5 BIOPHYSICAL BASELINE DESCRIPTION

This chapter provides a description of the current biophysical conditions against which the potential impacts of the proposed renewable energy facility can be assessed and future changes monitored. The chapter presents an overview of the aspects of the baseline conditions of the site and surrounding area which may be directly or indirectly affected by the proposed development.

5.1 PHYSICAL BASELINE

5.1.1 Site Setting

The proposed Richtersveld site is located on the on the sparse plains of the West Coast, 30 km south east of the town of Alexander Bay and 55 km north of the town of Port Nolloth (see *Figure 4.1*) The topography of the area consists of rolling dunes with intervening valleys and plains. There are sparse rocky outcrops on the site and twin hills of Boegoeberg North and Boegoeberg South are prominent features in an otherwise fairly flat landscape. The coastal plains to the west of the site have been mined extensively for alluvial diamonds and the open trenches are now largely abandon with little reclamation or rehabilitation having taken place. The indigenous vegetation of the area includes Northern Richtersveld Yellow Duneveld which occurs on the site and Richtersveld Coastal Duneveld, which occurs along the R382 and adjacent to the site.

There are a few farmsteads located on and near the site and the site can be considered rural and isolated. The site is currently utilised for grazing (sheep and goats), however, it does not appear to be permanently occupied. There is an existing 220kV transmission line that traverses the site.

The proposed site consists of the land parcels Korridor Wes Farm (Witbank (Farm 6/2)) and Korridor Wes Farm (Rooibank (Farm 7/2)) is owned by the Richtersveld Sida Hub Communal Property Association. The access road to the wind farm site passes though Farm Re/1 which is currently owned by Alexkor Ltd.

The Orange River mouth wetlands are located in Alexander Bay on the border of South Africa and Namibia (approximately 30 km northwest of the site). This area is designated as an internationally important wetland site under the Ramsar convention and is also listed as a non-statutory Important Bird Area (IBA) by Birdlife International (IBA ZA023) [(1)]. The Richtersveld National Park (part of the Richtersveld/Ais-Ais Transfrontier Park) is located more than 50 km to the northeast of the proposed wind farm site.

(1) http://www.birdlife.org/

5.1.2 Climate

The Alexander Bay area experiences cool winters and relatively hot and dry summers. The mean annual temperature is approximately 18 °C; the hottest months are December to February (with maximum temperatures of 30 °C in January) and the coldest months being between June and August (with minimum temperatures of 7 °C in July). The mean annual precipitation of parts of the coastal Richtersveld and areas adjoining the Namib Desert is extremely low, approximately 50 – 70 mm, with the majority of the rainfall occurring during the winter months. The rainfall regime of the area is relatively predictable and long droughts are rare. There is a high frequency of coastal fog in the area and extreme wind speeds and sand blasting from the south are common. Frost is rare in the area, occurring on only one day per year on average.

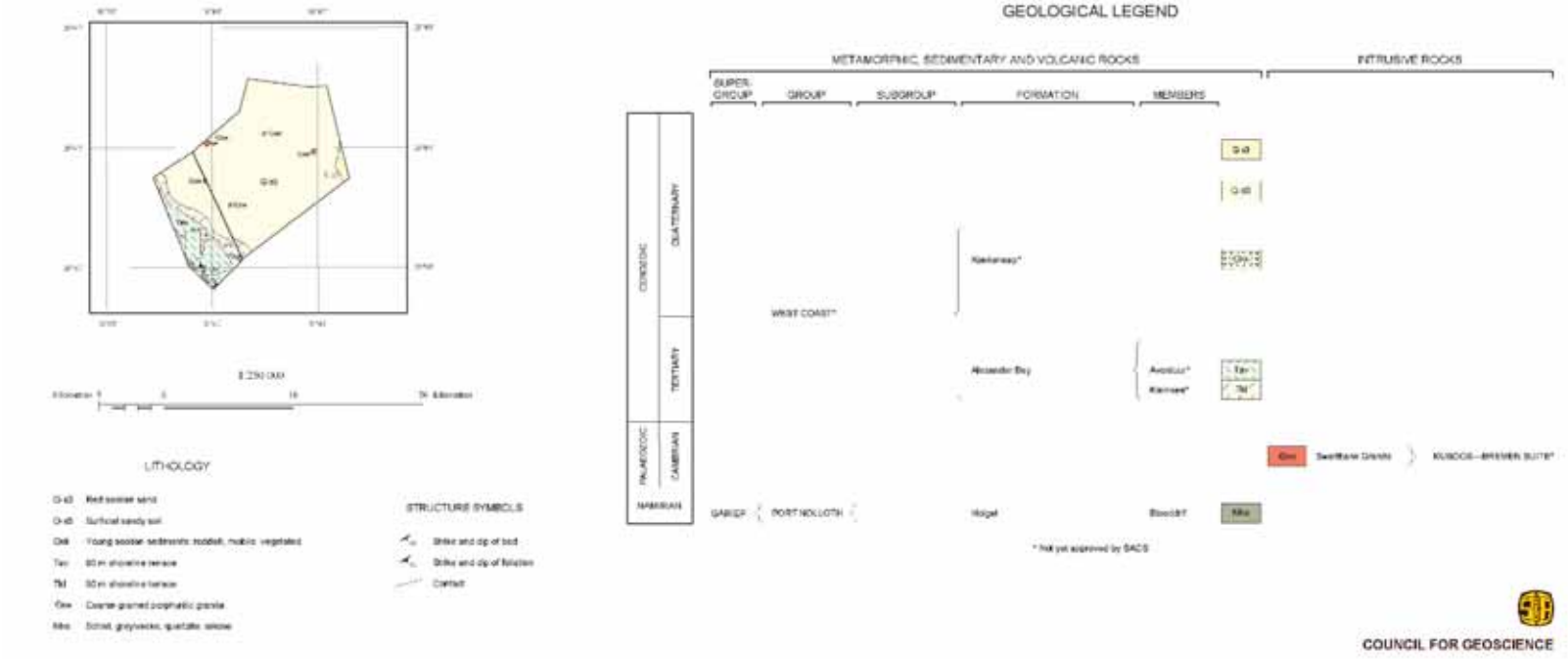
5.1.3 Topography

The site lies at approximately 250 m above sea level. From the Atlantic Ocean (located approximately 10 km to the west of the site) the topography rises up a short escarpment to a broad, open coastal plain, upon which the proposed site for the wind farm is situated. This open plain features broad low ridges which are predominantly orientated west-east. The areas surrounding the site are largely open with only low undulating hills and rises. There are no large hills or mountains in the immediate area and the most prominent feature in the landscape is that of Boegoeberg North and Boegoeberg South (see *Figure 5.6* and *Figure 5.7*). The closest areas of significant high ground are more than 20 km to the east of the site.

5.1.4 Geology and Soils

The site is dominated by sandy soils; rock outcrops, boulders and pavements are absent from the area. The site is underlain by recent and tertiary alluvium deposits of the Sandveld Group [(1);(2)]. This group consists of clay, sand, pebbles and boulders. The Sandveld Group is divided into four formations, namely the Springfontein Formation, the Veldrift Formation, the Langebaan Formation and the Witzand Formation.

(1) Keyser, N. (1997) 1:1 000 000 Geological map of the Republic of South Africa, Council for Geoscience, Pretoria.
(2) Department of Water Affairs and Forestry. (2000) Cape Town 3317, 1:500 000.



SCALE:

Not to scale

N

TITLE:

Figure 5.1: Geology of Richtersveld Site

CLIENT:

Chevron Southern Africa (Pty) Ltd

DATE: OCT 2011	CHECKED: LB	PROJECT: 0134745
DRAWN: AB	APPROVED: SHC	SCALE: Not to scale

DRAWING: Geology Map.mxd

REV: 0

ERM

Source: Geology supplied by Council for Geoscience: Spatial Data Management Unit
Inset: ESRI Data and Maps

SIZE: A4

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5.1.5 Surface Water and Groundwater

The aquifer beneath the site is classified as a major, intergranular aquifer [(1)]. The Sandveld Group is hydrologically divided into four units, namely the Cape Flats unit, the Silwerstroom-Witzand unit, the Grootwater unit and the Berg River unit. The main water bearing strata in this area is an intergranular aquifer made up of undifferentiated coastal deposits giving typical borehole yields between 0.2 and 2.0 l/s. Groundwater quality in the area is thought to be good with electrical conductivities between 30 – 250 mS/m. The Department of Water Affairs and Forestry map [(2)] classifies the regional aquifer as a poor aquifer with least vulnerability (likelihood of contaminants reaching a receptor) and low susceptibility (potential significance of contaminants reaching a receptor).

There are no permanent water bodies or watercourses within the site area and the site access road does not cross any watercourses. The closest major watercourse to the site is the Holgat River, which is located to the southeast and south of the site approximately 10 km from the site at its closest point. Topography maps show three pans to the west of the site (including Rietfonein Pan).

5.2 BIOLOGICAL BASELINE

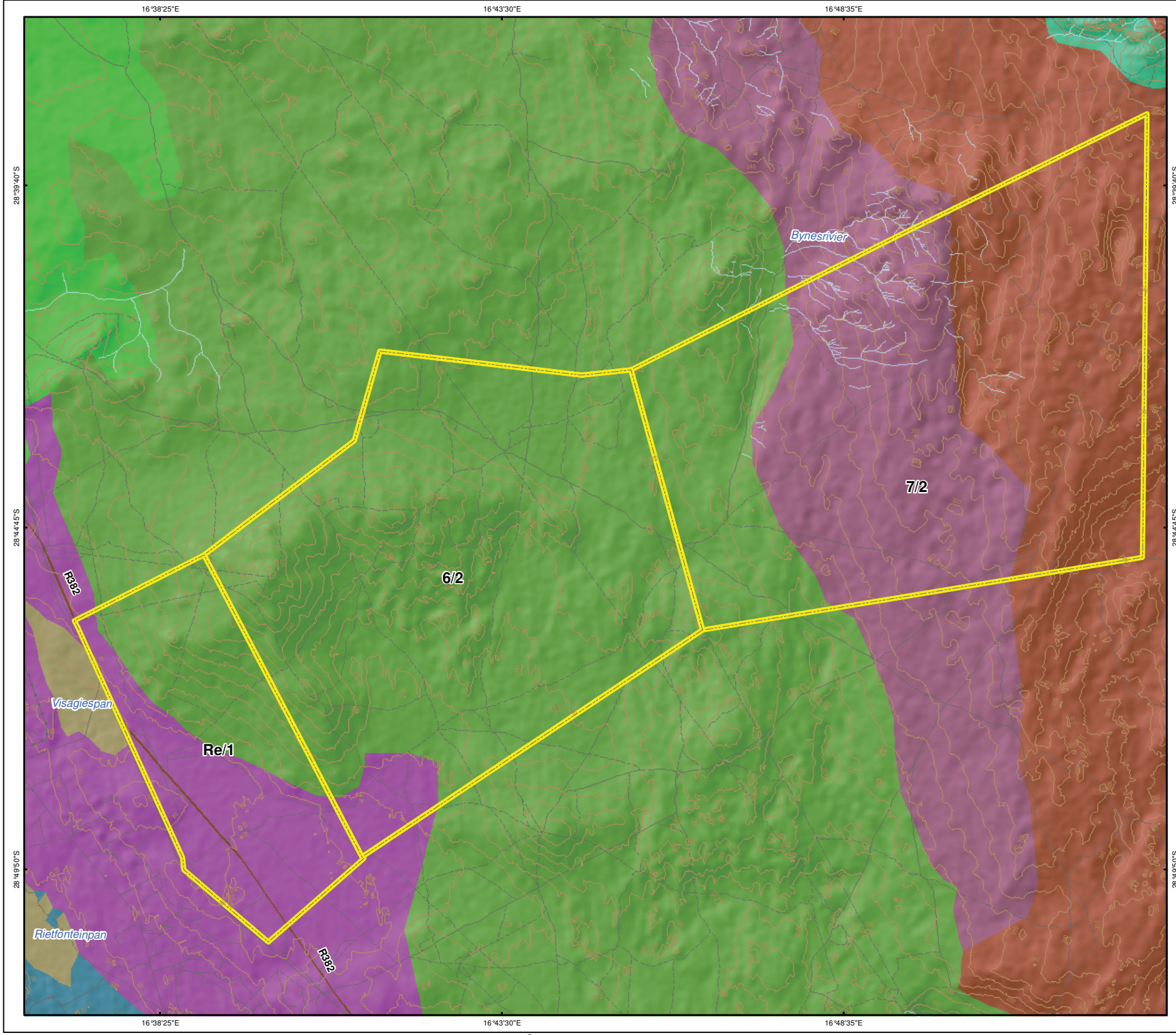
5.2.1 Flora

The site falls within the Succulent Karoo Biome where the soils and climate are the strongest determinants of the distribution of the array of plant species that occur. According to the national classification of the Vegetation of South Africa (Rebelo *et al.* 2006 in Mucina & Rutherford, 2006) the natural vegetation found on the Richtersveld site is Northern Richtersveld Yellow Duneveld, while Richtersveld Coastal Duneveld can be found west of the site, where the access road is located (see *Figure* 5.2). This vegetation type is dominated by succulent shrub species and woody shrubs. Mucina & Rutherford note that this unit is characterized by high beta diversity (species turnover from site to site) as a result of dune structures with large differences between mobile and fixed sand areas. None of this vegetation is currently conserved and a small amount has been transformed for mining.

In terms of the current land use, the site is used exclusively for extensive livestock grazing with sheep and goats. Due to the low rainfall, there is no cropping or intensive agriculture in the area. As the area is a communal rangeland, it is used by a number of pastoralists who herd their livestock during the day and bring them back to a kraal for shelter and protection from predators at night. Each pastoralist makes use of several such sites and moves from one to the other according to the available forage and other needs such as water availability. There are no fences which restrict livestock movement

(1) Meyer P.S. (2001) 1:500 000 General Hydrogeological Map (Cape Town 3317). Department of Water Affairs and Forestry.
(2) Department of Water Affairs and Forestry (1999). Aquifer Classification of South Africa, 1: 3 000 000.

and the rangeland is open access to all pastoralists who have user-rights (these are usually obtained by birth right). Areas close to the livestock posts showed greater evidence of livestock impact while areas that were far from any livestock posts showed little evidence of livestock grazing. In general, from an ecological perspective, the vegetation of the area can be considered to be in a fair to good condition (see *Figure 5.3*).



Legend

- Richtersveld Land Parcel
- Transmission Line
- Secondary Road
- Other Access
- Track/Footpath
- Contours (20m)
- Non-Perennial River

Vegetation Type (Protection Level)

- Namaqualand Salt Pans (Not protected)
- Namib Seashore Vegetation (Not protected)
- Northern Richtersveld Red Duneveld (Not protected)
- Northern Richtersveld Sandveld (Not protected)
- Northern Richtersveld Yellow Duneveld (Not protected)
- Richtersveld Coastal Duneveld (Not protected)
- Richtersveld Western Foothill Shrubland (Not protected)
- Richtersveld White Duneveld (Not protected)
- West Gariep Plains Desert (Not protected)

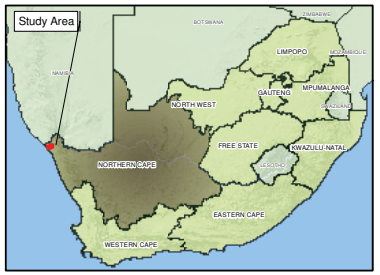


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Figure 5.2: Vegetation Types found in the vicinity of the Richtersveld Site

CLIENT:

G7 renewable ENERGIES

DATE: SEPT 2011	CHECKED: TS	PROJECT: 0134745
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 100 000

DRAWING: Vegetation Types.mxd | REV: 0

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Projection: Geographic, Datum: WGS84
Source: NGI, EnPAT, PPF, SANBI (Veg4 Status)
Inset Map, Esri Data & Maps

SIZE: A3

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Figure 5.3 View of site showing typical vegetation

Although the development area falls entirely within Northern Richtersveld Yellow Duneveld, several different plant communities and habitats are discernable at the site and the vegetation composition of parts of the site resembles that of some of the surrounding vegetation types more closely than Northern Richtersveld Yellow Duneveld. This is related to the presence of rocky outcrops and tall dunes at the site, which do not commonly occur within Northern Richtersveld Yellow Duneveld. Overall, soil depth, texture and sand mobility appear to be the dominant drivers of vegetation composition at the site. Four distinctive habitats with associated plant communities are recognized at the site, these are described in detail below.

Granite Outcrops

The granite outcrop comprises the hill towards the western extent of the site (*Figure 5.4*) where the Telkom communications tower is located. Parts of the lower slopes have been covered by wind-blown sand and the vegetation of these areas resembles the dunes rather than the rest of the hill. A relatively small amount of rock is actually exposed and the majority of this unit comprises the non-mobile soils of the hill itself. The rocky outcrop is considered a sensitive environment due to the novel habitat it contributes and the unique vegetation associated with it. Common species associated with this habitat include succulent and woody shrubs such as *Zygophyllum cordifolium*, *Tylecodon reticulatus*, *Sarcocaulon patersonii*, *Psilocaulon absimile*, *Brownanthus arenosus*, *Othonna cylindrica*, *Mesembryanthemum guerichianum*, *Euphorbia burmannii*, *Salsola tuberculata*, *E.chersina* and *Crassula columella;* the grasses *Schismus barbatus* and *Dregeochloa pumila*. Listed plant species that

were observed within this habitat include *Crassula brevifolia* subsp. *psammophila* and *Crassula plegmatoides*, both of which are listed as Vulnerable.

Figure 5.4 The rocky granite outcrop which occurs north of the communications mast towards the western boundary of the site

Sand Dunes

The sand dunes consist of both tall relatively steep dunes as well as low flat dunes, both types are well vegetated and are not mobile (*Figure 5.5*). The sand dunes comprise a large proportion of the site and the majority of the turbines are located within this habitat type. The vegetation associated with this habitat is generally taller than the other habitat types which can be ascribed to the deep sands associated with the dunes. This habitat type also contained a larger proportion of woody shrubs than the other habitat types. Common and dominant species include *Salvia lanceolata*, *Zygophyllum morgsana*, *Tetragonia fruticosa*, *Cladoraphis cyperoides*, *Othonna cylindrica*, *Stoeberia utilis*, *Cotyledon orbiculata*, *C.paniculata*, *Cephalophyllum ebracteatum*, *Asparagus capensis*, *A.retrofractus*, *Mesembryanthemum barklyi*, *Lycium cinereum*, *Lebeckia sericea*, *Searsia cf marlothii*, *Grielum grandiflorum*, *Didelta carnosa var tomentosa*, *Arctotis cf scullyi*, *Tripteris oppositifolia*, *Aloe arenicola*. This vegetation unit is considered of High Sensitivity as a result of the steep nature of the dunes and the potential for wind erosion in disturbed areas.

Figure 5.5 An example of the dune habitat found on the Richtersveld site

Plains Habitat

The plains habitat Figure 5.6 occurs around the fringes of the site, and a small number (about 10) of the turbines are located within this habitat type. The vegetation composition of this habitat type had several dominant species in common with the granitic areas but also contained several species which distinguished it from the other habitats. There was also some differentiation within this habitat based on the depth and mobility of the sand overlying the calcrete. Common species within this habitat type that were less common or did not occur within other habitat units include *Zygophyllum clavatum*, *Lycium decumbens*, *Lebeckia spinescens*, *Salsola tuberculata*, *Pteronia glabrata*, *Euphorbia ramiglans*, *Brownanthus pseudoschilchtianus*, *Chrysocoma puberula* and *Atriplex vestita*. This appeared to be an important habitat type for fauna due to the stability of the substrate and a number of burrow systems were observed within this unit.

Figure 5.6 ***Example of the plains habitat, looking west towards the coast, where the two Boegoeberg mountains can be seen protruding above horizon***

Coastal Belt

That part of the site which lies to the west of the Telkom tower appears to experience a greater occurrence and ecological expression of coastal fog. Although there were no distinct communities that could be identified, several species indicative of or associated with the coastal belt were observed in this area (*Figure 5.7*). This includes *Fenestraria rhopalophylla* subsp *aurantiaca* as well as *Dregeochloa pumila*, both of which are also highly localized species. The dunes in this area were also observed to be more mobile and there was greater evidence of wind blasting in this area as compared to the rest of the site.

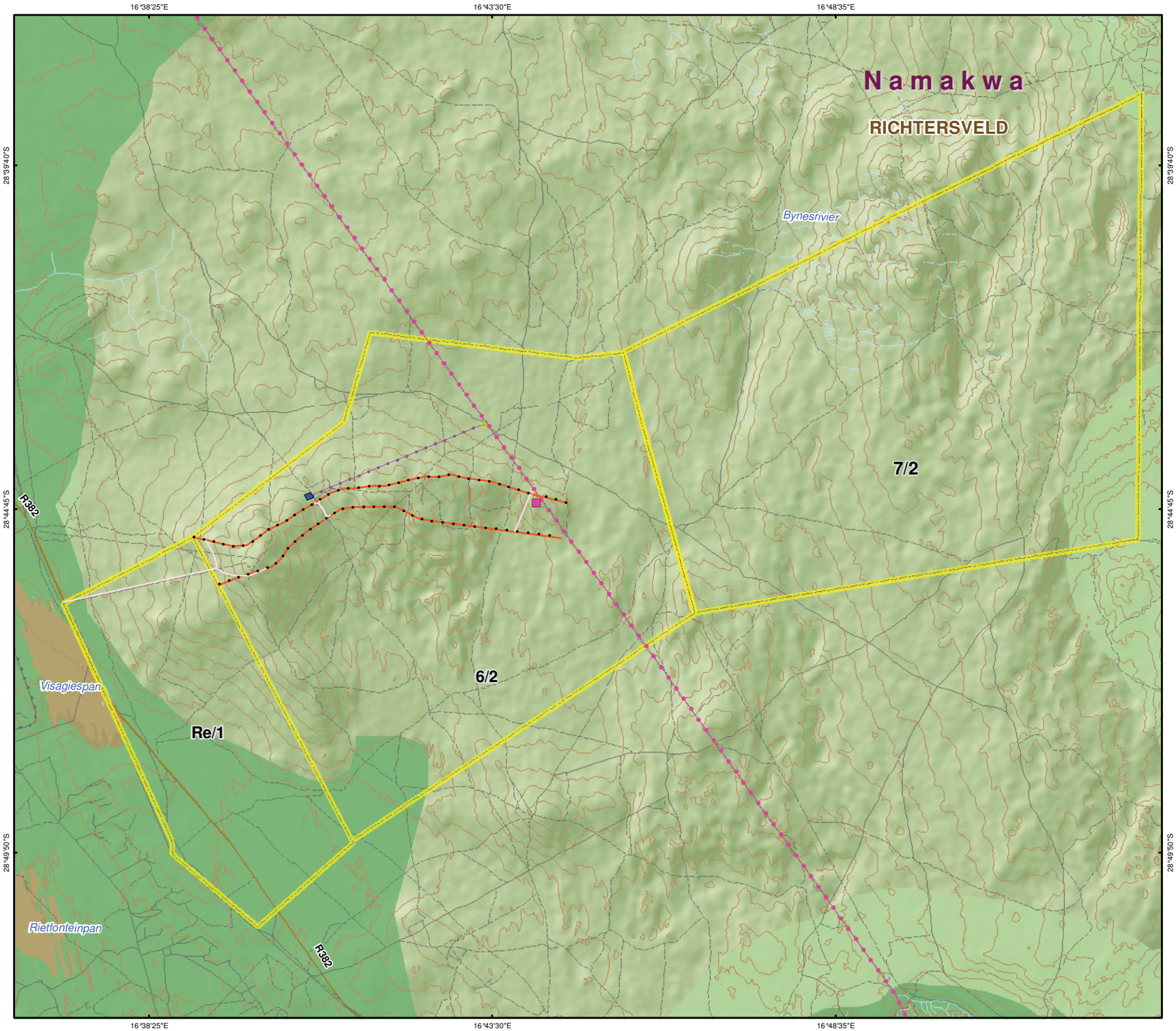
Figure 5.7 ***Looking out from the hill near the telecommunications mast towards the coastline, showing the two Boegoeberg mountains***

Critical Biodiversity Area

Bioregional plans are spatial plans published in terms of the Biodiversity Act. These map Critical Biodiversity Areas based on provincial or fine-scale biodiversity plans. The site lies within the planning domain of the *Namakwa District Biodiversity Sector Plan* (Desment & Marsh 2008). District-wide biodiversity assessments such as this are performed to inform Spatial Development Frameworks (SDFs), Biodiversity Sector plans, Environmental Management Frameworks (EMFs), Strategic Environmental Assessments (SEAs) and the Environmental Impact Assessment (EIA) process. The Biodiversity Assessments identify Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. Once gazetted, and incorporated into municipal SDFs and bioregional plans, such fine-scale plans are recognized under NEMA and the various activities listed under the act come into effect.

The CBA map for the general area surrounding the site is depicted in *Figure* 5.8. The map indicates that the coastal strip and a small portion of the existing access road (500 m) which will be widened falls within a CBA, although the development area itself is not classified as a CBA. It is anticipated that there will be some loss of vegetation adjacent to the existing access road in order to accommodate the widening of the road. However, this is not likely to significantly impact the CBA given that a relatively large road is already present. Provided that the upgrade proceeds sensitively and the appropriate

erosion control structures are put in place, the upgrade will not significantly impact the CBA or the local environment.



Legend

- Richtersveld Land Parcel
- Transmission Line
- Secondary Road
- Other Access
- Track/Footpath
- Contours (20m)
- Non-Perennial River
- Dry Pan
- Linking Station
- Substation Alternative 2
- 220kV Substation
- Existing Transmission Lines (Gromis\Oranjemund 1)
- Substation alternative
- Access Roads
- Wind Turbine Generator
- Internal Roads

Critical Biodiversity Areas

- Ecological Support Area
- CBA T2
- Other Natural Vegetation

SCALE:
0 1 2 3 4 5
Kilometres

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TITLE:

Figure 5.8: Alternative 1 on the Namakwa District Biodiversity Sector Plan CBA Map

CLIENT: G7 renewable ENERGIES

DATE: SEPT 2011	CHECKED: TS	PROJECT: 0134745
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 100 000

DRAWING: CBA Alt1.mxd | REV: 0

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Projection: Geographic, Datum: WGS84
Source: NGI, EnPAT, PPF, CBA - SANBI (BGIS)
Inset Map, Esri Data & Maps

SIZE: A3

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5.2.2 *Mammals, Reptiles and Amphibians*

There were no significant drainage lines visible at the site, which can be ascribed to the extremely low rainfall the area experiences. Run-on areas contained a greater density and stature of the vegetation, but there appeared to be little overall differentiation in species composition. The dunes contained the steepest habitat at the site, but due to the depth of the sand in these areas there is little or no run-off from the dunes. Some erosion was evident around the granitic areas, due largely to the roads and tracks which had captured overland flow and caused some superficial gulley erosion. Those parts of the granitic areas not overlaid with coarse wind-blown sand had hard soils with a very fine texture that were usually capped with a biological crust which may also impede infiltration and increase runoff from these areas. Therefore, apart from the rocky outcrop, there were very few specialized unique and localized habitats at the site that require specific action regarding the potential development of the site.

Approximately 40 mammal species potentially occur at the site (See *Annex E*). Due to the relatively low diversity of habitats available, not all of these are likely to occur at the site. There is a paucity of rocky habitats at the site and larger mammals such as Klipspringer and Rock Hyrax associated with rocky outcrops are not likely to occur at the site. This effect would be less significant for small mammals as they are able to make use of small outcrops such as occur at the site. Larger mammals common or likely to occur at the site include Steenbok *Raphicerus campestris*, Common Duiker *Sylvicapra grimmia*, Jackal *Canis mesomelas*, Caracal *Caracal caracaI,* Porcupine *Hystrix africaeaustralis* and Aardvark *Orycteropus afer*. Due to the mobility and broad habitat tolerances of these species, they are not likely to be highly sensitive to the development of the area.

The site contains a diverse small mammal community and a relatively large number of rodents, shrews, moles and mole rats occur in the area. Common species observed within the site include Brants's Whistling Rat *Parotomys brantsii*, Namaqua Rock Mouse *Micaelamys namaquensis* and the Bush Vlei Rat *Otomys unisulcatus*. Species associated with sandy habitats are likely to occur in the dunes while those which require a firmer substrate are likely to occur in the granitic outcrops as well as on the plains. Several listed species potentially occur in the area, these include Grant's Golden Mole *Eremitalpa granti* which is likely to occur in the dunes of the site and De Winton's Golden Mole *Cryptochloris wintoni* which occurs in sandy areas of the Namaqualand coastal plain and may occur within the western parts of the site. Both of these species are listed as Vulnerable as a result of their scarcity and the impact coastal mining activities have had on their habitat.

As many as 73 reptiles may occur at the site, indicating that the area has a high reptile diversity. The reptile fauna is potentially composed of 4 tortoise species, 24 snakes, 30 lizards and skinks, two chameleons and 13 geckos. This indicates that the area is particularly rich in snakes, lizards and skinks. Common species observed during the site visit include Smith's

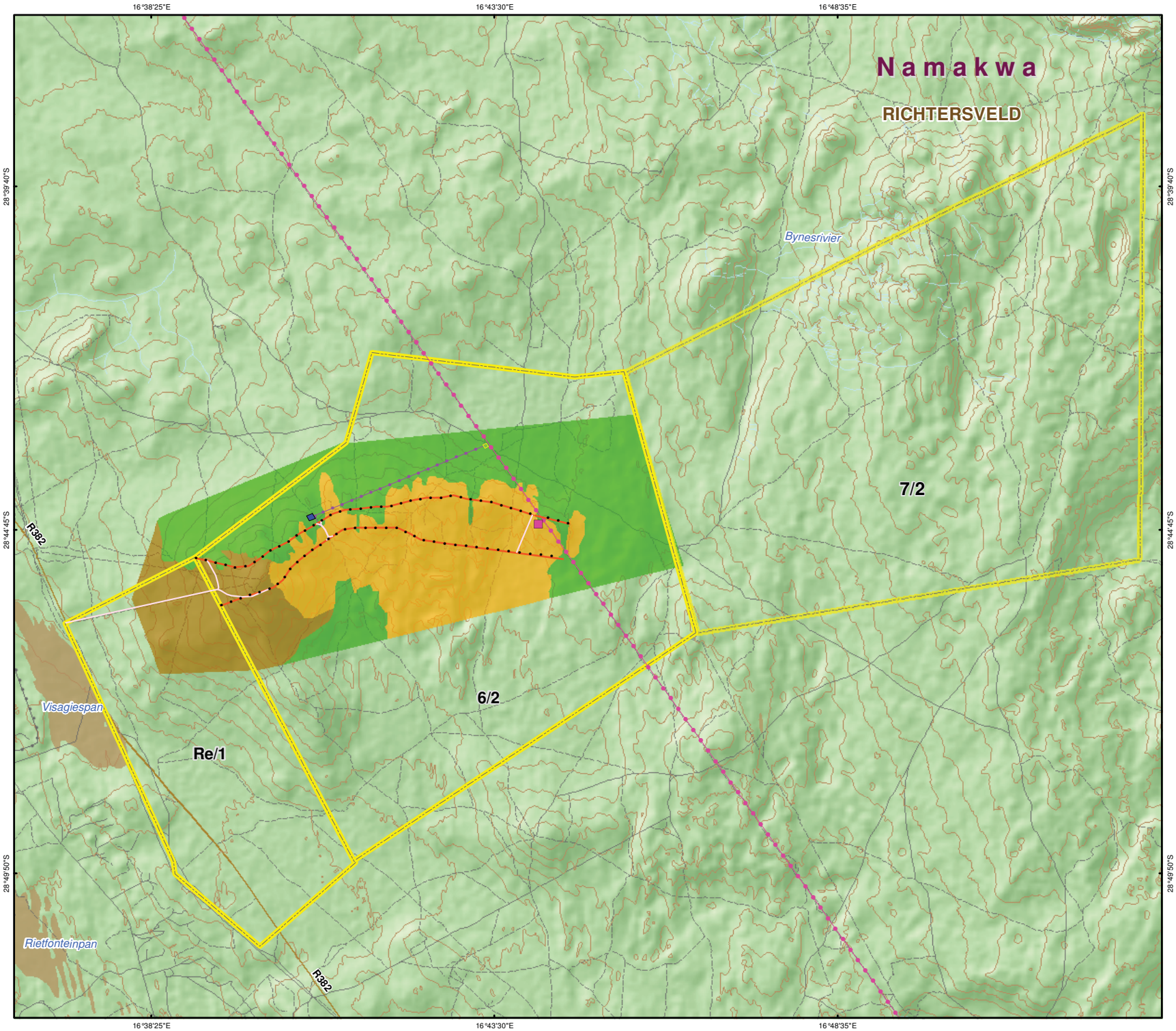
Desert Lizard *Meroles ctenodactylus* (pictured title page), Peers Girdled Lizard, *Cordylus peersi* and the Spotted Desert Lizard *Meroles suborbitalis*.

Eight species of conservation concern may occur in the area (Table 1), all of which are listed as Vulnerable or Near Threatened. Of these, species likely to occur at the site include the Namaqua Dwarf Adder, Lomi's Blind Legless Skink, Namaqua Plated Lizard and the Namaqua Day Gecko. The species associated with dunes or sandy habitats are likely to be most affected by the development, this includes the Namaqua Dwarf Adder and Lomi's Blind Legless Skink. Most of the other species are associated with rocky outcrops or stony hillsides, which are restricted in extent at the site.

Table 5.1 Reptile species of conservation concern which may occur at the G7 Richtersveld Wind Farm

Scientific Name	Common Name	Distribution	Status	Habitat
Homopus signatus	Speckled Padloper	Endemic	Near Threatened	Ridges and stony areas, often on plateaus and ridges
Lamprophis fiskii	Fisk's House Snake	Endemic	Vulnerable	Karroid sandy veld, but few specimens from widely scattered localities
Bitis schneideri	Namaqua Dwarf Adder	Narrow Endemic	Vulnerable	Semi-stable, vegetated coastal dunes
Typhlosaurus lomiae	Lomi's Blind Legless Skink	Endemic	Vulnerable	Sandy soils in succulent veld
Gerrhosaurus typicus	Namaqua Plated Lizard	Endemic	Near Threatened	Karroid succulent veld
Cordylus cataphractus	Armadillo Girdled Lizard	Endemic	Vulnerable	Rock outcrops and mountain ranges
Cordylus lawrenci	Lawrence's Girdled Lizard	Narrow Endemic	Near Threatened	Suculent karroid veld
Phelsuma ocellata	Namaqua Day Gecko	Endemic	Near Threatened	Boulder strewn hillsides and rocky outcrops

The proposed site lies within the known distribution range of seven frog and toad species. However, as a result of the scarcity of fresh water in the area, only three or four are likely to occur at the site. Species such as the Common Platanna *Xenopus laevis*, Namaqua Stream Frog *Strongylopus springbokensis* and to a lesser extent the Namaqua Caco *Cacosternum namaquense* are dependent to a greater or lesser degree on surface water for habitat or breeding purposes. The remaining species are either largely independent of water (*Breviceps* spp) or well adapted to arid conditions (*Vandijkophrynus* spp.). The Desert Rain Frog *Breviceps macrops* occurs in Strandveld vegetation up to 10 km from the coastline and is listed as Vulnerable. Since the site is less than 10 km from the coast and several other indicators of coastal affinity were observed at the site, it is likely that this species occurs along the western boundary of the site, as far east as the communications mast at least. As there are no wetlands at the site, there do not appear to be any specific areas that are important for amphibians. Nevertheless, for those species which require surface water at least for breeding purposes, any areas where standing water may occasionally gather for a few weeks at a time would be important.



Legend

- Richtersveld Land Parcel
- Northern Cape
- Transmission Line
- Secondary Road
- Other Access
- Track/Footpath
- Contours (20m)
- Non-Perennial River
- Dry Pan
- Linking Station
- Substation Alternative 2
- 220kV Substation
- Existing Transmission Lines (Gromis\Oranjemund 1)
- Substation alternative
- Access Roads
- Wind Turbine Generator
- Internal Roads

Ecological Sensitivity

- Very High
- High
- Medium

SCALE:

0 1 2 3 4 5

Kilometres

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TITLE:

Figure 5.9: Alternative 1 on the Ecological Sensitivity Map

CLIENT:

G7 renewable ENERGIES

DATE: SEPT 2011	CHECKED: TS	PROJECT: 0134745
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 100 000

DRAWING: Ecological Sensitivity Alt1.mxd

REV: 0

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Projection: Geographic, Datum: WGS84
Source: NGI, EnPAT, PPF, Natural Scientific Services
Ecology Impact Assesment - Simon Todd
Inset Map, Esri Data & Maps

SIZE: A3

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5.2.3 *Birds*

The Richtersveld site features relatively homogenous, semi-arid habitat, and consequently supports a relatively depauperate avifauna as most of the site features tracts of Northern Richtersveld Yellow Duneveld, (*Figure 5.10*). Around the crest of the hill there is a rocky ridgeline (*Figure 5.11*) which potentially attracts a slightly different community of birds, perhaps supplemented by cliff-dwelling or rock-loving species moving into the area occasionally from the prominent koppies situated some 5 km to the west – Boegoeberg North and South (*Figure 5.7*). The Eskom transmission line provides nesting, roosting and foraging habitat for corvids and various birds of prey.

The study area is situated about 30 km south-east of the Orange River Mouth Wetlands Important Bird Area and Ramsar site (Barnes 1998), which attracts large numbers of wetland birds.

More than 130 bird species could possibly occur on the proposed site (*Annex F*), including up to 13 red-listed species, 51 endemics or near-endemics, and three red-listed endemics (Ludwig's Bustard *Neotis ludwigii*, Black Harrier *Circus maurus* and Barlow's Lark *Calendulauda barlowi* of which at least two – Ludwig's Bustard and Barlow's Lark - might breed either on the site or within the broader impact area of the proposed WEF.

Figure 5.10 Northern Richtersveld Yellow Duneveld on the eastern aspects of the Richtersveld site

Figure 5.11 ***Looking west from the rocky ridge in the centre of the development area towards the coast and the two Boegoeberg koppies***

Avian Species Identified

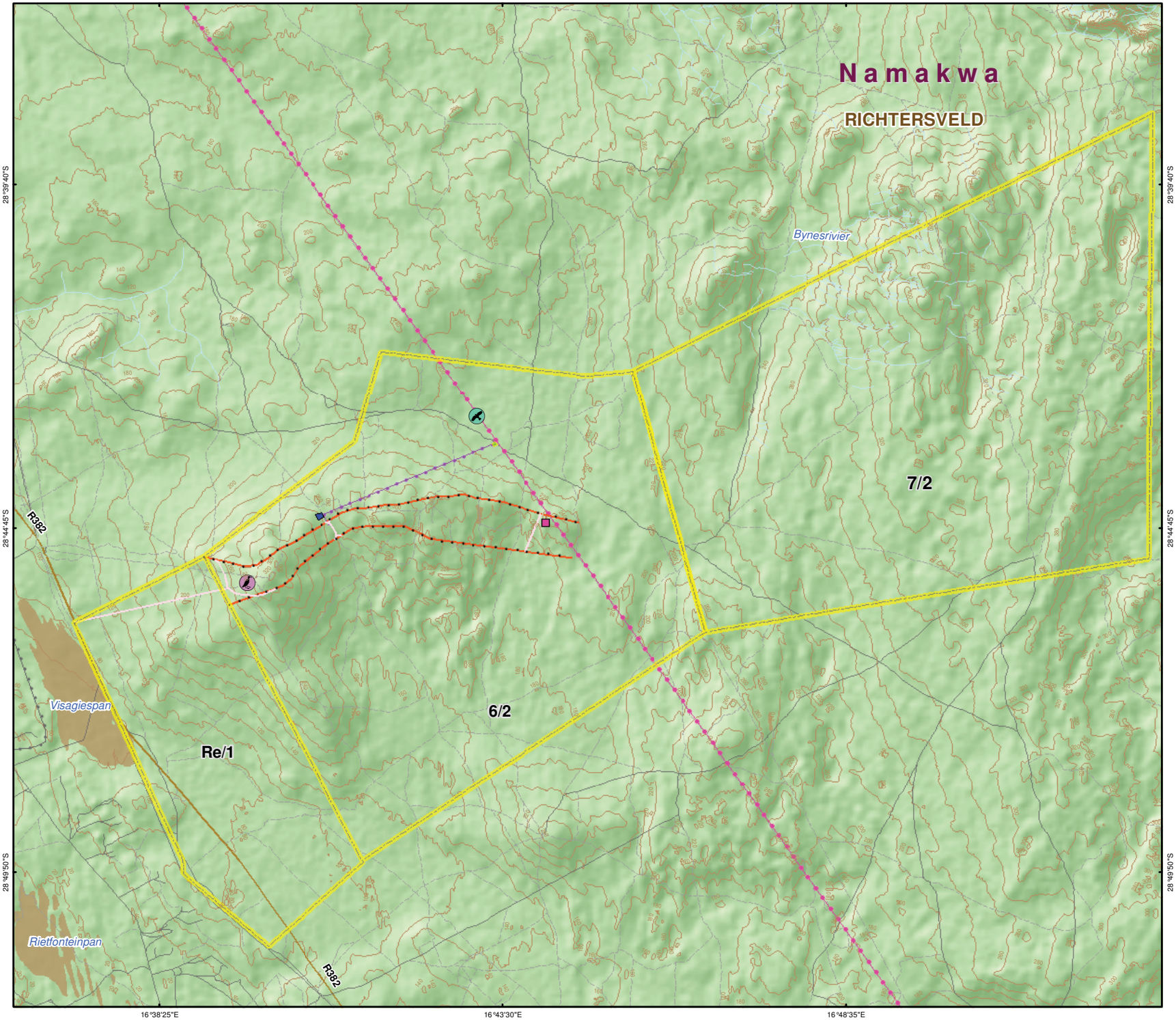
Twenty-seven species were seen during a site visit on 20 and 21 September 2010 (*Annex F*; a SABAP 2 atlas cards was compiled for the pentad 2845_1640). Significant observations included (i) a relatively high density of Barlow's Lark, apparently restricted to the west-facing slopes of the site (*Figure 5.12*), particularly along the main access road leading up to Visagiesfonteinkop (these birds were replaced by the more widespread Karoo Lark *Calendulauda albescens* on the redder sands on the eastern slopes of the site), and (ii) a pair of Lanner Falcons *Falco biarmicus* perched near to an old crow nest on a pylon of the Eskom transmission line (*Figure 5.12*). It was not possible to determine whether or not the Lanners were breeding at this location at the time, but signs under the pylon suggested that they are at least resident on this structure.

If and when the salt pans situated just west of the main road, and between the study site and the sea, are full of water, they are likely to attract numbers of wetland birds, in particular both Greater Flamingo *Phoenicopterus ruber* and Lesser Flamingo *Phoenicopterus minor*. These birds, and possibly also Great White Pelicans Pelecanus onocrotalus, may move into or through the general area in numbers on their way to and from wetland resource areas to the north (Orange River Mouth) and (more distantly) to the south.

The area probably doesn't support significant numbers of larger raptors, although the cliffs of the Boegoeberg koppies could hold breeding Verreaux's Eagle *Aquila verreauxii* and/or Cape Eagle Owl *Bubo capensis*, as well as Booted Eagle *Aquila pennatus*, and the Eskom transmission line probably supports at

least one breeding pair of Martial Eagle *Polemaetus bellicosus* within 10 km north or south of the development site. Issues with access to these areas precluded gaining any further clarity on the status of these birds in the area, and this should be a priority of the pre-construction monitoring programme outlined below. While none were seen in the area during the site visit, in some years under certain conditions (e.g. after good rainfall), there are likely to be significant numbers of the nomadic Ludwig's Bustard in the area (Allan 1994).

Fifteen priority species are recognized as key in the assessment of avian impacts of the proposed Richtersveld WEF (see *Annex F*). These are mostly nationally and/or globally threatened species which are known to occur, or could occur in relatively high numbers in the broader impact area of the development and which are likely to be, or could be, negatively affected by the WEF project. Martial Eagle was included despite the fact that it was not recorded in either SABAP 1 or SABAP 2 data for the area because the habitat on the site looks suitable.



Legend

- Richtersveld Land Parcel
- Northern Cape
- Transmission Line
- Secondary Road
- Other Access
- Track/Footpath
- Contours (20m)
- Dry Pan
- Non-Perennial River
- Linking Station
- Substation Alternative 2
- 220kV Substation
- Substation alternative
- Existing Transmission Lines (Gromis\Oranjemund 1)
- Access Roads
- Wind Turbine Generator
- Internal Roads

Bird Locations

- Barlow's Lark
- Lanner Falcon

SCALE:

0 1 2 3 4 5

Kilometres

N

TITLE:

Figure 5.12: Bird nests located in the vicinity of the Richtersveld site

CLIENT:

G7 renewable ENERGIES

DATE: SEPT 2011	CHECKED: TS	PROJECT: 0134745
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 100 000

DRAWING: Bird nests.mxd | REV: 0

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Tel: +27 (0)11 798 4300
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ERM

Projection: Geographic, Datum: WGS84
Source: NGI, EnPAT, PPF, Brid - Avisense Consulting (Andrew Jenkins)
Inset Map, Esri Data & Maps

SIZE: A3

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Overall, the most important aspects of the avifauna on the Richtersveld WEF site, and those most relevant to this impact assessment, are:

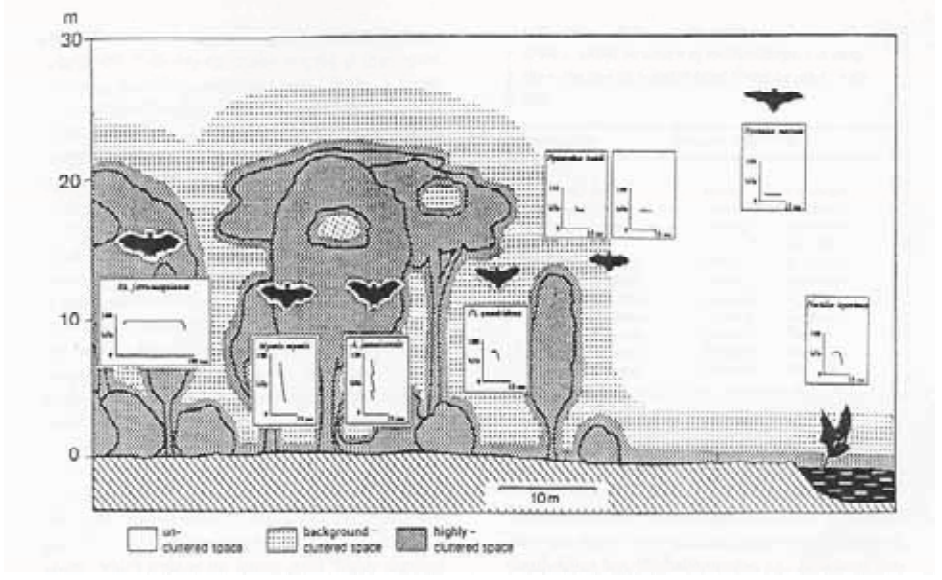
- Habitat occupied by good numbers of Barlow's Lark may be directly affected by the proposed WEF, with disturbance, habitat loss, displacement and possibly even collision impacts on this highly restricted, red-listed endemic.
- Flocks of overflying wetland birds, possibly numbering from 10s to 100s of birds, commuting between resource areas along the coast or associated with the nearby salt pans. Of particular concern here are Greater and Lesser Flamingo and Great White Pelican, all of which are threatened species and known to be collision prone. Collision risk in the flamingo's is exaggerated by the fact that they do most of their distance flying at night.
- Seasonal influxes of large terrestrial birds, especially Ludwig's Bustard and possibly also Kori Bustard *Ardeotis kori*. The former is a nomadic, nationally 'Vulnerable' and globally 'Endangered', near-endemic species, highly susceptible to collision mortality on power lines (Jenkins *et al.* 2009, 2010), and probably susceptible to turbine collision mortality. Numbers of Ludwig's Bustard in the general area of the proposed WEF were very high at the time of the site visit. Movements by this species are triggered by rainfall (Allan 1994), and so are inherently erratic and unpredictable in this semi-arid environment, where the quantity and timing of winter rains are highly variable between years. Hence, it is difficult to anticipate the extent to which Ludwig's Bustard may be exposed to collision risk or the less direct impacts of displacement by the proposed WEF, but should the conditions prevailing in the spring of 2010 be repeated during the life of the facility, there is a good chance that large numbers of this threatened species will be subjected to these effects.
- Resident and breeding raptors, in particular Lanner Falcon (at least one pair resident on the development site), Martial Eagle, Verreaux's Eagle, Booted Eagle and possibly Peregrine Falcon *Falco peregrinus*, Black Harrier (Curtis *et al.* 2004) and Secretarybird *Sagittarius serpentarius*. All of these birds, and especially the large eagles, have extensive foraging ranges, likely to take them from core breeding areas close to the development site well into the turbine arrays. All are threatened or locally scarce species, all are soaring birds to some extent, and all may be susceptible to displacement from prime foraging areas or collision with the turbine blades.

5.2.4 Bats

Bat habitat is usually characterized by the challenges the habitat presents for flight and echolocation in terms of clutter (objects that have to be detected or avoided). The habitat can thus be divided into several dimensions (highly cluttered space –dense vegetation or close to the substrate), background cluttered space (at the edge of vegetation or approximately 1 metre from the

substrate) and open space high above the substrate and vegetation (see *Figure* 5.13).

Figure 5.13 Bat activity in relation to vegetation characteristics



Bat Species Identified

The Richtersveld site is relatively uniform in landscape and habitat features, no specific bat habitat type can be singled out, with the exception of two rock outcrops that are present on the site, but situated far from any proposed turbine localities. Roosting habitat on the site is extremely limited.

Potential roost types that are applicable to the Richtersveld site include:
- Limited rock crevices,
- Burrows and small hollows, and
- Broadcasting tower infrastructure.

No bat activity was recorded on the bat detectors, and no bats were caught in the mist net. Overall, bat sampling was very limited but due to the bad weather and size of the site, as well as the limited time available for sampling, the probability of recording calls suitable for analysis were rare. The fact that bad weather was experienced during sampling in the form of strong winds and thick mist and rain, lessened the chances for success dramatically. Arnett (June, 2005) mentions that bat activity is known to be suppressed by strong winds, low temperatures and rainfall, especially if these factors are combined.

The climate of the area is known for the high frequency of coastal fog, extreme wind speeds and frequent storms. Hence, it is suspected that these conditions will limit bat activity for long periods of the year.

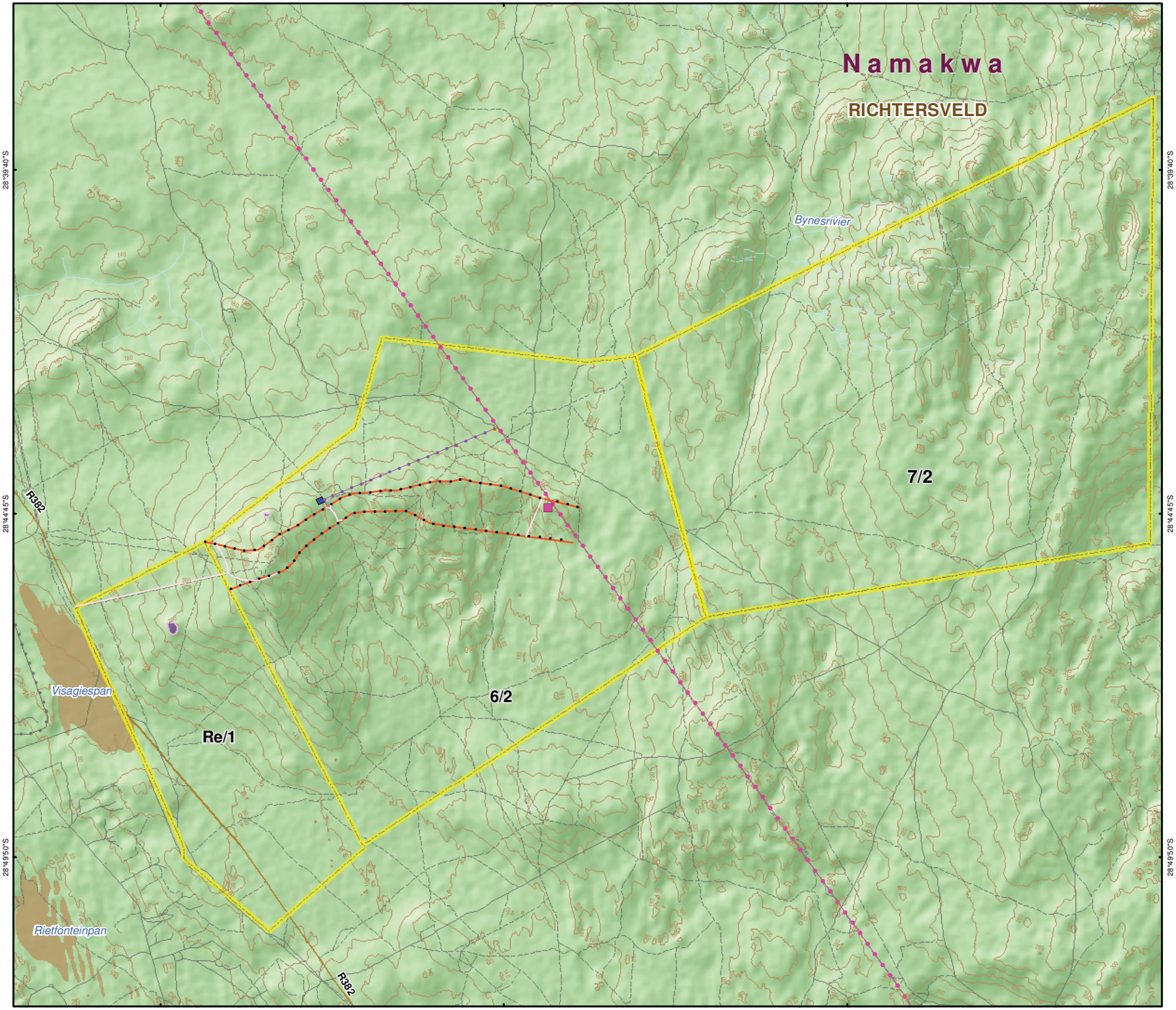
A detailed summary of potential bat species that may occur on the site, their conservation status and required roost types are described below in *Table 5.2.*

Table 5.2 Potential Species That May Occur in the Study Area

Family	Scientific name	Common name	Likelihood of occurrence	Conservation status	Site specific roost type
Nycteridae	*Nycteris thebaica*	Common slit faced bat	High	Least concern	Culverts, hollows, burrows
Hipposideridae	*Hipposideros caffer*	Sundevall's roundleaf bat	High	Least concern	Culverts, hollows, burrows
Rhinolophidae	*Rhinolophus capensis*	Cape horseshoe	Medium	Near threatened	Culverts, hollows
Molossidae	*Sauromys petrophilus*	Robert's flat-headed	Low	Least concern	Cracks in rocks
	Tadarida aegyptiaca	Egyptian free-tailed bat	Medium	Least concern	Rock crevices, tower structure
Vespertilionidae	*Neoromicia capensis*	Cape serotine	Medium	Least concern	Rock crevices, Tower infrastructure
	Eptesicus hottentotus	Long-tailed serotine	Medium	Least concern	Rock crevices, Tower infrastructure

Areas of Bat Conservation Importance

Due to the low availability of bat roosting habitat on the site, no specific areas have been identified as high sensitivity for bat habitat. The two rock outcrops on the site is the only landscape features that can offer significant roosting space for bats, apart from a few possible burrows elsewhere on the site. Due to the regular harsh weather conditions and lack of favourable bat habitat, these rock outcrops have been assigned a moderate sensitivity, with a 50m buffer around them (see *Figure 5.14*). It is very important to note that this map is based on the best scientific knowledge and judgement available at the time.



Legend

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- Substation alternative
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- Access Roads
- Wind Turbine Generator
- Internal Roads

Bat Sensitivity

- Sensitive Areas
- 50m Buffer

SCALE:

0 1 2 3 4 5

Kilometres

N

TITLE:

Figure 5.14: Bat Sensitivity areas on Richtersveld Site

CLIENT:

G7 renewable ENERGIES

DATE: SEPT 2011	CHECKED: TS	PROJECT: 0134745
DRAWN: AB	APPROVED: SHC	SCALE: 1 : 100 000

DRAWING: Bat Sensitivity Map.mxd

REV: 0

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ERM

Projection: Geographic, Datum: WGS84
Source: NGI, EnPAT, PPF, Bat Sensitivity - Natural Scientific Services Ecology Impact Assesment (Susan Abel)
Inset Map, Esri Data & Maps

SIZE: A3

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5.2.5 Protected and Conservation Areas

There are no protected areas located adjacent to the site, or within a 20 km radius of the site and as mentioned above, the site does not lie within a CBA.

The Richtersveld site is situated about 30 km south-east of the Orange River Mouth Wetlands Important Bird Area and Ramsar site (Barnes 1998), which attracts large numbers of wetland birds. The Namabiep Nature Reserve is located over 50 km east of the site and the Richtersveld National Park (part of the Richtersveld/Ais-Ais Transfrontier Park) is located more than 50 km to the northeast of the site (see *Figure 4.1*).