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SPECIALIST SCOPING STUDY OF SITE FOR PROPOSED ESKOM WIND ENERGY FACILITY ON THE CAPE WEST COAST: TERRESTRIAL VEGETATION COMPONENT

Prepared for: Savannah Environmental (Pty) Ltd., Johannesburg

Client: Eskom

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EXECUTIVE SUMMARY

This botanical scoping assessment was requested in order to help inform decisions regarding the placement of a proposed Eskom wind energy facility on the Cape west coast, just north of the Olifants river mouth, on a portion of three properties totalling 3700ha. The study area falls within the Namaqualand coastal region of the Cape Floristic Region, and is used primarily as a sheep grazing area, although there are old strip cultivation areas on about 600ha, which have not been cultivated for at least 12 years. The site visit was conducted in mid July, after good early rains, and thus most plants were identifiable, and seasonality is not regarded as a major constraint on the accuracy of the findings.

Two distinct vegetation types occur in the area, and where they meet a highly complex mosaic of both may be found. Namaqualand Strandveld (Succulent Karoo biome) occupies the coastal parts of the site, is an extremely widespread vegetation type along the west coast, and is regarded as a Least Threatened vegetation type in terms of the NSBA (Rouget et al 2004), with over 90% still intact. At least two Red Data Book listed plant species occur in this area, in low numbers, plus a further undescribed species of unknown status. Namaqualand Sand Fynbos (Fynbos biome) is found in the interior and lower parts of the site on a series of stabilised dunes and interdune slacks. Soils in this area are less alkaline, and about 60% of the species are the same as those found in the Strandveld. This vegetation type is also listed as Least Threatened in the NSBA, with 98% remaining, and a conservation target of 29% (1% currently conserved). At least one Red Data Book listed species was found in this area, in significant numbers, and the habitat is regarded as more sensitive than the Dune Strandveld area from an erosion and regional botanical point of view.

Particular areas of sensitivity occur in the middle of the site, and towards the coast at various points. These include at least two seasonal pans and some more extensive clay areas, with some small rocky outcrops in the south. The pans and rocky outcrops should be excluded from the development footprint, with buffers of at least 50m.

From a botanical point of view the least sensitive area is the previously strip cultivated portion (Low - Medium sensitivity) and is thus where most of the infrastructure (construction camp, operations base, substation) should be concentrated. Most of the Strandveld portions are deemed to be of Medium

botanical sensitivity, with the Sand Fynbos areas, clay areas, seasonal pans and rocky outcrops being of Medium to High sensitivity.

Direct loss of vegetation associated with the construction phase of the proposed development is likely to have no more than a Low – Medium impact on a regional scale, depending on the final extent and position of the actual footprints, and management of the land, and this must be carefully assessed once the alternative layouts are known, and suitable mitigation should then be outlined, along with EMP requirements. Indirect (mainly operational phase) impacts (disruption of ecological processes, etc.) are likely to be fairly insignificant, and can probably be best mitigated by removing livestock (and thus the grazing effects) from the site.

It is strongly recommended that Eskom should remove all livestock from the site, but this will obviously only be possible if Eskom owns the land, and this is thus also a firm recommendation. Removal of grazing pressure will have a beneficial effect on the natural vegetation, particularly in terms of natural rehabilitation, in that flowering and seed set of the remaining natural plants (especially pioneers such as the annuals) will be significantly better in the absence of grazing (which removes the flowers).

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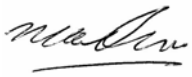
DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence and include an abbreviated Curriculum Vitae.

I, N.A. Helme, do hereby declare that I am financially and otherwise independent of the client and their consultants, and that all opinions expressed in this document are substantially my own.



NA Helme

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Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-western Cape. Since the end of 2001 I have been working on my own and trade as Nick Helme Botanical Surveys.

A selection of previous botanical work on the northern west coast is as follows:

- Scoping and Impact Assessment for proposed new Eskom powerline from Alexander Bay to Vredendal (SEFSA 2006)
- Assessment of proposed Bound for Gold mineral sands exploration program on the west coast south of Brand se Baai (Amathemba Environmental 2006)
- Fine Scale vegetation mapping project in NW Sandveld (CapeNature 2007)
- Vegetation survey of proposed Namakwa Sands heavy mineral sands expansion project at Brand se Baai and Koekenaap MSP (Crowther Campbell 2003)
- Impact Assessment of proposed Namakwa Sands expansion project, Brand se Baai (Golder 2005)
- Scoping and IA on upgrading of Lamberts Bay - Elands Bay road (Marion Thomas 2002; revised in 2004, for EPRMS).

1. INTRODUCTION AND STUDY AREA

This botanical assessment was requested in order to help inform decisions regarding the selection of a site for an Eskom wind energy facility on the Cape west coast, just north of the Olifants river mouth. The facility would comprise of up to 100 turbines, each up to 80m tall, connected by cabling and access roads. There would also need to be a small substation, and a new 132 kv sub-transmission line connecting to the main electricity grid. After an extensive process to identify a suitable site, a single study area ("the site") comprising three farms within the Matzikama Local Municipality has been chosen for more detailed investigation at the scoping and Impact Assessment stage. The three farms together total about 3700ha, and consist of the farms Gravewaterkop 158 Portion 5, Portion 620 of the farm Olifantsrivier Nedersetting, and Portion 617 of the farm Olifantsrivier Nedersetting. The site does not include the actual coastal strip, and is at least 2km from the coast. The total area spanned by the turbine network is anticipated to amount to about 2500ha.

The site is used primarily as a stock grazing area, with sheep being the main livestock, although some cattle are also present on site. Portion 620 of the farm Olifants Rivier Nedersetting seems to have been significantly more heavily grazed than the other areas on site, and the difference can be seen on satellite imagery. An estimated 600ha on farm Gravewaterkop 158 has been previously cultivated in the form of strips, and these strips were planted to winter cereals. However, the strips have not been cultivated for at least twelve years, according to the landowner.

The study area falls within the Namaqualand coastal region of the Cape Floristic Region, and actually includes two biomes – the Fynbos biome, and the Succulent Karoo biome (Mucina & Rutherford 2006). The site also falls within the buffer area of the proposed Knersvlakte Biosphere Reserve, although it is located within a very different ecosystem from the core area of the Biosphere, which is a sparsely vegetated arid area (the Knersvlakte) within the Succulent Karoo biome, and is at least 30km to the east of the core area.

The soil patterns, plus distance from the sea, largely determine the vegetation patterns in the area, which is typical of these coastal vegetation types, as fire is not an ecosystem driver in these arid areas (De Villiers *et al* 2005). Soils are typically deep, brown to orange to yellow sands, and range from fairly alkaline sands in the more coastal areas to neutral and even slightly acidic sands in the

stabilised inland dunes. The soils in the central transitional areas are often loamy sands, with the additional clays coming from underlying clays which are exposed in various places. Exposed rock is rare, but can be found in some of the interdune slacks, with the biggest exposures (each of about six patches covering less than 0.5ha) occurring in the southern parts of the site on farm Portion 620. These rocks appear to be a form of ferricrete, and may form a hardpan layer below the surface. No quartz patches occur on site. The single large seasonal pan is located on a hardpan and clay area at the central low point of the site, and at least two much smaller pans are found elsewhere on site (see Figure 2).

The site was visited on 15-16 July 2007.

2. LIMITATIONS AND ASSUMPTIONS

The site visit was conducted at an appropriate time of the year (late winter/early spring) from a plant seasonality point of view. Due to good early rains many (but not all) plants were identifiable, including the bulbs and annuals. Due to limitations imposed by the lack of flowering specimens of some species, and the difficulty of getting accurate names for certain taxa (such as the vygies, especially *Ruschia* and *Drosanthemum* species, where taxonomic problems are legion) the species based approach was also supplemented by a habitat-based approach, in which habitat type, quality, and rarity were used as surrogates for conservation value. This knowledge of important habitats in the area has been gained from previous experience in the region. Given the very large study site, and the difficulty of accessing certain areas (especially in the south, on Portion 620) it is possible that some important species or even small habitats were missed. Even in a 30ha site it is acknowledged to be impossible or at least very unlikely to record more than 75-80% of the plant species present at any one time, for the simple reason that many species flower at different times of the year (and some years not at all), and are often not identifiable when not flowering. Nevertheless, it is believed that a sufficiently accurate picture of the distribution and conservation value of the habitats on site has been obtained for the current purposes, and a confidence level of at least 80% is attached to the findings.

It should also be noted that mapping the extent of habitats and thus producing a sensitivity map of a site this large, and with numerous very subtle ecotones (transitions) and habitat mosaics, is not a particularly accurate undertaking, and thus the lines in the maps produced may be out by anything up to 30%.

Furthermore the situation is complicated by property differences associated with grazing intensity, which alters the spectral characteristics of the satellite image used to map the site. A further site visit at the IA stage would obviously help increase the accuracy of the findings to a certain degree, but this may be too late in the flowering season to be really useful, and it is not recommended that a further site visit be conducted unless the final layout indicates that infrastructure will be placed primarily within the higher sensitivity areas.

No exact facility, road, or powerline positions were provided for assessment prior to the survey and this must thus be regarded as a broad brush baseline assessment of the general area, rather than a detailed, focussed survey of exact footprints. The assessment of exact footprint impacts will be undertaken at the IA stage.

3. TERMS OF REFERENCE

Terms of reference (TOR) were the standard TOR as proposed by CapeNature, and DEA&DP's guidelines for biodiversity assessment (Brownlie 2005) were also adhered to. The CapeNature TOR are as follows:

- Describe the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.
- In terms of biodiversity pattern, identify or describe:

Community and ecosystem level

a. The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;

b. The types of plant communities that occur in the vicinity of the site.

c. Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment).*

Species level

a. Red Data Book (RDB) species (indicate position on map if possible).

b. The viability of and estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)

c. The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Other pattern issues

a. Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.

b. The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).

c. The condition of the site in terms of current or previous land uses.

- In terms of **biodiversity process**, identify or describe:

a. The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.

b. Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)

c. Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.

- What is the significance of the potential impact of the proposed project – with and without mitigation – on biodiversity pattern and process at the site, at local and regional scales?
- Recommend actions that should be taken to prevent or mitigate impacts. Indicate how these should be scheduled to ensure long-term protection, management and restoration of affected ecosystems and biodiversity (Most of this is relevant to the Impact Assessment phase).
- Indicate limitations and assumptions, particularly in relation to seasonality.

The scoping report includes:

» A description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility.
» A description and evaluation of environmental issues and potential impacts (including direct, indirect and cumulative impacts) that have been identified.
» Direct, indirect and cumulative impacts of the identified issues must be evaluated within the Scoping Report in terms of the following criteria:

- the *nature*, which shall include a description of what causes the effect, what will be affected and how it will be affected;
- the *extent*, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international.

» A statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts.

» 'Red Flag' any sensitive or no-go areas within the broader study area which could influence the siting of turbines or other associated infrastructure.

» Identification of potentially significant impacts to be assessed within the EIA phase and details of the methodology to be adopted in assessing these impacts. This should be of sufficient detail to include within the Plan of Study for EIA, and must include a description of the proposed method of assessing the potential environmental impacts associated with the facility.

» The associated infrastructure (including the substation site, access road and distribution line alignment) will be assessed in the EIA phase. Identify any issues which could potentially affect the siting of these, and list/discuss where necessary.

3. METHODOLOGY

The site was visited over two days in July 2007. Large parts of the site were driven, using the sandy farm tracks and the main dirt road to Skaapvlei, and habitat types and any special species were recorded. Vegetation types used are as defined in the new SA vegetation map (Mucina & Rutherford 2006). The study approach was partly informed by the guidelines prepared by Brownlie (2005).

Reference was made to extensive, detailed work done in similar habitat on the Namakwa Sands property some 20km further north (Helme & Desmet 2003), plus previous spring visits to the general area.

The study area falls just outside the Sandveld Fine Scale Vegetation Mapping Project (FSP) area recently conducted for CapeNature (Helme 2007), but both vegetation types in the study area were also present in the FSP area and I was thus able to gain valuable experience of these habitats just to the south of the Olifants river. For records of rare plants in the area I was able to access the GIS based information on the Cape Rares database (Spatial layer of rare and threatened plant localities managed by the Threatened Species Programme of

SANBI (January 2007)), but not surprisingly there are no records from the exact area.

4. VEGETATION ASSESSMENT

4.1 Regional context

There are two main vegetation types present on the site - Namaqualand Strandveld and Namaqualand Sand Fynbos (Mucina & Rutherford 2006; see Figures 1 and 2). The point where they meet is not at all clear cut in most cases (as is often the case with vegetation patterns), and they usually create a wide ecotonal (transitional) mosaic where they come together, and this has been depicted in Figure 2. This ecotonal mosaic is in effect a third, nameless vegetation type.

Namaqualand Strandveld is an extremely widespread vegetation type, especially in the context of the Cape Floristic Region, of which it is a part. This vegetation type extends from the Doringbaai area, some 20km south of the Olifants river mouth, up the west coast for about 300km, to the Hondeklipbaai area, and is thus formally part of the Succulent Karoo biome. The vegetation type typically occurs in a band from 1 to 30km inland, on deep sands, which are often grey, red, brown or orange.

Namaqualand Strandveld is regarded as Least Threatened vegetation type in terms of the National Spatial Biodiversity Assessment (NSBA; Rouget et al 2004), with 92% of its original extent still intact. Although large areas of Namaqualand Strandveld (358 000ha; Rouget et al 2004) remain on the west coast, where it is used primarily for small stock grazing, it should be remembered that the NSBA is based on 1996 data, and is thus now 11 years out of date, with significant subsequent habitat losses having occurred in various mining areas, notably in the Namakwa Sands mining area (up to 40 000ha; pers.obs.). Furthermore, Namaqualand Strandveld is significantly underconserved in formal conservation areas, with less than 1% of the national target of 26% under some sort of conservation management, and it is thus vulnerable to future transformation.

A portion of this vegetation type will be protected within the proposed expansion of the Namaqua National Park in the area between the Groen and the Spoeg rivers. Agriculture typically occurs on the edges of this vegetation type where there is more clay in the soil, as is the case on this site.

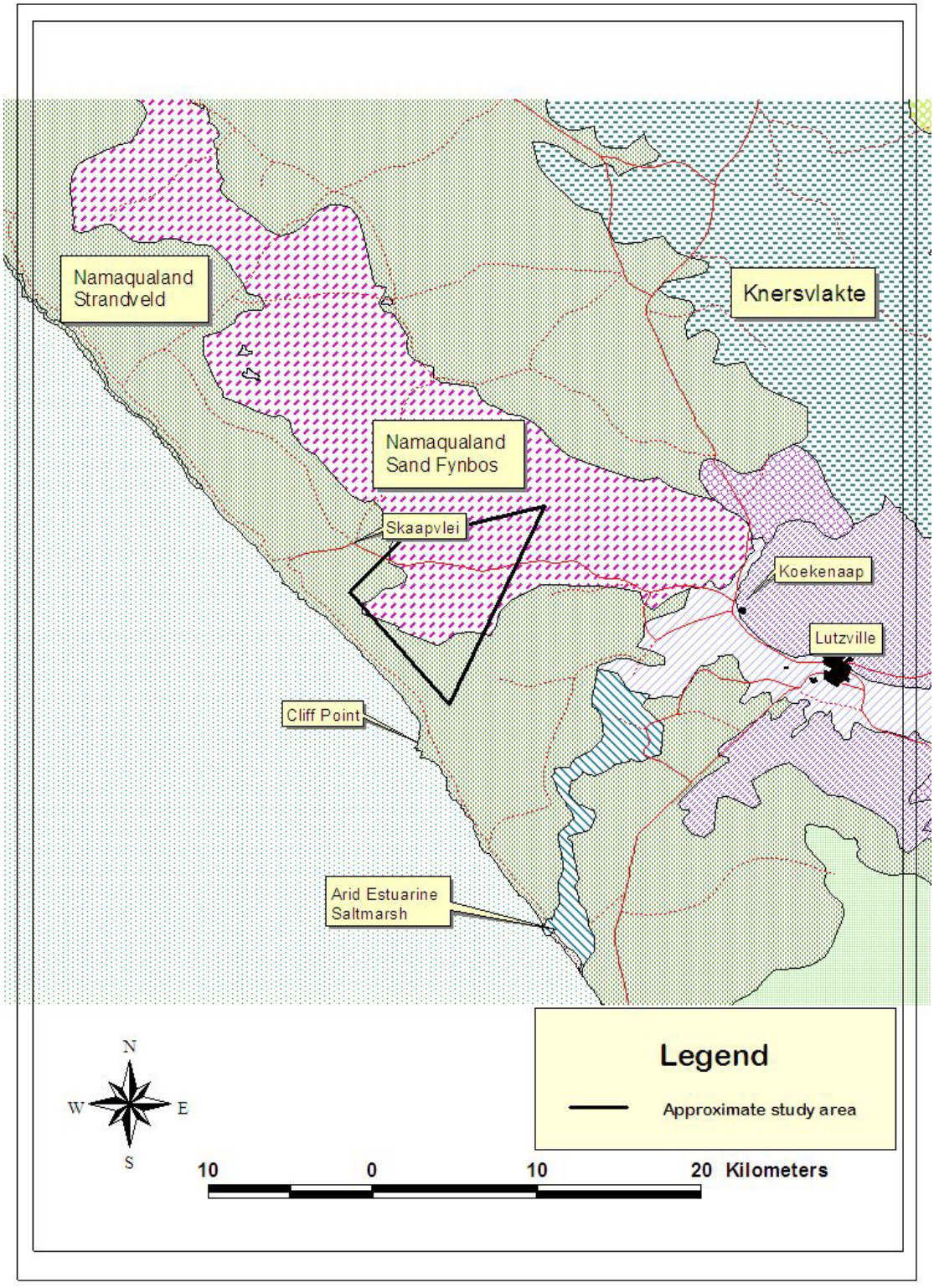

Figure 1: Extract from SA Vegetation map (Mucina & Rutherford 2006) showing that Namaqualand Strandveld and Namaqualand Sand Fynbos cover the site, and the bulk of the adjacent areas.

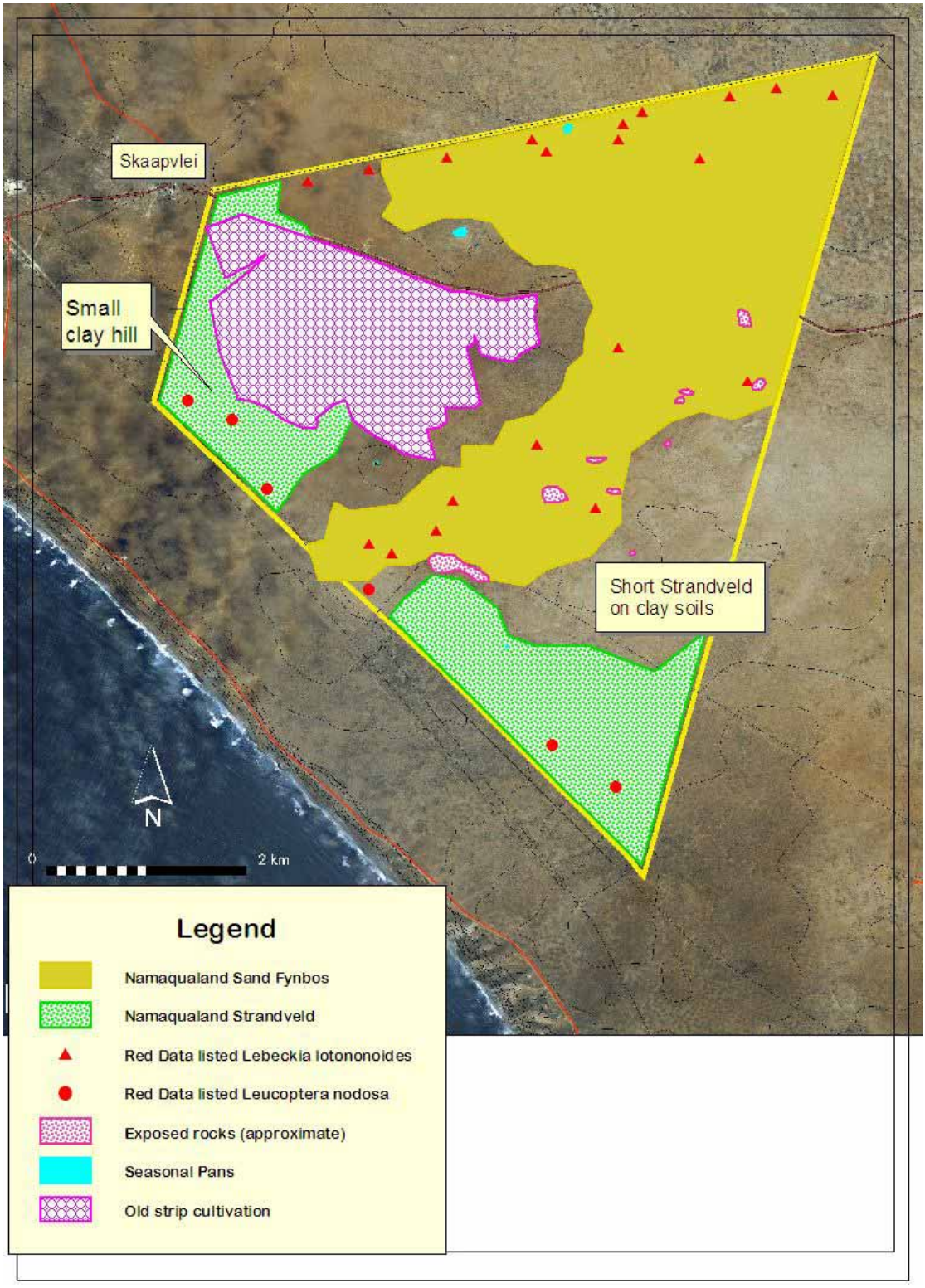

Figure 2: Satellite image of Site, showing key ecological and botanical features mentioned. All unhatched areas within site are transitional mosaic areas with a mix of both Namaqualand Strandveld and Sand Fynbos, and the eastern portion has a high proportion of Short Strandveld on clay sands. Red Data Book species locations approximate only.

There is significant variation within Namaqualand Strandveld in any one area (perhaps enough to separate them as distinct vegetation types with further work), and it is possible to recognise a number of different forms or subtypes (plant communities), some of which are present in the study area and will be described below.

The Namaqualand Sand Fynbos on site is part of a much more extensive belt that can be seen in Figure 1, extending some 10km to the east, 15km southeast to the Doringbaai area (Helme 2007), and far (over 200km) to the north. The vegetation type tends to occur on neutral to slightly acidic sands that are lighter in colour than Strandveld sands, and with a lower clay fraction. The unit is also listed as a Least Threatened vegetation type by the NSBA, but it is equally poorly conserved, with only 1% of its 29% (of original extent) target formally conserved (Rouget *et al* 2004). This is one of the few vegetation types within Namaqualand that is formally regarded as part of the Fynbos biome, and it is also very unusual in that it appears to be the only Fynbos vegetation type that regenerates in the absence of fire (Mucina & Rutherford 2006; pers. obs.). Fires in such arid areas are extremely rare, and most landowners cannot remember their Fynbos areas ever having burnt.

The primary threats to Namaqualand Sand Fynbos are climate change and mining for heavy mineral sands. The Brand se Baai mining operations about 40km north of this site have already totally destroyed the north - south linkages of this vegetation type in that area (complete loss of vegetation cover and ecological connectivity within the Sand Fynbos), and mining now extends almost 10km inland (pers. obs.), with no sign of mining slowing down. Climate change is a serious threat throughout Namaqualand, and many patches of Sand Fynbos have suffered severe drought related mortality in the last ten years (pers. obs.), and it is predicted that this is one of the vegetation types most likely to be totally altered by climate change.

4.2 Namaqualand Strandveld

Typical features of true Namaqualand Strandveld (see Plate 1) include a high percentage of succulents and leaf deciduous shrubs, moderate bulb diversity, and no Fynbos elements such as Ericaceae (heaths) and Proteaceae (proteas), with few Restionaceae (Cape reeds). Rare, range restricted and/or threatened plant species are also usually not a major feature of this vegetation type. Perennial plant cover ranges from fairly low (30%) to fairly high (70%), and average height

from 0.4 m to 1.2 m. Alien invasive vegetation is not normally a significant feature, and none was seen in this unit on site. Most of the Strandveld on site is tall (0.6-1.2m), but in areas where clay soils are present a much shorter and sparser type of Strandveld is found, more similar to Hardeveld (Heuweltjieveld).

Plate 1: View of typical tall Namaqualand Strandveld, showing dominant succulent perennials.

Typical indigenous species include *Zygophyllum morgsana* (skilpadbos; slaaibos), *Othonna cylindrica* (ossierapuisbos), *Tetragonia fruticosa* (klimopkinkelbossie), *Othonna coronopifolia, Tripteris oppositifolia, Lycium cinereum* (muisbos), *Salvia africana-lutea* (bruinstrandsalie), *Berkheya fruticosa*, *Lebeckia sericea* (fluitjiesbos), *Ruschia floribunda, Lampranthus watermeyeri, Euphorbia caputmedusae* (volstruisnek), *E. rhombophyllum, E. burmannii* (steenbokmelkbos), *Chrysanthemoides incana* (grysbietou), *Mesembryanthemum crystallinum* (soutslaai), *Hermannia scordifolia, H. trifurca* (poprosie), *Hermannia* sp. nov., *Thesidium spinosum, Nenax arenicola, Exomis microphylla, Willdenowia incurvata* (sonkwasriet), *Senecio bulbinifolius, Vanzijlia annulata, Cephalophyllum* sp., *Microloma sagittatum, Pteronia divaricata, P. ovalifolia*, *Euryops multifidus* (gombos), *Manulea cinerea, Tylecodon wallichii* (krimpsiektebos), *Stoeberia utilis* (asbos), *Manochlamys albicans* (spanspekbos; seepbos; soutbos), *Cissampelos capensis, Conicosia elongata* (vetkousie), *Arctotis canaliculata, Eriocephalus*

racemosa (kapokbossie; wilderoosmaryn), *Asparagus africana*, and *Helichrysum tricostatum.*

Scattered larger woody shrubs are a feature in some areas, especially in transitions to Sand Fynbos, and may include *Rhus glauca* (blue kuni bush), *Gymnosporia buxifolia* (pendoring), *Diospyros austro-africana*, and *Euclea racemosa* (sea guarrie). Grasses may be prominent after rains, mainly *Ehrharta calycina* (rooisaadgras) and *Stipagrostis zeyheri*. Bulbs include *Babiana brachystachys*, *B. grandiflora*, *Lachenalia unifolia*, *Oxalis flava*, *O. luteola*, *Trachyandra divaricata* (duinekool), *Trachyandra falcata* (veldkool), *Drimia* sp., and *Boophone haemanthoides* (gifbol). Annuals are likely to include *Helichrysum moeserianum, Oncosiphon* spp., *Dischisma* spp., *Polycarena* spp., *Manulea* spp., *Zalusianskya pusilla*, *Dorotheanthus bellidiformis* (bokbaaivygie), and *Ursinia* spp.

Heuweltjies (old eroded termite mounds) are present in some areas, and are characterised by few shrubs (mainly *Zygophyllum morgsana*) and a dominance of annuals (mainly *Foveolina tenella* and *Zalusianskya pusilla*).

Rare or localised plant species are not often recorded in this habitat, and few such species are likely to occur, at least in significant numbers. However, I was surprised to encounter *Leucoptera nodosa* (see Plate 2 and Figure 2), which is a rare succulent shrub in the daisy family, known only from seven collections in the Strandveld between Hondeklipbaai and Lamberts Bay (PRECIS data), and the species has recently been Red Data Book listed as Vulnerable (Raimondo & Helme – in prep). The species seems to occur as scattered individual plants (Figure 2, and in adjacent areas), and is never common, but the population on site (and on adjacent areas) may be at least locally important.

Plate 2: *Leucoptera nodosa* is a poorly known Red Data listed species restricted to coastal Namaqualand, and was found on site.

Hermannia sp. nov. (see Plate 3) is an undescribed (i.e. a "new" species) shrub (D. Gwynne- Evans – pers. comm) quite common on site. This 1m tall, attractive shrub is actually widespread in the Namaqualand Strandveld from the Olifants river north to the Groen River (pers. obs.), and is unlikely to be threatened.

Plate 3: The undescribed species of *Hermannia* (poprosie) that is common throughout much of the Strandveld on site.

Lebeckia lotononoides (Plate 4) is also a poorly known species that seems to be restricted to the Namaqualand Sand Fynbos (Boatwright and Van Wyk – in press; pers. obs). The sprawling species is quite common on site (see Figure 2), mainly in the Sand Fynbos areas, but also in the ecotones. It is not currently Red Data listed but will probably be listed as Near Threatened in the forthcoming revision, as some of its range is being impacted by mineral sand mining (Raimondo & Helme – in prep).

Plate 4: *Lebeckia lotononoides* is a range restricted species quite common on site, but mostly in the Sand Fynbos areas.

A succulent species of shrubby *Trachyandra* was collected in the clay soil areas and is the fairly rare but widespread Namaqualand species *T. involucrata*. The species is not considered threatened. The vygie *Vanzijlia annulata* is restricted to the coastal area from Doringbaai to the Groen river, but is not yet Red Data listed and is fairly common in many areas, including here.

Ferraria foliosa is a fairly wide ranging coastal endemic known from the area, and a few plants of a not yet flowering *Ferraria* were found, which are likely to be this species. This species is currently Red Data listed as Rare (Hilton Taylor 1996), but is due to be downlisted to Least Threatened (Raimondo & Helme – in prep.).

There is a moderate possibility of other rare or localised plant species occurring on site and remaining undetected due to the large site and the seasonal constraints.

Sensitivity: This vegetation type is sensitive to vehicular damage and trampling at all times of the year, but especially during the winter and spring growing period (May – Oct). Numerous fine rootlets occur very close to the soil surface to capture fog condensation and these are destroyed by pressure and trampling.

4.3 Namaqualand Sand Fynbos

This vegetation type is typically found on paler, neutral to acid sands which are present in the lower lying areas and on the old dunes in the north (see Figure 2). A number of subtypes (communities) could be recognised, many of which are ecotonal (transitional) with the Strandveld.

True Namaqualand Sand Fynbos is characterised by the presence of the following species, although not all of these are necessarily present in any one area: *Macrostylis decipiens* (fynblaar buchu), *Macrostylis crassifolia* (buchu), *Wiborgia obcordata*, *Thesium strictum, Lachnospermum fasciculatum, Trichogyne repens, Leucospermum rodolentum* (Sandveld speeldekussing), *Calopsis marlothii, Ischyrolepis macer, Psammotropha quadrangularis*, *Muraltia namaquensis*, and *Aspalathus spinescens* ssp. *lepida*. It appears that very few of these species are in fact present in the Fynbos on this site, which tends to be dominated by the less specialist species outlined below.

The following species are common in this vegetation type, and are restricted to Fynbos habitats, but in themselves are not diagnostic of pure Sand Fynbos (i.e. they also occur in Strandveld ecotones). However, where they are dominant this can be considered to be Sand Fynbos: *Willdenowia incurvata, Thamnochortus bachmanii, Stoebe nervigera*, *Kedrostis psammophila*, *Trichogyne ambigua* and *Elytropappus rhinocerotis* (renosterbos). Renosterbos occurs only where soils are thin, especially in shallow sands over ferricrete hardpans, and is never as dominant as it is in Renosterveld. *Willdenowia incurvata* is often dominant on dune ridges, with *Thamnochortus bachmanii* dominant on the flats between. In true Fynbos areas succulents are rare, and the only prominent species are *Lampranthus* cf. *montaguensis* and *Ruschia subpaniculata*. The Namaqualand Sand Fynbos endemic shrub *Nenax arenicola* is often common.

Plate 5: Sand Fynbos in the foreground on a dune ridge (note paler sands), with yellow flowered Strandveld elements (*Othonna cylindrica*). Taken from the north of the site looking south.

Small patches of taller woody shrubs (small trees) may occur, usually comprising *Euclea racemosa* (sea guarrie), *Rhus laevigata* (dune taaibos), *Diospyros lycioides* and *Gymnosporia buxifolia* (pendoring). Other shrubs found in the Fynbos may include *Struthiola ciliata, Melianthus elongata* (kruidjie roer my nie), *Felicia* sp., *Hermannia scordifolia, Thesium elatius* and *Salvia lanceolata* (salie). Bulbs include *Oxalis luteola, Babiana grandiflora, B. brachystachys, Arctopus monacanthus, Boophone haemanthoides* (gifbol) and *Brunsvigia orentalis*, whilst annuals include *Polycarena* sp., *Zalusianskya pusilla*, *Dischisma* sp., *Ursinia anthemoides, Manulea altissima* and *Nemesia affinis*. The graminoid *Ficinia argyropa* is quite common.

Rare species include *Lebeckia lotononoides* (see Strandveld account) and possibly the small, cryptic bulb *Eriospermum arenosum*. There is a Moderate likelihood of other undetected rare or range restricted species occurring in this habitat (such as *Babiana grandiflora* and *B. brachystachys*). The Red Data Listed proteoid *Leucospermum rodolentum* is not present.

Sensitivity: This vegetation type is sensitive to vehicular damage and trampling at all times of the year, and is also sensitive to wind erosion as soon as the vegetation cover is disturbed. Numerous fine rootlets occur very close to the soil surface to capture fog condensation and these are destroyed by pressure and trampling.

4.4 Strip Cultivation

Large parts of Portion 5 of Farm 158 have been cultivated using strip cultivation (see Figure 2; Plate 6), but significant natural rehabilitation has occurred in the strips since they were last cultivated twelve years ago. The cultivated areas are primarily on the Fynbos / Strandveld ecotone, although the unploughed strips indicate that the primary vegetation type is Strandveld (see Figure 2). It is evident that both the ploughed and unploughed strips have been quite heavily grazed over many years, as a number of the more sensitive species have disappeared (eg. *Ehrharta calycina, Eriocephalus racemosus*, *Stoeberia utilis, Tripteris oppositifolia*), and diversity is significantly lower here than in the nearby Strandveld areas where no strips are located, with diversity being about 60% of what it is in the latter areas.

Plate 6: View of old strip cultivation, indicating significant extent of natural rehabilitation since cessation of cultivation. Natural Strandveld vegetation occurs between the ploughed strips (right hand side of picture).

The ploughed strips have a lot of annuals, along with resilient shrubs such as *Exomis microphylla, Tetragonia fruticosa, Ruschia floribunda, Trachyandra divaricata, Drosanthemum* sp., *Hermannia trifurca* and *Zygophyllum morgsana*. No rare or localised species were recorded in the strip area, and none are expected. The area is consequently rated as being of lower sensitivity than anywhere else on site, and would therefore be the preferred areas for infrastructure development.

4.5 Seasonal pans

There are only three seasonal pans on site (Figure 2), but only one of these (just north of the main road) is of any size (about 1ha), and the other two would dry out very fast. The pans occur in a matrix of sandy soils, but are formed where the underlying clays come to the surface. The pans on this site do not appear to support any significantly different natural vegetation, which may be partly a result of disturbance in the form of heavy grazing. However, they have high ecological value, as the only natural open water sources in the area. These pans usually contain water for limited periods, typically during winter and spring, and may support numerous invertebrates, which attract wading birds such as spoonbills, ducks, etc. Many other birds visit the pans when they contain water, but they are usually too saline for frogs (pers. obs.).

4.6 Short Strandveld on Clay soils

The sparsely vegetated clay areas (see Plate 7) are present mainly in the southeastern part of the site and on a hill at the western edge of the strip ploughed area (Figure 2). The vegetation is reminiscent of Namaqualand Heuweltjieveld (Hardeveld), which occurs on granitic soils 30km to the northeast, but is still referred to in this report as being part of the Namaqualand Strandveld. Poorly developed heuweltjies (ancient, eroded termite mounds of higher fertility) are present, as are occasional quartz pebbles, but these are not sufficiently well developed to be termed “quartz patches”, which are such a feature of the Knersvlakte, 30km to the east. Water may accumulate in some of the low points, leading to the development of small pans (<20m diameter), and the rocky outcrops often occur in association with the clay areas. Nevertheless, these areas do support a distinct plant community that is not represented elsewhere on site, with species such as *Cephalophyllum* sp., *Drosanthemum* sp. (bead leaf vygie), *Salsola* sp. (gannabos), *Trachyandra involucrata, Bulbine praemorsa*, *Leipoldtia schultzei, Monilaria* sp., and *Psilocaulon junceum* (asbos).

Plate 7: View of sparsely vegetated clay soils, sometimes with quartz pebbles. Characterised by a community of small succulents not found in the adjacent Strandveld.

It is possible that some of these succulents could be regarded as threatened, or that rare geophytes are present in these patches, and thus these areas have been assessed as having a Medium - High sensitivity (Figure 3).

Sensitivity: This community is sensitive to all forms of disturbance, especially during the winter and spring growing period (May – Oct).

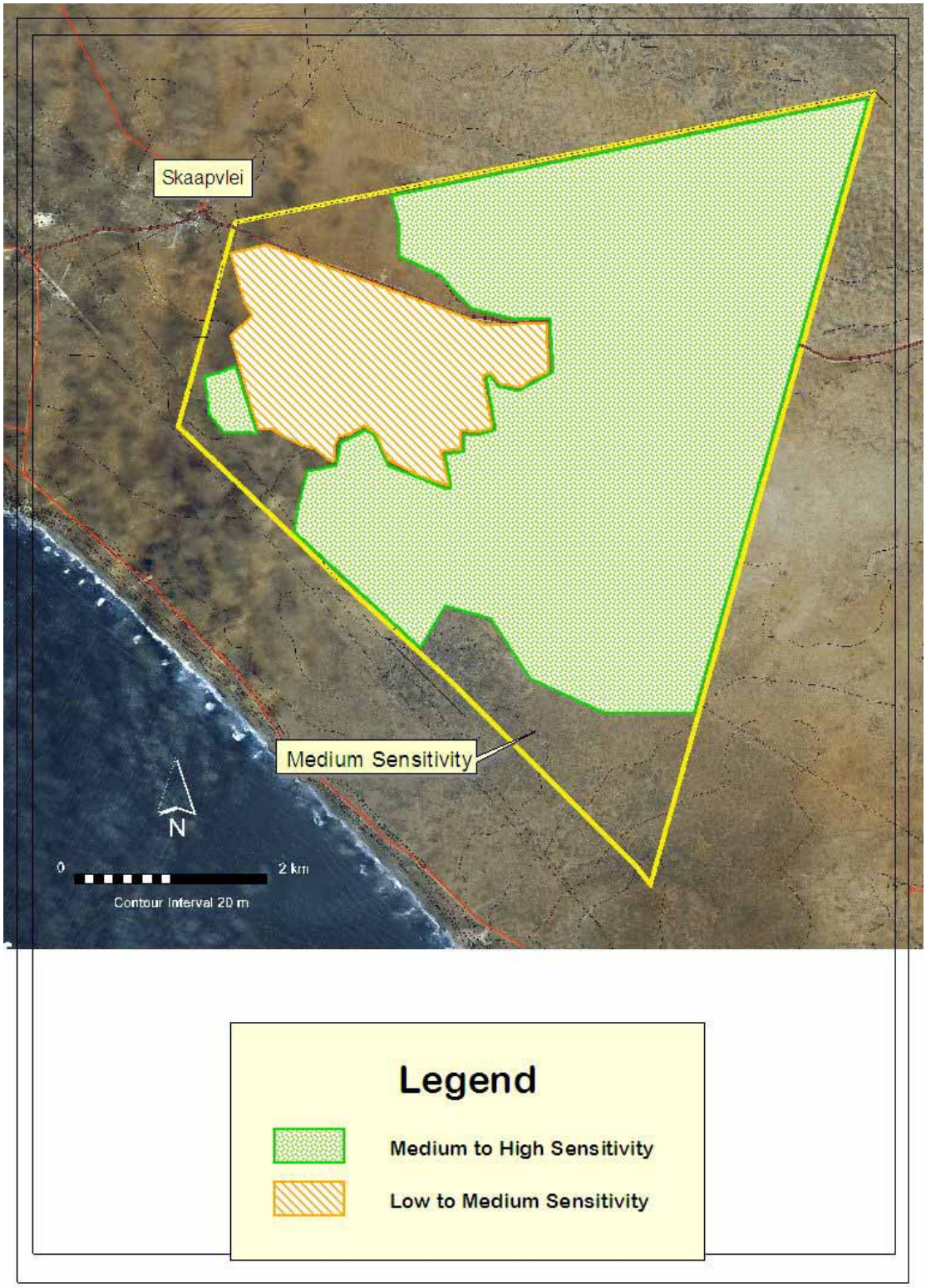

Figure 3: Botanical Sensitivity Map of the site. Note that unhatched areas within site are of Medium Sensitivity. In this report "Botanical Sensitivity" is the same as "Botanical Conservation Value".

5. BASIC ASSESSMENT

An assesment of botanical impacts depends entirely on knowing exact development footprints, as the **nature** of the impact is the loss of natural vegetation within the footprint. As this is not known at present an accurate assessment cannot be made. The **extent** of the impact will be both local and regional, although the former will be more significant than the latter. It is likely that the main turbines will be located along the main coastal ridge, where there are no "No Go" habitats or areas from a botanical point of view. Direct loss of vegetation in this area (due to construction) is unlikely to amount to more than 30% of the Strandveld, and 10% of the Sand Fynbos on site, in which case botanical impacts are likely to be no more than Low to Medium negative on a regional scale.

The informal road network created during construction could cause substantial local damage to the vegetation, and can best be mitigated by minimising the creation of tracks and any underground cabling, etc. These disturbances are likely to be of a long term nature, but not necessarily permanent, particularly if intact natural vegetation is maintained in the surrounding area which can naturally rehabilitate the disturbed areas.

Requirements at EIA stage

The proponent should prepare detailed infrastructure layouts for the Impact Assessment (IA) stage in order to allow for an accurate assessment of direct botanical impacts to be undertaken. Cognisance should be taken of the need to minimise service and construction tracks and undergound cabling networks. The botanist should assess local and regional impacts at the IA stage, and make detailed mitigation suggestions for planning, construction and operational stages. Most of these recommendations should be included within the construction and operational phase EMPs that should subsequently be prepared. Further botanical fieldwork is unlikely to be required at the IA stage. Indirect botanical impacts are likely to be positive in some cases, especially if the proponent purchases the land and removes the livestock. The IA should look at possible indirect botanical impacts in more detail, and should assess the need for possible biodiversity offsets (see DEA&DP 2007).

6. ASSOCIATED INFRASTRUCTURE

Associated infrastructure includes the access road and 132kV powerline to connect to the grid. The existing access route to the site via Koekenaap would be

considered as the first option for providing access to the site, and modifications made to the route where required. In addition, the preference is for the powerline to follow the access route as closely as possible, which will also allow for access to the powerline and ensure consolidation of the linear infrastructure. The actual point of connection to the grid is, however, not yet finalised.

Assessment of likely impacts

The **nature** of the impact would be loss of vegetation in any areas where new roads are required, and where powerline footprints are placed. This would clearly have a small negative impact at a local scale, but the regional significance is likely to be low, given that the routes pass through habitats that are relatively common and untransformed in the region. The extent of the impact depends largely on the actual routing of any roads and powerline infrastructure, and thus cannot be assessed at this stage, save to say that **extent** would probably be localised to the immediate development footprints.

Requirements at EIA stage

The proponent should prepare detailed infrastructure layouts for the Impact Assessment stage in order to allow for an accurate assessment of botanical impacts to be undertaken.

7. CONCLUSIONS AND RECOMMENDATIONS

- As there are no obvious concentrations of rare species or any especially threatened habitats or vegetation types on site there are no areas of High or Very High sensitivity indicated in Figure 3.
- It is clear that the least sensitive area is the previously cultivated area, which has a sensitivity of Low to Medium on a regional scale. In order to minimise direct impacts on the vegetation this is the area where the bulk of the infrastructure (such as the substation, construction camp and operations base) should be placed, if possible.
- The pure Namaqualand Strandveld areas have been assessed as being of Medium botanical sensitivity, and are presumably where much of the turbine infrastructure will be placed, as this is along the ridge closest to the sea. At least one Red Data Book listed species occurs only in this part of the site (but is widespread and rare in the region), but it is unlikely to be feasible to find and translocate these few plants.
- Direct loss of vegetation in this area (due to construction) is unlikely to amount to more than 30% of the Strandveld on site, in which case

impacts are likely to be no more than Low to Medium negative on a regional scale.

- The sparse vegetation on clay soils, all pans, all rocky areas, and all Sand Fynbos areas have been assessed as having a Medium to High sensitivity, and should ideally not be disturbed. The impacts of development in these areas will have to be assessed at the Impact Assessment stage once detailed alternative layouts are available. Ideally no infrastructure of any sort should be constructed in these areas, as the best mitigation is to avoid them, and other mitigation will not significantly reduce the impacts.
- The proposed facilities could be developed in areas of Low to Medium sensitivity without the need for significant mitigation, as overall impacts in these areas are likely to be Low negative on a regional scale.
- Indirect negative effects on the vegetation (disruption or change in ecological processes, shading, disturbance of wind flow, etc.) are likely to be minimal, although a possible indirect effect may be reduced bird densities and hence possible infestations of pests such as caterpillars, which could damage some plants if not controlled in the normal way (primarily by foraging of birds).
- Cumulative effects can only be assessed once the detailed layouts are known, but are driven primarily by the ongoing negative effects of mining in both vegetation types concerned, and the impacts of this development are likely to be significantly less than for various mining operations in the area.
- Limited mitigation such as Search and Rescue of translocatable succulents and bulbs may be proposed at the Impact Assessment stage, depending on the exact placement of turbines.
- It is recommended that roads be kept to a minimum during planning, construction and operational stages, as this will be one of the primary sources of direct vegetation loss and habitat fragmentation (an indirect effect).
- In order to minimise damage primary construction should ideally be timed to coincide with the dry season dormancy period for the vegetation (November – end April).
- Full mitigation recommendation will be outlined in the Impact Assessment stage, including requirements for construction and operational phase EMPs.
- It is strongly recommended that Eskom should remove all livestock from the site. This will obviously only be possible if Eskom owns the land, and

this thus also becomes a firm recommendation. One of the primary reasons for this recommendation is that removal of grazing pressure will have a beneficial effect on the natural vegetation, particularly in terms of natural rehabilitation, in that flowering and seed set of the remaining natural plants (especially pioneers such as the annuals) will be significantly better in the absence of grazing (which removes the flowers). If the nearby annuals and other plants are not grazed this means that natural rehabilitation of the areas disturbed by the project will be significantly improved, as there will be much more locally indigenous seed available nearby for establishment in the disturbed areas.

8. REFERENCES

Brownlie, S. 2005. *Guideline for involving biodiversity specialists in EIA processes: Edition 1.* CSIR Report No. ENV–S–C 2005 053 C. Republic of South Africa, Provincal Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.

Department of Environmental Affairs and Development Planning. 2007. *Provincial Guideline on Biodiversity Offsets*. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

De Villiers, C., Driver, A., Brownlie, S., Day, E., Euston-Brown, D., Helme, N., Holmes, P., Job, N., and A. Rebelo. 2005. *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape*. Fynbos Forum, c/o Botanical Society of South Africa, Conservation Unit, Kirstenbosch, Cape Town.

Helme, N. and P. Desmet. 2003. Namakwa Sands: Description of the vegetation of the expanded Brand se Baai mine site. Unpublished baseline report for CCA, Cape Town. Nick Helme Botanical Surveys, Scarborough.

Helme, N. A. 2007. Botanical report: Fine scale vegetation mapping in the Sandveld. Report for CapeNature, as part of the C.A.P.E. programme.

Hilton Taylor, C. 1996. Red data list of southern African plants. *Strelitzia* 4. National Botanical Institute, Pretoria.

Mucina, L. and M. Rutherford. *Eds.* 2006. Vegetation map of South Africa, Lesotho, and Swaziland. *Strelitzia 19*. South African National Biodiversity Institute, Pretoria.

Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B. & Cowling, R.M. 2004. *South African National Spatial Biodiversity Assessment 2004: Technical Report. Volume 1: Terrestrial Component.* Pretoria: South African National Biodiversity Institute.

D. Raimondo & N. Helme. In prep. Contribution to the updated Red Data Book list of threatened plants of South Africa.