KANGNAS WIND ENERGY FACILITY: PRE-CONSTRUCTION BOTANICAL WALK-THROUGH REPORT

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Prepared for South Africa Mainstream Renewable Power (Pty) Ltd

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National Legislation and Regulations governing this report

This is a 'specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014.

Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by South Africa Mainstream Renewable Power (Pty) Ltd (Mainstream) to provide specialist botanical consulting services for the pre-construction walk-through (botanical and ecological) of the designated area of the Kangnas Wind Energy Facility, Northern Cape Province.

Details of Specialist

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Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany).
- Botanical ecologist with over 35 years' experience in the field of Vegetation Science.
- Founded Bergwind Botanical Surveys & Tours CC in 2006.
- Has conducted over 300 specialist botanical / ecological studies.
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request).

Appendix 1. Curriculum vitae

Independence

The views expressed in the document are the objective, independent views of Dr McDonald and the survey was carried out under the aegis of, Bergwind Botanical Surveys and Tours CC. Neither Dr McDonald nor Bergwind Botanical Surveys and Tours CC have any business, personal, financial or other interest in the proposed development apart from fair remuneration for the work performed.

Conditions relating to this report

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Bergwind Botanical Surveys & Tours CC, its staff and appointed associates, reserve the right to modify the report in any way deemed fit should new, relevant or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field, or pertaining to this investigation.

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THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I David Jury McDonald, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct,
- 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;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- 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;
- 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;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Note: The terms of reference must be attached.

Signature of the specialist:

Bergwind Botanical Surveys & Tours CC

Name of company:

13 March 2016

Date:

CONTENTS

1 INTRODUCTION

Mainstream has been selected as the preferred bidder for the construction of a wind energy facility on the farms Smorgenskaduwee and Kangnas between Springbok and Aggeneys in the Northern Cape Province. The facility will be known as the Kangnas Wind Farm. Bergwind Botanical Surveys & Tours (CC) conducted the original botanical impact assessment and has been appointed to provide a botanical and ecological walk-through report prior to the commencement of construction. The walk-through is a permitting and authorization requirement prior to construction.

The objective of the walk-through is to determine if any important plant species (protected species and / or species of conservation concern (SCC)) occur within the development footprint i.e. at turbine sites or along the routes of roads required for construction and operation. This report presents the outcome of a two-day field investigation (walk-through) conducted together with Mr Chris van Rooyen, ornithologist, in early February 2016. This report is aimed at informing the application to the provincial authority for a permit to clear vegetation. Recommendations concerning avoidance of negative impacts are provided.

2 CONSTRUCTION AREA AND THE APPROVED DEVELOPMENT

2.1 Locality

The area originally investigated is 46 535 hectares (ha) in extent and consisted of five portions of four farms located approximately 48 km east of Springbok in the Nama Khoi Local Municipality, Namakwa District Municipality, Northern Cape Province. The study comprised Farm Kangnas 77, Portion 3 and Remainder (RE); Farm Koeris 78, Portion 1; Farm Areb 75, Remainder and Farm Smorgenschaduwe 127 Portion 0.

Authorization has now been granted for the construction of a wind farm in what is known as the ‘wind farm focus area’ or ‘lease area’ on the farms Kangnas 77 Portion 3 (2905.59 ha) and Smorgenschaduwe 127 Remainder (685.75 ha) (Figure 1).

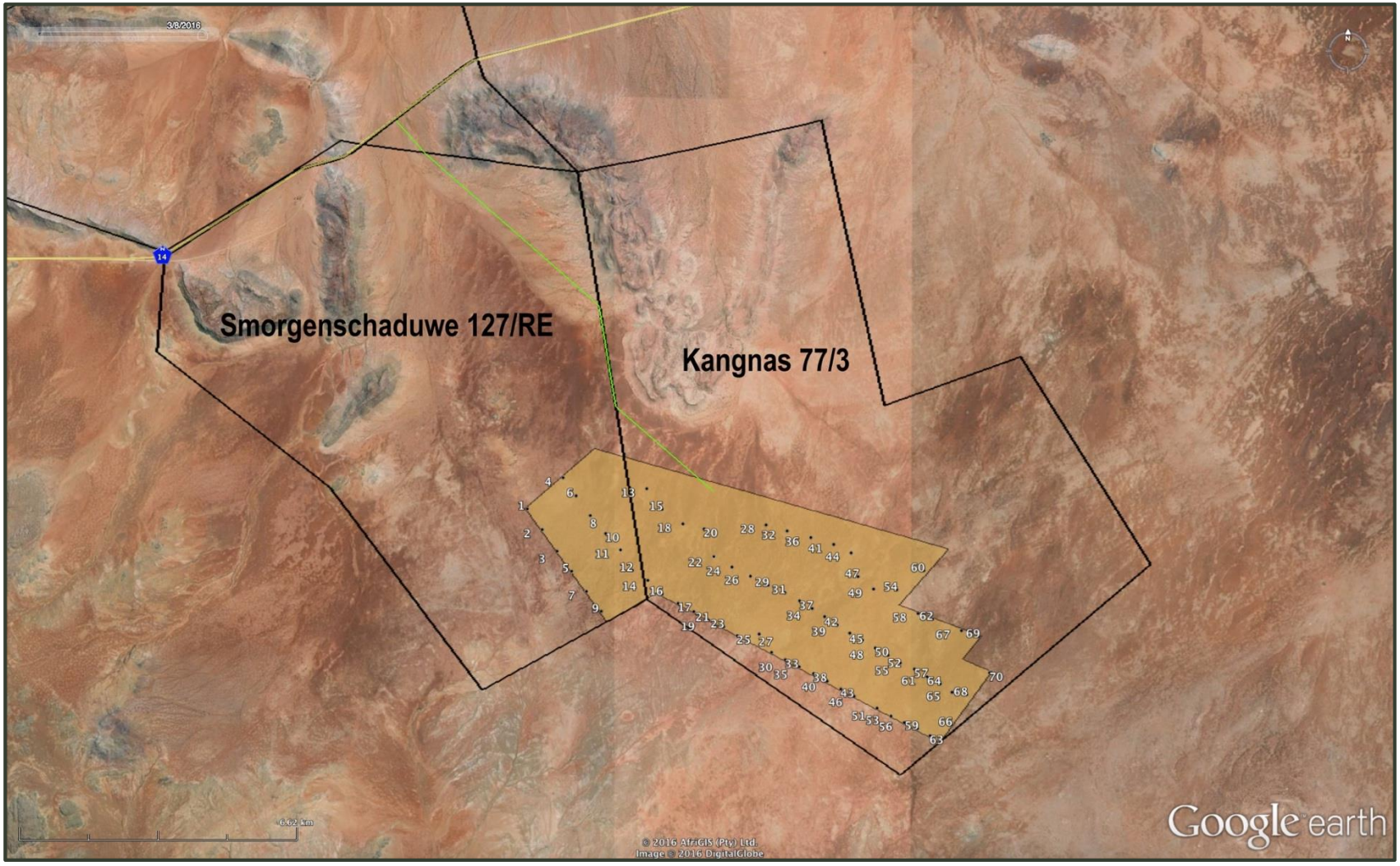

Figure 1. The boundaries (black) of farms Kangnas 77/3 and Smorgenschaduwe 127/RE superimposed on a Google Earth ™ image. The lease area in indicated as a buff-coloured area with the positions of the proposed 70 turbines shown.

2.2 Turbine Layout

It is envisaged that 70 wind turbines as per the layout in Figure 1, would be constructed in the 'lease area', in rows running roughly south-east to north-west. They would be located on open plains away from the low hills found on both land portions north of the 'lease area'.

3 THE WALK-THROUGH

The site was visited in summer on 3 & 4 February 2016. The approach was to traverse the site from west to east following existing roads. Given the expanse of the site as well as the uniformity over a wide area it was not considered necessary to visit every turbine footprint but rather to conduct an assessment of the overall potential impacts of the turbine sites and roads. To visit 70 turbine footprints would have been extremely time-consuming and would not have yielded any more useful data than that which was obtained using the approach that was followed. In addition, the walk-through was conducted in collaboration with Mr Chris van Rooyen, the appointed ornithologist, who was able to point out the habitat that was important to certain bird species, notably larks and sparrowlarks.

When the original botanical assessment was carried out by the author in July 2012, the entire study area was very dry and had not experienced good rain for some years. The tussock-forming white grasses were dry and forbs were scarce. When the 'lease area' was visited in February 2016 good rain had fallen on Kangnas 77/3 which resulted in a flush of green grass (see waypoint KWT1 in Table 1) and stimulation of shrub and forb species. Very much less rain had fallen on Smorenschaduwee 127/RE and the vegetation was much less stimulated (see waypoint KWT14 in Table 1).

3.1 Limitations and Assumptions

The walk-through approach may be faulted as being too superficial but it should be stressed that the objective of the method employed was to gain as much of an overview of the entire 'lease area' as possible in the allocated two days of field-time. The major assumption made was that there is **very little variation** in the vegetation and habitat within the 'lease area' and construction impacts would be much the same from one turbine site to the next. This assumption was tested in the field and the resulting conclusions given below.

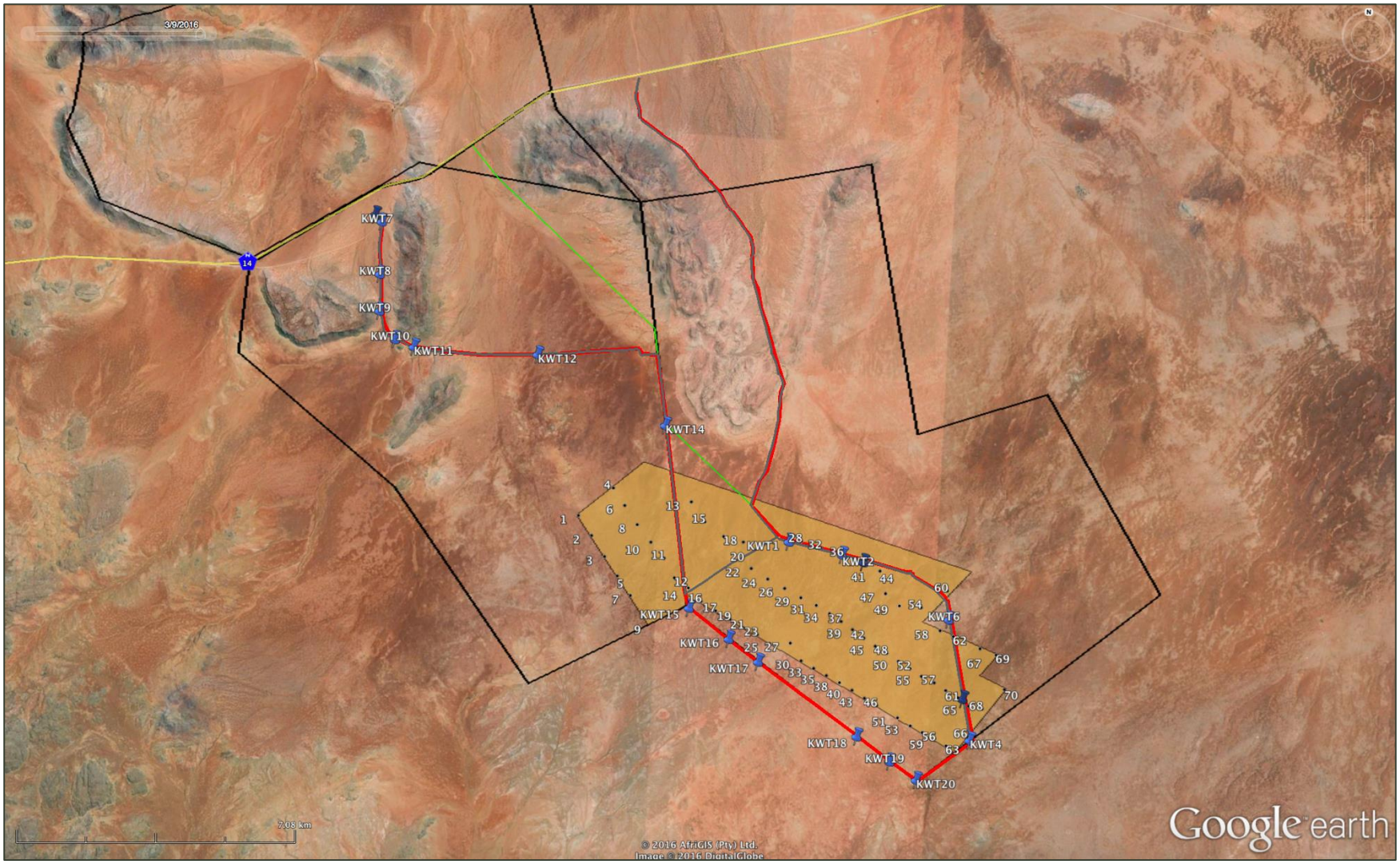

Figure 2. The routes followed (grey lines – Day 1; red line – Day 2) during the Kangnas Wind Farm walk-through. The waypoints are shown as KWT#.

4 WALK-THROUGH RESULTS

4.1 Vegetation and Flora

Apart from that there had been recent rain prior to the walk-through and that the vegetation was green, observations in the field confirmed the finding of the original botanical survey i.e. the vegetation is uniform over an extensive area and within the 'lease area' consists of only one type, Bushmanland Arid Grassland. The vegetation is dominated by white tussock grasses such as *Stipagrostis ciliata*, *Stipgrostis obtusa* and *Stipagrostis uniplumis*. Other grass species such as *Schmidtia kalahariensis* are less abundant.

The grass-dominated landscape is punctuated in places by mid-high shrubs of *Lycium cinereum* Thunb. and possibly *Lycium bosciifolium* Schinz (identification not confirmed). These shrubs may occur as scattered individuals or as clusters of shrubs and it is these areas that appear to be favoured by Red Larks (*Calendulauda burra*) that use them as elevated perches from which to launch for territorial display flights (Figure 3).

Figure 3. A Red Lark (*Calendulauda burra*) perched on *Lycium cinereum* and calling prior to a display flight.

Twenty waypoints were sampled during the walk-through and photographs take to record the landscape and vegetation condition. Comparison of the images from waypoint KWT15 in the south-west of the lease are with waypoint KWT1 in the north-east of the lease area serves to show the uniformity in the vegetation and landscape.

Table 1. Sample waypoints and illustrations of the vegetation found at the waypoints. The waypoints should be cross-referenced with Figure 2. (Note: KWT13 was not recorded).

Waypoint	Coordinates	Illustration
KWT1	S 29º 36’ 231.02.1” E 18º 21’ 30.1”	
KWT2	S 29º 36’ 39.7” E 18º 22’ 22.2”	

KWT3	S 29º 36’ 45.0” E 18º 22’ 42.6”	
KWT4	S 29º 39’ 07.6” E 18º 24’ 31.4”	

KWT5	S 29º 38’ 33.9” E 18º 24’ 22.8”	
KWT6	S 29º 37’ 29.0” E 18º 24’ 06.3”	

KWT7	S 29º 32’ 22.1” E 18º 14’ 50.4”	
KWT8	S 29º 33’ 05.5” E 18º 14’ 50.8”	

KWT9	S 29º 33’ 36.0” E 18º 14’ 52.3”	
KWT10	S 29º 33’ 58.9” E 18º 15’ 08.2”	

KWT11	S 29º 34’ 04.5” E 18º 15’ 26.6”	
KWT12	S 29º 34’ 06.2” E 18º 17’ 24.5”	

KWT14	S 29º 34’ 59.8” E 18º 19’ 28.8”	
KWT15	S 29º 37’ 29.3” E 18º 19’ 59.2”	

KWT16	S 29º 37’ 53.3” E 18º 20’ 38.4”	
KWT17	S 29º 38’ 11.0” E 18º 21’ 07.2”	

KWT18	S 29º 39’ 08.7” E 18º 22’ 43.9”	
KWT19	S 29º 39’ 28.2” E 18º 232’ 16.3”	

KWT20	S 29º 39’ 42.5” E 18º 23’ 42.4”	

4.2 General Ecology and Biodiversity at Kangnas

4.2.1 Alpha (α), Beta (β) and Gamma Diversity (γ)

Whittaker (1972) defined 'alpha diversity' as the species richness of a place. It is often applied to the entire biodiversity of a site (all interacting organisms at a site) and is also known as 'within-habitat diversity'. This measure was redefined on the basis of the structure of the community so that the most common expression of 'alpha diversity' is a measure both of the number of species and the proportion in which each species is represented in the community. When applied to a plant community, a community will have a high alpha diversity when there is a high number of species and their abundances are similar. Conversely, the plant community has a low alpha diversity when there is a low number of species and their abundances are similar.

A further important measure is 'beta diversity' which is 'between-habitat diversity' or the change in species number (species richness) from one site to the next. It is thus a measure the response of organisms to spatial heterogeneity. High beta-diversity implies low similarity between species composition of different habitats. It is usually expressed in terms of a similarity index between communities (or species turnover rate) between different habitats in the same geographical area (often expressed as some kind of gradient).

Both the above indices (alpha diversity and beta diversity) contribute to yet another index introduced by Whittaker known as 'gamma diversity'. This is also known as 'landscape diversity'. In this case the total species diversity in a landscape (γ) is determined by the

mean species diversity in sites or habitats at a more local scale (α-diversity) and the differentiation among those habitats (β-diversity).

4.2.2 Plant Community Diversity at Kangnas

What do alpha, beta and gamma diversity mean in the 'lease area' at Kangnas? These are important concepts to apply to the expression of biodiversity of at Kangnas. It has been mentioned above that there is a high degree of uniformity in the plant community found in the lease area. In the first instance the number of plant species in a local area is small but with high abundance of one or two species, hence **low alpha diversity**. Secondly, the turnover of species from one local area or site to the next in the lease are at Kangnas is low, therefore there is **low beta diversity**. Since these two indices are low the result is **low gamma diversity** (landscape or geographic diversity).

In the Kangnas 'lease area' the low values of all the above indices indicates that there is a low to very low botanical sensitivity. This supports the view that the receiving environment is close to ideal for the proposed wind energy infrastructure from a botanical perspective. It may also be expressed as the environment having a high **absorptive capacity** for the proposed infrastructure. Apart from the inevitable construction impacts that would be **Low Negative** the negative impacts to the vegetation as a 'vegetation type' would be minimal.

4.2.3 Listed and Protected Plant Species

A list of possible species found in the 2918CB Kangnas quarter-degree square was extracted from the Plants of Southern Africa – Online checklist. The list follows with each species preceded by its family name in upper case letters.

AMARYLLIDACEAE, Brunsvigia namaquana D.& U. Müll.-Doblies
ASPHODELACEAE, Aloe karasbergensis Pillans
ASTERACEAE, Dicoma capensis Less. "
ASTERACEAE, Dimorphotheca sinuata DC.
ASTERACEAE, Eriocephalus pedicellaris DC.
ASTERACEAE, Gazania lichtensteinii Less.
ASTERACEAE, Helichrysum hebelepis DC.
ASTERACEAE, Lasiospermum brachyglossum DC.
ASTERACEAE, Leysera tenella DC.
ASTERACEAE, Osteospermum pinnatum (Thunb.) Norl. var. breve Norl.
ASTERACEAE, Othonna macrophylla DC.
ASTERACEAE, Senecio cinerascens Aiton

ASTERACEAE, Senecio sisymbriifolius DC.
ASTERACEAE, Ursinia nana DC. subsp. nana
BORAGINACEAE, Lobostemon echioides Lehm.
BRASSICACEAE, Heliophila lactea Schltr.
CAMPANULACEAE, Wahlenbergia oxyphylla A.DC.
CRASSULACEAE, Adromischus nanus (N.E.Br.) Poelln.
CRASSULACEAE, Cotyledon orbiculata L. var. orbiculata
CUCURBITACEAE, Kedrostis africana (L.) Cogn.
EUPHORBIACEAE, Euphorbia namaquensis N.E.Br.
EUPHORBIACEAE, Euphorbia rhombifolia Boiss.
FABACEAE, Calobota sericea (Thunb.) Boatwr. & B.-E.van Wyk
FABACEAE, Crotalaria excisa (Thunb.) Baker f. subsp. excisa
FABACEAE, Lessertia diffusa R.Br.
FABACEAE, Lessertia incana Schinz
FABACEAE, Lessertia frutescens (L.) Goldblatt & Manning subsp. frutescens
FABACEAE, Rhynchosia schlechteri Baker f.
HYACINTHACEAE, Albuca glandulifera J.C.Manning & Goldblatt
HYACINTHACEAE, Lachenalia inconspicua G.D.Duncan
IRIDACEAE, Gladiolus equitans Thunb.
IRIDACEAE, Lapeirousia fabricii (D.Delaroche) Ker Gawl.
IRIDACEAE, Lapeirousia littoralis Baker subsp. littoralis
IRIDACEAE, Moraea herrei (L.Bolus) Goldblatt
IRIDACEAE, Tritonia karooica M.P.de Vos
LAMIACEAE, Stachys rugosa Aiton
MALVACEAE, Hermannia comosa Burch. ex DC.
MALVACEAE, Hermannia stricta (E.Mey. ex Turcz.) Harv.
MESEMBRYANTHEMACEAE, Antimima hantamensis (Engl.) H.E.K.Hartmann & Stüber
MESEMBRYANTHEMACEAE, Antimima papillata (L.Bolus) H.E.K.Hartmann
MESEMBRYANTHEMACEAE, Aridaria noctiflora (L.) Schwantes subsp. straminea (Haw.) Gerbaulet
MESEMBRYANTHEMACEAE, Cephalophyllum staminodiosum L.Bolus **RARE**
MESEMBRYANTHEMACEAE, Conophytum smorenskaduense de Boer **VULNERABLE**
MESEMBRYANTHEMACEAE, Conophytum verrucosum (Lavis) G.D.Rowley **RARE**
MESEMBRYANTHEMACEAE, Lampranthus amoenus (Salm-Dyck ex DC.) N.E.Br. **ENDANGERED**
MESEMBRYANTHEMACEAE, Psilocaulon coriarium (Burch. ex N.E.Br.) N.E.Br.
MESEMBRYANTHEMACEAE, Psilocaulon subnodosum (A.Berger) N.E.Br.
OXALIDACEAE, Oxalis sonderiana (Kuntze) T.M.Salter
POACEAE, Schmidtia kalahariensis Stent
POACEAE, Stipagrostis obtusa (Delile) Nees
POACEAE, Stipagrostis uniplumis (Licht.) De Winter var. uniplumis
POACEAE, Tricholaena capensis (Licht. ex Roem. & Schult.) Nees subsp. capensis
PORTULACACEAE, Anacampseros baeseckei Dinter
PORTULACACEAE, Avonia papyracea (E.Mey. ex Fenzl) G.D.Rowley subsp. papyracea
SCROPHULARIACEAE, Nemesia maxii Hiern
SCROPHULARIACEAE, Zaluzianskya sanorum Hilliard
TECOPHILAEACEAE, Cyanella hyacinthoides Royen ex L.
ZYGOPHYLLACEAE, Tribulus terrestris L.
ZYGOPHYLLACEAE, Zygophyllum retrofractum Thunb.

Of the species listed above (a list that is not comprehensive and is up to date only to 2009) only four (see red type above) species are ‘Red List’ species. They are all succulent species

in the family Aizoaceae (previously Mesembryanthemaceae as in the list). All these species are found on the rocky hills of Kangnas and Smorenskaduwee. They do not occur on the sandy plains within the 'lease area'. It can therefore be confidently concluded that there are no Red List species that would be affected by the wind energy facility infrastructure.

The Northern Cape Nature Conservation Act (Act No. 9 of 2009) was consulted to determine if any plant species in Schedule 1 (Flora): Specially Protected Plant Species and Schedule 2 (Flora): Protected Plant Species are likely to be affected in any way. It has been determined that there would be no negative influence on any of the listed plant species.

4.2.4 Other Ecological Considerations

Termite mounds are often considered to be important ecological indicators, indicating healthy ecosystems (Bonachela *et al.* 2015). Very few, if any, termite mounds were noted in the lease area at Kangnas. The question then is whether the ecosystem is in poor condition or not? The author does not believe that the ecosystem is in poor condition but the absence of termite mounds raises some interesting questions. One of these is that termites are a primary food source for animals such as Bat-eared Fox, Aardwolf and Aardvark. There was no evidence of these mammals in the Kangnas lease area and this could be related to the absence of termites or the low food availability due to the prolonged drought.

Ground squirrels (*Xerus inauris*) (Figure 4) were noted in the study area where they make extensive burrows. They are herbivorous, however, their presence appeared to have no adverse effect on the vegetation near their burrows.

Figure 4. Ground squirrels (*Xerus inauris*) commonly found in the Kangnas lease area.

The ornithological aspects of the ‘lease area’ are dealt with in a separate report, however, as noted above the grassland and low shrub habitat provides a home for various species of small passerine birds such as larks, sparrow-larks and chats. As noted above (see Figure 3), Near endemic Red Larks of of particular interest and rely on vegetation cover for their nests as well as shrubs for perches. Spike-heeled Larks (*Chersomanes albofasciata*) [Figure 5] that have a much wider distribution than Red Larks were observed during the walk-through and they make use of the low grassland habitat, tending not to perch of mid-high shrubs. Grey-backed Sparrowlarks (Figure 6) were noted using shrubs for cover but also flying between patches of mid-high vegetation.

Figure 5. Spike-heeled Lark

Figure 6. Grey-backed Sparrowlark

5. CONCLUSIONS AND RECOMMENDATIONS

As was found in the original botanical survey of the area proposed for the Kangnas Wind Farm (McDonald, 2012) the vegetation consists of only one type, Bushmanland Arid Grassland, in the area now selected for construction (the 'lease area'). The receiving environment has low to very low botanical sensitivity based on the low alpha, beta and gamma diversity. It is therefore concluded that the area selected for the wind farm, that was covered during the walk-through, is close to ideal for construction and operation of the proposed wind energy infrastructure. No turbine site or road route was singled out as botanically or ecologically sensitive and all are acceptable for construction. This conclusion is reached even though every single wind-turbine footprint was not visited. It is my opinion that this is one of the most suitable sites I have surveyed, of the many that I have studied, for purposes of wind energy generation.

No specific recommendations are made apart from advocating best practice to keep disturbance of vegetation to a minimum and for rehabilitation of disturbed areas that would not be required for operational purposes once construction has been completed.

6. REFERENCES

Bonachela, J.A., Pringle, R.M., Sheffer1, E., Coverdale, T.C., Guyton, J.A., Caylor, K.K., Levin S.A., Tarnita, C.E. 2015. Termite mounds can increase the robustness of dryland ecosystems to climatic change. *Science* 347, Issue 6222, pp. 651-655.

McDonald, D.J. Botanical Impacts Assessment: Kangnas Renewable Energy Facilities, Northern Cape.

Whittaker, R.H. 1972. Evolution and measurement of species diversity. Taxon 21, 213—251.

Website: Plants of Southern Africa – Online Checklist -- http://posa.sanbi.org/searchspp.php

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Report submitted: 13 March 2016

APPENDIX 1: Curriculum Vitae

Dr David Jury McDonald Pr.Sci.Nat.

Name of Company: Bergwind Botanical Surveys & Tours CC. (Independent consultant)

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E-mail: dave@bergwind.co.za

Website: www.bergwind.co.za

Profession: Botanist / Vegetation Ecologist / Consultant / Tour Guide

Date of Birth: 7 August 1956

Employment history:

- 19 years with National Botanical Institute (now SA National Biodiversity Institute) as researcher in vegetation ecology.

- Five years as Deputy Director / Director Botanical & Communication Programmes of the Botanical Society of South Africa

- Ten years as private independent Botanical Specialist consultant (Bergwind Botanical Surveys & Tours CC)

Nationality: South African (ID No. 560807 5018 080)
Languages: English (home language) – speak, read and write
Afrikaans – speak, read and write

Membership in Professional Societies:

- South Africa Association of Botanists
- International Association for Impact Assessment (SA)
- South African Council for Natural Scientific Professions (**Ecological Science, Registration No. 400094/06**)
- Field Guides Association of Southern Africa

Key Qualifications :

- Qualified with a M. Sc. (1983) in Botany and a PhD in Botany (Vegetation Ecology) (1995) at the University of Cape Town.
- Research in Cape fynbos ecosystems and more specifically mountain ecosystems.
- From 1995 to 2000 managed the Vegetation Map of South Africa Project (National Botanical Institute)
- Conducted botanical survey work for AfriDev Consultants for the Mohale and Katse Dam projects in Lesotho from 1995 to 2002. A large component of this work was the analysis of data collected by teams of botanists.
- **Director: Botanical & Communication Programmes** of the Botanical Society of South Africa (2000—2005), responsible for communications and publications; involved with conservation advocacy particularly with respect to impacts of development on centres of plant endemism.

- Further tasks involved the day-to-day management of a large non-profit environmental organisation.

- **Independent botanical consultant** (2005 – to present) over 300 projects have been completed related to environmental impact assessments in the Western, Southern and Northern Cape, Karoo and Lesotho. A list of reports (or selected reports for scrutiny) is available on request.

Higher Education

Degrees obtained
and major subjects passed: B.Sc. (1977), University of Natal, Pietermaritzburg
Botany III
Entomology II (Third year course)

B.Sc. Hons. (1978) University of Natal, Pietermaritzburg
Botany (Ecology /Physiology)

M.Sc - (Botany), University of Cape Town, 1983.
Thesis title: 'The vegetation of Swartboschkloof, Jonkershoek, Cape Province'.

PhD (Botany), University of Cape Town, 1995.
Thesis title: 'Phytogeography endemism and diversity of the fynbos of the southern Langeberg'.

Certificate of Tourism: Guiding (Culture: Local)
Level : 4 Code: TGC7 (Registered Tour Guide: WC 2969).

Employment Record :

January 2006 – present: Independent specialist botanical consultant and tour guide in own company:
Bergwind Botanical Surveys & Tours CC

August 2000 - 2005 : Deputy Director, later Director Botanical & Communication Programmes, Botanical Society of South Africa

January 1981 – July 2000 : Research Scientist (Vegetation Ecology) at National Botanical Institute

January 1979—Dec 1980 : National Military Service

Further information is available on my company website: www.bergwind.co.za