

Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> • Establish a monitoring program for the early detection and control of alien invasive plant species. • No alien invasive species should be used in landscaping or gardens on the site. 		
Direct impacts:		
<ul style="list-style-type: none"> • As a result of the loss of indigenous vegetation and resulting disturbance, declared alien species might invade the area. Removal of alien invasive plant species should be encouraged. 		
Indirect impacts:		
<ul style="list-style-type: none"> • Disturbance will favour alien species and without follow-up control, alien species may spread through the area. • Removal of alien species and the rehabilitation of the habitat may favour indigenous plant species. 		
Cumulative impacts:		
<ul style="list-style-type: none"> • The establishment of declared weedy and alien invasive plant species on the disturbed site could lead to their spread into the surrounding natural vegetation and onto neighbouring properties. Their presence may also slow down the recovery of the natural vegetation. • 		
Residual impacts:		
Low residual impact if the declared weedy and alien invasive species are controlled.		

CHAPTER 10

DISCUSSION

10.1 Vegetation type (regional)

The property falls in the Lower Gariep Alluvial Vegetation and Bushmanland Arid Grassland. The Lower Gariep Alluvial Vegetation is classified as "**endangered**" (NEMA (2011). About 6% is statutorily conserved in the Richtersveld and Augrabies Falls National Parks and about 50% transformed for agricultural purposes and alluvial diamond mining. Some clearing of vegetation for the resort occurred in the riparian vegetation (Figure 27). Two strips of riparian vegetation on the river bank have already been cleared for power lines (Figures 28 & 29). Therefore, further development in the riparian habitat must be discouraged or limited to the minimum.



Figure 27. Development in the riparian habitat of the Orange River.

Although only small patches of the Bushmanland Arid Grassland is conserved in statutory conservation areas such as the Augrabies Falls National Park, it is classified as '**least threatened**' because little of the area has been transformed and covers large areas of the Northern Cape (NEMA 2011). Most of this vegetation type on the property is undisturbed at present besides the clearance of vegetation underneath ESKOM power lines that dissect the site. The proposed racetrack and other associated development in the central parts of the site should be concentrated in the already disturbed areas (borrow-pit terrain) (Figure 30).



Figure 28. Clearing of the riparian habitat for first ESKOM power line.



Figure 29. Clearing of the riparian habitat for second ESKOM power line.



Figure 30. Borrow-pit disturbed area where the racetrack and associated infrastructure is to be developed.

10.2 Terrestrial plant associations on site

Most of the site consists of low hills and ridges with quartz outcrops in the central area, changing to undulating plains in the north. A high cover of quartz pebbles occurs in places. Some of the protected plant species occur in low numbers, e.g. *Vachellia erioloba*, although *Boscia albitrunca* and *Aloe claviflora* are more widespread. There is a small area in the north in Association 1 where a small population of *Titanopsis calcarea* is found along with *Avonia papyracea* that is more widespread (see GPS locations). *Dinteranthus pole-evansii*, a "vulnerable" species, was found on one location in the northern plains in Association 1. Association 1 is classified with a "high" sensitivity" where the habitat should be excluded from any development. Protected tree species and other Northern Cape protected species may not be removed or damaged without permits issued by the relevant authorities (NCNCA and DAFF).

10.3 Aquatic associations on site

A buffer zone of non-disturbance of at least 32 m from the edge of the Orange River and other drainage lines should be set aside. The riparian plant associations identified on site cover the banks of the Orange River in the southwest, with some ephemeral drainage lines more inland flowing towards the Orange River. Although some vegetation clearing and development in the riparian zone has already occurred, the river bank, channels and floodplains of the Orange River **should be excluded from any further development.**

The alluvial vegetation along the Orange River and along ephemeral drainage lines should be conserved because of their role in binding soil, preventing erosion of the riverbanks and because it constitutes important food sources and habitats for various fauna, e.g. nesting for bird species. The underbrush normally associated with these species also forms an important micro-habitat for a number of animal species.

There is currently a road following the ephemeral branch of the Orange River towards the picnic site on the banks of the river (Figures 31 & 32). Some ephemeral streams from the east join this branch in at least two places. In times of flood this terrain will most probably be under water. Access to the resort terrain on the river

bank will be cut off from the main resort unless a bridge is provided for access. A PES and EIS may be required by DWS for the crossing and construction of a bridge.



Figure 31. Road along the branch of the Orange River.



Figure 32. Picnic site on the water's edge accessed by the road shown in Figure 31.

Well-defined ephemeral drainage lines that dissect the site **should be excluded from any development**. The drainage lines are dry for most of the year and flow for short periods after relatively heavy rains. These seasonal drainage lines are not considered to be wetlands in the strict sense of the word but the flow of water should not be impeded, and prevention of erosion should be a high priority if the area is to be developed, e.g. erection of gabions (see section 10.6)

It is important to have undisturbed areas of at least the same size and of similar habitat than the area used for the resort development to allow for natural movement and re-colonization of displaced fauna. No further disturbance of the riparian habitat should be allowed.

10.4 Alien plant species

The presence of the woody invaders *Eucalyptus camaldulensis* and *Prosopis glandulosa* is of concern and these species should be eradicated as part of the management measures of the riverine habitat. Removal of alien species and the rehabilitation of the habitat may favour indigenous plant species. The use of alien species in landscaping or gardens around the resort development should be discouraged.

10.5 Mitigation

Mitigation is the actions undertaken to compensate for environmental damage. The following mitigation measures are proposed during the construction and operational phases of the project:

- Buffer zones in the riparian zones should be provided, i.e. a 32 m zone of undisturbed habitat measured from the water's edge. A buffer zone is a collar of land that filters out inappropriate influences from surrounding activities, also known as edge effects, including the effects of invasive plant and animal species, physical damage and soil compaction caused through trampling and harvesting, abiotic habitat alterations and pollution.
- Development should be contained within the approved development boundaries and unnecessary disturbance adjacent to the site should be avoided.
- Minimise further clearance of natural vegetation and disturbance along the Orange River. A permit has to be obtained from NCDENC and/or DAFF for the removal or transplanting of protected plant species.
- Dedicated roads should be used on site and random driving in the veld or on dunes should be prohibited.
- Dust control measures should be implemented during construction.
- Protected plant species such as *Vachellia erioloba* and *Boscia albitrunca* should be retained where possible because of their keystone role in the ecosystem, for example they bind the soil, prevent erosion and form important food sources and habitats for various fauna.
- Implement a monitoring program for the early detection of alien invasive plant species. The control program to combat declared alien invasive plant species should be continued during the operational phase.
- No alien invasive plant species should be used in landscaping or gardens on site.
- Any areas that will be denuded as a result of activities on site, should be re-vegetated (rehabilitated) as soon as possible to prevent soil erosion and establishment of alien invasive plant species.

10.6 Rehabilitation plan

It is proposed that a rehabilitation plan is designed to accelerate the natural succession process where vegetation clearing took place and the soil surface exposed. The suggested method of rehabilitation is the landscaping of the disturbed areas and spreading of indigenous grass seed mixtures mixed with mulch or topsoil. The grass and other plant species recommended should be adapted to the specific habitat conditions and if possible originate from the region. The selected species should be annual and perennial species in order to try to establish some form of cover and bring organic matter into the soil that will aid in water retention and germination of seeds.

- Use machinery and labour to landscape the site and prepare the surface for further rehabilitation.
- Active restoration such as oversowing with grass seed mixtures and brush packing/mulching, as well as irrigation, should be applied.

- Disturbed stream banks may be stabilised with stones, netting and logs.
- The control of soil erosion should take place continuously.
- Monitor the area regularly to assess the rehabilitation progress.
- Monitoring and control of declared weeds and alien invasive species should be conducted regularly. Only where manual techniques have failed may herbicides be considered. The contamination of soil and water should not occur.

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APPENDIX A

Plant species list of the Destination Rock Inn near
Groblershoop, Northern Cape

Trees	7
Shrubs	11
Dwarf shrubs	31
Grasses	27
Forbs	21
Succulents	11
Parasites	3
Sedges	1
Fern	1
Aliens	6
Total	119

Trees

Boscia albitrunca
Salix mucronata
Searsia lancea
Searsia viminalis
Vachellia erioloba
Vachellia karroo
Ziziphus mucronata

Shrubs

Cadaba aphylla
Calobota linearifolia
Ehretia alba
Grewia flava
Lycium bosciifolium
Lycium cinereum
Lycium hirsutum
Lycium oxycarpum
Phaeoptilum spinosum
Searsia burchellii
Senegalia mellifera

Dwarf shrubs

Aizoon burchellii
Aizoon schellenbergii
Aptosimum albomarginatum
Aptosimum cf. marlothii
Aptosimum lineare
Aptosimum spinescens
Asparagus cooperi
Barleria rigida
Calobota spinescens
Erioccephalus ericoides
Erioccephalus sp.
Hermannia spinosa
Justicia divaricatum
Justicia australis
Justicia incana
Justicia spartioides
Leucosphaera bainesii
Pegolettia retrofracta
Pentzia calcarea
Pentzia spinescens

Plinthus karooticus
Plinthus sericeus
Pollichia campestris
Pteronia sordida
Pteronia sp.
Rhigozum trichotomum
Roepera lichtensteiniana
Salsola aphylla
Salsola tuberculata
Tetraena decumbens
Tetraena rigida

Forbs

Acanthopsis hoffmannseggiana
Barleria lichtensteiniana
Blepharis mitrata
Coronopus integrifolius
Cullen tomentosum
Dicoma capensis
Erucastrum austroafricanum
Geigeria ornativa
Indigofera alternans
Lepidium africanum
Limeum cf. *aethiopicum*
Lophiocarpus polystachyus
Nolletia cf. *chrysocomoides*
Peliostomum leucorrhizum
Phyllanthus sp.
Ptychlobium biflorum
Senecio sisymbriifolius
Sericocoma avolans
Sesamum triphyllum
Tribulus cristatus
Tribulus zeyheri

Grasses

Anthephora pubescens
Aristida adscensionis
Aristida diffusa
Brachiaria glomerata
Cenchrus ciliaris
Cynodon dactylon
Enneapogon cenchroides
Enneapogon desvauxii
Enneapogon scaber
Eragrostis annulata
Eragrostis echinochloidea
Eragrostis lehmanniana
Eragrostis nindensis
Eragrostis obtusa
Eragrostis porosa
Fingerhuthia africana
Oropetium capense
Phragmites australis
Schmidtia kalahariensis
Setaria verticillata
Sporobolus fimbriatus
Stipagrostis amabilis
Stipagrostis anomala
Stipagrostis ciliata
Stipagrostis obtusa
Stipagrostis uniplumis
Tragus berteronianus

Parasites

Lacomucinaea lineata
Tapinanthus oleifolius
Thesium hystrix

Succulents

Aloe claviflora
Avonia papyracea
Cynanchum viminale
Dinteranthus pole-evansii
Euphorbia davyi
Euphorbia gariepina
Euphorbia rhombifolia
Kleinia longiflora
Mesembryanthemum coriarium
Monsonia crassicaule
Titanopsis calcarea

Sedges

Cyperus cf. laevigatus

Fern

Equisetum ramosissimum

Alien (exotic) plants

Argemone ochroleuca
Bidens bipinnata
Chenopodium album
Eucalyptus camaldulensis
Pergularia daemia
Prosopis glandulosa

APPENDIX B

Plant species list according to the 2821 DD & 2822 CC
quarter degree grids: NewPosa (SANBI)

<i>Adenium oleifolium</i> Stapf	LC
<i>Alternanthera pungens</i> Kunth	Naturalised
<i>Aptosimum albomarginatum</i> Marloth & Engl.	LC
<i>Arctotis leiocarpa</i> Harv.	LC
<i>Aristida adscensionis</i> L.	LC
<i>Aristida congesta</i> Roem. & Schult. subsp. <i>congesta</i>	LC
<i>Aristida diffusa</i> Trin. subsp. <i>burkei</i> (Stapf) Melderis	LC
<i>Aristida stipitata</i> Hack. subsp. <i>spicata</i> (De Winter) Melderis	LC
<i>Berkheya spinosissima</i> (Thunb.) Willd. subsp. <i>spinosissima</i>	LC
<i>Boerhavia cordobensis</i> Kuntze	Naturalised
<i>Brachiaria glomerata</i> (Hack.) A.Camus	LC
<i>Cenchrus ciliaris</i> L.	LC
<i>Centropodia glauca</i> (Nees) Cope	LC
<i>Chascanum pinnatifidum</i> (L.f.) E.Mey. var. <i>pinnatifidum</i>	LC
<i>Cheilanthes deltoidea</i> Kunze subsp. <i>deltoidea</i>	LC
<i>Chloris virgata</i> Sw.	LC
<i>Cleome angustifolia</i> Forssk. subsp. <i>diandra</i> (Burch.) Kers	LC
<i>Combretum erythrophyllum</i> (Burch.) Sond.	LC
<i>Corchorus asplenifolius</i> Burch.	LC
<i>Cucumis africanus</i> L.f.	LC
<i>Cullen tomentosum</i> (Thunb.) J.W.Grimes	LC
<i>Digitaria eriantha</i> Steud.	LC
<i>Dyerophytum africanum</i> (Lam.) Kuntze	LC
<i>Enneapogon cenchroides</i> (Licht. ex Roem. & Schult.) C.E.Hubb.	LC
<i>Enneapogon scaber</i> Lehm.	LC
<i>Eragrostis echinochloidea</i> Stapf	LC
<i>Eragrostis lehmanniana</i> Nees var. <i>lehmanniana</i>	LC
<i>Eragrostis pallens</i> Hack.	LC
<i>Eragrostis porosa</i> Nees	LC
<i>Felicia hirsuta</i> DC.	LC
<i>Ficus cordata</i> Thunb. subsp. <i>cordata</i>	LC
<i>Forsskaolea candida</i> L.f.	LC
<i>Geigeria pectidea</i> (DC.) Harv.	LC
<i>Gisekia africana</i> (Lour.) Kuntze var. <i>africana</i>	LC
<i>Gisekia pharnacioides</i> L. var. <i>pharnacioides</i>	LC
<i>Heliophila minima</i> (Stephens) Marais	LC
<i>Heliophila trifurca</i> Burch. ex DC.	LC
<i>Heliotropium ciliatum</i> Kaplan	LC
<i>Hermannia burkei</i> Burt Davy	LC
<i>Hermannia eenii</i> Baker f.	LC
<i>Hermannia spinosa</i> E.Mey. ex Harv.	LC
<i>Hermstaedtia fleckii</i> (Schinz) Baker & C.B.Clarke	LC
<i>Hibiscus elliotiae</i> Harv.	LC
<i>Indigofera alternans</i> DC. var. <i>alternans</i>	LC
<i>Jamesbrittenia integerrima</i> (Benth.) Hilliard	LC
<i>Jamesbrittenia tysonii</i> (Hiern) Hilliard	LC
<i>Justicia divaricata</i> Licht. ex Roem. & Schult.	LC
<i>Justicia puberula</i> Immelman	LC
<i>Justicia spartioides</i> T.Anderson	LC
<i>Kohautia caespitosa</i> Schnizl. subsp. <i>brachyloba</i> (Sond.) D.Mantell	LC
<i>Kohautia cynanchica</i> DC.	LC
<i>Lacomucinaea lineata</i> (L.f.) Nickrent & M.A.Garcia	LC
<i>Leobordea platycarpa</i> (Viv.) B.-E.van Wyk & Boatwr.	LC
<i>Lessertia frutescens</i> (L.) Goldblatt & J.C.Manning subsp. <i>frutescens</i>	LC
<i>Leucosphaera bainesii</i> (Hook.f.) Gilg	LC
<i>Limeum aethiopicum</i> Burm.f. var. <i>lanceolatum</i> Friedrich	NE
<i>Limeum argute-carinatum</i> Wawra ex Wawra & Peyr. var. <i>argute-carinatum</i>	LC
<i>Limeum fenestratum</i> (Fenzl) Heimerl var. <i>fenestratum</i>	LC
<i>Limeum myosotis</i> H.Walter var. <i>myosotis</i>	LC
<i>Lophiocarpus polystachyus</i> Turcz.	LC
<i>Lycium cinereum</i> Thunb.	LC

<i>Manulea schaeferi</i> Pilg.	LC
<i>Melinis nerviglumis</i> (Franch.) Zizka	LC
<i>Melinis repens</i> (Willd.) Zizka subsp. <i>grandiflora</i> (Hochst.) Zizka	LC
<i>Microlooma longitubum</i> Schltr.	LC
<i>Nemesia</i> sp.	
<i>Nymanina capensis</i> (Thunb.) Lindb.	LC
<i>Ocimum americanum</i> L. var. <i>americanum</i>	LC
<i>Panicum lanipes</i> Mez	LC
<i>Pentzia pinnatisecta</i> Hutch.	LC
<i>Polygala leptophylla</i> Burch. var. <i>leptophylla</i>	LC
<i>Prosopis glandulosa</i> Torr. var. <i>glandulosa</i>	NE, Naturalised
<i>Prosopis velutina</i> Wooton	NE, Naturalised, Invasive
<i>Ptychobium biflorum</i> (E.Mey.) Brummitt subsp. <i>biflorum</i>	LC
<i>Roepera lichtensteiniana</i> (Cham.) Beier & Thulin	LC
<i>Ruschia</i> sp.	
<i>Salsola kali</i> L.	Naturalised, Invasive
<i>Salsola tuberculatiformis</i> Botsch.	LC
<i>Schmidtia kalahariensis</i> Stent	LC
<i>Schmidtia pappophoroides</i> Steud.	LC
<i>Senecio consanguineus</i> DC.	LC
<i>Sericocoma avolans</i> Fenzl	LC
<i>Sesamum capense</i> Burm.f.	LC
<i>Sisymbrium burchellii</i> DC. var. <i>burchellii</i>	LC
<i>Solanum capense</i> L.	LC
<i>Sporobolus ioclados</i> (Trin.) Nees	LC
<i>Stipagrostis namaquensis</i> (Nees) De Winter	LC
<i>Stipagrostis obtusa</i> (Delile) Nees	LC
<i>Stipagrostis uniplumis</i> (Licht.) De Winter var. <i>uniplumis</i>	LC
<i>Striga gesnerioides</i> (Willd.) Vatke	LC
<i>Tapinanthus oleifolius</i> (J.C.Wendl.) Danser	LC
<i>Tephrosia dregeana</i> E.Mey. var. <i>dregeana</i>	LC
<i>Tragus berteronianus</i> Schult.	LC
<i>Tragus racemosus</i> (L.) All.	LC
<i>Tribulus zeyheri</i> Sond. subsp. <i>zeyheri</i>	LC
<i>Triraphis</i> sp.	
<i>Tulbaghia tenuior</i> K.Krause & Dinter	LC
<i>Vachellia haematoxylon</i> (Willd.) Seigler & Ebinger	LC

APPENDIX C

Differential table of the vegetation of the Destination Rock Inn site near Groblershoop, Northern Cape

Plant association	1	2	3	4	5	6	7	8	9	10	11	
Sample plot no.	1 1 4 9	1 1 2 3 6 7 8 0	3 3 3 7 2 3 6	1 1 2 2 3 0	3 8 9 7	2 2 2 2 1 4 7 6	1 2 2 3 4 8 5 9 1	1 2 2 5 2 3	1 3 3 5 0 4	1 3 3 3 1 5 8 9	2	4 1 6 0
Species group 1												
<i>Titanopsis calcarea</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Dicoma capensis</i>	+	.	.	.	.	.	.	.	.	.	.	.
Species group 2												
<i>Avonia papyracea</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Hermannia spinosa</i>	+	.	.	.	.	.	.	.	.	.	.	.
Species group 3												
<i>Aristida diffusa</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Ptychobolium biflorum</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Peliosotum leucorrhizum</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Limeum</i> sp.	.	.	.	.	.	.	.	.	.	.	.	.
Species group 4												
<i>Barleria lichtensteiniana</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Oropetium capense</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Cynanchum viminalis</i>	+	.	.	.	.	.	.	.	.	.	.	.
Species group 5												
<i>Stipagrostis anomala</i>	.	.	.	.	.	.	.	.	.	.	.	.
Species group 6												
<i>Acanthopsis hoffmannseggiana</i>	+	.	.	.	.	.	.	.	.	.	.	.
Species group 7												
<i>Tetraena rigida</i>	1	.	.	.	.	.	.	.	.	.	.	.
<i>Thesium hystrix</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Euphorbia garipeina</i>	.	.	.	.	.	.	.	.	.	.	.	.
Species group 8												
<i>Tetraena decumbens</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Eragrostis obtusa</i>	.	.	.	.	.	.	.	.	.	.	.	.
Species group 9												
<i>Euphorbia rhombifolia</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Aizoon burchellii</i>	.	.	.	.	.	.	.	.	.	.	.	.
Species group 10												
<i>Fingerhuthia africana</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Plinthus karoocicus</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lacomucinaea lineata</i>	.	.	.	.	.	.	.	.	.	.	.	.
Species group 11												
<i>Aptosimum cf. marlothii</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Aptosimum spinescens</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Enneapogon scaber</i>	1	.	.	.	.	.	.	.	.	.	.	.
<i>Blepharis mitrata</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pentzia calcarea</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Aloe claviflora</i>	a	.	.	.	.	.	.	.	.	.	.	.
<i>Pteronia sordida</i>	+	.	.	.	.	.	.	.	.	.	.	.
Species group 12												
<i>Cullen tomentosum</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Argemone ochroleuca</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Setaria verticillata</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Justicia divaricata</i>	.	.	.	.	.	.	.	.	.	.	.	.
Species group 13												
<i>Cadaba aphylla</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Eragrostis echinochloidea</i>	.	.	.	.	.	.	.	.	.	.	.	.
Species group 14												
<i>Leucosphaera bainesii</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Salsola tuberculata</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Sericocoma avolans</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Aizoon schellenbergii</i>	.	.	.	.	.	.	.	.	.	.	.	.
Species group 15												
<i>Enneapogon desvauxii</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Kleinia longiflora</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Roepera lichtensteiniana</i>	+	.	.	.	.	.	.	.	.	.	.	.
<i>Aptosimum albomarginatum</i>	1	.	.	.	.	.	.	.	.	.	.	.
<i>Barleria rigida</i>	+	.	.	.	.	.	.	.	.	.	.	.
Species group 16												

APPENDIX D

Curriculum vitae: DR NOEL VAN ROOYEN**1. Biographical information**

Surname	Van Rooyen
First names	Noel
ID number	501225 5034 084
Citizenship	South African
Business address	Ekotrust CC 7 St George Street Lionviham 7130 Somerset West South Africa
Mobile	082 882 0886
e-mail	noel@ekotrust.co.za
Current position	Member of Ekotrust cc
Professional registration	Botanical Scientist : Pr.Sci.Nat; Reg no. 401430/83

Academic qualifications include BSc (Agric), BSc (Honours), MSc (1978) and DSc degrees (1984) in Plant Ecology at the University of Pretoria, South Africa. Until 1999 I was Professor in Plant Ecology at the University of Pretoria and at present I am a member of Ekotrust cc.

2. Publications

I am the author/co-author of 123 peer reviewed research publications in national and international scientific journals and was supervisor or co-supervisor of 9 PhD and 33 MSc students. More than 300 projects were undertaken by Ekotrust cc over a period of more than 28 years.

Books

VAN ROOYEN, N. 2001. *Flowering plants of the Kalahari dunes*. Ekotrust CC, Pretoria. (In collaboration with H. Bezuidenhout & E. de Kock).

Author / co-author of various chapters on the Savanna and Grassland Biomes in:

LOW, B. & REBELO, A.R. 1996. *Vegetation types of South Africa, Lesotho and Swaziland*, Department of Environmental Affairs and Tourism, Pretoria.

KNOBEL, J. (Ed.) 1999, 2006. *The Magnificent Natural Heritage of South Africa*. (Chapters on the Kalahari and Lowveld).

VAN DER WALT, P.T. 2010. **Bushveld**. Briza, Pretoria. (Chapter on Sour Bushveld).

Contributed to chapters on vegetation, habitat evaluation and veld management in the book:

BOTHMA, J. du P. & DU TOIT, J.G. (Eds). 2016. **Game Ranch Management**. 5th edition. Van Schaik, Pretoria.

Co-editor of the book:

BOTHMA, J. du P. & VAN ROOYEN, N. (eds). 2005. **Intensive wildlife production in southern Africa**. Van Schaik, Pretoria.

3. Ekotrust CC: Core Services

Ekotrust CC specializes in vegetation surveys, classification and mapping, wildlife management, wildlife production and economic assessments, vegetation ecology, veld condition assessment, carrying capacity, biodiversity assessments, rare species assessments, carbon pool assessments and alien plant management.

4. Examples of projects

Numerous vegetation surveys and vegetation impact assessments for Baseline, Scoping and Environmental Impact Assessments (EIA's) were made both locally and internationally.

Numerous projects have been undertaken in game ranches and conservation areas covering aspects such as vegetation surveys, range condition assessments and wildlife management. Of note is the Kgalagadi Transfrontier Park; iSimangaliso Wetland Park, Ithala Game Reserve, Phinda Private Game Reserve, Mabula Game Reserve, Tswalu Kalahari Desert Reserve, Maremani Nature Reserve and Associate Private Nature Reserve (previously Timbavati, Klaserie & Umbabat Private Game Reserve).

Involvement in various research programmes: vegetation of the northern Kruger National Park, Savanna Ecosystem Project at Nylsvley, Limpopo; Kuiseb River Project (Namibia); Grassland Biome Project; Namaqualand and Kruger Park Rivers Ecosystem research programme.

5. Selected references of projects done by Ekotrust CC

VAN ROOYEN, N., THERON, G.K., BREDEKAMP, G.J., VAN ROOYEN, M.W., DEUTSCHLÄNDER, M. & STEYN, H.M. 1996. *Phytosociology, vegetation dynamics and conservation of the southern Kalahari*. Department of Environmental Affairs & Tourism, Pretoria.

VAN ROOYEN, N. 1999 & 2017. The vegetation types, veld condition and game of Tswalu Kalahari Desert Reserve.

VAN ROOYEN, N. 2000. Vegetation survey and mapping of the Kgalagadi Transfrontier Park. Peace Parks Foundation, Stellenbosch.

VAN ROOYEN, N, VAN ROOYEN, M.W. & GROBLER, A. 2004. Habitat evaluation and stocking rates for wildlife and livestock - PAN TRUST Ranch, Ghanzi, Botswana.

VAN ROOYEN, N. 2004. Vegetation and wildlife of the Greater St Lucia Wetland Park, KZN.

- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2008. Vegetation classification, habitat evaluation and wildlife management of the proposed Royal Big Six Nsubane-Pongola Transfrontier Park, Swaziland. Ekotrust cc.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2011. Habitat evaluation and wildlife management on the Meletse Wildlife Reserve, Limpopo. Ekotrust cc.
- VAN ROOYEN, M.W. & VAN ROOYEN, N. 2013. Carbon in the woody vegetation in the Mayoko area, Republic of Congo. Report to Flora, Fauna & Man Ecological Consultants.
- VAN ROOYEN, M.W. & VAN ROOYEN, N. 2013. Resource assessment of *Elephantorrhiza elephantina* on farms (or portions) of Abbey, Tweed, Concordia and Bellville, Northern Cape. Report to CSIR.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2014. Ecological evaluation and wildlife management on Ndzalama Nature Reserve and adjacent farms, Gravelotte, Limpopo province.
- VAN ROOYEN, M.W. & VAN ROOYEN, N. & VAN DEN BERG, H. 2016. Kathu Bushveld study: Research offset for first development phase of Adams Solor Energy Facility. Project conducted for Department of Environment and Nature Conservation Northern Cape (DENC) and the Department of Agriculture, Forestry and Fisheries (DAFF).
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2016. Ecological evaluation of the farm Springbokoog in the Van Wyksvlei region of Northern Cape, including a habitat assessment for the introduction of black rhinoceros. Ekotrust cc.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2018. Ecological evaluation and wildlife management of the farm Twin Oaks, Limpopo.

6. Selected publications

- VAN ROOYEN, N. 1978. A supplementary list of plant species for the Kruger National Park from the Pafuri area. *Koedoe* 21: 37 - 46.
- VAN ROOYEN, N., THERON, G.K. & GROBBELAAR, N. 1981. A floristic description and structural analysis of the plant communities of the Punda Milia - Pafuri - Wambiya area in the Kruger National Park, Republic of South Africa. 2. The sandveld communities. *Jl S. Afr. Bot.* 47: 405 - 449.
- VAN ROOYEN, N., THERON, G.K. & GROBBELAAR, N. 1986. The vegetation of the Roodeplaat Dam Nature Reserve. 4. Phenology and climate. *S. Afr. J. Bot.* 52: 159 - 166.
- VAN ROOYEN, N. 1989. Phenology and water relations of two savanna tree species. *S. Afr. J. Sci.* 85: 736 - 740.
- VAN ROOYEN, N., BREDENKAMP, G.J. & THERON, G.K. 1991. Kalahari vegetation: Veld condition trends and ecological status of species. *Koedoe* 34: 61 - 72.
- VAN ROOYEN, M.W., GROBBELAAR, N., THERON, G.K. & VAN ROOYEN, N. 1992. The ephemerals of Namaqualand: effect of germination date on development of three species. *J. Arid. Environ.* 22: 51 - 66.
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- STEYN, H.M., VAN ROOYEN, N., VAN ROOYEN, M.W. & THERON, G.K. 1996. The phenology of Namaqualand ephemeral species: the effect of sowing date. *J. Arid Environ.* 32: 407 - 420.
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- DE VILLIERS, A.J., VAN ROOYEN, M.W., THERON, G.K. & VAN ROOYEN, N. 1999. Vegetation diversity of the Brand-se-Baai coastal dune area, West Coast, South Africa: a pre-mining benchmark survey for rehabilitation. *Land Degradation & Development* 10: 207 - 224.
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- VAN ROOYEN, M.W., THERON, G.K., VAN ROOYEN, N., JANKOWITZ, W.J. & MATTHEWS, W.S. 2004. Mysterious circles in the Namib Desert: review of hypotheses on their origin. *Journal of Arid Environments* 57: 467-48.
- STEENKAMP, J.C. VOGEL, A., VAN ROOYEN, N., & VAN ROOYEN, M.W. 2008. Age determination of *Acacia erioloba* trees in the Kalahari. *Journal of Arid Environments* 72: 302 - 313.
- VAN DER MERWE, H., VAN ROOYEN, M.W. & VAN ROOYEN, N. 2008. Vegetation of the Hantam-Tanqua-Roggeveld subregion, South Africa Part 2. Succulent Karoo Biome-related vegetation. *Koedoe* 50: 160-183.
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Curriculum vitae: Gretel van Rooyen

1. Biographical information

Surname	Van Rooyen	Maiden name	Rösch
First names	Margaretha Wilhelmine		
ID number	5004130033084	Citizenship	South African
Home address	7 St George Street Lionviham 7130 Somerset West	Work address	Department of Botany University of Pretoria Pretoria 0002 South Africa
Mobile	072 0253386		
e-mail	gretel@ekotrust.co.za		
Current position	Honorary Professor in Plant Ecology Scientific advisor - Ekotrust		
Academic qualifications	BSc; BSc (Hons), HNOD, MSc (Botany), PhD (Plant ecology)		

2. Publications

I am author / co-author of more than 100 peer reviewed research publications and have presented / co-presented more than 100 posters or papers at international and national conferences. Five PhD-students and 29 Masters students have completed their studies under my supervision / co-supervision. I have co-authored a book as part of a series on the Adaptations of Desert Organisms by Springer Verlag (Van Rheede van Oudtshoorn, K. & Van Rooyen, M.W. 1999. *Dispersal biology of desert plants*. Springer Verlag, Berlin) and two wildflower guides (Van Rooyen, G., Steyn, H. & De Villiers, R. 1999. *Cederberg, Clanwilliam and Biedouw Valley*. Wild Flower Guide of South Africa no 10. Botanical Society of South Africa, Kirstenbosch, and Van der Merwe, H. & Van Rooyen, G. *Wild flowers of the Roggeveld and Tanqua*). I have also contributed to six chapters in the following books: (i) Dean, W.R.J. & Milton, S.J. (Eds) *The Karoo: Ecological patterns and processes*. Cambridge University Press, Cambridge. pp. 107-122; (ii) Knobel, J. (ed.) *The magnificent heritage of South Africa*. Sunbird Publishing, Llandudno. pp. 94-107; (iii) Hoffman, M.T., Schmiedel, U., Jürgens, N. [Eds]: *Biodiversity in southern Africa. Vol. 3: Implications for land use and management*: pp. 109–150, Klaus Hess Publishers, Göttingen & Windhoek; (iv) Schmiedel, U., Jürgens, N. [Eds]: *Biodiversity in southern Africa. Vol. 2: Patterns and processes at regional scale*: pp. 222-232, Klaus Hess Publishers, Göttingen & Windhoek; (v) Stoffberg, H., Hindes, C. & Muller, L. *South African Landscape Architecture: A Compendium and A Reader*. Chapter 10, pp. 129 – 140; and (vi) Stoffberg, H., Hindes, C. & Muller, L. *South African Landscape Architecture: A Compendium and A Reader*. Chapter 11, pp. 141 – 146.

3. Research interests

My primary research interests lie in population biology and vegetation dynamics. The main aim of the research is to gain an understanding of ecosystem dynamics and to use this understanding to develop strategies to conserve, manage, use sustainably or restore ecosystems. Geographically the focus of the studies has been primarily in Namaqualand (Northern Cape Province, South Africa; classified as Succulent Karoo) and the Kalahari although several studies were conducted in Maputaland (Northern KwaZulu-Natal) and Namibia.

4. Projects and selected project references

Over the past 40 years my research has centred around the population biology, vegetation dynamics and classification of the vegetation in the Succulent Karoo (Namaqualand, Tanqua, Hantam, Roggeveld), Kalahari (arid grassland) and Namib Desert in Namibia.

- UYS, N. & VAN ROOYEN, M.W. 2008. The status of *Aloe dichotoma* subsp. *dichotoma* (quiver tree) populations in Goegap Nature Reserve. Report to Northern Cape Nature Conservation.
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- VAN ROOYEN, M.W., VAN ROOYEN, N. & GAUGRIS, J.Y. 2018. Vegetation, plants and habitats of the Dish Mountain Project, Ethiopia. Biodiversity Baseline Report by FLORA FAUNA & MAN, Ecological Services Ltd.
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- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2004. Vegetation of the Langer Heinrich area, Swakopmund, Namibia. Report to SoftChem.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2004. Vegetation of the Power Line Route from Walvisbaai to Langer Heinrich. Namibia. Ekotrust cc, Pretoria.
- VAN ROOYEN, N., VAN ROOYEN, M.W. & GROBLER, A. 2004. Habitat evaluation and stocking rates for livestock and wildlife - PAN TRUST RANCH, Ghanzi, Botswana. Report to People and Nature TRUST, Botswana.
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- VAN ROOYEN, N., VAN DER MERWE, M.W. & VAN ROOYEN, M.W. 2011. The vegetation, veld condition and wildlife of Vaalputs. Report to NECSA.
- VAN ROOYEN, N., VAN ROOYEN, M.W. & VAN DER MERWE, H. 2012. The vegetation of Ratelkraal, Northern Cape. Report to Northern Cape Nature Conservation.
- VAN ROOYEN, N., & VAN ROOYEN, M.W. 2013. Vegetation of the Ongolo and Tumas sites of Reptile Uranium Namibia (RUN), Swakopmund, Namibia. Ekotrust cc, Pretoria.
- VAN ROOYEN, N. & VAN ROOYEN, M.W. 2013. Vegetation Monitoring Report: 2013 Veld condition Vaalputs. Report to NECSA.
- VELDSMAN, S. & VAN ROOYEN, M.W. 2003. An analysis of the vegetation of the Witsand Nature Reserve. Report to Northern Cape Nature Conservation.

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APPENDIX D (IV): AQUATIC **ASSESSMENT**



Aquatic Ecological Assessment Report

**A1 Groblershoop 50 MW PV Solar
Plant Facility, Northern Cape**

Province

May 2022

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Executive Summary

The project applicant, Orange River Solar Facility, proposes to formally develop a vacant portion of land for a 50 MW Photovoltaic (PV) solar power generation facility outside the town of Groblershoop, Northern Cape Province. The proposed development will entail formal construction on approximately 178 ha of vacant land, for the associated solar power generation facility infrastructure.

Environmental Management Group (Pty) Ltd was appointed by the applicant as the independent Environmental Assessment Practitioner (EAP), to conduct the legally required Basic Assessment (BA) process.

Due to the nature of potential ecological impacts posed by the proposed development to the local aquatic ecosystem and ecology, an Aquatic Ecological study is required. This is required in order to determine the potential presence of ecologically/conservationally significant or sensitive aquatic features/habitats, -species or -ecosystems, which may be adversely affected by the proposed development. Any potential aquatic ecological impacts associated with the proposed development, must be identified. Impact mitigation and management measures in accordance with the requirements of the National Environmental Management Act (Act No. 107 of 1998): Mitigation Hierarchy, must subsequently be recommended. This must be done in order to attempt to reduce/alleviate the adverse effects of identified potential aquatic ecological impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist, to conduct the required Aquatic Ecological study for the proposed development. This report constitutes the Aquatic Ecological Assessment.

A site assessment for the proposed development area was conducted on 04 January 2022. This date forms part of the growing season and most plant species present, could therefore be successfully identified.

Assessment Area

The assessment area constitutes a single footprint area of approximately 178 ha in size. The assessment area is situated on Portion 18 of the Farm Rooi Sand No. 387 (SG 21 Digit Code: C0280000000038700018), which is located approximately 4 km north of the town of Groblershoop. The town forms part of the !Kheis Local Municipality which in turn, forms part of the ZF Mgcawu District Municipality, Northern Cape Province. Access to the assessment area is obtained by way of the N-8 national highway and a subsequent dirt road from the east.

Methodology

The proposed development area was assessed on foot and with the use of a vehicle. Visual observations/identifications were made of any significant watercourses/wetlands and/or other ecologically sensitive/conservationally significant aquatic features/habitats and their conditions, as well as relevant species present. Identified species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 as well as the Provincially Protected species of the Northern Cape Nature Conservation Act (Act 9 of 2009). Significant watercourses/wetlands and/or other ecologically sensitive/conservationally significant aquatic features/habitats which were found to be present within the assessment area, were identified, delineated and discussed.

Georeferenced photographs were taken of any significant watercourses/wetlands and/or other ecologically sensitive/conservationally significant aquatic features/habitats, as well as any Red Data Species Listed-, nationally- or provincially protected species if encountered. This was done in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

Potential aquatic ecological impacts of the proposed development on the surrounding environment and the Orange River were identified, evaluated, rated and discussed. The Present Ecological State (PES) as well as the Ecological Importance and Sensitivity (EIS) of the identified watercourses/wetlands and/or aquatic features/habitats were also assessed and discussed.

Results and Conclusion

The assessment area falls within the Lower Orange Water Management Area (WMA 14) and the associated D73D quaternary surface water catchment- and drainage area. The Orange River flows past the assessment area, approximately 600 m to the west and continues in a north-westerly direction. The Orange River is considered a primary national water resource; any potentially significant negative impacts on the ecological functionality and/or -services provided by the river, which could pose a potential threat to national water security, should therefore be avoided as far as practicably/reasonably possible.

A localised linear topographic highpoint/ridge apex is present directly adjacent east of the assessment area, which roughly lies in a north-south direction. This highpoint/ridge apex acts as a natural surface water runoff and drainage linear separation, between the areas east and west of the highpoint/ridge apex, respectively. The assessment area therefore forms part of a small localised catchment- and drainage area, from which all surface water runoff subsequently drains in a westerly direction, towards the Orange River. Surface water drainage towards the east will therefore not be affected/impacted upon by the proposed development.

The assessment area constitutes a single footprint area of approximately 178 ha in size. The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints. The assessment area could therefore likely be prone to significant potential surface soil erosion, due to the sloping and undulating landscape together with the loosening of surface materials and clearance of vegetation caused by construction activities, which usually binds the soil surface. Such soil erosion could potentially lead to gradual continual contamination of the Orange River over time.

It is therefore recommended that vegetation clearance should be minimised as far as practicably/reasonably possible and should only occur within the PV grid-, internal access/services road- and other associated facility infrastructure footprints. Existing vegetation in- between the main physical footprint areas, should not be cleared or damaged and should be left intact and adequately conserved, as far as practicably/reasonably possible. This must be done in order to sufficiently manage and prevent any significant soil erosion from occurring in and around the assessment area, which could potentially lead to contamination of the Orange River over time.

The assessment area falls within a Critical Biodiversity Area two (CBA 2), in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province. From an aquatic perspective, the relevant CBA 2 is mainly associated with the important ecological corridor that runs along the Orange River.

Significant Watercourses

Eight significant first- and second-order ephemeral watercourses traverse the assessment area, which constitute the main surface water flow paths of the small localised catchment- and drainage area towards the west, associated with the assessment area. These watercourses therefore form an important part of the localised surface water catchment and drainage.

The significant watercourses scored a moderate Ecological Importance and Sensitivity (EIS) value and are viewed as being of moderate conversational significance/value for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, Critical Biodiversity Area two (CBA 2) as well as the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.

The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). No conservationally significant or important waterbird species/nests were observed, during the site assessment or are necessarily expected to utilise the assessment area for breeding, foraging and/or persistence purposes. Only common local resident bird species/nests were observed.

Although this is the case, the increased woody densities associated with the watercourses likely provide significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.

It is therefore recommended that the identified eight significant watercourses be adequately buffered out of the proposed development footprint area. A minimum approximately 35 m buffer distance is proposed to be implemented on both sides of all the watercourse edges. No current or future development is allowed to take place within these buffered zones.

It must be noted that ten small artificial earth dam walls have been constructed within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream. **The EAP must determine from the relevant competent authorities whether these dam walls possess the required Environmental Authorisations and Water Use Licenses, in accordance with the relevant/applicable environmental legislation. If this is not the case, it is recommended that the dam walls be completely removed from the watercourses, with immediate effect.**

The flow regimes of the watercourses should also be adequately restored in order to allow for continued flow within the localised catchment. This must be done to assist in maintaining the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.

Small Preferential Water Flow Paths/Drainage Lines

Due to the sloping and undulating landscape of the assessment area, numerous small first-order ephemeral preferential water flow paths/drainage lines also traverse the assessment area, of which three are deemed to be hydrologically significant. These flow paths/drainage lines assist with channelling and discharging surface water runoff through the assessment area, into the significant watercourses associated with the assessment area.

The flow paths/drainage lines scored a moderate to low/marginal Ecological Importance and Sensitivity (EIS) value and merely play an assisting role in the localised catchment and drainage. They are therefore not necessarily viewed as being of high conservational significance, from a hydrological perspective.

Avoidance of development through the flow paths/drainage lines would constitute the first impact mitigation option, in accordance with the requirements of the NEMA (Act No. 107 of 1998): Mitigation Hierarchy. However, as the flow paths/drainage lines merely play an assisting role in the small localised catchment and drainage, it is the opinion of the specialist that avoidance of development through the flow paths/drainage lines is not necessarily required, but is still recommended.

It is therefore recommended that the identified three flow paths/drainage lines be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is proposed to be implemented on both sides of all the flow path/drainage line edges. No current or future development is allowed to take place within these buffered zones.

However, if avoidance of development through the flow paths/drainage lines is not practicably possible/feasible, it is then recommended that sufficient continued stormwater runoff within- and through the assessment area towards the west, must still be ensured and sufficiently managed. An adequate Stormwater and Erosion Management Plan must be implemented during the construction- and operational phases of the proposed development, in order to assist with this and allow for continued flow within the localised catchment.

This must be done to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area. A Water Use License Application (WULA) must also be submitted to the Department of Water and Sanitation (DWS), to request authorisation for the proposed development through the flow paths/drainage lines that traverse the assessment area, in accordance with the National Water Act (Act No. 36 of 1998).

Small Depression Water-Pan

A small isolated depression water-pan is also situated directly adjacent outside the north-western corner boundary of the assessment area. The pan likely provides an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.

Due to the minute size and isolated nature of the small depression pan, it scored a moderate Ecological Importance and Sensitivity (EIS) value and is merely viewed as being of low to moderate conservational significance/value, from an aquatic perspective.

It is however recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.

No other ecologically/conservationally significant or sensitive wetlands, pans or aquatic features/habitats were found to be present within the assessment area. Due to the moderate to steeply sloping topography of the local landscape towards the Orange River to the west, it is also unlikely/improbable that any ecologically/conservationally significant or sensitive wetlands or pans would be present within the approximate 500 m 'zone of influence' surrounding the assessment area to the west.

Conclusion

Transformation of an aquatic Critical Biodiversity Area two (CBA 2), associated with the important ecological corridor that runs along the Orange River as well as continued impeding and contamination of the flow regimes of the watercourses and flow paths/drainage lines, within the associated local and broader quaternary surface water catchment- and drainage area, were identified and addressed as a significant potential long-term aquatic ecological impacts, associated with the construction- and operational phases of the proposed solar development.

These potential long-term aquatic ecological impacts identified for the proposed development, could potentially add moderate cumulative impact to existing negative impacts caused by the extensive presence of existing agricultural developments, along the localised and broader length of the Orange River.

It is however the opinion of the specialist, by application of the NEMA: Mitigation Hierarchy, that all the identified potential aquatic ecological impacts associated with the proposed development, can be suitably reduced and mitigated to within acceptable residual levels, by implementation of the recommended mitigation measures. It is therefore not anticipated that the proposed solar facility will necessarily add any significant residual cumulative aquatic ecological impacts to the surrounding environment or the Orange River, if all recommended mitigation measures as per this ecological report are adequately implemented and managed, for both the construction- and operational phases of the proposed development.

It is the opinion of the specialist from an aquatic ecological and hydrological perspective, that the construction and operation of the proposed 50 MW Photovoltaic (PV) solar power generation facility within the assessment area, should be considered by the competent authority for Environmental Authorisation and approval. All recommended mitigation measures as per this aquatic ecological report must however be adequately implemented and managed for both the construction- and operational phases of the proposed development. All necessary authorisations, permits and licenses must also be obtained prior to the commencement of any construction.

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Abbreviations

BA	Basic Assessment
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture Forestry and Fisheries
DENC	Northern Cape Department of Environment and Nature Conservation
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
MAP	Mean Annual Precipitation
NCPSBP	Northern Cape Provincial Spatial Biodiversity Plan 2016
NEMA	National Environmental Management Act (Act 107 of 1998)
NFA	National Forests Act (Act No. 84 of 1998)
NWA	National Water Act (Act No. 36 of 1998)
PES	Present Ecological State
WULA	Water Use License Application

Declaration of Independence

I, Adriaan Johannes Hendrikus Lamprecht, ID 870727 5043 083, declare that I:

- am the Director and Ecological Specialist of EcoFocus Consulting (Pty) Ltd
- act as an independent specialist consultant in the field of botany and ecology
- am assigned as the Ecological Specialist consultant by the Environmental Assessment Practitioner (EAP), Environmental Management Group (Pty) Ltd, for the proposed development
- do not have or will not have any financial interest in the undertaking of the proposed project activity other than remuneration for work as stipulated in the Purchase Order terms of reference
- confirm that remuneration for my services relating to the proposed development is not linked to approval or rejection of the project by the competent authority
- have no interest in secondary or subsequent developments as a result of the authorisation of the proposed project
- have no and will not engage in any conflicting interests in the undertaking of the activity
- undertake to disclose to the applicant and the competent authority any information that has or may have the potential to influence the decision of the competent authority
- will provide the applicant and competent authority with access to all relevant project information in my possession whether favourable or not

AJH Lamprecht



Signature

1. Introduction

The project applicant, Orange River Solar Facility, proposes to formally develop a vacant portion of land for a 50 MW Photovoltaic (PV) solar power generation facility outside the town of Groblershoop, Northern Cape Province. The proposed development will entail formal construction on approximately 178 ha of vacant land, for the associated solar power generation facility infrastructure.

Environmental Management Group (Pty) Ltd was appointed by the applicant as the independent Environmental Assessment Practitioner (EAP), to conduct the legally required Basic Assessment (BA) process.

Due to the nature of potential ecological impacts posed by the proposed development to the local aquatic ecosystem and ecology, an Aquatic Ecological study is required. This is required in order to determine the potential presence of ecologically/conservationally significant or sensitive aquatic features/habitats, -species or -ecosystems, which may be adversely affected by the proposed development. Any potential aquatic ecological impacts associated with the proposed development, must be identified. Impact mitigation and management measures in accordance with the requirements of the National Environmental Management Act (Act No. 107 of 1998): Mitigation Hierarchy, must subsequently be recommended. This must be done in order to attempt to reduce/alleviate the adverse effects of identified potential aquatic ecological impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist, to conduct the required Aquatic Ecological study for the proposed development. This report constitutes the Aquatic Ecological Assessment.

Preliminary preparations conducted prior to the ecological site assessment, were as follows:

- Georeferenced spatial information was obtained of the proposed development area, in order to determine the direct impact footprint area.
- A desktop study was conducted of the most up-to-date information/data available on the relevant vegetation types, national/provincial aquatic conservation significance status as well as the quaternary surface water catchment- and drainage area, associated with the proposed development area.

2. Date of Ecological Site Assessment

- A site assessment for the proposed development area was conducted on 04 January 2022. This date forms part of the growing season and most plant species present, could therefore be successfully identified.

3. Assessment Rational

South Africa is a country rich in natural resources and splendour and is rated as having some of the highest biodiversity in the world. Other than the pure aesthetic value which our biodiversity and natural resources provides, it also plays a significant positive role in our national economy. While continuous economic development and progress is a key national focus area, which forms a cornerstone in the socio-economic improvement of society and the livelihoods of communities and individuals, the preservation and management of the integrity and sustainability of our natural resources is also essential in achieving this objective.

Socio-economic development and progress can therefore not be completely inhibited for the sake of ensuring environmental conservation, therefore solutions and compromises rather need to be explored in order to achieve the need for socio-economic development without unreasonably jeopardising the needs of environmental conservation. A sustainable and responsible balance needs to be maintained in order to accommodate the requirements of both.

Adequate, sustainable and responsible utilisation and management of our natural resources is crucial. Finding the required balance between socio-economic development and environmental conservation, should therefore always be a priority focus point during any proposed development process.

Various environmental legislation in South Africa makes provision for the protection of our natural resources and the functionality of ecological systems in order to ensure sustainability. Such acts include the National Environmental Management: Biodiversity Act (Act 10 of 2004), National Forests Act (Act 84 of 1998), Conservation of Agricultural Resources Act (Act 43 of 1983), National Water Act (Act 36 of 1998) and framework legislation such as the National Environmental Management Act (Act 10 of 2004).

An Aquatic Ecological Assessment of the proposed development area was therefore conducted in order to identify and quantify any potential aquatic ecological impacts, associated with the proposed development.

4. Assumptions, Uncertainties and Gaps in Knowledge

Various assumptions need to be made during the assessment process, at the hand of the relevant specialist. It is therefore assumed that:

- all relevant project information provided to the ecological specialist by the EAP, was correct and valid at the time that it was provided.
- the proposed development area as provided by the EAP, is correct and will not be significantly deviated from, as this was the only area assessed.
- strategic level investigations undertaken by the applicant prior to the commencement of the Basic Assessment process, determined that the proposed development area represents a potentially suitable and technically acceptable location.
- the public, local communities, relevant organs of state and surrounding landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed development during the Basic Assessment process, through the provision of adequately facilitated public participation interventions and timeframes as stipulated in the NEMA: EIA Regulations, 2014.
- the need and desirability of the proposed development is based on strategic national, provincial and local plans and policies, which reflect the interests of both statutory and public viewpoints.
- the BA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts, associated with the construction and operational phases of the proposed development.
- it is assumed that strategic level decision making by the relevant authorities will be conducted through cooperative governance principles, with the consideration of environmentally sustainable and responsible development principles underpinning all decision making

Given that an BA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the BA process, namely process-related and prediction-related.

- Uncertainty of prediction is critical at the data collection phase as observations, recommendations and conclusions are made, solely based on professional specialist opinion. Final certainty will only be obtained upon actual implementation of the proposed development. Adequate research, specialist experience and expertise should however minimise this uncertainty.
- Uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the BA process. Continual two-way communication and coordination between EAP's and relevant authorities should however decrease the uncertainty of subjective interpretation. The importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant information and impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the objective interpretation of results and limit the occurrence and scale of uncertainty and subjectivity.
- The principle of human nature provides for uncertainties and unpredictability with regards to the socio-economic impacts of the proposed development and the subsequent public reaction/opinion, which will be received during the Public Participation Process (PPP)

Gaps in knowledge can be attributed to:

- This report purely constitutes an Aquatic Ecological Assessment; no terrestrial ecological aspects were therefore assessed or taken into account during any discussions, conclusions and/or recommendations associated with this report.
- The aquatic ecological assessment process was undertaken prior to the availing of certain information, which would only be derived from the final development design and layout. The design layout for the proposed development, had not been finalised yet at the time of the aquatic ecological assessment.
- The potential for future solar developments in the same geographical area, which could lead to further cumulative impacts, cannot be meaningfully anticipated. It is however likely that further similar solar developments and associated transformation could take place within the local or broader area, over time.

- The broader region surrounding the assessment area constitutes a vast, continuous undeveloped natural landscape although extensive existing agricultural developments are present, along the localised and broader length of the Orange River.
- No assessment was conducted of the approximate 500 m 'zone of influence' surrounding the assessment area, as per instruction of the EAP.

EcoFocus Consulting is an independent ecological specialist company. All information and recommendations as per this report are therefore provided in a fair and unbiased/objective manner and are based on qualitative data gathered as well as professional specialist observation and opinion

5. Assessment Area

The assessment area constitutes a single footprint area of approximately 178 ha in size. The assessment area is situated on Portion 18 of the Farm Rooi Sand No. 387 (SG 21 Digit Code: C0280000000038700018), which is located approximately 4 km north of the town of Groblershoop. The town forms part of the !Kheis Local Municipality which in turn, forms part of the ZF Mgcawu District Municipality, Northern Cape Province. Access to the assessment area is obtained by way of the N-8 national highway and a subsequent dirt road from the east.

See locality map below (see A3 sized map in the Appendices).

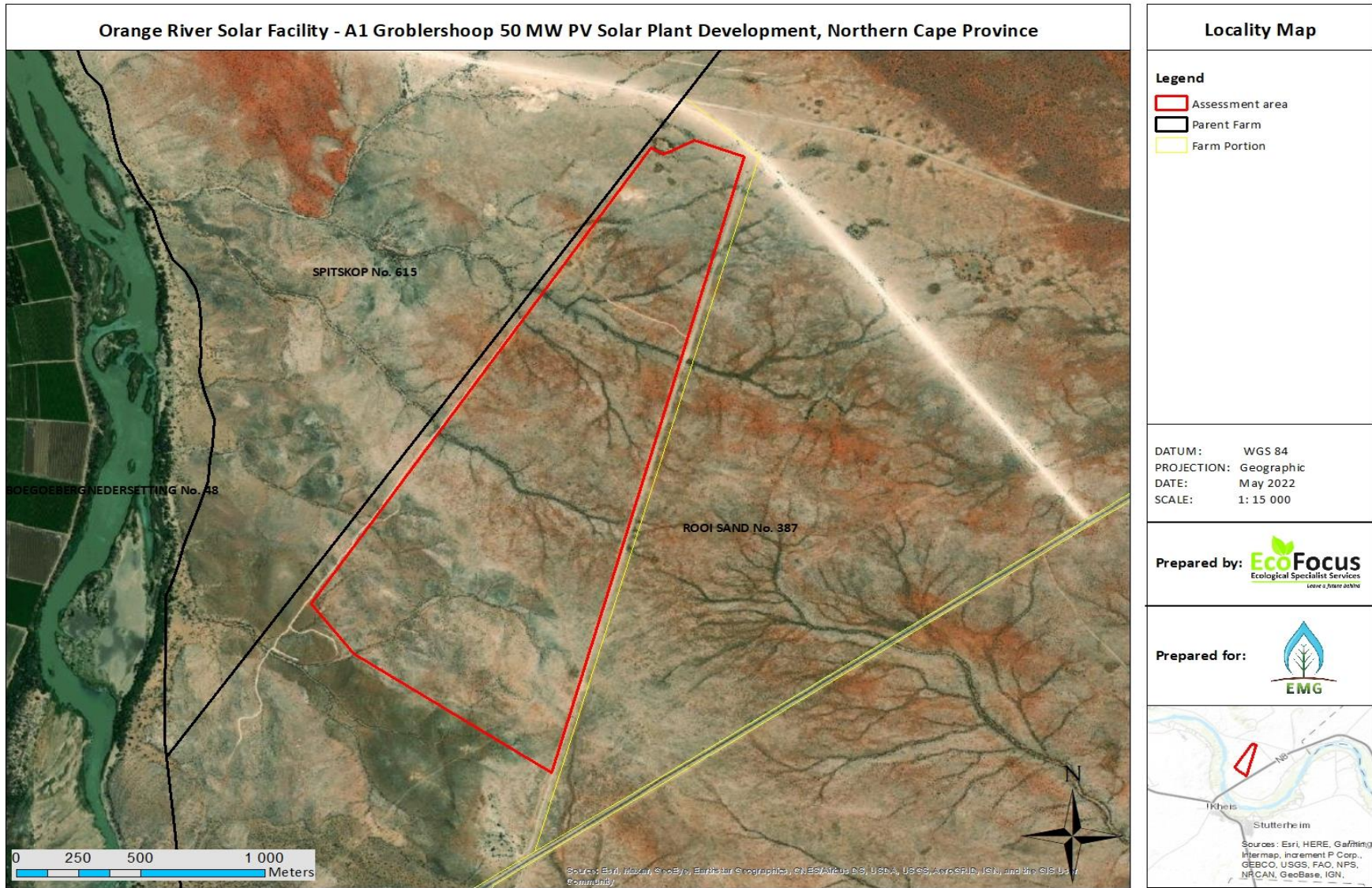


Figure 1: Locality map illustrating the assessment area

5.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 244 mm (www.climate-data.org). The maximum average monthly temperature is approximately 26.9°C in the summer months while the minimum average monthly temperature is approximately 9.8°C during the winter. Maximum daily temperatures can reach up to 34.6°C in the summer months and dip to as low as 1°C during the winter.

5.2. Geology and Soils

According to Mucina & Rutherford (2006) the main geology of the landscape and associated vegetation type can be described as the following:

The assessment area is mainly covered by recent alluvium and calcrete. Superficial deposits of the Kalahari Group are also present. Soils are mostly red-yellow apedal and free-draining, mainly of Ag and Ae land types.

5.3. Vegetation Type and Conservation Status

Vegetation Type

According to SANBI (2006-2019), the entire assessment area falls within the Bushmanland Arid Grassland vegetation type (Nkb 3). This vegetation type mainly consists of extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland and mostly dominated by white grasses such as *Stipagrostis* species. The vegetation type has the characteristics of semi desert (SANBI, 2006-2019). This vegetation type is classified as Least Concerned (SANBI, 2006-2019).

Aquatic Conservation Status

The Northern Cape Province does not possess separate/specific spatial data for terrestrial and aquatic provincial biodiversity conservation statuses/categories. The relevant provincial information is rather combined into a single wholistic provincial biodiversity conservation status/category spatial data set, which sets out biodiversity priority areas in the province. This spatial data set is known as the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP).

The assessment area falls within a Critical Biodiversity Area two (CBA 2), in accordance with the NCPSBP. CBA 2 are areas that have been selected as the best option for meeting biodiversity targets based on complementarity, efficiency and/or avoidance of conflict with other land or resource uses (Collins, 2018). From an aquatic perspective, the relevant CBA 2 is mainly associated with the important ecological corridor that runs along the Orange River, which flows past the assessment area, approximately 600 m to the west.

See vegetation type- and conservation status maps below (see A3 sized maps in the Appendices).

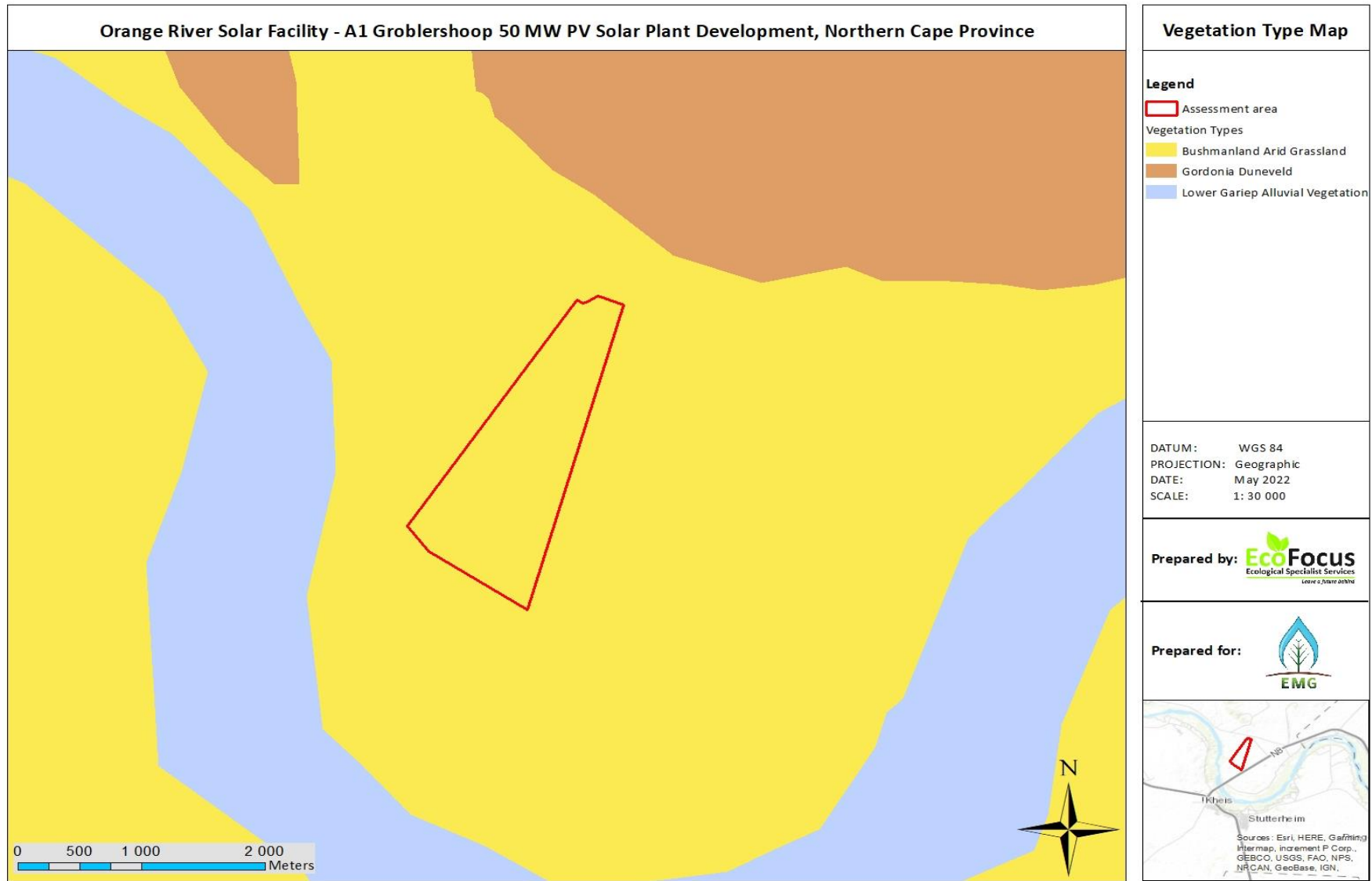


Figure 2: Vegetation type map illustrating the vegetation type associated with the assessment area