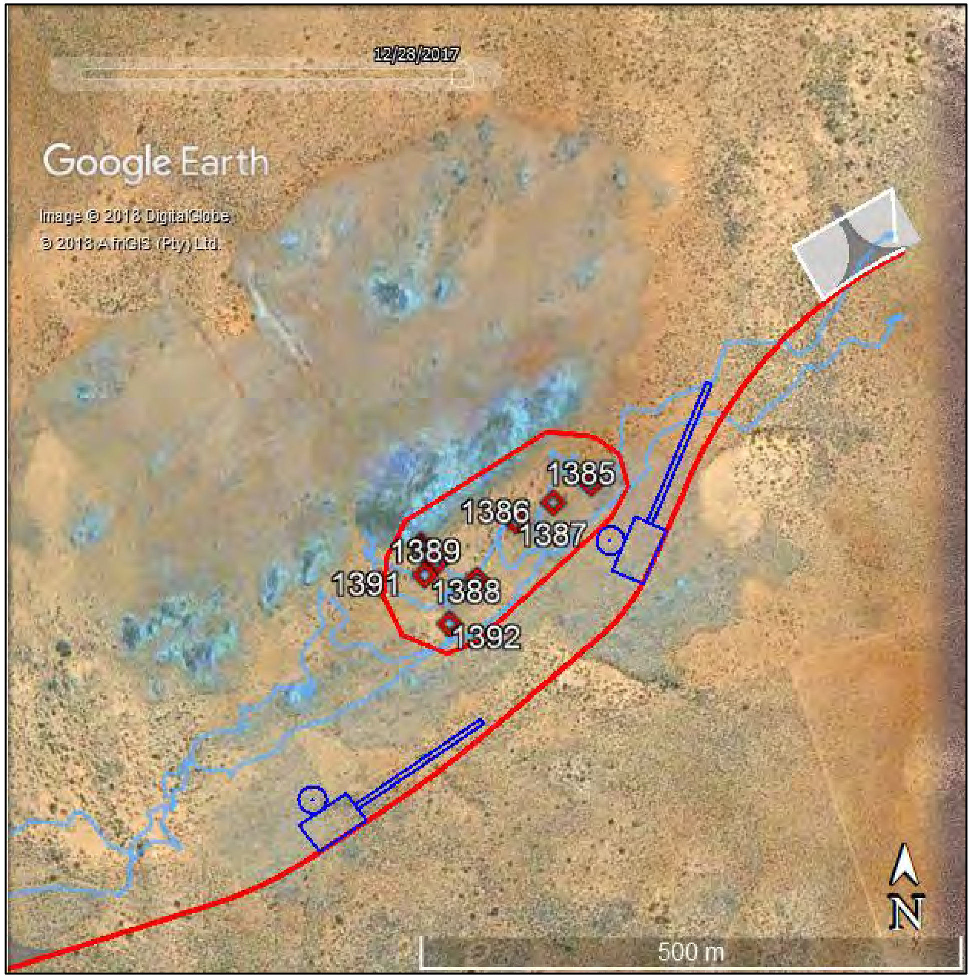

__Figure A2.5:__ Map showing finds.

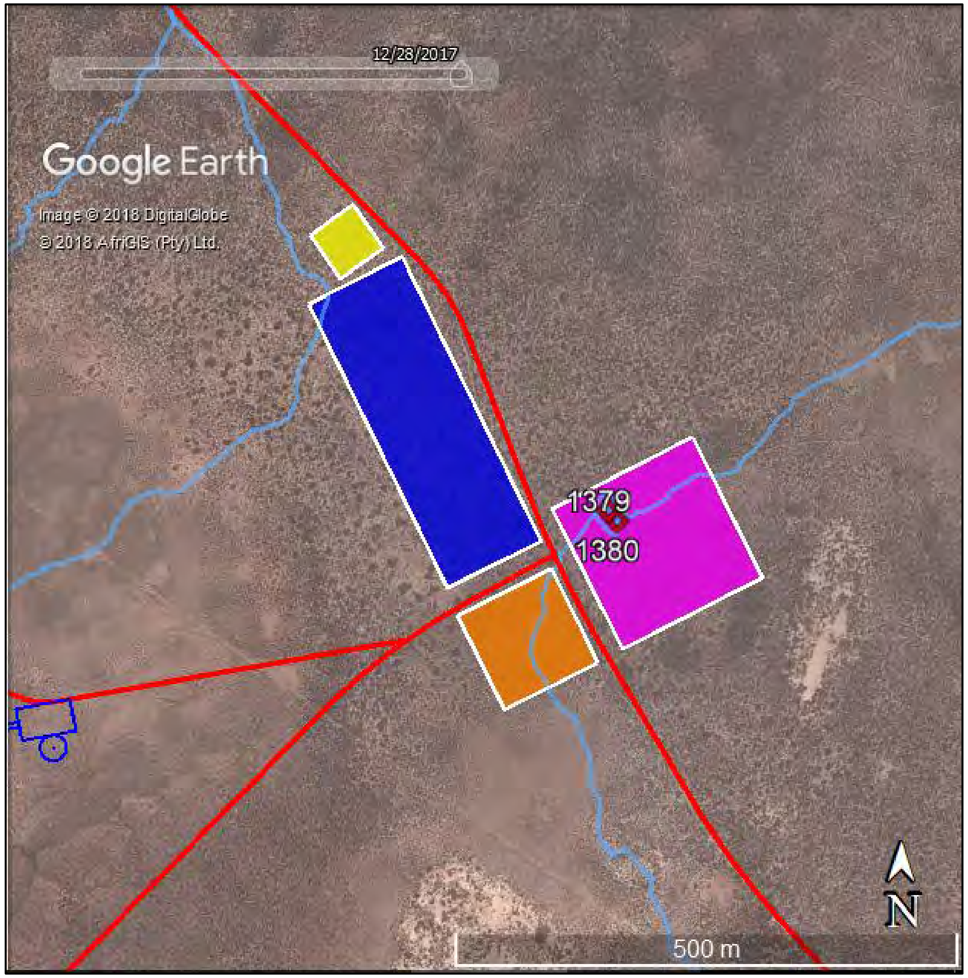

Figure A2.6: *Map showing finds.*

Figure A2.7: *Map showing finds.*

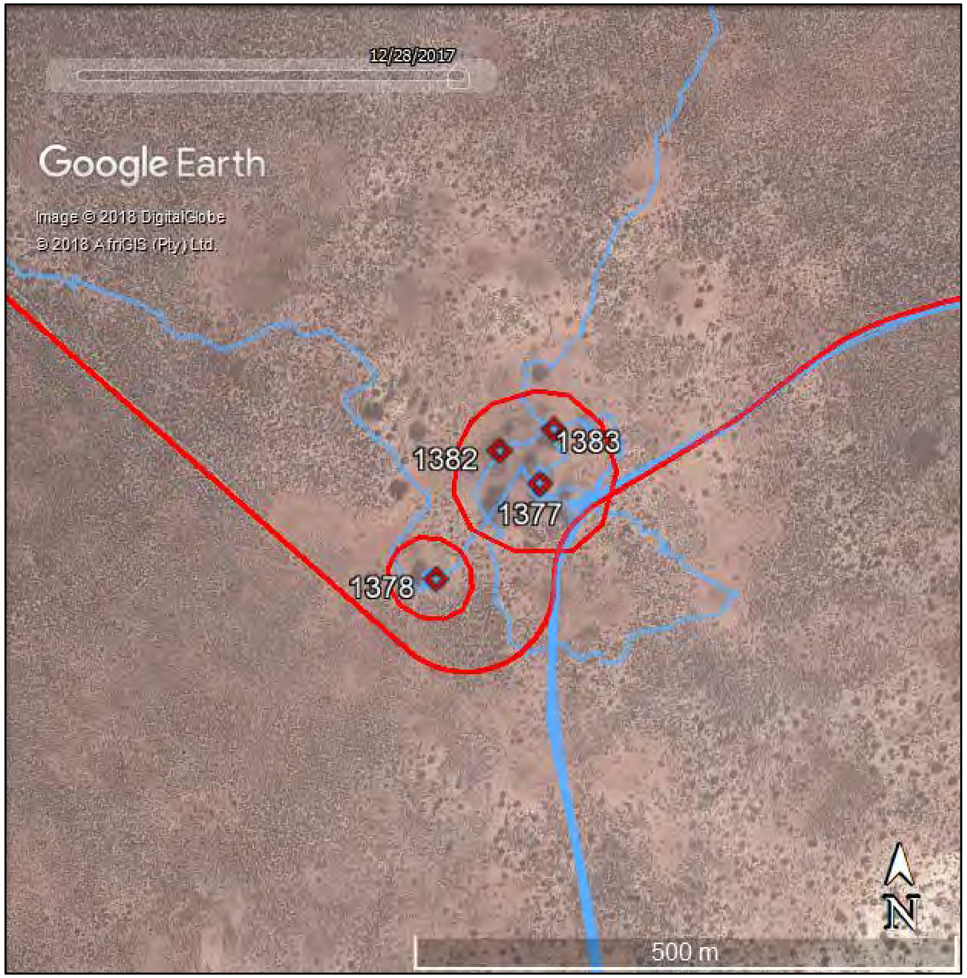

Figure A2.8: *Map showing finds.*

Figure A2.9: *Map showing finds.*

Figure A2.10: *Map showing finds.*

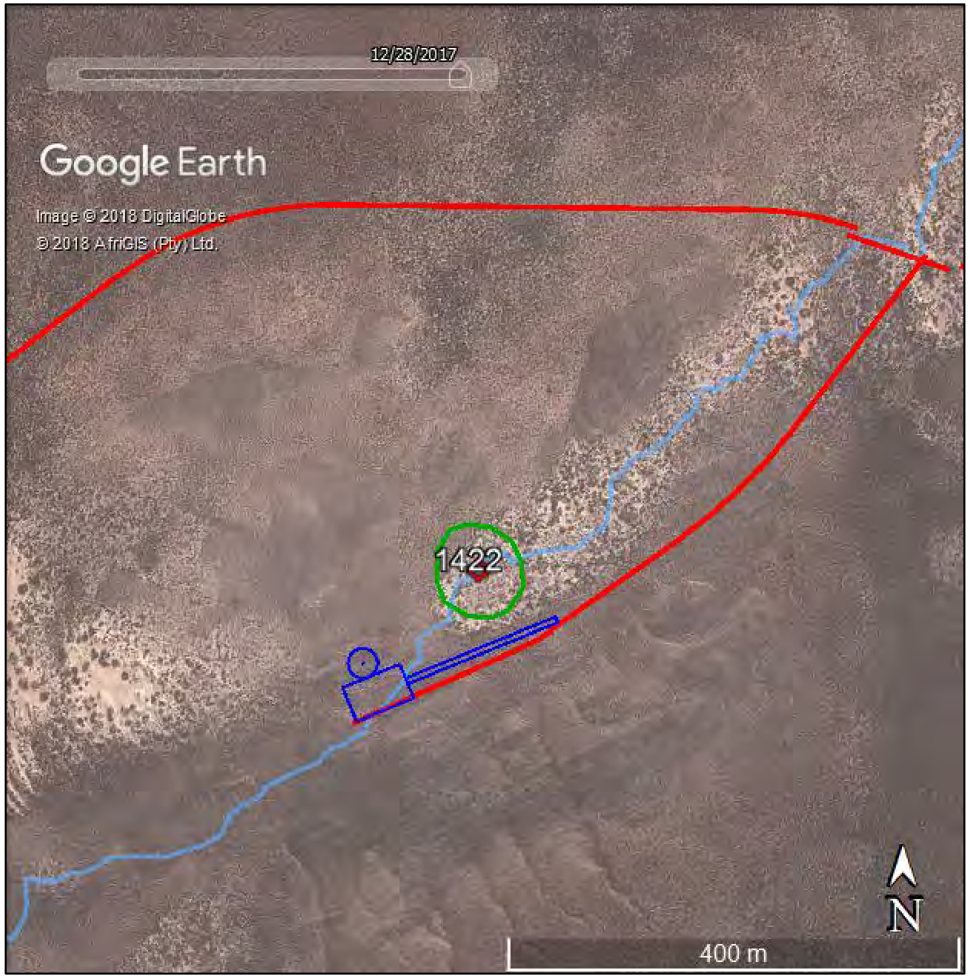

Figure A2.11: *Map showing finds.*

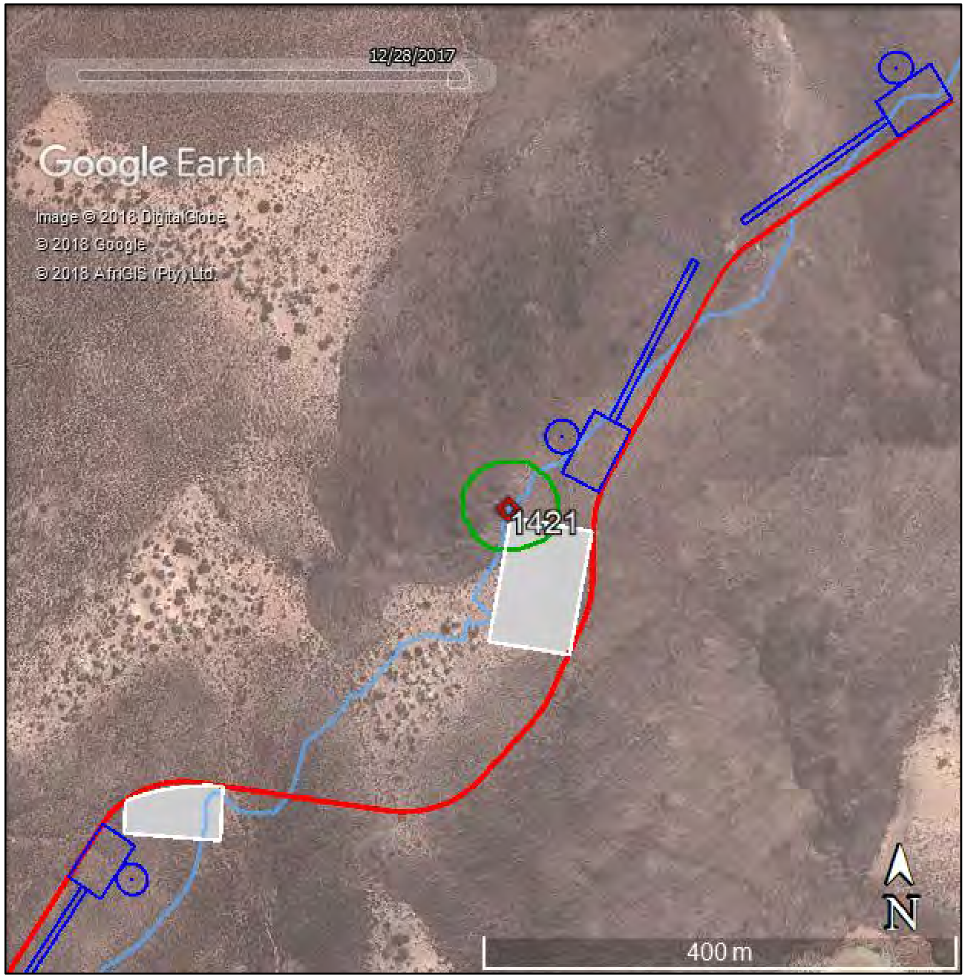

Figure A2.12: *Map showing finds.*

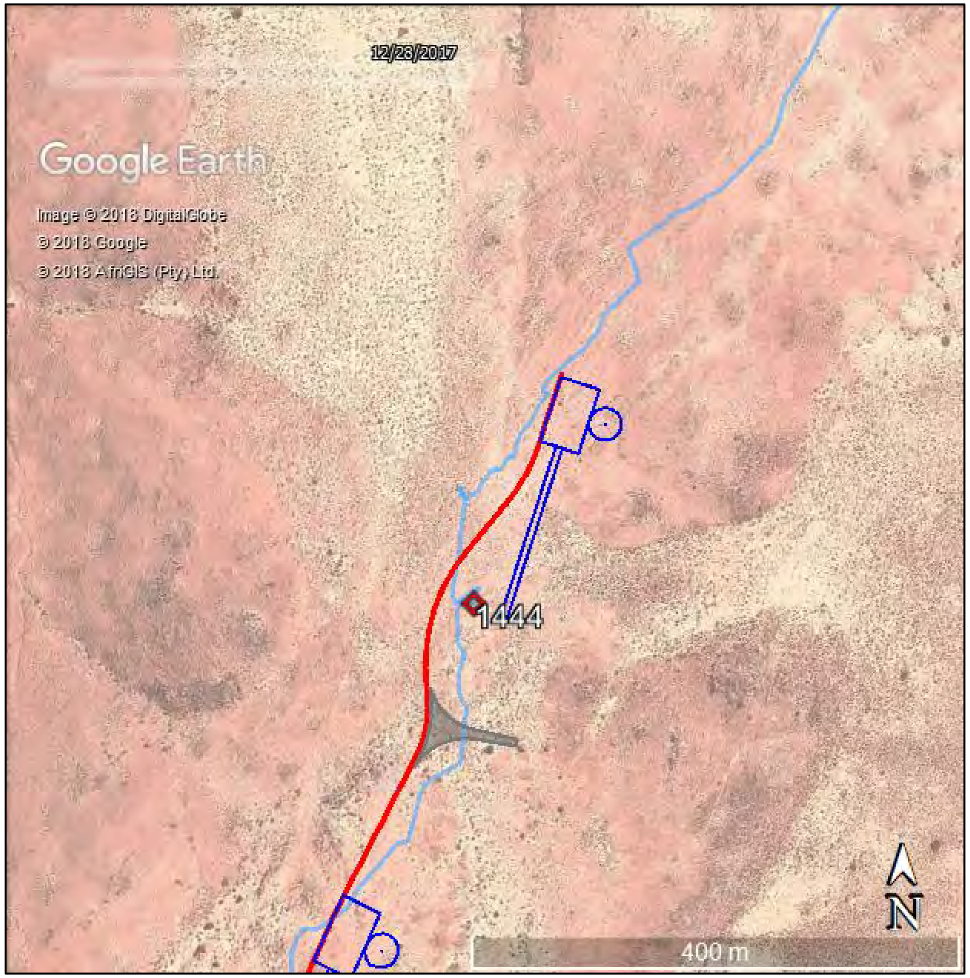

Figure A2.13: *Map showing finds.*

Figure A2.14: *Map showing finds.*

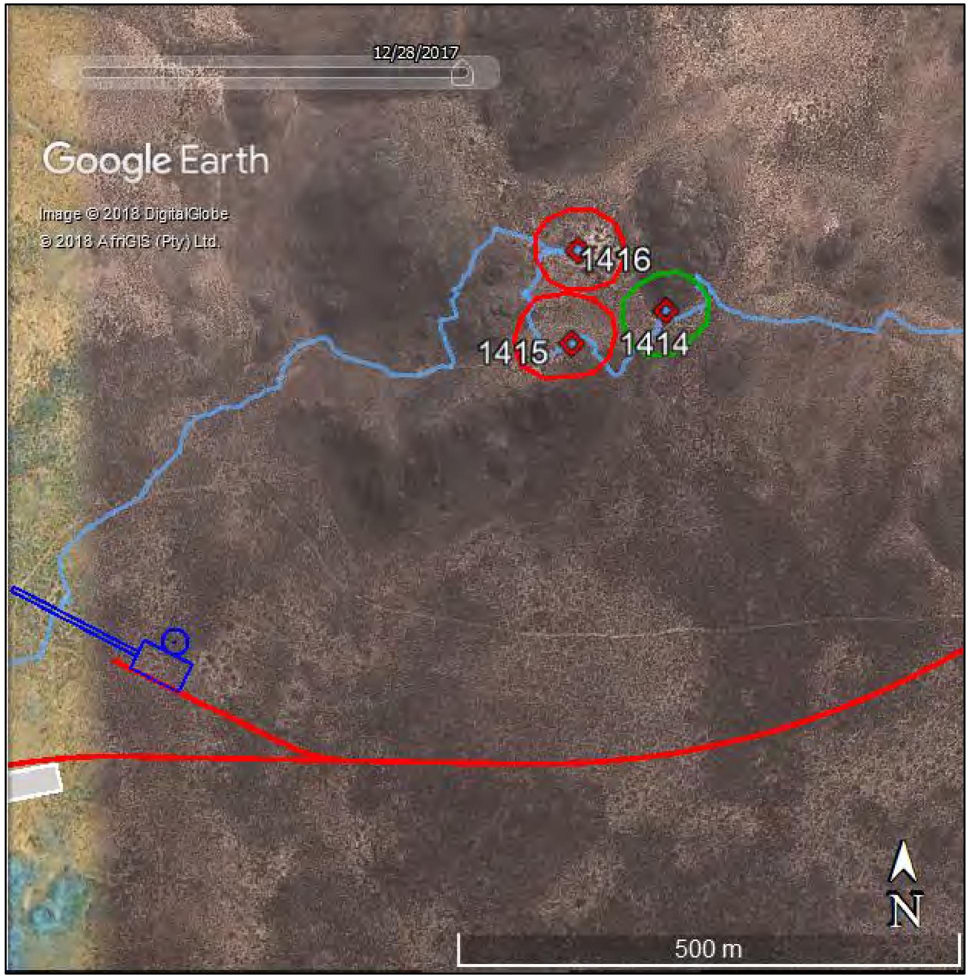

Figure A2.15: *Map showing finds.*

APPENDIX 3 – Graveyard details

The following list indicates the date of death and surname of each of the 17 named graves in the graveyard at waypoint 1378.

Date of death	Surname
1916	BRAND
1922	BRAND
1927	DE WAAL
1929	VAN DYK
1931	SCHREUDER
1935	ENGELBRECHT
1936	DE WAAL
1941	ENGELBRECHT
1942	VAN DYK
1944	ENGELBRECHT
1946	ENGELBRECHT
1946	DE WAAL
1948	DE WAAL
1954	RICH
1960	DE WAAL
1965	RICH
1990	DE WAAL

APPENDIX 4 – Palaeontological study

PALAEONTOLOGICAL ASSESSMENT
(DESKTOP STUDY)

PROPOSED KAP VLEY WIND ENERGY FACILITY
NAMAKWA DISTRICT MUNICIPALITY, NORTHERN CAPE

Kap Vley 315, Gra' Water 331, Platvley 314, Kouroontjie 316 , Kamaggas 200

By

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1 SEPTEMBER 2017

1. PROJECT NAME

Kap Vley Wind Energy Facility. Company Reg. No. K2011/103961/07

2. LOCATION

The proposed Kap Vley Wind Energy Facility is located west of the small town of Komaggas in the Nama Khoi Local Municipality, Namakqualand District Municipality, Northern Cape Province. The properties involved are Kap Vley 315, Gra' Water 331, Platvley 314, Kouroontjie 316 and Kamaggas 200 (Komaggas Municipal Land) (Figure 1). The relevant 1:50000 topo-cadastral map are 2917CC BRAZIL and 2917CD Komaggas.

3. LOCALITY PLAN

The spatial scope and basic layout of the proposed project is shown in Figure 1.

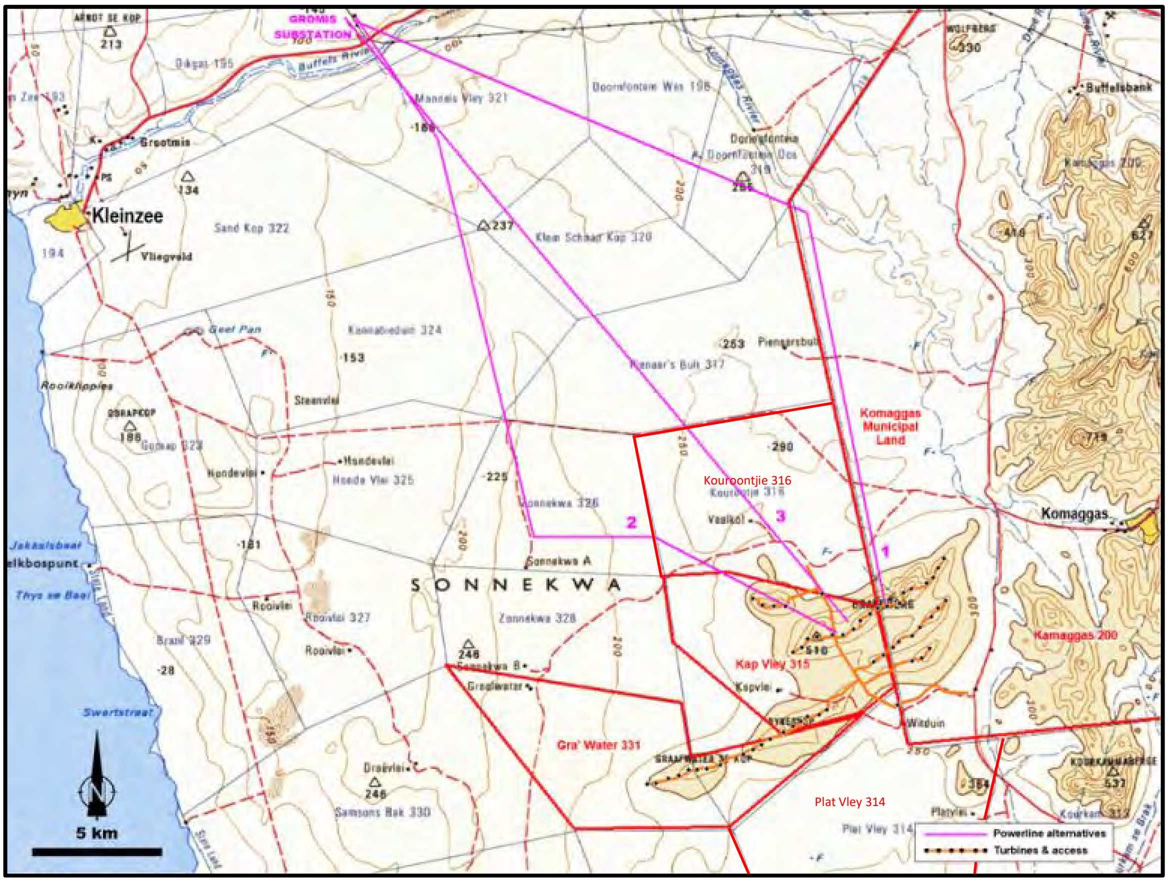

Figure 1. The proposed Kap Vley WEF. Extract 1:250000 2917 SPRINGBOK. Red = cadastrals, Orange with dots = access roads and turbines, Pink = power line alternatives.

4. PROPOSED DEVELOPMENT

The proposed Kap Vley Wind Energy Facility will comprise up to 45 wind turbines with concomitant infrastructure of access roads, construction laydown areas, cabling trenches, control stations, workshop and offices. Three alternative routes to the Gromis Substation or the Eskom substation near Kleinzee are under consideration (Figure 1). The wind energy facility is being assessed under a Scoping and Environmental Impact Assessment (EIA) process, while the power line alternatives form part of a separate Basic Assessment (BA) process.

This report is to inform the Heritage Impact Assessments (HIAs) for both the EIA and the BA and its brief is to inform about the palaeontological sensitivity of the proposed projects and the probability of fossils being uncovered in the subsurface and being disturbed or destroyed in the process of construction.

5. PALAEONTOLOGICAL HERITAGE RESOURCES IDENTIFIED

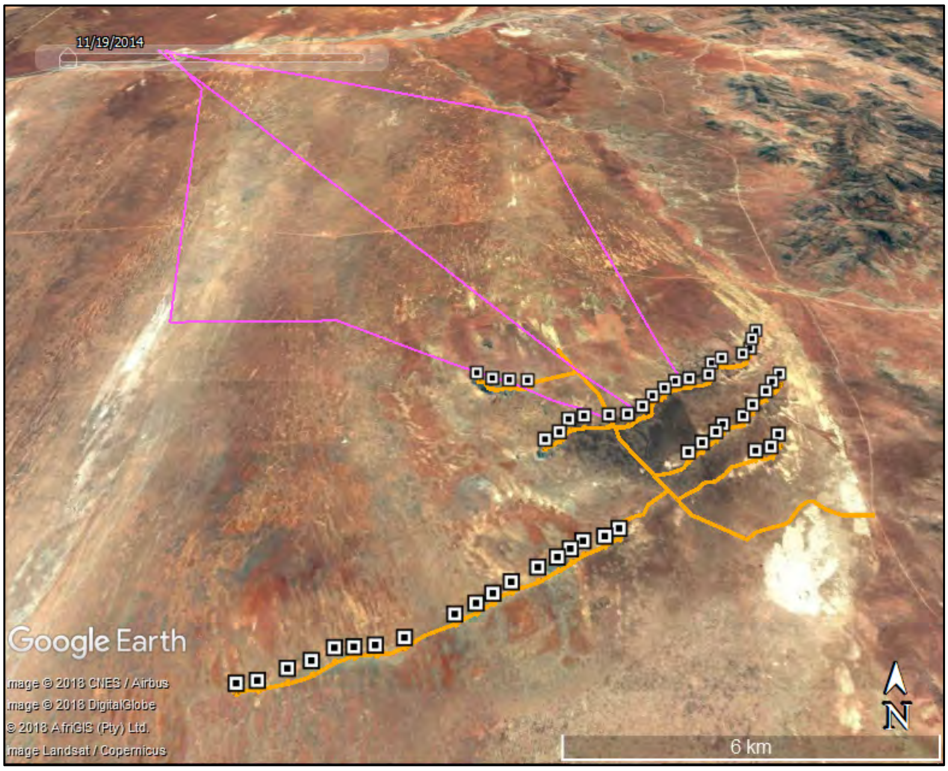

Figure 2. Geomorphological setting of the Kap Vley WEF. Simulated aerial view from Google Earth. Orange lines are the road layout, square symbols are turbines and pink lines are power line alternatives.

It is proposed to position the wind turbines along the summits of a range of low hill ridges rising inselberg-like ~200 m above the inner zone of the coastal plain – named Brandberg, Byneskop and Graafwater se Kop (Figures 1 & 2). The bedrock ridges are composed of quartzites and schists of the **Springbok Formation** (Bushmanland Group, Khurisberg Subgroup) (Figure 3, Ksg). These are very altered, ancient sediments ~1600 Ma (Ma = million years old) which now occur as remnant rafts of metasediments in the surrounding sea of molten-rock gneisses (Marais *et al*., 2001). There are no fossils in these rocks.

The slopes of the quartzite ridges are mantled by talus, colluvium, ephemeral stream deposits and windblown sands. These deposits are of low fossil bone potential. In the arid terrain the bones of animals remain exposed and have poor preservation potential due to weathering and bioerosion (gnawing) by rodents and insects. The fossil record in bedrock colluvia is very sparse. Notwithstanding, it is still possible that fossil material may occur. Hills provide vantage of the landscape for carnivores and scavengers and fossil bones from their activities could be present in places. Ephemeral streamwash deposits are poorly fossiliferous, but abraded bone fragments and teeth may occur sparsely in channel lags.

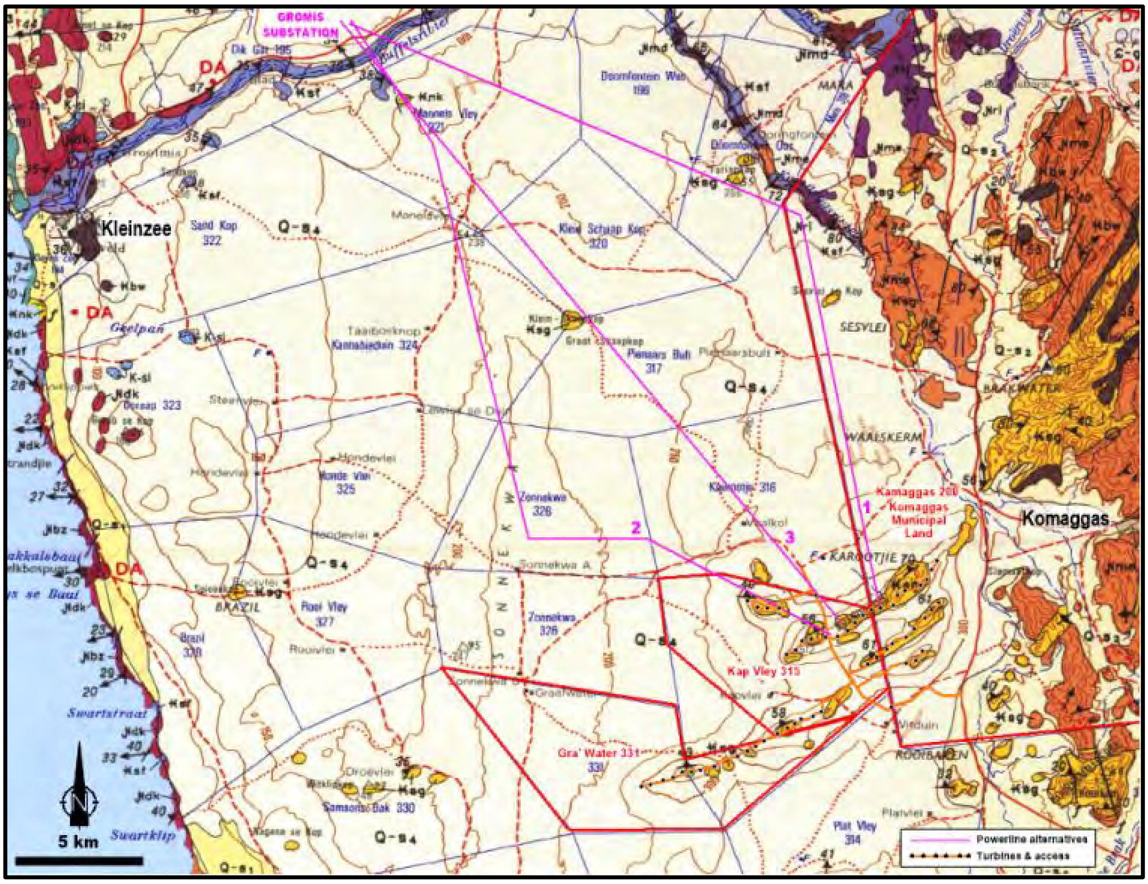

Figure 3. Geology of the Project Area. From 1:250000 Sheet 2917 Springbok, Council for Geoscience. ~~K~~sg = Springbok Fm (deep yellow). Q-s4 = late Quaternary aeolian sands (beige).

The quartzite ridges have had a continuing influence on wind flow, affecting aeolian deposition and erosion (Figure 2). Aeolian sands as plumes of various ages cover the area to the GROMIS substation, all subsumed in surface unit Q-s4 on the geological map (Figure3), described as "semi-consolidated piedmont deposits, red sand". Figure 2 shows the "dusting" of pale white to yellow sand swathes active during the last 12 000 years of the Holocene, overlying older, reddened sands. The older sands in the area have OSL ages ranging from the Last Glacial Maximum ~20 thousand years ago (ka), back to ~70 ka (Chase & Thomas, 2006, 2007).

The surficial coversands have low fossil potential in general. In places scatters of bone may occur on the underlying palaeosurface on compact red sands, usually associated with archaeological material, but such scatters would be virtually impossible to locate.

6. ANTICIPATED IMPACTS

Due to the low palaeontological potential of the hillslope colluvia and aeolian sands the impact of the construction of the proposed WEF on fossil heritage is considered to be LOW. The powerline alternatives entail shallow disturbance of superficial, geologically-young deposits which have low palaeontological potential and sensitivity. Notwithstanding, the history of these vast tracts of sands, gravels and pedocretes of the Northern Cape is very poorly known, with very few fossils to rely on. Hence, though of low probability, any find will be of considerable importance.

7. RECOMMENDATIONS

In view of the low fossil potential, monitoring of bulk earth works by a specialist is not justified. Notwithstanding, the sporadic fossil occurrences are then particularly important and efforts made to spot them are often rewarded. Buried archaeological material may also be encountered. It is recommended that a requirement to be alert for possible fossils and buried archaeological material be included in the EMPr for the Construction Phases of the proposed Kap Vley WEF, with a Fossil Finds Procedure in place. In the event of the exposure of fossil bones all work at that spot must cease and the ECO must inform SAHRA and a professional palaeontologist, who will then decide if avoidance or mitigation are preferred. Only a professional palaeontologist may excavate uncovered fossils with a valid mitigation permit from SAHRA.

8. REFERENCES

Chase, B.M. & Thomas, D.S.G. 2006. Late Quaternary dune accumulation along the western margin of South Africa: distinguishing forcing mechanisms through the analysis of migratory dune forms. Earth and Planetary Science Letters 251: 318–333.

Chase, B.M. & Thomas, D.S.G. 2007. Multiphase late Quaternary aeolian sediment accumulation in western South Africa: timing and relationship to palaeoclimatic changes inferred from the marine record. Quaternary International 166: 29–41.

Marais, J.A.H., Agenbacht, A.L.D., Prinsloo, M. & Basson, W.A. 2001. The geology of the Springbok area. Explanation of 1:250 000 Sheet 2917 (Springbok), Council for Geoscience, 103 pp.

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Scoping and Environmental Impact Assessment for the proposed Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape

UPDATED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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APPENDIX M:

Soils and Agricultural Potential Impact Assessment Report

SOILS AND AGRICULTURAL POTENTIAL ASSESSMENT

Scoping and Environmental Impact Assessment for the Proposed Kap Vley Wind Energy Facility near Kleinzee, in the Northern Cape

Report prepared for:	*Report prepared by:*
CSIR – Environmental Management Services P O Box 320 Stellenbosch 7600	Johann Lanz – Soil Scientist P.O. Box 6209 Stellenbosch, 7599 South Africa

March 2018

SPECIALIST EXPERTISE

Johann Lanz

Curriculum Vitae

Education

M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - June 1999
B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I am registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science, registration number 400268/12, and am a member of the Soil Science Society of South Africa.

Soil Science Consultant | **Self employed** | **2002 - present**

I run a soil science consulting business, servicing clients in both the environmental and agricultural industries. Typical consulting projects involve:

Soil specialist study inputs to EIA's, SEA's and EMPR's. These have focused on impact assessments and rehabilitation on agricultural land, rehabilitation and re-vegetation of mining and industrially disturbed and contaminated soils, as well as more general aspects of soil resource management. Recent clients include: Aurecon; CSIR; SiVEST; SRK Consulting; Juwi Renewable Energies; Mainstream Renewable Power; Subsolar; Tiptrans; Planscape; Afrimat; Savannah Environmental; Red Cap Investments; MBB Consulting Engineers; Enviroworks; Haw & Inglis.

Soil resource evaluations and mapping for agricultural land use planning and management. Recent clients include: Cederberg Wines; Unit for Technical Assistance - Western Cape Department of Agriculture; Vogelfontein Citrus; De Grendel Estate; Zewenwacht Wine Estate; Goedgedacht Olives;, Lourensford Fruit Company; Kaarsten Boerdery; Wedderwill Estate; Thelema Mountain Vineyards; Rudera Wines; Flagstone Wines; Solms Delta Wines; Dornier Wines.

I have conducted several research projects focused on conservation farming, soil health and carbon sequestration.

Soil Science Consultant | **Agricultural Consultors International (Tinie du Preez)** | **1998 - end 2001**

Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

Contracting Soil Scientist | **De Beers Namaqualand Mines** | **July 1997 - Jan 1998**

Completed a contract to make recommendations on soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

SPECIALIST DECLARATION

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

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

Signature of the specialist

Name of Specialists: Johann Lanz

Date: March 2018

EXECUTIVE SUMMARY

The proposed Kap Vley Wind Energy Facility will be located on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. This assessment has found that the proposed development is on land which is of extremely low agricultural potential and is unsuitable for cultivation.

The key findings of this study are:

- Soils on the ridges where turbines are proposed are dominated by rock outcrops and shallow, sandy soils on underlying rock of the Hutton and Mispah soil forms. Soils of the lower lying plains are deep to moderately deep, very sandy soils on underlying hardpan carbonate and are of the Hutton, Clovelly and Vilafontes soil forms.
- The major limitation to agriculture is the limited climatic moisture availability.
- As a result of this limitation, the study area is totally unsuitable for cultivation and agricultural land use is limited to grazing.
- The land capability is classified as Class 7 - non-arable, low potential grazing land and Class 8 – non-utilisable wilderness land. The site has a low grazing capacity.
- There are no agriculturally sensitive areas and no parts of the site need to be avoided by the development.
- The significance of all agricultural impacts is kept low by two important factors. The first is that the actual footprint of disturbance of the wind farm is very small in relation to the available grazing land. The second is the fact that the proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing.
- Five potential negative impacts of the development on agricultural resources and productivity were identified as:
    - Loss of agricultural land use caused by direct occupation of land by the development footprint;
    - Loss of topsoil in disturbed areas, causing a decline in soil fertility;
    - Soil Erosion caused by alteration of the surface characteristics;
    - Degradation of veld vegetation beyond the direct development footprint;
    - Cumulative regional loss of agricultural land use and potential.
- One potential positive impact of the development on agricultural resources and productivity was identified as:
    - Generation of alternative / additional land use income through the wind farm, which will improve cash flow and financial sustainability of farming enterprises on site.
- All impacts were assessed as having low or very low significance.
- Cumulative impact is also assessed as low. Furthermore it is far more preferable to incur a loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.
- Recommended mitigation measures include implementation of an effective system of storm water run-off control and the maintenance of vegetation cover to mitigate erosion; topsoil stripping and re-spreading to mitigate loss of topsoil; restricted vehicle access; and dust control.

- Due to the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised.
- There are no conditions resulting from this assessment that need to be included in the Environmental Authorisation, should this be granted.
- The overall significance of the impact on agriculture for the construction, operation and decommissioning phase is assessed as **very low**.

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Title page CV on page 1-2
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 3
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1 & 1.2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1.5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 5, 6 and 7
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 3.8 & Figure 3, Section 3.4, Page 16
g) an identification of any areas to be avoided, including buffers;	Section 1.3.8
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 3, Section.3.4, Page 16
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 6
k) any mitigation measures for inclusion in the EMPr;	Section 7 & 8
l) any conditions for inclusion in the environmental authorisation;	Section 9.2
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 9.1 Section 8
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

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TABLES

FIGURES

1. INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

This report presents the Soil and Agricultural Potential Assessment undertaken by Mr. Johann Lanz (an independent consultant), appointment by the CSIR, as part of the Environmental Impact Assessment for the proposed development of the Kap Vley Wind Energy Facility comprising a maximum capacity of 300 MW near Kleinzee, Northern Cape Province (see Figure 1.)

The objectives of the study are to identify and assess all potential impacts of the proposed development on agricultural resources including soils and agricultural production potential, and to provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified potential impacts.

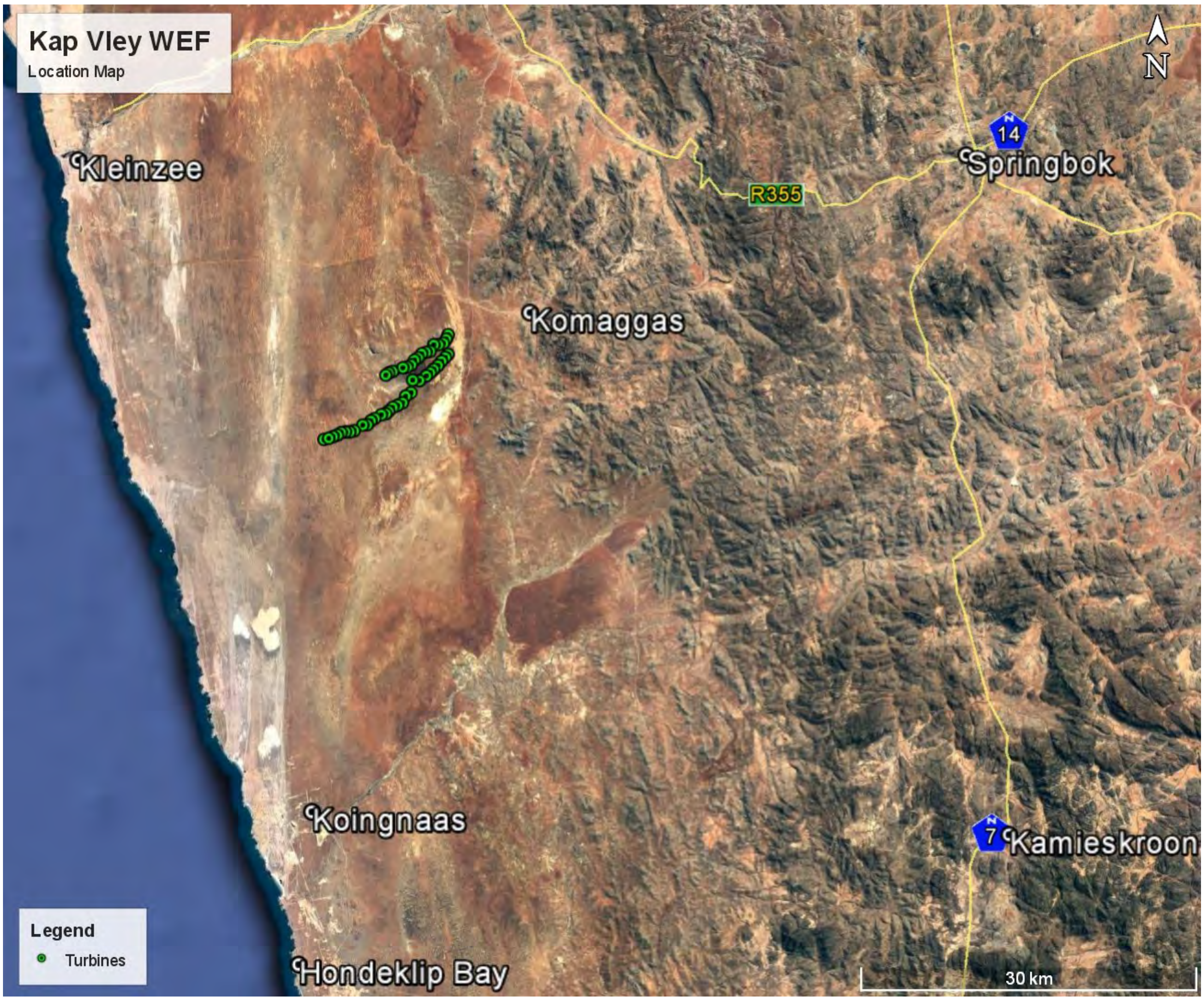

Figure 1. Location of the proposed Kap Vley Wind Energy Facility site, south east of Kleinzee in the Northern Cape.

1.2 Terms of Reference

The following Terms of Reference (ToR) applies to this study:

The report fulfils the ToR for an agricultural study as set out in the National Department of Agriculture's document, *Regulations for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011. DEA's requirements for an agricultural study are taken directly from this document, but use an older version of the document and not the most recent version, which was updated in 2011.

The study applies an appropriate level of detail for the agricultural suitability on site and for the level of impact of the proposed development on agricultural land. A detailed soil survey, as per the requirement in the above document, is appropriate for a significant footprint of impact on arable land. It is not appropriate for this site, where soil and climate constraints make cultivation completely non-viable. Conducting a soil survey at the required level of detail would be very time consuming but would also be unnecessary as it would add no value to the impact assessment. The level of soil assessment that was conducted for this report (reconnaissance ground proofing of land type data) is considered more than adequate for a thorough assessment of all agricultural impacts.

The above requirements together with requirements for an EIA specialist report may be summarised as follow:

- Based on existing data as well as a field soil survey, describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers).
- Describe the topography of the site.
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options.
- Describe the erosion, vegetation and degradation status of the land.
- Determine and map the agricultural potential across the site.
- Determine and map the agricultural sensitivity to development across the site, including “no-go” areas, setbacks/buffers, as well as any red flags or risks associated with soil and agricultural impacts.
- Identify relevant legislation and legal requirements relating to soil and agricultural potential impacts.
- Identify and assess all potential impacts (direct, indirect and cumulative) of the construction, operational and decommissioning phases of the proposed development on soils and agricultural potential, and note the economic consequences of the proposed development on soils and agricultural potential.
- Provide recommended mitigation measures, management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts.

In addition to the above, the following ToR has been provided by the CSIR:

- EIA Regulations, as amended;
- Adhere to the requirements of specialist studies as outlined in Appendix 6 of the 2014 NEMA
- Assess the no-go alternative very explicitly in the impact assessment section. Please note that the DEA considers a ‘no-go’ area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads and internal cables is allowed in the ‘no-go' areas. Should your definition of the ‘no-go’ area differ from the DEA definition; this must be clearly indicated in your assessment. You are also requested to indicate the ‘no-go’ area’s buffer.
- Assess cumulative impacts by identifying other wind and solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 50 km of the proposed Kap Vley WEF project) that have been approved (i.e. positive EA has been issued) or the EIA is currently underway. In addition, the cumulative

impact assessment for all identified and assessed impacts must be refined to indicate the following:

- Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.
- The cumulative impacts significance rating must also inform the need and desirability of the proposed development.
- A cumulative impact environmental statement on whether the proposed development must proceed.

- Provide a detailed description of your methodology, as well as indicate the locations and descriptions of turbine positions, and all other associated infrastructures that you have assessed and are recommending for authorisations.
- Provide a detailed description of all limitations to your studies. Your specialist studies must be conducted in the appropriate season and providing that as a limitation, will not be accepted by DEA.
- Based on existing data as well as a field soil survey, describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers);
- Describe the topography of the site;
- Describe historical and current land use, agricultural infrastructure, as well as possible alternative land use options;
- Describe the erosion, vegetation and degradation status of the land;
- Determine and map the agricultural potential across the site;
- Determine and map the agricultural sensitivity to development across the site, including “no-go” areas, setbacks/buffers, as well as any red flags or risks associated with soil and agricultural impacts;
- Identify relevant legislation and legal requirements relating to soil and agricultural potential impacts;
- Identify and assess all potential impacts (direct, indirect of the construction, operational and decommissioning phases of the proposed development) on soils and agricultural potential, and note the economic consequences of the proposed development on soils and agricultural potential. Use the CSIR methodology to determine the significance of potential impacts;
- Assess all alternatives, including the no-go alternative;
- Assessment cumulative impacts by identifying other REFs such as wind and solar and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 50 km of the proposed WEF). These include projects that have been approved (i.e. positive EA has been issued), have been constructed or projects for which an Application for Environmental Authorisation has been lodged with the Competent Authority (see Table 6.1 in Chapter 6 of this report for a list of projects);
- Provide recommended mitigation measures, management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts to be included in the EMPr;
- Provide a description of any assumptions, uncertainties, limitations and gaps in knowledge;
- Provide a description of the relevant legal context and requirements; and
- Incorporate and address issues and concerns raised during the Scoping and EIA phases of the project where they are relevant to the specialist’s area of expertise.

1.3 Approach and Methodology

The pre-fieldwork assessment was based on the existing Agricultural Geo-Referenced Information System (AGIS) data, as well as Google Earth satellite imagery for the site. The AGIS data was supplemented by a field investigation. This was aimed at ground-proofing the AGIS data and achieving an understanding of specific soil and agricultural conditions, and the variation of these across the site. The field investigation involved a drive and walk over of the site using assessment of surface conditions and existing exposures. The field assessment was done on 14 August 2017, during winter. An assessment of soils (soil mapping) and long term agricultural potential is in no way affected by the season in which the assessment is made, and the timing of the assessment therefore has no bearing on its results. Soils were classified according to Soil Classification Working Group (1991).

The field investigation also included a visual assessment of erosion and erosion potential on site, taking into account a potential development layout. The level of field investigation for this assessment is considered more than adequate for the purposes of this study (see Section 1.2).

The potential impacts identified in this specialist study have been assessed based on the criteria and methodology outlined in Chapter 4 of the Draft EIA Report. The ratings of impacts are based on the specialist's knowledge and experience of the field conditions and the impact of disturbances on those.

1.4 Assumptions, knowledge gaps and Limitations

The following assumptions were used in this specialist study:

- The study assumes that water for irrigation is not available across the site. This is based on the assumption that a long history of farming experience in an area will result in the exploitation of viable water sources if they exist, and none have been exploited in this area.
- Cumulative impacts are assessed by adding expected impacts from this proposed development to existing and proposed developments with similar impacts in a 50 km radius. The existing and proposed developments that were taken into consideration for cumulative impacts are listed in Appendix B.

The following limitation was identified in this study:

- The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

There are no other specific limitations or knowledge gaps relevant to this study.

1.5 Source of information

All data on land types, land capability, grazing capacity etc. was sourced from the online Agricultural Geo-Referenced Information System (AGIS), produced by the Institute of Soil, Climate and Water (Agricultural Research Council, 2007). Current and historical satellite imagery was all sourced from Google Earth. Rainfall and temperature data was sourced from The World Bank Climate Change Knowledge Portal (2015).

Soil data on AGIS originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.

Knowledge of the area was also supplemented by the author's extensive experience of soil rehabilitation and re-vegetation work in the surrounding mining areas (Lanz, 1997).

2. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO AGRICULTURAL IMPACTS

The components of the project that can impact on soils, agricultural resources and productivity are:

- The total physical footprint of the proposed project (i.e. maximum 56 turbines and supporting infrastructure)
- Construction activities that may disturb the soil profile and vegetation, for example for levelling, excavations, etc.

The facility will have a maximum generation capacity of 300 MW, and will comprise the following infrastructure:

- Turbines with foundations of 25 x 25 m x 1m deep;
- Hard standing areas for crane usage per turbine (1 ha);
- 37 km of internal gravel road linking turbine locations. The road will be 5 m in width and 15 m in sections to allow for passing, curvature and the physical footprint due to cut and fill requirements. Turning areas are also included.
- 22/33 kV to 132 kV collector substation of approximately 2.3 ha to receive, convert and step up electricity from the WEF to the 132 kV grid suitable supply. The facility will house control rooms and grid control yards for both Eskom and the Independent Power Producer (IPP) as well as a communication tower of up to 32 m.
- Operation and maintenance building (1 ha);
- Concrete batching plant (0.25 ha)
- Temporary site offices, construction camp area, and lay down areas: 13 ha, consisting of several areas along internal roads and centrally located;
- Fencing of 5 m high around the O&M building and the on-site substation;
- Cabling between turbines to be laid underground where practical, which will connect to an on-site substation; and
- Stormwater channels and culverts.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT: SOILS AND AGRICULTURAL CAPABILITY

This section is organised in sub headings based on the requirements of an agricultural study as detailed in Section 1.2 of this report.

A satellite image map of the study site is given in Figure 3 and photographs of site conditions are given in Figures 4 to 6.

3.1 Climate and water availability

The site has a very low rainfall of 98 mm per annum (The World Bank Climate Change Knowledge Portal, 2015). The average monthly rainfall distribution is shown in Figure 2. One of the most important climate parameter for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. Moisture availability largely controls what level of agricultural production (including grazing) is possible in a given environment. It is classified into 6 categories across the country (see Table 1). This site falls into the highest category, class 6, which is labelled as a very severe limitation to agriculture.

There are wind pumps with stock watering points across the area, but no other water or water storage infrastructure.

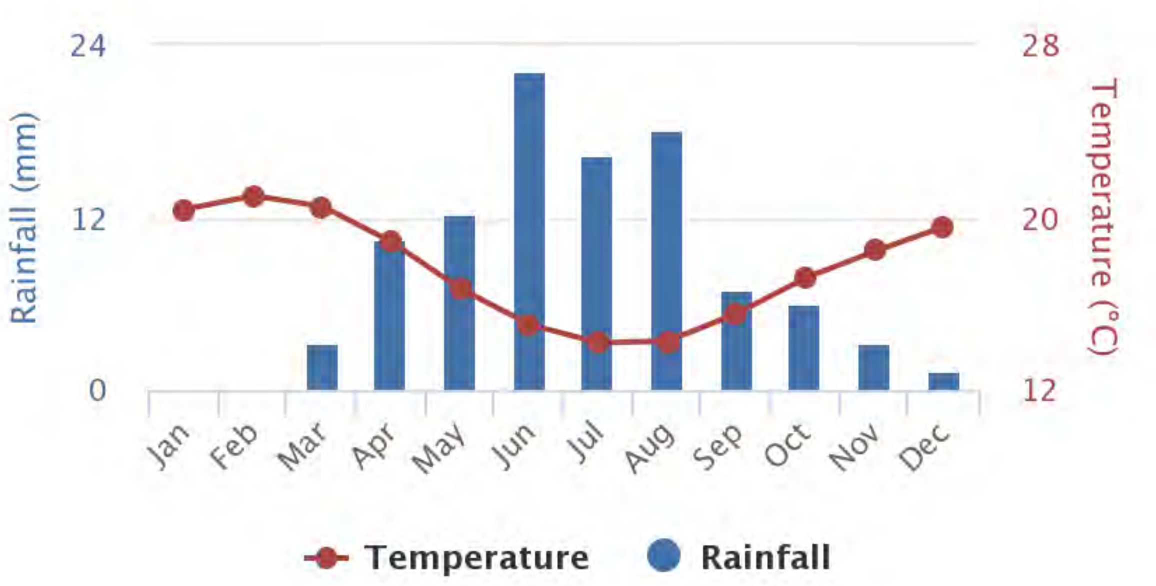

Figure 2. Average monthly temperature and rainfall for location (-29.86, 17.36) from 1991 – 2015 (The World Bank Climate Change Knowledge Portal, 2015).

Table 1. The classification of moisture availability climate classes across South Africa (Agricultural Research Council, 2007)

Class	Moisture availability		Description of agricultural limitation
	Summer rainfall areas (Rainfall/0.25 PET)	Winter rainfall areas (Rainfall/0.40 PET)	
C1	>34	>34	None to slight
C2	27-34	25-34	Slight
C3	19-26	15-24	Moderate
C4	12-18	10-14	Moderate to severe
C5	6-12	6-9	Severe
C6	<6	<6	Very severe

3.2 Terrain, topography and drainage

The proposed development is located on a series of ridges on the coastal plains. The coastal plains are at an altitude of approximately 250 m and the ridges range from an altitude of 300 m to a maximum altitude of just over 500 m. The proposed turbine locations are along the ridge lines. Slopes vary across the area, with maximum slopes of 35% down the sides of the ridges where they are highest and steepest. The maximum slopes that would be impacted by any project footprint are however much less and are not likely to exceed 10%.

The underlying geology of the ridges is migmatite and gneiss of the Namaqualand Metamorphic Complex. The geology of the coastal plains is aeolian material overlying Tertiary and Quaternary marine sediments.

No perennial drainage features occur on the site. There are some indistinct, intermittent drainage lines that would only flow temporarily after heavy rains.

3.3 Soils

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. There are two land types across the site. The coastal plains are entirely land type Ah38. Soils of this land type are predominantly deep to moderately deep very sandy soils on underlying hardpan carbonate. Predominant soil forms are Hutton, Clovelly and Vilafontes. These soils would fall into the Oxidic and Calcic (underlying hardpan carbonate) soil groups according to the classification of Fey (2010). The higher lying ridges comprise a different land type, Ib123, that is dominated by rock outcrop and shallow, sandy soils on underlying rock of the Hutton and Mispah soil forms. These soils would fall into the Oxidic and Lithic soil groups according to the classification of Fey (2010). A summary detailing soil data for the land types is provided in Appendix B, Table B1. The field investigation confirmed that the dominant soil types are as described in the land type data.

The sandy soils are susceptible to wind erosion. Although the soils are not classified as highly susceptible to water erosion, the aridity of the environment with consequent low plant cover means that erosion risk is nevertheless high (see Figure 4).

3.4 Agricultural capability

Land capability is the combination of soil suitability and climate factors. The flatter plains have a land capability classification, on the 8 category scale, of Class 7 - non-arable, low potential grazing land. The ridges are classified as Class 8 – non-utilisable wilderness land. The limitations to agriculture are predominantly the aridity and lack of access to water, but on the ridges where the turbines are located, the shallow soil depths and rock outcrops are further limitations.

The grazing capacity on AGIS is classified as low at greater than 31 hectares per large stock unit.

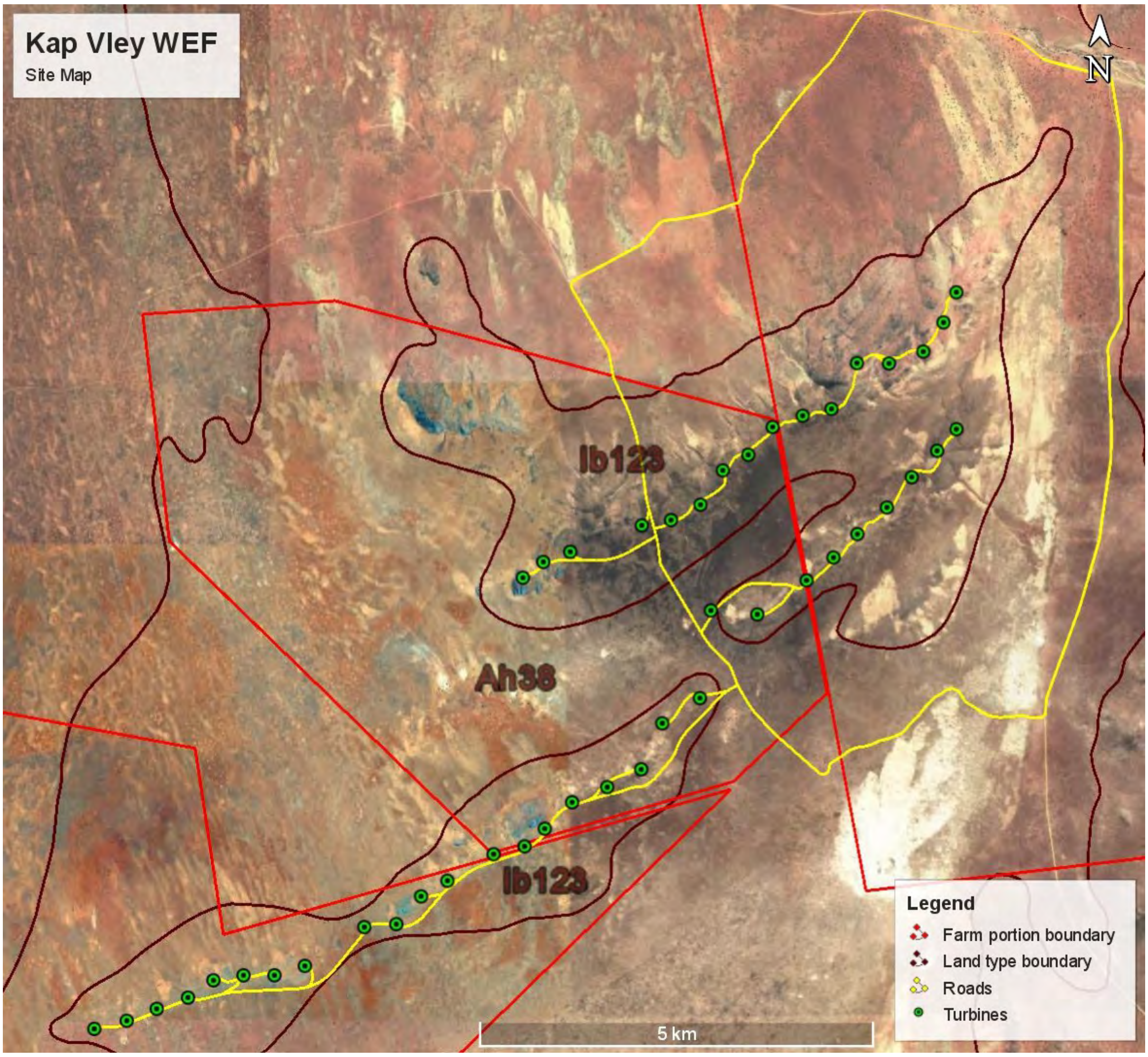

Figure 3. Satellite image site map of the proposed Kap Vley WEF showing land type distribution.

Figure 4. Photograph showing susceptibility to erosion that has occurred as a result of past disturbance.

Figure 5. Photograph of typical veld and landscape conditions across the proposed Kap Vley WEF site. This is the view looking north east along the top of one of the lower ridges, with the other ridges in the background left.

Figure 6. Photograph of typical veld and landscape conditions across the proposed Kap Vley WEF site. This is the view looking south west from one of the highest points along the highest ridge.

3.5 Land use and development on and surrounding the site

Low intensity grazing is the only agricultural activity in and surrounding the study area. The only agricultural infrastructure present on site wind pumps, stock watering points and fencing surrounding grazing camps. There is a farmstead on two of the three farm portions, but these are located on a different part of the farm as to where the proposed turbines are proposed..

Access to the site is by way of farm access roads off the nearest public road to the east.

3.6 Status of the land

The vegetation type for the site is Namaqualand Klipkoppe Shrubland on the ridges with Namaqualand Strandveld on the lower lying coastal plain areas. The vegetation has been grazed but there is not significant erosion or other degradation of veld except in isolated spots (see Figure 4).

3.7 Possible land use options for the site

The severe aridity means that low intensity grazing is the only possible agricultural land use for the site.

3.8 Agricultural sensitivity

Agricultural potential and conditions are very uniform across the site and the choice of placement of facility infrastructure, including access roads and transmission lines therefore has minimal influence on the significance of agricultural impacts. No sensitive agricultural areas occur within the study area. From an agricultural point of view, no parts of the site need to be avoided by the proposed development and no buffers are required.

4. APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

A change of land use (re-zoning) for the development on agricultural land needs to be approved in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA). This is required for long term lease, even if no subdivision is required. Rehabilitation after disturbance to agricultural land is managed by the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA). No application is required in terms of CARA. The EIA process covers the required aspects of this. The Department of Agriculture, Forestry and Fisheries (DAFF) reviews and approves applications in terms of these Acts according to their *Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land*, dated September 2011.

5. IDENTIFICATION OF KEY ISSUES

5.1 Identification of potential impacts

The potential impacts identified during the assessment are:

5.1.1 Construction phase

- Loss of agricultural land use;
- Soil erosion;
- Loss of topsoil; and
- Degradation of veld vegetation.

5.1.2 Operational phase

- Loss of agricultural land use;
- Generation of alternative land use income; and
- Soil erosion.

5.1.3 Decommissioning phase

- Loss of agricultural land use;
- Soil erosion;
- Loss of topsoil; and
- Degradation of veld vegetation.

5.1.4 Cumulative impact

- Regional loss of agricultural land.

6. ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

The significance of all potential agricultural impacts is low due to two important factors.

1. The actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the land available for grazing on the affected farm portions (<2% of the surface area). All agricultural activities will be able to continue unaffectedly on all parts of the farm other than the small development footprint for the duration of and after the project.
2. The proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing. These factors also mean that cumulative regional effects as a result of other surrounding developments, also have low significance.

All identified impacts are considered to be direct impacts. No indirect impacts were identified.

6.1 Construction phase

6.1.1 Loss of agricultural land use

Aspect / Activity	Occupation of the land by the project infrastructure
Type of impact	Direct
Potential Impact	Loss of agricultural land use is due to direct occupation of the land by all development infrastructure. It results in affected portions of land being taken out of agricultural production. This applies to the direct footprint of the development which comprises the turbine foundations, hard standing areas, roads and the footprint of other infrastructure. This represents a small proportion of the land surface area. During the construction phase there will be slightly more disturbance, due to temporary lay down areas and construction camps.
Mitigation Required	None possible
Impact Significance (Pre-mitigation)	Low
Impact Significance (Post-Mitigation)	Not applicable

6.1.2 Soil erosion

Aspect / Activity	Change in land surface characteristics.
Type of impact	Direct
Potential Impact	Erosion may be by wind or water. It can occur as a result of the alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources. Erosion can be effectively managed through mitigation measures.
Mitigation Required	Implement an effective system of storm water run-off control. Maintain, where possible, all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion.

Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

6.1.3 Loss of topsoil

Aspect / Activity	Activities that disturb the soil profile.
Type of impact	Direct
Potential Impact	Loss of topsoil can result from poor topsoil management (burial, erosion, etc) during construction related soil profile disturbance (levelling, excavations, road surfacing etc.). It will result in a decrease in the soil's capability for supporting vegetation.
Mitigation Required	Strip, stockpile and re-spread topsoil during rehabilitation.
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

6.1.4 Degradation of veld vegetation

Aspect / Activity	Vehicle traffic and dust generation
Type of impact	Direct
Potential Impact	Degradation of veld vegetation can occur beyond the direct footprint of the development due to vehicle trampling and dust deposition.
Mitigation Required	Control vehicle passage and control dust
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

6.2 Operational phase

6.2.1 Loss of agricultural land use

Aspect / Activity	Occupation of the land by the project infrastructure
Type of impact	Direct
Potential Impact	Loss of agricultural land use is due to direct occupation of the land by all development infrastructure. It results in affected portions of land being taken out of agricultural production. This applies to the direct footprint of the development which comprises the turbine foundations, hard standing areas, roads and the footprint of other infrastructure. This represents a small proportion of the land surface area.
Mitigation Required	None possible
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Not applicable

6.2.2 Soil erosion

Aspect / Activity	Change in land surface characteristics.
Type of impact	Direct
Potential Impact	Erosion may be by wind or water. It can occur as a result of the alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources. Erosion can be effectively managed through mitigation measures.
Mitigation Required	Implement an effective system of storm water run-off control. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion.
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

6.2.3 Additional land use income

Aspect / Activity	Project land rental
Type of impact	Direct
Potential Impact	This is a positive impact for agriculture. Alternative / additional land use income will be generated by the farming enterprise through the lease of the land for the WEF. This will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve its financial sustainability.
Mitigation Required	None
Impact Significance (Pre-mitigation)	Low
Impact Significance (Post-Mitigation)	Not Applicable

6.3 Decommissioning phase

6.3.1 Loss of agricultural land use

Aspect / Activity	Occupation of the land by the project infrastructure
Type of impact	Direct
Potential Impact	Loss of agricultural land use is due to direct occupation of the land by all development infrastructure. It results in affected portions of land being taken out of agricultural production. This applies to the direct footprint of the development which comprises the turbine foundations, hard standing areas, roads and the footprint of other infrastructure. This represents a small proportion of the land surface area. During the decommissioning phase there is more disturbance.
Mitigation Required	None possible
Impact Significance	Low

(Pre-mitigation)	
Impact Significance (Post-Mitigation)	Not applicable

6.3.2 Soil erosion

Aspect / Activity	Change in land surface characteristics.
Type of impact	Direct
Potential Impact	Erosion may be by wind or water. It can occur as a result of the alteration of the land surface run-off characteristics. Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, the establishment of hard standing areas and roads. Erosion will cause loss and deterioration of soil resources. Erosion can be effectively managed through mitigation measures.
Mitigation Required	Implement an effective system of storm water run-off control. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion.
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

6.3.3 Loss of topsoil

Aspect / Activity	Activities that disturb the soil profile.
Type of impact	Direct
Potential Impact	Loss of topsoil can result from poor topsoil management (burial, erosion, etc) during construction related soil profile disturbance (levelling, excavations, road surfacing etc.). It will result in a decrease in the soil's capability for supporting vegetation.
Mitigation Required	Strip, stockpile and re-spread topsoil during rehabilitation.
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

6.3.4 Degradation of veld vegetation

Aspect / Activity	Vehicle traffic and dust generation
Type of impact	Direct
Potential Impact	Degradation of veld vegetation can occur beyond the direct footprint of the development due to vehicle trampling and dust deposition.
Mitigation Required	Control vehicle passage and control dust
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

6.4 Cumulative impacts

Cumulative impact has been assessed by consideration of all renewable energy developments within 50 km of this development (see Appendix B). The cumulative impact is a regional loss of agricultural land. The impact is low because of the extremely limited agricultural potential of all land in the area, predominantly as a result of climatic limitations. There is no particular scarcity of such land in South Africa. Furthermore the footprint of disturbance of wind farms is very small in relation to available land (<2% of surface area). Therefore even if all farm portions in an area contained wind farms, the total cumulative footprint would never exceed 2%. In reality the cumulative impact is much lower because only a small percentage of farms is actually occupied by wind farms.

In addition, it is preferable to incur a cumulative loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development, elsewhere in the country.

The cumulative impact is assessed in table form below.

Aspect / Activity	Occupation of the land by the project infrastructure of multiple developments
Type of impact	Direct
Potential Impact	Cumulative impacts are likely to occur as a result of the regional loss of agricultural land and production because of other developments on agricultural land in the region. Because the loss of land is so small, and because the land is of low agricultural potential, the cumulative loss of agricultural resources is not significant either.
Mitigation Required	None
Impact Significance (Pre-mitigation)	Very low
Impact Significance (Post-Mitigation)	Very low

7. IMPACT ASSESSMENT SUMMARY

Table 2. Impact assessment summary table - Construction phase direct impacts

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
Occupation of the land by the project infrastructure	Loss of agricultural land use	Negative	Site	Short term	Moderate	Very Likely	Low	Low	Low	No	No	None	Not applicable	4	High
Change in land surface characteristics.	Erosion	Negative	Site	Medium term	Slight	Unlikely	Low	Low	Very low	No	Yes	Implement an effective system of storm water run-off control. Maintain vegetation cover.	Very low	5	High
Constructioactivities that disturb the soil profile.	Loss of topsoil	Negative	Site	Medium term	Slight	Unlikely	Low	Low	Very low	No	Yes	Strip, stockpile and re-spread topsoil during rehabilitation.	Very low	5	High
Vehicle traffic and dust generation	Degradation of veld vegetation	Negative	Site	Short term	Slight	Unlikely	Low	Low	Very Low	No	Yes	Control vehicle passage and control dust	Very Low	5	High

Table 3. Impact assessment summary table - Operational phase direct impacts

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
Occupation of the land by the project infrastructure	Loss of agricultural land use	Negative	Site	Short term	Slight	Very Likely	Low	Low	Very low	No	No	None	Not applicable	5	High
Change in land surface characteristics.	Erosion	Negative	Site	Medium term	Slight	Unlikely	Low	Low	Very low	No	Yes	Implement an effective system of storm water run-off control. Maintain vegetation cover.	Very low	5	High
Project land rental	Additional land use income	Positive	Site	Long term	Moderate	Very Likely	High	Low	Low	No	No	None	Not applicable	4	High

Table 4. Impact assessment summary table - Decommissioning phase direct impacts

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
Occupation of the land by the project infrastructure	Loss of agricultural land use	Negative	Site	Short term	Moderate	Very Likely	Low	Low	Low	No	No	None	Not applicable	4	High
Change in land surface characteristics.	Erosion	Negative	Site	Medium term	Slight	Unlikely	Low	Low	Very low	No	Yes	Implement an effective system of storm water run-off control. Maintain vegetation cover.	Very low	5	High
Constructional activities that disturb the soil profile.	Loss of topsoil	Negative	Site	Medium term	Slight	Unlikely	Low	Low	Very low	No	Yes	Strip, stockpile and re-spread topsoil during rehabilitation.	Very low	5	High
Vehicle traffic and dust generation	Degradation of veld vegetation	Negative	Site	Short term	Slight	Unlikely	Low	Low	Very Low	No	Yes	Control vehicle passage and control dust	Very Low	5	High

Table 5. Impact assessment summary table - Cumulative impacts

Impact pathway	Nature of potential impact/risk	Status	Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
Occupation of the land by the project infrastructure of multiple developments	Regional loss of agricultural land	Negative	Regional	Long term	Slight	Very Likely	High	Low	Very low	No	No	None	Not applicable	5	High

8. INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

The following mitigation measures are proposed for inclusion in the EMPr:

- Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at points where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.
- Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion.
- If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. Any subsurface spoils from excavations must be disposed of where they will not bury the topsoil of agricultural land.
- Restrict vehicle access to approved roads and areas only.
- Control dust generation during construction activities by implementing standard construction site dust control measures of damping down with water where dust generation occurs.

The following monitoring requirements are proposed for inclusion in the EMPr:

- Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.
- Establish an effective record keeping system for each area where soil is disturbed for construction and decommissioning purposes. Recommendations for the recording system are included in the EMPr.
- Undertake a periodic site inspection during construction to check for vehicle tracks beyond the approved vehicle areas.

9. CONCLUSIONS AND RECOMMENDATIONS

The proposed development is located on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of potentially arable land. The assessment has found that the proposed development will only impact agricultural land which is of extremely low agricultural potential and only suitable for low intensity grazing.

The significance of all agricultural impacts is low due to two important factors. Firstly, the actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the available grazing land on the effected farm portions (<2% of the surface area). All agricultural activities will be able to continue unaffectedly on all parts of the farm other than the small development footprint for the duration of and after the project. Secondly, the proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing. These factors also mean that cumulative regional effects as a result of other surrounding developments, also have low significance.

There are no agriculturally sensitive areas that need to be avoided by the development.

9.1 Final statement by the specialist - should the proposed activities be authorised?

Due to the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised.

9.2 Recommended conditions to be included in the environmental authorisation

There are no conditions resulting from this assessment that need to be included in the Environmental Authorisation should this be granted.

10. REFERENCES

Agricultural Research Council. 2007. AGIS Agricultural Geo-Referenced Information System available at http://www.agis.agric.za/.

Fey, M. 2010. Soils of South Africa. Cambridge University Press, Cape Town.

Lanz, J. 1997. An evaluation of revegetation at Namaqualand Mines with an emphasis on soil conditions. Unpublished Report produced for De Beers Consolidated Mines - Namaqualand Mines.

Soil Classification Working Group. 1991. Soil classification: a taxonomic system for South Africa. Soil and Irrigation Research Institute, Department of Agricultural Development, Pretoria.

The World Bank Climate Change Knowledge Portal available at http://sdwebx.worldbank.org/climateportal/

APPENDIX A: Soil data

Table A1. Land type soil data for site.

Land type	Land capability class	Soil series (forms)	Depth (mm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Ib123	8	Rock outcrop	0			R	61
		Hutton	50 - 150	5 - 10	5 - 20	R	14
		Mispah	50 - 100	6 - 20		R	12
		Swartland	100 - 200	10 - 20	35 - 45	so	8
		Glenrosa	50 - 100	6 - 20	15 - 25	R	6
		Valsrivier	300 - 500	15 - 25	35 - 45	vr,vp	0
		Dundee	200 - 600	10 - 20	10 - 25	R	0
		Oakleaf	300 - 500	15 - 25	15 - 35	R	0
Ah38	7	Hutton	400 - 1200	0 - 2	2 - 4	ca,ka,db	47
		Clovelley	> 1200	0 - 2	2 - 4		20
		Vilafontes	600 - 800	1 - 3	4 - 8		19
		Pinedene	700 - 800	1 - 3	3 - 8	gc	10
		Fernwood	> 1200	1 - 2	1 - 2		3
		Dundee	> 1200	1 - 3	1 - 3		1

Land capability classes: 7 = non-arable, low potential grazing land; 8 = non-utilisable wilderness land.

Depth limiting layers: R = hard rock; so = partially weathered bedrock; ca = soft carbonate; ka = hardpan carbonate; db = dorbank hardpan; vp = dense, structured clay layer; vr = dense, red, structured clay layer; gc = dense clay horizon that is frequently saturated.

APPENDIX B: Projects to be considered in terms of cumulative impacts

DEA Reference number	Project title	Applicant	EAP	MW
Wind Projects				
12/12/20/2331/1	Project Blue Wind Energy Facility Near Kleinsee Within The Nama Khoi Local Municipality, Northern Cape Province	Diamond Wind (Pty) Ltd	Savannah Environmental (Pty) Ltd	140
12/12/20/2331/3	Project Blue Wind Energy Facility (Phase 2 and 3) Near Kleinsee Within The Nama Khoi Local Municipality, Northern Cape Province	To review	Savannah Environmental Consultants (Pty) Ltd	0
12/12/20/2212	Proposed 300MW Kleinnzee WEF in the Northern Cape Province	Eskom Holdings SOC Limited	Savannah Environmental Consultants (Pty) Ltd	300
12/12/20/2154	Proposed Construction Of The 7.2MW Koingnaas Wind Energy Facility Within The De Beers Mining Area On The Farm Koingnaas 745 Near Koingnaas, Northern Cape Province	Just PalmTree Power Pty Ltd	Savannah Environmental Consultants (Pty) Ltd	7.2
Solar Projects				
14/12/16/3/3/1/416	Nigramoep PV Solar Energy Facility on a site near Nababeep, Northern Cape	To review	To review	20
14/12/16/3/3/2/562	Proposed Phase 2 - Construction of a 75MW solar PV on Farm 134/17 Klipdam, Springbok, within Nama Khoi Municipality, Northern Cape	NK Energie (Pty) Ltd	Cederberg Conservation Services (Pty) Ltd	75
12/12/20/1721/AM3	Proposed 55.5MW Springbok wind power generation facility, Northern Cape	Mulilo Renewable Energy (Pty) Ltd	Holland and Associates Environmental Consultancy (Pty) Ltd	55.5
14/12/16/3/3/1/511	The Construction Of 19 Mw Photovoltaic Solar Energy Facility On Portion 1 And 3 Of The Farm Melkboschkuil 132 In Carolusberg, Northern Cape Province	To review	Savannah Environmental Consultants (Pty) Ltd	20
14/12/16/3/3/1/974	Proposed 20MW solar PV on Farm 132/26 Melbokskuil within Nama Local Municipality, Northern Cape	NK Energie (Pty) Ltd	Cape Environmental Assessment Practitioners (Pty) Ltd	20

DEA Reference number	Project title	Applicant	EAP	MW
14/12/16/3/3/1/510	Proposed Construction of the O'Kiep (15MW) Photovoltaic solar energy facility on the remainder of the farm brakfontein NO. 133, O'Kiep Copper mine near Springbok, Northern Cape Province	Llio Energy (Pty) Ltd	Savannah Environmental (Pty) Ltd	15
12/12/20/2656	O'Kiep 2 PV Solar Energy Facility on a site in O'Kiep 2 near Springbok, Northern Cape Province	To review	Savannah Environmental (Pty) Ltd	15
14/12/16/3/3/1/557	The Kokerboom Photovoltaic Solar Power Facility On A Site South Of Springbok Within The Nama Khoi Local Municipality, Northern Cape Province	To review	EScience Associates (Pty) Ltd	10
14/12/16/3/3/1/558	The Establishment Of 10mw Baobab Photovoltaic Solar Energy Facility On The Farms Mesklip 14/259 And 23/259 Near Kamieskroon Northern Cape Province	To review	Savannah Environmental (Pty) Ltd	10

Scoping and Environmental Impact Assessment for the proposed Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape

UPDATED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

APPENDIX N:

Socio-Economic Impact Assessment Report

SOCIO-ECONOMIC IMPACT ASSESSMENT

Scoping and Environmental Impact Assessment for the Proposed Kap Vley Wind Energy Facility near Kleinzee, in the Northern Cape

and

Basic Assessment for the Transmission Line

Report prepared for:	*Report prepared by:*
	Surina Laurie
CSIR – Environmental Management Services	CSIR – Environmental Management Services
P O Box 320	P O Box 320
Stellenbosch	Stellenbosch
7600	7600

March 2018

SPECIALIST EXPERTISE

Surina Laurie (nèe Brink)

Profession	Environmental Assessment Practitioner/Project Manager
Years' experience	7 years
Nationality	South African
Professional Registration	Pr. Sci. Nat. 400033/15 (South African Council for Natural Scientific Professions) International Association for Impact Assessments (IAIA) South African Affiliate
Key skills	Project Management, Environmental Impact Assessments, Environmental Economics
Biographical sketch	Surina has 7 years' experience in managing various projects requiring Environmental Authorisation or related approvals. With her Masters' thesis she researched and addressed why there is a need to undertake a Cost Benefit Analysis (CBA) as part of any EIA. The need for a CBA stems from the fact that losing environmental services will have an economic impact on a regional/national level in the long term but this is usually not considered during an EIA process. A CBA will look at both the economic benefits (profit) from a project and the economic losses because of loss of ecosystem services or rehabilitation costs. By including a CBA in an EIA, both the economic and environmental financial implications (not just the environmental significance of an impact) of a project will be considered by the decision making authority prior to the issuing of Environmental Authorisations or permits. In 2016 se obtained a Postgraduate Certificate in Environmental Economics to further expand on her knowledge in this field.

Education

2015 – 2016 (Part-time)	*Postgraduate Certificate, Environmental Economics, University of London*
2013	*Project Management Course, University of Cape Town Graduate School of Business*
2011-2012 (Part-time)	*MPhil Environmental Management, University of Stellenbosch*
2007-2010	*BSc Conservation Ecology, University of Stellenbosch*

Employment record

Feb 2014 to present	*CSIR, Project Manager*
Sept 2011 to Jan 2014	*WSP Environmental (Pty) Ltd, Environmental Consultant*
Nov 2010 to Aug 2011	*EnviroAfrica, Junior Environmental Consultant*

SPECIALIST DECLARATION

I, **Surina Laurie**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

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

Signature of the specialist: 

Name of Specialist: Surina Laurie

Date: 05 March 2018

EXECUTIVE SUMMARY

The Socio-Economic Impact Assessment has been undertaken to determine the potential social and economic impacts (both positive and negative) that may occur due to the development of the Kap Vley Wind Energy Facility and associated transmission line proposed by juwi Renewable Energies (Pty) Ltd, close to Kleinzee and Komaggas in the Nama Khoi Local Municipality and the Namakwa District Municipality, Northern Cape Province. The study shows that the two key towns' socio-economic structures do differ significantly and potentially, the identified impacts may manifest differently or with a higher or lower impact significance within these two towns.

Socio-economic impacts and the respective significance of these impacts are highly dependent on the receiving social and economic environment or context in which the impacts occur. For example, a small community with high unemployment numbers and a declining economy would experience impacts differently compared to a community where everyone is fully employed and there is a growing economy with various economic drivers.

During the construction phase, it is anticipated that negative impacts may occur due the influx of people and the presence of workers on site. Positive impacts during this phase may occur due to the employment opportunities that will be created the project expenditure as part of the development of the WEF and associated electrical infrastructure. In terms of the economic opportunities, these are expected to be high (positive), should the recommended mitigation measures be implemented. The influx of people seeking employment opportunities will have a moderate negative impact, following mitigation. On a cumulative level, this impact is still considered to be a moderate negative impact.

During the operational phase, long term employment opportunities will be created and the Developer will have Social and Economic Development spend within the area. These are considered to be positive impacts and will have a high and very high, respectively, impact significance following mitigation. In terms of the negative impacts, the presence of the WEF may affect the Sense of Place. However, based on other specialist studies undertaken for this proposed development this impact is considered to be of very low negative significance. The loss of project expenditure and employment opportunities are the two negative impacts associated with the decommissioning phase. The loss of project expenditure is expected to have a low rating and the loss of employment opportunities, a very low significance following mitigation.

On a cumulative level, the impacts of project expenditure and the diversification of the local economy are considered to be of a high positive significance and the negative impact on the Sense of Place is considered to be very low. A summary impact table is included below:

Impact	Phase	Significance pre-mitigation	Significance post mitigation
Influx of people	Construction	High (-)	Moderate (-)
Employment opportunities		Moderate (+)	High (+)
Impact on surrounding land owners associated with the presence of workers		Moderate (-)	Low (-)
Project expenditure and new economic opportunities		High (+)	High (+)
Creation of long-term employment through operation and maintenance operations	Operational	Moderate (+)	High (+)

Impact	Phase	Significance pre-mitigation	Significance post mitigation
Project expenditure and long-term diversification of the economy		High (+)	Very High (+)
Impact of the visibility, operation and audibility of the development		Very Low (-)	Very Low (-)
Impact of the loss of project expenditure	Decommissioning	Moderate (-)	Low (-)
Loss of employment opportunities	Decommissioning	Moderate (-)	Very Low (-)
Influx of people	Cumulative	High (-)	Moderate (-)
Project expenditure and long-term diversification of the economy	Cumulative	High (+)	High (+)
Impact of the visibility, operation and audibility of the development	Cumulative	Low (-)	Very Low (-)

Based on the current socio-economic context of the area and the impacts identified, it is the opinion of the specialist that the project can go ahead, provided that the mitigation measures proposed are adopted and adhered to by the EA holder.

LIST OF ABBREVIATIONS

CSIR	Council of Scientific and Industrial Research
DEA	Department of Environmental Affairs
DM	District Municipality
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GDP	Gross Domestic Product
LM	Local Municipality
MW	Megawatt
NDP	National Development Plan
NIP	National Infrastructure Plan
PAP	Project Affected People
PICC	Presidential Infrastructure Coordinating Committee
IDP	Integrated Development Plan
SDF	Spatial Development Framework
SED	Social and Economic Development
SIPs	Strategic Integrated Projects
WEF	Wind Energy Facility

COMPLIANCE WITH THE APPENDIX 6 OF THE 2017 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 2
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1.3.2 & 2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 4, 5, 6 & 7
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.3.1
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 1.2, 6 & 7
g) an identification of any areas to be avoided, including buffers;	N/A
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3.3
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 4, 5 & 6
k) any mitigation measures for inclusion in the EMPr;	Section 6 & 7
l) any conditions for inclusion in the environmental authorisation;	Section 6 and 8
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 3.1
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	Please see the external review comments from Urban Econ attached as Appendix A of this study
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

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1 INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

The Socio-Economic Impact Assessment has been undertaken to determine the potential social and economic impacts (both positive and negative) that may occur due to the development of the Kap Vley Wind Energy Facility (WEF) and associated transmission line proposed by juwi Renewable Energies (Pty) Ltd, close to Kleinzee and Komaggas in the Nama Khoi Local Municipality (LM) and the Namakwa District Municipality (DM), Northern Cape Province.

1.2 Terms of Reference

- Desktop data gathering for baseline report and Scoping-level input;
- Primary data collection via a site visit and telephonic interviews;
- Secondary data collection by reviewing relevant plans, frameworks and policies;
- Preparation of draft baseline report and scoping level input; and
- Preparation of Socio-Economic Assessment for inclusion in Environmental Impact Assessment (EIA) report which includes:
    - Determining the fit of the proposed development with local, regional and national economic development visions and plans that considers renewable energy planning;
    - Determining and assessing the impacts on overall economic development potential in the area;
    - Assess the impacts associated with project expenditure on direct and indirect employment and household incomes;
    - Analysing the benefits from development to Kleinzee and the Komaggas local communities.
- Address comments received on study during the Public Participation Processes undertaken for the Scoping and EIA Reports.

In addition to the above, the following ToR has been provided by the CSIR:

- Adhere to the requirements of specialist studies as outlined in Appendix 6 of the 2014 NEMA EIA Regulations, as amended;
- Assess the no-go alternative very explicitly in the impact assessment section. Please note that the DEA considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads and internal cables is allowed in the 'no-go' areas. Should your definition of the 'no-go' area differ from the DEA definition; this must be clearly indicated in your assessment. You are also requested to indicate the 'no-go' area's buffer.
- Assess cumulative impacts by identifying other wind and solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 50 km of the proposed Kap Vley WEF project) that have been approved (i.e. positive EA has been issued) or the EIA is currently underway. In addition, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following:
    - Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.

- The cumulative impacts significance rating must also inform the need and desirability of the proposed development.
- A cumulative impact environmental statement on whether the proposed development must proceed.

- Provide a detailed description of your methodology, as well as indicate the locations and descriptions of turbine positions, and all other associated infrastructures that you have assessed and are recommending for authorisations.
- Provide a detailed description of all limitations to your studies. Your specialist studies must be conducted in the appropriate season and providing that as a limitation, will not be accepted by DEA.
- A review of the current socio-economic conditions in sufficient detail so that there is a baseline description/status quo against which impacts can be identified and measured. Consult secondary data sources (published documentation) to obtain basic socio-economic baseline demographics;
- Obtain socio-economic information from the land owners to inform the study;
- Identify and assess all potential impacts (direct, indirect) of the construction, operational and decommissioning phases of the proposed development. Use the CSIR methodology to determine the significance of potential impacts;
- Assess all alternatives, including the no-go alternative;
- Assessment cumulative impacts by identifying other REFs such as wind and solar and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 50 km of the proposed WEF). These include projects that have been approved (i.e. positive EA has been issued), have been constructed or projects for which an Application for Environmental Authorisation has been lodged with the Competent Authority (see Table 6.1 in Chapter 6 of this report for a list of projects);
- Provide recommended mitigation measures, management actions and monitoring requirements, to reduce negative measures and to enhance positive socio-economic impacts to be included in the EMPr;
- Provide a description of any assumptions, uncertainties, limitations and gaps in knowledge; and
- Incorporate and address issues and concerns raised during the Scoping and EIA phases where they are relevant to the specialist’s area of expertise.

1.3 Approach and Methodology

The socio-economic assessment was informed by undertaking primary and secondary data collection. Primary data collection refers to interviews with affected landowners, residents of the community and/or any adjacent landowners. Secondary data collection refers to the review of databases and documents to support the primary data collection findings.

1.3.1 Primary data collection

A site visit was undertaken on 14 and 15 August 2017 (during the Scoping phase) to Kleinzee and Komaggas. The site visit entailed the understanding of the current state of the two communities most likely to be affected (either positive or negative) by the development of the proposed Kap Vley WEF.

Several attempts were also made to engage with the relevant affected parties on their respective thoughts or concerns on the proposed development. The status of the engagement process is outlined in Table 1.

Table 1. Engagement with affected parties

Farm/institution	Contact Person	Position	Engagement status
Portion 3 of Platvley Farm 314	Albertus Johannes Roux	Landowner	Telephonic interview
Remaining Extent of Kap Vley number 315	Deon Kotze	Landowner	Telephonic interview
Neighbour	Danie and Meisie Engelbrecht	Adjacent landowner	Telephonic interview
Komaggas Clinic	Geraldine Marman	Clinic staff	Telephonic interview
Portion 0 of Farm 200 and Remaining Extent of Kourootjie Farm 316	S Titus	Komaggas Community	Was not reachable
Neighbour	Willem Engelbrecht	Adjacent Landowners	No response received to messages left
Neighbour	Bertus Brand	Adjacent Landowners	No response received to messages left
Ward 8 Municipal Councillor	Paulus van Reenen	Municipal councillor	Request for interview not granted

1.3.2 Secondary data collection

The observations made during the site visit and interviews were further informed by secondary data sources. These sources ranged from databases that included:

- StatisticsSA to provide a broad overview of the socio-economic setting of the area;
- National, provincial and local policy and plans to determine whether the proposed project is aligned with the planning objectives of the various spheres of government; and
- Relevant specialist studies undertaken for this project or similar renewable energy projects to determine the potential impact and linkages to this assessment.

The secondary data sources include:

Databases and national, provincial and local frameworks and plans:

- National Development Plan (2012).
- National Infrastructure Plan (2012).
- Integrated Resource Plan (2010).
- Statistics SA: Community Survey 2007 (2008).
- Statistics SA: Census 2011 (2013).
- Integrated Development Plan (IDP) of the Namakwa DM (2017-2022).
- IDP of the Nama Khoi LM (2014/2015), Second Revision.
- Strategic Development Framework (SDF) of the Nama Khoi LM (2014).
- Northern Cape Provincial SDF (2012).

Specialist studies relevant to the assessment:

- To understand the social issues experienced within small rural towns and the potential social impacts associated with introducing a renewable energy project into the areas, the Social Impact Assessment Report for the Nieuwehoop Solar Development Near Kenhardt (2014) was reviewed.
- In order to inform the impact assessment, the Scoping and Environmental Impact Assessment for the Proposed Development of the 300 MW Kleinzee Wind Energy Facility near Kleinzee, Northern Cape Province: EIA Final Report (2015) was reviewed to identify impacts to be considered as part of the cumulative impact assessment.
- The findings of Visual, Noise and Soils and Agriculture Potential Impact Assessments for the Proposed Development of the Kap Vley Wind Energy Facility near Kleinzee, Northern Cape Province and Basic Assessment for the Transmission Line (2018) was reviewed to inform the

impact identified within this assessment that relates to the visibility, operation and audibility of the development.

- To understand the economic opportunities and risks associated with introducing a wind energy facility into a rural area, the socio-economic specialist report for the proposed Ishwati Emoyeni Wind Energy Facility and Supporting Eskom Transmission and Eskom Distribution Grid Connection Infrastructure near Murraysburg, Western Cape (2012) was reviewed.
- To determine the potential consequences of the socio-economic impacts of a wind farm, Loeriesfontein was considered a good case study, since two wind farms, namely Loeriesfontein 2 and Khobab, have recently become operational in the area. A recent Socio-Economic Impact Assessment for an additional wind farm proposed in Loeriesfontein ("Graskoppies") undertaken by Urban-Econ (Urban-Econ, 2017) was reviewed since this study provides insight into the socio-economic setting of a town, following the introduction of wind farms, and therefore provides a good overview of the realities of introducing a wind farm into an area and the associated socio-economic impacts.

Newspaper articles:

- Diamond mines are not forever (2012) published in the Mail and Guardian.

1.3.3 Assumptions and Limitations

The following assumptions or limitations apply:

- All technical, financial and other information provided by the Applicant, other official sources and specialists involved in the EIA is assumed to be correct unless there is a clear reason to suspect incorrect information;
- The results from the primary data collection for this assessment are minimal, due to a lack of contactable parties. However, based on the feedback from the parties interviewed and the information sourced from the secondary data collection, it is the opinion of the author that the primary data collected is sufficient to inform the study;
- The secondary data sources provide an overview of the baseline socio-economic environment and should be viewed as providing an overall indication of the trends present within this setting. It should not be considered to be an exhaustive source;
- The assessment uses information from other economic and social specialist studies for EIAs of other similar renewable energy projects. This was done in order to avoid unnecessary duplication of effort;
- This study assumes that both the WEF and associated 132 kV transmission line will be constructed and that one will not be constructed without the other. Therefore, this study assesses the socio-economic impact of the full project i.e. the development of the WEF and transmission line;
- Given the relatively new nature of this form of energy production, there is very limited actual data in South Africa (i.e. after the commissioning of a WEF) on the efficiency of mitigation measures to manage factors such as the impact on tourist visits, land prices and business value.

Considering the information obtained during this study, it can be concluded that the level of risk associated with gaps in knowledge/data is low.

2 KEY GUIDING LEGISLATION

2.1 National Development Plan

The National Development Plan (NDP) was officially adopted in 2012 and sets targets for eliminating poverty and reducing inequality in South Africa by 2030. The strategic perspective of the NDP is based on the New Growth Path for South Africa with the objectives, by 2020, of creating five million new jobs, resolving structural problems in the economy, and identifying opportunities in specific sectors and markets which may serve as job drivers. The first job driver was identified as infrastructure development. The lack of adequate infrastructure is considered an obstacle to the development of the wider South African economy and to Government achieving its social, economic and political goals.

2.2 National Infrastructure Plan

The National Infrastructure Plan (NIP) is fully aligned with the NDP and sets goals for improving South Africa's economic landscape, creating job opportunities, and improving the delivery of basic services through infrastructure development. In order to address the challenges identified by the NIP, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC). Under the guidance of the PICC 18 Strategic Integrated Projects (SIPs) have been developed to promote fast-tracked development and growth of social and economic infrastructure across all nine provinces. Among the 18 SIPs, three target the energy sector. The three energy related SIPs are: SIP 8 – Green energy in support of the South African economy; SIP 9 – Electricity generation to support socio-economic development; and SIP 10 – Electricity transmission and distribution for all. SIP 8 in particular aims at facilitating the implementation of sustainable green energy initiatives as envisaged in the NDP and Integrated Resource Plan (discussed below).

2.3 Integrated Resource Plan

The Integrated Resource Plan (IRP) for South Africa for the period 2010 to 2030 (referred to as "IRP2010") and the IRP Updated Report (2013) proposes to secure 17 800 MW of renewable energy capacity by 2030. The Department of Energy (DOE) has subsequently entered into a bidding process for the procurement of 3 725 MW of renewable energy from Independent Power Producers (IPPs) by 2016 and beyond to enable the Department to meet this target. On 18 August 2015, an additional procurement target of 6 300 MW to be generated from renewable energy sources was added to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) for the years 2021 - 2025, as published in Government Gazette 39111. The additional target allocated for wind energy, solar PV energy, and solar CSP energy is 3 040 MW, 2 200 MW, and 600 MW respectively.

2.4 The Northern Cape Provincial Spatial Development Framework (2012)

As noted in the Northern Cape Provincial Spatial Development Framework (PSDF), published in 2012, the strong winds along the coastline of the Province provide a potential comparative economic advantage and could provide an alternative source of energy. Coupled with this, the PSDF aims in Section C8 under Energy Objectives to "(a) Promote the development of renewable energy supply schemes. Large-scale renewable energy supply schemes are strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimizing detrimental environmental impacts…. There is a national electricity supply shortage and the country is now in a position where it needs to commission additional plants urgently. Consequently, renewable energy projects are a high priority".

2.5 District and local planning documents

Economic development requirements inform spatial planning and related planning interventions. It is therefore important for a proposed development to be in line with the spatial planning of the municipality, albeit on a provincial or local level. IDPs and SDFs are the guiding documents in this regard. The SDF guides development to areas where municipalities have identified it as desirable. If a development it not in line with an IDP and SDF, there would need to be a clear motivation as to why the deviation from these plans should be approved. The following provincial and regional planning documents were found to be of relevance and are reviewed in more detail in the study:

- IDP of the Namakwa DM (2017-2022);
- IDP of the Nama Khoi LM (2014/2015), Second Revision; and
- SDF of the Nama Khoi LM (May 2014).

Considered as a whole, these documents recognise the importance of integrated and diversified economic development that makes optimal use of each area's comparative advantages. According to the Nama Khoi SDF, there is a proposal for a Wind Energy Corridor (Figure 1). The proposed Kap Vley WEF overlaps with this corridor (shown with the red star below) and is therefore in line with the spatial planning of the local municipality. In addition, the SDF notes that for Kleinzee, key focus areas should be on "*industries that support mari-culture; small-scale fishing; biofuels (seaweed) and wind energy projects. In addition to this, it is proposed that the linkage with the Kannikwa Vlakte wind farm to the north of Kleinzee be supported*" (page 118).

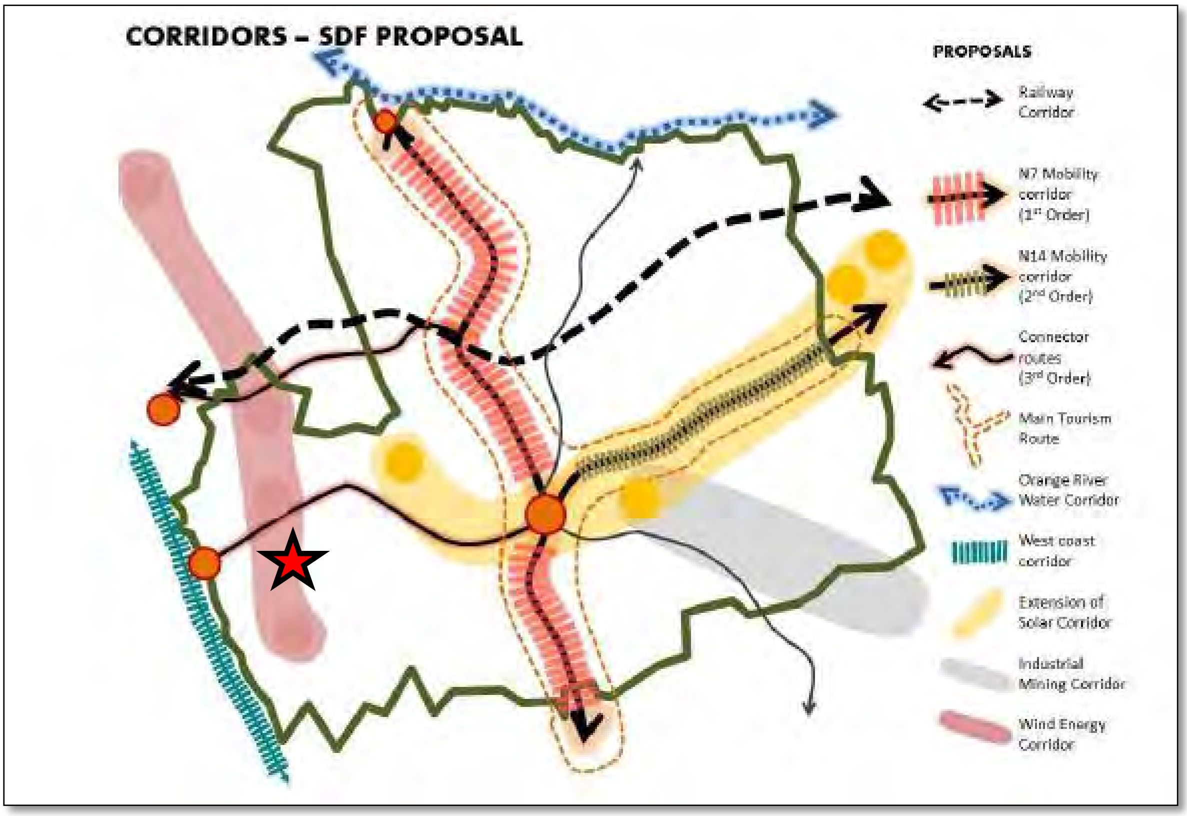


Figure 1. Nama Khoi SDF corridor proposal showing the proposed Kap Vley WEF being located in the identified Wind Energy Corridor.

3 DESCRIPTION OF THE AFFECTED SOCIO-ECONOMIC ENVIRONMENT

Socio-economic impacts and the respective significance of these impacts are highly dependent on the receiving social and economic environment or context in which the impacts occur. For example, a small community with high unemployment rates and a declining economy would experience impacts differently compared to a community where everyone is fully employed and there is a growing economy with various economic drivers.

Figure 2 shows the proposed Kap Vley WEF in relation to the closest towns or communities. As shown in the figure, the closest towns are Komaggas and Kleinzee. Both these towns fall within the Nama Khoi LM and the Namakwa DM, Northern Cape Province.

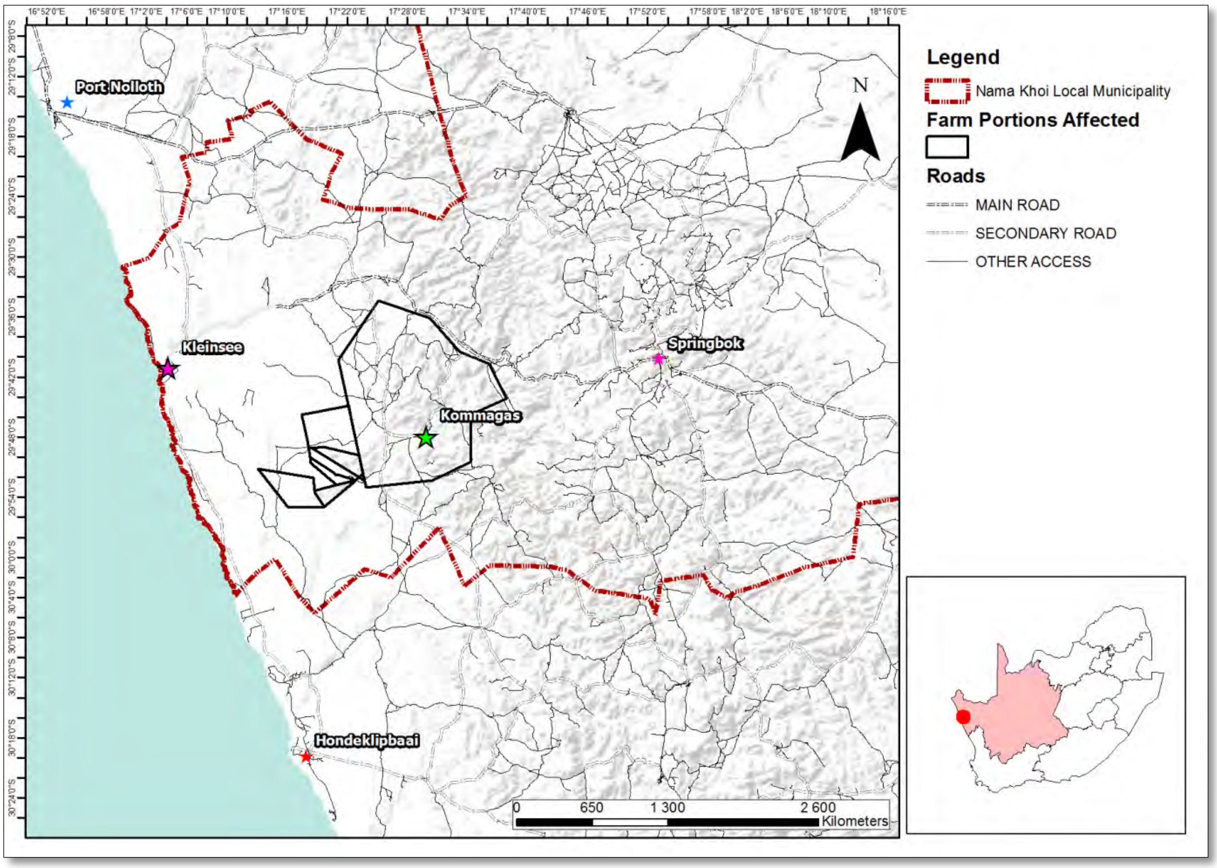


Figure 2. Location of the land portions affected by the proposed Kap Vley WEF and closest towns to the WEF

3.1 Results of engagement with affected parties

From the interviews, the overall consensus was that the proposed wind farm would be a welcome economic injection into an agricultural area that is very dependent on external factors, such as rainfall. The on-going drought of the last four years has put additional pressure on the farmers and it is reported that more than half of their sheep had to be sold to ensure that enough money is available to support the on-going farming practices.

A brief summary of the interviews are provided below:

Mr Deon Kotze (land owner)

Currently farms with sheep (Dorpers) and Meat Masters. He lives on the farm and goes to Springbok twice a month to purchase goods and for other services. Two workers reside permanently on the farm but their families do not live with them. Should the wind farm development realise, Mr Kotze will continue with his farming practices on site and indicated that the revenue from the wind farm will provide much needed support to making his farming enterprise more resilient.

Mr Albertus Roux (land owner)

Mr Roux farms with Dorpers and goats. He lives in Kammieskroon and drives to his farm once a week. He has no permanent workers on his farm. Should the wind farm realise, he will most likely consider introducing game to his farm that would require a lower carrying capacity and thereby reduce the pressure on his veld. This will ensure that his veld has time to recover from the current drought.

Mr and Mrs Engelbrecht (adjacent land owner)

Farms predominantly with Dorpers and Damara sheep. Mr and Mrs Engelbrecht live permanently on the farm and drive to Springbok to buy groceries, although Kleinzee has a couple of smaller shops that do sufficiently support the local residents. No workers live permanently on the farm. Mrs Engelbrecht indicated that the introduction of new development, specifically wind, would be a welcome economic injection to the area.

3.2 Surrounding land-uses

According to the Soils and Agricultural Potential Assessment low intensity grazing is the only agriculture activity undertaken in the area (Lanz, 2018). Subsistence farming is also undertaken where irrigation is available, particularly in the Komaggas settlement. Grazing farms tend to be large and farmsteads far apart in the semi-arid landscape. According to the Visual Imapact Assessment diamond mining took place in the past but appears to have largely ceased (Oberholzer and Lawson, 2018).

3.3 Tourism profile

Tourism impacts are often driven by changes to the Sense of Place of an area. The Nama Khoi SDF states that “the conservation areas and natural heritage wonders in the municipal area should be strengthened and marketed in order to create a unique ‘Sense of Place” for the Nama Khoi Local Municipality. The recreational and tourism potential of these places of interest should also be further exploited”. Furthermore, the SDF states that tourism is seen as the potential new contributor to economic development. These statements show that the LM has tourism orientated goals that should be considered as part of this project but also that currently, tourism is not the most important economic sector in the local and regional economy.

The proposed WEF is located 22 km from the Namaqua National Park. The park’s main tourist attraction is the spring bloom of brightly coloured flowers and it is estimated that 100 000 visitors come to the park on an annual basis. As shown in Figure 1 of this assessment, the LM identified the N7 and road from Springbok to Upington as main tourism corridors. The proposed Kap Vley WEF and associated infrastructure do not fall within this corridor.

Currently, the Kleinzee tourism activities include:

- 4x4 and Mine Tours;
- Kleinzee Museum;
- Kleinzee Nature Reserve; and
- Seal Colony.

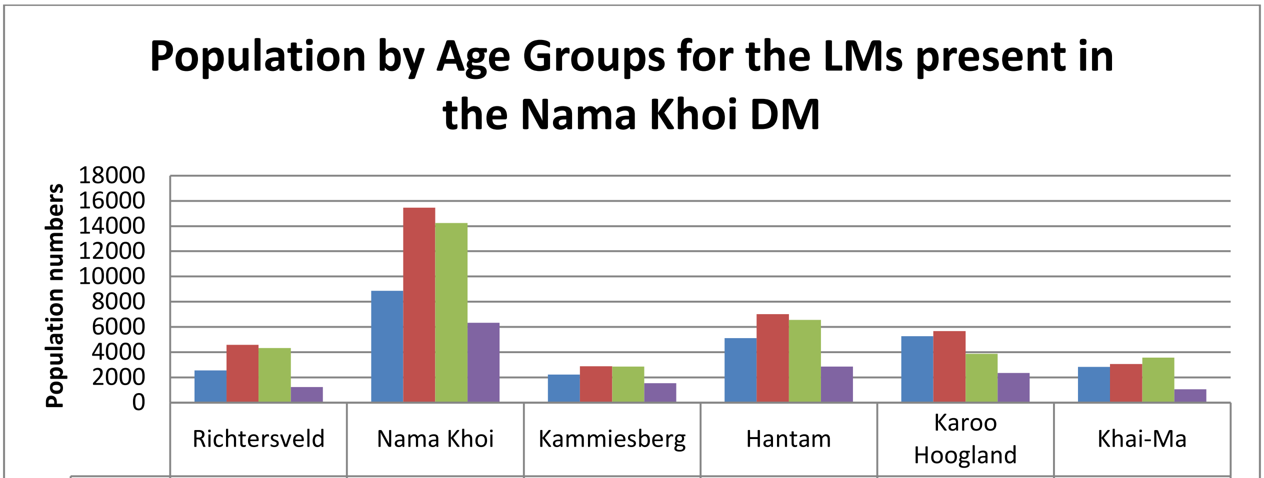
3.4 Demographic profile

The **Namakwa DM** is one of five district municipalities within the Northern Cape Province. The main seat of the DM is located in Springbok. According to the Namakwa DM's IDP (2017-2022), the DM is the least populated DM in the Northern Cape Province. The DM consists of seven LMs, including the **Nama Khoi LM** in which the proposed development occurs.

The Nama Khoi LM is divided into nine wards:

- Ward 1: Concordia, Gamoep
- Ward 2: Steinkopf, Rooiwal, Goodhouse, Vioolsdrift
- Ward 3: Steinkopf South, Bulletrap
- Ward 4: Carolusberg, Springbok, Fonteintjie, and part of Bergsig
- Ward 5: Bergsig
- Ward 6: Okiep, Rooiwinkel, Kouroep
- Ward 7: Bergsig Vaalwater, Matjieskloof
- Ward 8: Komaggas, Kleinzee, Buffelsrivier
- Ward 9: Nababeep

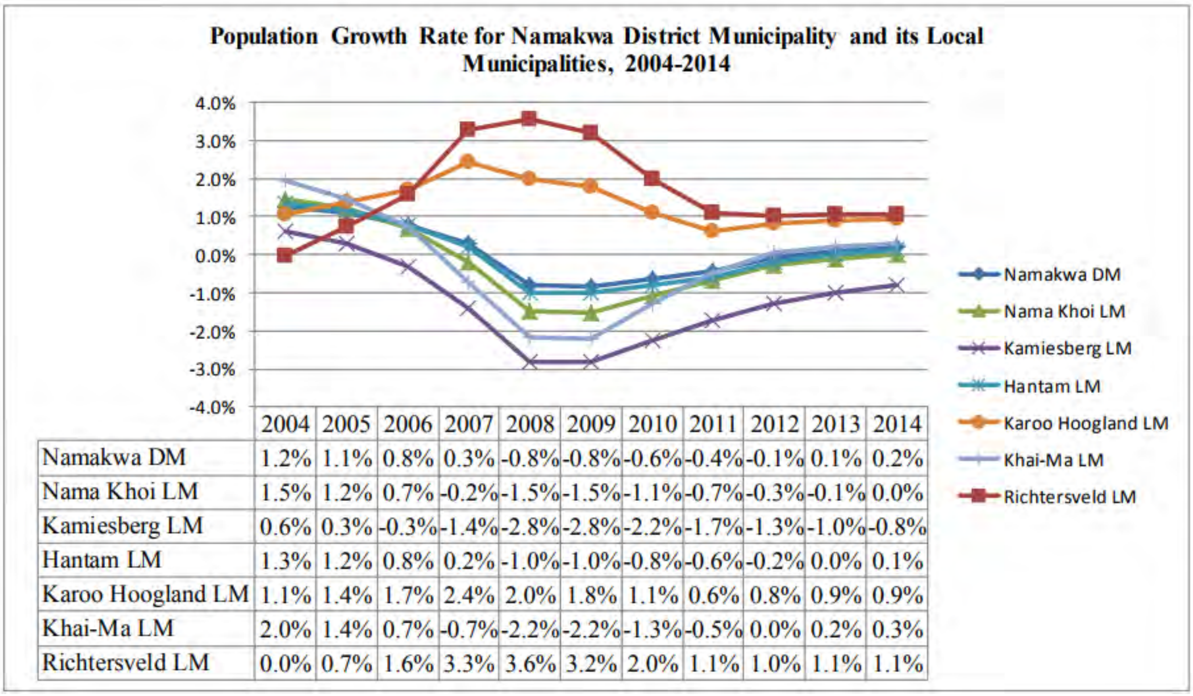
Figure 3 shows the age group distribution of the population present within each LM forming part of the Namakwa DM. The Nama Khoi LM has the highest population group within the 15-54 and 54-64 age groups. The overall dominant age group within the DM is the 15-54 age group, which, according to the Namakwa DM IDP, shows that within the DM there is need for job creation and new employment opportunities.



	Richtersveld	Nama Khoi	Kammiesberg	Hantam	Karoo Hoogland	Khai-Ma
0-14	2548	8864	2225	5125	5254	2834
15-54	4578	15457	2880	7006	5677	3049
54-64	4336	14252	2852	6560	3875	3557
65+	1225	6328	1540	2855	2362	1053

Figure 3. Population by age groups for the LMs present within the Nama Khoi DM (Nama Khoi DM IDP, 2017)

Within the DM, the population growth rate declined during 2008 to 2012 and then increased slightly in 2013 and 2014. Within the period from 2004 to 2014, the overall population growth within the DM has declined (Figure 4). The only LM that has shown a constant growth rate is the Richtersveld and Karoo Hoogland LMs. The Nama Khoi LM showed a steady decline in population growth rates in the period 2007 to 2013 and a zero percent growth rate in 2014.



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Namakwa DM	1.2%	1.1%	0.8%	0.3%	-0.8%	-0.8%	-0.6%	-0.4%	-0.1%	0.1%	0.2%
Nama Khoi LM	1.5%	1.2%	0.7%	-0.2%	-1.5%	-1.5%	-1.1%	-0.7%	-0.3%	-0.1%	0.0%
Kamiesberg LM	0.6%	0.3%	-0.3%	-1.4%	-2.8%	-2.8%	-2.2%	-1.7%	-1.3%	-1.0%	-0.8%
Hantam LM	1.3%	1.2%	0.8%	0.2%	-1.0%	-1.0%	-0.8%	-0.6%	-0.2%	0.0%	0.1%
Karoo Hoogland LM	1.1%	1.4%	1.7%	2.4%	2.0%	1.8%	1.1%	0.6%	0.8%	0.9%	0.9%
Khai-Ma LM	2.0%	1.4%	0.7%	-0.7%	-2.2%	-2.2%	-1.3%	-0.5%	0.0%	0.2%	0.3%
Richtersveld LM	0.0%	0.7%	1.6%	3.3%	3.6%	3.2%	2.0%	1.1%	1.0%	1.1%	1.1%

Figure 4. Population growth rate of the DM as well as the LMs (Nama Khoi DM IDP, 2017).

3.5 <u>Economy</u>

Within the DM, several sectors contribute to the municipality's economy and the Gross Domestic Product (GDP). The Nama Khoi LM is the largest contributor to the Namakwa DM's GDP. Figure 5 shows the various sectors that contributed to each LM's economy. The contributing sectors include agriculture, mining, electricity, construction and trade.

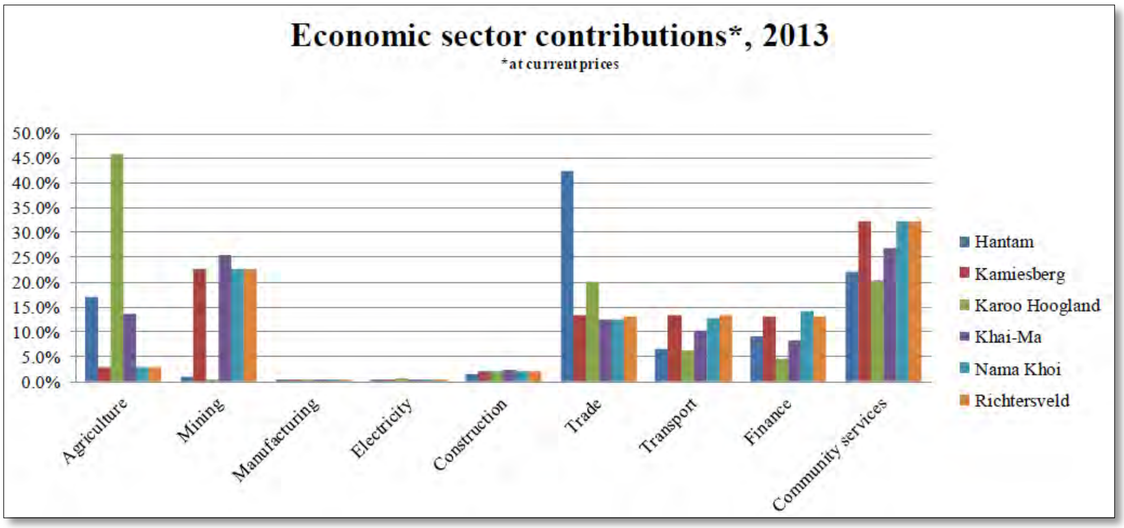


Figure 5. Sectors contributing to the LM's local economies in 2013

The largest sector within the LM is community services. When comparing the growth rates of the Nama Khoi LM in 2004 and 2014, most of the sectors have seen growth with the exception of the finance sector (Table 2).

Table 2. Sector growth rates for the Namakwa DM and associated LMs (2004 and 2014).

	Agriculture		Mining		Manufacturing		Electricity		Construction		Trade		Transport		Finance		Community services		Total Industries	
	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014
Richtersveld LM	-12.5%	6.1%	0.8%	-2.4%	-6.4%	-1.2%	-5.5%	-3.5%	-8.1%	0.4%	-6.0%	-0.7%	-5.1%	1.3%	11.3%	0.0%	-8.7%	1.1%	-0.2%	-1.4%
Nama Khoi LM	-11.7%	4.5%	-2.2%	-2.4%	-4.1%	-1.2%	-5.4%	-2.6%	-6.0%	1.0%	-3.5%	-0.4%	-3.0%	2.0%	20.1%	-0.4%	-6.9%	1.4%	-1.3%	-2.5%
Kamiesberg LM	-12.9%	3.7%	0.9%	-2.4%	-4.9%	-1.5%	15.6%	-3.1%	-6.9%	0.2%	-4.7%	-0.9%	-3.9%	1.2%	16.9%	-0.6%	-7.7%	0.8%	0.0%	-1.4%
Hantam LM	2.3%	4.6%	16.9%	-2.4%	11.6%	0.3%	23.7%	-1.8%	9.9%	1.9%	12.2%	0.6%	13.4%	2.7%	26.0%	1.5%	9.1%	2.4%	10.7%	2.2%
Karoo Hoogland LM	5.4%	5.7%	11.5%	-2.4%	15.1%	1.8%	23.9%	-0.8%	13.2%	2.9%	15.0%	1.8%	17.1%	3.3%	27.8%	3.5%	12.3%	3.2%	12.0%	3.7%
Khai-Ma LM	-8.4%	4.4%	0.7%	-4.1%	-0.2%	-1.1%	5.0%	-2.1%	-2.2%	1.2%	0.4%	0.2%	1.0%	2.0%	20.7%	-0.2%	-3.1%	1.8%	1.0%	-2.3%
Namakwa DM	5.1%	0.5%	-3.9%	-0.7%	-0.2%	1.1%	-2.2%	4.1%	1.7%	-0.6%	0.5%	3.5%	2.5%	2.9%	0.7%	20.8%	2.2%	-0.9%	-0.2%	1.5%

Source: Global Insight, 2015 [Version 832(2.5q)]

3.5.1 Labour force and Employment Structure

In 2011, in the dominant age group (15-64), the employment status of the majority of the people are "not economically active", while the second highest employment status shows that people are "employed". The unemployment rate in 2011 was 22,9%, which is slightly lower than the national (26,6%) and provincial (27,1%) percentages.

The average household in the Nama Khoi LM earns between R 19 601- R 38 200 per annum (Figure 6). Even though the majority of the population is "not economically active", the average household income shown in the figure may be attributed to the grants used within the LM. According to the Nama Khoi IDP, approximately 48.6 % of the population receives a "child support grant" and 18.4% receives a "disability grant".

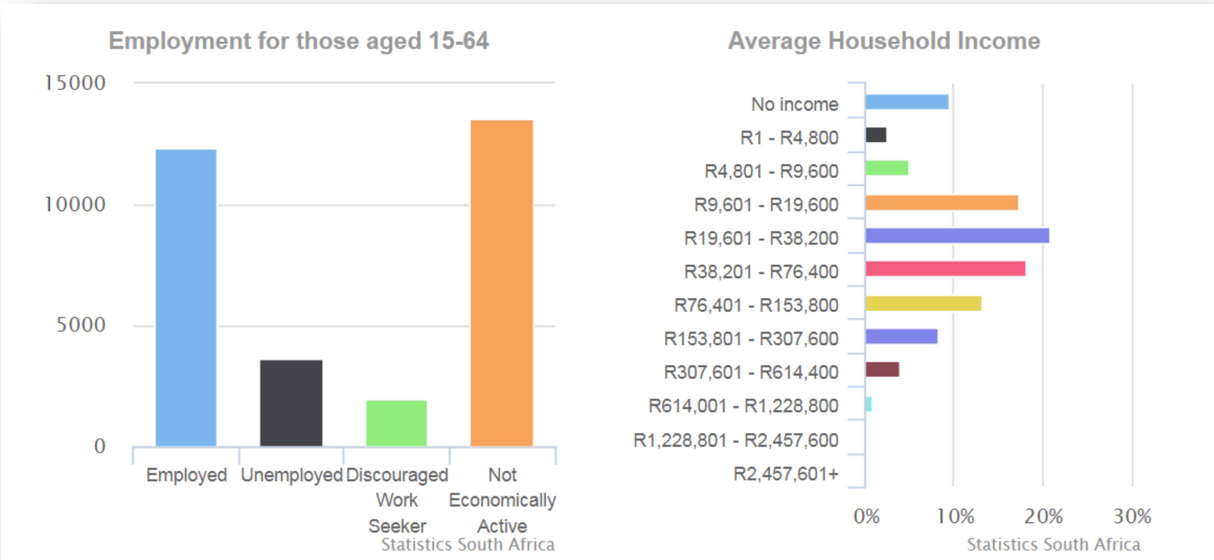


Figure 6. Economic figures for the Nama Khoi LM. Employment figures (left) and average household incomes (right) (StatsSA, 2013)

In terms of the main sectors that contribute to employment opportunities within the LM, the majority of the residents are employed in General Government (21,7%), Community, Social and Personal Services (17,3%), Wholesale and Retail Trade, Catering and Accommodation (17,3%) and Mining (16%). The majority of the LM's population is employed in the following occupations: elementary occupations (21,4%), craft and related trade workers (11,9%) and service workers, shop and market sales workers (11,4%). According to the Nama Khoi LM, this shows that there is limited professional skills in the area.

3.5.2 Access to services and state of local built environment

Access to services (water, electricity, sanitation) show the standard of living of the people in the area. The availability or access to roads, educational facilities, hospitals or clinics further show the state of the living conditions.

Access to water and sanitation

Within the LM, 74,9% of households have access to piped water inside their dwelling, while 21 % have access to piped water inside their yard. In terms of access to sanitation, 63,5 % of the LM's population has access to a flush toilet system (connected to a sewerage system), with 10,9 % has access to a flush toilet with a septic tank and 10,4% a pit toilet with ventilation.

Housing

The majority of the population (80,2%) of the LM lives in a house or brick structure on a separate stand or yard, while the second highest percentage (5,5%) live in a traditional dwelling/structure made of traditional materials. This is in-line with the DM and province's percentages.

The Nama Khoi IDP notes that even though the majority of the households have access to basic services, rural areas are experiencing an increase in backlogs in electricity provision, housing, access to water and sanitation. This can mostly be attributed to the increase in the number of households within the LM and the lack of capacity of the LM to keep up with the demand for basic services.

3.5.3 Health

The HIV/AIDS prevalence in the Nama Khoi LM has nearly doubled during 2001 to 2010, with a growth rate of 62,8 %. In 2010, the estimated percentage of the LM's population that was infected was 6%. The infection rate within the LM is higher than the DM (60,8%) and the province (46,2%). The Nama Khoi IDP notes that the rate and real percentage of the population that are infected may be higher due to not all the cases being reported. Ms Marman form Komaggas Clinic confirmed that there is a stigma associated with the virus which in turn means some infected community members do not seek treatment and/or tell people that they are infected. In terms of tuberculosis (TB), Ms Marman indicated that of the more or less 5000 people living in Komaggas, only 5 are currently being treated for TB. She also noted that the rate of teenage pregnancies is high within the community.

3.5.4 Kleinzee and Komaggas

According to a Mail and Guardian article in 2011, Kleinzee was established as a mining town in 1926. The town was supported by the mining company, De Beers, through the supply of free services such as water and electricity as well as 25 recreational clubs including a golf course, tennis courts and a swimming pool. At the peak of the mine, it was estimated that a million carats of diamonds were mined in the area per year. In the 1980's it was estimated that 3 000 people were employed in Kleinzee and the population was close to 6 000 people. In 2007, De Beers significantly scaled down their operations in the town and linked to this, residents lost their jobs and moved away. De Beers has subsequently sold their Namaqualand Mines to Transhex in 2011 and only a small amount of mining is still occurring in the area, approximately 100 000 carats a year. Rehabilitation efforts by Transhex are however still providing jobs to a limited number of residents. Within the town, most of the houses are empty and limited services are still available (Stilwell, 2011).

During the site visit in August 2017, a resident indicated that recently the pharmacy and the butchery closed. The Cape Times noted in 2013 that only 10 children were enrolled at the town's preprimary school and 50 children in the primary school. Kleinzee does not have a high school or hospital

(Dolley, 2012). According to the census data of 2011, Kleinzee had a total population of 728, with an average household size of 1,9 (StatsSA, 2013).

Komaggas is named after a tributary of the Buffelsrivier. Historically the area was established as a station of the London Missionary Society in 1829. According to the census data of 2011, Komaggas has a population size of 3116 with an average household size of 3,7 (StatsSA, 2013). According to the Nama Khoi SDF, because of the low population threshold and isolation of Komaggas, development strategies should be focused on developing human capital. For instance, it would not be feasible to develop schools and hospitals in Komaggas and as such mobile services such as clinics and libraries should be the main focus for investment. Learners should be transported to Springbok's schools.

Based on the demographic profiles of the two towns, the following comparisons can be made (as shown in the figures below). The majority of the residents in both towns are coloured (Figure 7). As shown in Figure 8 below, the majority of the people living in Kleinzee are in the age group between 45 - 49, with the second largest group of age 20 - 24. Compared to Kleinzee, the majority of the Komaggas population is aged between 0 – 29 years which shows a much younger population group. The lowest percentage of people in Komaggas is in the 35 – 39 age group. In terms of the highest education level reached by individuals within Kleinzee and Komaggas; the majority of the population in Kleinzee has completed secondary school, while the majority of residents in Komaggas has some secondary school grades completed (Figure 9).

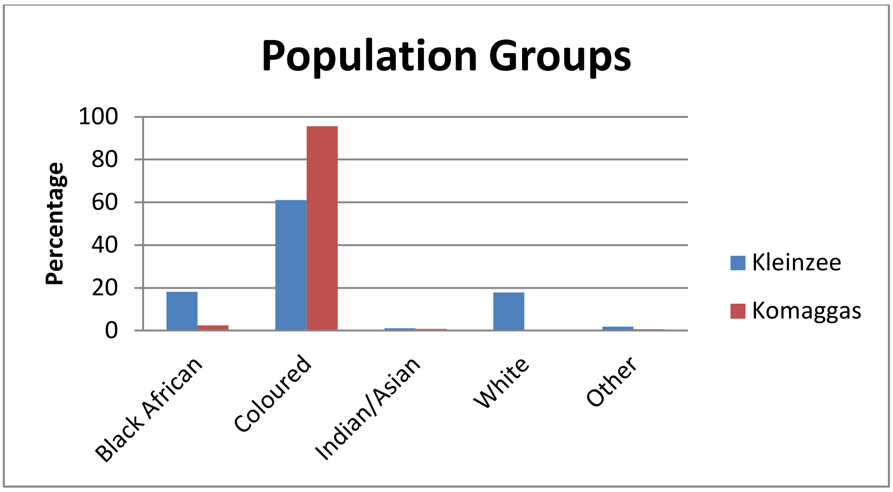
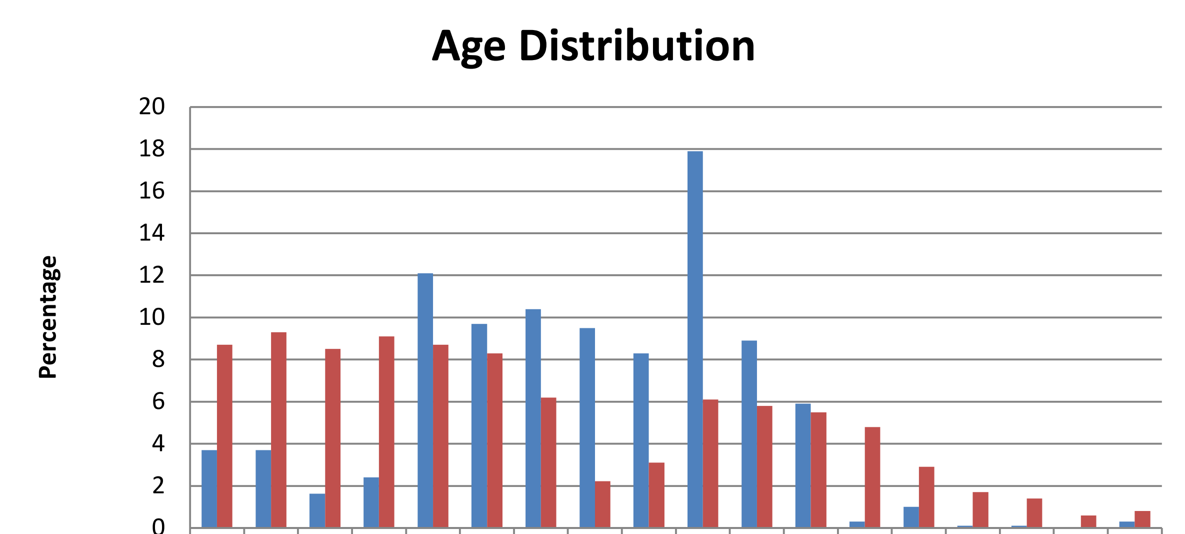


Figure 7. Population groups residing within Kleinzee and Komaggas (2011) (StatsSA, 2013).



	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Kleinzee	3.7	3.7	1.63	2.4	12.1	9.7	10.4	9.5	8.3	17.9	8.9	5.9	0.31	1	0.1	0.1	0	0.3
Komaggas	8.7	9.3	8.5	9.1	8.7	8.3	6.2	2.23	3.11	6.1	5.8	5.5	4.8	2.9	1.7	1.4	0.6	0.8

Figure 8. Age distribution within Kleinzee and Komaggas (2011) (StatsSA, 2013)

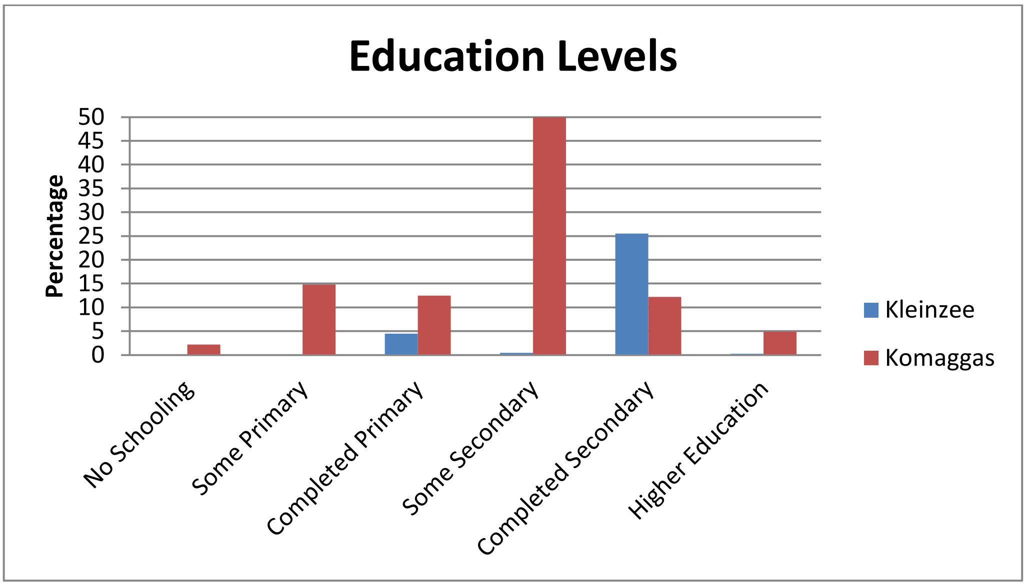


Figure 9. Highest education levels achieved by population in Kleinzee and Komaggas (2011) (StatsSA, 2013)

According to the Community Survey (2007) included in the Nama Khoi IDP in 2001, the unemployment rate in Kleinzee was 5% and 41% for Komaggas. The Labour Participation Rate, which refers to the measure of the economy's labour force who is either employed or actively looking for work, was 89% and 68% for Kleinzee and Komaggas, respectively (StatsSA, 2008).

4 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO SOCIO-ECONOMIC IMPACTS

In terms of a WEF and associated electrical infrastructure development, there are normally three key phases which have a potential to impact on the socio-economic context of the area. The key phases and the project aspects related to the socio-economic assessment are outlined below:

Construction phase

- Construction staff required to construct the WEF and associated infrastructure on site;
- Visibility of construction and WEF infrastructure; and
- Project expenditure.

Operational phase

- Operational staff required to maintain and manage the WEF;
- Visibility of WEF and associated infrastructure; and
- Project expenditure.

Decommissioning phase

- Decommissioning staff required to decommission the WEF and associated infrastructure;
- Visibility of structures to decommission WEF infrastructure; and
- Loss of project expenditure.

5 IDENTIFICATION OF KEY ISSUES

5.1 Key Issues Identified During the Scoping Phase

The following key issues, based on the project aspects (as discussed within in Section 4 of the report) have been identified:

- Staff required to construct, operate and decommission the WEF and associated infrastructure on site, will cause an **influx of people and impact on surrounding landowners associated with the presence of workers**;
- The WEF and associated infrastructure will be visible which may have an impact on **tourism** and **surrounding property values**;
- The landowner will have an alternative land-use for his property, which will **diversify his income stream**;
- The project owner would need to employ people to work on the project and potentially source materials from local businesses, thereby **creating local employment opportunities** and **income for other sectors**; and
- The project owner would need to spend their Social and Economic Development (SED) budget in the local area, potentially **providing benefits to the local communities**.

5.2 Identification of Potential Impacts for all phases of the development

To note, the identification of impacts and their respective significance have been grouped together in certain instances. This has been undertaken to ensure that double counting of impacts do not occur. Based on the key issues identified above, the following key impacts have been determined and are discussed in the section below:

- Impact 1: Influx of people
- Impact 2: Impact of employment opportunities
- Impact 3: Impact on surrounding landowners associated with the presence of workers
- Impact 4: Project expenditure
- Impact 5: Visibility, operation and audibility of the development

6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

6.1 Construction Phase

6.1.1 Influx of people

Nature of the impact

A socio-economic assessment undertaken by Urban-Econ noted that due to the WEF developments within the Loeriesfontein area, the town experienced an influx of people who want to benefit from the WEF development through either employment or other economic opportunities indirectly offered by the WEF (Urban-Econ, 2017). Therefore, with the development of the proposed Kap Vley WEF and associated electrical infrastructure it is likely that job seekers will be attracted to the towns of Kleinzee and Komaggas. Such an influx generally causes a disturbance in the existing social order as prevailing leadership, kinship and social control mechanisms are challenged by new and alternative values, beliefs and practices. Disturbance of the existing social order commonly results in the deterioration of social capital and general disorientation of affected communities (du Toit, 2014).

Furthermore, in-migration is likely to place additional strain on formal housing and bulk services. This can lead to a growth in housing needs which may place additional pressure on the LM that already notes within the IDP that there is a backlog in delivering these services due to the increase in people coming into area.

On a community level, there may be concerns that the influx of people will be associated with a negative impact on social structures and increased crime levels. These types of impacts usually stem from people coming to the area, hoping to get work without success but can also occur when they do find work (Van Zyl, 2012).

Significance of impact without mitigation measures

The impact is rated as having a high significance (negative) rating before mitigation.

Proposed mitigation measures

- Initiating the education campaign among the local community (in partnership with the community members already active in the area) focusing on alcohol abuse, drug abuse, HIV/AIDS, Sexually Transmitted Diseases etc. prior the start of construction and maintaining these throughout the project's duration.

- The applicant and the contractor should implement an HIV/AIDS awareness programme for all workers at the outset of the construction phase.
- Arrangements must be made to enable workers from outside the area to return home over the weekends/at regular intervals. This would reduce the risk posed by non-local construction workers to local family structures and social networks.
- Make condoms freely available to employees and all contractor workers.
- Introduce alcohol testing on a weekly basis for construction workers.
- Developing a Code of Conduct for all employees related to the project, which includes no tolerance of activities such as alcohol and drug abuse.
- Recruitment should be done following a transparent approach and adequately communicated in the area to limit the chances of people staying for longer period in hope of finding a job.

Significance of impact with mitigation measures

The impact is rated as having a moderate significance (negative) rating after mitigation.

6.1.2 Impact on employment during the construction phase

Nature of the impact

Based on the information supplied by juwi, during the construction phase, it is expected that approximately 323 job opportunities, of which 140 opportunities will be provided to residents within the local area, will be created during the 24 month construction period. It is anticipated that of the total job opportunities, 12 % will be of medium to highly skilled and 31 % of low skilled people from the local workforce (within the local municipality) (Table 3). In addition, it is anticipated that skills development of those employed as part of the WEF development will occur.

As discussed within this assessment, the majority of the people living in Kleinzee are in the age group between 45 - 49, with the second largest group of age 20 - 24. Comparatively, the majority of the Komaggas population is aged between 0 – 29 years which shows a much younger population group. In terms of the highest education level reached by individuals within Kleinzee and Komaggas; the majority of the population in Kleinzee has completed secondary school, while the majority of residents in Komaggas have some secondary school grades completed. Specifically for Komaggas, an opportunity therefore exists to employ the community for the low skilled activities required.

Table 3. Employment opportunities and source of employees during the construction phase

	Construction job opportunties		
	Medium to highly skilled	Low skill	Total
Anticipated % of total workers to be sourced from local municipal area	12%	31%	
Number of workers from the local area	40	100	140
Anticipated % of total workers to be sourced from the province	12%	31%	
Number of workers from the province	40	100	140
Anticipated % of total workers to be sourced from South Africa	13%	0%	
Number of workers from the rest of South Africa	41	0	41
Anticipated % of total workers to be sourced from overseas	1%	0	
Number of workers from overseas	2	0	2
Total anticipated employment opportunities			**323**

Significance of impact without mitigation measures

The impact is rated as having a moderate significance (positive) rating before mitigation.

Proposed mitigation measures

- Implement a 'locals first' policy with regard to labour needs. This can be incorporated into a Workforce Recruitment Policy. The Workforce Recruitment Policy should include:
  - A clear definition of who is considered to be local residents; known as the Project Affected People (PAP). The purpose of demarcating the PAP is to develop a criterion of characteristics considered to identify a given job seeker as a PAP. Once this criterion is known; all subsequent job seekers can be screened against it in order to determine whether they receive preference for employment;
  - A database of local residents and their relevant skills and experience;
  - The selection criteria for allocating jobs;
  - Reserve employment, where practically possible, for local residents; and
  - Should be contractually binding.
- Where possible, subcontract to local construction companies
- Consultation with local authorities is essential so as to manage job creation expectations and ensure that all eligible workers in the primary study area are informed of the opportunities.
- Contracts ensuring that on-the-job training is included and enforced as a condition for the development of this project.
- To improve the chances of skills development during the construction phase, contractors are encouraged to provide learner-ships and encourage further knowledge sharing.
- To ensure that skills are adequately acquired, additional training programmes need to be held during the construction phase to prepare the identified community members to be employed at the next phase, i.e. the operational phase.
- Developers should be open to local recruitment processes and be willing to offer some skills transfer during this phase of the project to ensure the maximum utilisation local labour.
- Employ labour intensive construction methods, where economically feasible and technically possible.
- Establish a local skills desk to identify the skills set of the local residents available for the construction and operational phases of the WEF and the associated electrical infrastructure;

Significance of impact with mitigation measures

The impact is rated as having a high significance (positive) rating.

6.1.3 Impact on surrounding land owners associated with the presence of workers

Nature of the impact

As is often the case with large projects, there are concerns that due to the presence of workers there would be a risk of stock theft, poaching, increased veld fires and damage to farm infrastructure associated with the presence of workers on the site particularly during construction (Van Zyl, 2012).

Significance of impact without mitigation measures

The impact is rated as having a moderate significance (negative) rating before mitigation.

Proposed mitigation measures

Construction phase:

- No fires should be allowed onsite.
- No construction workers, with the exception of security personnel, will be allowed to stay on the site overnight.
- A complaints register must be available on site at all time to any individual who may have a complaint. These complaints must be noted and suitable action taken to address the complaint.
- The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis;
- The Environmental Management Programme (EMPr) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.
- The project owner is responsible to compensate neighboring land owners for losses incurred, if losses occurred are proven to be due to the development of the WEF and associated electrical infrastructure.

Significance of impact with mitigation measures

Should the mitigation measures be implemented, as outlined above, the impact significance would be reduced to low (negative) rating.

6.1.4 Impact of project expenditure and new economic opportunities

Nature of the impact

During the construction phase of the project, the WEF will provide an injection into the local economy via project expenditure. The positive impact of project expenditure during the construction phase can be measured by looking at increased income via employment opportunities. Direct household income would come from the wages paid during the construction phase of the project. These estimates were calculated by using an assumed average monthly salary for each skill category (R 4000 for low skilled and R 30 000 for medium and highly skilled employees) multiplied by the amount of direct jobs to potentially be created, as shown in Table 3. For these estimates the total income during the construction phase was based on a 24 month period. To note: these estimates should be treated as indicators and are not absolute. As shown in Table 4, total income to be created during the construction phase is estimated to be R 83 160 000. As noted in Section 3.5.1 of this assessment, the average household in the Nama Khoi LM earns between R 19 601- R 38 200 per annum (between R1633 – R 3183 per month). The additional income into the area will therefore also lead to an increased expenditure on local goods and services.

Table 4. Total household income during the construction phase (2017 Rands)

	Income during the construction phase		
	Medium to highly skilled	Low skill	Total
Number of workers from the local area	R 28 800 000.00	R 9 600 000.00	R 38 400 000.00
Number of workers from the province	R 28 800 000.00	R 9 600 000.00	R 38 400 000.00
Number of workers from the rest of South Africa	R 4 920 000.00	R -	R 4 920 000.00
Number of workers from overseas	R 1 440 000.00	R -	R 1 440 000.00
Total			**R 83 160 000.00**

The is also the potential for an increase on other economic opportunities that can be created due to the development of the Kap Vley WEF and associated electrical infrastructure. An Urban-Econ report noted that in Loeriesfontein "Subsequent to the establishment of wind farms in the area, new economic opportunities in Loeriesfontein town have emerged. Public transport has benefitted as a result of the increased demand for the transportation of workers to and from construction sites. Cleaning services have also provided work opportunities for unemployed individuals whilst informal trading amongst residents has also increased and has stimulated further income and job creation in the town. Wind farm construction companies either pay their workers once a month or every fortnight; this has resulted in more money in circulation as the purchasing power of local residents also increased. This is important as it may assist in reducing the number of people living below the poverty line. Upon consultation, one farmer went to the extent of sharing that poverty levels have been slightly alleviated in the Loeriesfontein town" (Urban-Econ, 2017).

<u>Significance of impact without mitigation measures</u>

The impact is rated as having a high significance (positive) rating before mitigation.

<u>Proposed mitigation measures</u>

- Engage with local communities (Kleinzee and Komaggas) with respect to their possible involvement during construction in providing supporting services such as catering, temporary housing of workers, transportation, etc.
- The proponent must procure goods and services, as far as practically possible, from within the project area. Only if required goods and services are not affordably and readily available in the study area should the proponent seek to obtain it elsewhere. It is also suggested that regularly required goods and services (e.g. food and accommodation) be obtained from as large a selection of service providers as possible to ensure distribution of project benefits.

<u>Significance of impact with mitigation measures</u>

The impact is rated as having a high significance (positive) rating after mitigation.

6.2 <u>Operational Phase</u>

6.2.1 Creation of long-term employment during operation and maintenance

<u>Nature of the impact</u>

For the operational phase, which is expected to be 20 years, a total of 35 job opportunities will be created. It is estimated that 29 % of medium to highly skilled workers and 71 % of the low skilled workers will be locally sourced (Table 5). The remaining job opportunities will be sourced from outside the local area. From the primary and secondary data sources it can be concluded that the economy of the LM requires integrated and diversified economic development. The long-term job opportunities may provide income resilience to some community members employed by the WEF. This supported by the observations noted in an Urban-Econ report, whereby the Loeriesfontein community depends on income from farming activities and the introduction of WEFs into the area created a source of alternative income to the community (Urban-Econ, 2017).

In terms of skills development during the operational phase to those that are permanently employed; it is anticipated, the low skilled workers will benefit from the skills transfer and knowledge development. This will contribute to building on or expanding their skills set.

Table 5. Employment opportunities and source of employees during the operational phase

	Operational job opportunties		
	Medium to highly skilled	Low skill	Total
Anticipated % of total workers to be sourced from local municipal area	29%	71%	
Number of workers from the local area	5	12	17
Anticipated % of total workers to be sourced from the province	29%	71%	
Number of workers from the province	5	12	17
Anticipated % of total workers to be sourced from South Africa	100%	100%	
Number of workers from the rest of South Africa	1	0	1
Anticipated % of total workers to be sourced from overseas	0%	0%	
Number of workers from overseas	0	0	0
Total anticipated employment opportunities			35

Significance of impact without mitigation measures

The impact is rated as having a moderate significance (positive) rating before mitigation.

Proposed mitigation measures

- Where possible, ensure that the local community members are prioritised for the allocation of the created jobs.
- Contracts ensuring that knowledge sharing and on-the-job training should be enforced as a condition for the development of the project.

Significance of impact with mitigation measures

The impact is rated as having a high significance (positive) rating.

6.2.2 Impact of project expenditure and long-term diversification of the economy

Nature of the impact

During the operational phase of the project, the project will provide an injection into the local economy via project expenditure. The positive impact of the project expenditure can be measured by looking at increased income via employment opportunities. The estimates were calculated by using an assumed average monthly salary for each skill category (R 4000 for low skilled and R 30 000 for medium and highly skilled employees) multiplied by the amount of direct jobs to potentially be created, as shown in Table 5. For these estimates the total income during the operational phase was based on a 20 year period. To note: these estimates should be treated as indicators and are not absolute. In addition, no incremental increase because of inflation (i.e. wages are constant) was assumed for the income generated during operational phase. As shown in Table 6, total income to be created during the operational phase is estimated to be R 102 240 000.

Most of the employment opportunities will be created during the construction phase. While temporary employment opportunities are not ideal, it would still provide an income to people who would not necessarily have access to other forms of income. This would indirectly contribute to the overall well-being of families and the community.

Table 6. Total household income during the operational phase (2017 Rands)

	Income during the operational phase		
	Medium to highly skilled	Low skill	Total
Total income of workers from local area	R 36 000 000.00	R 11 520 000.00	R 47 520 000.00
Total income of workers from province	R 36 000 000.00	R 11 520 000.00	R 47 520 000.00
Total income of workers from the rest of South Africa	R 7 2000 000.00	-	R 7 2000 000.00
Total income of workers from overseas	-	-	-
Total			**R 102 240 000.00**

The Nama Khoi SDF indicates that due to the declining mining sector, the LM must diversify its economy. The increased economic activity that will most likely occur due to the development of the Kap Vley WEF will diversify the local economy. The diversification could enhance the resilience of the local economy by making it less vulnerable to external shocks that may affect the economic sectors that the economy it currently dependent on.

Procurement of goods and services within the LM during the operational phase of the proposed project is likely to hold socio-economic benefits as a result of the multiplier effect (i.e. the increase in total income resulting from a new injection of spending). A secondary indirect impact might result from entrepreneurial development in the project area, whereby niche and/or supporting goods and service industries are developed in response to the demand created for such services in the area (Van Zyl, 2012).

In addition, feedback from the developer indicates that local communities will benefit in two ways from the project. The first will be through the SED commitments associated with the project, the scope of which is dependent on the requirements at the time, but currently approximately 2 % of project revenue would need to be allocated to the local communities. Secondly, the local Komaggas community is also a landowner through the municipality and will thus receive compensation in this regard to the value of approximately 1 % of project revenue. These findings are supported by the observations included within the Urban-Econ report which state that “due to the influx of people in the town, the economic impact has been positive for the town as a result of this; food and fuel sales have spiralled increasing businesses’ gross revenues and profits in an unprecedented manner.” (Urban-Econ, 2017)

<u>Significance of impact without mitigation measures</u>

The significance of the impact of project expenditure is considered to be high (positive) during the operational phase.

Proposed mitigation measures

- The economic development plans to be developed must be prepared by socio-economic experts, to ensure that they can be effectively implemented and managed, bringing maximum benefit to the community.
- Support local businesses as far as possible.
- Liaise closely with the local municipality and other stakeholders involved in socio-economic development in order to ensure that any projects are integrated into wider strategies and plans with regard to socio-economic development.
- Proponent/project owner needs to establish a relationship with the local authorities such as the Nama Khoi LM and local community leaders to ensure that the SED initiatives that are implemented during the pre-operational stage are aligned with the relevant needs of the Kleinzee and Komaggas communities.

- The fair and transparent application of the Department of Energy's (DoE) requirements for local benefit enhancement will require extensive interactions and engagement with the local community and its representatives. The applicant should therefore ensure that adequate time and resources are devoted to these activities.

Significance of impact with mitigation measures

The project expenditure will have a very high (positive) impact for the operational phase.

6.2.3 Impact of the visibility, operation and audibility of the development

Nature of the impact

As concluded by Dr Hugo van Zyl based on a literature review included in the socio-economic assessment undertaken for a proposed wind farm close to Murraysburg in 2015 (Van Zyl, 2013), the majority of the relatively limited evidence literature tends to indicate that overall significant negative property value from wind farms are uncommon. However, where negative impacts have been noted, were for cases where the turbines affected the Sense of Place of an area due its proximity to or alteration of natural features. As highlighted within the Visual Impact Assessment for the Kap Vley WEF, even though the turbines will be seen from various viewpoints, the significance of this on the Sense of Place is deemed to be moderate (Oberholzer and Lawson, 2018).

In addition, property values in the area may be impacted on if the current land-use is negatively impacted on. As indicated in Lanz (2018), it is unlikely that the agricultural potential or current agricultural activities on site will be threatened or impeded on by the WEF and associated infrastructure. The noise impact assessment undertaken by De Jager (2018) confirms that the significance of the noise impact from the Kap Vley WEF would be considered to be low.

Significance of impact without mitigation measures

Given that it is expected that the visibility, operation and audibility of the development will not affect the Sense of Place, future tourism plans (as outlined in the SDF), or the current land-use, the impact is considered to be of very low (negative) significance.

Proposed mitigation measures

- The mitigation measures proposed by the visual, agricultural and noise specialists should be adhered to.

Significance of impact with mitigation measures

The impact is considered to be very low (negative) following the implementation of the mitigation measures.

6.3 Decommissioning Phase

6.3.1 Impact of the loss of project expenditure

Should the WEF discontinue operations, following the 20 year operational period, it is expected that the project expenditure (as outlined within Section 6.2.2) will no longer exist. Potentially, the community would have become to reply on the economic opportunities associated with project expenditure.

Significance of impact without mitigation measures

This significance of this impact is expected to be moderate (negative).

Proposed mitigation measures

- When devising enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises. This would mean that following the operational phase, these enterprises may be able to continue to operate.

Significance of impact with mitigation measures

The impact is considered to be low (negative) following the implementation of the mitigation measures.

6.3.2 Loss of employment opportunities

If the WEF is decommissioned, the operational staff that were employed will not be required. The will mean that 35 permanent jobs will be lost, with 17 from the local area.

Significance of impact without mitigation measures

This significance of this impact is expected to be moderate (negative).

Proposed mitigation measures

Contracts ensuring that knowledge sharing and on-the-job training should be enforced as a condition for the development of the project. This will ensure that all employees will have acquired a skills set that will potentially enable them to find other work at similar developments.

Significance of impact with mitigation measures

The impact is considered to be low (negative) following the implementation of the mitigation measures.

6.4 Cumulative Impacts

Cumulative impacts must be considered for any development because individually a project may not have a significant impact but collectively similar projects may have significant impacts. The projects that form part of the cumulative assessment have been included in the Environmental Assessment Report. In total, four wind farms and three solar PV projects are proposed within 50 km from the proposed Kap Vley WEF. In addition, a 400 kV transmission line proposed by Eskom has also been approved within the area. The projects within the immediate surroundings are shown in Figure 10.

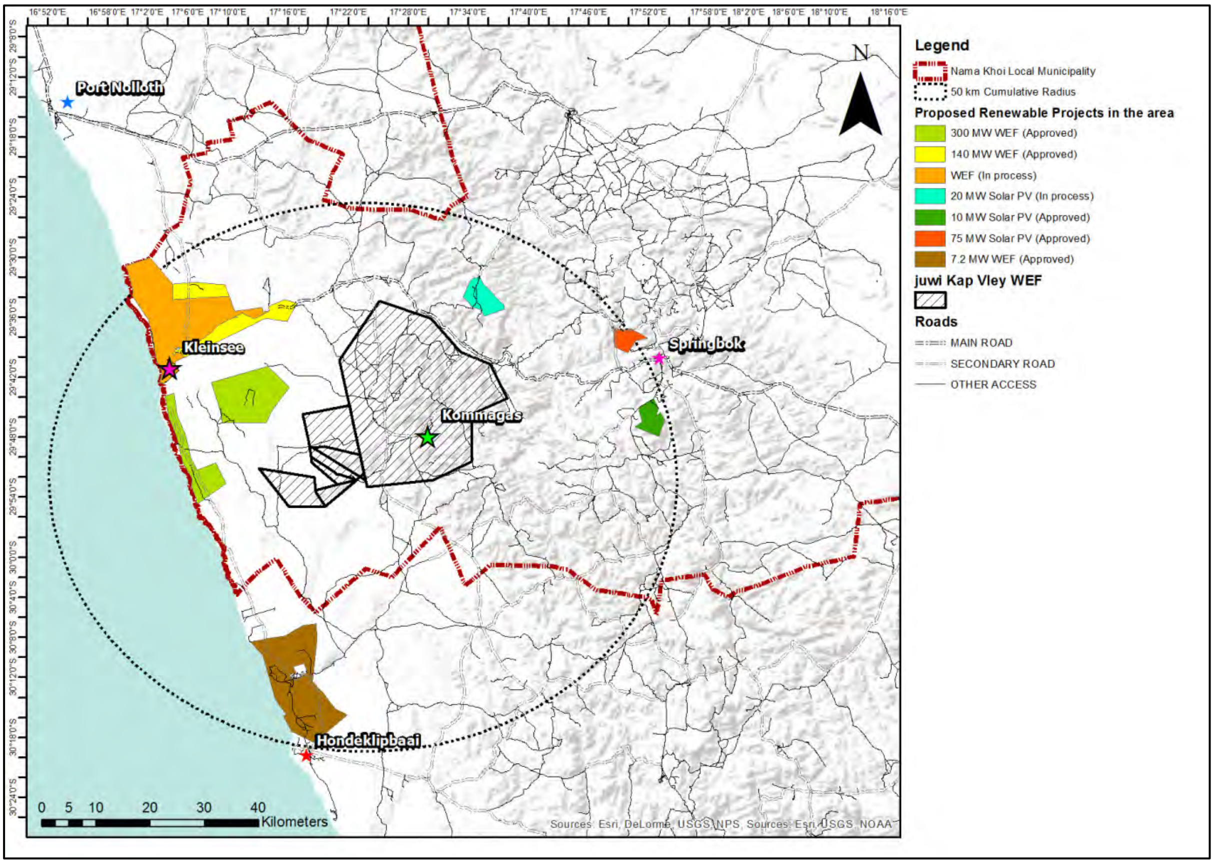


Figure 10. Renewable projects (wind and solar PV) approved or in process

For the cumulative assessment it should be noted that Kleinzee and Komaggas may not be the closest towns to the project and therefore any positive or negative cumulative impacts may not necessarily occur only within these towns. This is particular true for employment opportunities and project expenditure. However, cumulative impacts are considered on a regional level and therefore the towns that may be impacted on due to the development of the renewable projects and electrical infrastructure are Kleinzee, Komaggas, Springbok and Hondeklipbaai.

The EIA for the proposed Kleinzee 300 MW WEF, proposed by Eskom (Savannah Environmental, 2015) (shown in green in the figure above) concluded that the following cumulative impacts may apply: degradation of access roads, traffic congestion, nuisance impact to adjacent landowners, impact on farming practices, security issues and labour unrest. Overall, the study concluded that the negative cumulative socio-economic impact is considered medium and the positive cumulative socio-economic impact is considered to be high.

Based on the above and the impacts identified above, the following cumulative impacts may occur:

6.4.1 Influx of people

Should all the projects proceed within the region, there will be an influx of people and an increase of workers at the renewable energy projects. Given that there may be a higher expectancy of employment opportunities, this will facilitate a larger influx of people from outside the region which will in turn create other social problems. The impact would be manageable with the proposed mitigation measures outlined within Section 6.1.1. and will be spread across the towns of Kleinzee, Komaggas, Springbok and Hondeklipbaai. The significance of the cumulative impact will be moderate (negative).

6.4.2 Project expenditure

Positive project expenditure within the region may show other potential investors that the area is worth investing in, which will potentially create other investment opportunities within the region. This would be considered to have a high (positive) cumulative impact.

6.4.3 Visibility, operation and audibility of the development

A key concern, should all the projects be constructed within the region is that the Sense of Place of the region will be significantly impacted on and the property values will be negatively impacted on. Based on the findings of the Visual Impact Assessment, the cumulative impact is considered to be medium (Oberholzer and Lawson, 2018). Impact to tourism and property values will however be reduced due to the distances between the projects. The significance of the cumulative impact is therefore considered to low (negative).

7 IMPACT ASSESSMENT SUMMARY

Table 7. Impact assessment summary table

Impact pathway	Nature of potential impact/risk	Status [1]	Extent [2]	Duration [3]	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of risk/opportunity = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk or opportunity (after mitigation)	Ranking of impact/ risk	Confidence level
CONSTRUCTION PHASE															
Influx of people	Influx of people causes a disturbance in the existing social order Additional strain on municipal services	Negative	Regional	Long-term	Severe	Very Likely	Low	Moderate	High	No	Yes	See Section .6.1.1	Moderate	3	Medium
Employment opportunities	Employment opportunities and skills development	Positive	Regional	Medium term	Substantial	Likely	Low	Moderate	Moderate	No	Yes	See Section 6.1.2	High	2	Medium
Impact on surrounding land owners associated with the presence of workers	The presence of workers presence of workers could increase the risk of stock theft, poaching, increased veld fires and damage to farm infrastructure	Negative	Local	Medium terms	Substantial	Likely	Low	Moderate	Moderate	No	Yes	See Section 6.1.3	Low	4	Medium
Project expenditure and new economic opportunities	Increased income via employment New economic opportunities	Positive	Regional	Medium term	Major	Likely	High	Low	High	No	Yes	See Section .6.1.4	High	2	Medium
OPERATIONAL PHASE															
Creation of long-term employment through operation and maintenance operations	Employment opportunities and skills development Alternative form of income	Positive	Regional	Long term	Substantial	Likely	Low	Moderate	Moderate	No	Yes	See Section .6.2.1	High	2	Medium
Project expenditure and long-term diversification of the economy	Increased income via employment New economic opportunities SED spending	Positive	Regional	Long term	Outstanding	Likely	High	Low	High	No	Yes	See Section 6.2.2	Very High	1	Medium
Impact of the visibility, operation and audibility of the development	The visibility, operation and audibility of the development make affect the Sense of Place	Negative	Regional	Long term	Slight	Not likely	High	Low	Very Low	No	Yes	See Section. 6.2.3	Very low	5	Medium
DECOMMISSIONING PHASE															
Impact of the loss of project expenditure	Loss of Increased income via employment Loss of new economic opportunities Loss of SED spending	Negative	Regional	Long term	Substantial	Likely	High	Low	Moderate	No	Yes	See Section .6.3.1	Low	5	Medium

1 Status: Positive (+) ; Negative (-)

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

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

Loss of employment opportunities	Loss of employment	Negative	Regional	Long term	Substantial	Likely	High	Low	Moderate	No	Yes	See Section 6.3.2	Very low	5	Medium
CUMULATIVE IMPACTS															
Influx of people	Influx of people causes a disturbance in the existing social order Additional strain on municipal services	Negative	Regional	Long term	Substantial	Likely	Low	Moderate	High	No	Yes	See Section 6.4.1	Moderate	2	Medium
Project expenditure and long-term diversification of the economy	Increased income via employment New economic opportunities SED spending	Positive	Regional	Long term	Major	Very Likely	High	Low	High	No	Yes	See Section .6.4.2	High	2	Medium
Impact of the visibility, operation and audibility of the development	The visibility, operation and audibility of the development make affect the Sense of Place	Negative	Regional	Long term	Moderate	Not likely	High	Low	Low	No	Yes	See Section .6.4.3	Very low	5	Medium

8 CONCLUSION AND RECOMMENDATIONS

The study found that the two key towns that will be affected by the proposed Kap Vley WEF and associated electrical infrastructure are Kleinzee and Komaggas. These two towns' socio-economic structures do differ significantly (as outlined within Section 3.5.4) and potentially, the identified impacts may manifest differently or with a higher or lower impact significance within these two towns.

During the construction phase, it is anticipated that negative impacts may occur due the influx of people and the presence of workers on site. Positive impacts during this phase may occur due to the employment opportunities that will be created the project expenditure as part of the development of the WEF and associated electrical infrastructure. The influx of people seeking employment opportunities will have a moderate negative impact, following mitigation. On a cumulative level, this impact is still considered to be a moderate negative impact. In terms of the economic opportunities, these are expected to be high (positive), should the recommended mitigation measures be implemented.

During the operational phase, long term employment opportunities will be created and the WEF ownership will spend SED within the area. These are considered to be positive impacts and will have a high and very high, respectively, impact significance following mitigation. In terms of the negative impacts, the presence of the WEF may affect the Sense of Place. However, based on other specialist studies undertaken for this proposed development this impact is considered to be of very low negative significance. The loss of project expenditure and employment opportunities are the two negative impacts associated with the decommissioning phase. The loss of project expenditure is expected to have a low rating and the loss of employment opportunities, a very low significance following mitigation.

On a cumulative level, the impact of project expenditure and the diversification of the local economy are considered to be of a high positive significance and the negative impact on the Sense of Place is considered to be very low.

The measures included within Section 6 above should be considered to be included within the Environmental Authorisations, should it be granted by the DEA. Based on the current socio-economic context of the area and the impacts identified, it is the opinion of the specialist that the project can go ahead, provided that the mitigation measures proposed are adopted and adhered to by the EA holder.

9 REFERENCES

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APPENDIX A: EXTERNAL REVIEW LETTER

A1: REVIEW LETTER OF ACCEPTANCE FROM REVIEWER (MS ELENA BROUGHTON)

Note: The revised Socio-Economic Impact Assessment was accepted after the comments from the reviewer (in the first review letter was addressed)

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27 February 2018

To whom it may concern

RE: REVIEW OF THE SOCIO-ECONOMIC IMPACT ASSESSMENT STUDY THAT WAS UNDERTAKEN BY THE COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR) FOR THE PROPOSED KAP VLEY WIND ENERGY FACILITY NEAR KLEINZEE IN THE NORTHERN CAPE

This document was compiled in response to a request by the CSIR to provide a peer review of the socio-economic impact study undertaken for the above-mentioned project and completed by the CSIR. The peer review is provided for the socio-economic impact assessment report compiled by the CSIR's Surina Laurie dated February 2018 and submitted for the peer review on 23 February 2018.

1. Terms of reference for the review

The assessment was completed in line with the following Terms of Reference prescribed by the Department of Environmental Affairs for peer review and included in the scope of work for the peer reviewer:

a) Acceptability of the terms of reference;
b) Is the methodology clearly explained and acceptable;
c) Evaluate the validity of the findings (review data evidence);
d) Discuss the suitability of the mitigation measures and recommendations;
e) Identify any short comings and mitigation measures to address the short comings;
f) Evaluate the appropriateness of the reference literature;
g) Indicate whether a site-inspection was carried out as part of the peer review; and
h) Indicate whether the article is well-written and easy to understand.
i) Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPR, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated;
j) Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input;
k) Indicate if the studies being referred to covers the preferred site; and
l) Provide an indication on the cumulative impacts of these studies in relation to the proposed development.

2. Assessment

The following sections comment on each aspect of the Terms of Reference separately.

a) Acceptability of the terms of reference

The Terms of Reference for the socio-economic study included in the report are acceptable.

b) Is the methodology clearly explained and acceptable?

The methodology included in the report focused on the primary data gathering activities and is incomplete and cannot be accepted as it stands. The major gaps are related to the absence of the following:

- The overall approach to the socio-economic impact assessment
- Complete list of primary and secondary sources utilised in the assessment (the list in the report is incomplete)
- Explanation of how secondary sources, such as literature review and other studies completed in the area, were used in the report and the implications thereof on the assessment
- A clear description of the consultation process followed, the response rate among the targeted parties, and linked to that the confidence level of the assessment (some of that information is provided later in the document; however, it should be included earlier and should have a clear indication of whether the primary data gathered represent a complete information concerning directly and indirectly affected parties or is only partially complete)
- Indication of the assumptions, limitation, and gaps in knowledge acquired during the study and how it affected the assessment of the impacts
- Comment on the level of risk associated with the gaps in knowledge

c) Evaluate the validity of the findings (review data evidence)

The report is well written, and it is clear that the specialist attempted to investigate the socio-economic issues and the potential effects of the proposed project to the best of her knowledge and ability. Having said this, some of the findings and assessments included in the report are not supported by relevant secondary or primary data.

The baseline information is relevant; however it lacks the assessment of local community dynamics, the socio-economic priorities for the municipality and nearby communities where the project is to be located, the property dynamics, the tourism profile and dynamics, the labour force and unemployment situation in the nearby communities. It is my opinion that the incomplete knowledge of the socio-economic dynamics at the local level and at the community level compromised the assessment, as it limited the baseline knowledge and as a result influenced the assessment of potential impacts and their significance ratings.

Furthermore, there seems to be a misinterpretation of what is considered to be a socio-economic impact and what is the enabler or a cause thereof. The report refers to project expenditure, influx of people, and visual aspects as impacts, while at the same acknowledging that these are "social disruptors". As a result, the report does not provide a clear differentiation among the socio-economic impacts that could be exerted by the above-mentioned processes or activities. For example, potential stock theft and social ills in the surrounding communities are combined under the analysis of the effect of influx of people and rated as one impact. The significance of these impacts and a range of mitigation measures that need to be introduced though are completely different, therefore these impacts should be analysed separately from each other.

The overall approach to the analysis of impacts, where the focus is on the processes that cause potential positive or negative effects resulted in the unsubstantiated assessment of the potential effects and compromised the validity of findings. Experience shows that the developments of such nature in rural remote areas have a significant negative effect on the economies of the nearby towns, health of the community members, social relations, community structures and safety. One of the example of these is the town of Loeriesfontein, which is located in the same Province.

d) Discuss the suitability of the mitigation measures and recommendations

The provided mitigation measures are sound, but some could be considered impractical - either difficult to implement or difficult to monitor, if implemented. For example:

> "Arrangements should be made to ensure all non-local workers are transported back to their area of residence, following the construction phase." (CSIR, 2018, p15)

The fact that the impacts were not assessed separately also means that some of the mitigations measures that should be proposed to address or eliminate potential socio-economic effects in the local communities were missing.

e) Identify any short comings and mitigation measures to address the short comings

The report needs to:

- Expand on the methodology and clearly outline the gaps in the data and implications of these gaps on the assessment

- Expand on the socio-economic profile focusing on the socio-economic dynamics within the nearest towns to have a more comprehensive view of the current challenges experienced by the local communities, the labour force profile, the key economic activities, etc.
- Provide a description of the project in terms of the socio-economic parameters
- Provide a map of the other projects planned in the area to have a clear understanding on how far or how close these projects are located relative to the proposed site, as well as to the nearby communities under analysis
- Review and analyse potential socio-economic impacts caused by the influx of people, project expenditure, and visual effects separately from each other, rate them accordingly, and provide mitigation measures

f) Evaluate the appropriateness of the reference literature

The referenced literature is appropriate. Some data may be considered outdated (for example the use of Census 2011), but this could be easily mitigated by supporting the secondary information with observations and data gathered from interviews and other primary data sources. Unfortunately, though, the report provided limited information on the dynamics and socio-economic profiles of the local communities gathered from interviews with community members.

g) Indicate whether a site-inspection was carried out as part of the peer review

No site inspection was carried out as part of the peer review.

h) Indicate whether the article is well-written and easy to understand

The report is well written, and the specialist's command of English is commendable.

i) Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated

It is advisable to firstly separate the socio-economic impacts and provide mitigation measures for these separately too. The impacts on the nearby communities should be particularly emphasised and mitigation measures to address these should be clearly stated. It would be beneficial if the specialist used case studies to identify potential effects, i.e. identified and experienced impacts in rural remote communities where wind farms have already been constructed.

j) Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input

The details of the site inspection, or rather primary data gathering comprising engagements with Interested and Affected Parties need to be expanded on. A clear indication of which farm portions to be affected, who are the owners of these farm portions, and who were possible to engage with should be provided and commented on to indicate whether the assessment of the impacts on the directly and adjacent farms is based on the complete information or not. Engagement with the local authorities, community members in the nearby towns (i.e. local church leaders, police, clinics) would also be highly insightful and would be able to provide information on the local socio-economic dynamics, which could in turn be used to assess potential effects of influx of people into these towns during construction.

k) Indicate if the studies being referred to covers the preferred site

The report makes reference to the other studies that were completed for similar projects in the area, however, it did not provide references to these studies and it is unclear how relevant these studies were for this assessment.

l) Provide an indication on the cumulative impacts of these studies in relation to the proposed development

The report provided the assessment of cumulative effects, but it was not clear what impacts were determined to be significant in the other studies and how these relate to the proposed project.

3. Concluding remarks

In conclusion, the report was well written, but the assessment of socio-economic impacts was done in the context of incomplete knowledge of the local socio-economic dynamics in the area and as a result failed to comprehensively assess potential socio-economic impacts with a specific reference to the possible effects on the local communities considering the remoteness of the project location from economic hubs and development nodes.

While no red flags can be identified that may prevent the project from being developed from a socio-economic impact perspective, the incomplete assessment of potential socio-economic impacts means that the proposed mitigation measures were also partial and had gaps. It would be advisable to amend the report to ensure that the mitigations measures included in the EMPr are comprehensive and address all possible socio-economic implications of the project.

Yours sincerely,

Elena Broughton
For URBAN-ECON Development Economists (Pty) Ltd
Manager Innovation and Sustainable Development
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A2: REVIEW COMMENTS ADDRESSED BY THE SPECIALIST

Socio-economic Impact Assessment
Kap Vley Wind Energy Facility and associated electrical infrastructure
Author Response Sheet: 06 March 2018

Reviewer comment	Author Response
a) Acceptability of the terms of reference The Terms of Reference for the socio-economic study included in the report are acceptable.	Noted.
b) Is the methodology clearly explained and acceptable? The methodology included in the report focused on the primary data gathering activities and is incomplete and cannot be accepted as it stands. The major gaps are related to the absence of the following: • The overall approach to the socio-economic impact assessment	Please refer to an amended Section 1.1.3 for an updated approach and methodology section which better outlines the methodology followed and the sources utilised as part of the assessment.
• Complete list of primary and secondary sources utilised in the assessment (the list in the report is incomplete)	Please refer to Section 1.1.3 (approach and methodology) and Section 1.9 (the references list)
• Explanation of how secondary sources, such as literature review and other studies completed in the area, were used in the report and the implications thereof on the assessment	Please refer to Section 1.1.3.2
• A clear description of the consultation process followed, the response rate among the targeted parties, and linked to that the confidence level of the assessment (some of that information is provided later in the document; however, it should be included earlier and should have a clear indication of whether the primary data gathered represent a complete information concerning directly and indirectly affected parties or is only partially complete)	Please refer to Section 1.1.3.1
• Indication of the assumptions, limitation, and gaps in knowledge acquired during the study and how it affected the assessment of the impacts	Please refer to Section 1.1.4
• Comment on the level of risk associated with the gaps in knowledge	Please refer to Section 1.1.4
c) Evaluate the validity of the findings (review data evidence) The report is well written, and it is clear that the specialist attempted to investigate the socio-economic issues and the potential effects of the proposed project to the best of her knowledge and ability. Having said this, some of the findings and assessments included in the report are not supported by relevant secondary or primary data. The baseline information is relevant; however it lacks the assessment of local community dynamics, the socio-economic priorities for the municipality and nearby communities where the project is to be located, the property dynamics, the tourism profile and dynamics, the labour force and unemployment situation in the nearby communities. It is my opinion that the incomplete knowledge of the socio-economic dynamics at the local level and at the community level compromised the assessment, as it limited the baseline knowledge and as a	The approach and methodology section was updated to provide the reviewer (and subsequent readers of the report) with a better understanding of the methodology undertaken for this assessment. The impacts identified where also updated with the information sourced from the primary and secondary data sources. This was undertaken when the report was compiled but not explicitly stated as such. This has been rectified. Section 1.3 (Description of the receiving socio-economic environment) has also been updated with labour force and employment structures, health, access to services and a clearer outline of the results of the engagement with affected parties. It is the opinion of the author that the issues highlighted within this section have been appropriately addressed and considered.

Socio-economic Impact Assessment
Kap Vley Wind Energy Facility and associated electrical infrastructure
Author Response Sheet: 06 March 2018

result influenced the assessment of potential impacts and their significance ratings.	
Furthermore, there seems to be a misinterpretation of what is considered to be a socio-economic impact and what is the enabler or a cause thereof. The report refers to project expenditure, influx of people, and visual aspects as impacts, while at the same acknowledging that these are "social disruptors". As a result, the report does not provide a clear differentiation among the socio-economic impacts that could be exerted by the above-mentioned processes or activities. For example, potential stock theft and social ills in the surrounding communities are combined under the analysis of the effect of influx of people and rated as one impact. The significance of these impacts and a range of mitigation measures that need to be introduced though are completely different, therefore these impacts should be analysed separately from each other.	Noted and thank you for the comment. The impacts have been split to clearly show the social impacts/risks versus the economic opportunities. Please refer to Section 1.6. In addition, additional mitigation measures were sourced from an assessment undertaken by Urban-Econ (2017) to ensure alignment with recent socio-economic studies undertaken.
The overall approach to the analysis of impacts, where the focus is on the processes that cause potential positive or negative effects resulted in the unsubstantiated assessment of the potential effects and compromised the validity of findings. Experience shows that the developments of such nature in rural remote areas have a significant negative effect on the economies of the nearby towns, health of the community members, social relations, community structures and safety. One of the example of these is the town of Loeriesfontein, which is located in the same Province.	The impacts have been split to clearly show the social impacts/risks versus the economic opportunities. Please refer to Section 1.6. As noted in the assessment (following the review), to determine the potential consequences of the socio-economic impacts of a wind farm, Loeriesfontein was considered a good case study, since two wind farms, namely Loeriesfontein 2 and Khobab, have recently become operational in the area. A recent Socio-Economic Impact Assessment for an additional wind farm proposed in Loeriesfontein ("Graskoppies") undertaken by Urban-Econ (Urban-Econ, 2017) was reviewed since this study provides insight into the socio-economic setting of a town, following the introduction of wind farms, and therefore provides a good overview of the realities of introducing a wind farm into an area and the associated socio-economic impacts
d) Discuss the suitability of the mitigation measures and recommendations The provided mitigation measures are sound, but some could be considered impractical - either difficult to implement or difficult to monitor, if implemented. For example: *"Arrangements should be made to ensure all non-local workers are transported back to their area of residence, following the construction phase." (CSIR, 2018, p15)* The fact that the impacts were not assessed separately also means that some of the mitigations measures that should be proposed to address or eliminate potential socio-economic effects in the local communities were missing.	The impacts have been split to clearly show the social impacts/risks versus the economic opportunities. Please refer to Section 1.6. In addition, additional mitigation measures were sourced from an assessment undertaken by Urban-Econ (2017) to ensure alignment with recent socio-economic studies undertaken.
e) Identify any short comings and mitigation measures to address the short comings The report needs to: • Expand on the methodology and clearly outline the gaps in the data and implications of these gaps on the assessment	The approach and methodology section was updated to provide the reviewer (and subsequent readers of the report) with a better understanding of the methodology undertaken for this assessment. The impacts identified where also updated

Socio-economic Impact Assessment
Kap Vley Wind Energy Facility and associated electrical infrastructure
Author Response Sheet: 06 March 2018

	with the information sourced from the primary and secondary data sources. This was initially undertaken when the report was compiled but not explicitly stated as such. This has been rectified. The Assumption and Limitations section (Section 1.1.4) has also been updated.
• Expand on the socio-economic profile focusing on the socio-economic dynamics within the nearest towns to have a more comprehensive view of the current challenges experienced by the local communities, the labour force profile, the key economic activities, etc.	Section 1.3 has been updated to address the reviewer's comments.
• Provide a description of the project in terms of the socio-economic parameters	Section 1.3 has been updated to address the reviewer's comments.
• Provide a map of the other projects planned in the area to have a clear understanding on how far or how close these projects are located relative to the proposed site, as well as to the nearby communities under analysis	Please refer to Figures 2 and 10 included within the report.
• Review and analyse potential socio-economic impacts caused by the influx of people, project expenditure, and visual effects separately from each other, rate them accordingly, and provide mitigation measures	Please refer to an updated Section 1.6.
f) Evaluate the appropriateness of the reference literature The referenced literature is appropriate Some data may be considered outdated (for example the use of Census 2011), but this could be easily mitigated by supporting the secondary information with observations and data gathered from interviews and other primary data sources. Unfortunately, though, the report provided limited information on the dynamics and socio-economic profiles of the local communities gathered from interviews with community members.	 Please refer to an updated Section 1.1.3 (approach and methodology), it is the opinion of the author that the comment has been addressed and that the process undertaken is sufficient to inform the impacts.
g) Indicate whether a site-inspection was carried out as part of the peer review No site inspection was carried out as part of the peer review.	Noted.
h) Indicate whether the article is well-written and easy to understand The report is well written, and the specialist's command of English is commendable.	Noted.
i)Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated It is advisable to firstly separate the socio-economic impacts and provide mitigation measures for these separately too. The impacts on the nearby communities should be particularly emphasised and mitigation measures to	 This comment has been addressed by separating the economic and social impacts from each other. This ensured that economic opportunities and social risks are not intertwined in one impact and to ensure that clear mitigation measures are

Socio-economic Impact Assessment
Kap Vley Wind Energy Facility and associated electrical infrastructure
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address these should be clearly stated. It would be beneficial if the specialist used case studies to identify potential effects, i.e. identified and experienced impacts in rural remote communities where wind farms have already been constructed.	provided to manage each impact/opportunity appropriately. In addition to the studies already reviewed to inform the assessment, a study undertaken by Urban-Econ was also reviewed and used to identify impacts and appropriate mitigation measures. This provided further insight into the impacts associated with the development of wind energy facilities in rural communities, specifically where there are already operational wind farms present in the area.
j) Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input The details of the site inspection, or rather primary data gathering comprising engagements with Interested and Affected Parties need to be expanded on. A clear indication of which farm portions to be affected, who are the owners of these farm portions, and who were possible to engage with should be provided and commented on to indicate whether the assessment of the impacts on the directly and adjacent farms is based on the complete information or not. Engagement with the local authorities, community members in the nearby towns (i.e. local church leaders, police, clinics) would also be highly insightful and would be able to provide information on the local socio-economic dynamics, which could in turn be used to assess potential effects of influx of people into these towns during construction.	Please refer to Section 1.1.3 (approach and methodology).
k) Indicate if the studies being referred to covers the preferred site The report makes reference to the other studies that were completed for similar projects in the area, however, it did not provide references to these studies and it is unclear how relevant these studies were for this assessment.	Please see the list included in Section 1.1.3 and Section 1.9.
l) Provide an indication on the cumulative impacts of these studies in relation to the proposed development The report provided the assessment of cumulative effects, but it was not clear what impacts were determined to be significant in the other studies and how these relate to the proposed project.	Only one Environmental Impact Assessment Report was available within the public domain for review. This study does assess socio-economic impacts but based on the data, no primary research was undertaken and the impacts and mitigation measures identified, very generic.
3. Concluding remarks In conclusion, the report was well written, but the assessment of socio-economic impacts was done in the context of incomplete knowledge of the local socio-economic dynamics in the area and as a result failed to comprehensively assess potential socio-economic impacts with a specific reference to the possible effects on the local communities considering the remoteness of the project location from economic hubs and development nodes. While no red flags can be identified that may prevent the project from being developed from a socio-economic	We welcomed Urban-Econ's review of this socio-economic assessment and for the constructive comments. The author has addressed all comments/concerns raised as part of the external review (as outlined above) and trust that the amended report will meet the expectations of the reviewer.

Socio-economic Impact Assessment
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impact perspective, the incomplete assessment of potential socio-economic impacts means that the proposed mitigation measures were also partial and had gaps. It would be advisable to amend the report to ensure that the mitigations measures included in the EMPr are comprehensive and address all possible socio-economic implications of the project.	

A3: FOLLOW-UP REVIEW LETTER FROM THE REVIEWER

URBAN-ECON
Development Economists

Celebrate Development Diversity

P.O. Box 13554, HATFIELD 0028
Tel: (012) 342-8686
Fax: (012) 342 8688
e-mail: pta@urban-econ.com

14 March 2018

To whom it may concern

RE: FOLLOW-UP ON THE REVIEW OF THE SOCIO-ECONOMIC IMPACT ASSESSMENT STUDY THAT WAS UNDERTAKEN BY THE COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR) FOR THE PROPOSED KAP VLEY WIND ENERGY FACILITY NEAR KLEINZEE IN THE NORTHERN CAPE

The review undertaken on 27 February 2018 has reference. I have received the updated socio-economic impact assessment report for the above-mentioned project dated March 2018 and have gone through the changes made to the specialist study based on the comments made by me and submitted on 27 February 2018.

I hereby acknowledge that I am satisfied with the changes made to the assessment, as well as the updates made to the report in general, and believe that they adequately address the comments and recommendations provided by me in my original review letter. I have no further comments on the report. I also support the revised assessments of potential socio-economic impacts that are expected to ensue from the proposed project as well as the suggested recommendations to mitigate the negative effects.

Yours sincerely,

Elena Broughton
For URBAN-ECON Development Economists (Pty) Ltd
Manager Innovation and Sustainable Development
Cell: 082 463 2325
elena@urban-econ.com

CITY OF TSHWANE CITY OF CAPE TOWN ETHEKWINI NELSON MANDELA BAY MBOMBELA MANGAUNG

URBAN-ECON Development Economists (Pty) Ltd Co. Reg Number: 2012/220355/07

A4: CV OF THE REVIEWER: MS ELENA BROUGHTON

Elena Broughton

1

Date of Birth:	11 September 1980
Designation:	Manager: Innovation & Sustainable Development
Profession:	Senior Development Economist
Specialisation:	Sustainable Development Specialist
Years within Firm:	12 Years
Nationality:	Russian/SA Citizen
Years of Experience:	12 Years
HDI Status:	White Female

Education:	
University of Pretoria - 2011	MSc (Technology Management)
University of Pretoria - 2007	BScHons (Technology Management)
Parkland College, USA - 2004	Computer Integrated Accounting
Parkland College, USA - 2004	Independent Business
Parkland College, USA - 2003	Intermediate Accounting
Parkland College, USA - 2003	Records Management
Parkland College, USA - 2003	Financial Accounting
Parkland College, USA - 2003	Managerial Accounting
Nizhny Novgorod University, Russia - 2002	BComHons (Economics)

Professional Membership:
SAPOA - Urban-Econ Development Economists (Pty) Ltd

Language Proficiency:	Reading	Writing	Speaking
English	Excellent	Excellent	Excellent
Russian	Excellent	Excellent	Excellent

Key Qualification:

Elena Broughton completed her BComHons in Economics in Russia, at Nizhny Novgorod State University in 2002 specialising in regional economics. At the same time, she completed an additional degree as Translator/Interpreter in Professional Orientated Communication. After completion of her Honours degree in Economics, Elena moved to the USA and stayed there for 1.5 years. During her stay in the USA, she completed a number of Accounting and Business courses at Parkland College, Illinois. In 2007, she obtained her BScHons in Technology Management (Cum Laude) at the University of Pretoria and later received her MSc in Technology Management (2011) from the same university.

Elena Broughton is a senior professional at Urban-Econ and a manager of the Innovation & Sustainable Development Unit. She has an extensive knowledge in various fields of economic development, including policy evaluation, feasibility studies, impact assessments, investment strategy formulation, strategic decision analysis, and monitoring and evaluation. She is experienced in developing input-output and SAM-based models, as well as development and application of other econometric techniques. Elena has a proven track record of managing complex multidisciplinary projects and a team of sub-consultants.

Employment History:

2004 - current	Urban-Econ: Development Economist

Relevant experience:

- West Rand Tailings Retreatment Project Economic Impact Assessment
- Palmietkuilen Mining Project near Springs Economic Impact Assessment
- Thabametsi IPP Coal-fired Power Station near Lephalale Socio-Economic Impact Assessment
- Thabametsi Coal Mine Sustainable Development Investigation and Economic Impact Assessment
- Doornhoek Fluorspar Project, near Zeerust Socio-Economic Impact Assessment

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Elena Broughton

- Colenso Coal Mine and Coal-Fired Power Station Socio-Economic Impact Assessment. Kwazulu-Natal
- Waterberg Coal-Powered Power Stations Economic Impact Study, Limpopo
- Socio-Economic Impact Assessment for the Construction of an Attenuation Pond in Louwlardia, the Tshwane Metro
- West Rand Tailings Retreatment Project Economic Impact Assessment
- Biotherm Eureka and Aleta Wind Energy Facilities Socio-Economic Impact Assessment
- Mafube Coal Mine Expansion Sustainable Development Investigation and Economic Impact Assessment
- Sishen Mine Waste Dumps Macro-Economic and Economic Impact Assessment
- Eskom Coal 1 and Coal 2 Economic Impact Assessments, Mpumalanga
- Eskom: Ariadne-Eros Transmission Line Economic Impact Assessment
- Eskom CSP Macro-Economic Impact Assessment
- Eskom Ingula Pumped Storage Scheme Regional Economic Impact Assessment
- Eskom Wind Energy Facility 1 (WEF1) Macroeconomic and Regional Impact Assessment
- Eskom Sere Wind (WEF1) Macro-Economic Impact Assessment
- Eskom Kendal And Lethaba EIA: Economic Impact Assessments
- BRMO Gloria Mine Sinter Plant and Mine Expansion Economic Impact Assessment
- Volspuit Mine Socio-Economic Impact Assessment
- Wag'nbiekiespan PV Solar Energy Facility near Boshof, the Free State Province (75 MW PV solar facility)
- Braamhoek Pumped Storage Scheme Impact Analysis
- Saldanha Bay Separation Plant Economic Impact Assessment
- Zandkopsdrift Rare Earth Elements (REE) Project Economic Impact Assessment
- Balmoral Economic Impact Assessment
- Mafube Nooitgedacht and Wildfontein EIA/EMP Sustainable Development Investigation Study
- De Hoop Dam Economic Impact Monitoring Framework
- N3 Highway Economic Impact Assessment
- The Mandela Bay Precinct Economic Impact Assessment
- Harrismith Logistics Hub Impact Assessment
- Megamall Economic Impact Assessment
- Coega Ridge Economic and Social Impact Assessments
- Amanzi Economic & Social Impact Assessment
- Socio-Economic Impact Assessment of the Proposed New Eskom Power Stations in the Witbank Area and Northern Free State
- Arriesfontein Solar Energy Park near Danielskuil in the Northern Cape
- Humansrus Solar Energy Facility near Postmasburg in the Northern Cape (100 MW CSP-Tower facility)
- Rooipunt Solar Energy Park near Upington in the Northern Cape (100 MW CSP-Tower facility and 215 MW PV solar facility)
- Farm 198 PV Solar Energy Facility north of Kimberley in the Northern Cape (210 MW PV solar facility)
- Wag'nbiekiespan PV Solar Energy Facility near Boshof, the Free State Province (75 MW PV solar facility)

Countries of Work Experience:

- South Africa
- Russia
- Zambia
- Namibia

References:

- Dr. JL Oberholzer Email: judex@urban-econ.com Cell Phone: +27 (0) 82 770 8770

Contact Details:

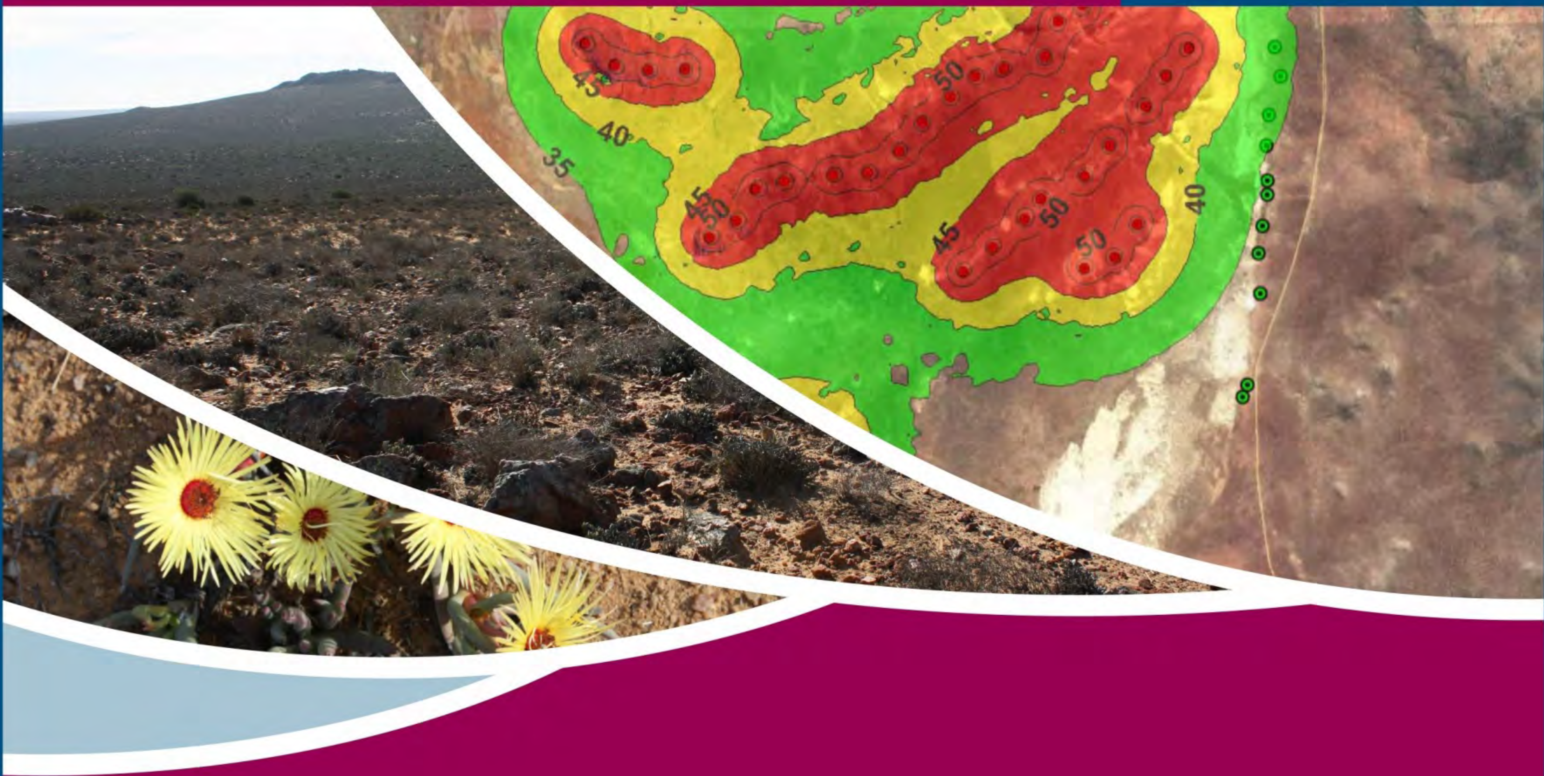
- Elena Broughton Email: elena@urban-econ.com Cell Phone: +27 (0) 82 4632325

Celebrate Development Diversity

URBAN-ECON

Scoping and Environmental Impact Assessment for the proposed Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape

UPDATED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT



APPENDIX O:

Noise Impact Assessment Report

juwi Renewable Energies (Pty) Ltd

SPECIALIST INPUTS: ENVIRONMENTAL NOISE IMPACT ASSESSMENT

As part of EIA for Kap Vley Wind Energy Facility; and BA for associated Powerline Corridor near Kleinzee, Northern Cape Province

Study done for:

CSIR
our future through science

Prepared by:

EAR
Enviro Acoustic Research

P.O. Box 2047, Garsfontein East, 0060
Tel: 012 – 004 0362, Fax: 086 – 621 0292, E-mail: info@eares.co.za

EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE

Enviro-Acoustic Research (EARES) was contracted by the juwi Renewable Energies (Pty) Ltd ('juwi') to determine the potential noise impact on the surrounding environment due to the proposed development of the Kap Vley Wind Energy Facility (WEF) and its associated Powerline to be constructed within a 200 m corridor. This facility with its associated infrastructure will be located on various farms south west of Komaggas in the Northern Cape Province.

This report describes ambient sound levels in the area, potential worst-case noise rating levels and the potential noise impacts that the facility and its associated infrastructure may have on the surrounding environment, highlighting the methods used, potential issues identified, findings and recommendations. This report did not investigate vibrations and only briefly considers blasting.

This study considered local regulations and both local and international guidelines, using the terms of reference (ToR) as proposed by SANS 10328:2008 to allow for a comprehensive Environmental Noise Impact Assessment report.

PROJECT DESCRIPTION

juwi Renewable Energies (Pty) Ltd propose the development of a commercial wind farm with its associated Powerline Corridor on various properties south-west of the town of Komaggas in the Northern Cape Province. The proposed Kap Vley WEF may have up to 45 wind turbines, each with a maximum hub height (hh) of 150 m and a rotor diameter of up to 160 m. A maximum of 40 km overhead powerline corridor which will connect the on-site substation to either the Gromis Substation or the new Eskom substation, for which the location still needs to be determined, is also associated with the WEF.

The developer has been evaluating several turbine models, however the selection will only be finalised at a later stage once the most optimal wind turbine is identified (pending factors such as meteorological data, price and financing options, guarantees and maintenance costs, etc.). As the noise propagation modelling requires the specifications of a wind turbine, the Acciona AW125/3000 was selected as a reference turbine. It is widely used and known to have a high noise emission level, and thus serves as a worse-case scenario for impact assessment.

The powerline corridor has been found not to have any notable noise impacts, and no impacts have thus been assessed or mitigation recommendations or EMPr requirements have thus been identified for this component of the proposed development.

BASELINE ASSESSMENT

Ambient sound levels were measured at one location over two (2) night-time periods. Sound measurements indicated an area with a potential to become very quiet, with wind-induced noise impacting on the ambient sound levels at times.

Measurements illustrate the rural character of the area during periods, with mainly natural sounds defining the acoustic character. The area is considered **Rural** in terms of the SANS 10103:2008 Rating Level.

NOISE IMPACT DETERMINATION AND FINDINGS

Based on sound measurements, the audible character of the soundscape as well as developmental character the area is naturally quiet. The acceptable noise rating level would be typical of a rural noise district (as per SANS 10103:2008). This allows daytime noise limits of 52 dBA with night-time noise limits of 42 dBA (during lower wind conditions as increased wind speeds would increase ambient sound levels).

The potential noise impact for the WEF was evaluated using a sound propagation model. Conceptual scenarios were developed for the construction and operational phases. With the modelled input data as used, this assessment indicated that:

- A potential noise impact of a **low** significance during the construction of the wind turbines;
- A potential noise impact of a **low** significance during the construction of the power line (preferred corridor). There is no risk of a noise impact for the other two power line corridors;
- A potential noise impact of a **low** significance for construction traffic;
- A potential noise impact of a **low** significance during the operational phase. The addition of the proposed Kap Vley WEF will not increase the cumulative noise levels at the Noise Sensitive Development (NSD) and the significance of the cumulative noise impact will also be **low**.

No mitigation in terms of the WEF or Powerline Corridor is critically required but measures are included for the WEF for the developer to note. The developer however must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from location where construction or operational activities are taking place.

NEED AND DESIRABILITY OF PROJECT

The proposed WEF (worst-case scenario evaluated) will slightly raise the noise levels at a number of potential noise-sensitive developments. There is no alternative location where the wind farm can be developed as the presence of a viable wind resource determines the viability of a commercial WEF. While the location cannot be moved, the wind turbines within the WEF can be moved around, although this layout is the result of numerous evaluations and modelling to identify the most economically feasible and environmentally friendly layout.

The proposed layout will result in increased noise levels in the area, but the noise levels will be low and is unlikely to impact on the quality of living for the surrounding receptors. In terms of acoustics, there is no benefit to the surrounding environment (closest receptors). The predicted noise impacts are low and the significance will be very low.

The project however, will greatly assist in the provision of energy, which will allow further economic growth and development in South Africa and locally. The project will generate short and long-term employment and other business opportunities and promote renewable energy in South Africa and locally. People in the area that are not directly affected by increased noise will have a positive perception of the project and will see the need and desirability of the project.

With its promise for environmental and economic advantages, wind power generation has significant potential to become a large industry in South Africa. However, when wind farms are near to potential sensitive receptors, consideration must be given to ensuring a compatible co-existence. The potential sensitive receptors should not be adversely affected and yet, at the same time, wind farms need to reach an optimal scale in terms of layout and number of units.

Wind turbines produce sound, primarily due to mechanical operations and aerodynamic effects at the blades. Modern wind turbine manufacturers have virtually eliminated the noise impact caused by mechanical sources and instituted measures to reduce the aerodynamic effects. But, as with many other activities, the wind turbines emit sound power levels at a level that can impact on areas at some distance away. When potentially sensitive receptors are nearby, care must be taken to ensure that the operations at the wind farm do not cause undue annoyance or otherwise interfere with the quality of life of the receptors.

It should be noted that this does not suggest that the sound from the wind turbines should not be audible under all circumstances, this is an unrealistic expectation that is not required or expected from any other agricultural, commercial, industrial or transportation related noise source. Rather, that the sound due to the wind turbines should be at a reasonable level in relation to the ambient sound levels.

MANAGEMENT AND MITIGATION OF NOISE IMPACT

This study uses the noise emission characteristics of the Acciona AW125 3000 wind turbine, resulting in a worst-case scenario in terms of noise emissions from the WEF being evaluated. With the input data as used, this assessment indicated that the potential noise impact from the WEF would be of a **low** significance during both the construction and operational phases (construction and operation of the Wind Turbines).

For the Powerline Corridor no notable impacts have been identified during any of the phases. No mitigation measures are thus recommended or required for either the WEF or Powerline Corridor.

RECOMMENDATIONS AND CONCLUSIONS

This study determined the significance of the potential noise impact from the construction and operation of the WEF and associated Powerline. While there is a potential noise impact due to increased traffic during the construction of the WEF, the significance is **low** and the noise impacts do not constitute a fatal flaw. With mitigation is critically required and no additional work or assessment is required or recommended.

The developer however should investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from the location where construction or operational activities are taking place.

The potential noise impact for the WEF must again be evaluated should the layout be changed where any wind turbines are located closer than 1,000 m from a confirmed NSD or if the developer decides to use a different wind turbine that has a sound power emission level higher than the Acciona WTG used in this report (sound power emission level exceeding 108.4 dBA re 1 pW).

Considering the **low** significance of the noise impacts (inclusive of cumulative impacts) for the WEF and neglible impacts for the associated Powerline , there is no reason that the proposed Kap Vley Wind Energy Facility with its associated Powerline Corridor should not be authorised.

CONTENTS OF THE SPECIALIST REPORT – CHECKLISTS

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 6 (as amended 7 April 2017)	**Cross-reference in this report**
(a) details of— the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	**Section 12**
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	*(page ix)*
(c) an indication of the scope of, and the purpose for which, the report was prepared;	**Section 1.1**
(cA) an indication of the quality and age of base data used for the specialist report;	**Section 3.2**
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	**Section 3.2 and Section 8**
(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Section 1.3 and 3.2**
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	**Section 1.4, 2.2, and 3.2**
(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	**Section 1.3, 2.3 and 3.2**
(g) an identification of any areas to be avoided, including buffers;	**Section 1.3, 2.3 and 3.2**
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	**Figure 1.1** **Buffers not required**.
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	**Section 6**
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	**Sections 7** and **Sections 8**
(k) any mitigation measures for inclusion in the EMPr;	**Sections 9.4**
(l) any conditions for inclusion in the environmental authorisation;	**Sections 9.4**
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	**Section 10**
(n) a reasoned opinion— i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	i. **Section 11** ii. **Sections 9.4**
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	No comments received
(p) any other information requested by the competent authority	N/A
2. Where a government notice gazetted by the Minister provides for any protocol of minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	N?A

This report should be sited as:

De Jager, M. (2017): "*Environmental Noise Impact Assessment for the Proposed Kap Vley Wind Energy Facility near Komaggas, Northern Cape: Summary Report*". Enviro-Acoustic Research CC, Pretoria

Client:

CSIR for	PO Box 320
juwi Renewable Energies (Pty) Ltd	Stellenbosch
	7599

Report no:

CSIR-JKVWEF/ENIA/201709-Rev 3/Short

Author:

M. de Jager *(B. Ing (Chem))*

Review:

Shaun Weinberg *(B.Sc. Applied Mathematics in Physics Stream – in process)*

Date:

March 2018

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for environmental authorization:-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

PROJECT TITLE

Kap Vley Wind Energy Facility near Kleinzee, Northern Cape Province

Specialist:	Noise		
Contact person:	Morné de Jager		
Postal address:	PO Box 2047, Garsfontein East		
Postal code:	0060	Cell:	082 565 4059
Telephone:	012 004 0362	Fax:	086 621 0292
E-mail:	morne@eares.co.za		
Professional affiliation(s) (if any)			

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, **Morné de Jager**____________________, declare that –

General declaration:

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.

M. Jager

Signature of the specialist:

Enviro Acoustic Research cc

Name of company (if applicable):

2018 – 04 - 08

Date:

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

DEA	Department of Environmental Affairs
DoE	Department of Energy
EA	Environmental Authorisation
EARES	Enviro Acoustic Research cc
EP	Equator Principles
EPFI	Equator Principles Financial Institution
FEL	Front end loader
hh	Hub height
i.e.	that is
i.t.o	in terms of
IFC	International Finance Corporation
km	kilometres (measurement of distance)
LDV	Light delivery vehicle
mamsl	Meters above mean sea level
m/s	meters per second
MW	Megawatt
NCR	Noise Control Regulations (under Section 25 of the ECA)
NSD	Noise Sensitive Development
SANS	South African National Standards (from South African Bureau of Standards)
ToR	Terms of Reference
UTM	Universal Transverse Mercator
WHO	World Health Organisation
WEF	Wind Energy Facility
WTG	Wind Turbine Generator

1 INTRODUCTION

1.1 INTRODUCTION AND PURPOSE

Enviro-Acoustic Research CC was contracted by juwi Renewable Energies (Pty) Ltd ("juwi') to conduct an Environmental Noise Impact Assessment (ENIA) to determine the potential noise impact on the surrounding environment due to the proposed development of the Kap Vley commercial Wind Energy Facility (WEF) with its associated Powerline Corridor near Komaggas in the Northern Cape Province.

This report describes ambient sound levels in the area, potential worst-case noise rating levels and the potential noise impact that the facility, may have on the surrounding environment, highlighting the methods used, potential issues identified, findings and recommendations. This report did not investigate vibrations and only briefly considers blasting.

This study considered local regulations and both local and international guidelines, using the terms of reference (ToR) as proposed by SANS 10328:2008 to allow for a comprehensive Noise Report.

1.2 BRIEF PROJECT DESCRIPTION

juwi propose the development of a commercial wind farm with its supporting powerline corridor on various properties south-west of the town of Komaggas in the Northern Cape Province.

The proposed Kap Vley WEF may have between 20 and 45 wind turbines, each with a maximum hub height (hh) of between 80 and 150 m and a rotor diameter of 100 to 160 m.

Other infrastructure associated with the proposed WEF may include:

- Internal access roads between the different wind turbines;
- A temporary contractor's camp and construction compound;
- A laydown area next to the locations of the proposed wind turbines;
- Foundations to support the wind turbines;
- One or more onsite substations;
- Cabling between the turbines, to be laid underground where practical, which will connect to one or more on-site substations;

- Site offices and a workshop area for operations and maintenance purposes.

Associated with the proposed Kap Vley WEF there will also be a powerline corridor connecting the WEF to the Gromis Substation located on the remainder of the Farm Dikgat 195 or closer to the new Eskom substation (the location still needs to be determined) via a 132 kV overhead transmission line.

Depending on the location of the substation on-site, a maximum of 40 km will be accommodated for overhead line, connecting the on-site substation to the Gromis Substation (or the new Eskom substation for which the location still needs to be determined), inside the 200m wide assessed corridor.

1.3 POTENTIAL NOISE-SENSITIVE RECEPTORS (DEVELOPMENTS) AND NO-GO AREAS

Potential sensitive receptors, also known as NSD's, located within or close to the WEF, were identified using Google Earth® (green dots, see **Figure 1-1**). This was followed with a site visit (August 2017) to confirm the status of the identified structures. The following should be noted:

- NSD01 (2 dwellings): The farmhouse is occasionally used while the smaller dwelling is accommodated by a farm employee. The farm employee stays permanently on the farm.; and
- NSDs 02 – 18: This is a number of dwellings that are occasionally (a few months a year) used by migrating sheep herders. The employee at NSD01 confirmed that the dwelling at NSD11 was occupied at the time of the site visit.

1.4 TERMS OF REFERENCE (TOR)

A noise impact assessment must be completed for the following reasons:

- If there are potential noise-sensitive receptors staying within 1,000 m from industrial activities (SANS 10328:2008);
- If there are potential noise-sensitive receptors staying within 2,000 m from any wind turbine (SANS 10328:2008);
- It is a controlled activity in terms of the NEMA regulations and a ENIA is required, because:
    - It may cause a disturbing noise that is prohibited in terms of section 18(1) of the Government Notice 579 of 2010; and
- It is generally required by the local or district authority as part of the environmental authorization or planning approval in terms of Regulation 2(d) of GN R154 of 1992.

In addition, Appendix 6 of GN 982 of December 2014 (as amended in Gov. Gaz. 40772, 7 April 2017), issued in terms of the National Environmental Management Act, No. 107 of 1998 also defines minimum information requirements for specialist reports. As such this report was drafted considering the requirements of this Appendix as well as the guidelines set by SANS 10103:2008 and SANS 10328:2008.

In addition to the above, the following ToR has been provided by the CSIR:

- Adhere to the requirements of specialist studies as outlined in Appendix 6 of the 2014 NEMA EIA Regulations, as amended;
- Assess the no-go alternative very explicitly in the impact assessment section. Please note that the DEA considers a ‘no-go’ area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads and internal cables is allowed in the ‘no-go' areas. Should your definition of the ‘no-go’ area differ from the DEA definition; this must be clearly indicated in your assessment. You are also requested to indicate the ‘no-go’ area’s buffer.
- Assess cumulative impacts by identifying other wind and solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 50 km of the proposed Kap Vley WEF project) that have been approved (i.e. positive EA has been issued) or the EIA is currently underway. In addition, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following:
- Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.
- The cumulative impacts significance rating must also inform the need and desirability of the proposed development.
- A cumulative impact environmental statement on whether the proposed development must proceed.
- Provide a detailed description of your methodology, as well as indicate the locations and descriptions of turbine positions, and all other associated infrastructures that you have assessed and are recommending for authorisations.
- Provide a detailed description of all limitations to your studies. Your specialist studies must be conducted in the appropriate season and providing that as a limitation, will not be accepted by DEA.

- Undertake a preliminary (scoping) study mainly in accordance with Section 7 of the South African National Standard (SANS) 10328:2008 ("Methods for environmental noise impact assessments in terms of NEMA"). This will include:
- Identification and description of the noise sources associated with the proposed development;
- Identification of potential noise sensitive areas or receptors that could be impacted upon by noise emanating from the proposed development;
- Estimation of the acceptable rating level of noise on identified noise sensitive areas;
- Estimation of the noise emissions from the identified noise sources and estimation of the expected rating level of noise at the identified noise sensitive areas;
- Estimation and assessment of the noise impacts on identified noise sensitive areas or receptors in accordance with SANS 10103:2008 and the National Noise Control Regulations;
- Consideration of possible alternative noise mitigation procedures;
- Determine whether the proposed development has significant acoustical implications;
- A description of the current environmental conditions from a noise perspective in sufficient detail so that there is a baseline description/status quo against which impacts can be identified and measured i.e. sensitive noise receptors etc;
- A review of detailed information relating to the project description in order to precisely define the environmental risks in terms of noise emissions;
- Identification of issues and potential impacts related to noise emissions, which are to be considered in combination with any additional relevant issues that may be raised through the PPP;
- Identification of relevant legislation and legal requirements;
- A description of the regional and local features;
- Calculation of baseline noise measurements (i.e. of the existing ambient noise (day and night time));
- Modelling of the future potential noise impacts during all phases of the proposed development taking into consideration sensitive receptors;
- Identification of buffer zones and no-go areas to inform the turbine layout (if relevant);
- Identify and assess all potential impacts (direct, indirect) of the construction, operational and decommissioning phases of the proposed development. Use the CSIR methodology to determine the significance of potential impacts;
- Assess all alternatives, including the no-go alternative;
- Assessment cumulative impacts by identifying other REFs such as wind energy facilities in the local area (i.e. within 50 km of the proposed WEF). These include projects that have been approved (i.e. positive EA has been issued), have been

constructed or projects for which an Application for Environmental Authorisation has been lodged with the Competent Authority (see Table 6.1 in Chapter 6 of this report for a list of projects);

- Provide recommended mitigation measures, management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts to be included in the EMPr;
- Provide a description of any assumptions, uncertainties, limitations and gaps in knowledge; and
- Incorporate and address issues and concerns raised during the Scoping and EIA phases where they are relevant to the specialist's area of expertise.

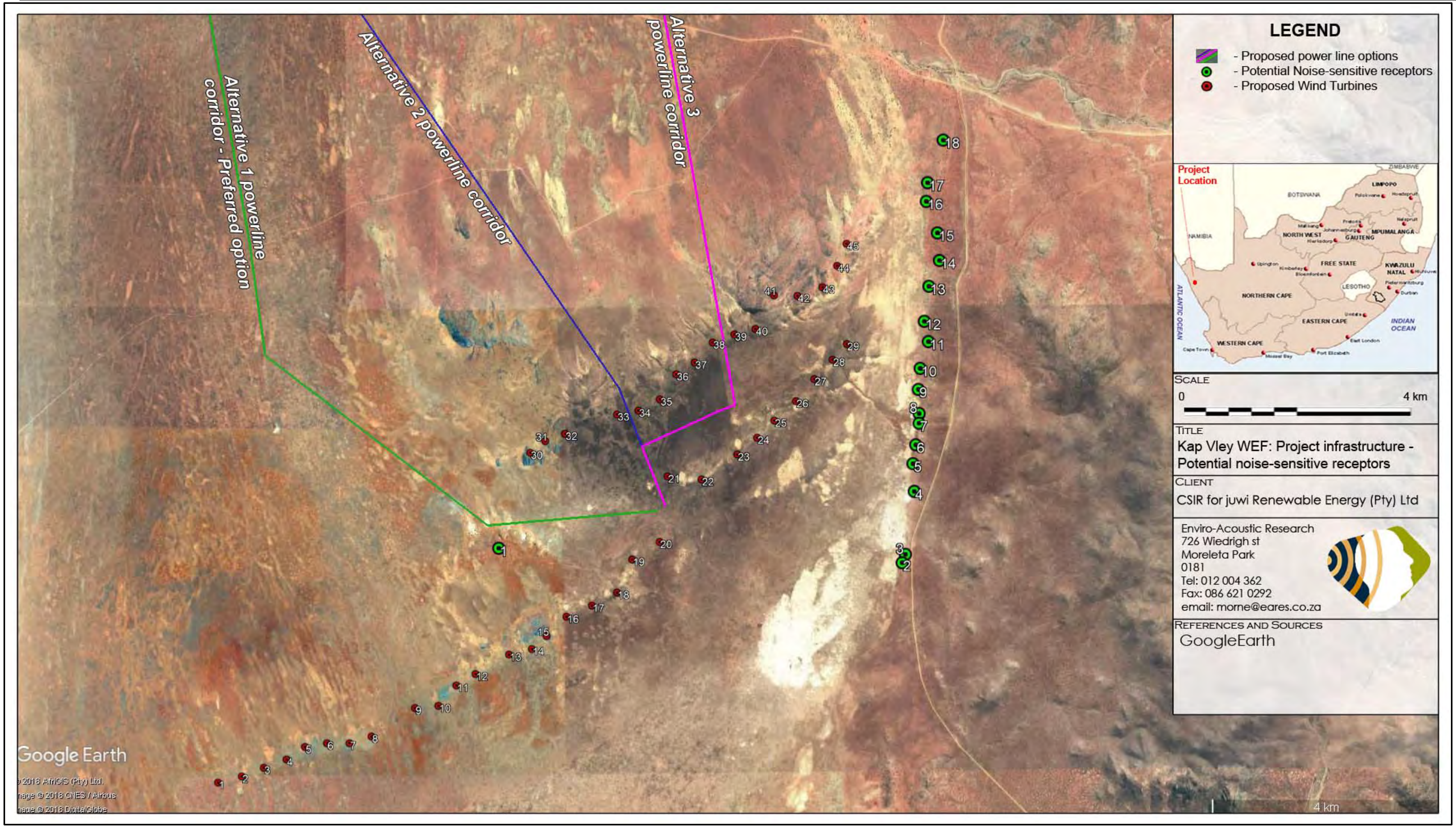


Figure 1-1: Aerial image indicating potentially noise-sensitive developments (green dots)

2 LEGAL CONTEXT, POLICIES AND GUIDELINES

2.1 THE ENVIRONMENT CONSERVATION ACT (ACT 73 OF 1989)

The Environment Conservation Act ("ECA") allows the Minister of Environmental Affairs and Tourism ("now the Ministry of Water and Environmental Affairs") to make regulations regarding noise, among other concerns. See also **section 2.1.1**.

2.1.1 Noise Control Regulations (GN R154 of 1992)

In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in *Government Gazette* No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. The National Regulations will be in effect in the Northern Cape Province.

"**disturbing noise**" as:
Noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

"**zone sound level**" as:
A derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. *This is the same as the Rating Level as defined in SANS 10103:2008.*

In terms of Regulation 4 of the Noise Control Regulations:
"No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof".

2.2 Noise Standards

There are a few South African scientific standards (SABS) relevant to noise from mines, industry and roads. They are:

- SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004. 'Calculating and predicting road traffic noise';
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful *per se.*

2.3 International Guidelines

While a number of international guidelines and standards exist, those selected below are used by numerous countries for environmental noise management.

2.3.1 Guidelines for Community Noise (WHO, 1999)

The World Health Organization's (WHO) document on the *Guidelines for Community Noise* is the outcome of the WHO- expert task force meeting held in London, United Kingdom, in April 1999. It is based on the document entitled "Community Noise" that was prepared for the WHO and published in 1995 by the Stockholm University and Karolinska Institute.

The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments.

Guidance on the health effects of noise exposure of the population has already been given in an early publication of the series of Environmental Health Criteria. The health risk to humans from exposure to environmental noise was evaluated and guidelines values derived. The issue of noise control and health protection was briefly addressed.

The document uses the L_{Aeq} and L_{AMax} noise descriptors to define noise levels. It should be noted that a follow-up document focusing on Night-time Noise Guidelines for Europe (WHO, 2009) was published.

2.3.2 The Assessment and Rating of Noise from Wind Farms (ETSU, 1997)

This report describes the findings of a Working Group on Wind Turbine Noise, facilitated by the United Kingdom Department of Trade and Industry. It was developed as an Energy Technology Support Unit [1] (ETSU) project. The aim of the project was to provide information and advice to developers and planners on noise from wind turbines. The report represents the consensus view of a number of experts (experienced in assessing and controlling the environmental impact of noise from wind farms). Their findings can be summarised as follow:

1. Absolute noise limits applied at all wind speeds are not suited to wind farms; limits set relative to the background noise (including wind as seen in **Figure 5-2**) are more appropriate;
2. $L_{A90,10mins}$ is a much more accurate descriptor when monitoring ambient and turbine noise levels;
3. The effects of other wind turbines in a given area should be added to the effect of any proposed wind energy facility, to calculate the cumulative effect;
4. Noise from a wind energy facility should be restricted to no more than 5 dBA above the current ambient noise level at a NSD. Ambient noise levels are measured onsite in terms of the $L_{A90,10min}$ descriptor for a period sufficiently long enough for a set period;
5. Wind farms should be limited to within the range of 35 dBA to 40 dBA (day-time) in a low noise environment. A fixed limit of 43 dBA should be implemented during all night time noise environments. This should increase to 45 dBA (day and night) if the NSD has financial investments in the wind energy facility; and
6. A penalty system should be implemented for wind turbine/s that operates with a tonal characteristic.

This is likely the guideline used in the most international countries to estimate the potential noise impact stemming from the operation of a Wind Energy Facility. It also recommends an improved methodology (compared to a fixed upper noise level) on

[1] ETSU was set up in 1974 as an agency by the United Kingdom Atomic Energy Authority to manage research programmes on renewable energy and energy conservation. The majority of projects managed by ETSU were carried out by external organizations in academia and industry. In 1996, ETSU became part of AEA Technology plc which was separated from the UKAEA by privatisation.

determining ambient sound levels in periods of higher wind speeds, critical for the development of a wind energy facility. Because of its international importance, the methodologies used in the ETSU R97 document will be considered.

The document uses the $L_{Aeq,f}$ and L_{A90} descriptors to define noise levels using the "Fast"-time weighting.

2.3.3 Noise Guidelines for Wind Farms (MoE, 2008)

This document establishes the sound level limits for land-based wind energy generating facilities and describes the information required for noise assessments and submissions under the Environmental Assessment Act and the Environmental Protection Act, Canada.

The document defines:

- Sound Level Limits for different areas (similar to rural and urban areas), defining limits for different wind speeds at 10 m height, refer also **Table 2-1**[2]
- The Noise Assessment Report, including;
    - Information that must be part of the report
    - Full description of noise sources
    - Adjustments, such as due to the wind speed profile (wind shear)
    - The identification and defining of potential sensitive receptors
    - Prediction methods to be used (ISO 9613-2)
    - Cumulative impact assessment requirements
    - It also defines specific model input parameters
    - Methods on how the results must be presented
    - Assessment of Compliance (defining magnitude of noise levels)

Table 2-1: Summary of Sound Level Limits for Wind Farms (MoE)

Wind speed (m/s) at 10 m height	4	5	6	7	8	9	10
Wind Turbine Sound Level Limits, Class 3 Area, dBA	40	40	40	43	45	49	51
Wind Turbine Sound Level Limits, Class 1 & 2 Areas, dBA	45	45	45	45	45	49	51

The document used the $L_{Aeq,1hr}$ noise descriptor to define noise levels. It is not clear whether the instrument must be set to the "Fast" or "Impulse" time weighing setting, but, as the "Fast" setting is used in most international countries it is assumed that the instrument will be set to the "Fast" setting.

[2]The measurement of wind induced background sound level is not required to establish the applicable limit. The wind induced background sound level reference curve was determined by correlating the A-weighted ninetieth percentile sound level (L90) with the average wind speed measured at a particularly quiet site. The applicable Leq sound level limits at higher wind speeds are given by adding 7 dB to the wind induced background L90 sound level reference values

It should be noted that these Sound Level Limits are included for the reader to illustrate the criteria used internationally. Due to the lack of local regulations specifically relevant to wind energy facilities this criteria will also be considered during the determination of the significance of the noise impact.

2.3.4 Equator Principles

The **Equator Principles** (EPs) are a voluntary set of standards for determining, assessing and managing social and environmental risk in project financing. Equator Principles Financial Institutions (EPFIs) commit to not providing loans to projects where the borrower will not or is unable to comply with their respective social and environmental policies and procedures that implement the EPs.

The Equator Principles were developed by private sector banks and were launched in June 2003. Revision III of the EPs has been in place since June 2013. The participating banks chose to model the Equator Principles on the environmental standards of the World Bank (1999) and the social policies of the International Finance Corporation (IFC). Eighty-three financial institutions (2016) have adopted the Equator Principles, which have become the de facto standard for banks and investors on how to assess major development projects around the world.

The environmental standards of the World Bank have been integrated into the social policies of the IFC since April 2007 as the International Finance Corporation Environmental, Health and Safety (EHS) Guidelines.

3 CURRENT ENVIRONMENTAL SOUND CHARACTER

3.1 INFLUENCE OF WIND ON NOISE LIMITS

Current local regulations and standards do not consider changing ambient (background) sound levels due to natural events such as can be found near the coast or areas where wind-induced noise are prevalent. This is unfeasible with wind energy facilities as these facilities will only operate when the wind is blowing. It is therefore important that the contribution of wind-induced noise be considered when determining the potential noise impact from such a facility. Care should be taken when taking this approach due to other factors that complicate noise propagation from wind turbines.

While the total ambient sound levels are of importance, the spectral characteristics also determine the likelihood that someone will hear external noise that may or may not be similar in spectral characteristics to that of the vegetation that created the noise. Bolin (2006) investigated spectral characteristics and determined that annoyance might occur at levels where noise generated by wind turbine noise exceeds natural ambient sounds with 3 dB or more.

Low frequency noise can also be associated with some wind turbines. Separating the potential low frequency noise from wind turbines from that generated by natural sources as well as other anthropogenic sources can and will be a challenge.

There are a number of factors that determine how ambient sound levels close to a dwelling (or the low-frequency noise levels inside the house) might differ from the ambient sound levels further away (or even at another dwelling in the area), including:

- Type of activities taking place in the vicinity of the dwelling;
- Equipment being used near the dwelling, especially equipment such as water pumps, compressors and air conditioners;
- Whether there are any windmills (*"windpompe"*) close to the dwelling as well as their general maintenance condition;
- Type of trees around dwelling (conifers vs. broad-leaved trees, habitat that it provides to birds, food that it may provide to birds);
- The number, type and distance between the dwelling (measuring point) and trees. This is especially relevant when the trees are directly against the house (where the branches can touch the roof);
- Distance to large infrastructural developments, including roads, railroads and even large diameter pipelines;

- Distances to other noise sources, whether anthropogenic or natural (such as the ocean or running water);
- The material used in the construction of the dwelling;
- The design of the building, including layout and number of openings;
- How well the dwelling is maintained; and
- The type and number of farm animals in the vicinity of the dwelling.

3.2 AMBIENT SOUND MEASUREMENTS

The measurement locations are illustrated in **Figure 3-1** as blue squares.

Because wind induced noise are a significant source of noise during periods when wind turbines operate, it cannot be excluded. It however, complicates ambient sound measurements, as a few singular measurements will provide insufficient data to allow any confidence in the subsequent information obtained. As a result ambient sound measurements were collected over a period of two night-time periods to ensure sufficient sound level measurement data. This data can then be analysed with the wind speed data that will provide a sound level versus wind speed curve as illustrated in **Figure 5-2**.

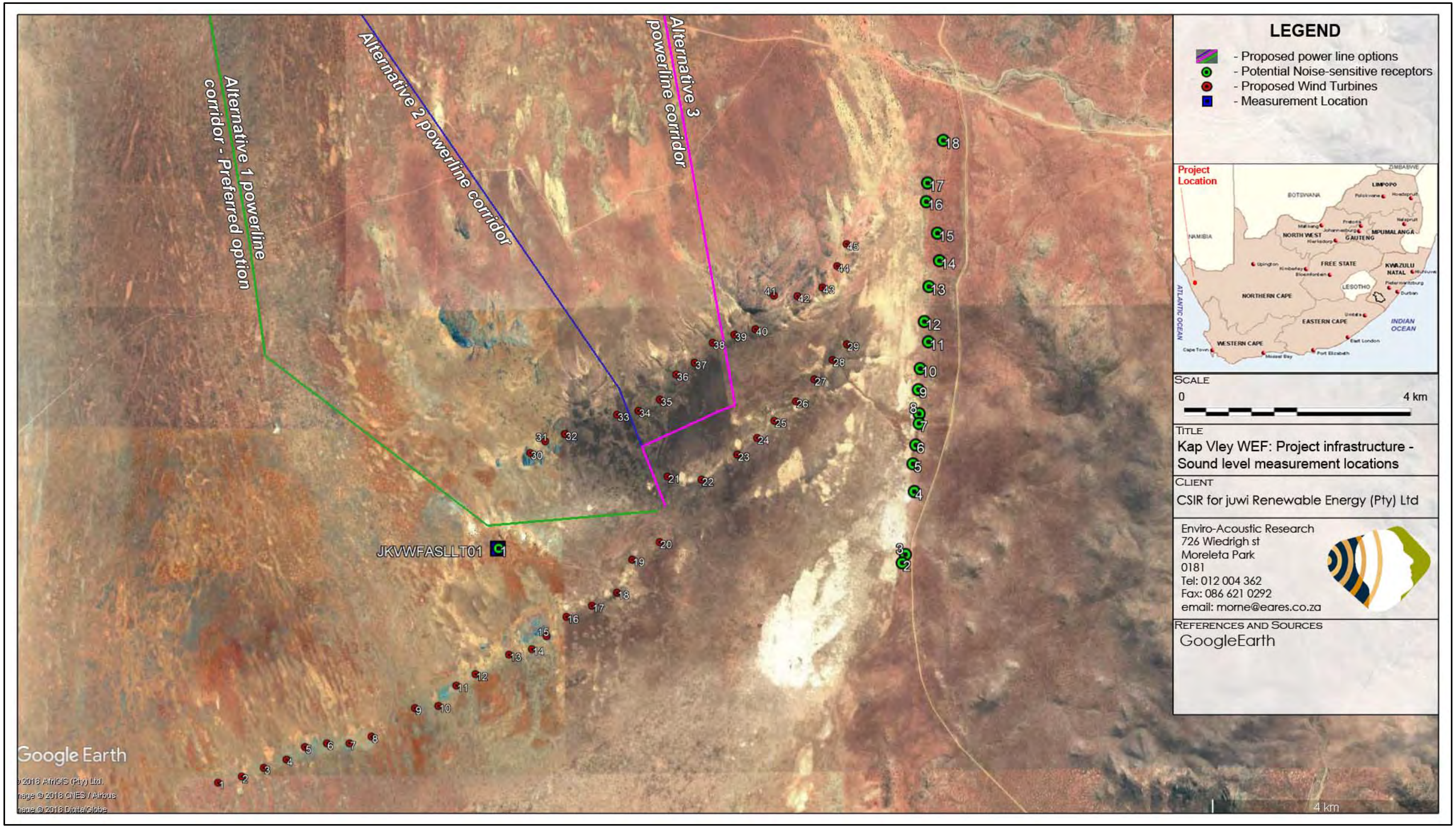


Figure 3-1: Localities where ambient sound levels were measured (green dots -potential noise-sensitive receptors)

3.2.1 Measurement location JKVWFASLLT01

The measurement location was located in front of the main dwelling of the farm. The dwelling is only used on occasion, with an employee living in a second dwelling around 50m from the microphone. There were a number of chickens around his dwelling, but they were generally not audible. It was reported that the sheep stay close to the dwelling at night. The equipment defined in **Table 3-1** was used for gathering data. Measured sound levels are presented in **Figure 3-2** and **Figure 3-3** and described in **Table 3-2**. It should be noted that the wind speed data is from a wind mast on the hill and not at the house. Wind speeds at the house would be significantly less than the wind speeds on the top of the hill.

Table 3-1: Equipment used to measure sound levels at JKVWFASLLT01

Equipment	Model	Serial no	Calibration Date
SLM	Svan 977	34849	June 2016
Microphone	ACO Pacific 7052E	55974	June 2016
Calibrator	Quest CA-22	J 2080094	July 2017

* Microphone fitted with the RION WS-03 outdoor all-weather windshield.

Sounds heard during the period the instrument was deployed and collected (approximately 60 – 80 minutes) are defined in **Table 3-2**.

Table 3-2: Noise/sounds heard during site visits at receptor JKVWFASLLT01

		During Deployment	During Collection
Magnitude Scale Code: • Barely Audible • Audible • Dominating or clearly audible	Faunal and natural	Wind induced noise at times and birds dominating.	Birds dominating. Sheep bleating in area.
	Residential	Dog barking for a while at arrival, but reported that dog is normally quiet. Radio playing but employee said that he will turn it down.	Dog barking for a short while.
	Industrial & transportation	Nothing	Nothing

Impulse equivalent sound levels (South African legislation): Figure 3-2 illustrates how the impulse-weighted 10-minute equivalent values change over time with **Table 3-3** defining the average values for the time period. This sound descriptor is mainly used in South Africa to define sound and noise levels. The instrument is set to measure the impulse time-weighted sound levels.

Fast equivalent sound levels (International guidelines): Fast-weighted 10-minute equivalent (average) sound levels for the day and night-time periods are shown on **Figure 3-2** with **Table 3-3** defining the average values for the time period. Fast-weighted equivalent sound levels are included in this report as this is the sound descriptor used in most international countries to define the Ambient Sound Level.

Statistical sound levels ($L_{A90,f}$): The L_{A90} level is presented in this report as it is used to define the "background ambient sound level", or the sound level that can be expected if there were little single events (loud transient noise) that impact on the average sound level. L_{A90} is a statistical indicator that describes the noise level that is exceeded 90% of the time and frequently used to define the background sound level internationally. The instrument is set to fast time-weighting. It is illustrated against time on **Figure 3-3** and defined in **Table 3-3**.

Measured maximum and minimum sound levels: These are statistical sound descriptors that can be used to characterise the sound levels in an area along with the other sound descriptors. These sound level descriptors are defined in **Table 3-3** and illustrated in **Figure 3-3**.

Table 3-3: Sound levels considering various sound level descriptors at JKVWFASLLT01

	$L_{Amax,i}$ (dBA)	$L_{Aeq,i}$ (dBA)	$L_{Aeq,f}$ (dBA)	$L_{A90,f}$ (dBA90)	$L_{Amin,f}$ (dBA)	Comments
Day arithmetic average	-	40	35	24	-	-
Night arithmetic average	-	27	25	20	-	-
Day minimum	-	17	18	-	16	-
Day maximum	78	56	48	-	-	-
Night minimum	-	16	18	-	15	-
Night maximum	68	43	38	-	-	-
Day 1 equivalent	-	39	34	-	-	Late afternoon and evening only
Night 1 Equivalent	-	33	30	-	-	8 hour night equivalent average
Day 2 equivalent	-	46	40	-	-	16 hour day equivalent average
Night 2 Equivalent	-	31	27	-	-	8 hour night equivalent average
Day 3 equivalent	-	48	41	-	-	Early morning only

The data indicate a very quiet area with mainly sounds of natural origin dominating. It should be noted that the employee switched off the radio during the measurement. The sound from the radio was only audible during very quiet periods at the microphone (lull in both winds and bird calls).

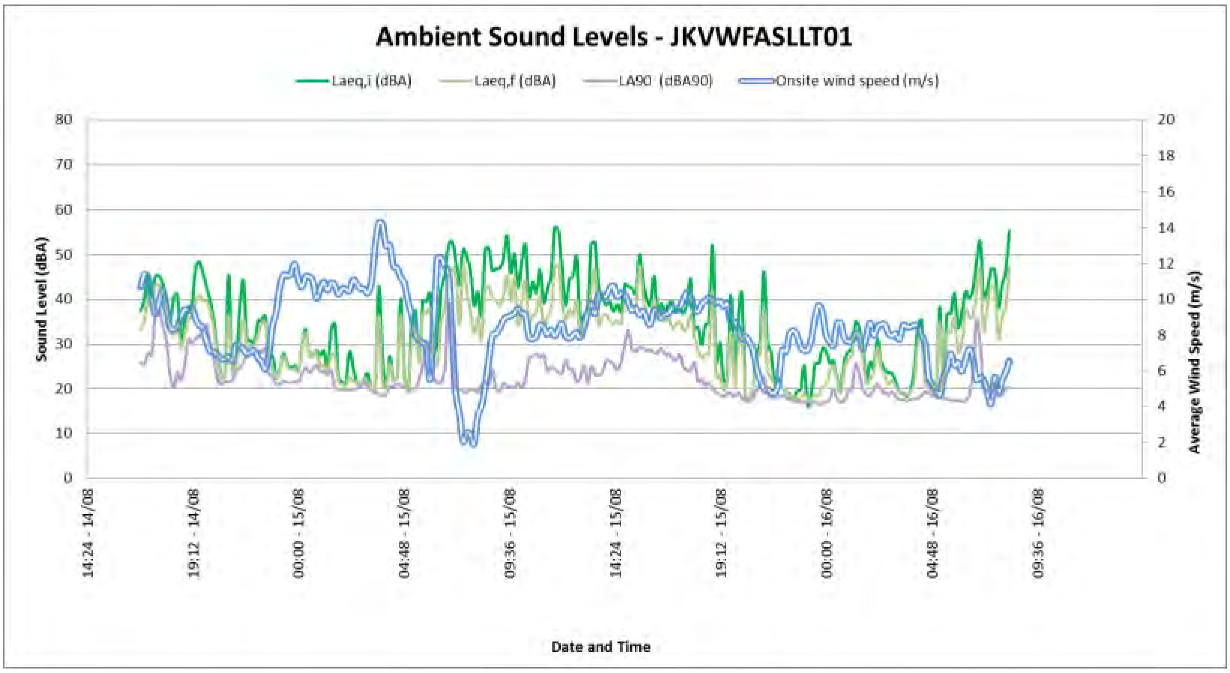


Figure 3-2: Ambient Sound Levels at JKVWFASLLT01

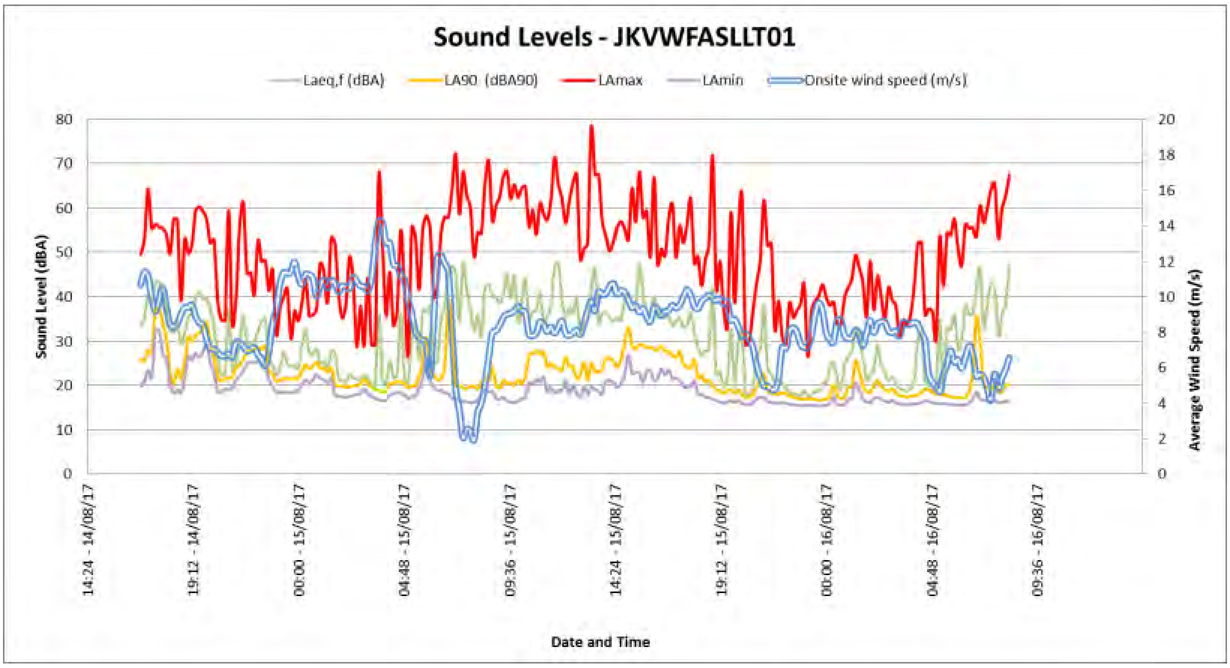


Figure 3-3: Maximum, minimum and statistical values at JKVWFASLLT01

4 POTENTIAL NOISE SOURCES

Increased noise levels are directly linked with the various activities associated with the construction of the WEF and related infrastructure, as well as the operational phase of the WEF. The most significant stage relating to noise is generally the operational phase, and not the construction phase. This normally is due to the relatively short duration of construction activities.

4.1 POTENTIAL NOISE SOURCES: CONSTRUCTION PHASE

4.1.1 Construction equipment

It is estimated that construction will take approximately 18 - 24 months subject to the final design of the WEF, weather and ground conditions, including time for testing and commissioning. There are numerous activities that can take place simultaneously during the construction phase, such as:

- Site survey and preparation;
- Site clearing (for the WEF components as well as for the associated powerline corridor)
- Transport of components & equipment to site;
- Establishment of site entrance, internal access roads, contractors compound and passing places;
- Establishment of laydown & hard standing areas;
- Civil works to sections of the public roads to facilitate with turbine delivery;
- Site preparation activities;
- Construct turbine foundations;
- Erecting the wind turbines;
- Establishment of ancillary infrastructure;
- Construct powerline foundations; and
- Site rehabilitation.

There are a number of factors that determine the audibility as well as the potential of a noise impact on receptors. Maximum noise generated can be audible over a large distance; however, it is generally of very short duration.

Average or equivalent sound levels is another factor that impacts on the ambient sound levels and is the constant sound level that the receptor can experience. Typical sound power levels associated with various activities that may be found at a construction site are presented **Table 4-1**.

Table 4-1: Potential equivalent noise levels generated by various equipment

Equipment Description	Equivalent (average) Sound Levels (dBA)	Operational Noise Level at given distance considering equivalent (average) sound power emission levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
		5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Bulldozer CAT D10	111.9	86.9	80.9	74.9	66.9	60.9	57.4	54.9	51.3	46.9	43.4	40.9	34.9
Bulldozer CAT D11	113.3	88.4	82.3	76.3	68.4	62.3	58.8	56.3	52.8	48.4	44.8	42.3	36.3
Bulldozer CAT D9	111.9	86.9	80.9	74.9	66.9	60.9	57.4	54.9	51.3	46.9	43.4	40.9	34.9
Bulldozer CAT D6	108.2	83.3	77.3	71.2	63.3	57.3	53.7	51.2	47.7	43.3	39.8	37.3	31.2
Bulldozer CAT D5	107.4	82.4	76.4	70.4	62.4	56.4	52.9	50.4	46.9	42.4	38.9	36.4	30.4
Bulldozer Komatsu 375	114.0	89.0	83.0	77.0	69.0	63.0	59.5	57.0	53.4	49.0	45.5	43.0	37.0
Bulldozer Komatsu 65	109.5	84.5	78.5	72.4	64.5	58.5	54.9	52.4	48.9	44.5	41.0	38.5	32.4
Diesel Generator (Large - mobile)	106.1	81.2	75.1	69.1	61.2	55.1	51.6	49.1	45.6	41.2	37.6	35.1	29.1
Dumper/Haul truck - CAT 700	115.9	91.0	85.0	78.9	71.0	65.0	61.4	58.9	55.4	51.0	47.5	45.0	38.9
Dumper/Haul truck - Terex 30 ton	112.2	87.2	81.2	75.2	67.2	61.2	57.7	55.2	51.7	47.2	43.7	41.2	35.2
Dumper/Haul truck - Bell 25 ton (B25D)	108.4	83.5	77.5	71.4	63.5	57.5	53.9	51.4	47.9	43.5	40.0	37.5	31.4
Excavator - Cat 416D	103.9	78.9	72.9	66.8	58.9	52.9	49.3	46.8	43.3	38.9	35.4	32.9	26.8
Excavator - Hitachi EX1200	113.1	88.1	82.1	76.1	68.1	62.1	58.6	56.1	52.6	48.1	44.6	42.1	36.1
Excavator - Hitachi 870 (80 t)	108.1	83.1	77.1	71.1	63.1	57.1	53.6	51.1	47.5	43.1	39.6	37.1	31.1
Excavator - Hitachi 270 (30 t)	104.5	79.6	73.5	67.5	59.6	53.5	50.0	47.5	44.0	39.6	36.0	33.5	27.5
FEL - CAT 950G	102.1	77.2	71.2	65.1	57.2	51.2	47.6	45.1	41.6	37.2	33.7	31.2	25.1
FEL - Komatsu WA380	100.7	75.7	69.7	63.7	55.7	49.7	46.2	43.7	40.1	35.7	32.2	29.7	23.7
General noise	108.8	83.8	77.8	71.8	63.8	57.8	54.2	51.8	48.2	43.8	40.3	37.8	31.8
Grader - Operational Hitachi	108.9	83.9	77.9	71.9	63.9	57.9	54.4	51.9	48.4	43.9	40.4	37.9	31.9
Grader	110.9	85.9	79.9	73.9	65.9	59.9	56.4	53.9	50.3	45.9	42.4	39.9	33.9
JBL TLB	108.8	83.8	77.8	71.8	63.8	57.8	54.3	51.8	48.3	43.8	40.3	37.8	31.8
Road Transport Reversing/Idling	108.2	83.3	77.2	71.2	63.3	57.2	53.7	51.2	47.7	43.3	39.7	37.2	31.2
Road Truck average	109.6	84.7	78.7	72.6	64.7	58.7	55.1	52.6	49.1	44.7	41.1	38.7	32.6
Vibrating roller	106.3	81.3	75.3	69.3	61.3	55.3	51.8	49.3	45.8	41.3	37.8	35.3	29.3
Water Dozer, CAT	113.8	88.8	82.8	76.8	68.8	62.8	59.3	56.8	53.3	48.8	45.3	42.8	36.8

4.2 Potential Noise Sources: Operational Phase

The operational life of the wind turbine facility is expected to be approximately 20 years which could be extended through regular maintenance and/or upgrades in technology. During the operational phase of the WEF, the majority of the WEF turbine sites will continue with its current agricultural use. The only development related activities on-site will be routine servicing and unscheduled maintenance. The noise impact from maintenance activities is insignificant, with the main noise source being the wind turbine blades and the nacelle (components inside).

Noise emitted by wind turbines can be divided in two types of noise sources. Firstly, aerodynamic sources, due to the passage of air over the wind turbine blades. Secondly, mechanical sources that are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. These sources generally have different characteristics and can be considered separately. In addition there are other lesser noise sources, such as the substations themselves, traffic (maintenance), as well as transmission line noise.

5 NOISE IMPACT AND SIGNIFICANCE

5.1 WHY NOISE CONCERNS COMMUNITIES[3]

Noise can be defined as "unwanted sound", and an audible acoustic energy that adversely affects the physiological and/or psychological well-being of people, or which disturbs or impairs the convenience or peace of any person. One can generalise by saying that sound becomes unwanted when it:

- Hinders speech communication;
- Impedes the thinking process;
- Interferes with concentration;
- Obstructs activities (work, leisure and sleeping); and
- Presents a health risk due to hearing damage.

Severity of the annoyance depends on factors such as:

- Background sound levels, and the background sound levels the receptor are used to;
- The manner in which the receptor can control the noise (helplessness);
- The time, unpredictability, frequency distribution, duration, and intensity of the noise;
- The physiological state of the receptor; and
- The attitude of the receptor about the emitter (noise source).

5.2 IMPACT ASSESSMENT CRITERIA

5.2.1 Noise criteria of concern

The criteria used in this report were drawn from the criteria for the description and assessment of environmental impacts considering the latest EIA Regulations and DEAT (2002) guideline, SANS 10103:2008 as well as guidelines from the World Health Organization.

There are a number of criteria that are of concern for the assessment of noise impacts. These can be summarised in the following manner:

- *Increase in noise levels:* People or communities often react to an increase in the ambient noise level they are used to, which is caused by a new source of noise. With regards to the Noise Control Regulations (promulgated in terms of the ECA), an increase of more than 7 dBA is considered a disturbing noise. See also **Figure 5-1**.

[3]World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

- *Zone Sound Levels:* Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 5-1**.
- *Absolute or total noise levels:* Depending on their activities, people generally are tolerant to noise up to a certain absolute level, e.g. 65 dBA. Anything above this level will be considered unacceptable.

In South Africa, the document that addresses the issues concerning environmental noise is SANS 10103:2008 (See also **Table 5-1**). It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed.

While acoustical measurements indicated an area where the ambient sound levels are slightly higher than typically associated for a rural area, the potential noise impact will be evaluated in terms of (i.t.o.) the rural acceptable rating level as well as the IFC noise-limits as defined below:

- "Rural Noise Districts" (45 and 35 dBA day/night-time Rating i.t.o. SANS 10103:2008); and
- "Equator principles" (55 and 45 dBA day/night-time limits i.t.o. IFC Noise Limits).

SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If Δ is the increase in sound level, the following criteria are of relevance (see also **Figure 5-1**):

- **Δ ≤ 3 dBA:** An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level would not be noticeable.
- **3 < Δ ≤ 5 dBA:** An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area.
- **5 < Δ ≤ 15 dBA:** An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'.

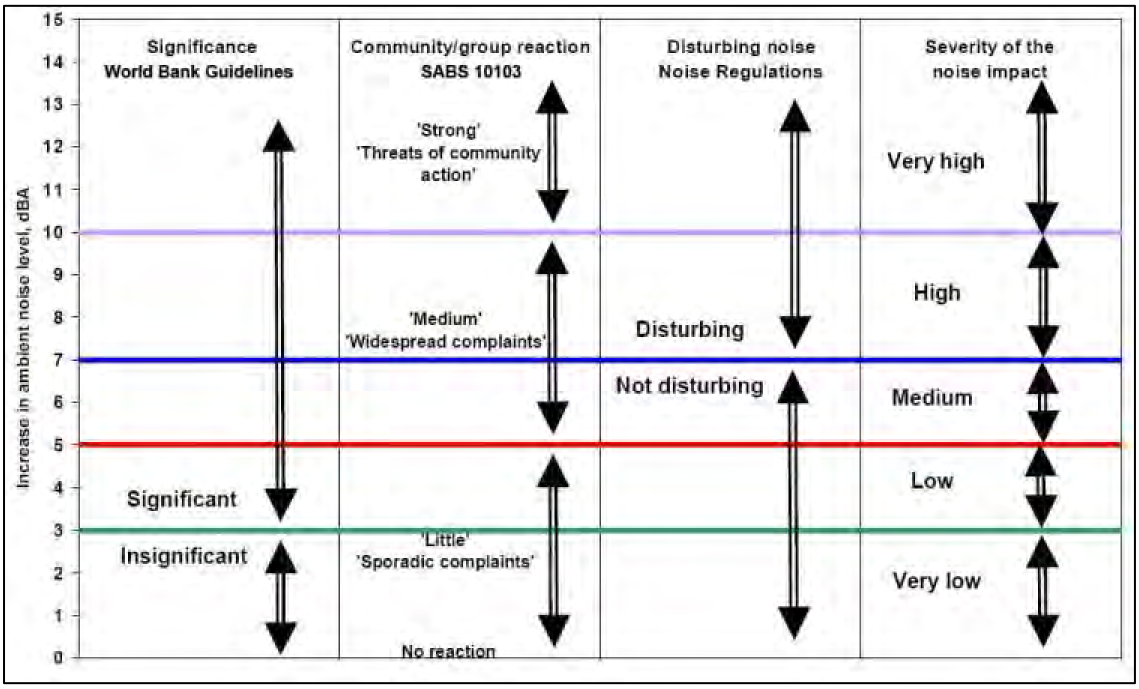


Figure 5-1: Criteria to assess the significance of impacts stemming from noise

Table 5-1: Acceptable Zone Sound Levels for noise in districts (SANS 10103:2008)

1	2	3	4	5	6	7
Type of district	**Equivalent continuous rating level ($L_{Req.T}$) for noise** dBA					
	Outdoors			**Indoors, with open windows**		
	Day/night $L_{R,dn}$ [a]	**Daytime** $L_{Req,d}$ [b]	**Night-time** $L_{Req,n}$ [b]	**Day/night** $L_{R,dn}$ [a]	**Daytime** $L_{Req,d}$ [b]	**Night-time** $L_{Req,n}$ [b]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

Note that an increase of more than 7 dBA is defined as a disturbing noise and prohibited (National and Provincial Noise Control Regulations).

5.2.2 Determining appropriate Zone Sound Levels

SANS 10103:2008 does not cater for instances when background ambient sound levels change due to the impact of external forces. Locations close (closer than 500 meters from coastline) from the sea for instance always have an ambient sound level exceeding 35 dBA, and, in cases where the sea is rather turbulent, it can easily exceed 45 dBA. Similarly, noise induced by high winds is not considered in the SANS standard.

Setting noise limits relative to the ambient sound level is relatively straightforward when the prevailing ambient sound level and source level are constant. However, wind turbines only start to operate when wind speeds exceed 3 m/s. Noise emissions therefore relate to the wind speed and similarly, the environment in which they are heard also depends upon the strength of the wind and the noise associated with its effects. It is therefore necessary to derive an ambient sound level that is indicative of the noise environment at the receiving property for different wind speeds so that the turbine noise level at any particular wind speed can be compared with the ambient sound level in the same wind conditions.

5.2.2.1 Using International Guidelines to set Noise Limits

When assessing the overall noise levels emitted by a Wind Energy Facility, it is necessary to consider the full range of operating wind speeds of the wind turbines. This covers the wind speed range from around 3-5 m/s (the turbine cut-in wind speed) up to a wind speed range of 25-35 m/s measured at the hub height of a wind turbine. However, ETSU-R97 (1996) proposes that noise limits only be placed up to a wind speed of 12 m/s for the following reasons:

1. Wind speeds are not often measured at wind speeds greater than 12 m/s at 10 m height;
2. Reliable measurements of background ambient sound levels and turbine noise will be difficult to make in high winds due to the effects of wind noise on the microphone and the fact that one could have to wait several months before such winds were experienced;
3. Turbine manufacturers are unlikely to be able to provide information on sound power levels at such high wind speeds for similar reasons; and
4. If a wind farm meets noise limits at wind speeds lower than 12m/s, it is most unlikely to cause any greater loss of amenity at higher wind speeds. Turbine noise levels increase only slightly as wind speeds increase; however, background ambient sound levels increase significantly with increasing wind speeds due to the force of the wind.

Ambient sound vs. wind speed data is presented in **Figure 5-2**[4]. This is a quiet (as per the opinion of the author) location[5] where there were no apparent or observable sounds

[4] The sound level measuring instruments were located at a quiet location in the garden of the various houses. Data was measured in 10-minute bins and then co-ordinated with the 10 m wind speed derived from the wind mast of the developer. This wind mast normally was not close to the dwelling, at times being further than 5,000

that would have impacted on the measurements, presenting the A-Weighted sound levels at an inland area. The figures clearly indicate a trend where sound levels increase if the wind speed increases. This has been found at all locations where measurements have been done for a sufficiently long enough period of time (more than 30 locations – more than 38,000 measurements).

It should be noted that there are few sheep in the area due to the drought and the receptor at NSD01 confirmed that the dwellings in the area (NSD02 – NSD18) are mainly used during summer periods when field conditions are ideal for feeding sheep. These sheep are frequently gathered in pens close to these dwellings at night to protect them from caracal and other predators. The proximity of the sheep to the dwellings would also raise ambient sound levels.

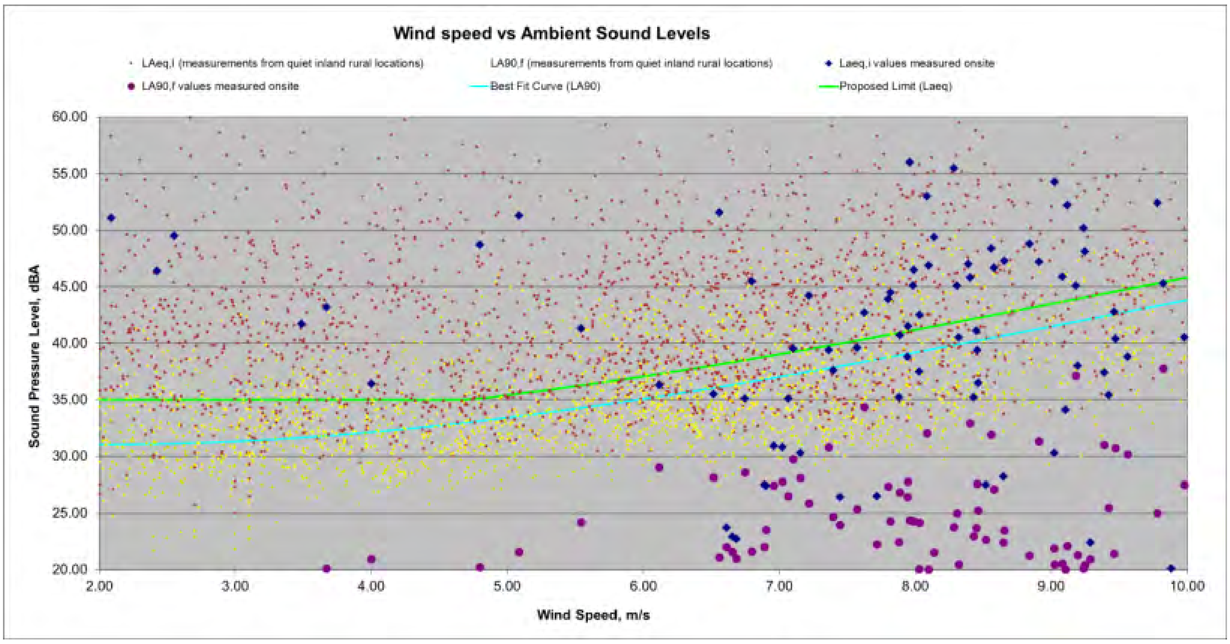


Figure 5-2: Ambient sound levels – quiet inland location (A-Weighted)

Considering this data as well as the international guidelines, noise limits starting at 40 dB that increase to more than 45 dB (as wind speeds increase) are acceptable. In addition, project participants could be exposed to noise levels up to 45 dBA (ETSU-R97) at lower wind speeds.

5.2.2.2 Using local regulations to set noise limits

Noise limits as set by the National Noise Control Regulations (GN R154 of 1992 - **section 2.1.1**) defines a "**disturbing noise**" as the noise that —

meters from the measurement location. It is possible that the wind may be blowing at the location of the wind mast with no wind at the measurement location, resulting in low sound levels recorded.

[5] Different area where longer measurements were collected.

- exceeds the rating level by 7 dBA;
- exceeds the residual noise level (where the residual noise level is higher than the rating level); or
- in the case of a low-frequency noise, exceeds the level specified in Annex B of SANS 10103;

Accepting that the area is a rural district, night-time rating levels would be 35 dBA and a noise level exceeding 42 dBA could be a disturbing noise (therefore the noise limit). The daytime rating level is 45 dBA (52 dBA for a disturbing noise).

Considering Figure 5-2 it should be noted that ambient sound was very low in the area during the period that winds were blowing (and the wind turbines will be operational). These low ambient sound levels will increase the probability of a potential noise impact which was considered in the impact assessment phase.

5.2.3 Determining the Significance of the Noise Impact

The level of detail as depicted in the EIA regulations was fine-tuned by assigning specific values to each impact while considering the DEAT (2002) guideline. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value as defined in the third column in the tables below.

The impact consequence is determined by summing the scores of Magnitude (**Table 5-2**), Duration (**Table 5-3**), Spatial Extent (**Table 5-4**), Reversibility (**Table 5-5**) and the Irreplaceability of the Resource (**Table 5-6**). An explanation of the impact assessment criteria is defined in the following tables.

Table 5-2: Impact Assessment Criteria - Magnitude

This defines the impact as experienced by any receptor. In this report the receptor is defined as any resident in the area, but excludes faunal species.		
Rating	**Description**	**Score**
Low	Increase in average ambient sound levels less than 3 dB from the expected wind induced ambient sound level. No change in ambient sound levels discernible. Total projected noise level is less than the Zone Sound Level in wind-still conditions.	1
Medium	Increase in average sound pressure levels between 3 and 5 dB from the (expected) wind induced ambient sound level. The change is barely discernible, but the noise source might become audible.	2
High	Increase in average sound pressure levels between 5 and 7 dB from the (expected) wind induced ambient sound level. Sporadic complaints expected. Any point where the zone sound levels are exceeded during wind still conditions.	3

Very High	Increase in average sound pressure levels higher than 7 dB from the (expected) wind induced ambient sound level. This can be considered as a disturbing noise level. Medium to widespread complaints expected.	4

Table 5-3: Impact Assessment Criteria - Duration

The lifetime of the impact that is measured in relation to the lifetime of the proposed development (construction, operational and closure phases).		
Rating	**Description**	**Score**
Short	Impacts are predicted to be of short duration (portion of construction period) and intermittent/occasional (less than a year).	1
Medium term	Impacts that are predicted to last only for the duration of the construction period (1 – 2years).	2
Long term	Impacts that will continue for the life of the Project, but ceases when the Project stops operating.	3
Permanent	Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	4

Table 5-4: Impact Assessment Criteria – Spatial extent

Classification of the physical and spatial scale of the impact		
Rating	**Description**	**Score**
Site	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
Local	The impact could affect the local area (within 1,000 m from site).	2
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.	3
National / International	The impact could have an effect that expands throughout the country (South Africa) and further.	4

Table 5-5: Impact Assessment Criteria - Reversibility

The reversibility of the potential impact.		
Rating	**Description**	**Score**
High	High reversibility of impacts (impact is highly reversible at end of project life, i.e. this is the most favourable assessment for the environment. For example, the nuisance factor caused by noise impacts associated with the operational phase of an exporting terminal can be considered to be highly reversible at the end of the project life)	1
Moderate	Moderate reversibility of impacts	2
Low	Low reversibility of impacts	3
Non-reversible	Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment. The impact is permanent. For example, the loss of a paleontological resource on the site caused by building foundations could be non-reversible)	4

Table 5-6: Impact Assessment Criteria – Loss of Resources

Irreplaceability of resource loss caused by impacts		
Rating	**Description**	**Score**
High	High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment. For example, if the project will destroy unique wetland systems, these may be irreplaceable)	4
Moderate	Moderate irreplaceability of resources	3
Low	Low irreplaceability of resources	2

Replaceable	Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment)	1

This information is used to calculate the Consequence to define the anticipated severity of the impact (**Table 5-7**).

Table 5-7: Impact Assessment Criteria – Consequence

Consequence of environmental impact		
Rating	**Description**	**Score**
Extreme	Extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease	16<
Severe	Severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease	12 < 16
Substantial	Substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease	8 < 12
Moderate	Notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner	4 < 8
Slight	Negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected	< 4

The impact significance (see **section 5.2.4**) is determined by multiplying the Consequence result with the Probability score (**Table 5-8**).

Table 5-8: Impact Assessment Criteria - Probability

This describes the likelihood of the impacts actually occurring, and whether it will impact on an identified receptor. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:		
Rating	**Description**	**Score**
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).	1
Probable	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined to be up to 50 %.	2
Highly probable	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined to be between 50 and 90 %.	3
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined to be higher than 90 %.	4

5.2.4 Defining the potential significance of the Noise Impact

Following the assignment of the necessary weights to the respective aspects, criteria are summed (Consequence score, **Table 5-7**) and multiplied by their assigned probabilities (**Table 5-8**), resulting in a Significance Rating value the noise impact (see **Table 5-9**).

Table 5-9: Potential significance of Noise Impact without and with mitigation

SR<16	Very Low Risk	Very low - The risk/impact may result in no or very minor alterations of the environment and any potential noise impacts can be easily avoided by implementing appropriate mitigation measures. The noise impact will not have an influence on decision-making.
16<**SR** <32	Low	Low - Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required. The noise impact will not have an influence on decision-making).
32<**SR** <48	Moderate	Moderate - An impact or risk which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
48<**SR** <64	High	High – An impact or risk that is significant, having a considerable effect on the environment. Mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.
SR>60	Very High	Very High – An impact is significant resulting in major alteration of the environment. Significant mitigation and management will be required to reduce impact or risk. An impact that will influence the decision about whether or not to proceed with the project.

6 ASSUMPTIONS AND LIMITATIONS

6.1 MEASUREMENTS OF AMBIENT SOUND LEVELS

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin. It is impossible to quantify and identify the numerous sources that influenced one 10-minute measurement using the reading result at the end of the measurement. Therefore trying to define ambient sound levels using the result of one 10-minute measurement will be very inaccurate (very low confidence level in the results) for the reasons mentioned above. The more measurements that can be collected at a location the higher the confidence levels in the ambient sound level determined. The more complex the sound environment, the longer the required measurement. It is assumed that the measurement locations represent other residential dwellings in the area (similar environment), yet, in practice this can be highly erroneous as there are numerous factors that can impact on ambient sound levels, including;
    - the distance to closest trees, number and type of trees as well as the height of trees;
    - available habitat and food for birds and other animals;
    - distance to residential dwelling, type of equipment used at dwelling (compressors, air-cons);
    - general maintenance condition of house (especially during windy conditions); and
    - a number and type of animals kept in the vicinity of the measurement locations.
- Measurement locations for this project were selected to be in a relative quiet area, away from the residential dwelling to minimize the potential of extraneous noise impacting on the ambient sound levels,
- Exact location of a sound level meter in an area in relation to structures, infrastructure, vegetation and external noise sources will influence measurements. It may determine whether one is measuring anthropogenic sounds from a receptors dwelling, or environmental ambient soundscape contributors of significance (faunal, roads traffic, railway line movement etc.). At times there are extraneous noise that cannot be heard during deployment, or not operational, that can significantly impact on readings (such as water pumps, transformers, faunal communication, etc.);

- Determination of existing road traffic and other noise sources of significance are important (traffic counts etc.) – when close to any busy or significant roads. Traffic however is highly dependent on the time of day as well as general agricultural activities taking place during the site investigation. Traffic noise is one of the major components in urban areas and could be a significant source of noise during busy periods. This study found that traffic in this rural area was very low, yet it cannot be assumed that it is always low.
- Measurements over wind speeds of 3m/s could provide data influenced by wind-induced noise. While the windshields used limits, the effect of fluctuating pressure across the microphone diaphragm, the effect of wind-induced noise in the trees in the vicinity of the microphone did impact on the ambient sound levels. The site visit unfortunately coincided with a relatively windy period;
- Ambient sound levels are dependent not only on time of day and meteorological conditions, but also change due to seasonal differences. Ambient sound levels are generally higher in summer months when faunal activity is higher and lower during the winter due to reduced faunal activity. Winter months unfortunately also coincide with lower temperatures and very stable atmospheric conditions, ideal conditions for propagation of noise. Many faunal species are more active during warmer periods than colder periods. Certain cicada species can generate noise levels up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals[6];
- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high. This is due to faunal activity which can dominate the sound levels around the measurement location. This generally is still considered naturally quiet and understood and accepted as features of the natural soundscape, and in various cases sought after and pleasing;
- Considering one or more sound descriptor or equivalent can improve an acoustical assessment. Parameters such as L_{AMin}, L_{AIeq}, L_{AFeq}, L_{Ceq}, L_{AMax}, L_{A10}, L_{A90} and spectral analysis form part of the many variables that can be considered; and
- As a residential area develops the presence of people will result in increased sounds. These are generally a combination of traffic noise, voices, animals and equipment (incl. TV's and Radios). The result is that ambient sound levels will increase as an area develops.

[6] Clyne, D. *"Cicadas: Sound of the Australian Summer, Australian Geographic"* Oct/Dec Vol 56. 1999.

6.2 CALCULATING NOISE EMISSIONS ADEQUACY OF PREDICTIVE METHODS

The noise emissions (noise rating levels) into the environment from the various sources as defined by the project developer will be calculated using the sound propagation models described by ISO 9613-2 (operational phase) and SANS 10357:2004 [7] (construction phase). The following will be taken into account:

The following were considered:

- The sound power emission levels of the proposed equipment;
- The octave band sound pressure emission levels of processes and equipment;
- The distance of the receiver from the noise sources;
- The impact of atmospheric absorption;
- The operational details of the proposed project, such as projected areas where activities will be taking place;
- Topographical layout; and
- Acoustical characteristics of the ground. 25% soft ground conditions were modelled, as the area where the activity would be taking place is acceptably vegetated and sufficiently uneven to allow the consideration of relatively soft ground conditions. This is because the use of hard ground conditions could represent a too precautionary situation.

The potential noise rating levels due to construction traffic will be estimated using the SANS 10210:2004 algorithm, considering mainly the distance of a conceptual noise-sensitive receiver to the centre of a 2-way road. Mainly primary[8] corrections are used and include:

- Number of heavy and light vehicles (10 each for this report);
- Average road speed (100 and 60 km/h for this report);
- Road surface corrections (tar and gravel road for this project).

It should be noted that these models mainly project long-term average noise levels and cannot reflect transient effects (unmaintained equipment, broken or non-functional engines, etc.).

It is important to understand the difference between sound or noise level as well as the noise rating level (also see Glossary of Terms). Sound or noise levels generally refer to a sound pressure level as measured using an instrument, whereas the noise rating level refers to a calculated sound exposure level to which various corrections and adjustments were added. These noise rating levels are further processed into a 3D map illustrating

[7] SANS 10357:2004 The calculation of sound propagation by the Concave method'
[8] Secondary corrections include screening and reflection effects, angle-of-view corrections etc.

noise contours of constant rating levels or noise isopleths. In this project it illustrates the potential extent of the calculated noise of the complete project and not noise levels at a specific moment in time. It is used to define potential issues of concern and not to predict a noise level at a potential noise-sensitive receptor. For this the selected model is internationally recognised and considered adequate.

6.3 ADEQUACY OF UNDERLYING ASSUMPTIONS

Noise experienced at a certain location is the cumulative result of innumerable sounds emitted and generated both far and close, each in a different time domain, each having a different spectral character at a different sound level. Each of these sounds is also impacted differently by surrounding vegetation, structures and meteorological conditions that result in a total cumulative noise level represented by a few numbers on a sound level meter.

As previously mentioned, it is not the purpose of noise modelling to accurately determine a likely noise level at a certain receptor, but to calculate a noise rating level that is used to identify potential issues of concern.

6.4 UNCERTAINTIES ASSOCIATED WITH MITIGATION MEASURES

Any noise impact can be mitigated to have a low significance, however, the cost of mitigating this impact may be prohibitive, or the measure may not be socially acceptable (such as the relocation of a NSD), or the mitigation may result in the project not being economically viable. These mitigation measures may be engineered, technological or due to management commitment.

For the purpose of the EIA (determination of the significance of the noise impact) mitigation measures will be selected that are feasible, mainly focussing on management of noise impacts using rules, policy and require commitment from the project applicant. This however does not mean that noise levels cannot be reduced further, only that to reduce the noise levels further may require significant additional costs (whether engineered, technological or management requirements).

It should be noted that the significance of the potential noise impacts were determined to be low for the construction and operational phases.

6.5 UNCERTAINTIES OF INFORMATION PROVIDED

While it is difficult to define the character of a measured noise in terms of numbers (third octave sound power levels in this case), it is also difficult to accurately model noise levels at a receptor from any operation. The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. Assumptions include:

- The octave sound power levels selected for processes and equipment accurately represent the sound character and power levels of this processes/equipment. The determination of these levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;
- Sound power emission levels from processes and equipment change depending on the load the process and equipment is subject too. While the octave sound power level is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load. Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worst-case scenario;
- As it is unknown which processes and equipment will be operational (when and for how long), modelling considers a scenario where all processes and equipment are under full load for a set time period. Modelling assumptions comply with the precautionary principle and operational time periods are frequently overestimated. The result is that projected noise levels would likely over-estimate noise levels;
- Ambient sound levels vary over time of day, season and largely depend on the complexity and development character of the surrounding environment. To allow the calculation of change in ambient sound levels, a potential ambient sound level of 35 dBA is assumed. This level represents a quiet environment;
- Modelling cannot capture the potential impulsive character of a noise that can increase the potential nuisance factor;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify; and
- Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. 75% hard ground conditions will be modelled even though the area is where the facility will be located is relatively well vegetated and uneven, this will allow a more worst-case scenario.

7 PROJECTED NOISE RATING LEVELS

7.1 PROPOSED CONSTRUCTION PHASE NOISE IMPACT

This section investigates the conceptual construction activities as discussed in **section 4.1**. Construction activities are highly dependent on the final operational layout. The draft layout as provided by the developer is presented in **Figure 7-1**. As can be seen from these layouts, a number of different activities might take place close to potentially sensitive receptors, each with a specific potential impact.

7.1.1 Description of Construction Activities Modelled

The following construction activities could take place simultaneously and were considered:

- o General work at a temporary workshop area. This would be activities such as equipment maintenance, off-loading and material handling. All vehicles will travel to this site where most equipment and material will be off-loaded (general noise, crane). Material, such as aggregate and building sand, will be taken directly to the construction area (foundation establishment). It was assumed that activities will be taking place for 16 hours during the 16 hour daytime period;
- o Surface preparation prior to civil work. This could be the removal of topsoil and levelling with compaction, or the preparation of an access road (bulldozer/grader). Activities will be taking place for 8 hours during the 16 hour daytime period;
- o Preparation of turbine foundation area (sub-surface removal until secure base is reached – excavator, compaction, and general noise). Activities will be taking place for 10 hours during the 16 hour daytime period;
- o Pouring and compaction of foundation concrete (general noise, electric generator/compressor, concrete vibration, mobile concrete plant, TLB). As foundations must be poured in one go, the activity is projected to take place over the full 16 hour day time period;
- o Erecting of the wind turbine generator (general noise, electric generator/compressor and a crane). Activities will be taking place for 16 hours during the 16 hour daytime period;
- o Preparation of powerline corridor and foundation area (clearing of vegetation, sub-surface removal until secure base is reached – excavator, compaction, and general noise). Activities will be taking place for 10 hours during the 16 hour daytime period; and
- o Traffic on the site (trucks transporting material, aggregate/concrete, work crews) moving from the workshop/store area to the various activity sites. All vehicles to travel at less than 60 km/h, with the construction vehicles travelling to the areas where work may be taking place.

There will be a number of smaller equipment, but the addition of the general noise source (at each point) covers most of these noise sources. It is assumed that all equipment would be operating under full load (generate the most noise) at a number of locations and that atmospheric conditions would be ideal for sound propagation. This is likely the worst case scenario that can occur during the construction of the facility.

As it is unknown where the different activities may take place it was selected to model the impact of the noisiest activity (laying of foundation totalling 113.6 dBA cumulative noise impact – various equipment operating simultaneously) at all locations (over the full daytime period of 16 hours) where wind turbines (or power pylons) may be erected for both layouts, calculating how this may impact on potential noise-sensitive developments (see **Figure 7-3**). Noise created due to linear activities (roads) were also evaluated and plotted against distance as illustrated in **Figure 7-4**[9].

Even though construction activities are projected to take place only during day time, it might be required at times that construction activities take place during the night (particularly for a large project). Construction activities that may occur during night time include:

- o Concrete pouring: Large portions of concrete do require pouring and vibrating to be completed once started, and work is sometimes required until the early hours of the morning to ensure a well-established concrete foundation. However the work force working at night for this work will be considerably smaller than during the day; and
- o Working late due to time constraints: Weather plays an important role in time management in construction. A spell of bad weather can cause a construction project to fall behind its completion date. Therefore, it is hard to judge beforehand if a construction team would be required to work late at night.

7.2 OPERATIONAL PHASE NOISE IMPACT

Typical day time activities would include:

- The operation of the various Wind Turbines,
- Maintenance activities (relatively insignificant noise source).

Noise generated from the operation of the wind turbines during the daytime period was not considered for the EIA. This is as the WEF is generally masked by other noise from a variety of sources surrounding potentially noise-sensitive developments. However, times when a quiet environment is desired (at night for sleeping, weekends etc.) ambient sound levels are more critical. The time period investigated therefore would be a quieter period,

[9] Sound level at a receiver set at a certain distance from a road

normally associated with the 22:00 – 06:00 timeslot. Maintenance activities would therefore not be considered, concentrating on the ambient sound levels created due to the operation of the various Wind Turbine Generators (WTGs) at night.

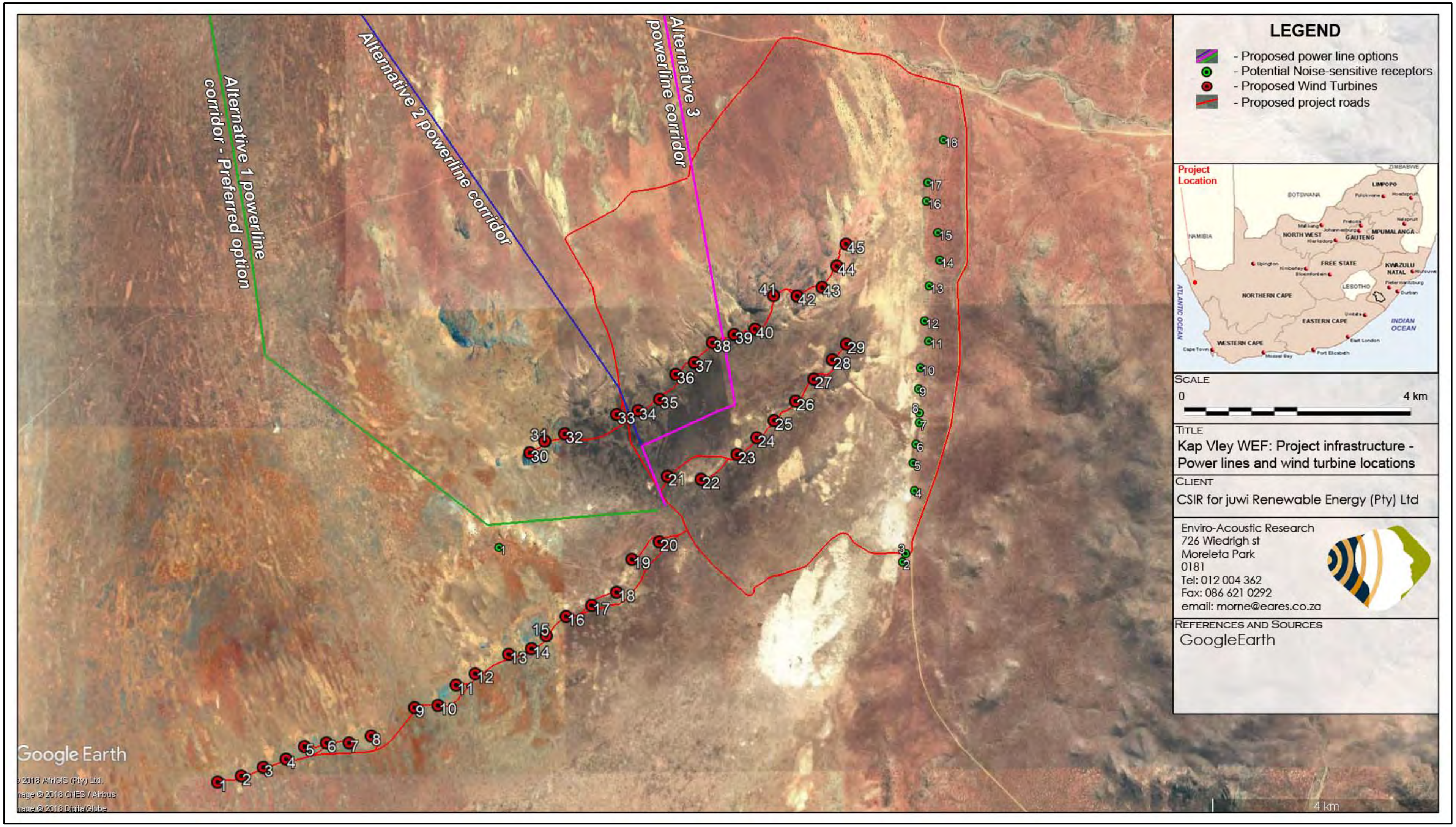


Figure 7-1: Wind Turbine Locations (and access roads) for the Kap Vley WEF – Final EIA Layout

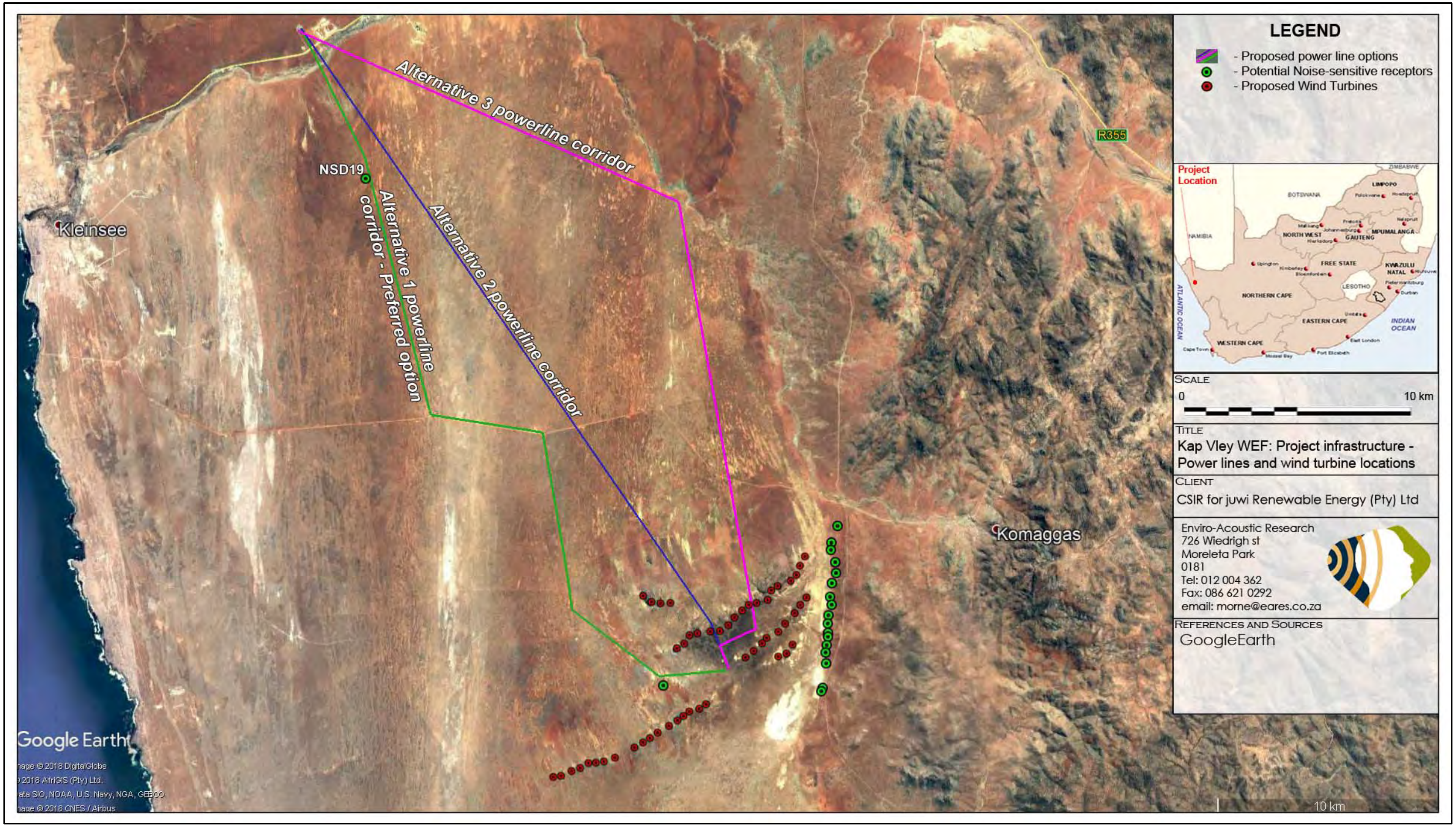


Figure 7-2: Wind Turbine Locations (and power line options) for the Kap Vley WEF – Final EIA Layout

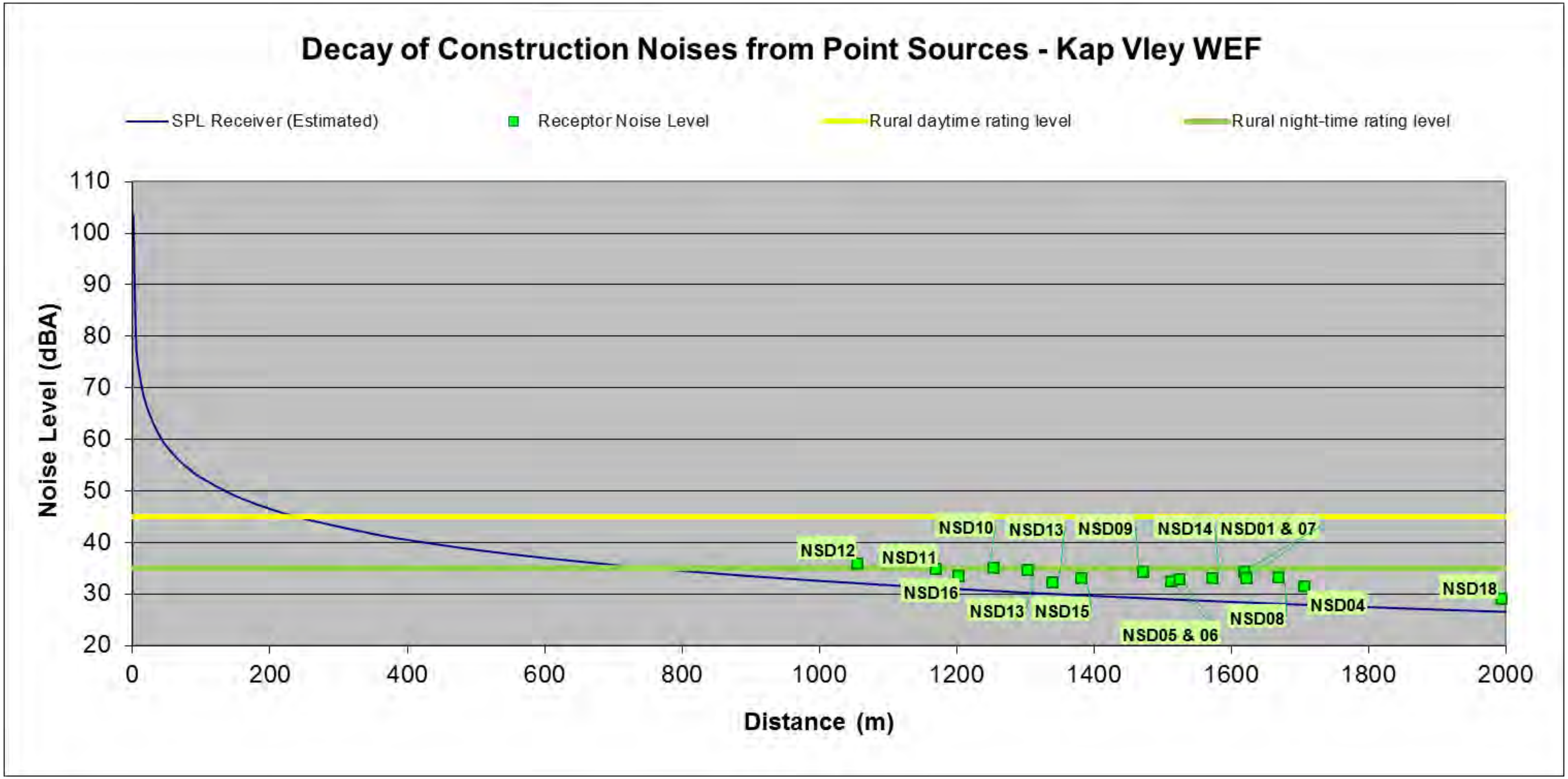


Figure 7-3: Projected conceptual construction noise levels[10] – Decay of noise from construction activities

[10] The SPL Receiver graph can also be used for the construction of the overhead power line to allow connection to the ESKOM grid. Any activities further than 500 m from any receiver will have a noise impact of low significance (daytime construction activities).

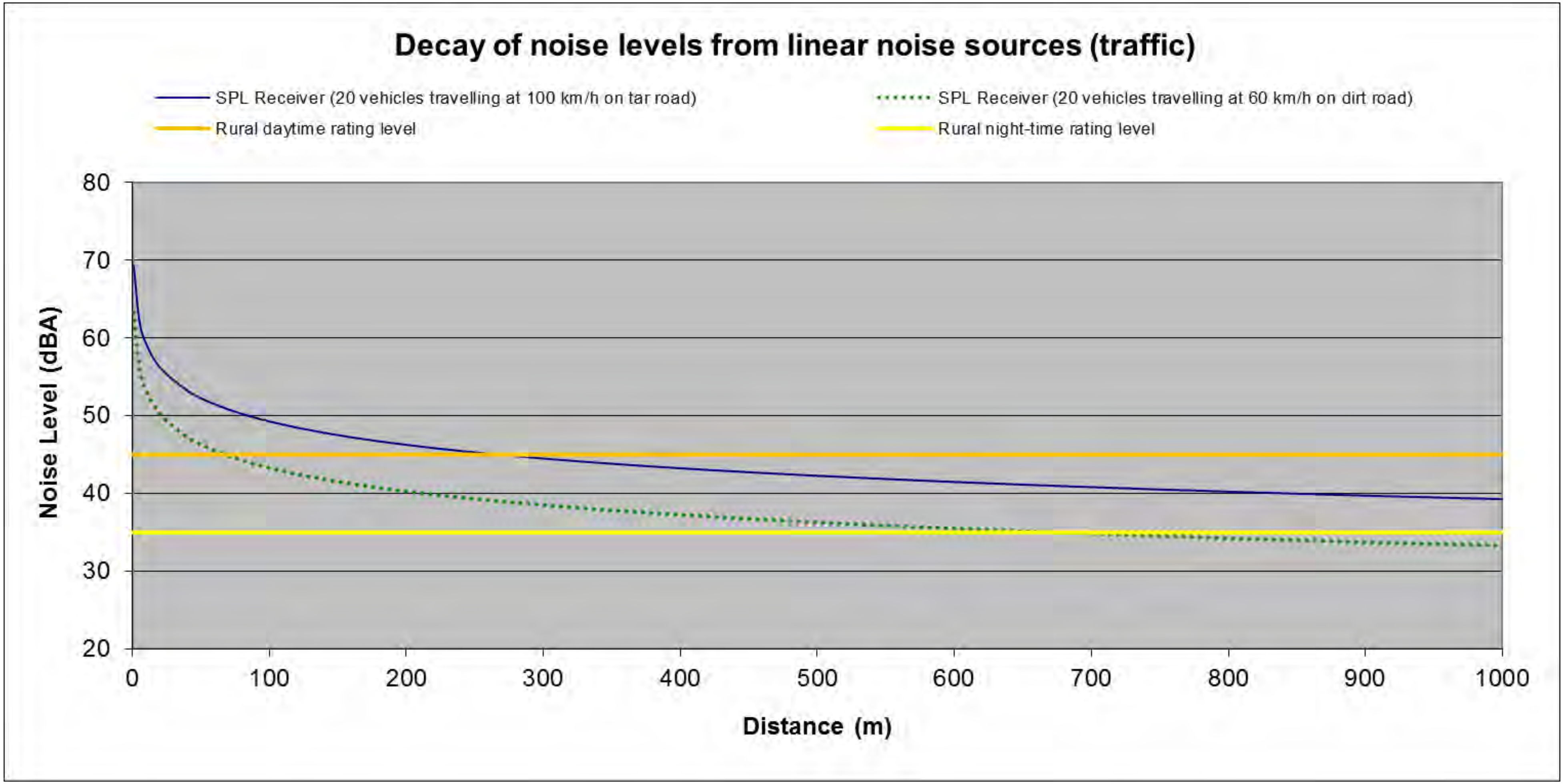


Figure 7-4: Projected conceptual construction noise levels – Decay over distance from linear activities

The draft layout presented in **Figure 7-1** was evaluated using the sound power emission levels for the Acciona AW125/3000. Being a “loud” wind turbine, this will represent the worst case scenario as the author is not aware of another wind turbine with higher sound power emission levels.

The calculated octave sound power levels of the Acciona AW125/3000 wind turbine as used for modelling are presented in **Table 7-1**, considering the 7 m/s wind speed for the noise contours. The difference between the proposed height of the nacelle (up to 150 m) and height used for modelling (87.5 m) will have a negligible impact on the results because changes in hub-height generally do not change the sound power emission level (for the same wind turbine), or the change is insignificantly small.

Table 7-1: Octave Sound Power Emission Levels used for modelling: Acciona AW125/3000

Wind Turbine: Acciona AW125/3000 at hh87.5										
Source Reference: Acciona Windpower. General Document DG200383, Rev D dated 04/04/14										
Maximum expected A-weighted Octave Sound Power Levels										
	16	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Lpa (dB)	*not reported*	117.3	111.5	110.9	109.9	107.0	103.3	97.0	86.6	81.3
L_{WA} (dBA)	*not reported*	77.4	85.3	94.7	101.2	103.8	103.3	98.2	87.6	81.3

A-Weighted Sound Power Levels	
Wind speed at 10m height	Sound power level (dBA)
4	*101.4 **
5	*105.3 **
6	107.3
7	108.4
8	108.3
9	107.8
10	107.8

Total noise rating levels is illustrated in **Figure 7-6** with **Figure 7-5** defining the noise rating levels at the closest potential noise-sensitive receptors.

7.3 POTENTIAL CUMULATIVE NOISE IMPACTS

Cumulative noise impacts generally only occur when noise sources (such as other wind turbines) are closer than 2,000 m from each other (around 1,000 m from the conceptual receptor located between them). The cumulative impact also only affects the area between the wind turbines of the various wind farms.

If the wind turbines of one wind farm are further than 2,000 m from the wind turbines of the other wind farm, the magnitude (and subsequently the significance) of the cumulative noise impact is reduced. If the distance between the wind turbines of two wind farms are further than 4 000 m, cumulative noise impacts are non-existent.

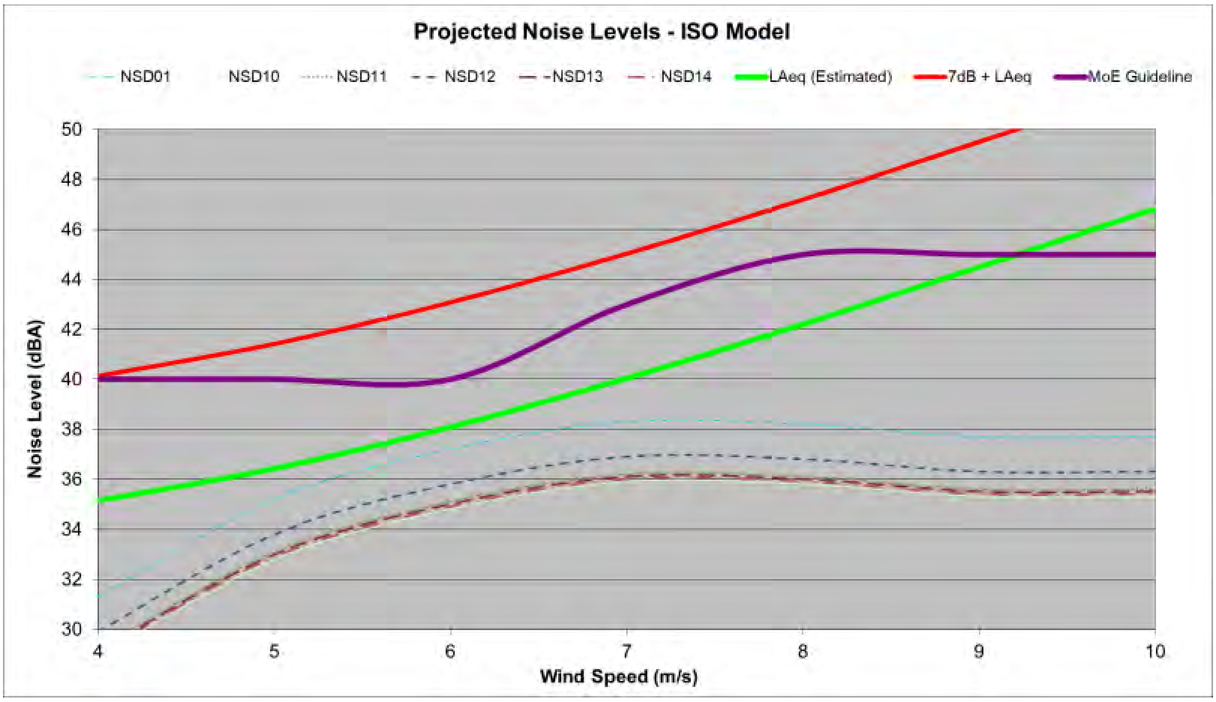


Figure 7-5: Projected noise rating levels at different wind speeds

There are a few proposed renewable projects in the vicinity of the Kap Vley project, with the author knowing of the following WEFs proposed in the area (within 30 km):

- Project Blue WEF [Diamond Wind (Pty) Ltd],
- Kleinzee WEF [Eskom Holdings SOC Limited],
- Koningaas WEF [Just Palmtree Power (Pty) Ltd].

The introduction of the Kap Vley WEF however will not result in a cumulative noise effect as these facilities are further than 5 000 m from the turbines of the proposed Kap Vley WEF. The noise contours from these activities would not even show on **Figure 7-6**.

7.4 DECOMMISSIONING AND CLOSURE PHASE NOISE IMPACT

The potential for a noise impact to occur during the decommissioning and closure phase will be much lower than that of the construction and operational phases and noise from the decommissioning and closure phases will therefore not be investigated further.

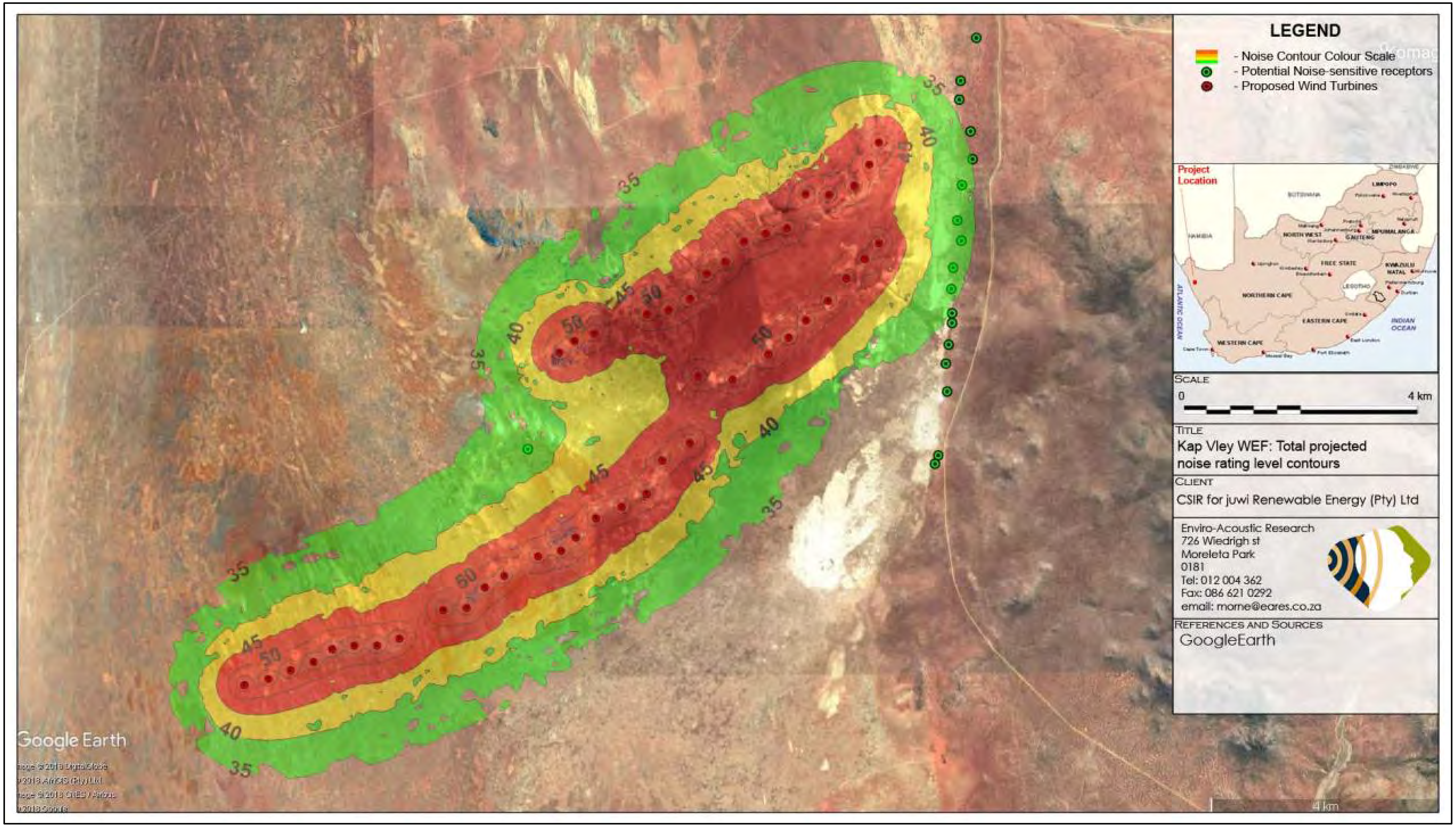


Figure 7-6: Projected conceptual noise rating levels of the Kap Vley WEF during operation

8 SIGNIFICANCE OF THE NOISE IMPACT

8.1 PLANNING PHASE NOISE IMPACT

No noise is associated with the planning phase and this will not be investigated in further.

8.2 CONSTRUCTION PHASE NOISE IMPACT

The impact assessment for the various construction activities are described in **section 4.1**, defined and assessed in **section 8.1**. Considering the projected noise levels (all significantly less than 45 dBA – projected at less than 39 dBA) as well as the expected daytime ambient sound level (arithmetic average 40 dBA, see also **Figure 5-2**), there is a very low risk for a noise impact during the construction phase for daytime construction activities (see **Table 8-1**).

Table 8-1: Impact Assessment: Construction Activities during the day

Aspect / Impact pathway: Various construction activities taking place simultaneously during the day may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Construction)**	
All NSD	Noise levels below 38 dBA	Noise levels below 38 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	Moderate (3)	Moderate (3)
Consequence	Moderate (8)	Moderate (8)
Probability	Improbable (1)	Improbable (1)
Significance	**Very Low Risk (8)**	**Very Low Risk (8)**
Can impacts be mitigated?	Yes, but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Low daytime ambient sound levels assumed.		
Mitigation: Significance of noise impact is very low for the scenario as conceptualized. Mitigation are however highlighted for the developer to consider during the future planning stages to ensure that the significance of the noise impact remain very low.		
Cumulative impacts: Potential of cumulative noise impact is low.		

It is important to note that the developer confirmed that there will be no constructing activities at night, or that that night-time construction activities will be minimal. Considering potential delays' relating to civil works (especially concrete pouring that must be undertaking in one go), the potential significance due to night-time construction activities was assessed in **Table 8-2**.

Table 8-2: Impact Assessment: Construction Activities at night

Aspect / Impact pathway: Various construction activities taking place simultaneously at night may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Construction)**	
All NSD	Noise levels below 38 dBA	Noise levels below 38 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	High (4)	High (4)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	Moderate (3)	Moderate (3)
Consequence	Substantial (12)	Substantial (12)
Probability	Probable (2)	Probable (2)
Significance	**Low Risk (24)**	**Low Risk (24)**
Can impacts be mitigated?	Yes, but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Very low night-time ambient sound levels assumed.		
Mitigation: Significance of noise impact is very low for the scenario as conceptualized. Mitigation are however highlighted for the developer to consider during the future planning stages to ensure that the significance of the noise impact remain very low.		
Cumulative impacts: Potential of cumulative noise impact is low.		

The noise levels associated with the construction of the overhead power line (to allow connection to the grid) and access roads can be estimated using **Figure 7-3.** From this figure it can be seen that the construction noise levels will be well within the acceptable daytime rating levels (52 dBA) if these activities are further than approximately 100 m from the closest receptors (daytime construction activities). Therefore, there is no potential of a noise impact for daytime construction activities (power line).

Considering the three power line options and the location of potential noise-sensitive receptors (see **Figure 7-2**), there is a low potential for a noise impact as highlighted in **Table 8-3**.

Table 8-3: Impact Assessment: Construction of preferred power line

Aspect / Impact pathway: Various construction activities taking place simultaneously during the day may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Construction)**	
NSD19	Estimated noise levels of 48 dBA	Noise levels below 35 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	None (1)	None (1)
Consequence	Moderate (6)	Moderate (6)
Probability	Improbable (1)	Improbable (1)
Significance	**Very Low Risk (6)**	**Very Low Risk (6)**
Can impacts be mitigated?	-	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Very low night-time ambient sound levels assumed.		
Mitigation: It is not known if this dwelling is used for residential purposes. If occupied, daytime activities would have a low noise impact and no mitigation is required.		
Cumulative impacts: Potential of cumulative noise impact is low.		

The potential magnitude of noise rating levels due to construction traffic can be estimated using **Figure 7-4**. While the graph depends on the average speed and number of vehicles, the figure can still be used to estimate potential noise impacts. For an average of 10 each vehicles travelling at an average 60 km/h on a gravel road, noise from construction traffic will be well within the acceptable daytime rating levels (52 dBA) if the roads are further than approximately 60 m from the closest receptors (daytime construction activities). Similarly, construction noise levels will be well within the acceptable night-time rating levels (42 dBA) if these activities are further than approximately 140 m from the closest receptors.

It should be noted that, due to very low ambient sound levels measured onsite, night-time construction activities are not recommended. Excluding NSD03, these activities are unlikely to increase the noise levels above the noise limits at most receivers, but, due to the quiet soundscape night-time noise will be highly audible and could cause a noise nuisance. The potential impact of night-time traffic is assessed in **Table 8-4**.

Table 8-4: Impact Assessment: Daytime construction traffic

Aspect / Impact pathway: Various construction vehicles passing close to potential noise-sensitive receptors at night may increase ambient sound levels and crease disturbing noise		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Construction)**	
NSD03 and NSD04	Noise levels as high as 62 dBA	Noise levels below 42 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	Very high (4)	Low (1)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	None (1)	None (1)
Consequence	Moderate (8)	Moderate (8)
Probability	Improbable (1)	Improbable (1)
Significance	**Low Risk (22)**	**Very Low Risk (6)**
Can impacts be mitigated?	Negative	-
Confidence in findings: High. Worst-case scenario evaluated with numerous construction vehicles passing the receptors at night. Very low night-time ambient sound levels assumed.		
Mitigation: The significance of the noise impact is considered low and additional mitigation is not required. If occupied, the relocation of access roads further than 140m from NSD would minimise the noise impact.		
Cumulative impacts: Potential of cumulative noise impact is low.		

8.3 Operational Phase Noise Impact

Only the night-time scenario was assessed, as this is the most critical time period when a quiet environment is desired. The noise rating levels are calculated in **section 7.2** for the various operational activities defined in **section 4.2**.

As can be seen from **Figure 7-5**, the projected noise rating levels will be less than 42 dBA (the acceptable night-time noise limit as per **section 5.2.2.2**) at all NSDs. Based on the projected noise rating levels:

- Considering $L_{Aeq,i}$ sound levels measured onsite (see **Figure 5-2**), ambient sound levels would range between 25 – 45 dBA at a 7 m/s wind speed. Assuming a sound level typical of the L_{A90} graph, equivalent ambient sound levels could be around 37 dBA;
- The change in ambient sound levels therefore would be around 3 dB when assuming ambient sound levels of 37 dBA. The **magnitude** may be **Medium (2)**. It should be noted that it is expected that the wind turbines may be clearly audible at the identified receptors at times;
- The duration will be the full project life - **Long term (3)**;

- The wind turbines may be audible up to 2,000 m during special conditions – **Regional (3)**;
- The noise impact will stop once the project terminates and reversibility is **High (1)**;
- There is a significant potential that surrounding noise-sensitive receptors lose an environment where natural noise dominated – **Significant (3)**;

The significance of the noise impact is considered to be low as assessed and summarized in **Table 8-5**.

Table 8-5: Impact Assessment: Operational Activities at night

Aspect / Impact pathway: Wind turbines operating simultaneously at night. Increases in ambient sound levels due to air-borne noise from the wind turbines.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Operation)**	
All NSD	Noise levels below 42 dBA	Noise levels below 42 dBA
	Without mitigation	**With mitigation (not required but possible)**
Status (positive/negative)	Negative	Negative
Magnitude	Medium (2)	Medium (2)
Duration	Long (3)	Long (3)
Extent	Regional (3)	Regional (3)
Reversibility	High (1)	High (1)
Loss of resources	Significant (3)	Significant (3)
Consequence	Substantial (12)	Substantial (12)
Probability	Probable (2)	Probable (2)
Significance	**Low Risk (24)**	**Low Risk (24)**
Can impacts be mitigated?	Yes but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all wind turbines operating under full load. Very low ambient sound levels assumed.		
Mitigation: Significance of noise impact is low for the scenario as conceptualized.		
Cumulative impacts: There is no potential for a cumulative noise impact.		

8.4 CUMULATIVE NOISE IMPACT

The introduction of the Kap Vley WEF will not raise the total noise rating level at any other NSD at other proposed wind farms in the area, as it is too far from these projects. The significance of the noise impact will be non-existent (definite confidence level).

8.5 DECOMMISSIONING PHASE NOISE IMPACT

Final decommissioning activities will have a noise impact lower than either the construction or operational phases. This is because decommissioning and closure activities normally take place during the day using minimal equipment (due to the decreased urgency of the project). While there may be various activities, there is a very small risk for a noise impact. The significance of any noise impact would be low, similar to the construction noise impact as defined in **Table 8-6** and **Table 8-7** for the day and night-time activities respectively.

Table 8-6: Impact Assessment: Decommissioning Activities during the day

Aspect / Impact pathway: Various decommissioning activities taking place simultaneously during the day may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (decommissioning)**	
All NSD	Noise levels below 38 dBA	Noise levels below 38 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	Moderate (3)	Moderate (3)
Consequence	Moderate (8)	Moderate (8)
Probability	Improbable (1)	Improbable (1)
Significance	**Very Low Risk (8)**	**Very Low Risk (8)**
Can impacts be mitigated?	Yes, but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Low daytime ambient sound levels assumed.		
Mitigation: No mitigation required or recommended for decommissioning activities.		
Cumulative impacts: Potential of cumulative noise impact is low.		

Table 8-7: Impact Assessment: Decommissioning Activities at night

Aspect / Impact pathway: Various decommissioning activities taking place simultaneously at night may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (decommissioning)**	
All NSD	Noise levels below 38 dBA	Noise levels below 38 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	High (4)	High (4)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	Moderate (3)	Moderate (3)
Consequence	Substantial (12)	Substantial (12)
Probability	Probable (2)	Probable (2)
Significance	**Low Risk (24)**	**Low Risk (24)**
Can impacts be mitigated?	Yes, but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Very low night-time ambient sound levels assumed.		
Mitigation: No mitigation required or recommended for decommissioning activities.		
Cumulative impacts: Potential of cumulative noise impact is low.		

8.6 EVALUATION OF ALTERNATIVES

8.6.1 Alternative 1: No-go option

The ambient sound levels will remain very low.

8.6.2 Alternative 2: Proposed Renewable Power Generation activities

The proposed renewable power generation activities (worse-case evaluated) will raise the noise levels at a number of potential noise-sensitive developments slightly. There is no alternative location where the wind farm can be developed as the presence of a viable wind resource determines the viability of a commercial WEF. While the location cannot be moved, the wind turbines within the WEF can be moved around, although this layout is the result of numerous evaluations and modelling to identify the most economically feasible and environmentally friendly layout.

The proposed layout will result in increased noise levels in the area, but the noise levels will be low and is unlikely to impact on the quality of living for the surrounding receptors. In terms of acoustics, there is no benefit to the surrounding environment (closest receptors). The predicted noise impacts are of low significance (before-) and of very low significance (after mitigation – if implemented).

The project however, will greatly assist in the provision of energy, which will allow further economic growth and development in South Africa and locally. The project will generate short and long-term employment and other business opportunities and promote renewable energy in South Africa and locally. People in the area that are not directly affected by increased noise will have a positive perception of the project and will see the need and desirability of the project.

8.6.3 Location alternatives

The development of a WEF is highly dependent on the prevailing wind quality and character. The wind turbines will be located on the top of ridges that are not used by people. Located in an area where the population density is relatively low, the location of the facility is ideal.

9 MITIGATION OPTIONS

The study considers the potential noise impact on the surrounding environment due to construction activities during the day and night-time periods. It was determined that the potential noise impact would be of low significance and mitigation measures are not required or recommended.

The developer must know that community involvement needs to continue throughout the project. Annoyance is a complicated psychological phenomenon, as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational reaction to the sound itself. At all stages surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations. It is counterproductive to suggest that the activities (or facility) will be inaudible due to existing high ambient sound levels. The magnitude of the sound levels will depend on a multitude of variables and will vary from day to day and from place to place with environmental and operational conditions. Audibility is distinct from the sound level, because it depends on the relationship between the sound level from the activities, the spectral character and that of the surrounding soundscape (both level and spectral character).

The developer must implement a line of communication (i.e. a help line where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers. The Wind Energy Facility should maintain a commitment to the local community (people staying within 2,000 m from construction or operational activities) and respond to concerns in an expedient fashion. Sporadic and legitimate noise complaints could develop. For example, sudden and sharp increases in sound levels could result from mechanical malfunctions or perforations or slits in the blades. Problems of this nature can be corrected quickly and it is in the developer's interest to do so.

9.1 MITIGATION OPTIONS AVAILABLE TO REDUCE NOISE IMPACT DURING CONSTRUCTION

Mitigation options included both management measures as well as technical changes. This assessment indicated a noise impact of **low** significance during the construction of the WEF as well as day-time construction of overhead powerline, access roads and construction traffic. No additional mitigation measures are required or recommended. Continuing management objectives would be:

- Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 7 dBA;
- Ensure that total noise levels are less than 42 dBA at all potential noise-sensitive receptors;
- Prevent the generation of nuisance noises;
- Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.

9.2 Mitigation options available to reduce Noise Impact during operation

The significance of noise during the operational phase is low and additional mitigation measures are not required.

9.3 Mitigation options available to reduce Noise Impact during decommissioning

The potential significance of the noise impact would be similar as the construction phase and no further mitigation is recommended or required for the decommissioning phase. Continuing management objectives would be:

- Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 7 dBA;
- Ensure that total noise levels are less than 42 dBA at all potential noise-sensitive receptors;
- Prevent the generation of nuisance noises;
- Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.

9.4 Special Conditions

9.4.1 Mitigation options that should be included in the Environmental Management Programme (EMPr)

1. The developer must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from location where construction activities are taking place or operational wind turbine. A complaints register must be kept on site.
2. The developer should minimize night-time construction traffic if the access road is closer than 140m from NSD, alternatively, the access road must be relocated further than 140m from NSD (night-time traffic passing occupied houses).

9.4.2 Special conditions that should be considered for the Environmental Authorization

1. The potential noise impact must again be evaluated should the layout be changed where any wind turbines are located closer than 1,000 m from a confirmed NSD.
2. The potential noise impact must again be evaluated should the developer make use of a wind turbine with a maximum sound power emission level exceeding 108.4 dBA re 1 pW.
3. The developer must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from location where construction or decommissioning activities are taking place or from the operational wind turbine.

10 ENVIRONMENTAL MONITORING PLAN

Environmental Noise Measurement can be divided into two distinct categories, namely:

- Passive measuring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active measuring – the measurement of noise levels at identified locations.

Due to the projected noise impact of a low significance during the operational phase, no active environmental noise monitoring is recommended.

Should a reasonable and valid complaint about noise be registered, it is the responsibility of the developer to investigate this complaint as per the following sections. It is recommended that the noise investigation be done by an independent acoustic consultant.

While this section recommends a noise monitoring programme, it should be used as a guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

10.1 MEASUREMENT LOCALITIES AND PROCEDURES

10.1.1 Measurement Localities

Noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument must be deployed at a control point away from the potential noise source during the measurement period.

10.1.2 Measurement Frequencies

Once-off measurements if and when a reasonable and valid noise complaint is registered. Results and feedback must be provided to the complainant. If required and recommended by an acoustic consultant, there may be follow-up measurements or a noise monitoring programme can be implemented.

10.1.3 Measurement Procedures

The measurement of ambient sound levels should occur over a period of at least 5 nights. If required, noise levels should be measured over a period of at least 5 nights.

Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit).

Best fit analysis should be conducted on the data, where a best-fit graph are fitted through the sound (noise) levels versus the wind speeds to determine average noise levels at a set wind speed.

Spectral frequencies should also be measured to define the potential origin of noise and illustrate the spectral character of the sounds measured. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

11 CONCLUSIONS AND RECOMMENDATIONS

This report provides input to the Environmental Impact Assessment for the proposed Kap Vley WEF south-west of Komaggas, Northern Cape Province and its associated 200 m Powerline Corridor. The report considers the ambient sound levels previously measured in the area, the author's expertise, as well as a output of sound propagation model (making use of the worst-case scenario in terms of the precautionary approach) to identify potential issues of concern.

The potential noise impact for the WEF was evaluated using a sound propagation model. Conceptual scenarios were developed for the construction and operational phases. With the modelled input data as used, this assessment indicated that:

- A potential noise impact of a **very low** significance (before mitigation) and very low significance (after mitigation) during the day for the construction phase of the WEF;
- A potential noise impact of a **low** significance (before and after mitigation) at night for the construction phase of the WEF;
- A potential noise impact of a **low** significance (before mitigation) and very low (after mitigation) for daytime construction traffic;
- A potential noise impact of a **very low** significance during the construction of the powerline (preferred corridor A). There is no risk of a noise impact for the other two power line corridors;
- A potential noise impact of a **very low** significance (before and after mitigation) for the operation of the wind turbines at night; and
- A potential noise impact of a **low** significance (before and after mitigation) for the decommissioning of the WEF and associated powerline.

No additional work or assessment is required or recommended. The developer however should investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from the location where construction or operational activities are taking place.

The potential noise impact for the WEF must again be evaluated should the layout be changed where any wind turbines are located closer than 1,000 m from a confirmed NSD or if the developer decides to use a different wind turbine that has a sound power emission level higher than the Acciona WTG used in this report (sound power emission level exceeding 108.4 dBA re 1 pW).

Considering the **low** significance of the noise impacts (with mitigation, inclusive of cumulative impacts) for the WEF and associated infrastructure, there is no reason that the proposed Kap Vley Wind Energy Facility with its associated Powerline Corridor should not be authorised.

12 THE AUTHOR

The Author started his career in the mining industry as a bursar Learner Official (JCI, Randfontein), working in the mining industry, doing various mining related courses (Rock Mechanics, Surveying, Sampling, Safety and Health [Ventilation, noise, illumination etc] and Metallurgy. He did work in both underground (Coal, Gold and Platinum) as well as opencast (Coal) for 4 years. He changed course from Mining Engineering to Chemical Engineering after his second year of his studies at the University of Pretoria.

He has been in private consulting for the last 15 years, managing various projects for the mining and industrial sector, private developers, business, other environmental consulting firms as well as the Department of Water Affairs. During that period he has been involved in various projects, either as specialist, consultant, trainer or project manager, successfully completing these projects within budget and timeframe. During that period he gradually moved towards environmental acoustics, focusing on this field exclusively since 2007.

He has been interested in acoustics as from school days, doing projects mainly related to loudspeaker design. Interest in the matter brought him into the field of Environmental Noise Measurement, Prediction and Control. He has been doing work in this field for the past 8 years, and was involved with the following renewable projectsin the last few years:

Wind Energy Facilities	*Full Environmental Noise Impact Assessments for - Bannf (Vidigenix), iNCa Gouda (Aurecon SA), Isivunguvungu (Aurecon), Kokerboom 1 (Aurecon), Kokerboom 2 (Aurecon), Kokerboom 3 (Aurecon), Kangnas (Aurecon), Plateau East and West (Aurecon), Wolf (Aurecon), Outeniqwa (Aurecon), Umsinde Emoyeni (ARCUS) , Komsberg (ARCUS), Karee and Kolkies Wind Farms (ARCUS), San Kraal (ARCUS), Phezukomoya (ARCUS), Canyon Springs (Canyon Springs), Perdekraal (ERM), Scarlet Ibis (CESNET), Albany (CESNET), Sutherland (CSIR), Rietrug (CSIR), Sutherland 2 (CSIR), Teekloof (Mainstream), Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Happy Valley (SE), Deep River (SE), Tsitsikamma (SE), AB (SE), West Coast One (SE), Hopefield II (SE), Namakwa Sands (SE), VentuSA Gouda (SE), Dorper (SE), Amakhala Emoyeni (SE), Klipheuwel (SE), Cookhouse (SE), Cookhouse II (SE), Rheboksfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Koningaas (SE), Eskom Aberdene (SE), Spitskop (SE), Castle (SE), Khai Ma (SE), Poortjies (SE), Korana (SE), IE Moorreesburg (SE), Gunstfontein (SE), Vredenburg (Terramanzi), Loeriesfontein (SiVEST), Rhenosterberg (SiVEST), Noupoort (SiVEST), Prieska (SiVEST), Dwarsrug (SiVEST), Graskoppies (SiVEST), Hartebeest Leegte (SiVEST), Ithemba (SiVEST), !Xha Boom (SiVEST), Spitskop West (Terramanzi), Msenge Emoyeni (Windlab)*

13 REFERENCES

In this report reference was made to the following documentation:

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14. USEPA, 1971: *Effects of Noise on Wildlife and other animals*
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Scoping and Environmental Impact Assessment for the proposed Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape

UPDATED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

APPENDIX P:

Transportation Impact Assessment Report

TRANSPORTATION IMPACT ASSESSMENT

Scoping and Environmental Impact Assessment for the Proposed Kap Vley Wind Energy Facility near Kleinzee, in the Northern Cape

and

Basic Assessment for the Transmission Line

Report prepared for:	*Report prepared by:*
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March 2018

SPECIALIST EXPERTISE (SHORT CV)

CHRISTO BREDENHANN
Associate: Transport Planning

Transport and Infrastructure

5 years with the firm

16 years total

Areas of practice

Traffic & Transportation Engineering

Transportation Planning

Education

BEng (Hons) Traffic and Transportation Engineering, University of Pretoria (2010)

BEng Civil Engineering, University of Johannesburg (RAU), 1996

Professional membership

Professional Engineer, Engineering Council South Africa (20150149)

Associate Member, South African Institute of Civil Engineering (201300003)

CAREER SUMMARY

Mr Bredenhann is a professional engineer with over 16 years' work experience, specialising in the traffic and transportation engineering sector. He has extensive experience in traffic and transportation impact assessments and statements for a multitude of land uses, formal review of traffic impact assessments, transportation planning, micro and macro network and capacity analysis, transportation planning and design, road safety audits, traffic signal timing design, road signs and markings audits, multi-modal transport assessments, non-motorised transport analysis and design and transport management plans.

Relevant expertise includes project management, proposal preparation, preparation of tender documentation and bid adjudication, public transport planning and operational management, procedure development for the monitoring of integrated rapid transit operations and public transport scheduling development.

Countries of work experience include South Africa, Ethiopia, Uganda and the United Kingdom.

PROFESSIONAL EXPERIENCE

- Athlone Power Station Redevelopment, Cape Town, South Africa (Current): Lead Traffic Engineer and Transportation Planner - Transportation input to development framework and layouts. Liaison with client, stakeholders & authorities. Undertake full traffic impact assessment for Council approval for 35 ha mixed-use redevelopment of Athlone Power Station site as Transit Oriented Development. Client: City of Cape Town. Project Value: ZAR 2 m. Fee Value: ZAR 100,000.
- Ethiopian Agri-processing Plants TIA, Ethiopia (Current): Lead Transportation Engineer. Client: UNOPS. Project Value: Unknown. Fee Value: ZAR 135,000.
- IRT Phase 2A Trunk & Feeder support infrastructure Work Package E5 Stage 2 Road Safety Audit, City of Cape Town, Western Cape, South Africa (Current): Lead Road Safety Auditor. Client: GIBB Engineering & Science. Project Value: ZAR Unknown. Fee Value: ZAR 25,000.
- Farm Bergendal 1706 Mixed-Use Development TIA, Bloemfontein, Free State Province, South Africa (Current): Lead Transportation Engineer. Client: WSP Bloemfontein. Project Value: Unknown. Fee Value: ZAR 48,000.
- Tsogo Sun Wharf Street TIA, Cape Town, Western Cape, South Africa (Current): Lead Transportation Engineer. Client: Tsogo Sun. Project Value: ZAR Unknown. Fee Value: ZAR 132,000.
- Conradie Better Living Model Exemplar Project, Cape Town, South Africa (2016): Lead Traffic Engineer and Transportation Planner - Transportation input to development framework and layouts. Liaison with client, stakeholders and authorities. Develop and draft traffic impact assessment, including revisions, and Council approval for 22 ha high-density residential and mixed-use Transit Oriented Development. Client: Provincial Government of Western Cape. Project Value: ZAR 2.5 m. Fee Value: ZAR 2.5 m.
- Port of Saldanha Bay Traffic Study, Saldanha Bay, Western Cape, South Africa (2017): Project Leader - Traffic study with specific focus on measures to improve efficiency and operation of all multi-purpose terminal traffic. Client: Transnet Port Terminals. Fee Value: ZAR 210,000.
- Biotherm Solar and Wind Power Plants, Northern and Western Cape, South Africa (2016): Lead Transportation Engineer - Traffic impact assessment. Value: ZAR 100,000. Fee Value: ZAR 45,000.

SPECIALIST DECLARATION

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

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

Signature of the specialist: ______________________________

Name of Specialist: Christo Bredenhann

Date: 14 March 2018

EXECUTIVE SUMMARY

WSP Group Africa (Pty) Ltd (WSP) has been appointed by juwi Renewable Energies to undertake a Transportation Impact Assessment (TIA) as part of the Environmental Impact Assessment (EIA) process for the proposed Kap Vley Wind Energy Facility (WEF) and the Basic Assessment (BA) for its associated 200 m wide power line corridor. The facility and power line infrastructure will be located near Kleinzee in the Northern Cape. The TIA assessed the expected traffic related impacts of the proposed facility during the construction, operation and subsequent decommissioning phases. In terms of the BA process for the power line corridor, no notable traffic related impacts have been identified, and therefore no impacts relating to the power line corridor were assessed or recommendations proposed to be included in the Environmental Management Programme (EMPr).

With regard to the wind energy facility, the estimated peak trip generation of the facility will be 33 veh/hr in the weekday AM and PM peaks during the Construction phase, and will be negligible for the operational phase. It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the local access roads will be lower than during the Construction phase.

The main traffic related environmental impacts for the Construction, Operation and Decommissioning phases are listed below:

- Noise, dust & exhaust pollution due to vehicle trips on-site.
- Noise, dust and exhaust pollution due to additional trips on the local unsurfaced access roads.
- Noise and exhaust pollution due to additional trips on the R355 (Provincial road) and N7 Freeway (National road).

The significance of the overall impact for each phase with regards to the above traffic related environmental impacts is Low before and after mitigation.

The mitigating measures recommended during the construction phase is dust monitoring and control of all on-site and local unsurfaced roads. The expected traffic increase on the local unsurfaced access roads during the construction phase may result in deterioration of the road, as it is not designed for abnormal and heavy traffic volumes. The cost of maintaining and repairing this road during the Construction phase of the projects should be borne by the developer.

The Cumulative traffic impact of the known wind and solar energy projects in the area has been assessed, and is regarded as of low significance on the local and regional road network. Other latent developments in the greater area may utilize sections of the same regional (R355) and national (N7) road network. However, these road sections are mostly surfaced and the traffic volumes from them is likely to be low. The proposed Eskom Kleinzee 300MW WEF will be located south of Kleinzee on the west coast. The facility may take access off the N7 from Springbok via the R355, the Komaggas gravel road or mainly gravel roads from Garies via Hondeklipbaai and Koingaas. The R355 is the most direct and mostly surfaced route from the N7 to the facility. It is therefore unlikely that this WEF, or any other potential developments in the greater area will utilize the same local unsurfaced roads from the Kap Vley development to Komaggas.

The EMPr for the Kap Vley wind energy facility must include dust monitoring and mitigation measures for the on-site and unsurfaced local access roads, during the Construction and Decommissioning phases. No other traffic related conditions are required for the Environmental Authorisation, should it be granted.

It is the Professional Transportation Engineers' opinion that the proposed development should be authorised from a traffic and transportation impact point of view.

LIST OF ABBREVIATIONS

DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
TIA	Transportation Impact Assessment
SANRAL	South African National Roads Agency (Ltd)
veh/hr	Vehicles per hour
NMT	Non-motorised transport
WEF	Wind Energy Facility
ToR	Terms of Reference
REF	Renewable Energy Facilities
m	metres
m^2	Square metres
m^3	Cubic metres
km	Kilometre
ha	hectare

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 (7 April 2017)	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	CV-Page 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 2
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Sections 1.3 and 1.5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 4 & 5
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying alternatives;	Section 2 & 5
g) an identification of any areas to be avoided, including buffers;	N/A
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figures 1, 2 and 3
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 4, 5 and 6
k) any mitigation measures for inclusion in the EMPr;	Section 6 and 7
l) any conditions for inclusion in the environmental authorisation;	Section 8
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6 and 8
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity and activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a
2. Where a government notice gazetted by the Minister provides for any protocol of minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	n/a

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TABLES

FIGURES

1 INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

WSP Group Africa (Pty) Ltd (WSP) has been appointed by juwi Renewable Energies to undertake a Transportation Impact Assessment (TIA) of the proposed Kap Vley Wind Energy Facility to be located near Kleinzee in the Northern Cape.

This report assesses the expected traffic related impacts of the proposed facility during the construction, operation and subsequent decommissioning phases. The purpose of this report is to also consider the traffic impact that the facility will have on the surrounding road network and environment, and to propose mitigating measures to address these impacts, where required.

1.2 Terms of Reference

The Terms of Reference for a TIA is as per the requirements of the South Africa Committee of Transport Officials, South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012. The scope covers the following:

- Previous traffic related studies, submissions and approvals (if relevant).
- Description of the extent of the development, including location and land-use/s.
- Description of the phased development of the facility (if applicable).
- Record of liaison with authorities.
- Record of site visits, if required.
- Description of the local and potentially affected road network, including planning and comment on the road condition, where information is available.
- Description of latent developments in the vicinity of the facility that may also have an impact on the local road network
- Assessment of the required site access, parking and internal circulation.
- Assessment of expected trip generation (construction & operational phases).
- Capacity analysis (construction & operational phases)
- An assessment of the expected total E80's (heavy axle loading) for the life cycle of the facility.
- Assessment of public transport and Non-motorised Transport (NMT).
- Recommendations and conclusions with regards to the required traffic and transport related road upgrades.

The ToR for the TIA include the following: Assess traffic impacts on the relevant main roads to be affected: N7, N14 and R355;

- Identify and assess all potential traffic impacts (direct, indirect) of the construction, operational and decommissioning phases of the proposed development.
- Assess all alternatives, including the no-go alternative.
- Assess cumulative impacts by identifying other Renewable Energy Facilities (REFs) such as wind and solar and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 50 km of the proposed WEF). These include projects that have been approved (i.e. positive EA has been issued), have been constructed or projects for which an Application for EA has been lodged with the Competent Authority.
- Provide recommended mitigation measures, management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts to be included in the Environmental Management Programme (EMPr);
- Provide a description of any assumptions, uncertainties, limitations and gaps in knowledge.
- Incorporate and address issues and concerns raised during the Scoping and EIA phases where they are relevant to the specialist's area of expertise.

1.3 Approach and Methodology

The Approach and Methodology is as per the ToR, listed in Section 1.2. Also note the following:

- Liaison & Data Collection
  - o Comments or approval will not be required from the District Municipality and the Northern Cape Provincial Government Department of Roads & Public Works with regards to the proposed development and its potential impact on any local and provincial roads. This is due to the very low expected trip generation during all phases of the facility (construction, operation and decommissioning).
  - o The relevant authority and/or owner of the local and regional roads will have to be consulted and will have to provide approval for the transportation of any abnormal loads to or from the facility.
- A specific transport related site visit was not deemed necessary for this assessment due to the remote proposed access to the local road network and the negligible expected trip generation of the development during all phases (Construction, Operation, and Decommissioning).
- This report has informed the Basic Assessment (BA) and EIA of the application and will be submitted as part of the EIA and BA process.

1.4 Assumptions and Limitations

The calculation of the expected trip generation and related impact/s on the local road network is based on information provided by juwi. This information was not validated for accuracy.Traffic counts were not undertaken of the local roads, as the volumes are expected to be negligible due to the location, network connectivity and land-use in the vicinity of the study area.

The following trip generation assumptions are relevant and are based on South African conditions:
- Standard bus occupancy to places of work: 65 persons.
- Average private vehicle occupancy to/from places of work: 1.5 passengers.

There are no known mitigation measures pertaining to the specific field of study that are inherent to the project design.

The following assumptions and limitations apply:
- No previous Transportation Assessments have been undertaken as part of this assessment.
- No local traffic counts were undertaken, as they are not required.
- Cumulative impacts are assessed by adding the expected impacts from this proposed development to existing and proposed developments with similar impacts in a 50 km radius. The existing and proposed developments that were taken into consideration for cumulative impacts include:
  - o Proposed 300MW Kleinzee WEF, Northern Cape.
  - o Project Blue Wind Energy Facility near Kleinzee within the Nama Khoi Local Municipality, Northern Cape (Phases 1-3).
  - o Proposed Koingnaas Wind Energy Facility (Basic Assessment Process).
  - o Nigramoep PV Solar Energy Facility on a site near Nababeep, Northern Cape.

There are no known gaps in information in preparing this TIA.

1.5 Source of Information

Information used in this TIA includes:
- Local, Provincial and National Road network information and maps were sourced from the 1:50 000 South African Topographical Maps, Chief Directorate: Surveys and Mapping, MapStudio, GoogleEarth, Google Maps, The South African National Roads Agency (Ltd).

- The satellite image used as a background was obtained from the Google EarthPro and Google Maps.
- Latent Energy developments in the study area was sourced from the Department of Environmental Affairs: The South African Renewable Energy Application Data, Quarter 2, 2017. www.environment.gov.za.
- The Infrastructure, Construction, Operation, and Decommissioning information of the development was sourced from juwi.

2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO TRANSPORT IMPACTS

2.1 Location of the development

The facilities will be located on various farm portions located in the Nama Khoi Local Municipality of the Namaqualand District Municipality in the Northern Cape Province.

Refer to Figure 1 for the locality map of the farm portions, proposed internal roads and power line route options, and Figure 3 in Section 2.6 for the proposed wind turbine locations along the proposed internal roads.

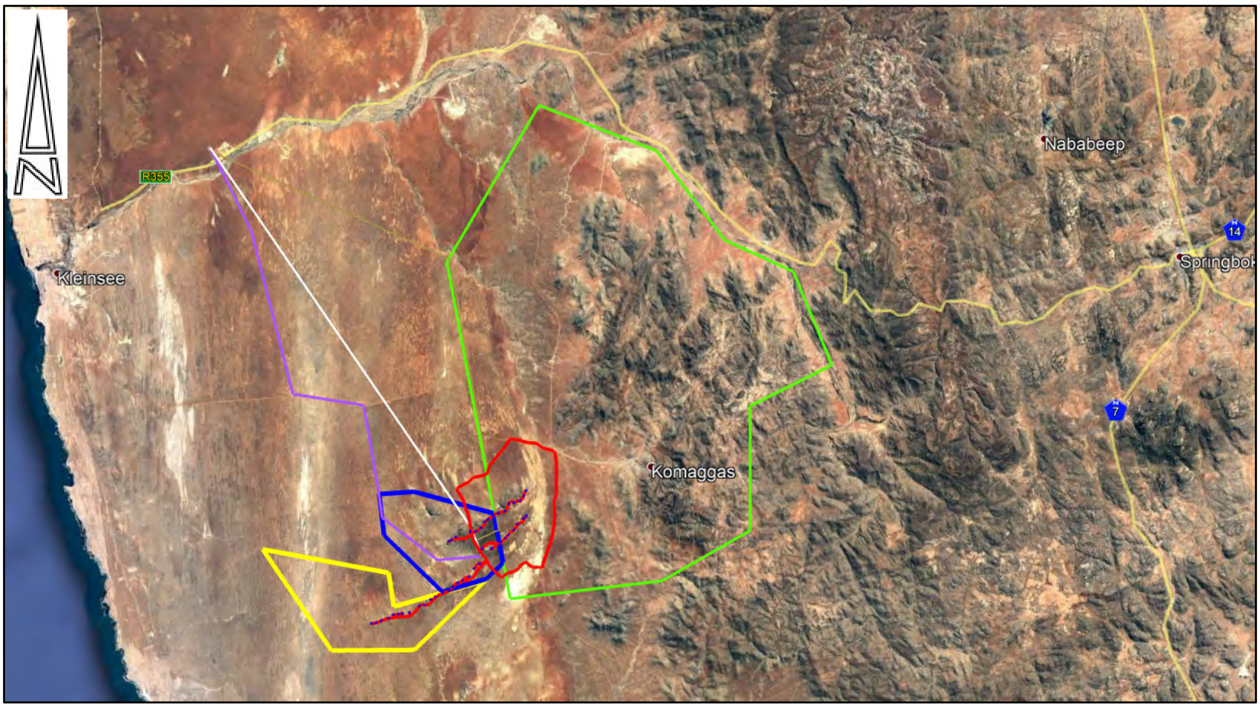

Figure 1. Farm portions of the proposed Kap Vley WEF development area

Source: GoogleEarth

2.2 Type and Extent of the development

The Kap Vley Wind Energy Facility will consist of up to 45 turbines located over 8 farm portions with a total area of approximately 128 ha. The facility will only cover a fraction of the total area during the various phases.

Refer to Table 1 for the detailed project description.

Table 1. Technical details of the facility

Generation Capacity	50-300 MW
Internal access roads	37 km of internal road linking the turbine locations. The road will be 5 m in width and 15 m in sections to allow for passing, curvature and the physical footprint due to cut and fill requirements. Turning areas are also allowed for.
Area of internal roads	Minimum 18.5 ha
Area occupied by on-site sub-station	2.3 ha (+/- 150 m x 150 m)
Number of turbines	20 – 45
Total area occupied by the turbine foundations	25 m x 25 m each
Turbine hub height	80 m - 150 m
Rotor Diameter	100 m - 160 m
Turbine Foundation	• Reinforced foundation of 25 m x 25 m deep • The extent and volume of excavation areas unknown. • Crane Platform with foundation –1 ha per turbine
Area of preferred Operations and Maintenance building	1 ha
Construction and lay down areas	• Site offices, construction camp area & lay down areas: 13 ha • Consisting of several areas along internal roads, centrally located. • On-site concrete batching plant: 0.25 ha
Cement Batching Plant (construction phase)	0.25 ha (50 m x 50 m)
Type and Height of fencing	Fencing will be required round the O&M Building and on-site substation and will be a maximum of 5 m high.
Electrical infrastructure	3 alternative power-line routings under consideration – none will have traffic related impacts
Powerline Corridor	The proposed Kap Vley WEF will connect to the Gromis Substation located on the remainder of the Farm Dikgat 195 or closer to the new Eskom substation for which the location still needs to be determined via a 132 kV overhead transmission line. Depending on the location of the substation on-site, a maximum of 40 km will be accommodated for the length of the proposed overhead line, connecting the on-site substation to the Gromis Substation or the new Eskom substation for which the location still needs to be determined.

2.3 Phasing of the development

The implementation planning of the facility is as follows:

- Commencement of construction: 2020
- Construction period: 12 – 18 months
- Commencement of operational phase: 2021
- Operational lifespan: 20 years

2.4 Road Network Master Planning

The client provided notional information of the planned upgrade of a local unsurfaced road between Garies and Kleinzee. The route starts at the N7 north of Garies, follows a westerly alignment to Hondeklip Baai on the west coast, and from there a northern alignment along the coast via Koingnaas to Kleinsee. It is understood that the road upgrade is dependant on the Eskom Kleinzee WEF, as listed in Section 1.4.

The Garies/Kleinzee route (unsurfaced or potentially upgraded in future), is not a viable access route to the Kap Vley facility due to the following:

- The distance between Garies and Komaggas along this route is approximately 250 km.
- The distance between Garies and Komaggas via Springbok along the N7 and the R355 is approximately 190km.
- The route via Springbok is therefore substantially shorter, and on a higher order and speed National road and provincial road.

The planned upgrade of the road, or in the event that the upgrade does not proceed, will not have an impact on the Kap Vley development, nor will the Kap Vley development have an impact on the road.

2.5 Road network description

The local road network consists of numerous unsurfaced roads that traverse the various farm portions. The proposed internal roads will link with 2 of the external roads at two locations as shown in Figure 2. The external roads links to the town of Komaggas to the east, and from there a single carriageway surfaced road links to the R355. The R355 is a Provincial Road which follows an east-west alignment between Kleinzee on the west coast and Springbok to the east. It is a surfaced single-carriageway 2-way road with no shoulders between the Komaggas access road and Springbok. It is unsurfaced between the Komaggas access road and Kleinzee. Refer to Figure 3.

An unsurfaced road from Garies via Hondeklip Baai and Kleinzee can also be utilised to access the development from the west. However, as noted in Section 2.4, this route is substantially longer than the direct route via Komaggas to Springbok and the the N7 and N14.

Figure 2. Regional road network

Source: GoogleMaps

2.6 <u>Proposed Internal service road network</u>

Unsurfaced internal roads are proposed for the construction and operation phases. These service roads of approximately 37 km in length will be 5m wide with sections of 15m wide to allow for passing, curvature and the physical footprint due to cut and fill requirements. Turning areas are also included. Refer to Figure 3.

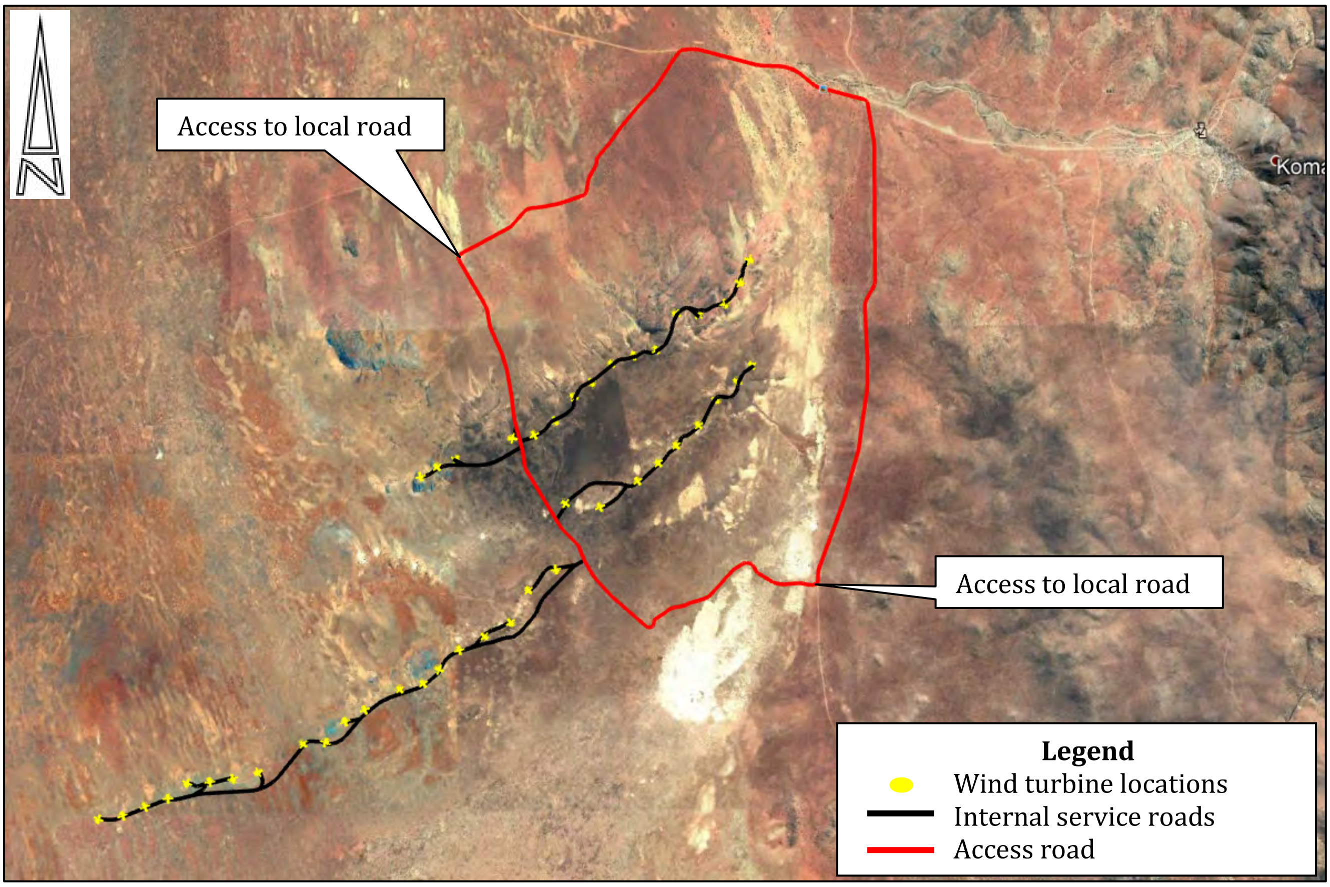

Figure 3. Turbine locations, internal access roads and access to external roads

Source: GoogleEarth

2.7 Access to the local road network

It is noted that the proposed internal roads link with the two external roads at the two locations as shown in Figure 3. These roads will be used during construction and for the future operational and ultimate decommissioning phase of the facility. These access locations are remote on very lightly traffic unsurfaced roads, and should therefore be suitable.

The expected traffic increase on these local roads during the construction phase may result in deterioration of the roads, as they are not designed for abnormal loads (weight) or high traffic volumes.

The transport route/s of the construction materials, components and any oversized/weight components may be National, Provincial or Local roads; and approval will have to be obtained from each authority for the transportation of any oversized or abnormally heavy components. This is normally the responsibility of the logistics company in charge of these deliveries.

Upgrades to the vertical or horizontal alignment of the local access roads may be required depending on the length and width of abnormal vehicles. These alignment grades cannot be determined at this stage, as the abnormal vehicle dimensions are unknown.

2.8 Parking Provision

The proposed on-site parking provision will be limited to the following:

- Construction phase: temporary parking for construction staff and construction deliveries.
- Operational phase: parking for operational & maintenance staff vehicles
- Decommissioning phase: temporary parking for construction staff and construction deliveries.

All parking will be accommodated on-site during all phases.

2.9 Public & Non-Motorised Transport Assessment

In terms of section 29 of the National Land Transport Transition Act (NLTTA) 22 of 2000, it is a requirement that an assessment of public and non-motorised transport be included in a traffic impact assessment.

Due to the remote location of the site, on private farms, public access will not be allowed or required during the construction or operational phases of the project. There is therefore no need for public transport services or non-motorised transport infrastructure, except for the transport of construction staff to and from the site, refer to Section 12.2.

2.10 Existing traffic impacts

There are no existing traffic impacts on the local roads, as the farm portions are agricultural with little to no crops or livestock rearing.

2.11 Existing traffic flows

No traffic surveys were deemed necessary due to the remote location of the development and the low-order and low-volume access roads that will be utilised during the construction period.

2.12 Development Trip Generation

The South African Trip Data Manual (TMH17) does not contain estimates for expected trip generation of a wind energy facility. The trip generation for the construction, operation and decommissioning phases was therefore estimated from client information and assumptions based on similar construction projects. Also note that the estimated traffic generation detailed below represents an absolute maximum.

Transportation Impact Assessment (TIA) is normally required for the following, refer to Table 2.

Table 2: Thresholds for TIA's

THRESHOLD VALUE	STUDY REQUIRED
Less than 50 trips per peak hour	Access Study
More than 50 trips but less than 150 trips per peak hour	Traffic Impact Statement
More than 150 trips per peak hour	Traffic Impact Study (TIA)

- At an estimated 35 veh/hr during the peak construction period, a TIA will under normal circumstances not be required for this development, due to the expected very low trip generation of the site.

2.12.1 Construction phase traffic

The construction phase of the facility will generate the only notable vehicle volumes that requires assessment. Construction traffic will include vehicles for material and component deliveries, construction staff and all other associated personnel. Trips will include the delivery of over-sized components such as rotor blades, mast sections and generators. The route/s between the origin of the material and components and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of any oversized or weight components.

The construction phase traffic was estimated based on the assumptions listed per traffic type below.

2.12.2 Construction Staff Trip generation

- An estimated construction period of 12 to 18 months, with a variable number of staff required depending on the construction phase.
- Approximately 250 workers will be on-site every day during the peak construction period.
- Workers will not be accommodated on-site, and will be transported to site in buses from Kleinzee, Komaggas and Springbok.
- 85% of the total work force (unskilled and semi-skilled workers) will utilise buses to site from neighbouring towns: Kleinzee, Komaggas and Springbok.
- Skilled personnel will travel by private car with an average occupancy of 1.5 persons.
- 100% of the unskilled staff transport will be by bus, with 65 person per bus occupancy.
- 0% of the unskilled staff transport will be by mini-bus.
- Staff will not utilise non-motorised transport (NMT) to site due to the excessive distances to the closest towns.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all the buses will arrive and again depart during the morning and evening peaks.

Refer to Table 3 for the total trip generation for the construction staff. The number of workday PM trips will be the same.

Table 3: Total peak hour trip generation – construction staff

STAFF TYPE	**TOTAL**		
Unskilled/Semi-skilled staff (Maximum workers per day)	213		
Skilled staff (Maximum workers per day)	37		
Total (Maximum workers per day)	**250**		
TRIP TYPE	**TOTAL (VEH/HR)**	**IN (VEH/HR)**	**OUT (VEH/HR)**
AM Peak hour bus trips	8	4	4
AM Peak hour private vehicle trips	25	25	0
Total AM peak hour trips	**33**	**29**	**4**

2.12.3 Construction Material Trip generation

- A maximum of 45 turbines will be installed over the 8 farm portions.
- The turbine towers are expected to have a hub height of up to 150 m, with a rotor diameter of up to 160m.
- Each 160 m diameter turbine rotor will require 3 blades of up to 80 m long (maximum). Rotor blades will be manufactured off-site, (locally or abroad). Imported components (rotor blades, hubs, etc.) will likely be imported from abroad via the Port of Saldanha Bay in the Western Cape. The final dimensions and weight of the blades, their point of origin and the resultant route to the facility will determine the vehicle type and special permits that may be required for the transportation of these blades.
- The transport route/s between the Port of Saldanha Bay or other Ports and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of all oversized and/or weight components. This will be determined by the responsible parties of the component imports (developer, logistics companies, etc.).
- The tower masts will be constructed of tubular steel, pre-cast or in-situ cast concrete or a steel and concrete hybrid. The material type is primarily determined by the height of the tower. Steel tower masts are constructed in sections of up to 30 m, and are lifted into place on site. Pre-cast concrete masts are usually constructed in sections off-site, and also lifted into place on-site. Concrete and steel hybrid masts are usually constructed from a concrete base section of up-to 80 m, and an upper section of steel. These components are also manufactured off site and lifted into place on site.
- The type and point of origin of the tower mast components will determine the delivery route and will again determine the special permits that may be required for transportation to the site.

Assumptions were made to estimate the expected trip generation of the construction phase, refer to Table 4.

- Masts are manufactured from 5 x 30 m steel segments. One segment can be delivered per vehicle trip.
- 1 rotor blade can be transported on an abnormal size vehicle.
- The foundation quantities for a typical tower is approximately 625 m^3 of concrete reinforced with 94 tons of steel.
- Aggregate for concrete is transported in 32 ton loads.
- Standard reinforced concrete (excluding steel) weighs approximately 2,250 kg/m^3.
- Concrete is mixed on site.
- Steel is transported in 32 ton loads on standard flatbed vehicles.
- Component and material deliveries will take place over a period of 18 months.
- A total of 3,014 delivery trips (in & out total) will be required over 18 months, which is approximately 8 trips a day (In & out total) for a 22 day work month.
- The delivery of materials during the AM and PM peak hours specifically will therefore be very low, as delivery vehicles will arrive and depart randomly throughout the day and after hours. If a conservative maximum of 15% of the daily trips are generated during the AM and PM peaks respectively, less than 2 trips will be generated during the peaks.

Table 4. Estimated construction phase trip generation

	Mast component (No.)	Rotor blades (No.)	Rotor	Nacelle	Generator	Foundation material - Concrete (m^3)	Foundation material - Steel reinforcement (tons)
No. of turbines: 1	5 x 30 m length steel sections	3 x 80m length	1	1	1	625	94
No. of turbines: 45	225	135	45	45	45	28,125	4,230
No. of vehicle trips (in & out)	**450**	**270**	**90**	**90**	**90**	**1,758**	**266**
Total No. of trips (in & out)	**3,014**						
No. of trips per workday (in & out)	**8**						
No. of trips per workday peak hour (in & out)	**2 (maximum)**						

2.12.4 Trip generation summary

Refer to Table 5 for the expected combined trip generation of the facility. It is assumed that the peak construction activities and associated highest vehicle trips will not occur at the same time, therefore Table 5 shows a maximum which is highly unlikely.

Table 5: Total maximum AM/PM peak hour trip generation (Construction phase)

FACILITY	VEHICLE TRIPS PER PEAK HOUR		
	Staff (In : Out : Total)	Material deliveries (In : Out : Total)	Total (In : Out : Total)
Kap Vley WEF (In:Out:Total)	29 : 4 : 33	1 : 1 : 2	**30 : 5: 35**

The potential maximum vehicle trips per peak hour is low.

Engineers' opinion: The above analysis and resultant trip generation represents an unlikely worst-case scenario. The background vehicle volumes along the R355 from where all trips will distribute onto the major road network, specifically National Road N7, is very low.

National Road N7 is a Class 1 Freeway, and the negligible traffic generation from this development and the cumulative impact of latent developments in the greater area will have no impact on the route.

In conclusion, the traffic impact of the facility on the local and major road network is expected to be negligible. Also refer to Section 7.

2.13 E80 summary

The total E80 loading of the construction vehicles on the local road network was estimated for the concrete and steel deliveries for the facility. The return E80 pavement loading of the empty vehicles was not calculated, as these are negligible.

Note that these calculations assume that all delivery and return trips occur along the same route to and from the site, and is therefore a conservative maximum.

- Concrete: 879 trips at 3,5 E80/HV
- Steel: 133 trips at 4.7 E80/HV

The estimated total E80 loading for the duration of the construction period is approximately 0.0035 million, and the following mitigating measures are deemed necessary:

- Local (unsurfaced roads): regular maintenance and repair of the local access roads due to damage by construction vehicles will be required.
- R355 (surfaced): No mitigating measures required.
- National Road N7 (surfaced): No mitigating measures required.

2.13.1 Operational phase traffic

The operational phase of the facility will require very few permanent staff. The vehicle trips that will be generated by the personnel will be negligible and the associated traffic impact on the surrounding road network will therefore be negligible.

2.13.2 Decommissioning phase traffic

Following the initial 20-year operational period of the facilities, its continued economic viability may be investigated. If it is still deemed viable its life may be extended; if not, it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, reused and recycled or disposed of. The site will be returned to its current use.

It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the local road network will again be lower than during the Construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.

2.14 Capacity analysis

A capacity analysis of the access intersections was not undertaken as it is not deemed necessary for a development with such low maximum traffic generation.

2.15 Powerline Corridor

A powerline will be required to connect the proposed Kap Vley WEF facility to the national grid. The facility will connect to the Gromis Substation located on the remainder of the Farm Dikgat 195 or closer to the new Eskom substation for which the location still needs to be determined via a 132 kV overhead transmission line.

Depending on the location of the substation on-site, a maximum of 40 km will be accommodated for the length of the proposed overhead line, connecting the on-site substation to the Gromis Substation or the new Eskom substation for which the location still needs to be determined.

Refer to Figure 4 for the three power line alignment alternatives.

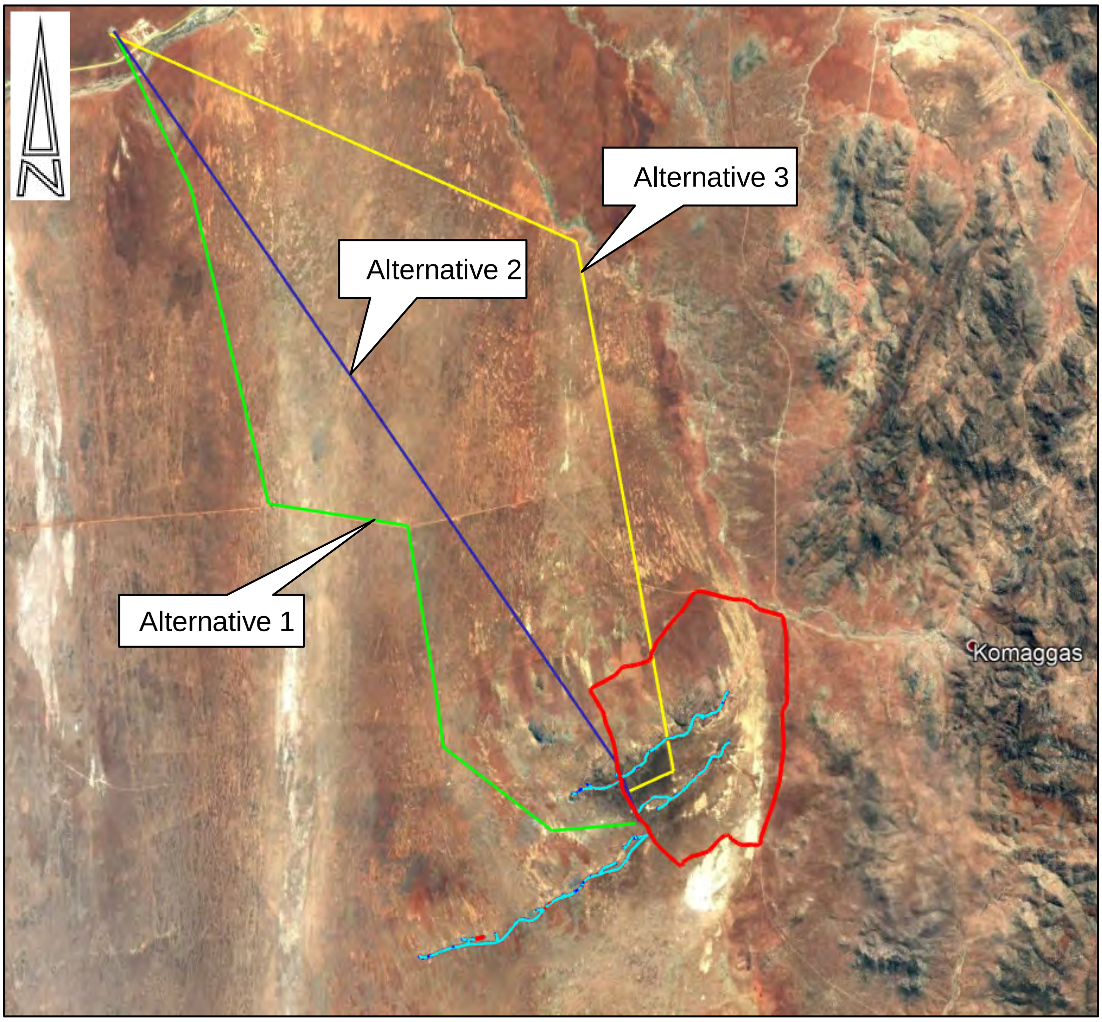

Figure 4. Power line alignment alternatives
Source: GoogleEarth

The likely traffic related impacts due to the powerline (all alternatives) are briefly discussed below:

<u>Construction phase</u>

- The construction phase of the powerline will generate the only notable vehicle volumes that requires assessment. Construction traffic will include vehicles for deliveries (pylon components, foundation material, power cables, etc.), construction staff and all other associated personnel. Abnormal vehicle trips are unlikely.
- The routes between the origin of the material and labour and the powerline construction area is expected to be from the N7 via the R355, the Komaggas road, the WEF's internal road network and other local farm roads.
- The construction period will be approximately 12 – 18 months.
- The expected construction vehicle volumes and number of staff has not been determined. It can be expected that the volumes will be substantially lower than for the construction of the WEF itself.
- Therefore the construction phase traffic and associated impact is regarded as low.

Operational phase

- Negligible traffic will be generated to maintain the powerline, therefore there will be no traffic impact.

Decommissioning phase

- Following the initial 20-year operational period of the facilities, its continued economic viability may be investigated. If it is still deemed viable its life span may be extended; if not, it will be decommissioned. If it is completely decommissioned, the power line infrastructure may also be disassembled, reused and recycled or disposed of.
- It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the local road network will be negligible.

3 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

A TIA is normally required by the local authority (Local & District Municipality), where a land-use change or densification (Rezoning) is applied for. However, that is not the case for this proposed development due to the very low or negligible traffic generation during the construction, operation and decommissioning phases.

There are no National Roads in the vicinity of the development, however the development traffic may utilise the N7 from Springbok. Due to the low/negligible traffic volumes and the high-order classification of the route, the South African National Roads Agency (Ltd) (SANRAL) will not be required to approve the TIA.

Note that the transport of any abnormal or oversized items on National or other roads will require approval from the relevant road owner (authority). These routes and trips can however not be assessed at this stage.

4 IDENTIFICATION OF KEY ISSUES

4.1 Key Issues Identified During the Scoping Phase

The potential traffic related issues identified during the scoping phase of this EIA process include:

Construction phase

- Increased vehicles trips on the internal roads
- Increased vehicles trips on the local access roads
- Increased vehicles trips on the high-order local road (R355 & N7)

Operational phase

- Increased vehicles trips on the internal roads
- Increased vehicles trips on the local access roads
- Increased vehicles trips on the high-order local road (R355 & N7)

Decommissioning phase

- Increased vehicles trips on the internal roads

- Increased vehicles trips on the local access roads
- Increased vehicles trips on the high-order local road (R355 & N7)

Consultation process
No traffic related comments have been received yet through the EIA public participation process to date.

4.2 Identification of Potential Impacts

Based on the increased number of vehicle trips expected due to the development, the following potential impacts have been identified:

Construction Phase
- Noise, dust & exhaust pollution due to vehicle trips on-site
- Noise, dust and exhaust pollution due to additional trips on the local unsurfaced access roads
- Noise and exhaust pollution due to additional trips on the R355 & N7

Operational Phase
- Noise, dust & exhaust pollution due to vehicle trips on-site
- Noise, dust and exhaust pollution due to additional trips on the local unsurfaced access roads
- Noise and exhaust pollution due to additional trips on the R355 & N7

Decommissioning Phase
- Noise, dust & exhaust pollution due to vehicle trips on-site
- Noise, dust and exhaust pollution due to additional trips on the local unsurfaced access roads
- Noise and exhaust pollution due to additional trips on the R355 & N7

4.3 Cumulative impacts

The known latent energy facilities in the region are:
- Proposed 300MW Kleinzee WEF, Northern Cape. The EIA, dated May 2015, was made available. A TIA is not included in this report.
- Project Blue Wind Energy Facility near Kleinzee within the Nama Khoi Local Municipality, Northern Cape (Phases 1-3)
- Proposed Koingnaas Wind Energy Facility Environmental Basic Assessment Process,
- Nigramoep Solar PV Energy Facility on a site near Nababeep, Northern Cape.

The EIA for the proposed Kleinzee WEF identified three potential access routes to the site, namely:
- R355 via Springbok (97km). The most direct primarily tarred road.
- Komaggas gravel road off the R355 – Shortest route to the N7.
- Combination of mainly gravel roads from Garies off the N7 via Hondeklipbaai and Koingaas.

The EIA stated that there are no preferences regarding access to the WEF from an environmental perspective.

The cumulative traffic impacts due to these latent developments in the study area is of low significance. The reasons are as follow:

- The latent developments are located more than 30 km from the proposed Kap Vley Development.
- The construction and future decommissioning phase time periods of the latent developments are unknown. During these phases the highest additional traffic generation will occur. However, it is unlikely that these phases will coincide exactly with those of the Kap Vley construction and decommissioning phase time periods. The cumulative impacts are therefore regarded as low, even if they should coincide.
- The operational phases of the various latent development and the Kap Vley development will coincide more, as these are long term (20 year) phases. The negligible additional traffic during the operational phase of each development, and their cumulative traffic impact, will be low.
- The latent developments will not utilize the local same unsurfaced roads that the Kap Vley development will use. The unsurfaced roads are more prone to traffic impacts due to them being unsurfaced and of a lower order, i.e. not designed for large volumes of traffic.
- The latent developments may utilize section of the same regional R355) and national (N7) road network. However, these roads or sections of roads are higher order surfaced and the low traffic volumes from these developments will have a low cumulative impact.

5 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

5.1 Potential Impact 1 - Noise, dust & exhaust pollution due to vehicle trips on-site (Construction Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - Regular dust suppression methods on internal local roads (dust suppressant) if required
- It is recommended that dust prevention and monitoring form part of the Environmental Management Programme (EMPr).
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and construction materials to site.

5.2 Potential Impact 2 - Noise, dust & exhaust pollution due to vehicle trips on the local unsurfaced access roads (Construction Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - Maintenance and repairs of local roads
- It is recommended that dust prevention (as required) and monitoring form part of the EMPr.
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and construction materials to site

5.3 Potential Impact 3 – Noise & exhaust pollution due to vehicle trips on the local provincial road (R355) (Construction Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None

- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and construction materials to site
- There are no viable alternatives with less impact identified to transport staff and construction materials to site

5.4 Potential Impact 4 – Noise & exhaust pollution due to vehicle trips on the High-order (National) road network (N7) (Construction Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and construction materials to site
- There are no viable alternatives with less impact identified to transport staff and construction materials to site

5.5 Potential Impact 5 - Noise, dust & exhaust pollution due to vehicle trips on-site (Operation phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures – None (very low vehicle volumes and no heavy vehicles)
- Low significance of impact with mitigation measures

5.6 Potential Impact 6 - Noise, dust & exhaust pollution due to vehicle trips on the local unsurfaced access roads (Operation Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None (very low vehicle volumes and no heavy vehicles)
- Low significance of impact with mitigation measures

5.7 Potential Impact 7 – Noise & exhaust pollution due to vehicle trips on the local provincial road (R355) (Operation Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures

5.8 Potential Impact 8 – Noise & exhaust pollution due to vehicle trips on the high order (National) road network (N7) (Operation Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures

5.9 Potential Impact 9 - Noise, dust & exhaust pollution due to vehicle trips on-site (Decommissioning phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - Regular dust suppression methods on internal local roads if necessary (dust suppressant)
- It is recommended that dust prevention and monitoring form part of the EMPr.
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the site

5.10 Potential Impact 10 - Noise, dust & exhaust pollution due to vehicle trips on the local unsurfaced access roads (Decommissioning phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- It is recommended that dust prevention and monitoring form part of the EMPr.
- Low significance with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the site

5.11 Potential Impact 11 – Noise & exhaust pollution due to vehicle trips on the local provincial road (R355) (Decommissioning phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the site

5.12 Potential Impact 12 – Noise & exhaust pollution due to vehicle trips on the high order (National) road network (N7) (Decommissioning phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the site

5.13 Cumulative Impacts

- The potential cumulative traffic impacts due to the latent developments in the study area is of low significance, refer to Section 4.3 and below.

5.14 Cumulative Potential Impact 13 – Noise & exhaust pollution due to vehicle trips on the local provincial road (R355) (All phases)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the various latent sites.

5.15 Cumulative Potential Impact 14 – Noise & exhaust pollution due to vehicle trips on the high order (National) road network (N7) (All phases)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the various latent sites.

6 IMPACT ASSESSMENT SUMMARY

The assessment of impacts and recommendation of mitigation measures as discussed above are collated in Table 6-1 to Table 6-4 to below.

Table 6-1 Impact assessment summary table for the Construction Phase

Impact pathway	Nature of potential impact/ risk	Status[1]	Extent[2]	Duration[3]	Consequence	Probability	Reversibility of impact	Irreplace-ability of receiving environment / resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
CONSTRUCTION PHASE															
Vehicle trips on-site	Noise, dust & exhaust pollution	Negative	Local	Medium term	Slight	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes - no	Dust suppression and maintenance of internal roads	Low	4	High
Additional trips on the local unsurfaced access roads	Noise, dust & exhaust pollution	Negative	Regional	Medium term	Slight	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes – no	Maintenance/ repairs of local roads	Low	4	High
Additional trips on the R355	Noise & exhaust pollution	Negative	Regional	Medium term	Slight	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High
Additional trips on the N7	Noise & exhaust pollution	Negative	Regional	Medium term	Slight	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High

[1] Status: Positive (+) ; Negative (-)
[2] Site; Local (<10 km); Regional (<100); National; International
[3] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

Table 6-2 Impact assessment summary table for the Operational Phase

Impact pathway	Nature of potential impact/ risk	Status[4]	Extent[5]	Duration[6]	Consequence	Probability	Reversibility of impact	Irreplace-ability of receiving environment / resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
OPERATIONAL PHASE															
Vehicle trips on-site	Noise, dust & exhaust pollution	Negative	Local	Long term	Moderate	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes - no	Dust suppression and maintenance of internal roads	Low	4	High
Additional trips on the local unsurfaced access roads	Noise, dust & exhaust pollution	Negative	Regional	Long term	Moderate	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes - no	Maintenance /repairs of local roads	Low	4	High
Additional trips on the R355	Noise & exhaust pollution	Negative	Regional	Long term	Moderate	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High
Additional trips on the N7	Noise & exhaust pollution	Negative	Regional	Long term	Moderate	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High

[4] Status: Positive (+) ; Negative (-)
[5] Site; Local (<10 km); Regional (<100); National; International
[6] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

Table 6-3 Impact assessment summary table for the Decommissioning Phase

Impact pathway	Nature of potential impact/ risk	Status[7]	Extent[8]	Duration[9]	Consequence	Probability	Reversibility of impact	Irreplace-ability of receiving environment / resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
DECOMMISSIONING PHASE															
Vehicle trips on-site	Noise, dust & exhaust pollution	Negative	Local	Short term	Moderate	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes – no	Dust suppression and maintenance of internal roads	Low	4	High
Additional trips on the local unsurfaced access roads	Noise, dust & exhaust pollution	Negative	Regional	Short term	Moderate	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes – no	Maintenance /repairs of local roads	Low	4	High
Additional trips on the R355	Noise & exhaust pollution	Negative	Regional	Short term	Moderate	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High
Additional trips on the N7	Noise & exhaust pollution	Negative	Regional	Short term	Moderate	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High

[7] Status: Positive (+) ; Negative (-)
[8] Site; Local (<10 km); Regional (<100); National; International
[9] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

Table 6-4 Impact assessment summary table - Cumulative

Impact pathway	Nature of potential impact/ risk	Status[10]	Extent[11]	Duration[12]	Consequence	Probability	Reversibility of impact	Irreplace-ability of receiving environment / resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
CUMULATIVE IMPACTS															
Additional trips on the R355	Noise & exhaust pollution	Negative	Regional	Long term	Slight	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High
Additional trips on the N7	Noise & exhaust pollution	Negative	Regional	Long term	Slight	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High

[10] Status: Positive (+) ; Negative (-)
[11] Site; Local (<10 km); Regional (<100); National; International
[12] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

7 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

It is recommended that dust prevention and monitoring form part of the EMPr for the EIA for wind energy facility as detailed below. Since no traffic impacts are associated with the power line corridor there are no traffic related recommendations for the BA for the power line corridor.

Construction phase

- Internal roads - regular monitoring of site road surface quality, construction traffic and dust monitoring.
- Implementation of dust suppression methods when required (i.e. water spraying, grading of road surfaces)
- Local access roads - regular monitoring of road surface quality, construction traffic and dust monitoring.

Operation phase

No traffic related EMPr mitigation measures required due to negligible traffic volumes on-site, on local access roads and on provincial roads.

Decommissioning phase

- Internal roads - regular monitoring of site road surface quality, construction traffic and dust monitoring.
- Implementation of dust suppression methods when required (i.e. water spraying, grading of road surfaces)
- Local access roads - regular monitoring of road surface quality, construction traffic and dust monitoring.

8 CONCLUSION AND RECOMMENDATIONS

The key findings of this TIA are as follow:

- There are no notable traffic related impacts associated with the proposed power line corridor, and therefore no impacts assessed on EMPr recommendations made as part of the BA process for the power line corridor.
- With regard to the wind energy facility, there are no confirmed planned road upgrades in the study area that will have an impact on the Kap Vley development. The potential upgrade of the Garies/Hondeklipbaai /Kleinsee route will have no traffic impact on the development or vice-versa.
- The known latent developments in the study area will have a negligible cumulative traffic impact on the local, regional or national road network. The reasons are as follow:
    - The latent developments are located more than 30 km from the proposed Kap Vley Development.
    - The construction and future decommissioning phases of the latent developments are unknown. During these phases the highest additional traffic generation will occur. However, it is unlikely that these phases will coincide exactly with those of the Kap Vley construction and decommissioning phases. The cumulative impacts are therefore regarded as low, even if they coincide.

  - o The operational phases of the various latent development and the Kap Vley development will coincide more, as these are long term (20 year) phases. The negligible additional traffic during the operational phase of each development, and their cumulative traffic impact, will be low.
  - o The latent developments will not utilize the local same unsurfaced roads that the Kap Vley development will use. The unsurfaced roads are more prone to traffic impacts due to them being unsurfaced and of a lower order, i.e. not designed for large volumes of traffic.
  - o The latent developments may utilize section of the same regional R355) and national (N7) road network. However, these roads or sections of roads are higher order surfaced roads and the low traffic volumes from these developments will have a low cumulative impact.

- The site can be accessed off two existing local roads (unsurfaced) via the R355, a single carriageway 2-way surfaced road (1 lane per direction), with no surfaced shoulders. It is recommended that only the existing local roads be utilised for access during construction, operational and the decommissioning phase.
- Construction, operational and decommissioning phase parking will be accommodated on-site.
- There is no need for public transport services or non-motorised transport infrastructure to serve the site for the construction and operational phase, except for the transport of staff.
- The estimated peak trip generation of the facility will be 35 veh/hr in the weekday AM and PM peaks during the Construction and Decommissioning phases, and will be negligible for the operational phase.
- The expected traffic increase on the internal and local access roads during the construction phase may result in deterioration of the road, as it is not designed for abnormal and heavy traffic volumes. The cost of maintaining and repairing this road during the Construction phase of the projects should be borne by the developer.
- It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the local access roads will be lower than during the Construction phase. Any damage to the unsurfaced roads caused by the decommissioning phase traffic should be repaired at the cost of the developer.
- The estimated total E80 loading on the surfaced road to the R355, the surfaced portion of the R355 to Springbok and National Road N7 for the duration of the construction period is negligible, and no mitigating measures are deemed necessary.
- The transport route/s between the origin of the construction material and turbine components and the facility may be National, Provincial or Local roads; and each authority will be required to provide the necessary permits for the transportation of any oversized or abnormally heavy components.
- A capacity analysis of the accesses was not undertaken and is not deemed necessary.
- The mitigating measures recommended are dust monitoring and control on all on-site and local unsurfaced roads.

The EMPr for the Kap Vley wind farm must include dust monitoring and mitigation measures for the on-site and unsurfaced local access roads, during the Construction and Decommissioning phase. This should be a condition for the Environmental Authorisation of the facility.

No other traffic related conditions are required for the Environmental Authorisation for the Kap Vley wind farm or its associated power line corridor, should it be granted.
It is the Professional Transportation Engineers' opinion that the proposed development should be authorised from a traffic and transportation impact point of view.

9 REFERENCES

- South Africa Committee of Transport Officials, TMH 17 South African Trip Data Manual, Version 1.01, September 2013.

- South Africa Committee of Transport Officials, South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012.

- Van Zijl. A study on the design and material costs of tall wind turbine towers in South Africa, AC Way, GPAG. Technical Paper. Journal of the South African Institution of Civil Engineering, (Vol 57), December 2015.

- Savannah Environmental (Pty) Ltd, Proposed Kleinzee 300MW Wind Energy Farm, South of Kleinsee, Northern Cape Province. Final Environmental Impact Assessment Report, May 2015

Scoping and Environmental Impact Assessment for the proposed Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape

UPDATED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

APPENDIX Q:

Ecological Offset Study

JUWI KAP VLEY WIND FARM - ECOLOGICAL OFFSET STUDY

PRODUCED FOR JUWI RENEWABLE ENERGIES

3Foxes Biodiversity Solutions

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Final Draft

June 2018

Contents

LIST OF FIGURES:

1. BACKGROUND

Juwi Renewable Energies is proposing to develop the Kap Vley wind farm near to Komaggas in the Northern Cape. The proposed Kap Vley project would consist of up to 45 turbines with associated infrastructure and a grid connection to the Eskom Gromis Substation approximately 32km north west of the site. The total footprint of the Wind Farm development would be approximately 128ha. The development is currently in the EIA Phase and has not yet been authorised.

The project site is located within a Critical Biodiversity Area as well as within an area variously recognised to be of high biodiversity value. The sensitivity of the site has been confirmed through extensive fieldwork at the site as part of the EIA. Recognising the sensitivity of the site, the developer has taken a pro-active approach to impact avoidance and mitigation at the site. This includes detailed habitat mapping at the site to inform the layout and reduce on-site impacts as far possible. While this has been very effective at reducing the impact of the development on plant species of concern as well as sensitive habitats, some residual impact remains due to the overall general sensitivity of the site as well as the status of the affected area as a Critical Biodiversity Area. As a result, some of the ecological impacts associated with the development have been assessed as being of moderate significance after mitigation. Based on these results, the ecological specialist has recommended that the developer should include an offset study as part of the development application. The purpose of the offset would be to provide an off-site mitigation of the residual impact of the development.

Juwi has thus commissioned this offset study to coincide with the EIA process and inform the decision making process in line with the Draft National Offset Policy (Government Notice 276 of 2017). The inclusion of the Offset Study in the EIA process has, to date, been a voluntary pro-active step initiated by the developer and was not been requested by either DEA or DENC. However, given the sensitivity of the site, it was anticipated the development would potentially be fatally flawed without an offset and such a measure would likely have emerged as a need or requirement during the EIA process. This is in line with the 2014 EIA Regulations and offset guidelines which recommend that the need for an offset should be evaluated at the pre-application phase and the necessary steps taken to include the offset in the EIA process and provide opportunity for the issuing authority (DEA) and other stakeholders to comment on the proposed offset.

The Ecological Offset Study has the following broad aims:

- Provide an outline of the current framework for biodiversity offsets. A summary of the current Draft National Biodiversity Offset Policy is provided, highlighting the relevant sections as they pertain to the current development.
- Place the habitats present at the site in a regional context and identify features of the site that may make it of regional significance.

- Identify if and where similar habitat may occur on the coastal plain of Namaqualand.
- Explore identified potential offset areas in terms of the draft national offset guidelines and the regional conservation context to ensure that identified offset areas meet the like for like offset criterion, but also occur in an area where their long-term sustainability can be ensured.
- Evaluate the most appropriate type of offset to be developed in terms of land acquisition or stewardship and the recommended management authority.
- Identify any further actions and priorities required for taking the offset process forward.

2. FRAMEWORK FOR BIODIVERSITY OFFSETS

Habitat loss is recognized as the primary driver of biodiversity loss and biodiversity offsets are becoming an internationally accepted tool which can be used to ensure that development is ecologically sustainable by enhancing the conservation and sustainable use of priority ecosystems and fragile biodiversity-rich areas not under formal protection. The NBF (National Biodiversity Framework, 2009) states that "*In some cases, following avoidance and mitigation, there is still residual damage to biodiversity as a result of a development. In such cases, if the development is socially and economically sustainable, ecological sustainability may be achieved through a biodiversity offset. A biodiversity offset involves setting aside land in the same or a similar ecosystem elsewhere, at the cost of the applicant, to ensure no net loss of important biodiversity. Biodiversity offsets are particularly important in securing threatened ecosystems and critical biodiversity areas.*"

The desired outcome of biodiversity offsets is to ensure that:

1. The cumulative impact of development authorization and land use change does not:
   - result in the net loss of CBA's or jeopardize the ability to meet South Africa's targets for biodiversity conservation;
   - lead to ecosystems becoming more threatened than 'Endangered'; and/or
   - cause a decline in the conservation status of species and the presence of 'special habitats'.
2. Conservation efforts arising from the development application process, and contributing to improved protection of South Africa's unique species and ecosystems in perpetuity, are focused in areas identified as priorities for biodiversity conservation. Particular emphasis is on consolidation of priority areas and securing effective ecological links between priority areas; and
3. Ecosystem services provided by affected biodiversity and on which local or vulnerable human communities - or society as a whole - are dependent for livelihoods, health and/or safety, are at minimum safeguarded, and preferably improved.

The basic principles and tenets that underlie offsets and their practical implementation required to achieve the above goals are outlined below. The majority of this is taken directly or synthesised from the draft 2017 offset guidelines.

Defining Biodiversity Offsets

Biodiversity Offsets are conservation measures designed to remedy the residual negative impacts of development on biodiversity and ecological infrastructure, once the first three groups of measures in the mitigation sequence have been adequately and explicitly considered (i.e. to avoid, minimize and rehabilitate/restore impacts). Offsets are the 'last resort' form of mitigation, only to be implemented if nothing else can mitigate the impact (Figure 1). It is important to note in this regard that the offset is therefore not a form of mitigation in itself and the implementation of an offset does not release the requirement or need to implement the full array of mitigation and avoidance options at the impacted site.

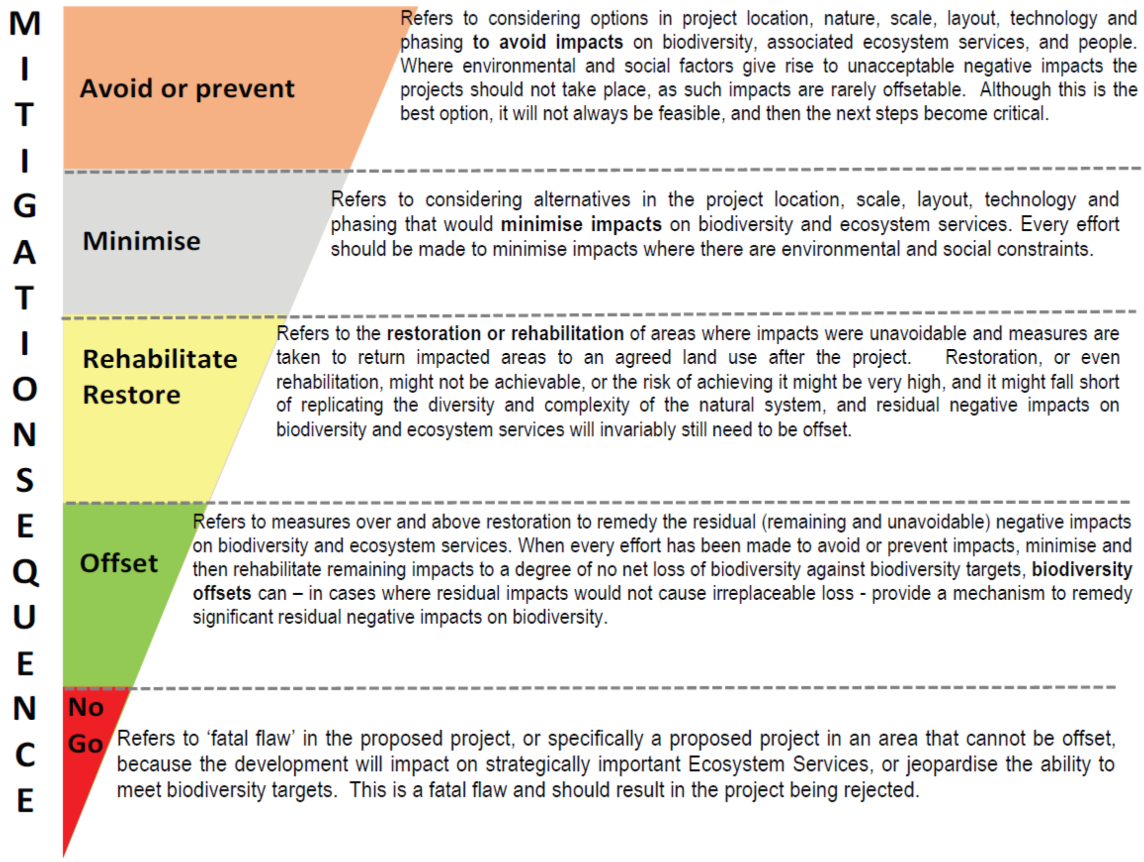

Figure 1. The mitigation hierarchy and the location of offsets within this context as the last resort for development.

There are limits to what can or should be offset

Biodiversity offsets are to be used in cases where the EIA process identifies negative residual impacts of 'medium' or 'high' significance on biodiversity. Activities resulting in impacts of 'low' significance may not require an offset. Impacts on biodiversity of 'very high' significance may not be able to be fully offset because of the conservation status, irreplaceability, or level of threat to affected biodiversity, or the risk of preventing scientific targets for conserving that biodiversity from being met. In these cases, given that the proposed activity would lead to irreversible impacts and irreplaceable loss of biodiversity, alternatives to the proposal should be sought; i.e. the proposed activity should not be authorized in its current form.

The principle of ecosystem protection

Biodiversity offsets should ensure the long-term protection of priority ecosystems on the ground and improve their condition and function, thereby resulting in measurable positive outcomes for biodiversity conservation 'on the ground'. These outcomes could contribute to improved ecosystem integrity and increased use and/ or cultural value of offset areas and the ecosystems of which they are part.

No Net Loss up to specified limits of acceptable change

Offsets should not be used to 'soften' a development proposal that would result in unacceptable loss of biodiversity. Biodiversity offsets should be designed in such a way that scientific targets for conserving ecosystems and other biodiversity features in the long term are attainable and not undermined as a consequence of the proposed activity. No biodiversity feature (species or ecosystem) should be at risk of being pushed beyond an Endangered threat status by a development.

Locating biodiversity offsets in the landscape

Biodiversity offsets should be located in the landscape in such a way that they help to secure priority areas for conservation, improve connectivity between these priority areas, and/ or consolidate or expand existing protected areas. Where priority ecosystem services are residually affected, biodiversity offsets should preferably be located in the landscape in such a way that they deliver equivalent services to affected parties; that failing, additional compensation measures would be needed for these parties.

Equivalence – 'like for like'

Biodiversity offsets should comprise - or benefit - the same biodiversity components as those components that would be negatively affected by development. In exceptional cases only, and only with support from the provincial conservation agency, could consideration be given to the biodiversity offset targeting a relatively more threatened ecosystem or habitat.

Additionality – new action required

Biodiversity offsets must result in conservation gains above and beyond measures that are already required by law or would have occurred had the offset not taken place.

Defensibility

The measure of residual negative impacts on biodiversity caused by a proposed development, as well as the design and implementation of biodiversity offsets, should be based on the best available biodiversity information and sound science, and should incorporate local traditional or conventional knowledge as appropriate. Offsets must consider all significant residual impacts on biodiversity: direct, indirect and/ or cumulative impacts. The scope of assessment must include due consideration of impacts on recognized priority areas for biodiversity conservation; impacts on biodiversity pattern (conservation status of ecosystem and species, importance to migratory species) and ecological and evolutionary processes (must look across scales and take into account connectivity, gradients and corridors); and impacts on ecosystems or species on which there is high dependence for health, livelihoods, and/ or wellbeing.

2.1 GENERAL PROCEDURES TO BE FOLLOWED WHEN CONSIDERING OFFSETS

The 2014 EIA Regulations as part of the introduction of the "One Environmental System" (where different application and authorisation processes are run concurrently), impose very tight timeframes on BAR and S&EIR processes. In order for the biodiversity impacts to be adequately assessed and evaluated, and the mitigation sequence applied, it is desirable to evaluate the probable need for – and design of - offsets in the pre-application phase. It is therefore important for the applicant and Environmental Assessment Practitioner (EAP) to work with the Competent Environmental Authority (CEA) in the pre-application phase to finalise as much of the biodiversity-related work as possible before the application is submitted. This should include:

a. Pre-application meeting with the CEA and EAP to determine the possibility of an offset being required. If an offset might be required, it becomes imperative for the applicant to investigate other project alternatives during the EIA process, particularly where impacts are likely to be of high or very high significance.
    - *Pre-EIA meetings were held with DENC, DEA, SANParks and WWF for this purpose.*
b. The biodiversity specialist(s), appointed by the applicant, should be fully appraised of the development proposal, including feasible location or siting alternatives, proposed layouts, operational activities, associated activities and infrastructure on which the development depends, likelihood of risks (amongst others) in order to perform specialist studies that can produce reliable and defensible significance ratings for negative impacts on biodiversity, as well as mitigation recommendations. Specialist studies should be done well in advance of the submission of the application.
    - *The specialist and author of this report has been closely involved from the inception and screening phases of the proposed project and has done several site visits at the early stages for the purpose of preparing fine scale sensitivity maps of the site. These maps have since informed several iterations of the layout aimed at reducing the environmental impact of the development as far as possible.*

c. Should there be potentially significant negative impacts on biodiversity, the environmental assessment should undertake a process to exhaust the mitigation sequence to reduce the impact on biodiversity through the investigation of alternatives. The study should clearly show how the mitigation sequence has been followed.

- *The various mitigation and avoidance measures implemented at the site are fully detailed in the specialist terrestrial ecology EIA report. This includes a full walk-through of the development footprint and detailed mapping of populations of plant species of conservation concern as well as mapping of sensitive habitats and No-Go Areas. The detailed mapping has allowed for effective avoidance to be implemented by the developer at the planning stage, which has reduced on-site impacts on fauna and flora to an acceptable level. Initial screenings and consideration of alternative sites found that based on environmental and the wind criteria only the current site is a feasible alternative. The extensive avoidance and planning stage mitigation and avoidance that has been implemented at the site indicates that the mitigation hierarchy has been well adhered to and it is only the impacts on CBAs and future conservation options that cannot be mitigated to a low level and which potentially require an offset.*

d. Should residual impacts of very high significance be probable, the applicant would effectively be pursuing his/ her application on risk.

- *This risk was noted and addressed with DENC, DEA, SANParks and WWF before the initiation of the EIA process. In terms of assessed impacts, residual impacts on fauna and flora have been assessed as being of Low Significance while residual impacts on CBAs and future conservation options were assessed as being of Moderate Significance.*

e. If the biodiversity specialist(s) subsequently confirms that the residual negative impacts on biodiversity of medium/high significance would be unavoidable, offsets should be discussed with the CEA and, if deemed appropriate, offset investigation, planning and design would best commence pre-authorisation and be incorporated into all stages of the EIA process.

- *Early engagements with DENC, DEA, SANParks and WWF prior to the commencement of the EIA process led to the preparation of this offset report that investigates and makes recommendations for potential offsets as part of the EIA process. If agreed to by the relevant stakeholders, the recommendations of this offset study will be included and made conditions to the Environmental Authorisation for the proposed development.*

f. If an offset is required, the authorisation should state that development may only commence after the offset has been secured.

- *In discussion with DENC and DEA it has been agreed that the recommendations of this offset study become conditions of the DEA, and that the EA will contain a further condition that construction may only commence once a binding offset agreement has been concluded between* *all relevant stakeholders which may include DENC, SANParks, WWF and the developer.*

2.2 DESIGNING AND LOCATING AN OFFSET

There is no single best approach to decide on an appropriate offset. However, unless there is a compelling reason not to follow this process, the offset design process should comprise of the following seven steps:

1. Obtain a measure of the residual loss of biodiversity (i.e. residual negative impacts) as a consequence of the proposed development. This measure at minimum relates to the area and condition of affected ecosystem/ habitat;
   - *See Section 3 of this report*

2. Determine the best type of offset;
   - *See Section 4 of this report*

3. Determine the required size of offset and, where applicable, its optimum location;
   - *See Section 5 of this report*

4. Investigate candidate offset site(s) in the landscape that could meet the offset requirements. Check whether any eligible offset receiving area is suitable;
   - *See Section 6 of this report*

5. Decide on the best way to secure the offset, and ensure that the offset option would be acceptable to the CEA and the statutory conservation authorities;
   - *See Section 7 of this report*

6. Prepare an Offsets Report or dedicated section within the EIA report; and
   - *This report*

7. Conclude agreements on offsets (between the applicant and an implementing agent) and develop an Offset Management Programme, where applicable.
   - *See Section 7 of this report describing how a binding offset agreement between the relevant stakeholders must be made a condition before construction may commence.*

2.3 REQUIREMENTS FOR A PROPOSED OFFSET AS PART OF THE EIA PROCESS

A CEA (Competent Environmental Authority i.e. DEA) may require that an Offset Report or an Offset Agreement be submitted as part of the final Basic Assessment or EIA Report, or that an Offset Agreement be concluded prior to the commencement of the listed activity. Where the applicant has secured and will manage (or contract a third party to manage) an offset, an Offsets Management Plan/ Programme may also be required to be submitted to the CEA.

Reporting on Offset performance and sufficiency should be included in the EMPr for any project.

Any Offset Report would be submitted as a specialist report with, and incorporated into, the BAR or EIR. At minimum, it should include the following information (see Appendix 3 of the 2014 EIA Regulations):

1. An evaluation of the adequacy of measures considered and adopted to avoid, minimize and rehabilitate potentially significant negative impacts on biodiversity. (That is, were these measures sufficient; were reasonable and feasible alternative measures investigated, or could greater effort have been made particularly to avoid and minimize these impacts?).
    - *See Sections 3 and 4 of this report*
2. A clear statement regarding the appropriateness of considering biodiversity offsets in this case. (That is, are there any residual impacts of 'very high' significance that could lead to irreplaceable loss of biodiversity and/ or priority ecosystem services?).
    - *See Sections 3 & 4 of this report*
3. A reliable measure of residual negative impacts on significant biodiversity and ecosystem services requiring offsets.
    - *See Section 3 of this report as well as the main EIA study*
4. It must take into account gaps in information or low levels of confidence in the predicted negative impacts.
    - *See Section 3 of this report*
5. It must give due consideration to uncertainties or low levels of confidence in the outcome of proposed measures to avoid, minimise and/ or rehabilitate negative impacts.
    - *See Section 3 of this report*
6. The duration of residual negative impacts of the proposed activity on biodiversity, taking a risk-averse approach, to determine the minimum duration of the biodiversity offset(s).
    - *See Section 3.5 of this report*
7. An explicit statement on the required size of the biodiversity offset to remedy these residual negative impacts, applying the basic offset ratio and adjustments as appropriate.
    - *See Section 5 of this report*
8. A description of the offset options considered (like for like habitat, trading up, or other), giving defensible reasons for arriving at the proposed offset type.

- *See Section 4 of this report*

9. Where the proposed offset comprises land to be secured and managed:

    a) Evaluation of the probable availability of suitable offset site(s) in the surrounding landscape to meet offset requirements.
    b) Description of potential site(s) for biodiversity offset(s).
    c) Description of stakeholder engagement process in identifying and evaluating the adequacy and acceptability of the proposed offset site.
    d) Description of proposed approach to securing the offset site(s) (e.g. conservation servitude, protected area consolidation/ stewardship) and how it would be managed.
    e) Evaluation of probable adequacy of proposed offset site(s) by biodiversity specialist(s) and, where relevant, a social/ livelihood specialist:
        - *Is there a high level of confidence that offset site(s) would remedy residual impacts on a) biodiversity pattern (threatened ecosystems, threatened species and special habitats), b) biodiversity process, and c) on ecosystem services, while making a positive contribution to the long term conservation of biodiversity in the South Africa?)*
        - *Would the offset sites be located in recognised 'offset receiving areas'?*
        - *If relevant, is the motivation for a 'trading up' offset defensible in the specific context?*
        - *Would the offset site(s) be functionally viable in the long term?*
    f) A reliable estimate of the costs of acquiring or securing, rehabilitating and managing the necessary offset site(s) for the duration of residual negative impacts;
    g) Responsibility for managing, monitoring and auditing the biodiversity offset;
        - *Who would be responsible for implementing, managing and auditing the biodiversity offset?*
        - *Statement regarding the adequacy of capacity of the institution, organization or other party to meet obligations in terms of above responsibilities;*
    h) What measures would be taken to ensure that society as a whole, and affected communities in particular, would not be left more vulnerable or less resilient as a consequence of the proposed development [i.e. where offsets

are to remedy loss of biodiversity underpinning valued ecosystem services, would the proposed offset(s) be affordable, accessible and acceptable to the main affected parties];

- *Any negative impacts on local communities and/or society as a whole as a consequence of the proposed offset. If yes, how would these negative impacts be avoided;*

- *Would the proposed use of the biodiversity offset site(s) be compatible with biodiversity conservation objectives? In particular, where an offset for residual negative impacts on biodiversity also provides offsets for residual impacts on ecosystem services, assurance must be provided that the latter would not compromise the biodiversity value of that offset (e.g. if biodiversity is to be a direct-use resource, then use could lead to degradation of that biodiversity / ecosystem).*

i) What mechanism is to be used to provide sufficient funds for acquiring/ securing and managing the biodiversity offset site(s) for the duration of residual negative impacts of the proposed activity (i.e. Who will be the recipient of money? How will funds flow to the implementing agent?)

The above forms a Terms of Reference for the current study and outlines the basic questions to be addressed in this study.

3. KAP VLEY BASELINE AND REGIONAL SIGNIFICANCE

In this section, the regional context and features of the site are analysed, starting at a broad scale and filtering down through ever-finer scales to the habitats of significance present at the site and finally the species of concern that have been observed at the site and the significance of their presence. It is important to note that the level of certainty with regards to the information provided increases significantly as the scale of study decreases. As such, the information as provided in the National Vegetation Map (Mucina and Rutherford 2006) is considered significantly less reliable than the fine-scale vegetation mapping and observations of species of conservation concern (SCC) present at the site. It is important to note that the site is described in detail in the EIA report and this is not repeated in full here but rather those aspects of specific relevance to the offset are highlighted and discussed.

3.1 CONSERVATION PLANNING CONTEXT

In this section, the relevant conservation planning tools for the broad area are illustrated and discussed. The most important of these are the recently completed Northern Cape Conservation Plan (2016) and the Northern Cape Protected Area Expansion Strategy (2017). These maps indicate biodiversity priority areas required to maintain species richness and ecological processes in the first instance and areas that should be targeted for formal conservation expansion in the second. The two above plans are not entirely independent of one another as all areas demarcated as conservation expansion focus areas, are classified as Tier 1 or Tier 2 CBAs and some of the CBAs are demarcated with the specific purpose in mind of maintaining development-free corridors between existing conservation areas to facilitate future expansion of conservation areas into these corridors. The location of NC-PAES Focus Areas is designed so as to ensure the minimum land requirement to meet conservation targets but also to avoid isolated target areas and append these onto existing conservation areas where possible.

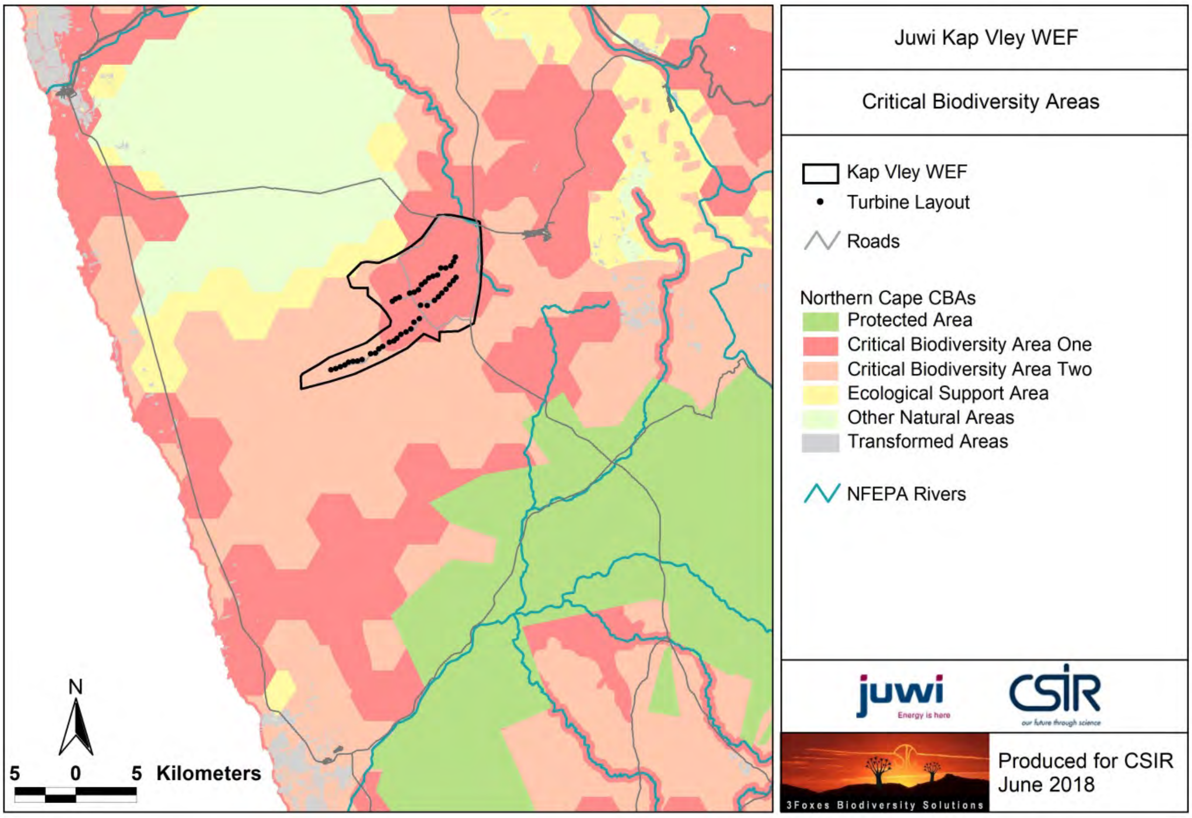

Figure 2. Critical Biodiversity Areas map for the study area, showing that the majority of site falls within a level one CBA and the remainder within a Tier 2 CBA.

The relevant section of the recently developed Northern Cape Conservation Plan which maps Critical Biodiversity Areas (CBA) map for the Northern Cape is illustrated above in Figure 2. The map illustrates that the majority of the site lies within a Level 1 CBA, indicating a high priority area for biodiversity maintenance. Although the associated land-use guidelines for the different levels of CBA have not been released for the Northern Cape, such areas are usually not considered favourable for development and represents one of the main arguments for the requirement of an offset for the Kap Vley development. It is however important to note that the development does not destroy the site but generates a local impact usually equivalent to less than 5% of the site. For many species this is a minor impact and most ecological processes are still able to function normally. Consequently, the original impacted site would still retain significant ecological and conservation value after development.

One of the reasons that the area has been identified as a CBA is because it has been identified as a biodiversity priority area by experts under the SKEP Programme (Figure 3). The site also falls within a Northern Cape Protected Area Expansion Strategy (NC-PAES) Focus Area (2017), which further highlights the significance of the area for conservation purposes (Figure 4). Apart from highlighting the significance of the study area for conservation, the NCPAES also highlights areas where an offset would be seen as being most beneficial and desirable. The CBA and NC-PAES status of the site provides the primary cause and motivation for the need for an offset for the development at a broad scale (process level), while the on-site biodiversity and presence of numerous species of conservation concern also motivate the need for an offset from on-site considerations (species impacts).

It is of some relevance to note that the NC-PAES includes extensive areas of communal land. It is not likely that these areas can be incorporated into traditional conservation areas and must be conserved as “working landscapes” with the people who rely on these areas for livelihoods still active in the landscape. A significant proportion of the Kap Vley site falls within the Kommagas communal area and as such is considered not available for the traditional style of formal conservation expansion through land purchase and incorporation into declared nature reserves. Alternative options are however possible as illustrated by the Richtersveld National Park. Such alternative options are however more difficult to implement and on some level involve a compromise between the needs of people and the environment. This is highlighted here as having some relevance to the current development as while there are extensive Northern Cape Protected Area Expansion Strategy focus areas mapped around the site, much of this cannot be easily transferred to traditional protectionist-style conservation. It would be hard to argue that the wind farm is not compatible with the concept of a working landscape and as such, the development of the Kap Vley Wind Farm would impact on future conservation options to a lesser degree than might otherwise have been the case if the footprint has been restricted to private land. In addition, it is certainly true that appropriately mitigated wind farm development has less of an impact on biodiversity at the landscape scale than poor grazing management such as typically occurs within communal areas, which is a pervasive impact affecting all levels of the ecosystem. In the current case, there are clear fence-line contrasts between the vegetation on the communal rangeland and on the adjacent private rangeland, indicative of the high grazing pressure on the communal rangeland.

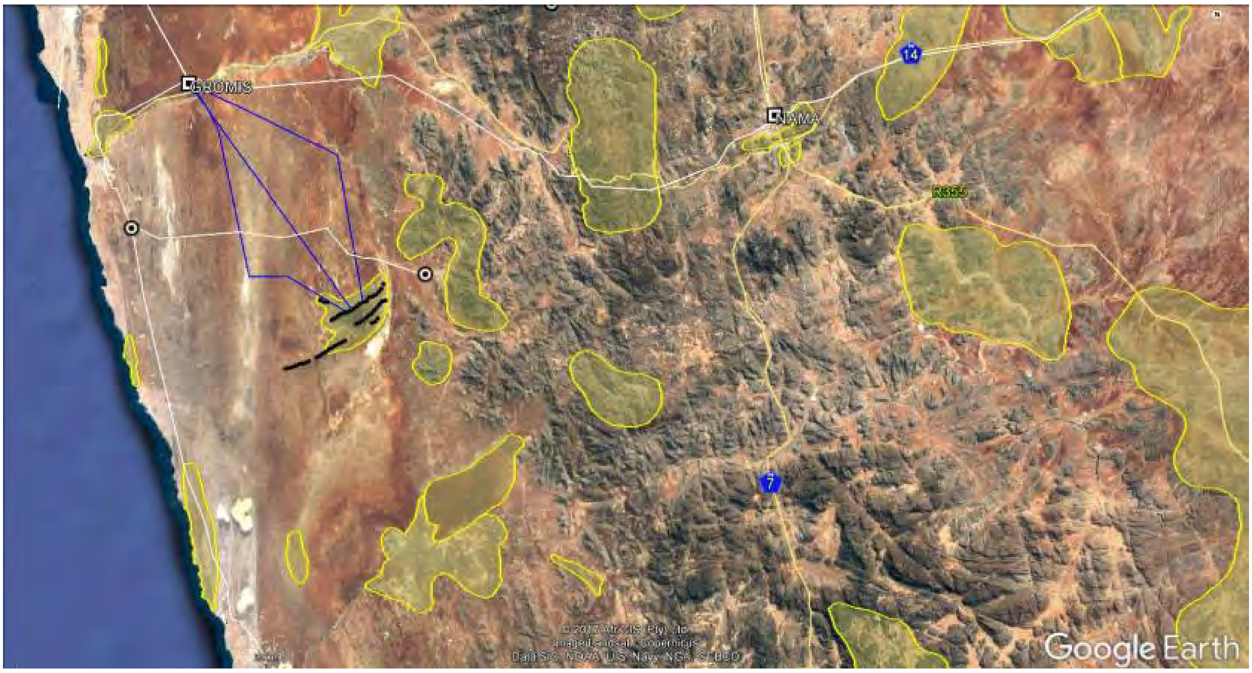

Figure 3. SKEP Expert Priority Areas that were identified by various experts as part of the SKEP programme. This includes Sandberg, which occupies the majority of the Kap Vley site.

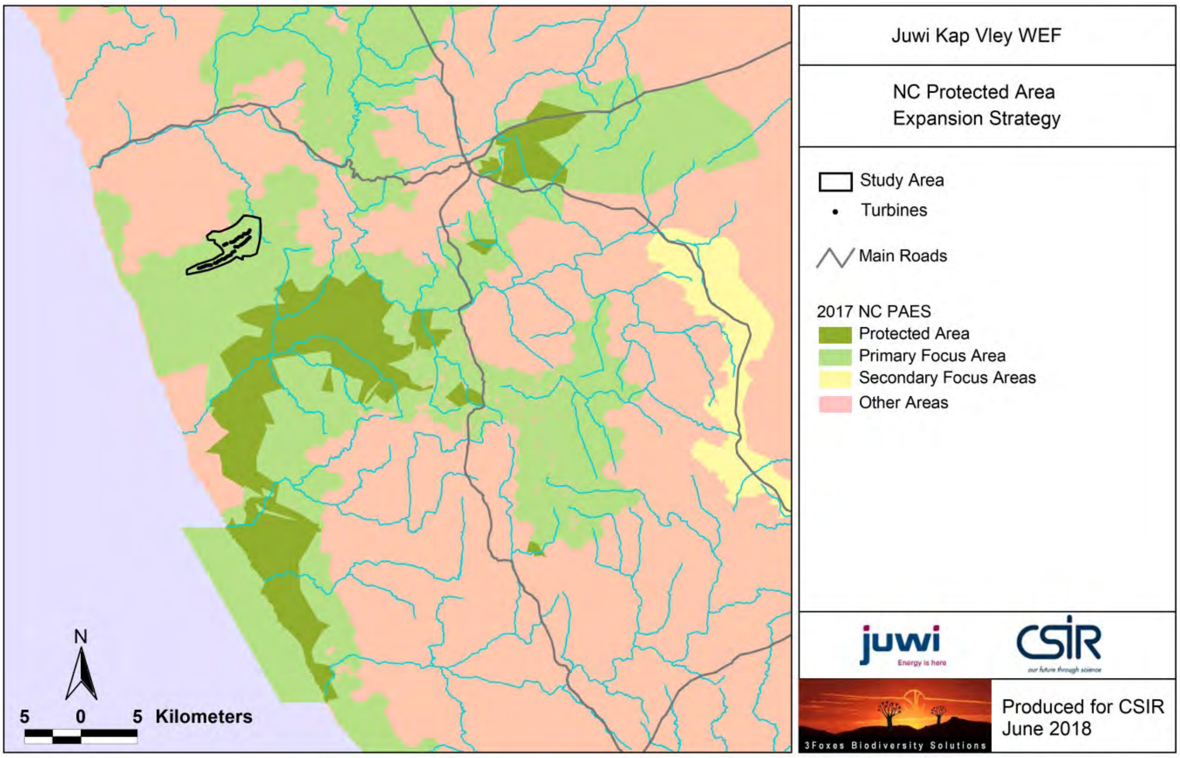

Figure 4. Northern Cape Protected Area Expansion Strategy map for the broader study area, showing the Kap Vley site falling within a Primary Focus Area.

3.2 BROAD-SCALE VEGETATION TYPES

According to the national vegetation map (Mucina & Rutherford 2006/2012), there are three vegetation types within the boundaries of the study area, Namaqualand Klipkoppe Shrubland, Namaqualand Strandveld and Namaqualand Sand Fynbos (Figure 5).

The majority of the site is mapped as Namaqualand Klipkoppe Shrubland. This vegetation unit occupies 10936 km^2 of central Namaqualand from Steinkopf to Nuwerus in the south. Namaqualand Klipkoppe Shrubland is associated with the rocky hills, granite and gneiss domes of the mountains of central Namaqualand. Due to its' steep and rocky nature, Namaqualand Klipkoppe Shrubland has not been impacted by intensive agriculture and 6% is currently conserved, mainly within Goegap and the Namaqua National Park. As Namaqualand Klipkoppe Shrubland is still largely intact it has been classified as Least Threatened. Mucina & Rutherford list 15 endemic species for this vegetation type. At a coarse level, it is sensitive largely in terms of offering a diverse habitat for fauna such as reptiles but relatively speaking does not have a high abundance of listed plant species.

The majority of the lower-lying parts of the site are classified as Namaqualand Strandveld which occurs in the Northern and Western Cape Provinces from the southern Richtersveld as far south as Donkins Bay. Especially in the north of this unit it penetrates up to 40km inland and approaches the coast only near the river mouths of the Buffels, Swartlintjies, Spoeg, Bitter and Groen Rivers. In the south of the unit it is variably narrow and approaches the coast more closely. It consists of flat to undulating coastal peneplains with vegetation being a low species richness shrubland dominated by a plethora of erect and creeping succulent shrubs as well as woody shrubs. In wet years annuals are also abundant. It is associated with deep red or yellowish-red Aeolian dunes and deep sand overlying marine sediments and granite gneisses. Mucina and Rutherford list eight endemic species for this vegetation type. About 10% of this vegetation type has been lost mainly to coastal mining for heavy metals and it is not currently listed.

There is a narrow strip of Namaqualand Sand Fynbos mapped along the eastern boundary of the study area. Namaqualand Sand Fynbos typically occurs on acid to neutral sands, often on windblown dunes and on the dune slacks. It is distributed in the Northern and Western Cape from the vicinity of the study area to Koekenaap in the south, along the coastal plain. It occurs on Aeolian deep, loose, red sands overlying marine or other sediments. It is usually a low to medium shrubland, often dominated by restios, with *Proteaceae* often present, usually in low numbers. Bulbs and annuals may be common, with succulents common only on dune slacks. It is not a fire driven system and often forms mosaics with various Strandveld types, and boundaries can be very diffuse.

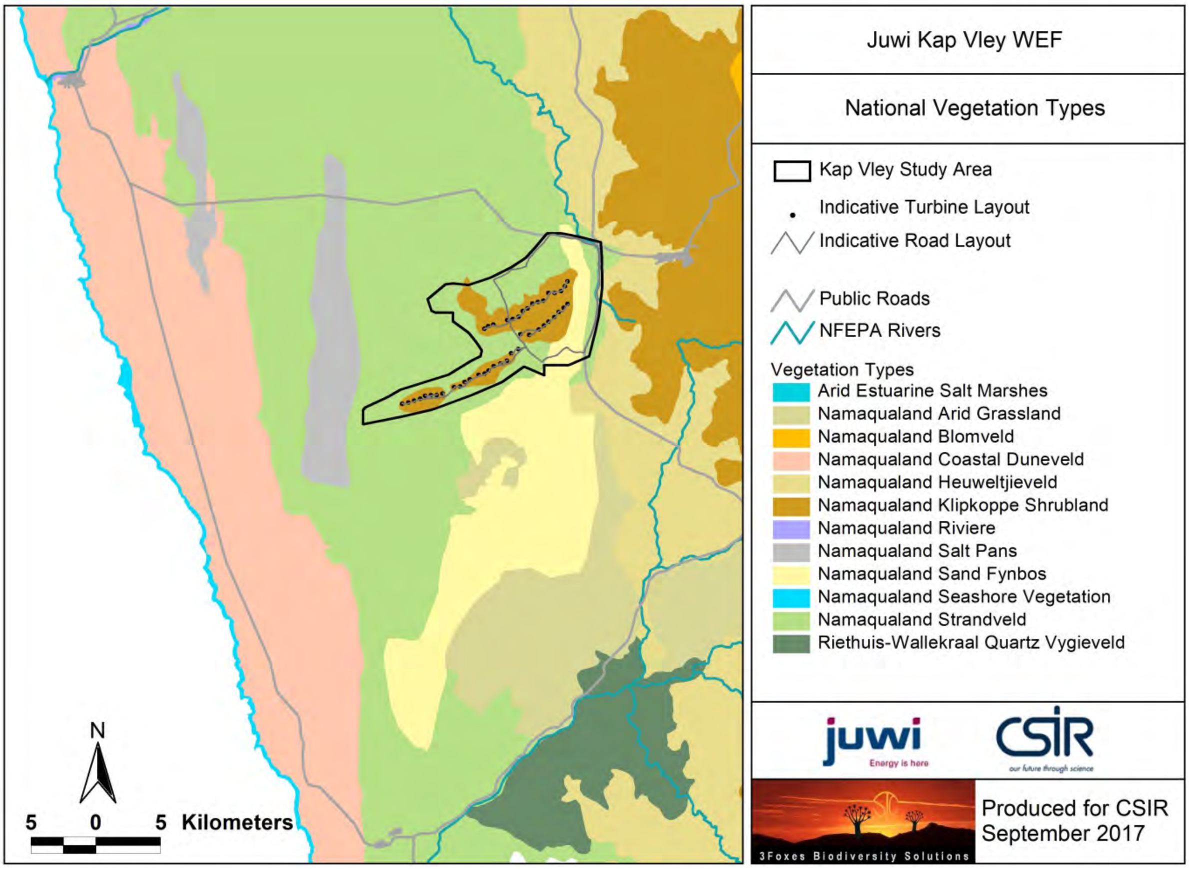

Figure 5. Vegetation map of the study area according to the 2012 update of the Mucina & Rutherford (2006) vegetation map.

The national vegetation map does not provide a very satisfactory reflection of the vegetation of the site. This relates firstly to the large extent of Namaqualand Klipkoppe Shrubland mapped at the site compared to the limited extent of this unit actually present as well as the limited mapped extent of Namaqualand Sand Fynbos compared to the large extent of this unit present at the site. These deficiencies in the Vegmap have been recognised before and are largely resolved in the next section.

3.3 Fine-Scale Vegetation Patterns.

The national vegetation map does not provide an adequate representation of the vegetation of the Kap Vley area. An important biodiversity feature of the site is the fine-scale habitat heterogeneity along the ridges that characterise the site. Of particular significance are the areas of sand fynbos which are associated with loose red sands in the valley and along the slopes of the ridges of the site. The majority of species of conservation concern which occur at the site are associated with this habitat. As such, this habitat has been identified as being the primary indicator of potential offset target areas.

The Sand Fynbos vegetation types of the coastal plain have been mapped in detail by Desmet, Turner & Helme, (2009) and the area which includes the site is illustrated below (Figure 5). This study however maps only Sand Fynbos and related units and other vegetation types have not been mapped in greater detail, with the result that it must still be used in conjunction with the Vegmap to provide a full picture of the vegetation in and around the site. The fine-scale mapping recognises the presence of several plant communities at the site including Restio Fynbos, which characterises the valley between the two ridges of the site as well as several types of Dune Fynbos, which includes the deeper and sometimes more mobile sands which occur along the ridges of the site. The fine-scale mapping provided by Desmet et al. significantly improves our understanding of the presence and distribution of Sand Fynbos on the Coastal Plain of Namaqualand. As they have considered a variety of habitats as well as the unit as a whole, it is useful in indicating the types and distribution of the different habitat units identified. This also provides the primary basis for identifying potential offset areas where similar habitats as affected at the Kap Vley site can be found in the broader Namaqualand Coastal Plain region.

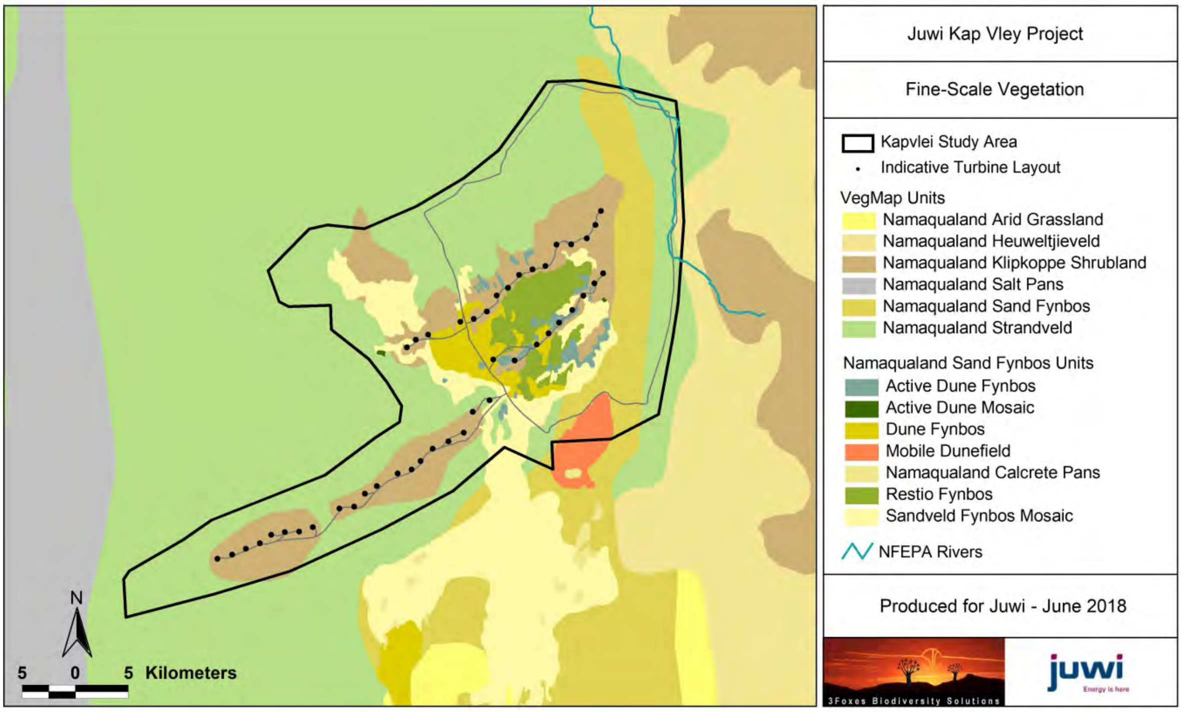

Figure 6. Combined vegetation map showing the Sand Fynbos vegetation units identified by Desmet, Turner and Helme (2009) within the site as well as the 2012 update of the Mucina & Rutherford (2006) national vegetation map for all units not mapped by Desmet at al..

3.4 Impact on Plant Species of Conservation Concern

In order to evaluate the impact of the development on plant species of conservation concern, a full walkthrough of the development footprint was conducted as part of the fieldwork for the EIA. As such, the distribution of all plant species of conservation concern in the development footprint has been quantified and mapped and used to inform the layout of the development and the avoidance that has been implemented.

The primary concern has been to ensure that impacts on species of conservation concern (SCC) are minimised and that the local populations of such species are not compromised. A limit of acceptable loss of 5% of the local population was set as a tolerance for all species of concern. However, post-mitigation impacts on such species is estimated at 2% for species of lower concern and less than 1% for species classified as Endangered. Consequently, this is a minor local impact that would not compromise the viability of the local population and as such, would have negligible consequence for the population as a whole and no species would be elevated to a higher threat status.

A summary of the SCC observed at the site and the likely impact on these species is summarized below in Table 1. The presence of these species at the site is of significance because these species are associated with the Sand Fynbos vegetation that is of primary concern at the site. In addition, potential offset areas should be identified and evaluated based on the presence of these key species.

Table 1. Species of Conservation Concern (SCC) confirmed present at the Kap Vley site, and a short consideration of their significance for the development of the site.

Species & Image	IUCN Status & Abundance on-site	Significance for Kap Vley development
Aspalathus albens	Recently downgraded from VU to LT. Fairly common on deep sands.	Populations are localised and total impact on this species at the site would be very low. Overall significance of the population at the site is low.
Metalasia adunca	NT Widespread on dunes and sandy slopes	Common in many areas of the dune habitat and mobile sands. As it occurs as many scattered individuals, some impact on this species is unavoidable. However, the proportion of individuals affected is low and as this is fairly widespread species, the residual impact is not considered highly significant.
Muraltia obovate	VU Common and widespread across most habitats with sandy soils	Very common at the site and full avoidance will not be possible, but impact on the local population not likely to be highly significant as it is common within favourable habitat. Implications for the development are low.
Agathosma elata	EN Locally abundant on sandy slopes	Scattered but healthy populations which have been completely avoided. Impact on this species would have high significance but avoidance has been effective at minimising impact. The local population is considered to be regionally significant.

Argyrolobium velutinum	EN Occasional on sandy slopes	Occasional scattered plants that can't be easily avoided. Overall significance of the impact on this species is considered to be low as it favours the low-lying areas of sand fynbos which has a minimal development footprint.
Caesia sabulosa	VU Uncommon	Not common at the site and significant impact is not likely. Implications for the development is low and the local population is not seen as having high importance.
Lampranthus procumbens	VU Common on sandy slopes	Locally common at the site. Impact on this species would have high significance but the important populations have been avoided although some residual impact is likely.
Phyllobolus tenuiflorus	VU Uncommon on rocky soils	Not common at the site and it is not likely that a significant impact would be generated. Low significance for the development.
Leucospermum praemorsum	VU Common among dunes	Common on sand dunes and while significant avoidance for this species has been implemented, this is a dominant species across large areas and some local residual impact on this species will occur. Moderate significance for the development as this is likely the most northern population of this species. The local population is seen as locally significant, but as this species has large populations elsewhere, it is not considered to be of regional significance.

3.5 ON-SITE HABITAT DESCRIPTION & SENSITIVITY

A fine-scale habitat map of the site has been produced as part of the EIA study and is depicted below (Figure 7). The majority of the development footprint occurs along the ridges of the site which are either rocky areas belonging to the Namaqualand Klipkoppe Shrubland vegetation type or within dunes or deep sands dominated by Namaqualand Sand Fynbos. The abundance of species of conservation concern is particularly high within the areas of Sand Fynbos and some of these habitats are considered to be particularly sensitive and vulnerable to disturbance. Within the areas of Namaqualand Klipkoppe Shrubland there are several areas of high sensitivity related largely to habitat value for fauna or flora rather than the presence of specific plant species of conservation concern.

The assessed sensitivity of the site is illustrated below in Figure 8. The mapping includes several no-go areas, which are considered to be areas critical for the maintenance of biodiversity at the site, both in terms of biodiversity pattern (presence of species of habitats of concern) and biodiversity process (broad-scale ecological processes such as migration and dispersal). Keeping these areas free of development is seen as a key avoidance measure required to ensure that the residual impacts associated with the development are reduced to an acceptable level. Impact to these areas would be considered to represent a fatal flaw and impacts to these areas cannot be adequately offset. A number of turbines and access roads were located in these areas in previous iterations of the layout, but have been dropped or relocated in response to the sensitivity mapping.

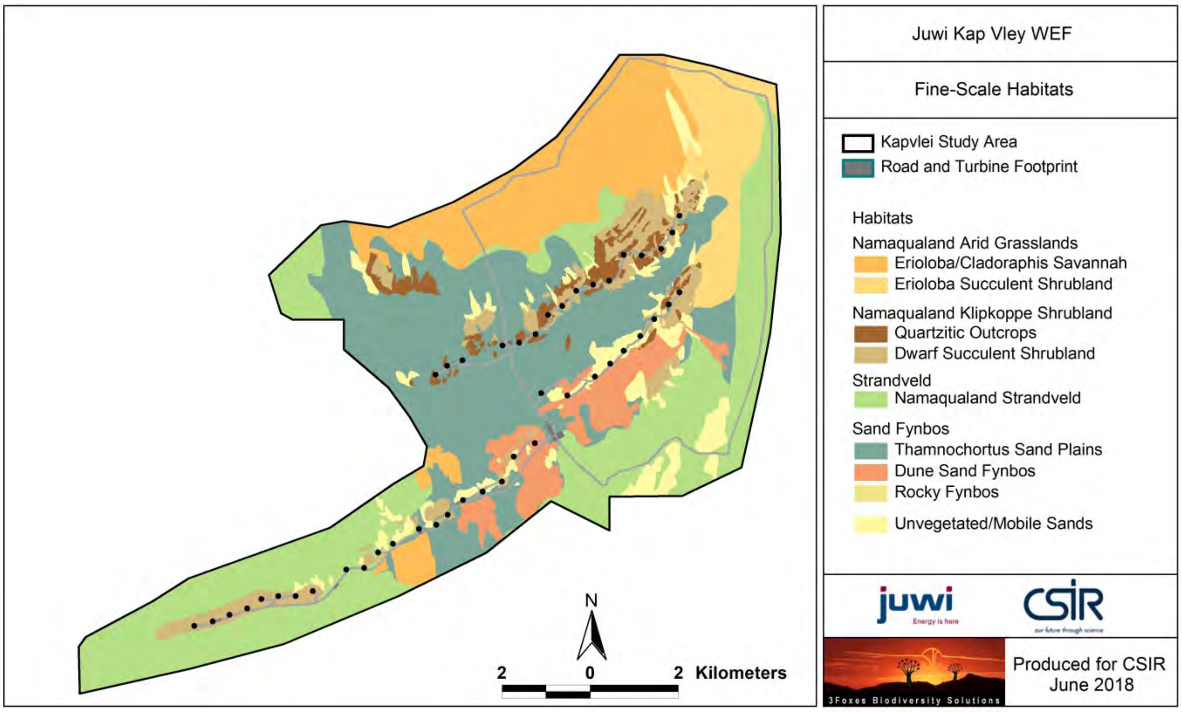

Figure 7. Fine-scale habitat map developed for the Kap Vley site, showing the distribution of the different habitats that have been mapped at the site as part of the EIA studies. These are mapped based on high resolution aerial photography (2017) and on the ground validation during the walk-through survey of the development footprint.

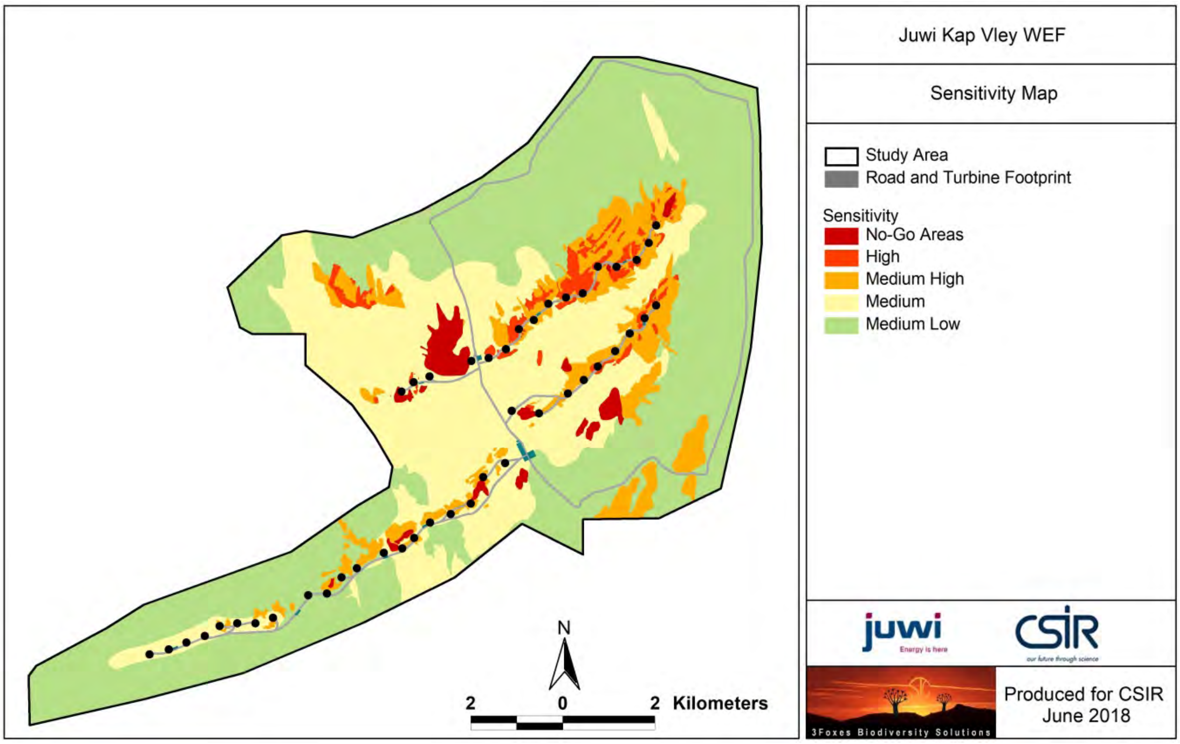

Figure 8. Ecological sensitivity map for the Kap Vley study area, showing that the majority of the development footprint is in areas of medium sensitivity. There is full avoidance of the no-go areas. At the mapping scale the points indicating the turbines are large and bleed into the adjacent sensitive areas, but these have been validated in the field and do not impact the areas demarcated as no-go areas.

3.6 GAPS IN INFORMATION

The calculation of an offset ratio as well as the assessed impacts of the development are to a large degree contingent on an accurate and comprehensive evaluation of the receiving environment as well as a reliable description of the project and its' footprint. Gaps in information around these areas can significantly compromise the evaluation or use of an offset as a viable avenue to mitigate the residual impacts of a development. As such, any remaining gaps and uncertainties with regards to the receiving environment or the potential impact of the development on the receiving environment must be explicitly considered.

Due the presence of numerous species and habitats of concern at the site, a large degree of uncertainty with regards to impacts on these species and features is considered unacceptable. This partly motivates the large amount of fieldwork and detailed mapping that has been conducted at the site to inform the EIA process as well as the various layout iterations that have preceded the final assessed layout. A full walk-through of the development footprint has been conducted with the result that all populations of plant species and habitats of conservation concern within or near the development footprint have been accurately mapped. As such, there is little uncertainty with regards to the direct impact of the development on these features. In addition, detailed faunal assessment has taken place, with includes pitfall trapping, small mammal trapping as well as three months of camera trapping for larger mammals. As a result, the faunal community of the site is well characterised and while there may be some species present that have not been encountered, the common and dominant species have certainly been well characterised.

In terms of the long-term impact of the development on the receiving environment, there are some impacts potentially associated with wind farms that are not well known generally. This includes the impact of the development on subterranean fauna such as burrowing skinks and golden moles which may be sensitive to vibrations or noise generated by the turbines. This represents a small number of species and would not impact on any species of high conservation concern. Regardless of the extent of this impact, it is not likely to extend much beyond the site and as such, the calculated offset would provide for such impacts as well.

A significant potential impact of the development that may be underestimated is the risk of wind erosion. If wind erosion at the site is not well mitigated, it would spread beyond the development footprint and significantly increase the extent of habitat loss resulting from the development. This highlights the need to ensure that erosion control at the site is strictly enforced during construction and operation. Specific measures to ensure that this occurs can be included in the EMPr for the development. In addition, it is recommended that post-construction monitoring is implemented to evaluate firstly, if the actual development footprint corresponds with the assessed footprint and secondly to evaluate whether the erosion control measures that have been implemented are effective and whether any additional measures are required.

Based on the above considerations, there are no significant gaps in knowledge that would compromise the overall evaluation of impacts resulting from the development or the effectivity of an offset to mitigate the residual impacts of the development.

4. EVALUATION OF THE NEED & SUITABILITY OF AN OFFSET

In terms of the requirements for an offset study, it is required to evaluate the adequacy of measures considered and adopted to avoid, minimize and rehabilitate potentially significant negative impacts on biodiversity. Any development must ensure that there is no residual impacts of very high significance that could lead to irreplaceable loss of biodiversity and/ or priority ecosystem services. In other words, an offset does not negate the need to reduce on-site impacts to an acceptable level. The manner in which the Kap Vley development as followed the mitigation hierarchy to reduce impacts as far as possible has been detailed in the preceding sections and is also summarised below. Significant and detailed avoidance has been implemented at the site and reducing impacts further is not likely to be possible without compromising the viability of the development. Consequently, the residual impacts cannot be further reduced through on-site mitigation and the offset is the remaining option within the mitigation hierarchy.

Impacts associated with the Kap Vley development have been assessed in the ecological specialist study for the EIA as being of moderate or low significance after mitigation. Such mitigation does not include the implementation of the offset. The purpose of the offset is to mitigate the residual moderate impacts to a low level. It is however important to note that the specialist ecological study considers the residual impacts on the site to be acceptable, which is a precondition for the implementation of an offset. The moderate impacts have been achieved through the detailed fine-scale mapping of the site, the walk-through of the footprint and the avoidance that the developer has implemented in response the detailed ecological work. This avoidance has been effective at reducing the impact of the development on key species and habitats to low levels. The limits of acceptable change associated with each mapped sensitivity category is provided below in Table 2. None of the limits were exceeded by the development after the implementation of the avoidance through refining and adjusting the final development footprint. The footprint area within the different sensitivity categories is listed below in Table 3. Aside from excluding all development from the no-go areas, development within the High sensitivity areas was reduced as much as possible although there will still be some impact to these areas (Table 3) that cannot be easily avoided. This is however less than 5ha of the total 220ha extent of this sensitivity class and as such, this loss is considered acceptable. The majority (60ha) of the development footprint is located within areas considered to be Medium sensitivity with a lower extent in areas considered to be Medium High sensitivity (17.9ha).

Table 2. Limits of acceptable change that were applied in the EIA and the associated recommended offset ratios within each mapped sensitivity class. Recommended offset ratios for CBA and protected area expansion strategy focus areas are also provided.

Sensitivity	Description	Acceptable Loss	Recommended Offset Ratio
No Go Areas	These are considered critical areas for biodiversity pattern and process maintenance.	Zero.	Loss of habitat these areas cannot be adequately offset.
High	These are high value habitats with confirmed presence of significant populations of SCC	5%	1:30
Medium/High	High value habitats vulnerable to disturbance or with confirmed presence of SCC at low density	10%	1:20
Medium	Moderate value habitat that is locally restricted or not widely available.	25%	1:10
Medium/Low	Typical habitat of high availability	40%	Offset not required

	with low abundance of SCC.		
Critical Biodiversity Areas	CBAs	5%	1:20
NC PAES	Protected Area expansion strategy target areas	5%	1:20

The primary residual impact which motivates for the offset is the moderate residual impact on CBAs and NCPAES areas. As the entire site is within CBAs and NCPAES focus area, some impact on these features cannot be avoided. However, as described above, the main biodiversity features of concern have been well-avoided and the main residual impact would be habitat loss within the CBA and some potential disruption of broad-scale ecological processes and gradients. Given the nature of the residual impact of the development, an offset is considered to be an appropriate off-site mitigation measure. However, this needs to cater to both the site level impacts on species as well as the broad-scale regional effects on processes.

In terms of offset options, this can include trading like for like habitat, trading up or other options. However, in the current case, it is clear that trading *like for like* is the preferred offset option. This is because the affected Sand Fynbos vegetation is a restricted vegetation type with a high abundance of species of conservation concern that warrants further protection. The offset could be used to contribute to meeting this need and is the most direct and appropriate form of mitigation in this regard. Trading up is not seen as a viable alternative as there are few options for trading up in the vicinity of the site and this is usually only used where the like for like criterion cannot be easily met.

5. CALCULATION OF THE REQUIRED OFFSET

Although the offset guidelines provide an indication of the appropriate offset ratios for development within areas of different conservation value, these are minimum recommended value and there is some discretion of the specialist to recommend higher values if appropriate. In terms of the different ecological sensitivity categories mapped at the site, the offset ratios which are deemed appropriate are listed above in Table 2. For the High sensitivity areas, an offset ratio of 1:30 has been recommended, while this deceases to 1:10 for the Medium sensitivity areas. The total required offset based only on the site sensitivity information is calculated at 1069ha. However, the required offset ratio for CBAs and protected area expansion target areas is higher than that for the lower sensitivity classes with the result that the offset must be corrected to accommodate the CBA and NC-PAES status of the site. The recommended offset ratio for the CBAs/NC-PAES areas is 1:20. This results in a total recommended offset for the Kap Vley Wind Farm of 2580 ha. It is important to note that this is the extent of matching sensitivity habitat and not the required extent of the land portion/s to be acquired. In addition, this is a gross calculation of the total extent of the offset and does not provide an appropriate breakdown of how this should be distributed among the target habitats. Such a breakdown is provided in the next section of the study.

The 1:20 offset ratio within the CBA/NC-PAES areas was recommended as an appropriate offset ratio for these areas based on the ecological sensitivity of these areas as well as an evaluation of the resultant offset target and the ability of the offset to mitigate the impacts of the Kap Vley development on broad scale ecological processes. When applied back onto to the turbine locations as a validation, the offset is equivalent to a buffer of 600m around the turbines. At this distance, there are likely very few residual ecological impacts on fauna or flora and as such this offset is considered adequate.

Table 3. Extent of the different sensitivity classes that occur within the overall site and within the development footprint. The footprint is expressed as a percentage loss of the extent of that sensitivity category. The resulting offset values are also calculated, based firstly on only the site sensitivity mapping and then secondly on the combination of the site information and CBA/NC-PAES status of the site. The final offset ratio/area used is therefore the greater of either the site or CBA/PAES ratios/areas.

Sensitivity	Total Extent (ha)	Development Footprint (ha)	% Loss	On-Site Offset	CBA / NC PAES Offset
No Go Areas	191.47	0	0	0	0
High	220.23	3.5	1.59	105	105
Medium/High	922.21	17.93	1.94	358.6	358.6
Medium	3032.77	60.56	2.00	605.6	1211.2
Medium/Low	5303.47	45.27	0.85	0	905.4
Total		**127.26**		**1069.2 ha**	**2580.2 ha**

6. IDENTIFICATION OF POTENTIAL OFFSET TARGET AREAS

There are several features of the broader Kap Vley and Sandberg area that warrants its' status as a CBA and NCPAES focus area. This includes the unique *Acacia erioloba* population on the plains towards Kommagas, the quartzitic outcrops along the ridges of the site and the extensive dune and sand plain fynbos habitats of the site. The species of conservation concern which have been identified at the site are largely associated with the areas of sand fynbos. In terms of the impact of the development, this is restricted largely to the areas of sand fynbos and quartzitic hills with a smaller area within Namaqualand Strandveld. There are two impacts that warrant offsetting, firstly there is the habitat loss within the CBA/NC-PAES area and then secondly there is the residual impact on plant species of conservation concern and their associated habitat. As the plant species of conservation concern are associated with sand fynbos, the offset should be determined based primarily on the presence of this habitat and especially the presence of the identified key species of conservation concern. However, the presence of Namaqualand Klipkoppe Shrubland is also seen as high desirable as this habitat is also considered generally sensitive and would be impacted by the development. Preferably, target areas should also accommodate some of the process-orientated features of the Kap Vley site such as the habitat heterogeneity of the site and the associated upland-lowland gradients evident at the site.

A table which provides the target extent of vegetation and habitat types that should be captured within the offset are outlined below. These extents are based on the footprint of the Kap Vley development within the Sand Fynbos and Namaqualand Klipkoppe Shrubland vegetation types. These are the minimum target areas that the offset should strive for and can obviously be exceeded. However, they are not considered substitutable, meaning that exceeding the target on one vegetation type does not decrease the required target on another. An offset target has not been set for the Namaqualand Strandveld as the former habitats are considered to be the more sensitive habitats that would be impacted and are considered of greater concern compared to the Namaqualand Strandveld vegetation type which has a low abundance of species of concern within the affected area. Evaluation criteria that should be used to evaluate potential offset areas are also listed and provide the basis for identifying suitable offset areas. It is important to note that the offset area does not have to consist of a single contiguous offset, but could comprise more than one non-adjacent cadastral unit, provided that the protection of the different units results in the offset meeting the overall offset objectives.

Table 4. Target areas and evaluation criteria or characteristics that potential offset target areas should contain.

Habitat Types	Target Extent	Evaluation Criteria
Sand Fynbos	1125ha	This should include representative sections of the Dune Fynbos and Restio Fynbos habitat types. The majority of species of concern should be represented by healthy populations (100s to 1000s of individuals).
Klipkoppe Shrubland	510ha	Ideally the offset should capture the transition or gradient from lower-lying sand fynbos or strandveld to rocky uplands. There are no specific plant species of concern that should be represented in the Klipkoppe Shrubland habitat type. However, the presence of restricted plant communities or habitat types such as quartz patches is seen as desirable.

Namaqualand Strandveld	No Target	There is no requirement for the offset to specifically include an area of Namaqualand Strandveld. However, as the Sand Fynbos and Strandveld frequently occur as a mosaic, it is likely that Strandveld will be incidentally captured in the offset area.
Desirable Process Features		
Upland-Lowland Gradients	The offset should preferably include upland-lowland gradients equivalent to those present on Kap Vley.	
Vegetation Boundaries	The Kap Vley site includes numerous vegetation gradients and boundaries which are seen to favour long-term resilience to global change. The offset area should also function, either on its own or when associated with the Namaqua National Park to similarly increase connectivity and enhance ecological resilience.	
Required Institutional Features		
Is within an identified protected area expansion site	It is recommended that the offset is located within an area that is contiguous with the National Park, or alternatively within an area that has been identified as being important for protected area expansion and where the long-term sustainability of the offset can be assured.	
Not under mining or other rights	Any identified offset properties should not be under some other kind of rights, including land reform, mining, prospecting or other development application.	

Currently the best available information on the distribution of Sand Fynbos in Namaqualand is the fine-scale mapping of Desmet et al. (2009). This indicates that the Kap Vley site is at the northern-most extent of Sand Fynbos and that all other mapped units are all to the south of the site (Figure 9). As a result, the offset target area will have to be located to the south of Kap Vley and no options to the north are being investigated as there are no known areas of sand fynbos further north.

Based on the habitat mapping at Kap Vley, it appears that the areas of Sand Fynbos immediately south of the site may not have the required SCC present as this area consists largely of the Sandveld Fynbos Mosaic habitat type. This habitat unit is characterised by a fine-scale mix of Strandveld and Sand Fynbos with Strandveld on the dune crests and slopes and Sand Fynbos in the low-lying dune slacks where moisture availability is higher. If the presence of Restio Fynbos and Dune Fynbos are taken as key indicators, then significant habitat does not occur until the area between Koingnaas and Hondeklip Bay. Previous experience in the area indicates that the species of conservation concern present at Kap Vley are also well represented in this area and as such represents a suitable offset target area based on the “like for like” criterion. A species list for these areas is included at the end of this document and confirms the presence of the species of conservation concern in this area and provides some validation of these areas as viable offset target areas. Several of these areas are contiguous with the Namaqua National Park, which provides the opportunity for the offset to be incorporated into the National Park which would ensure the long-term sustainability of the offset.

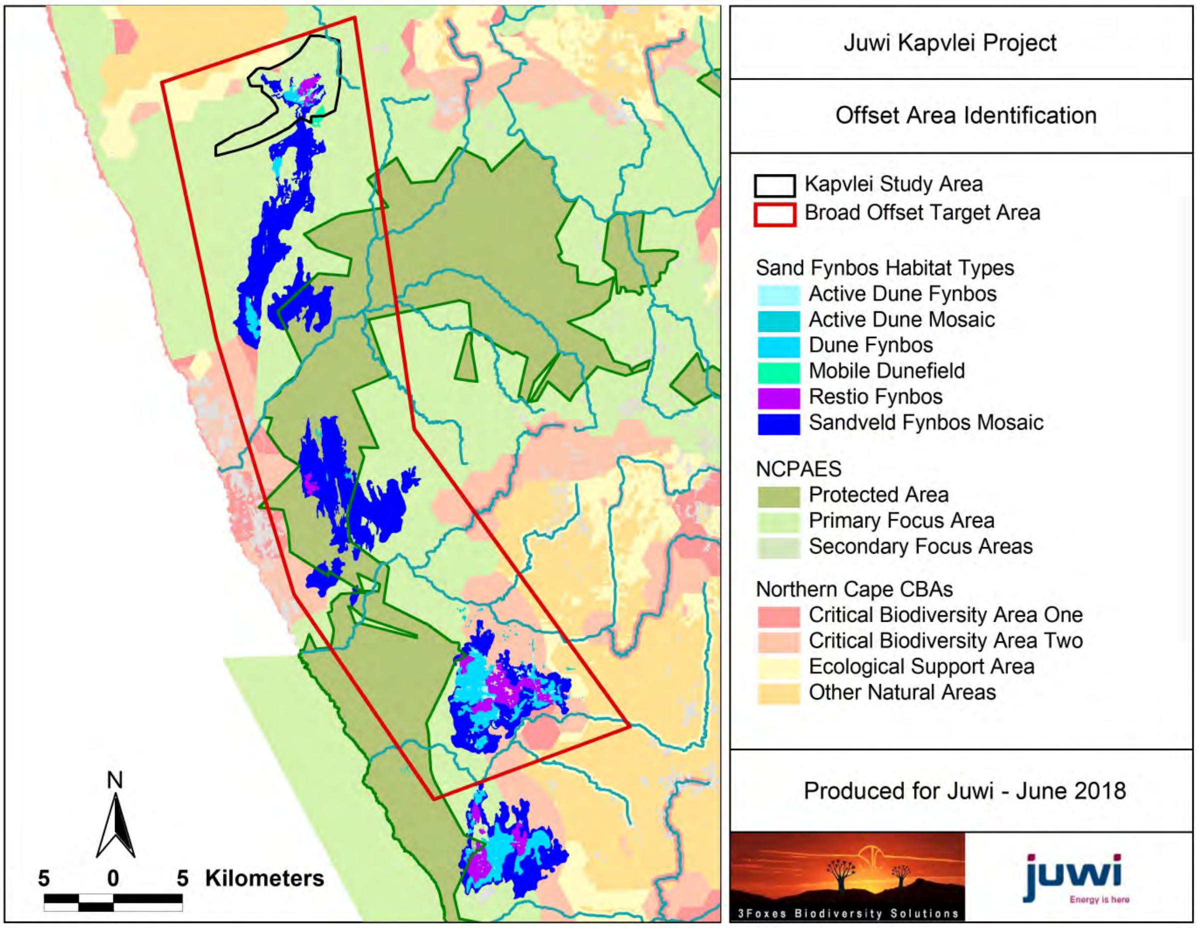

Figure 9. Combined map showing the distribution of Sand Fynbos habitat types over-laid on the NCPAES and the CBA map for the area from Kap Vley to just south of the Bitter River. This should represent the primary offset target area where offsets should be located.

While the offset target habitat and potential receiving areas have been detailed above, it is critical to validate the offset and evaluate whether the stipulated habitat targets are actually available in the area and thus potentially achievable. It would not be possible to achieve the offset target if the remaining extents of the target habitats were already captured within a protected area of have been lost to transformation. The extent of the different Namaqualand Sand Fynbos habitat types which are available overall, already captured within the Namaqua National Park, within 100km of Kap Vley which is seen to represent local availability and the overall remaining extent potentially availability for use of an offset within 100km of Kap Vley is detailed below in Table 5. The Dune Fynbos habitat types and Restio Fynbos are currently poorly represented within the National Park, but are the dominant habitat types at Kap Vley appear to be readily available in the local area with more than 5000ha of Dune Fynbos habitat types available and over 2000ha of Restio Fynbos. The Sandveld Fynbos Mosaic which is the typical form of sand fynbos in the area is also still widely available but it fairly well represented within the National Park at 12.64% of the total extent. It is clear based on these figures that the offset target of 1125ha of Sand Fynbos is a reasonable target that can be achieved within the local area. Although the presence of the plant species of conservation concern is seen as the defining criterion for the selection of the final offset target area, Dune Fynbos in particular is poorly represented within the National Park and the offset could significantly improve the representation of this habitat within conservation areas. This analysis is restricted to the Namaqualand Sand Fynbos habitat types as this is the limiting habitat in the area compared to the Namaqualand Klipkoppe Shrubland vegetation type which occurs extensively in the area and usually demarcates the inland boundary of the coastal plain.

Table 5. The representation of Namaqualand Sand Fynbos habitat types within Kap Vley, within 100km of Kap Vley which is seen to represent local availability, the extent within the Namaqua National Park and the local availability of the different habitat types which is the remaining extent within 100km of Kap Vley that is not within the National Park or within Kap Vley itself.

Habitat	Global Ha	100km of KapVley		Within Kap Vley		Namaqua NP		Available Locally
		Ha	% of Total	Ha	% of Local	Ha	% of Total	
Active Dune Fynbos	1398	813	58.19	164	20.13	17	1.19	633
Active Dune Mosaic	2284	429	18.79	4.1	0.97	173	7.59	252
Dune Fynbos	12422	4864	39.16	368	7.58	100	0.81	4395
Gravel Patch Fynbos	115	0	0.00	0	0.00	0	0.00	0
Heuweltjie Fynbos Mosaic	10633	0	0.00	0	0.00	36	0.34	0
Restio Fynbos	7421	3025	40.77	452	14.95	396	5.33	2177
Sandveld Fynbos Mosaic	74215	31284	42.15	855	2.73	9384	12.64	21044

7. APPROACH TO THE IMPLEMENTATION OF THE OFFSET

Before an offset can be considered, it must be demonstrated to have long-term viability ecologically, but also with regards to management responsibility for the site. An offset can take on a variety of different forms and does not necessarily have to include land purchase. However, in order to ensure the long-term sustainability of the offset and also to ensure that a suitable and capable management authority can take on the management commitment of the offset, the developer has chosen land purchase as the preferred offset type. Stewardship is another viable possibility in the area that could be considered if land purchase is not possible.

In order to ensure that the offset is located within appropriate offset receiving areas, the developer has engaged WWF-SA to facilitate the land purchase. As WWF-SA has an active land purchase programme in Namaqualand which works in collaboration with SANParks and DENC, this will ensure that the offset is located within identified target areas. The land would be purchased by WWF-SA on behalf of the client and management would be transferred to SANParks. Funds from the developer would be made available to manage the offset for the 20 year duration of the offset. However while this represents the preferred scenario for the developer, this requires the coincidence of the final offset area to be purchased with areas and habitats that SANParks are willing and able to include in the National Park. This may not be the case with the result that there is a risk that the offset may not be achieved if this is provided as the only viable scenario. As such, the possibility of another management authority for the offset must be considered. If the management of the offset is not transferred to SANParks then this would have be transferred to another entity such as an NGO active in the conservation sector or a new independent management authority could be started, in which case NC-DENC would be the responsible authority for ensuring compliance with the offset conditions.

Although the offset would only come into effect once the project is firstly authorised and secondly is selected as a preferred bidder under the REIPPP, once financial close of the project is achieved construction can commence within 6 months with the result that this can place significant pressure on the developer to conclude the offset. In order to expedite the process later on, it is recommended that the negotiation process with WWF and SANParks should not be stalled and contingent on receiving preferred bidder status. As such, this would allow the developer and WWF to undertake due diligence and secure conditional Sale Agreements at suitable price points before preferred bidder status is announced. These agreements would then be triggered at the commencement of construction at Kap Vley.

8. CONCLUSION AND RECOMMENDATIONS

The Kap Vley site falls within a CBA and NCPAES Focus Area. In addition, a number of plant species of conservation concern are confirmed present at the site. As a result of these features, potential impacts at the site are a concern, particularly residual impacts on CBAs and plant species of conservation concern. As offsets should not be used to compensate for significant impact on species or habitats of conservation concern, it is important to firstly assess whether or not the mitigation to be implemented at the site can reduce on-site impacts to an acceptable level. The final preferred layout that has been assessed in the EIA has been iteratively developed in response to the results of extensive fieldwork at the site to identify and map sensitive habitats and populations of species of conservation concern. As a result of this avoidance, on-site impacts have been reduced as far as possible and no local populations of plant species of conservation concern would be compromised or elevated to a higher threat level as a result of the development. As the entire site falls within a CBA, impacts on CBAs cannot be avoided and moderate residual impact on habitat loss and broad-scale ecological processes within the CBA is expected to occur. The residual impact on the CBA and plant species of conservation concern provide the motivation for the offset.

Given the nature of the residual impact of the development, an offset is considered to be an appropriate off-site mitigation measure. The calculation of the required offset was based on a 1:30 offset ratio for the high sensitivity parts of the site and a 1:20 ratio for the remainder of the site. The resulting calculation provides for a minimum offset target area of 2 580ha. The existence and availability of suitable offset areas is an important criterion that must be demonstrated before an offset can be implemented. The presence of Sand Fynbos and in particular the dune and restio dominated habitats with the presence of the identified plant species of conservation concern are taken as key indicators of potentially suitable target offset areas. Such areas are present to the south of the site in the broad area between Koingnaas and Hondeklip Bay and south of the Spoeg River. Previous experience in the area indicates that the species of conservation concern present at Kap Vley are also well represented in this area and as such these are valid offset target areas based on the “like for like” criterion. An analysis of the availability of these habitats in the local area indicates that the offset target habitats are sufficiently available in the area and that the targets can be achieved.

In terms of the implementation of the offset, the developer has engaged WWF-SA which has an active land purchase programme in Namaqualand and which works in collaboration with SANParks and NC-DENC. As such, any land purchase facilitated by WWF-SA would likely occur within identified priority and target areas that have the support of the national and provincial conservation bodies. Meetings to investigate the implementation of the offset have already been held with the developer, NC-DENC, WWF and SANParks. In the meetings, SANParks have indicated that a land management budget would be required for them to be able to take responsibility for the offset. In response to this need, the developer has committed to providing the appropriate funds to manage the offset area for the 20 year duration of the wind farm. This would ensure that the offset is protected in perpetuity and has long-term sustainability and an identified management authority. However, as no formal agreement with SANParks has been signed, alternative options for the management of the offset much remain on the table until such time as the offset target areas have been secured and a legally binding agreement with SANParks to take on the management of these areas has been signed.

This offset study is an assessment of the validity of an offset as a mitigation measure to account for residual impact at Kap Vley. It provides an analysis of the biodiversity attributes of the site and makes a recommendation with regards to the offset ratio and resultant extent of the required offset. It further identifies broad potential offset target areas that are known to contain the plant species of concern that have been identified at the Kap Vley site. In order to take the offset process forward, specific properties will have to be identified and evaluated in terms of their suitability as well as availability for purchase or other conservation commitment. While it is clear that suitable areas exist, their availability in terms of land tenure, land reform status, presence of valid prospecting or mining rights, or with other infrastructure or affected party interests will need to be investigated and may exclude many properties from contention.

The Kap Vley project has not yet been authorised and while this offset study forms part of the EIA process, exactly how the timing of the offset process should work in relation to the EIA process is not well clarified at this point due to the recent advent of offsets as an accepted mitigation alternative. Given the uncertainly of the REIPPP process, the development is not certain to go ahead with the result that the offset process cannot proceed to an implementation phase until such time as the project receives preferred bidder status as defined within the REIPPPP. As the obligations of the developer would only come into effect at the commencement of construction, this is several years away at best. There is thus a danger that the offset study may become too prescriptive if specific property details or offset type are “locked into” the offset and significant changes in land use occur in the intervening years within identified offset target areas.

The institutional and legal arrangements regarding the offset are in early stages of development and additional attention to this aspect will be required to ensure that a binding agreement between the developer, WWF, NC-DENC, SANParks and any other required parties can be drawn up prior to construction. This document is not seen as the appropriate place to further elucidate these requirements and it is suggested that an Offset Implementation Agreement which reduces the specifics of the offset requirements, roles and responsibilities, costs, timelines and penalties to writing is developed. This would come into effect once the project received preferred bidder status and the parties would then have to agree to which milestones would need to have been achieved before the commencement of construction. This will in effect dictate the required timelines and associated milestones associated with the implementation of the offset.

However, as there is not an Offset Implementation Agreement currently in place, measures need to be taken to ensure that the developer is locked into the offset and that this is effectively achieved. This would be facilitated through the stipulation of conditions in the Environmental Authorisation issued by DEA. Thereafter, it would be the responsibility of the implementing partners to ensure that the requirements of the agreement are met once the implementation agreement has been signed. The following minimum conditions are made in this regard and have been developed with input from Mark Botha through the course of his review of this document:

1. A biodiversity offset is required mitigation for this activity (Kap Vley Wind Farm). The offset must secure in perpetuity at least 1125 ha of Sand Fynbos and 510 ha Klipkoppe Shrubland vegetation types and not be less than 2580 ha in aggregate extent. The Sand Fynbos vegetation types should include intact and representative areas of the Dune Fynbos and Restio Fynbos habitat types as defined by the terrestrial ecological specialist study.

2. Offset sites need to be at least in as good or better condition compared to the impacted areas, and contain viable populations of the majority of impacted species. Ideally, Offset sites should be declared as a protected area under the Protected Areas Act, be adjacent to an existing protected area, or at a minimum facilitate ecological connectivity in the region.

3. Before construction of any component of the activity begins, the requisite outcomes and necessary arrangements for the implementation of the offset must be captured in an Offset Implementation Agreement with credible implementing partners, which agreement must be concluded and submitted to DENC for approval, which approval shall not be unreasonably withheld.

4. The agreement must at least set out the specific areas which will be secured, how they will be rehabilitated and protected in the long term, what financial provision has been made for the establishment and management of the offset for 30 years and what implications and penalties exist to ensure the performance of all parties in offset implementation.

9. REFERENCES

Desmet, P.G., Turner, R. C. and Helme, N. A. 2009. Namaqua Sands Regional Context Vegetation Study. Report for Golder Associates Africa, Halfway House, South Africa.

Mucina L. & Rutherford M.C. (eds) 2006. *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

10. APPENDIX 1. DESCRIPTION OF OFFSET TARGET AREAS

Several broad potential offset target areas have been identified as part of this study. These are to the east and to the south of Hondeklipbay, south of Kap Vley. Species lists are available for these areas and confirm the presence of the target species of conservation concern which are present at Kap Vley. These are briefly illustrated below and the species lists for each area provided thereafter. The condition of these areas is generally good to reasonable and is not highly degraded. Some of these areas are however currently being targeted as offset areas for mines in the Hondeklipbay area. However, going forward, these areas should be investigated in greater detail and especially which properties are being targeted for offsets as the current development could also add to these and increase the overall effectiveness of the conservation expansion happening in this area.

Example of Sand Fynbos habitat from the extensive area of Sand Fynbos south of Spoeg Rivier, showing dense restio-dominated vegetation on the lower-lying areas between the dunes and a dune fynbos-strandveld mix on the dunes areas. The image also illustrates the elevation gradients present in the area, with a higher lying hill visible in the distance. There are also rocky areas present in the north of this area that would be suitable offset areas for the Klipkoppe Shrubland habitat type at Kap Vley.

Example of Sand Fynbos habitat from the area north of the Spoeg River. The landscape consists of flats dominated by restios alternating with dune fynbos and Strandveld.

11. APPENDIX 2. SPECIES LIST OF OFFSET TARGET AREAS

A species list for the offset target areas is provided below. These are species confirmed present within the core sand fynbos habitat types and not the wider area which includes the rocky outcrops or adjacent vegetation types.

Species	Present	Red List Status
Acanthopsis carduifolia	1	
Adenogramma mollugo	1	
Agathosma elata		EN
Albuca grandis	1	
Albuca secunda	1	
Albuca spiralis	1	
Aloe krapohliana		DDD
Amphibolia laevis		
Amphiglossa tomentosa	1	
Antimima sp		
Arctotis decurrens	1	
Arctotis sp nov 1.(perennial, orange)		STBA
Arctotis sp nov 2 (rubrosabulosa MS)		
Argyrolobium velutinum	**1**	EN
Aspalathus albens		VU
Aspalathus cuspidata		
Aspalathus quinquefolius		
Aspalathus spinescens ssp lepida	1	
Aspalathus pulicifolia	1	
Asparagus aethiopicus	1	
Asparagus undulatus	1	
Asparagus declinatus	1	
Asparagus asparagoides	1	
Asparagus alopecurus	1	
Asparagus capensis	1	
Asparagus exuvialis	1	
Asparagus rubicundus	1	
Babiana brachystachys		
Babiana confusa		
Babiana grandiflora	1	
Babiana hirsuta	1	
Babiana sinuata	1	
Berkheya fruticosa	1	
Boophone haemanthoides	1	
Brassica tournefortii		
Brownanthus sp		
Brunsvigia bosmaniae	1	
Calobota angustifolia	1	
Caesia sabulosa		VU
Calobota lotononoides		NT
Calobota sericea	1	

Cephallophyllum aff framesii	1	
Cheiridopsis sp nov		STBA
Chlorophytum viscosum	1	
Chrysocoma longifolia	1	
Chrysocoma ciliata	1	
Chrysocoma sp		
Cissampelos capensis	1	
Cladoraphis cyperoides	1	
Cleretum bellidiformis	1	
Cleretum hestermalanense	1	
Cleretum rourkei	1	
Cliffortia juniperina		
Cliffortia teretifolia		
Clutia daphnoides	1	
Clutia aff polifolia		
Conicosia elongata	1	
Conicosia pugioniformis	1	
Conophytum pageae		
Corycium crispum		
Cotula thunbergii	1	
Cotyledon orbiculata	1	
Crassula deceptor		
Crassula expansa	1	
Crassula muscosa		
Crassula nudicaulis	1	
Cyanella orchidiformis		
Cytinus sanguineus	1	
Diascia sp PF	1	
Dicrocaulon ramulosum	1	
Dicrocaulon sp 1		
Dicrocaulon sp 2		
Didelta carnosa	1	
Didelta spinosa	1	
Dimorpotheca pinnata		
Dimorpotheca pluvialis	1	
Dimorpotheca tragus	1	
Diosma ramosissima		
Diospyros austro-africana	1	
Dischisma spicata	1	
Drosanthemum sp	1	
Drosanthemum salicola		
Ehrharta barbinodis	1	
Ehrharta calycina	1	
Elegia sp nov		STBA
Elytropappus rhinocerotis	1	
Eriocephalus africanus var paniculatus	1	
Eriocephalus racemosus	1	
Eriocephaplus namaquensis	1	
Eriospermum arenosum	**1**	VU
Eriospermum paradoxum		
Eriospermum sp		
Euclea tomentosa	1	

Euphorbia burmanii	1	
Euphorbia caputmedusae	1	
Euphorbia hamata	1	
Euphorbia cf mauritanica	1	
Euphorbia tenax	1	
Euphorbia tuberosa	1	
Euryops multifidus	1	
Euryops tenuissimus		
Felicia australis	1	
Felicia brevifolia	1	
Felicia dregei	1	
Felicia filifolia	1	
Felicia hyssopifolia	1	
Felicia sp small WF	1	
Feraria ornata	1	
Ferraria flava	1	
Ferraria tall	1	
Ficinia argyropa	1	
Ficinia deusta	1	
Ficinia indica		
Frankenia pulverulenta		
Galenia africana	1	
Galenia fruticosa	1	
Galenia sarcophylla	1	
Galium capense		
Gazania tenuifolia	1	
Gazania	1	
Gethyllis britteniana	1	
Gethyllis ciliaris	1	
Gladiolus carinatus	1	
Gloveria integrifolia	1	
Gnidia clavata	1	
Gnidia Sp.	1	
Grielum grandiflorum		
Grielum humifusum	1	
Gymnosporia buxifolia	1	
Gymnodiscus capillaris	1	
Hebebstreitia cordata		
Hebensreitia sp		
Helichrysum dunense		VU
Helichrysum tricostatum		NT
Helichrysum stellatum	**1**	
Helichrysum sp		
Heliophila cornuta		
Heliophila crithmifolia		
Heliophila juncea	1	
Heliophila sp		
Heliophila arenaria var. arenaria	1	
Hemimeris racemosa	1	
Hermannia cuneifolia	1	
Hermannia heterophylla	1	
Hermannia scordifolia	1	

Hermannia sp nov	**1**	STBA
Hermannia trifurcoides ms (Sp E)	**1**	
Hermannia trifurca	1	
Hessea pilosula		
Hirpicium alienatum	1	
Hoplophyllum spinosum		
Hyobanche glabrata	1	
Hypertelis angrae pequenae		
Indigofera meyeriana		
Isolepis sp		
Jacobsenia sp nov		STBA
Jordaaniella cuprea	1	
Jordaaniella spongiosa		
Justicia cuneata	1	
Kedrostis psammophila	1	
Lachenalia anguinea	1	
Lachenalia mutabilis	1	
Lachenalia punctata	1	
Lachenalia splendida	1	
Lachenalia sp nov arenicola	**1**	STBA
Lachenalia undulata		
Lampranthus procumbens	**1**	VU
Lampranthus stipulaceus	1	
Lapeirousia arenicola		
Lebeckia multiflora	1	
Lebeckia ambigua		
Lessertia rigida	1	
Leucadendron brunioides ssp bruniodes		
Leucoptera nodosa	**1**	VU
Leucospermum praemorsum	**1**	
Leucospermum rodolentum		VU
Limeum africanum	1	
Limeum fenestratum	1	
Limonium sp nov (dagmarae MS)	1	
Lobostemon cinereus	1	
Lotononis sp		
Lycium strandveldense		
Lycium feroxissimum	1	
Lycium oxycarpum	1	
Lyperia tristis	1	
Manulea altissima	1	
Melianthus elongatus	1	
Melolobium adenodes	1	
Mesembryanthemum crystallinum	1	
Mesembryanthemum rapaceum	1	
Metalasia adunca	**1**	NT
Metalasia densa	1	
Microloma sagittatum	1	
Mollugo cerviana	1	
Mollugo pusilla		
Monechma spartioides		
Monilaria chrysoleuca		

Monsonia spinosa		
Moraea ciliata	1	
Muraltia obovata	**1**	VU
Muraltia spinosa	1	
Nemesia anisocarpa		
Nemesia sp nov. YF	1	
Nemesia bicornis	1	
Nemesia ligulata		
Nenax arenicola	1	
Nestlera biennis		
Odyssea paucinervis		
Oncosiphon schlechteri		EN
Oncosiphon suffruticosus	1	
Ornithogalum multifolium		
Ornithoglossum viride	1	
Osteospermum grandiflorum	1	
Osteospermum incanum	1	
Monoculus monstrosus	1	
Othonna aff. Hederifolia		
Othonna arbuscula		
Othonna coronopifolia	1	
Othonna cuneata		
Othonna cylindrica	1	
Othonna lepidocaulis		Rare
Othonna leptodactyla		
Othonna retrofracta		
Othonna sedifolia	1	
Othonna undulosa	1	
Oxalis annae	1	
Oxalis copiosa	1	
Oxalis flava	1	
Oxalis gracilis		
Oxalis hirta	1	
Oxalis obtusa	1	
Oxalis purpurea	1	
Pelargonium caroli-henrici		Rare
Pelargonium fulgidum		
Pelargonium gibbosum	1	
Pelargonium senecioides	1	
Pelargonium triste	1	
Pelargonium karooicum	1	
Pelargonium praemorsum subsp. praemorsum	1	
Pelargonium DL geophyte	1	
Pharnaceum lanatum	1	
Pharnaceum microphyllum	1	
Phylica sp	1	
Phyllobolus sp		
Phyllobolus tenuiflorus		VU
Phyllopodium pumilum	1	
Psammotropha quadrangularis	1	
Psilocaulon sp		
Pteronia divaricata	1	

Pteronia onobromoides	1
Pteronia ovalifolia	1
Pteronia pallens	1
Restio macer	1
Rhynchopsidium pumilum	
Romulea tabularis	
Ruschia fugitans	1
Ruschia goodiae	1
Ruschia small fls	
Ruschia subpaniculata	
Ruschiella lunulata	1
Salvia africana lutea	1
Salvia lanceolata	
Sarcocaulon ciliatum	1
Searsia leavigata	1
Searsia longispina	1
Selago sp.	1
Senecio alooides	
Senecio arenarius	
Senecio bulbinifolia	
Senecio littoreus	
Senecio sarcoides	1
Spergularia media	
Sporobolus virginicus	
Stipagrostis ciliata	1
Stipagrostis obtusa	
Stipagrostis zeyheri	1
Stoebe nervigera	1
Stoeberia frutescens	
Stoeberia utilis	1
Struthiola leptantha	1
Tetragonia echinata	
Tetragonia nigrescens	1
Tetragonia fruticosa	1
Thamnochortus bachmanii	
Thesium elatior	
Thesium polycephalum	1
Thesium spinosum	
Thesium strictum	
Trachyandra arenicola	1
Trachyandra involucrata	1
Trachyandra divaricata	1
Trachyandra falcata	1
Tribolium hispidum	
Trichogyne repens	1
Tripteris clandestina	1
Tripteris nordenstamii	
Tripteris oppositifolia	1
Tripteris sp	
Tylecodon ventricosus	1
Ursinia speciosa	1
Wachendorfia multiflora	1

Wahlenbergia asparagoides	**1**	VU
Watsonia meriana	1	
Wiborgia aff monoptera	1	
Wiborgia obcordata	1	
Wiborgia fusca	1	
Willdenowia arescens	1	
Willdenowia incurvata	1	
Zaluzianskya affinis	1	
Zugophyllum teretifolia	1	
Zygophyllum cuneifolium	1	
Zygophyllum morgsana	1	
Zygophyllum cordifolium		
Zygophyllum spinosa		

Annexure 1

Review of the Biodiversity Offset Study for the Kap Vley Wind Energy Facility (JUWI) Namaqualand by Mr Mark Botha of Conservation Strategy Tactics & Insight

Addendum to the Review conducted by Mark Botha of the Kap Vley Biodiversity Offset report (dated 8 June 2018), following the incorporation of review comments and required inclusions in Final Kap Vley Offset report.

MARK BOTHA

CONSERVATION STRATEGY TACTICS & INSIGHT

To: Minnelise Levendal
CSIR, Implementation Unit (Environmental Management Services)
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By email

RE: Incorporation of comments and required inclusions in Final Kap Vley Offset report

This note is an addendum to my Professional Review of the Kap Vley Biodiversity Offset report (dated 8 June 2018), to record that I have reviewed the final Ecological offset Study (Final version compiled by Todd on 12 June 2018) and that it addresses all the substantial and material changes which I had suggested in my review.

In particular, there is now clarity on the specific requirements of the offset in terms of vegetation type and component habitats (Table 4), more general ecological factors that need to be met by the offset and an indication of the species requirements as well as likelihood of offset areas being available (Table 4 and 5).

I note that more specific conditions of authorisation that capture the most important elements of the offset have been drawn up for consideration by the competent authorities, and that this should guide the relevant implementation scenarios sufficiently.

There is sufficient information contained in this report for the applicant and authorities to understand the biodiversity offset requirements from the proposed Kap Vley.

Please do not hesitate to contact me for any further clarity or information on my review.

Yours truly,

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CONSERVATION STRATEGY TACTICS & INSIGHT

Review Opinion

Review of the Biodiversity Offset Study for the Kap Vley Wind Energy Facility (JUWI) Namaqualand.

I have been appointed by Juwi Energy through the CSIR to review the adequacy and accuracy of the biodiversity offset study conducted by Simon Todd (Todd 2018) during the EIA process of the Kap Vley Wind Energy Facility (WEF). The review timelines are exceedingly short, and preclude discussions with affected authorities and a site visit.

Offset studies rely heavily on the accuracy of information from specialist studies. This review specifically excludes assessment of the veracity of the actual floral or faunal specialist studies as I have no field knowledge of the site. However, I have no reason to doubt the accuracy of these studies and must take the information as sufficiently accurate for offset determination purposes.

I was asked to review the offset study after the EIA processes were essentially complete, specialists had been briefed, completed their field work and compiled their findings. It is impossible for me to know all the detail of what transpired during this process, what mitigation measures were agreed to, and what negotiations/ communications have been entered into. I base this opinion on a review of the single report before me, the Draft EIA and the Terrestrial Ecology study. It is often easy to critique processes and studies with hindsight. Any suggestions on the process are included to improve Offset related practice in the future.

As a declaration of any potential conflict of interest, I have been retained by WWF-SA to provide ad-hoc advice and guidance on various offset matters, including in Namaqualand. WWF-SA have been identified as a possible role player in implementation of the Kap Vley offset.

I am an independent specialist offset practitioner, with 8 years of experience in developing offsets and negotiating implementation agreements in South Africa. To the extent possible, I take responsibility for the shortcomings in the offset determination under review, provided that the recommended rectification is adhered to. I have no other interest in this project or the client, and the opinion expressed herein is my own.

10 June 2018

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Summary

1- It appears that a sound identification and refinement of vegetation and habitat units has been undertaken
2- Residual impact analysis (after mitigation) and calculations seem appropriate
3- The mitigation hierarchy seems to have been adhered to as far as reasonably possible
4- Suitable offset ratios have been adopted and the calculations for the full offset requirement are appropriate. I would suggest that adding in the approximate area of each habitat to be secured/offset would be required for authorities to understand the requirements for authorisation conditions. I cannot provide this with the data and time available, but it would be a straightforward exercise for the specialist responsible.
5- The type of offset required has not been suggested. It seems an assumption has been made (given the involvement of potential implementing partners) that land will be purchased for this offset. Technically, the offset can be achieved through the long term protection and management of a site without purchase necessarily being required. Locating the receiving areas and stipulating a purchase mode in the publicly available documents (both Draft EIA reports and specialist reports), can significantly impact on the likelihood of offset implementation as the few targeted landowners may be able to hold the process ransom. I would urge the removal of Figure 2 and 3 in the Offset section in the DEIAR showing farm portions overlaid on offset target areas. While this is not a shortcoming of the offset report *per se* it may complicate implementation unless the partners involved succeed in securing lease or sale agreements for the respective pieces of land soon.
6- A first cut attempt at identifying receiving areas has been completed. However, the occurrence of the relevant impacted species of conservation concern in these sites is unreferenced and un-supported with data. And current ecological condition of these sites is not compared to the impacted areas. This should be rectified. In a revised version of the Report submitted to me for review, mention is made of a more detailed analysis of the particular offset receiving sites. It is impossible to tell whether the pertinent information has been gathered or shared with authorities.
7- Other required or desirable characteristics of the ideal offset sites have not been elaborated on. Whether this is a concern is unclear. Considerations include:
    a. the presence of (or at least habitats for) other impacted fauna (presumably primarily herpetological) although the other specialist reports did not indicate any offset-type mitigation was required; and
    b. the matrix of different habitats and substrates which appears to be a feature of the impact site (especially the juxtaposition of the rocky and sandy areas as well as strandveld, fynbos and other constituents).
8- The implementation arrangements suggested are rather naïve. SANParks concurrence with the likely offset site, and other park-centric requirements for offset acceptance, would have been invaluable – at least to contrast with the biodiversity requirements.
9- There is no indication of the availability of any specific offset site. Land held communally, or being reserved for land reform, or with valid prospecting or mining rights over it, or with other infrastructure or affected party interests, or in a very poor ecological condition, is usually not considered as available for securing as an offset. Several areas proposed for this offset have already been earmarked for other developments' offsets.
10- Costs to implement the offset and manage the site are required, even if just a rough estimation, but whether they should form part of the Offset Report or made available to authorities is debatable.
11- Alternative models of implementation arrangements, including who holds the land in the long term and who procures relevant services on the land, would clarify the most suitable offset arrangement.
12- A crisp summary of the required biodiversity characteristics of the offset, areas of different habitat units to be secured, likely indications of where they would be found in available (at least in a confidential form to the applicant, commenting authorities and implementing entities) are needed.
13- Although the biodiversity metrics in the offset study are adequate and sufficiently accurate, greater attention to the specific implementation arrangements should have been given, and codified in a

suitably constructed condition of authorisation for use by the competent authority, should it decide to authorise this application.

Offset Studies – good practice guidance

I am not privy to the specific terms of reference given to the ecological specialist to compile the offset report – it appears that the "broad aims" set out in the final paragraph of Section 1 and the Minimum requirements for Offset Reports in Section 2 (copied into Annexure A of this document) form the Brief.

According to the draft national Biodiversity Offset Policy there are seven basic steps to developing an offset:

1. *Obtain a measure of the residual loss of biodiversity (i.e. residual negative impacts) as a consequence of the proposed development. This measure at minimum relates to the area and condition of affected ecosystem/ habitat;*
2. *Determine the best type of offset;*
3. *Determine the required size of offset and, where applicable, its optimum location;*
4. *Investigate candidate offset site(s) in the landscape that could meet the offset requirements. Check whether any eligible offset receiving area is suitable;*
5. *Decide on the best way to secure the offset, and ensure that the offset option would be acceptable to the CEA and the statutory conservation authorities;*
6. *Prepare an Offsets Report or dedicated section within the EIA report; and*
7. *Conclude agreements on offsets (between the applicant and an implementing agent) and develop an Offset Management Programme, where applicable.*

Adherence to these steps and the specifics of Annexure A will be used as a rough framework to assess the adequacy and accuracy of the offset report.

Assessment and Mitigation Measures

The Terrestrial Ecology study accurately characterises the sensitivity of the receiving environment – in terms of the presence of critical biodiversity areas (CBA 1 and 2), and as a focus area for Protected Area expansion. Sensibly, the consultant interrogated the national vegetation types and refined and augmented them with finer scale mapping and characterisation of habitat units. This allowed a sufficiently accurate and robust sensitivity rating for different vegetation receptors to be developed, and a basis for amending turbine and road layouts to mitigate impact. The risk and uncertainty associated with the impacts are sufficiently small as to require no additional consideration in the offset.

It appears that several iterations of layout alternatives were interrogated to reduce impact and avoid no-go areas (Section 5.1.6 of the Draft EIA report). As the Terrestrial Ecology study found that impacts were sufficiently mitigated and the significance of remaining impacts was Moderate (section 4 of the Offset report), I am satisfied that with the information available that sufficient mitigation has been conducted before calculating the residual impact.

Impact metrics and ratios

The various calculations and assumptions determining the footprint impacts appear robust. However, there is little information or a final map showing layout of turbines, road and infrastructure over the affected habitats, and no summary table of the footprint impacts. Table 3 provides a summary of impacts on the different sensitivity ratings, but this is not helpful in determining the appropriate offset quantum per habitat (see later).

I am in broad agreement with the suggested ratios for the offset as reflected in Table 2 of the Offset Report. There is an argument for the base ratio for CBAs to be 30:1. However, the consultant has pursued the right approach by identifying the specific features that indicate the likely designation as CBA1, understood their landscape distribution and species composition, and suggested appropriately scaled ratios for the different sensitivity components. I support the use of these ratios and their application to the different sensitivity receptors.

Suggested offset type, metrics, and location

The study assumes that purchase of nearby sites that meet the required characteristics is the only appropriate offset type. I concur that there is no chance of rehabilitating a degraded site to function as an offset or to remove pressure elsewhere to achieve the offset outcome. However, it is possible to "secure" (*i.e*. to protect from incompatible land uses and maintain or restore appropriate management regimes) an area in the long term without purchasing it. Restricting offsetting to purchase (although the most likely and most secure modality in this area) does open the applicant to possibility of being held ransom. Personally, I would avoid using the word "purchase" when discussing offset type in a report.

I concur with the offset calculations set out in Table 3 of the offset report – 2580ha is an accurate offset for the predicted residual impacts. A shortcoming, though, is the lack of a table breaking this required area up into the specific vegetation types that are required to be offset. Sensitivities are not the appropriate currency for determining offsets – they should be only used for impact assessment and avoidance. Other features of the offset (habitat composition, ecosystem functionality or ecological process considerations would have been a useful adjunct to a blunt figure.

It is difficult to comment on the suggested location of the offset sites as I understand that even if a more detailed assessment of specific target properties was done for the client, it is not available for my review and has likely not been made available to the commenting authorities. Although I feel that the general location of the offset on the various Namaqua Sand Fynbos occurrences to the south of the WEF is sensible, there is little further information on which to make an assessment. What is clear, however, is that several of the areas identified are not available as an offset as they have been identified as an offset for other authorised activities (known to me), and also fall into areas which have apparently been awarded prospecting or mining rights, and for which impact assessments are underway (of which I have limited information).

Ideally, the consultant should have constructed a confidential list of potentially suitable offset target properties, indicating:

- Their relative contributions to the different habitats required to be offset
- Their ownership details (available from readily available online databases)
- The status of Prospecting and/or Mining Rights (available from the DMR in Springbok with some effort), information about land claims or land reform or other projects which may impact availability as an offset
- A note on their ecological condition, rehabilitation requirements (preferably with an indication of cost), and their suitability or appeal to SANParks for consolidation into Namaqua National Park.

Without this list, it is very difficult for commenting (or competent) authorities to assess whether the offset has a high likelihood of being successfully implemented. This is a key consideration for moving forward, and requires more in-depth engagement with SANParks (Planning, Namaqua Park and Scientific Services) and DENC (Research and Development Advice).

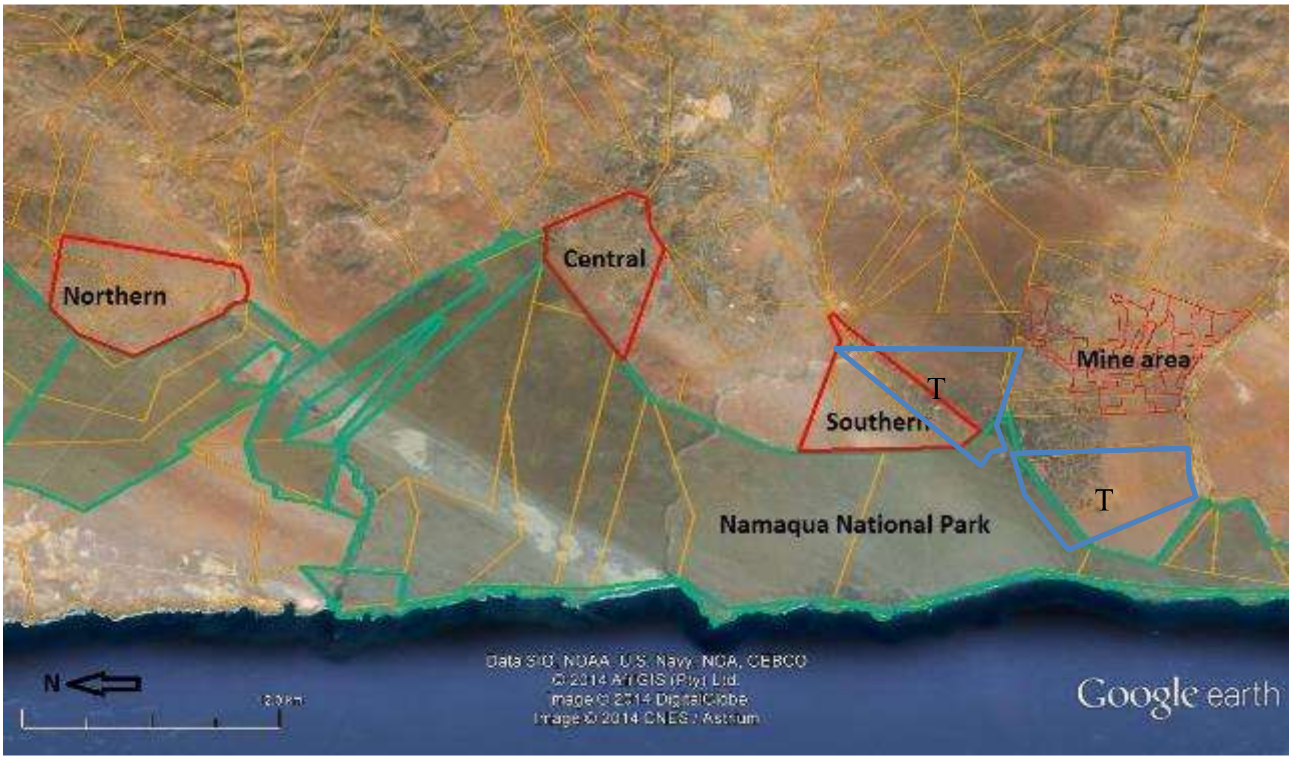

Figure 1. The two areas (Northern & Central) which were identified as possible offset candidate sites for Kap Vley WEF, were also identified as offset sites for a mine to the SE of Namaqua National Park (Mine area).

Process considerations

What appears missing from the offset study development process was the strategic discussions with both the commenting authorities on what they would deem appropriate as an offset, and also with SANParks on their approach to the offset, especially given that the specialists' recommendation (and suggested subsequent condition of authorisation) was to conclude an agreement with SANParks to incorporate and manage the offset as part of the NNP.

Ideally, once the offset quantum and optimum location were determined, these should have been discussed with SANParks by the EAP or the specialists to get their 'in-principle' agreement to take on these areas, as well as to elicit from them what the management and other considerations would entail, as well as the additional likely process considerations (e.g. sign off by senior management) that should have been followed to lead to a concrete offset condition being included in the EA.

I'm unclear at what stage an implementation agreement between the parties for this offset was to be drafted or discussed. It may be that this is still planned, and that other information has been assembled to help construct this agreement. Without insight into the terms of such an agreement, it will be difficult for commenting authorities or the public to know if the impacts can be sufficiently and durably offset. The EIA regime does not really cater for these types of agreements in the stipulated time frames, but they are crucial to assess whether the offset is viable and likely to be effective final mitigation.

Alignment with Draft National Offsets Policy

The table below summarises the alignment of the Offset study for the Kap Vley WEF with good practice guidance. None of the misalignments are serious, but they do open the space for difficulties in negotiating the relevant implementation agreements between the parties.

Table 1: A rapid assessment of the Offset Study with the stages proposed in the National Offsets Policy

Stage	Done	Impact on Offset effectiveness
1. Obtain a measure of the residual loss of biodiversity	✓	none
2. Determine the best type of offset;	✓	Minor if anything
3. Determine the required size of offset and, where applicable, its optimum location;	✓	Optimum sites not accurately identified for commenting authorities
4. Investigate candidate offset site(s) in the landscape	X	Unknown. Candidate site knowledge was relied on from previous field work. At the least this should have been referenced and relevant data (e.g. species lists) provided. Data on suitability and availability is crucial for authorities to assess likelihood of successful implementation
5. Decide on the best way to secure the offset, ensure acceptable to the CEA and the statutory conservation authorities;	X	Lack of concurrence with DENC & SANParks lead to delays, and protracted process. SANParks needs to consider the other impacts of the WEF on the Park and their mandate, and may be reticent in negotiating/accepting offset sites.
6. Prepare an Offsets Report or dedicated section within the EIA report; and	✓	Insufficient detail of the specific requirements to offset different component habitats, and insufficient detail on target sites to reach a decision
7. Conclude implementation agreements on offsets, develop Offset Management Plan, if required	X	Places pressure on negotiations, allows subjectivity to intrude. Delay in agreement with authorities may impact on financial close or activity commencement, unless a third party implementer can assume some risk and the authorities are satisfied with the various agreements for implementation.

Overall opinion.

The draft National Policy on Offsets provides a clear statement of intent against which to judge the efficacy of any suite of offset activities, viz:

***"The desired outcome of biodiversity offsets** is to ensure that:*

1. *The cumulative impact of development authorization and land use change does not:*
   - *result in the loss of CBA's or jeopardize the ability to meet the South Africa's targets for biodiversity conservation;*
   - *lead to ecosystems becoming more threatened than 'Endangered'; and/or*
   - *cause a decline in the conservation status of species and the presence of 'special habitats'.*
2. *Conservation efforts arising from the development application process, and contributing to improved protection of South Africa's unique species and ecosystems in perpetuity, are focused in areas identified as priorities for biodiversity conservation. Particular emphasis is on consolidation of priority areas and securing effective ecological links between priority areas."*

I find no reason to doubt the sufficiency of prior mitigation, or accuracy of the offset calculations and parameters. The specialist could have set out in clearer detail the specific areas of which habitats and features need to be satisfied by the offset. Further, a detailed and confidential list of suitable available properties could have been shared with the authorities to provide comfort that the offset outcomes were attainable. There was a significant emphasis on the earlier phases of offset determination, with insufficient attention and detail provided for in the later phases. In particular, the minimum requirements 8 and 9 a) – i) in Annexure A are insufficiently laid out. This needs to be rectified, but whether it is done in the offset report or (my suggested preference) in an Offset Implementation Agreement between the applicants and authorities/implementers is debatable.

I would urge the parties to reduce the specifics of the offset requirements, roles and responsibilities, costs, timelines and penalties to writing at their earliest convenience. If nothing else this will highlight any outstanding information required from an offset study, and clarify for the authorities the likelihood of the offset being implemented. This process does not need to wait for the final authorisation, as the implementation of the agreement will always be conditional on all approvals being obtained.

However, these aforementioned short-comings notwithstanding, the quantum of the offset is sufficient, the suggested locations in the PA expansion focus areas adjacent to Namaqua National Park and the mode of likely implementation is sensible and pragmatic and the likelihood of securing 2580ha of the required habitats in this region does seem attainable. Provided the additional specifics alluded to here can be attended to and implementation arrangements can be finalised before construction commences, I see no reason not to support the offset requirements as set out in the study.

Mark Botha
9 June 2018

References and Literature

CSIR 2018. *Scoping and Environmental Impact Assessment for the proposed Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape. Draft EIAR.* Submitted April 2018. DEA Ref 14/12/16/3/3/2/1046. CSIR, Stellenbosch.

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Desmet, P.G., Turner, R. C. and Helme, N. A. 2009. *Namaqua Sands Regional Context Vegetation Study*. Report for Golder Associates Africa, Halfway House, South Africa.

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Annexures

Minimum requirements for an offset study – From Section 2 of Todd (2018)

"*At minimum, it should include the following information (see Appendix 3 of the 2014 EIA Regulations):*

1. *An evaluation of the adequacy of measures considered and adopted to avoid, minimize and rehabilitate potentially significant negative impacts on biodiversity. (That is, were these measures sufficient; were reasonable and feasible alternative measures investigated, or could greater effort have been made particularly to avoid and minimize these impacts?).*
2. *A clear statement regarding the appropriateness of considering biodiversity offsets in this case. (That is, are there any residual impacts of 'very high' significance that could lead to irreplaceable loss of biodiversity and/ or priority ecosystem services?).*
3. *A reliable measure of residual negative impacts on significant biodiversity and ecosystem services requiring offsets.*
4. *It must take into account gaps in information or low levels of confidence in the predicted negative impacts.*
5. *It must give due consideration to uncertainties or low levels of confidence in the outcome of proposed measures to avoid, minimise and/ or rehabilitate negative impacts.*
6. *The duration of residual negative impacts of the proposed activity on biodiversity, taking a risk-averse approach, to determine the minimum duration of the biodiversity offset(s).*
7. *An explicit statement on the required size of the biodiversity offset to remedy these residual negative impacts, applying the basic offset ratio and adjustments as appropriate.*
8. *A description of the offset options considered (like for like habitat, trading up, or other), giving defensible reasons for arriving at the proposed offset type.*
9. *Where the proposed offset comprises land to be secured and managed:*
    a) *Evaluation of the probable availability of suitable offset site(s) in the surrounding landscape to meet offset requirements.*
    b) *Description of potential site(s) for biodiversity offset(s).*
    c) *Description of stakeholder engagement process in identifying and evaluating the adequacy and acceptability of the proposed offset site.*
    d) *Description of proposed approach to securing the offset site(s) (e.g. conservation servitude, protected area consolidation/ stewardship) and how it would be managed.*
    e) *Evaluation of probable adequacy of proposed offset site(s) by biodiversity specialist(s) and, where relevant, a social/ livelihood specialist:*

- *Is there a high level of confidence that offset site(s) would remedy residual impacts on a) biodiversity pattern (threatened ecosystems, threatened species and special habitats), b) biodiversity process, and c) on ecosystem services, while making a positive contribution to the long term conservation of biodiversity in the South Africa?)*
- *Would the offset sites be located in recognised 'offset receiving areas'?*
- *If relevant, is the motivation for a 'trading up' offset defensible in the specific context?*
- *Would the offset site(s) be functionally viable in the long term?*

f) A reliable estimate of the costs of acquiring or securing, rehabilitating and managing the necessary offset site(s) for the duration of residual negative impacts;

g) Responsibility for managing, monitoring and auditing the biodiversity offset;

- *Who would be responsible for implementing, managing and auditing the biodiversity offset?*
- *Statement regarding the adequacy of capacity of the institution, organization or other party to meet obligations in terms of above responsibilities;*

h) What measures would be taken to ensure that society as a whole, and affected communities in particular, would not be left more vulnerable or less resilient as a consequence of the proposed development [i.e. where offsets are to remedy loss of biodiversity underpinning valued ecosystem services, would the proposed offset(s) be affordable, accessible and acceptable to the main affected parties];

- *Any negative impacts on local communities and/or society as a whole as a consequence of the proposed offset. If yes, how would these negative impacts be avoided;*
- *Would the proposed use of the biodiversity offset site(s) be compatible with biodiversity conservation objectives? In particular, where an offset for residual negative impacts on biodiversity also provides offsets for residual impacts on ecosystem services, assurance must be provided that the latter would not compromise the biodiversity value of that offset (e.g. if biodiversity is to be a direct-use resource, then use could lead to degradation of that biodiversity / ecosystem).*

i) What mechanism is to be used to provide sufficient funds for acquiring/ securing and managing the biodiversity offset site(s) for the duration of residual negative impacts of the proposed activity (i.e. Who will be the recipient of money? How will funds flow to the implementing agent?)

Scoping and Environmental Impact Assessment for the proposed Kap Vley Wind Energy Facility near Kleinzee in the Northern Cape

UPDATED DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

APPENDIX R:

Wake Loss Statement

DNV·GL

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7 Walter Sisulu Avenue
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South Africa
c/o Sebastian Lau

DNV GL South Africa Pty Ltd
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Foreshore, Cape Town 8001
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Tel: +27 (0)21 418 1891

Date:	**Our reference**:	**Your reference**:
18 January 2018	198426-ZACT-L-01-C	PO 0187

Qualitative Evaluation of Wake Impact from Kap Vley wind farm in South Africa

Dear Sebastian,

juwi Renewable Energies (Pty) Ltd ("juwi") approached DNV GL South Africa (Pty) Ltd ("DNV GL") to qualitatively evaluate the potential wake impact of the Kap Vley wind farm on a proposed relatively nearby wind farm undergoing development by Eskom ("Eskom Project"). The Kap Vley wind farm is being developed by juwi in the Northern Cape province of South Africa and is located approximately 50 km west of the town of Springbok. The locations of the proposed Kap Vley wind turbines and the Eskom Project boundary have been provided by juwi and are presented in Figure 1. In addition to the location of the two projects, juwi has also provided measured wind data from the on-site met mast at the Kap Vley site in the form of annual wind speeds, turbulence intensity and wind rose.

DNV GL has not conducted a quantitative modelling study to estimate the wake impact of the Kap Vley wind farm on the neighbouring wind farm. Instead, DNV GL has evaluated the following factors qualitatively to assess whether there may be a potential impact based on DNV GL's experience:

- The locations of the Kap Vley wind turbines and met mast;
- The location of the Eskom Project (as indicated by project boundaries only);
- Annual mean wind speeds and turbulence intensity from the Kap Vley met mast at the upper measurement height;
- The wind rose generated from the Kap Vley met mast (as provided by juwi); and
- Satellite imagery of topography and ground cover.

The magnitude of the wake impact from one wind farm to a neighbouring wind farm is largely driven by the direction of the winds, the distance between the two projects and the atmospheric conditions such as turbulence intensity. Low ambient turbulence intensity tends to elevate wind farm wakes and generally increases the distance with which wakes persist.

The Eskom Project is located 16 km northwest of the closest proposed Kap Vley wind turbine at a bearing of approximately 300 degrees. It is noted that 31 of the 44 proposed Kap Vley wind turbines are 20 km or further from the closest outer boundary of the Eskom Project. DNV GL typically does not consider neighbouring wind farms that are in excess of 20 km away in the evaluation of external wake impact, as the wake impact tends to be negligible and the magnitude of the wake impact predicted by the models at this distance from the wind farm has a higher degree of uncertainty associated with it.

It is noted that the measured turbulence intensity at the top of the mast at 15 m/s is low, approximately 5%. This low ambient turbulence has the potential to increase the internal wake effects of the Kap Vley

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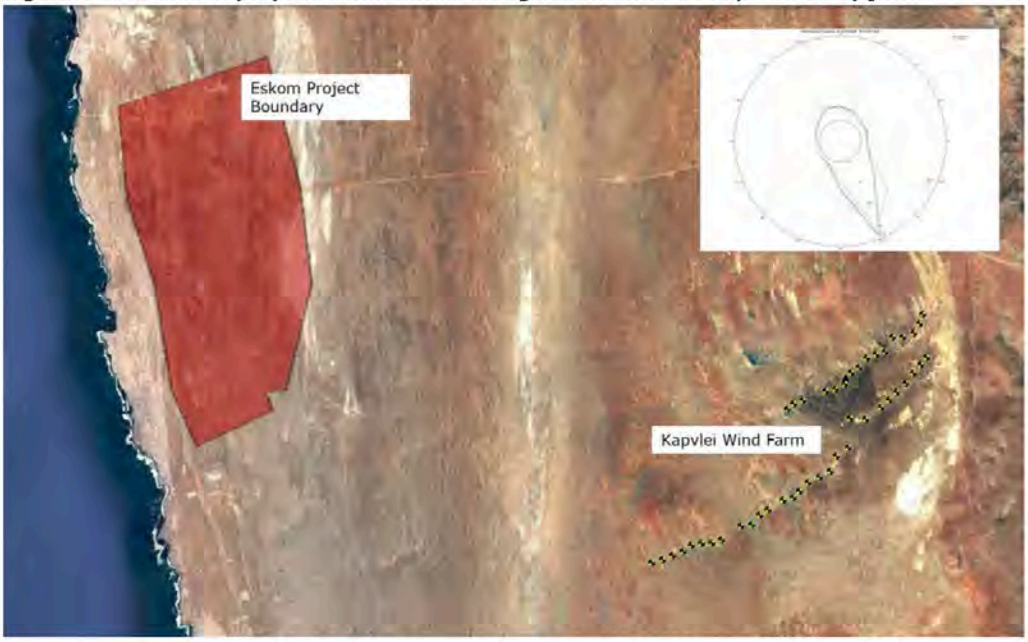
wind farm and also cause the wakes from the wind farm to persist for longer distances. However, without comprehensive modelling of the wake effect, it is impossible to determine the exact magnitude of this effect.

Figure 1 Locations of proposed wind farms alongside the wind rose provided by juwi



According to wind data provided by juwi at the location of the Kap Vley met mast, the predominant wind direction is 160 degrees. It is noted that the wind rose provided is fairly unidirectional, with very little time occurring where winds prevail from other direction sectors. It is further noted that the measured wind rose on-site is supported by two independent sources of long-term reference station data. This provides confidence that the wakes from Kap Vley wind farm will not interfere with the Eskom Project. It also provides confidence that although the low level of turbulence intensity may increase the chance of the wakes persisting, that because of the direction of the winds, the wake effects will still not impede on the Eskom Project.

Based on the location of the proposed wind farms, the wind rose and the distance of the projects from one another, DNV GL believes that wake impact of the Kap Vley wind farm on the neighbouring wind farm to be negligible.

Sincerely
for DNV GL South Africa Pty Ltd

Stefanie M Bourne

Stefanie Bourne, Senior Engineer

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