EIA REPORT:

Specialist ecological study on the potential impacts of the proposed Tsitsikamma Community Wind Energy Facility Project, Eastern Cape

Prepared by

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on behalf of
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EIA REPORT: 1st Draft

David Hoare Consulting cc
Biodiversity Assessments, Vegetation Description / Mapping, Species Surveys

REGULATIONS GOVERNING THIS REPORT

This report has been prepared in terms the EIA Regulations promulgated under the *National Environmental Management Act* No. 107 of 1998 (NEMA) and is compliant with Regulation 385 Section 33 - Specialist reports and reports on specialized processes under the Act. Relevant clauses of the above regulation are quoted below and reflect the required information in the "Control sheet for specialist report" given above.

Regulation 33. (1): An applicant or the EAP managing an application may appoint a person who is independent to carry out a specialist study or specialized process.

Regulation 33. (2): A specialist report or a report on a specialized process prepared in terms of these Regulations must contain:

(a) details of (i) the person who prepared the report, and
(ii) the expertise of that person to carry out the specialist study or specialized process;
(b) declaration that the person is independent in a form as may be specified by the competent authority;
(c) indication of the scope of, and the purpose for which, the report was prepared;
(d) description of the methodology adopted in preparing the report or carrying out the specialized process;
(e) description of any assumptions made and any uncertainties or gaps in knowledge;
(f) description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;
(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;
(h) description of any consultation process that was undertaken during the course of carrying out the study;
(i) summary and copies of any comments that were received during any consultation process;
(j) any other information requested by the competent authority.

Appointment of specialist

Dr David Hoare of David Hoare Consulting cc was commissioned by Savannah Environmental (Pty) Ltd to provide specialist consulting services for the Environmental Impact Assessment for the proposed Oyster Bay Wind Energy Facility in the Eastern Cape Province. The consulting services comprise an assessment of potential impacts on the flora, fauna, vegetation and ecology in the study area by the proposed project.

Details of specialist

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Summary of expertise

Dr David Hoare:

- PhD in ecology
- Registered professional member of The South African Council for Natural Scientific Professions (Ecological Science, Botanical Science), registration number 400221/05.
- Founded David Hoare Consulting cc, an independent consultancy, in 2001.
- Ecological consultant since 1995.
- Conducted, or co-conducted, over 250 specialist ecological surveys as an ecological consultant.
- Published six technical scientific reports, 15 scientific conference presentations, seven book chapters and eight refereed scientific papers.
- Attended 15 national and international congresses & 5 expert workshops, lectured vegetation science / ecology at 2 universities and referee for 2 international journals.

Independence

David Hoare Consulting cc and its Directors have no connection with Exxaro Resources / Watt Energy. David Hoare Consulting cc is not a subsidiary, legally or financially, of the proponent. Remuneration for services by the proponent in relation to this project is not linked to approval by decision-making authorities responsible for authorising this proposed project and the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project. David Hoare is an independent consultant to Savannah Environmental (Pty) Ltd and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work. The percentage work received directly or indirectly from the proponent in the last twelve months is 0% of turnover.

Scope and purpose of report

The scope and purpose of the report are reflected in the "Terms of reference" section of this report.

Conditions relating to this report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. David Hoare Consulting cc and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

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INTRODUCTION

Terms of reference and approach

Savannah Environmental (Pty) Ltd. was appointed by Exxaro Resources & Watt Energy to undertake an application for environmental authorisation through an Environmental Impact Assessment (EIA) for the proposed "Tsitsikamma Community Wind Energy Facility." The project involves the establishment of a wind energy facility and associated infrastructure, including up to 50 wind turbines, on-site substation/s, a 132 kV power line linking to Eskom's Melkhout substation, underground cables linking the turbines to the substation, workshop area and internal access roads to each turbine. The purpose of the EIA is to identify environmental impacts associated with the project.

In February 2011 David Hoare Consulting cc was appointed by Savannah Environmental (Pty) Ltd to undertake an ecological assessment of the study area. The specific terms of reference for the ecological EIA study are as follows:

- An indication of the methodology used in determining the significance of potential environmental impacts;
- A description of the environmental issues that were identified during the environmental impact assessment process;
- An assessment of the significance of direct, indirect and cumulative impacts in terms of standard criteria;
- A description and comparative assessment of all alternatives identified during the environmental impact assessment process;
- Recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Plan;
- An indication of the extent to which the issue could be addressed by the adoption of achievable mitigation measures;
- A description of any assumptions, uncertainties and gaps in knowledge;
- An environmental impact statement which contains
- A summary of the key findings of the environmental impact assessment,
- An assessment of the positive and negative implications of the proposed activity,
- A comparative assessment of the positive and negative implications of the distribution line alternatives,
- A comparative assessment of the postivie and negative implications of the access road alternatives.

This report provides details of the results of the EIA phase. The findings of the study are based on a combination of a desktop assessment of the study area, detailed interpretation of aerial photography, fieldwork undertaken on site and expert knowledge of the area gained from general fieldwork conducted in the Eastern Cape over a number of years.

Study area

At a regional level the study area falls within the Eastern Cape Province approximately 22 km to the west of the town of Humansdorp. A more detailed description of the study area is provided in a section below.

METHODOLOGY

The environmental study is to be undertaken in two phases, a Scoping phase and an Environmental Impact Assessment phase. The objective of the EIA phase study was to assess the significance of potential impacts on flora, fauna and ecology within the study area. This report contains all the descriptive information on flora and fauna that were presented in the Scoping report as well as a comprehensive assessment of potential impacts. The results of the EIA phase study are provided in this report

Assessment philosophy

Many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have been previously disturbed. Assessing the potential impacts of a proposed development often requires evaluating the conservation value of a site relative to other natural areas and relative to the national importance of the site in terms of biodiversity conservation. A simple approach to evaluating the relative importance of a site includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?

Thus, the general approach adopted for this type of study is to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws. Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. These can be organised in a hierarchical fashion, as follows:

Species

1. threatened plant species
2. protected trees
3. threatened animal species

Ecosystems

1. threatened ecosystems
2. protected ecosystems
3. critical biodiversity areas
4. areas of high biodiversity
5. centres of endemism

Processes

1. corridors
2. mega-conservancy networks
3. rivers and wetlands
4. important topographical features

It is not the intention to provide comprehensive lists of all species that occur on site, since most of the species on these lists are usually common or widespread species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which are most likely to result in significant negative impacts

on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National legislation protecting environmental and biodiversity resources, including, but not limited to the following which ensure protection of ecological processes, natural systems and natural beauty as well as the preservation of biotic diversity in the natural environment:

1. Environment Conservation Act (Act 73 of 1989)
2. National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)
3. National Environmental Management Biodiversity Act, 2004. (Act 10 0f 2004)

Plant and animal species of concern

The purpose of listing Red Data plant and animal species was to provide information on the potential occurrence of species of special concern in the study area that may be affected by the proposed infrastructure. Species appearing on these lists could then be assessed in terms of their habitat requirements in order to determine whether any of them have a likelihood of occurring in habitats that may be affected by the proposed infrastructure.

Lists were compiled specifically for any species of conservation concern previously recorded in the area and any other species with potential conservation value. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute for the quarter degree squares within which the study area is situated.

Regulations published for the National Forests Act provide a list of protected tree species for South Africa. The species on this list were assessed in order to determine which protected tree species have a geographical distribution that coincides with the study area and habitat requirements that may be met by available habitat in the study area.

Lists of threatened animal and bird species that have a geographical range that includes the study area were obtained from literature sources (Alexander & Marais 2007, Barnes 2000, Branch 1988, 2001, du Preez & Carruthers 2009, Friedmann & Daly 2004, Mills & Hes 1997). The likelihood of any of them occurring was evaluated on the basis of habitat preference and habitats available at each of the proposed sites. The three parameters used to assess the probability of occurrence for each species were as follows:

- *Habitat requirements*: most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics within the study area were assessed;
- *Habitat status*: in the event that available habitat is considered suitable for these species, the status or ecological condition was assessed. Often, a high level of degradation of a specific habitat type will negate the potential presence of Red Data species (especially wetland-related habitats where water-quality plays a major role); and
- *Habitat linkage*: movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to these surrounding habitats and adequacy of these linkages are assessed for the ecological functioning Red Data species within the study area.

For all threatened organisms (flora and fauna) that occur in the general geographical area of the site, a rating of the likelihood of it occurring on site is given as follows:

- LOW: no suitable habitats occur on site / habitats on site do not match habitat description for species;
- MEDIUM: habitats on site match general habitat description for species (e.g. fynbos), but detailed microhabitat requirements (e.g. mountain fynbos on shallow soils overlying

Table Mountain sandstone) are absent on the site or are unknown from the descriptions given in the literature or from the authorities;
- HIGH: habitats found on site match very strongly the general and microhabitat description for the species (e.g. mountain fynbos on shallow soils overlying Table Mountain sandstone);
- DEFINITE: species found in habitats on site.

Habitat sensitivity

The purpose of producing a habitat sensitivity map is to provide information on the location of potentially sensitive features in the study area. This was compiled by taking the following into consideration:

1. The general status of the vegetation of the study area was derived by compiling a landcover data layer for the study area (*sensu* Fairbanks et al. 2000) using available satellite imagery and aerial photography. From this it can be seen which areas are transformed versus those that are still in a natural status.
2. Various provincial, regional or national level conservation planning studies have been undertaken in the area, e.g. the National Spatial Biodiversity Assessment (NSBA), Eastern Cape Biodiversity Conservation Plan (ECBCP). The mapped results from these were taken into consideration in compiling the habitat sensitivity map.
3. Habitats in which various species of plants or animals occur that may be protected or are considered to have high conservation status are considered to be sensitive.

An explanation of the different sensitivity classes is given in Table 1. Areas containing untransformed natural vegetation of conservation concern, high diversity or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered potentially sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to potentially have low sensitivity.

Table 1: Explanation of sensitivity ratings.

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
VERY HIGH	Indigenous natural areas that are highly positive for any of the following: • presence of threatened species (Critically Endangered, Endangered, Vulnerable) and/or habitat critical for the survival of populations of threatened species. • High conservation status (low proportion remaining intact, highly fragmented, habitat for species that are at risk). • Protected habitats (areas protected according to national / provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act) And may also be positive for the following: • High intrinsic biodiversity value (high species richness and/or turnover, unique ecosystems)	• CBA 1 areas. • Remaining areas of vegetation type listed in Draft Ecosystem List of NEM:BA as Critically Endangered, Endangered or Vulnerable. • Protected forest patches. • Confirmed presence of populations of threatened species.

	• High value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value) • Low ability to respond to disturbance (low resilience, dominant species very old).	
HIGH	Indigenous natural areas that are positive for any of the following: • High intrinsic biodiversity value (moderate/high species richness and/or turnover). • presence of habitat highly suitable for threatened species (Critically Endangered, Endangered, Vulnerable species). • Moderate ability to respond to disturbance (moderate resilience, dominant species of intermediate age). • Moderate conservation status (moderate proportion remaining intact, moderately fragmented, habitat for species that are at risk). • Moderate to high value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value). And may also be positive for the following: • Protected habitats (areas protected according to national / provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act)	• CBA 2 "critical biodiversity areas". • Habitat where a threatened species could potentially occur (habitat is suitable, but no confirmed records). • Confirmed habitat for species of lower threat status (near threatened, rare). • Habitat containing individuals of extreme age. • Habitat with low ability to recover from disturbance. • Habitat with exceptionally high diversity (richness or turnover). • Habitat with unique species composition and narrow distribution. • Ecosystem providing high value ecosystem goods and services.
MEDIUM-HIGH	Indigenous natural areas that are positive for one or two of the factors listed above, but not a combination of factors.	• CBA 2 "corridor areas". • Habitat with high diversity (richness or turnover). • Habitat where a species of lower threat status (e.g. (near threatened, rare) could potentially occur (habitat is suitable, but no confirmed records).
MEDIUM	Other indigenous natural areas in which factors listed above are of no particular concern. May also include natural buffers around ecologically sensitive areas and natural links or corridors in which natural habitat is still ecologically functional.	
MEDIUM-	Degraded or disturbed indigenous natural	

LOW	vegetation.	
LOW	No natural habitat remaining.	

Any natural vegetation within which there are features of conservation concern will be classified into one of the high sensitivity classes (MEDIUM-HIGH, HIGH or VERY HIGH. The difference between these three high classes is based on a combination of factors and can be summarised as follows:

1. Areas classified into the VERY HIGH class are vital for the survival of species or ecosystems. They are either known sites for threatened species or are ecosystems that have been identified as being remaining areas of vegetation of critical conservation importance. CBA1 areas would qualify for inclusion into this class.
2. Areas classified into the HIGH class are of high biodiversity value, but do not necessarily contain features that would put them into the VERY HIGH class. For example, a site that is known to contain a population of a threatened species would be in the VERY HIGH class, but a site where a threatened species could potentially occur (habitat is suitable), but it is not known whether it does occur there or not, is classified into the HIGH sensitivity class. The class also includes any areas that are not specifically identified as having high conservation status, but have high local species richness, unique species composition, low resilience or provide very important ecosystem goods and services. CBA2 "irreplaceable biodiversity areas" would qualify for inclusion into this class, if there were no other factors that would put them into the highest class.
3. Areas classified into the MEDIUM-HIGH sensitivity class are natural vegetation in which there are one or two features that make them of biodiversity value, but not to the extent that they would be classified into one of the other two higher categories. CBA2 "corridor areas" would qualify for inclusion into this class.

Assessment of impacts

Direct, indirect, and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase were assessed in terms of the following criteria:

» The **nature**, which includes a description of what causes the effect, what will be affected and how it will be affected.
» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 was assigned as appropriate (with 1 being low and 5 being high):
» The **duration**, wherein it was indicated whether:
  * the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  * the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  * medium-term (5–15 years) – assigned a score of 3;
  * long term (> 15 years) - assigned a score of 4; or
  * permanent - assigned a score of 5;
» The **magnitude**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they

temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

» The **probability** *of occurrence*, which describes the likelihood of the impact actually occurring. Probability was estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
» the **significance**, was determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
» the **status**, which was described as either positive, negative or neutral.
» the degree to which the impact can be reversed.
» the degree to which the impact may cause irreplaceable loss of resources.
» the degree to which the impact can be mitigated.

The **significance** was calculated by combining the criteria in the following formula:

S=(E+D+M)P

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
» 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
» > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Limitations

- Red List species are, by their nature, usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of ommitting any species, but it is always possible that a species that does not occur on a list may be unexpectedly located in an area.

Exclusions

The avifaunal assessment is excluded from this study and will be undertaken by a separate specialist.

DESCRIPTION OF STUDY AREA

Location

The study site is situated approximately 22 km west of Humansdorp in the Eastern Cape Province and falls within the quarter degree grids 3424AB and 3424BA (Figure 1). The site is situated between the N2 national road and the coast.The study area is located between coast and the N2 that links Port Elizabeth to George / Knysna. Access to the site is via the R62 road from Humansdorp towards the west, which runs parallel to the N2 national road. From the R62 are various roads running towards the coast, of which one to Klidrif and one to Orangezicht provide access to the site. The site is therefore well-connected to a major route in this region. There is a road running through the site that connects Orangezicht to Klipdrif and various smaller roads providing access to other parts of the site.

The farm portions on which the proposed wind energy facility would occur include the following: Remainder of the Farm 678, Portion 3, 4, 5, 6, 7, 8, 9 of the Farm 787, Farm 818, Portion 3 of the Farm Klip Rug 676, Portion 2 of the Farm New Driefontein 720, Portion 1 of the Farm Ou Driefontein 721, Portions 3 and 5 of the Farm Vergaarderings Kraal 675 and Portions 19 and 22 of the Farm Zalverige Valley 660. No alternative site is currently being considered for the proposed wind energy facility.

The Melkhout substation is located off site near Humansdorp. This is a minimum of 20 km from the site.

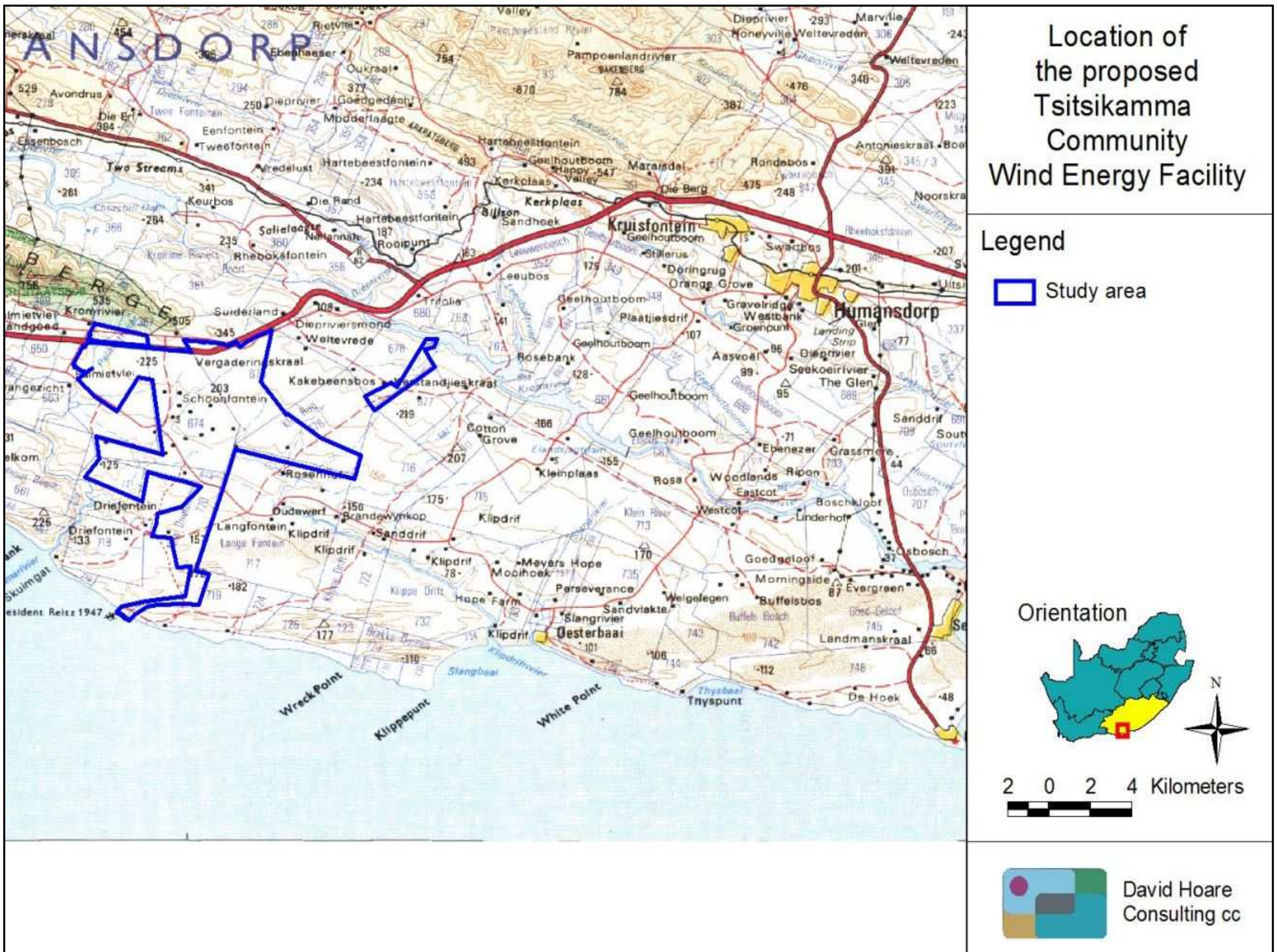

Figure 1: Location of the proposed Tsitsikamma Community Wind Energy Facility.

Physiography and soils

The study site is located on the coastal plains south of the Cape Fold mountains in the Humansdorp region. The site is flat to undulating, sloping gently towards the coast. The plains are dissected by relatively shallow river valleys in which perennial or non-perennial streams are found. Most of the site is underlain by Table Mountain Group rocks, except in the southern part of the site closest to the coast, where vegetated sand dunes are found.

The study area is moderately sloping. The elevation varies from sea level to 253 m above sea level. The site slopes in general towards the coast, but slopes and topography are locally influenced by the various river valleys.

The site is in the catchment of the Klipdrif River, which flow into the sea about 12.5 km to the south-east of the site. There are a number of small drainage lines dissecting the landscape, many of which originate on site. Most of the site drains into the Tsitsikamma River and the Palmiet River, a small tributary of the Tsitsikamma River. The easternmost parts of the site drain into small tributaries of the Klipdrif River.

Detailed soil information is not available for broad areas of the Eastern Cape. As a surrogate, landtype data was used to provide a general description of soils in the study area (landtypes are areas with largely uniform soils, topography and climate). There are three landtypes in the study area, the Ca, Ha and Bb landtypes (Land Type Survey Staff, 1987). The Ca land type indicates land that qualifies as a plinthic catena, but which has, in upland positions, margalitic and/or duplex soils that together cover more than 10% of the total area.

The Ha land type indicates land types in which deep grey regic sands of the Fernwood form occupy more than 80% of the area. The southern half of the site falls within this land type (MacVicar et al. 1974).

The Bb land type indicates land in which red and/or yellow apedal soils (Hutton, Bainsvlei, Avalon, Glencoe and Pinedene forms) that are dystrophic and/or mesotrophic predominate over red and/or yellow apedal soils that are eutrophic, and in which red soils (mainly Hutton and Bainsvlei) are not widespread (MacVicar et al. 1974). A small piece of the north-eastern part of the site and the easternmost section of land (remaining portion of the Farm 678) falls within this land type.

Climate

The study area has warm summers and mild winters. The average daily minima for the coldest months are above freezing. There are, on average, three days of frost per year. The proximity of the coast ameliorates all climate extremes, but the site is in the first range of low mountains inland of the coast and is therefore affected by the proximity of these mountains.

A weak bimodal pattern of rainfall exists in the study area with a slightly higher proportion of spring and autumn rainfall. Rainfall may, however, fall at any time of the year. The mean annual rainfall in the study area is estimated to be approximately 650 mm (Dent *et al*. 1989). In grasslands, all areas with less than 400 mm are considered to be arid grasslands. The study area can therefore be considered to be relatively moist.

Landuse and landcover of the study area

Landcover data for the area (Fairbanks et al. 2000) indicates that a large proportion of the site has been cultivated. There are, however, areas of remaining natural habitat in patches on site, primarily associated with drainage lines (thicket), some rocky areas (fynbos) and the southern portions of the site that occur on dune sand. The natural parts of the landscape consist primarily of low grassy fynbos, thicket and woodland. The national landcover map (Fairbanks et al. 2000) indicates the presence of two thicket patches in the centre of the site, but these are actually patches of alien trees.

Broad vegetation types

Vegetation may be described at various hierarchical levels from Biome, to broad Vegetation Type and down to Plant Community level associated with local habitat conditions. There are three general descriptions of the vegetation in the study area. Acocks (1953) published the first comprehensive description of the vegetation of South Africa, which was updated in 1988. This was followed by an attempted improvement (Low & Rebelo 1998) which became widely used due to the inclusion of conservation evaluations for each vegetation type, but is often less rigorous than Acocks's original publication. More recently, a detailed map of the country was produced (Mucina *et al.*, 2005). A companion guide to this map (Mucina & Rutherford 2006), containing up-to-date species information and a comprehensive conservation assessment of all vegetation types, has just been published. The classification of the vegetation according to the most recent publication is given below.

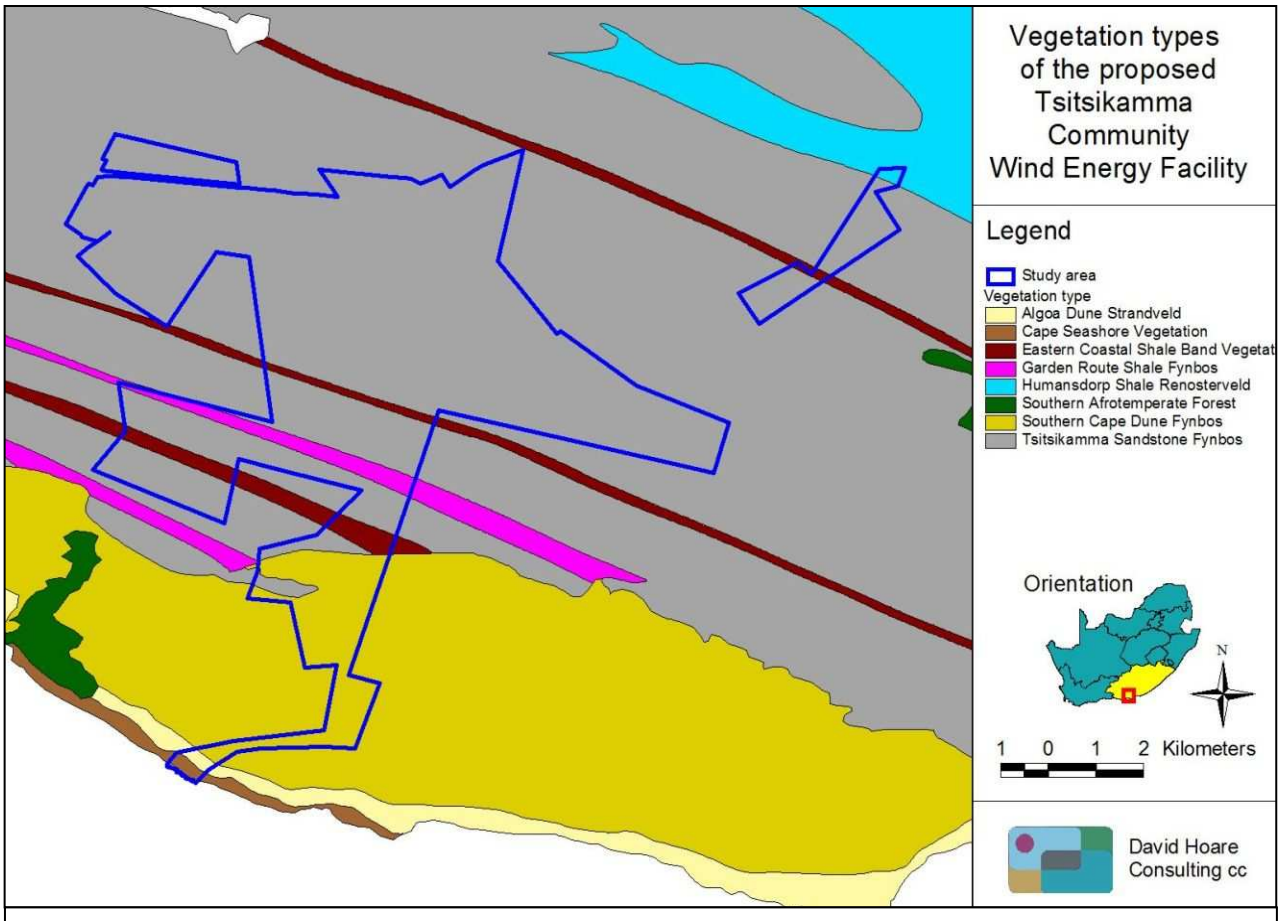

Figure 2: Vegetation types of the study site and surrounding areas.

According to this most recent vegetation map of the country (Mucina *et al.*, 2005) the study area falls primarily within two main vegetation types, i.e. ***Tsitsikamma Sandstone Fynbos*** and ***Southern Cape Dune Fynbos***, both of which which fall within the Fynbos Biome. There are also small areas of five other vegetation types apparently occurring on site, namely ***Eastern Coastal Shale Band Vegetation***, ***Garden Route Shale Fynbos***, ***Humansdorp Shale Renosterveld***, ***Algoa Dune Strandveld*** and ***Cape Seashore Vegetation***. There are areas of Southern Afrotemperate Forest indicated as occurring nearby, but none of this appears to occur on the site.

Tsitsikamma Sandstone Fynbos is found along the Tsitsikamma Mountains from Uniondale to Cape St Francis (Rebelo et al. 2006). This landscape consists of relatively low mountains with gentle to steep slopes. The vegetation type occurs on both the northern and southern slopes of the mountains. It is a medium-dense, tall proteoid shrubland over a dense, moderately tall ericoid-leaved shrubland (Rebelo et al. 2006). This vegetation type occurs in the northern half of the site under assessment (Figure 2), most of which is transformed by cultivation on site.

Southern Cape Dune Fynbos occurs in the Western and Eastern Cape from Wilderness and Buffels Bay near Knysna to Oyster Bay (Rebelo et al. 2006). The vegetation type occurs on the coastal dune cordons, often with steep slopes. It is a fynbos heath vegetation dominated by sclerophyllous shrubs with a rich restio undergrowth (Rebelo et al. 2006). This vegetation type occurs in the southern half of the site under assessment (Figure 2), which appears from aerial imagery to be largely intact on site.

Eastern Coastal Shale Band Vegetation occurs on the shale bands in the eastern Outeniqua, Langkloof, Tsitsikamma and Kareedouw Mountains and along the southern Cape coastal plains to around Oyster Bay (Rebelo et al. 2006). These shale bands form narrow strips 80 - 200 m wide that are smooth and relatively flat. The vegetation type ranges from thicket to renosterveld and fynbos, including all structural types, although they are often grassy in character (Rebelo et al. 2006). This vegetation type occurs in three narrow bands through the study area (Figure 2), all of which appear to have been transformed by cultivation.

Garden Route Shale Fynbos occurs primarily from Heidelberg to Plettenberg Bay, but also in patches along coastal platform shale bands south of the Tsitsikamma Mountains (Rebelo et al. 2006). The vegetation occurs on undulating hills and moderately undulating plains on coastal forelands. It is a tall, dense proteoid and ericaceous fynbos in wetter areas and graminoid fynbos in drier areas. Most shale areas are covered by afrotemperate forest so this fynbos is confined to flatter more extensive landscapes that are exposed to frequent fire. In the study area, this vegetation type is confined to a single narrow band that lies in an east-west direction through the centre of the site (Figure 2), which appears from aerial imagery to be completely transformed on site.

Humansdorp Shale Renosterveld occurs, across its geographic range, in three swathes, one of which extends from Jeffreys Bay near the coast inland past Humansdorp to the lower reaches of the Dieprivier near Two Streams (Rebelo et al. 2006). The vegetation type occurs on moderately undulating plains and undulating hills. It is a vegetation composed of low, medium dense graminoid, dense cuppressoid-leaved shrubland, dominated by renosterbos (Rebelo et al. 2006). There are both grassland shrubland and grassland forms of the renosterveld. Thicket patches are common on termitaria and fire-safe enclaves. This vegetation type occurs as a small sliver in the extreme northern part of the site (Figure 2), which appears from aerial imagery to be intact.

Algoa Dune Strandveld occurs in the Eastern Cape Province in a narrow coastal strip from the mouth of the Tsitsikamma River to the Sundays River mouth (Mucina *et al.*, 2006). It is found on dunes mainly outside the influence of salt spray. It is a dense thicket dominated by stunted trees, shrubs (often armed with spines and thorns), abundant lianas and sparse herbaceous and grassy undergrowth. It occurs on site in a short section along the coast, just inland of the shoreline (Figure 2).

Cape Seashore Vegetation occurs along the Eastern and Western Cape Province coasts from the Olifants River mouth on the Atlantic Ocean to East London on the Indian Ocean (Mucina *et al.*, 2006). It is found on beaches, coastal dunes, dune slacks and coastal cliffs. It may be an open, grassy, herbaceous and sometimes dwarf-shrubby, sometimes succulent vegetation, often dominated by single pioneer species. The plant communities present reflect the age of the substrate and natural disturbance regime, distance from the upper tidal mark and the exposure to prevailing winds. This vegetation occurs along the short section of shoreline on site (Figure 2), which consists of a mixture of rocky areas and dune sand.

Conservation status of broad vegetation types

The vegetation types of South Africa have been categorised according to their conservation status which is, in turn, assessed according to degree of transformation and rates of conservation. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. On a national scale these thresholds are as depicted in Table 2, as determined by best available scientific approaches (Driver et al. 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver et al. 2005).

Table 2: Determining ecosystem status (from Driver et al. 2005). *BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)			
	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists national vegetation types that are afforded protected on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the Draft Ecosystem List versus in the scientific literature. The legal status of the Draft National List is higher than that of the scientific publication.

Tsitsikamma Sandstone Fynbos is classified in Mucina *et al*. (2006) as Vulnerable, with 40% conserved of a target of 23% and 33% transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), does not list this vegetation type in any conservation category.

Southern Cape Dune Fynbos is classified in Mucina *et al*. (2006) as Least Threatened, with 16% conserved of a target of 36% and 17% transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National

Environmental Management: Biodiversity Act (Act No. 10, 2004), does not list this vegetation type in any conservation category.

Eastern Coastal Shale Band Vegetation occurs is classified in Mucina *et al*. (2006) as Endangered, with 16% conserved of a target of 27% and 64% transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists this vegetation type as Vulnerable.

Garden Route Shale Fynbos is classified in Mucina *et al*. (2006) as Endangered, with 5% conserved of a target of 23% and 54% transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists this vegetation type as Vulnerable.

Humansdorp Shale Renosterveld is classified in Mucina *et al*. (2006) as Endangered, with none conserved of a target of 29% and 61% transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists this vegetation type as Endangered.

Algoa Dune Strandveld is classified in Mucina *et al*. (2006) as Least Threatened, with 4% conserved of a target of 20% and 11% transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), does not list this vegetation type in any conservation category, but coastal areas (within 1000 m of the shoreline) are protected under the Integrated Coastal Zone Management Act (Act No. 24 of 2008).

Cape Seashore Vegetation is classified in Mucina *et al*. (2006) as Least Threatened, with 45% conserved of a target of 20% and 2% transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), does not list this vegetation type in any conservation category, but coastal areas (within 1000 m of the shoreline) are protected under the Integrated Coastal Zone Management Act (Act No. 24 of 2008).

Table 2: Conservation status of different vegetation types occurring in the study area, according to Driver *et al*. 2005 and Mucina *et al*. 2005.

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver *et al*. 2005; Mucina *et al*., 2006	Draft Ecosystem List (NEMBA)
Tsitsikamma Sandstone Fynbos	23	40	33	Vulnerable	Not listed
Southern Cape Dune Fynbos	36	16	17	Least Threatened	Not listed
Eastern Coastal Shale Band Vegetation	27	16	64	Endangered	Vulnerable
Garden Route Shale Fynbos	23	5	54	Endangered	Vulnerable
Humansdorp Shale Renosterveld	29	0	61	Endangered	Endangered
Algoa Dune Strandveld	20	4	11	Least Threatened	Not listed

Cape Seashore Vegetation	20	45	2	Least Threatened	Not listed

The Cape Floristic Region

The study area occurs within the Cape Floristic Region (see Figure 3), which is recognised as one of the principal centres of diversity and endemism in Africa (van Wyk & Smith 2001). Moreover, it is one of the earth's 25 hotspots, i.e. geographical areas that contain the world's greatest plant and animal diversity while also being subjected to high levels of pressure from development and/or degradation (Mittermeier *et al*. 2000). The Cape Floristic region is also the only hotspot that encompasses an entire Floristic Kingdom. This region has the greatest extratropical concentration of plant species in the world, with 9000 plant species, 6210 of which are endemics (Cowling & Pierce 2000). Diversity and endemism are high at the generic and familial level as well, with five of South Africa's 12 endemic plant families.

The characteristic and most widespread vegetation of the Cape Floristic Region (CFR) is fynbos, consisting of hard-leaved, evergreen, fire-prone shrubs. Other vegetation types occurring in the CFR are Renosterveld, Succulent Karoo, Subtropical Thicket and Afromontane forest, although only Fynbos and Renosterveld are considered to be the main vegetation types in the CFR. Fynbos is associated with the nutrient poor soils of the Cape fold Belt mountains. It is very species rich, with over 75% of the CFR species associated with it, including all the endemic families and most of the endemic genera (van Wyk & Smith 2001). The vegetation type is characterized by a preponderance of Restionaceae, Ericaceae and Proteaceae and a paucity of annuals and grasses. Fynbos is rich in geophytes, notably from the families Liliaceae, Iridaceae and Orchidaceae, and is thought to harbour the richest geophyte flora in

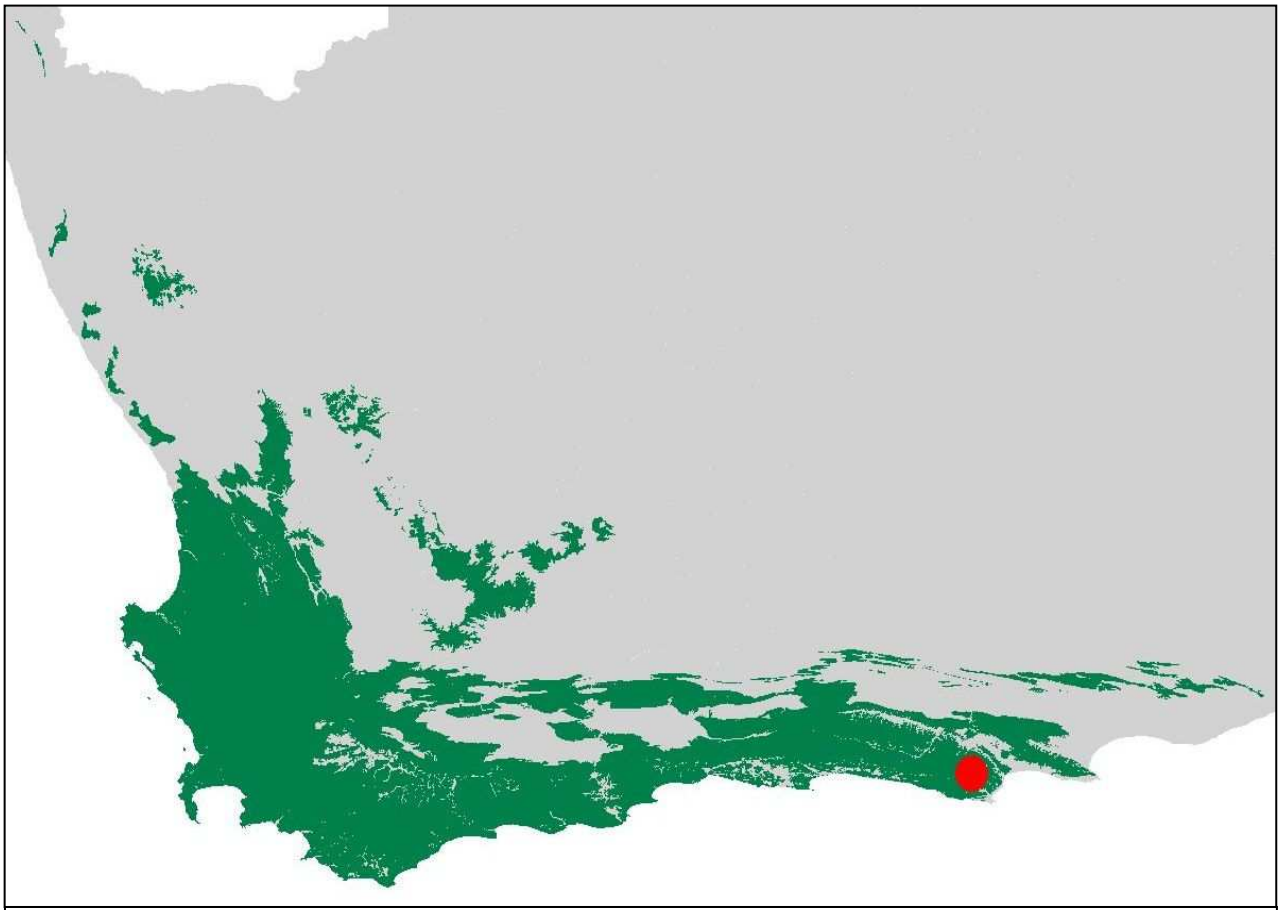

Figure 3: Relationship of the Fynbos Biome to the study area (red circle).

the world (Cowling & Richardson 1995). Many different types of Fynbos vegetation are recognised: a total of 78 fynbos and 38 renosterveld vegetation types have been mapped in the recently compiled vegetation map of South Africa (Mucina, Rutherford & Powrie 2005) of a total of 435 vegetation types of the whole country (more than a quarter of the total).

The Fynbos Biome and the CFR are largely concurrent and also match the boundaries of the two main vegetation types found in the Fynbos Biome, fynbos and renosterveld.

Permanent and complete transformation of habitat has affected 33% of the CFR hotspot, which includes the Oyster Bay site. Less than 20% of the total area covered by the CFR hotspot can be considered close to the pristine state in the sense that it is entirely free of alien plants and subjected to appropriate fire and grazing regimes (Cowling & Pierce 2000). The study area is within this hotspot area near its eastern end (see Figure 3) and, although the hotspot contains a wide variety of vegetation types, the study area contains a number of vegetation types that are typical of the areas of concern within the hotspot.

Red List plant species of the study area

Lists of plant species previously recorded in the quarter degree grids in which the study area is situated were obtained from the South African National Biodiversity Institute. These are listed in Appendix 1. Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed.

The species on this list were evaluated to determine the likelihood of any of them occurring on site. Of the species that are considered to occur within the geographical area under consideration, there were fifteen species recorded in the quarter degree grid in which the study area is located that are listed on the Red List that could occur in habitats that are available in the study area. According to IUCN Ver. 3.1 (IUCN, 2001) one of these is listed as Critically Endangered, two as Endangered, eight as Vulnerable and four as Near Threatened (see Table 3 for explanation of categories). All except three of these species are highly likely to occur on site; the site is at the locality where the species have been previously recorded or the species have been recorded just adjacent to the site in similar habitats.

Table 3: Explanation of IUCN Ver. 3.1 categories (IUCN, 2001), and Orange List categories (Victor & Keith, 2004).

IUCN / Orange List category	Definition	Class
EX	Extinct	Extinct
CR	Critically Endangered	Red List
EN	Endangered	Red List
VU	Vulnerable	Red List
NT	Near Threatened	Orange List
Declining	Declining taxa	Orange List
Rare	Rare	Orange List
Critically Rare	Rare: only one subpopulation	Orange List
Rare-Sparse	Rare: widely distributed but rare	Orange List
DDD	Data Deficient: well known but not enough information for assessment	Data Deficient
DDT	Data Deficient: taxonomic problems	Data Deficient
DDX	Data Deficient: unknown species	Data Deficient
LC	Least Concern	Least Concern

Red List animal species of the study area

All Red List vertebrates (mammals, reptiles, amphibians, fish) that could occur in the study area are listed in Appendix 2. Those vertebrate species with a geographical distribution that includes the study area and habitat preference that includes habitats available in the study area are discussed further.

There are a number of mammal species of conservation concern that have a distribution that coincides with the study area. Only four of these are considered to have a possibility of occurring on site as a result of habitats available, i.e. the Brown Hyaena, the Fynbos Golden mole and the Natal Long-fingered Bat, all listed as Near Threatened[1].

There are two reptile and no amphibian species of conservation concern that have a distribution that includes the study area and which could occur on site. The two reptile species are the Spotted Rock Snake (Rare) and the Yellow-bellied House Snake (Near Threatened). There are therefore no threatened (CR, EN or VU) reptile or amphibian species that are likely to occur on site (see Table 3 for explanation of conservation categories).

In summary, there are four near threatened species that may occur on site, as follows:

(1) Brown Hyaena,
(2) Fynbos Molden mole,
(3) Natal Long-fingered Bat,
(4) Yellow-bellied House Snake.

Protected trees

Tree species protected under the National Forest Act are listed in Appendix 3. Those that have a geographical distribution that includes the study area are *Curtisia dentata, Ocotea bullata, Pittosporum viridiflorum, Podocarpus falcatus, Podocarpus latifolius and Sideroxylon inerme* subsp. *inerme*.

Ocotea bullata occurs in montane forest. *Pittosporum viridiflorum* occurs along forest margins, in bush-clumps and in bushveld, often in rocky outcrops. *Podocarpus falcatus* is found in Afromontane forest. *Podocarpus latifolius* is found in coastal and Afromontane forest. *Sideroxylon inerme* subsp. *inerme* usually only occurs in coastal areas, in dune thicket and forest, but may also occur on termitaria in bushveld.

Based on habitat preferences, any of these species could occur on or near the site. *Sideroxylon inerme* subsp. *inerme*, *Pittosporum viridiflorum*, *Podocarpus falcatus* and *Podocarpus latifolius* have been previously recorded in the grid in which the study site is located, as well as surrounding grids (see Appendix 4). Large numbers of were found in the dune area in the southern part of the site. There were also scattered individuals found in small rocky outcrops in fynbos areas and in wooded drainage lines dominated by indigenous species, mostly in areas surrounding the site.

[1] Note that there are a number of species previously listed in a threatened category that, according to the IUCN, are now listed as Least Concern (see Appendix 2).

Other features of conservation concern

There have been a number of regional conservation assessments produced within the Eastern Cape Province, including the following:

Subtropical Thicket Ecosystem Programme (STEP)
Succulent Karoo Ecosystems Programme (SKEP)
National Spatial Biodiversity Assessment (NSBA)
Eastern Cape Biodiversity Conservation Plan (ECBCP).

These studies identify patterns and processes that are important for maintaining biodiversity in the region. Unfortunately, many of these studies have been done using coarse scale satellite imagery that does not provide spatial or spectral accuracy at the scale of the present study. They are, however, useful for understanding broad issues and patterns within the area. The ECBCP has integrated all previous studies and is a useful reference for identifying conservation issues in the study area and surrounds.

The ECBCP identifies Critical Biodiversity Areas (CBAs), which are terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning (Berliner & Desmet 2007). The ECBCP identifies CBAs at different levels with decreasing biodiversity importance, as follows:

1. PA: Protected areas.
2. CBA 1: CR vegetation types and irreplaceable biodiversity areas (areas definitely required to meet conservation targets).
3. CBA 2: EN vegetation types, ecological corridors, forest patches that do not fall

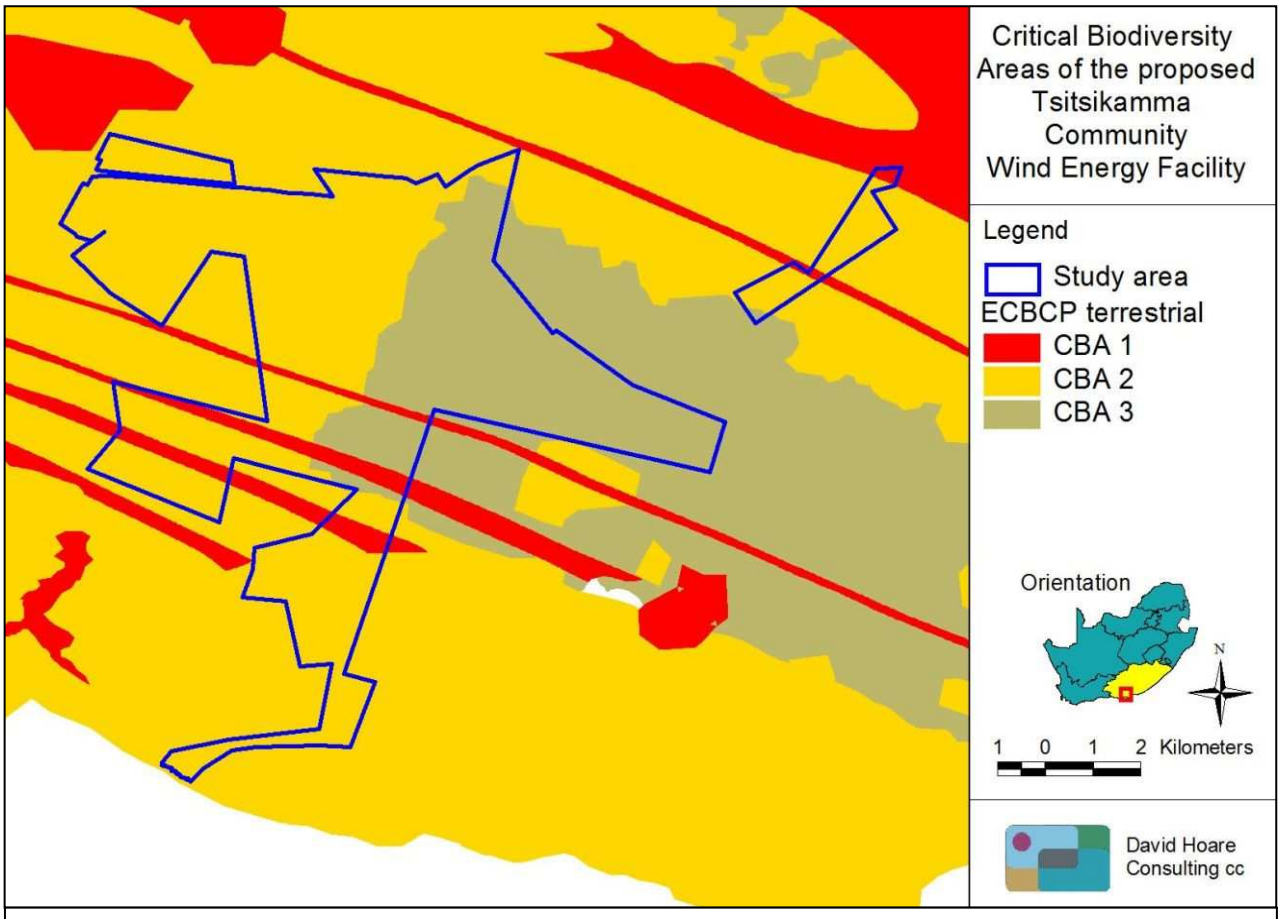

Figure 4: Important biodiversity areas of the study area (from ECBCP).

into CBA 1, 1 km coastal buffer, irreplaceable biodiversity areas that do not fall into CBA 1.

4. CBA 3: VU vegetation types.

Within and around the study area, the ECBCP identifies CBAs at three levels that occur within the study area and surroundings (Figure 4). The CBA 1 areas that fall within the study site are vegetation types of high conservation value, in this case Eastern Coastal Shale Band Vegetation, Garden Route Shale Fynbos and Humansdorp Shale Renosterveld, all classified as Endangered. The CBA 2 areas that fall within the study site are corridor areas and vegetation identified in the STEP project as being important (Southern Cape Dune Fynbos). The corridor areas are important for a number of reasons, including the maintenance of ecological processes. The CBA 3 areas that fall within the study site are vegetation types of conservation importance (in this case Tsitsikamma Sandstone Fynbos). Despite the site falling into these CBAs the vegetation is largely transformed due to cultivation, except for the southern third of the site.

Sensitivity assessment

The sensitivity assessment identifies at a high (regional) level those parts of the study area that have high conservation value or that may be sensitive to disturbance. Areas containing untransformed natural vegetation, high diversity or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to have low sensitivity. The information provided in the preceding sections was used to compile a

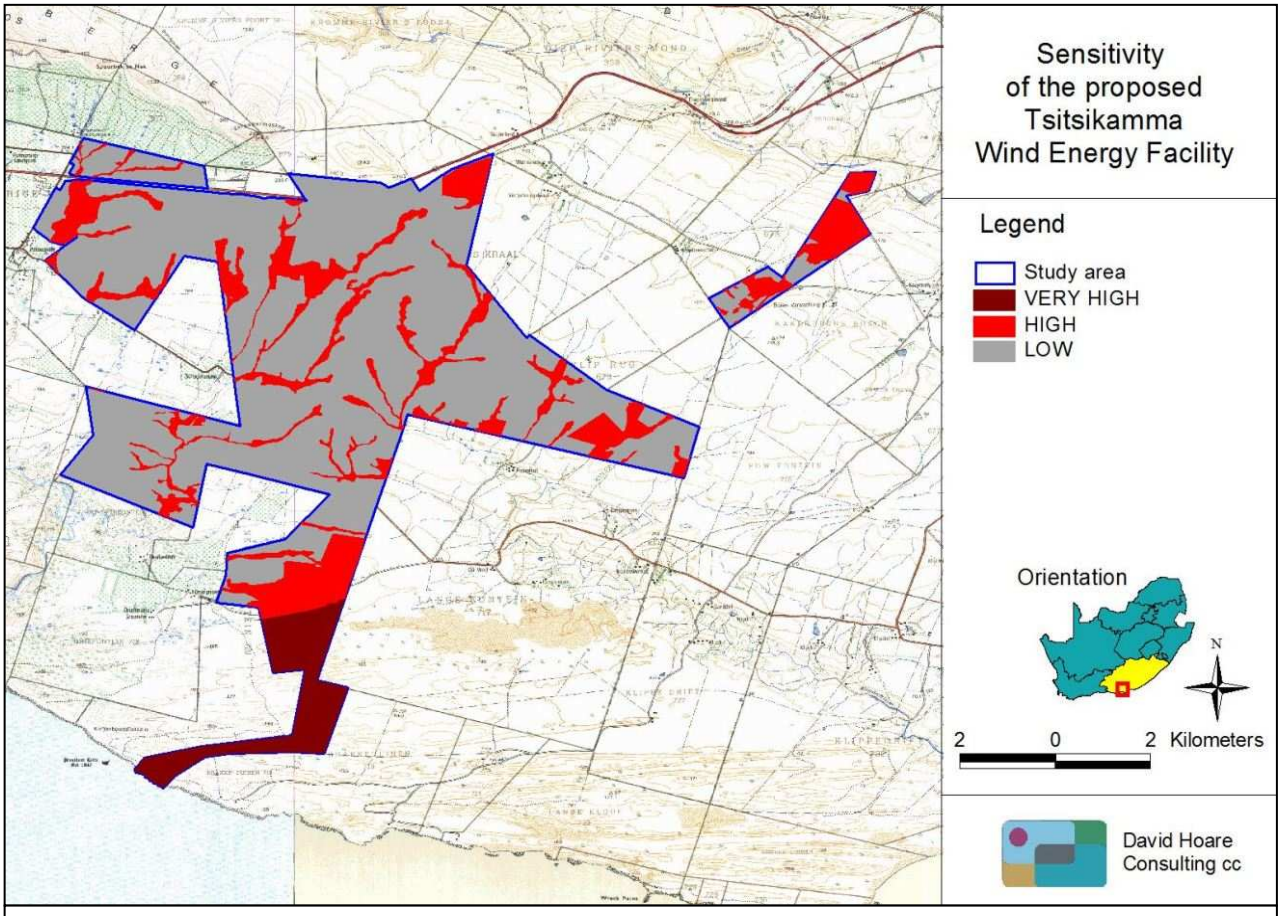

Figure 5: Sensitivity within different parts of the study area.

map of remaining natural habitats and areas important for maintaining ecological processes in the study area. Broad scale mapping was used to provide information on the location of sensitive features. There are a number of features that need to be taken into account in order to evaluate sensitivity in the study area. These include the following:

1. vegetation of conservation importance: this is based primarily on the ECBCP assessment (see Figure 4), the Draft Ecosystem List and the fact that the site falls within the Cape Floristic Region;
2. perennial and non-perennial rivers and streams and wetlands: this represents a number of ecological processes including groundwater dynamics, hydrological processes, nutrient cycling and wildlife dispersal;
3. potential occurrence of populations of Red List organisms, including flora and fauna that have been evaluated as having a high chance of occurring within remaining natural habitats within the study area.
4. estuaries and estuarine habitats that occur off-site, but which may be affected by activities on site.

These factors have been taken into account in evaluating sensitivity within the study area (Figure 5). The sensitivity classification for the site is as follows:

1. VERY HIGH: The area of vegetation dunes in the southern part of the site is classified as having VERY HIGH sensitivity and conservation value (see Figure 5).
2. HIGH: All of the remaining natural areas on site are classified as having high sensitivity (see Figure 5). They are considered to have high intrinsic biodiversity value, including high species richness, high habitat variability and high probability of containing species of narrow distribution and/or ecological amplitude. In addition, they are considered to be areas that provide high value ecosystem goods and services.
3. LOW: Areas where no natural vegetation occurs is classified as having low sensitivity (see Figure 5). This includes cultivated lands, alien trees, areas of buildings, roads and bare ground.

RELEVANT LEGISLATIVE AND PERMIT REQUIREMENTS

Relevant legislation is provided in this section to provide a description of the key legal considerations of importance to the proposed project. The applicable legislation is listed below.

Legislation

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

NEMA requires, inter alia, that:

- "development must be socially, environmentally, and economically sustainable",
- "disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied." ,
- "a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions",

NEMA states that "the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

Environment Conservation Act No 73 of 1989 Amendment Notice No R1183 of 1997

The ECA states that:

Development must be environmentally, socially and economically sustainable. Sustainable development requires the consideration of inter alia the following factors:

- that pollution and degradation of the environment is avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and
- that negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where they cannot be altogether prevented are minimised and remedied.

The developer is required to undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations in order to control activities which might have a detrimental effect on the environment. Such activities will only be permitted with written authorisation from a competent authority.

National Forests Act (Act no 84 of 1998)

Protected trees

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that (according to Section 15(1)) 'no person may cut, damage, disturb, destroy or remove any *protected tree*, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'. GN 1042 provides a list of protected tree species (amends GN 1012).

Forests

Prohibits the destruction of indigenous trees in any natural forest without a licence.

National Environmental Management: Biodiversity Act (Act No 10 of 2004)

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Chapter 4 of the Act relates to threatened or protected ecosystems or species. According to Section 57 of the Act, "Restricted activities involving listed threatened or protected species":

- (1) A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are "of a nature that may negatively impact on the survival of a listed threatened or protected species".

Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. According to Section 75 of the Act, "Control and eradication of listed invasive species":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.
- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

Government Notice No. 1477 of 2009: Draft National List of Threatened Ecosystems

Published under Section 52(1)(a) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). This Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004).

GNR 151: Critically Endangered, Endangered, Vulnerable and Protected Species List

Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

GNR 1187: Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List

Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

- Category 1 plants: are prohibited and must be controlled.
- Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.

- Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands.

National Water Act

Wetlands, riparian zones and watercourses are defined in the Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998). A "watercourse" in terms of the National Water Act (act 36 of 1998) means:

- River or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and

Any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

National Veld and Forest Fire Act (Act No. 101 of 1998)

Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

Integrated Coastal Zone Management Act (Act No. 24 of 2008)

The purpose of the Act is to establish a system of integrated coastal and estuarine management in the Republic, including norms, standards and policies, in order to promote the conservation of the coastal environment, and maintain the natural attributes of coastal landscapes and seascapes, and to ensure that development and the use of natural resources within the coastal zone is socially and economically justifiable and economically sustainable; to define rights and duties in relation to coastal areas; to determine the responsibilities of organs of state in relation to coastal areas; to prohibit incineration at sea; to control dumping at sea, pollution in the coastal zone, inappropriate development of the coastal environment and other adverse effects on the coastal environment; to give effect to South Africa's international obligation in relation to coastal matters; and to provide for matters connected therewith. The Act provides for integrated management of the coastal zone and contains a number of Chapters dealing with various components. Those that may affect the current project are as follows:

- A coastal protection zone is defined in which development is restricted or controlled. A relatively arbitrary distance of 1000 m is defined in the act as constituting this coastal protection zone, but sections of the act (sections 26 to 29) set out procedures whereby the various coastal areas may be specifically demarcated on a case-by-case basis.
- Assessing the environmental impact of activities which may detrimentally affect the coastal zone will be done in terms of the general environmental impact assessment regulations which were promulgated in terms of Chapter 5 of NEMA. Section 63 of Act 24 of 2008 provides the factors and criteria which the competent authority must consider when issuing environmental authorisations for activities affecting the coastal zone.

Other Acts

Other Acts that may apply to biodiversity issues, but which are considered to not apply to the current site are as follows:

- National Environmental Management Protected Areas Act (Act No. 57 of 2003)
- Marine Living Resources Act (Act No. 18 of 1998)
- Sea Birds and Seals Protection Act (Act No. 46 of 1973)
- Lake Areas Development Act (Act No. 39 of 1975)
- Mountain Catchment Areas Act (Act No. 63 of 1970)

DESCRIPTION OF INFRASTRUCTURE

The position of the proposed infrastructure within the study area is indicated in Figure 6. This shows 31 turbines. These will be linked by a network of internal access roads (layout not provided), which is also the planned position of the underground cables linking the turbines to one another and to the internal substation. Turbines are mostly within close proximity to existing roads on site. For the purposes of the impact assessment, it is therefore assumed that the shortest distance to the turbine from an existing road will be the preferred route of internal access roads.

No substation position was provided.

There are three alternative powerline alignments from the site to the Melkhout substation, which is located just to the north of Humansdorp. These are shown in Figure 6 (option A in yellow, option B in purple, option C in pink and sections common to options B and C in light blue).

An indication of turbine positions in relation to sensitive features on site is shown in Figure 7.

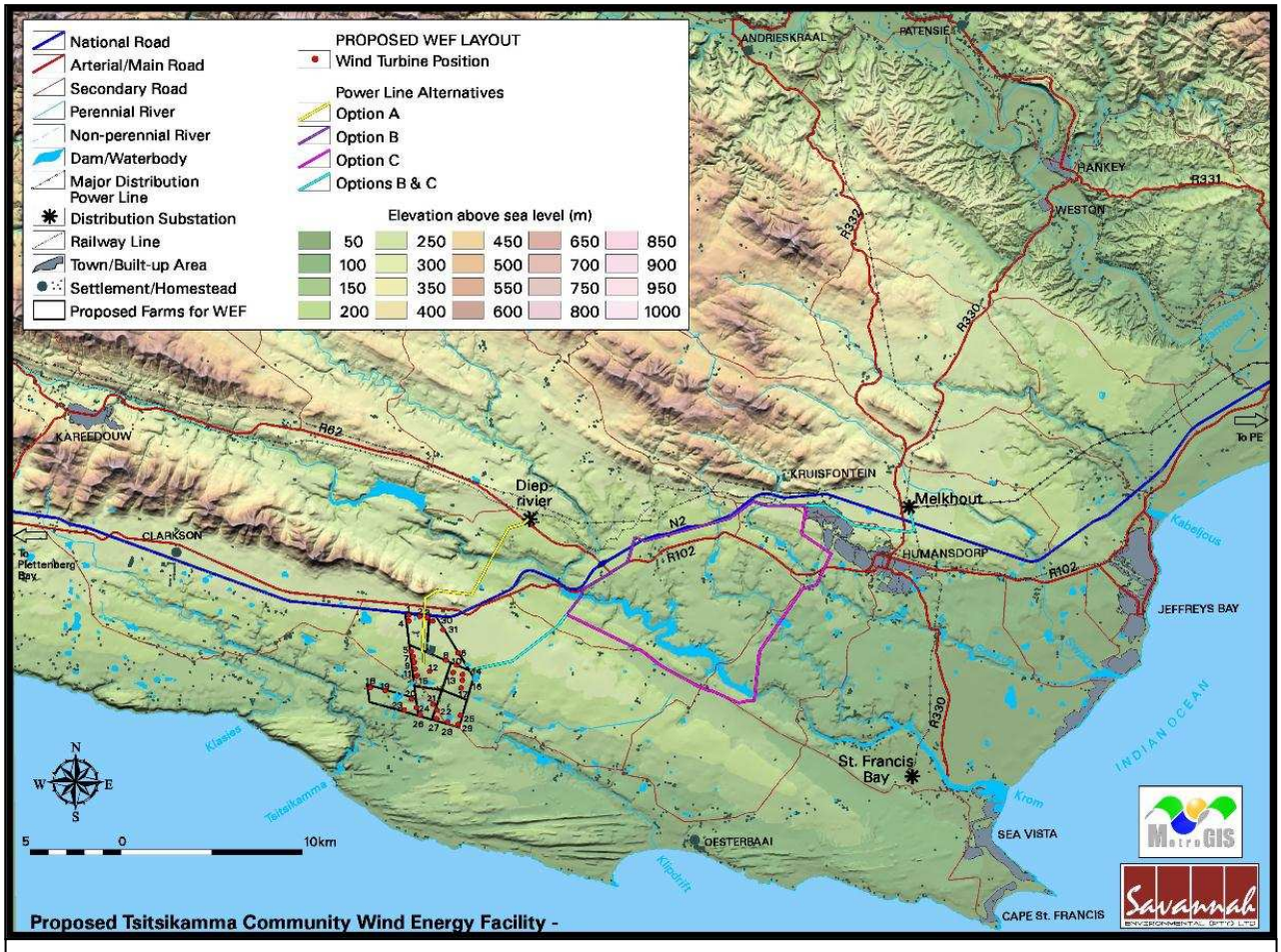

Figure 6: Proposed infrastructure position in the study area.

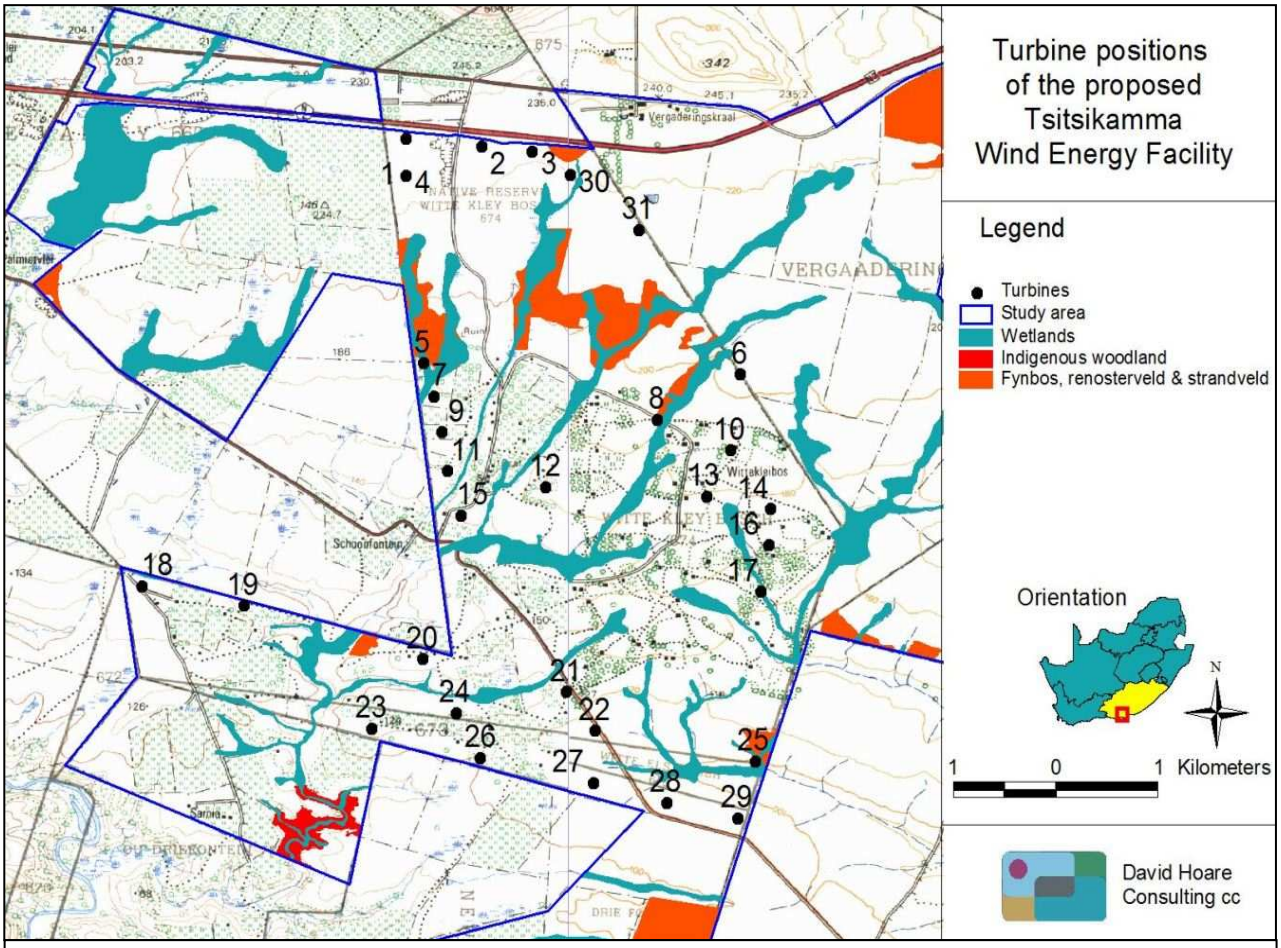

Figure 7: Turbine positions in relation to sensitive features on site.

IDENTIFICATION OF RISKS AND POTENTIAL IMPACTS

Potential issues relevant to potential impacts on the ecology of the study area include the following:

- Impacts on biodiversity: this includes any impacts on populations of individual species of concern (flora and fauna), including protected species, and on overall species richness. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern.
- Impacts on sensitive habitats: this includes impacts on any sensitive or protected habitats, including, for example, indigenous forest, thicket and wetland vegetation, that leads to direct or indirect loss of such habitat.
- Impacts on ecosystem function: this includes impacts on any processes or factors that maintain ecosystem health and character, including the following:
    - disruption to nutrient-flow dynamics;
    - impedance of movement of material or water;
    - habitat fragmentation;
    - changes to abiotic environmental conditions;
    - changes to disturbance regimes, e.g. increased or decreased incidence of fire;
    - changes to successional processes;
    - effects on pollinators;
    - increased invasion by alien plants.

  Changes to factors such as these may lead to a reduction in the resilience of plant communities and ecosystems or loss or change in ecosystem function.
- Secondary and cumulative impacts on ecology: this includes an assessment of the impacts of the proposed project taken in combination with the impacts of other known projects for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.
- Impacts on the economic use of vegetation: this includes any impacts that affect the productivity or function of ecosystems in such a way as to reduce the economic value to users, e.g. reduction in grazing capacity, loss of harvestable products. It is a general consideration of the impact of a project on the supply of so-called ecosystem goods and services.

A number of direct risks to ecosystems would result from construction of the proposed WEF, as follows:

- Clearing of land for construction.
- Construction of access roads.
- Establishment of borrow and spoil areas.
- Chemical contamination of the soil by construction vehicles and machinery.
- Operation of construction camps.
- Storage of materials required for construction.

Description of potential impacts

Major potential impacts are described briefly below. These are compiled from a generic list of possible impacts derived from previous projects of this nature and from a literature review of the potential impacts of wind energy facilities on the ecological environment. There are two major ways that wind-energy development may influence ecosystem structure and functioning—through direct impacts on individual organisms and through impacts on habitat structure and functioning. The most important potential negative ecological impacts of a WEF

are related to bird and bat mortality and loss of habitat. The most important positive environmental impact of a WEF is related to decreased dependency on coal power. Potential impacts are discussed in more detail below:

Impact 1: Impacts on bats

Nature: Bird and bat deaths are one of the most controversial biological issues related to wind turbines. The deaths of birds and bats at wind farm sites have raised concerns by conservation agencies internationally. In order to address this issue in South Africa, the Endangered Wildlife Trust (EWT) and BirdLife South Africa (BLSA) have combined efforts to lobby for the appropriate consideration of the potential negative effects of wind energy production.

Bats have been found to be particularly vulnerable to being killed by wind turbines. It has long been a mystery why they should be so badly affected since bat echo-location allows them to detect moving objects very well. A recent study in America has found that the primary cause for mortality is a combination of direct strikes and barotrauma (bats are killed when suddenly passing through a low air pressure region surrounding the turbine blade tips causing low pressure damage to the bat's lungs, Baerwald *et al*. 2008). The relative importance of this impact on bat populations depends on which species are likely to be affected, the importance of the site for those species and whether the site is within a migration corridor for particular bat species.

The most vulnerable species are those that are already classified as threatened species, including those classified as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species unless the impact occurs across a wide area that co-incides with their overall distribution range. Loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations or the habitat that they depend on. Consequences may include:

1. fragmentation of populations of affected species;
2. reduction in area of occupancy of affected species; and
3. loss of genetic variation within affected species.

These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chances of the species overall survival chances.

It has been evaluated that there is one Near Threatened bat species that could occur site or in the surrounding areas, the Natal Long-fingered Bat. This species is most likely to be affected by the operation of the WEF to a greater extent than the construction of the WEF.

Impact 2: Impacts on other threatened animals

Nature: Threatened animal species are affected primarily by the overall loss of habitat, since direct construction impacts can often be avoided due to movement of individuals from the path of construction.

Threatened species include those classified as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localized populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened animal species, loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations or the habitat that they depend on. Consequences may include:

1. fragmentation of populations of affected species;
2. reduction in area of occupancy of affected species; and
3. loss of genetic variation within affected species.

These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chances of the species' overall survival chances.

It has been evaluated that there are three mammal species of conservation concern that could potentially be affected by the proposed wind energy facility, i.e. the Brown Hyaena and the Fynbos Golden Mole, listed as Near Threatened. In addition, there is one near threatened reptile species that has a distribution that includes the study area and which could occur on site, i.e. the Yellow-bellied House Snake.

The Brown Hyaena is a mobile animal that is likely to avoid the site during construction and re-appear afterwards. This species is therefore unlikely to be affected by construction of the proposed infrastructure. This species is therefore unlikely to be affected by construction or operation of the proposed infrastructure and impacts on this species are not assessed further.

The Yellow-bellied House Snake is usually found in rocky areas. On-site, these are the areas that have not been ploughed, i.e. the remaining patches of natural fynbos. Although listed as Near Threatened, occurs throughout a wide part of South Africa and is very unlikely to be significantly affected by the complete loss of the site, which constitutes a very small fraction of its potential overall range. This species is therefore unlikely to be affected by construction of the proposed infrastructure and impacts on this species are not assessed further.

The Fynbos Golden Mole is found in lowland fynbos and Knysna forest, also in urban areas. It prefers sandy soils with a deep litter layer. The dune area in the southern part of the site is the most suitable habitat on site for this species. The mole species is not mobile and, if it occurs on site, is likely to be affected by the construction of infrastructure since it is largely unable to move away during construction and is dependent on habitat remaining intact.

Impact 3: Impacts on threatened plants

Plant species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities, but are also affected by overall loss of habitat.

Threatened species include those classified as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localized populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened plant species, loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations. Consequences may include:

1. fragmentation of populations of affected species;
2. reduction in area of occupancy of affected species; and
3. loss of genetic variation within affected species.

These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chances of the species' overall survival chances.

There are twelve Red List plant species that have a geographic distribution that includes the site and which have a high chance of occurring in the study area. This includes two species

Figure 8: Protea coronata.

classified as Endangered, seven as Vulnerable and three as Near Threatened. There is also one Critically Endangered species, one Vulnerable species and two Near Threatened species that have a medium probability of occurring on site. Most of the species that have a high probability of occurring on site would probably occur within the dune habitat in the southern part of the site.

There are two species (one Endangered and one Vulnerable) with a high probability of occurring in habitats outside the dune habitat in the southern part of the site (where infrastructure is proposed to be located). There are another four species with a moderate probability of occurring in these habitats. One species, *Bobartia macrocarpa*, listed as Vulnerable, was recorded on site on the farm Klip Rug and on the Remainder of farm 678. No infrastructure is proposed for these areas.

Impact 4: Impacts on protected tree species

There are a number of tree species that are protected according to Government Notice no. 1012 under section 12(I)(d) of the National Forests Act, 1998 (Act No. 84 of 1998). In terms of section1 5(1) of the National Forests Act, 1998 "no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license granted by the Minister to an (applicant and subject to such period and conditions as may be stipulated".

A number of species have a geographic distribution that includes the study area appear on this list, including the following: *Curtisia dentata, Ocotea bullata, Pittosporum viridiflorum, Podocarpus falcatus, Podocarpus latifolius and Sideroxylon inerme* subsp. *inerme*. They all occur primarily in forest or woodland habitat or in drainage lines. Based on the assessment of available habitat, *Sideroxylon inerme* is considered to be highly likely to occur on site and the remaining species could occur on site. No individuals of protected trees were found in areas outside drainage lines or dunes (in the southern part of the site). The dune area in the southern part of the site had large numbers of the protected tree, *Sideroxylon inerme* subsp. *inerme*, but no infrastructure is proposed for this part of the site.

Impact 5: Impacts on indigenous natural vegetation (terrestrial)

Construction of infrastructure may lead to direct loss of vegetation. This will lead to localised or more extensive reduction in the overall extent of fynbos vegetation. Where this vegetation has already been stressed due to degradation and transformation at a regional level, the loss

may lead to increased vulnerability (susceptibility to future damage) of the habitat. Consequences of the impact occurring may include:

1. negative change in conservation status of habitat (Driver et al. 2005);
2. increased vulnerability of remaining portions to future disturbance;
3. general loss of habitat for sensitive species;
4. loss in variation within sensitive habitats due to loss of portions of it;
5. general reduction in biodiversity;
6. increased fragmentation (depending on location of impact);
7. disturbance to processes maintaining biodiversity and ecosystem goods and services; and
8. loss of ecosystem goods and services.

The remaining natural vegetation on site is classified as Endangered, Vulnerable or Least Threatened. The site also falls within the Cape Floristic Region and affects areas classified as important corridors or habitats in the ECBCP.

Impact 6: Impacts on wetlands

Construction may lead to some direct or indirect loss of or damage to seasonal marsh wetlands or drainage lines or impacts that affect the catchment of these wetlands. This will lead to localised loss of wetland habitat and may lead to downstream impacts that affect a greater extent of wetlands or impact on wetland function. Where these habitats are already stressed due to degradation and transformation, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat. Physical alteration to wetlands can have an impact on the functioning of those wetlands. Consequences may include:

1. increased loss of soil;
2. loss of or disturbance to indigenous wetland vegetation;
3. loss of sensitive wetland habitats;
4. loss or disturbance to individuals of rare, endangered, endemic and/or protected species that occur in wetlands;
5. fragmentation of sensitive habitats;
6. impairment of wetland function;
7. change in channel morphology in downstream wetlands, potentially leading to further loss of wetland vegetation; and
8. reduction in water quality in wetlands downstream of road.

The site contains a number of streams and drainage lines in which wetlands occur. More importantly, one of the major wetland systems on site constitutes part of the catchment for two estuaries on the coast down stream of the site (the Tsitsikamma and Krom River estuaries).

Impact 7: Establishment and spread of declared weeds and alien invader plants

Major factors contributing to invasion by alien invader plants includes high disturbance. Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003, Watkins *et al*. 2003). Consequences of this may include:

1. loss of indigenous vegetation;
2. change in vegetation structure leading to change in various habitat characteristics;
3. change in plant species composition;
4. change in soil chemical properties;
5. loss of sensitive habitats;
6. loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
7. fragmentation of sensitive habitats;

8. change in flammability of vegetation, depending on alien species;
9. hydrological impacts due to increased transpiration and runoff; and
10. impairment of wetland function.

A checklist of species previously recorded in the grid in which the site is located indicates that the following species are likely to invade the site, given the right conditions: *Acacia cyclops*, *Acacia saligna*, *Acacia mearnsii*, *Datura stramonium*, *Hakea sericea* and *Pinus pinaster*. The black wattle (*Acacia mearnsii*) is currently the most problematic invader on site, but *Pinus pinaster* also occurs in significant numbers. The potential therefore exists for extensive and diverse invasion of the site. The habitats most likely to be affected are watercourses, strandveld and fynbos.

ASSESSMENT OF IMPACTS

Impacts are assessed for each component of infrastructure for the proposed wind energy facility. There is therefore a seperate assessment for the turbines, substation, overhead power lines and the combination of underground cables between turbines and internal access roads.

Wind turbines

A total of 31 turbines have been proposed for the site. The position of these in the study area is indicated in Figure 7.

Impact 1: Impacts on bats

There is one near threatened bat species that could potentially be affected by the proposed wind energy facility. This is the Natal long-fingered bat (NT). This is a cave-dwelling species that may form colonies of many hundreds of thousands of individuals. They roam up to 15 km from roosting sites to find prey at night. This species is most likely to be affected by the operation of the turbines to a greater extent than the installation of the turbines. No caves, mines or rock crevices were found on site, but there is a high likelihood of rock crevices being found in the low mountains to the north of the site. The speciest has a wide distribution and the conservation status of the species will not be affected by construction on site or operation of the wind energy facility. Cumulative impacts due to the high number of wind energy facilities proposed for the region may, however, be of concern.

Extent: The impact will occur at the site of the proposed WEF, but will have an impact at a more regional level, since it affects entire populations of the affected species and may affect migration routes of species.

Duration: The impact will be of long-term duration, because it will occur for the entire duration of the operation of the wind energy facility.

Magnitude: If any populations of the species occurs in the area, the potential magnitude of the impact could be low and will cause a slight impact on population processes.

Probability: The bat species of concern has been previously recorded in the grid to the north of the site. The probability of the impact occurring is therefore relatively high and is scored as highly probable.

Potential significance: The overall significance of the impact is rated as medium.

Mitigation measures: A preconstruction survey for bats should be undertaken to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site. If this preconstruction survey finds that the presence of bats or roosting habitats of concern occur, then a monitoring programme must be implemented to document the effect on bats of the turbines. The detail of this monitoring programme must be informed by the outcomes of the preconstruction survey. If the turbines are found to have a significant negative impact on bats then further measures will need to be implemented to control the impact, for example, halting operation during low wind conditions. A study done recently showed a 73% drop in bat fatalities when wind farm operations were stopped during low wind conditions, when bats are most active (Arnett et al. 2009).

Nature: Impacts on individuals of bat species of conservation concern		
	Without mitigation	**With mitigation**
Extent	regional (3)	regional (3)
Duration	long-term (4)	long-term (4)
Magnitude	low (4)	minor (2)
Probability	Highly probable (4)	probable (3)
Significance	**medium (44)**	**low (27)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) A preconstruction survey for bats should be undertaken to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site. (2) If this preconstruction survey finds that the presence of bats or roosting habitats of concern occur, then a monitoring programme should be implemented to document the effect of wind turbines on bat species of concern. (3) If the turbines are found to have a significant negative impact on bats then further measures will need to be implemented to control the impact.		
Cumulative impacts: Large number of other wind energy facilities proposed in this general area could result in a cumulative impact on bats that is more significant than any single facility.		
Residual Impacts: Likely to be a residual impact despite any mitigation measures.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 2: Impacts on threatened terrestrial animal species

As discussed above ("Description of potential impacts"), only the Fynbos Golden Mole, listed as Near Threatened, could potentially be negatively affected by the proposed infrastructure. The mole species is not mobile and, if it occurs on site, is likely to be affected by the construction of infrastructure since it is largely unable to move away during construction and is dependent on habitat remaining intact. The Fynbos Golden Mole is found in lowland fynbos and Knysna forest, also in urban areas. It prefers sandy soils with a deep litter layer. The dune area in the southern part of the site is highly suitable habitat for this species, although it could potentially occur in other parts of the site where suitable soil conditions occur.

Extent: The impact will be local.

Duration: The impact will occur during construction and will be medium-term (if a population is affected, the duration will be until the population has recovered from any potential impact). However, loss of habitat is likely to be permanent.

Magnitude: At a local scale, the impact is likely to result in a slight impact on population processes for the affected species, which is scored as low.

Probability: It is improbable that the impact will occur (it is not known whether the species of concern, the Fynbos Golden Mole, will be affected or not - if they occur it is improbable that they will be affected). Based on the proposed position of turbines, no highly suitable habitat will be affected.

Mitigation measures: None

Nature: Impacts on individuals of threatened animal species		
	Without mitigation	**With mitigation**
Extent	local (3)	local (3)
Duration	permanent (5)	permanent (5)
Magnitude	low (4)	low (4)
Probability	improbable (2)	improbable (2)
Significance	**low (24)**	**low (24)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Not required	
Mitigation: (1) None		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions) may exacerbate this impact.		
Residual Impacts: Likely to be residual impacts only if the impact actually occurs, which is considered unlikely.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 3: Impacts on threatened plants

There are four threatened and two near threatened species that could occur in habitats away from the dunes in the southern parts of the site and could therefore be affected by proposed infrastructure. None of these species occur in disturbed habitats, which is where all the turbines are proposed to be placed. One species, *Bobartia macrocarpa*, listed as Vulnerable, was recorded on site on the farm Klip Rug and on the Remainder of farm 678. No infrastructure is proposed for these areas. One species (*Protea coronata*) has been previously recorded at a number of locations close to the national road, although the accuracy of the latitude-longitude positions sourced requires verification considering the number of sitings in and around the study area that are within cultivated lands. Turbines are therefore unlikely to have an impact on populations of threatened or near threatened plant species, although there are potentially individuals of *Protea coronata* nearby.

Extent: The impact will occur at the site of the proposed turbines. The impact will therefore be evaluated at a local scale.

Duration: The impact will be due primarily to construction impacts. Over the long-term there may be recruitment into habitats surrounding the impact zone. The species is serotinous and regenerates from seed following fire. There is therefore natural loss of adults and recruitment from seed at regular intervals (10-20 years). The potential duration of an impact of a loss of a few individuals is therefore medium-term at the most.

Magnitude: The magnitude of the impact could potentially be of minor magnitude and loss of one or more individuals will not result in an impact on population processes.

Probability: Given the fact that individuals have been recorded in close proximity to proposed turbines (numbers 1, 2 and 3), the probability of the impact occurring is probable.

Mitigation measures: As a precaution, a preconstruction survey for *Protea coronata* should be undertaken at the location of turbines 1, 2 and 3 to determine whether this species occurs within the footprint of these turbines or not. The species is serotinous and regenerates from seed following fire mortality of adult plants. If any individuals occur there, viable seeds should be collected at the appropriate time of the year and sown within suitable nearby habitats. The

best approach would probably be to cut off entire flowering branches and place them within suitable habitat.

Nature: Impacts on plant species of conservation concern		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	minor (2)	zero (0)
Probability	probable (2)	Improbable (2)
Significance	**low (12)**	**Low (8)**
Status (positive or negative)	negative	negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) As a precaution, a preconstruction survey for *Protea coronata* should be undertaken at the location of turbines 1, 2 and 3 to determine whether this species occurs within the footprint of these turbines or not. (2) If any individuals occur there, viable seeds should be collected at the appropriate time of the year and sown within suitable nearby habitats. The best approach would probably be to cut off entire flowering branches and place them within suitable habitat.		
Cumulative impacts: None.		
Residual Impacts: None		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 4: Loss of individuals of protected tree species

A number of species have a geographic distribution that includes the study area appear on this list, including the following: *Curtisia dentata*, *Ocotea bullata*, *Pittosporum viridiflorum*, *Podocarpus falcatus*, *Podocarpus latifolius* and *Sideroxylon inerme* subsp. *inerme*. Only *Sideroxylon inerme* subsp. *inerme* was found on site, in the dunes area in the southern part of the site. No turbines are proposed for this area and it is considered highly unlikely that any protected trees will be affected by installation of turbines. The significance of this impact is rated as zero for this infrastructure component and not assessed further.

Impact 5: Loss or fragmentation of indigenous natural vegetation

The remaining natural vegetation on site is classified as Endangered, Vulnerable or Least Threatened. The site also falls within the Cape Floristic Region and affects areas classified as important corridors or habitats in the ECBCP. None of the turbines are proposed to be located within areas of remaining natural vegetation. This potential impact will, therefore, not occur. The significance of this impact is rated as zero and is not assessed further for this infrastructure component.

Impact 6: Damage to wetlands/watercourses

Turbines 5, 8, 17 and 25 are located very close to the edge of wetlands / watercourses. The site of turbines 5 and 17 are heavily invaded and it was difficult to determine where the edge of the watercourse was in this degraded environment. A large concrete foundation may stabilize these degraded areas to some extent.

Extent: The impact will occur at the site of the proposed turbines, but could have downstream impacts. The extent of the potential impact is therefore on the site and surroundings.

Duration: The impact will occur during construction, but will probably result in impacts that have a long-term effect.

Magnitude: In the long-term, impacts will result in processes continuing but in a modified way, which is scored as moderate.

Probability: According to the provided layout, it is improbable that the impact will occur.

Mitigation measures:

1. Turbine 8 should be moved 30 m westwards along the existing access track and turbine 25 should be moved 20 south-west of its current position.

Nature: Damage to wetlands / watercourses		
	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	moderate (6)	minor (2)
Probability	improbable (2)	improbable (2)
Significance	**low (24)**	**low (16)**
Status (positive or negative)	negative	negative
Reversibility	Irreversible	Reversible to some degree
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) Turbine 8 should be moved 30 m westwards along the existing access track and turbine 25 should be moved 20 south-west of its current position.		
Cumulative impacts: none.		
Residual Impacts: None expected.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 7: Establishment and spread of declared weeds and alien invader plants

Turbines will create areas of disturbance, but this is within an already disturbed landscape in which aliens have already invaded extensively. It is therefore expected that conditions favouring the establishment and spread of alien invasive plants will be very slightly enhanced, if at all.

Extent: The impact will occur at the site of the proposed turbines. The surrounding landscape is already extensively invaded, so the potential to spread into the surrounding landscape is minimal. The impact will therefore be evaluated at a scale of local.

Duration: The impact will occur for the duration of the operation of the facility. This is scored as long-term.

Magnitude: Due to the current disturbed and severe invaded nature of the site, the impact of additional disturbance is unlikely to be enhanced. It is scored as minor.

Probability: It is assessed as probable that this impact will occur in the absence of control measures.

Mitigation measures: Disturbance of indigenous vegetation must be kept to a minimum. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be controlled so as to avoid the development of a soil seed bank of alien plants within the stock-piled soil. Any alien plants must be immediately controlled, including existing invasions, especially within wetlands and watercourses. An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.

Nature: Establishment and spread of declared weeds and alien invader plants		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	minor (2)	moderate (6)
Probability	probable (3)	probable (3)
Significance	**low (21)**	**+medium (33)**
Status (positive or negative)	negative	positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) keep disturbance of indigenous vegetation to a minimum (2) rehabilitate disturbed areas as quickly as possible (3) do not translocate soil stockpiles from areas with alien plants (4) control any alien plants, especially within wetlands and watercourses (5) establish an ongoing monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Overhead powerline/s

There are three alternative powerline alignments from the site to the Melkhout substation, which is located just to the north of Humansdorp. These are shown in Figure 6.

Impact 1: Impacts on bats

There is one near threatened bat species that could potentially be affected by the proposed wind energy facility. This is the Natal long-fingered bat (NT). This is a cave-dwelling species that may form colonies of many hundreds of thousands of individuals. They roam up to 15 km from roosting sites to find prey at night. No caves, mines or rock crevices were found on site,

but there is a high likelihood of rock crevices being found in the low mountains to the north of the site. This species is not likely to be significantly affected by overhead powerlines. Collisions with powerlines may occur during times when individuals are not actively hunting and are not making use of echo-location.

Extent: The impact will occur at the site of the proposed powerlines.

Duration: The impact will be of long-term duration, because it will occur for the entire duration of the operation of the powerline.

Magnitude: The potential magnitude of the impact could be minor (will not result in an impact on population processes) due to the low number of individuals that are likely to be affected.

Probability: The bat species of concern has been previously recorded in the grid to the north of the site. It is highly probable that the species occurs on site, but there is a low likelihood of collsions taking place.The probability of the impact occurring is therefore relatively low and is scored as improbable.

Potential significance: The overall significance of the impact is rated as low.

Mitigation measures: None required.

Nature: Impacts on individuals of threatened bat species		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	long-term (4)	long-term (4)
Magnitude	minor (2)	minor (2)
Probability	improbable (2)	improbable (2)
Significance	**low (14)**	**low (14)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) None.		
Cumulative impacts: Any other infrastructure could cause similar impacts.		
Residual Impacts: None.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 2: Impacts on threatened terrestrial animal species

As discussed above ("Description of potential impacts"), only the Fynbos Golden Mole, listed as Near Threatened, could potentially be negatively affected by the proposed infrastructure. The mole species is not mobile and, if it occurs on site, is likely to be affected by the construction of infrastructure since it is largely unable to move away during construction and is dependent on habitat remaining intact. The Fynbos Golden Mole is found in lowland fynbos and Knysna forest, also in urban areas. It prefers sandy soils with a deep litter layer. The dune area in the southern part of the site is highly suitable habitat for this species, although it could potentially occur in other parts of the site where suitable soil conditions occur.

Extent: The impact will be local.

Duration: The impact will occur during construction and will be medium-term (if a population is affected, the duration will be until the population has recovered from any potential impact).

Magnitude: At a local scale, the impact is likely to result in a small impact on population processes for the affected species, if any.

Probability: It is improbable that the impact will occur (it is not known whether the species of concern, the Fynbos Golden Mole, will be affected or not - if they occur it is improbable that they will be affected). Based on the proposed position of powerlines, no highly suitable habitat will be affected.

Mitigation measures: None

Nature: Impacts on individuals of threatened animal species		
	Without mitigation	**With mitigation**
Extent	local (3)	local (3)
Duration	medium-term (3)	medium-term (3)
Magnitude	small (1)	small (1)
Probability	improbable (2)	improbable (2)
Significance	**low (14)**	**low (14)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Not required	
Mitigation: (1) None		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions) may exacerbate this impact.		
Residual Impacts: Unlikely to be residual impacts.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 3: Impacts on threatened plants

There are four threatened and two near threatened species that could occur in habitats away from the dunes in the southern parts of the site and could therefore be affected by proposed powerline routes. One of these is listed as critically endangered (*Erica humansdorpensis*), one as endangered (*Osteospermum pterigoideum*, two as vulnerable (*Bobartia macrocarpa* and *Selago rotundifolia*) and two as near threatened (*Pauridia minuta* and *Protea coronata*). One species, *Bobartia macrocarpa*, listed as Vulnerable, was recorded on site on the farm Klip Rug and on the Remainder of farm 678. One species (*Protea coronata*) has been previously recorded at a number of locations close to the national road, although the accuracy of the latitude-longitude positions sourced requires verification considering the number of sitings in and around the study area that are within cultivated lands.

For powerline Options B and C, any of these species could be affected. For powerline Option A, there is an additional near threatened species, *Aloe micracantha*, that could be affected.

Extent: The impact will occur at the site of the proposed powerline servitude and towers.

Duration: The impact will be due primarily to construction impacts. Over the long-term there may be recruitment into habitats surrounding the impact zone. The duration of the impact is therefore scored as medium-term.

Magnitude: The magnitude of the impact depends on the species. The known location of the Critically Endangered species (*Erica humansdorpensis*) is not within the path of the proposed powerline (all options). There are only two known locations remaining of the Endangered species (*Osteospermum pterigoideum*), which are not within the path of the proposed powerline (all options). The species of highest conservation concern would therefore be vulnerable. The impact is therefore most likely to be of low magnitude (could cause a slight impact on population processes).

Probability: Due to the high number of potentially affected species, the wide distribution of some of these species within the general area, the fact that some species have been recorded nearby to proposed powerlines and the fact that the proposed alignments affect some areas of natural vegetation where species of concern are likely to occur, it is assessed as highly probable that impacts will occur.

Mitigation measures: Undertake a pre-construction walk-through survey of the servitude of the selected powerline route to determine whether any individuals of plant species of concern occur there or not. If possible, avoid affected populations by shifting powerline tower structures slightly. A shift of a relatively short distance may be sufficient. Depending on the species potentially affected, other measures appropriate to the ecology of the species may be possible to mitigate impacts, for example collecting seed and sowing it in suitable nearby habitat. A qualified botanist should be consulted in such cases and measures determined in consultation with relevant authorities. If avoiding populations is not possible and any individuals of threatened species will be destroyed, a permit is required in terms of Chapter 7 of the National Environmental Management: Biodiversity Act to carry out a restricted activity involving a specimen of a listed threatened or protected species.

Nature: Impacts on threatened plants (Erica humansdorpensis, CR)		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	low (4)	minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**medium (32)**	**Low (12)**
Status (positive or negative)	negative	negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) Undertake a pre-construction walk-through survey of the servitude of the selected powerline route to determine whether any individuals of plant species of concern occur there or not. (2) If possible, avoid affected populations by shifting powerline tower structures slightly. (3) Depending on the species potentially affected, other measures appropriate to the ecology of the species may be possible to mitigate impacts, for example collecting seed and sowing it in suitable nearby habitat. A qualified botanist should be consulted in such cases and measures determined in consultation with relevant authorities. (4) If avoiding populations is not possible and any individuals of threatened species will be destroyed, a permit is required in terms of Chapter 7 of the National Environmental Management: Biodiversity Act to carry out a restricted activity involving a specimen of a listed threatened or protected species.		
Cumulative impacts:		

Soil erosion, habitat loss, alien invasions, change in runoff and drainage may all lead to additional impacts that will exacerbate this impact.
Residual Impacts: Will probably be low if control measures are effectively applied

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 4: Loss of individuals of protected tree species

A number of species have a geographic distribution that includes the study area appear on this list, including the following: *Curtisia dentata*, *Ocotea bullata*, *Pittosporum viridiflorum*, *Podocarpus falcatus*, *Podocarpus latifolius* and *Sideroxylon inerme* subsp. *inerme*. Only *Sideroxylon inerme* subsp. *inerme* was found on site, in the dunes area in the southern part of the site. This species also occurs sporadically on rocky outcrops within natural fynbos along the proposed alignments (all three) and within drainage lines dominated by woodland/thicket.

Duration: The impact will be long-term to permanent because clearing of trees for construction purposes will lead to the complete loss of those individuals.

Extent: The impact will occur at the site of the individual tower structures of the proposed powerline, although, in some cases, trees may be required to be removed within the entire servitude. It may affect single individuals of protected species.

Magnitude: The potential magnitude of this impact will be low (may cause a slight impact on population or ecosystem processes), due to the small number of trees that are likely to be affected.

Probability: It is highly likely that there will be protected trees affected.

Mitigation measures: Undertake a walkthrough survey of the selected route, once tower positions are known, in order to determine the exact number of individuals of each species that will be affected. Although not considered a mitigation measure, a permit would need to be obtained for any protected trees that are affected, so a legal obligation remains to determine the presence of protected trees irrespective of the significance of the impact. If large numbers of trees will be affected, then additional biodiversity offsets or planting programmes will be required.

Nature: Loss of individuals of protected trees		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (40)**	**low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To some degree	
Mitigation: Undertake a walkthrough survey of the selected route, once tower positions are known, in order to determine the exact number of individuals of each species that will be affected. Obtain a permit for any protected trees that have to be destroyed in order to construct the powerline. If large numbers of trees will be affected then additional		

biodiversity offsets or planting programmes will be required.
Cumulative impacts: Impacts due to alien invasions and damage to watercourses may possibly cause damage to habitat where protected trees could grow that may exacerbate this impact.
Residual Impacts: None likely

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 5: Loss or fragmentation of indigenous natural vegetation

The remaining natural vegetation on site is classified as Endangered, Vulnerable or Least Threatened. The site also falls within the Cape Floristic Region and affects areas classified as important corridors or habitats in the ECBCP. Powerlines are situated primarily in previously disturbed parts of the landscape. It is not expected that powerline towers will have a major effect on natural vegetation, due to the small footprint of each tower structure, but it is still possible that insensitive development could cause impacts.

Extent: The impact will occur at the site of the proposed powerline tower structures. The construction of the tower structures potentially affects a small proportion of natural vegetation on site and is scored as local.

Duration: The impact will occur during construction, but will be long-term. Effective revegetation could reduce this to a medium-term impact.

Magnitude: At a local scale, the impact is likely to result in a slight impact on processes, which is scored as low.

Probability: According to the provided layout, it is highly probable that the impact will occur. All powerline alternatives cross areas of natural vegetation. However, for Option A, it is definite that there will be impacts.

Mitigation measures:

1. Align the powerline as much as possible near to existing roads and tracks to minimize the need for construction or maintenance of additional service roads.
2. Unnecessary impacts on surrounding natural vegetation must be avoided. The construction impacts must be contained to the servitude of the powerline.
3. Disturbed areas must be rehabilitated as quickly as possible.

Nature: Loss of habitat within indigenous natural vegetation types		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Long-term (4)	medium-term (3)
Magnitude	low (4) / moderate (6) (Option A)	low to minor (3)
Probability	Highly probable (4) / definite (5) (Option A)	probable (3)
Significance	**medium (36)** **medium (55) (Option A)**	**low (21)**
Status (positive or negative)	negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes

Can impacts be mitigated?	No	
Mitigation: (1) Align the powerline as much as possible near to existing roads and tracks to minimize the need for construction or maintenance of additional service roads. (2) Avoid unnecessary impacts on natural vegetation surrounding the powerline. (3) Disturbed areas must be rehabilitated as quickly as possible		
Cumulative impacts: Soil erosion, alien invasions, damage to wetlands may all lead to additional loss of habitat that will exacerbate this impact.		
Residual Impacts: Some loss of natural vegetation type is likely to occur, but only a small extent is potentially at risk.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 6: Damage to wetlands/watercourses

All the overhead powerline options cross wetlands / watercourses in various places.

Extent: The impact will occur at the site of the proposed powerline tower structures. The extent of the potential impact is therefore on the local scale.

Duration: The impact will occur during construction, but will probably result in impacts that have a long-term effect.

Magnitude: In the long-term, impacts will result in a slight impact on processes, which is scored as low.

Probability: According to the provided layout, it is highly probable that the impact will occur.

Mitigation measures:

1. Tower structures must be placed outside wetland boundaries. It should be possible for all powerlines to span any wetlands or watercourse.
2. If watercourses cannot be avoided, there is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.

Nature: Damage to wetland areas resulting in hydrological impacts		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	low (4)	minor (2)
Probability	Highly probable (4)	probable (3)
Significance	**medium (36)**	**low (21)**
Status (positive or negative)	negative	negative
Reversibility	Irreversible	Reversible to some degree
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) Place powerline tower structures a minimum of 50 m outside wetland boundaries, OR (2) obtain a permit from DWA to impact on any wetland or water resource.		
Cumulative impacts:		

Soil erosion, alien invasions, may lead to additional impacts on wetland habitats that will exacerbate this impact.
Residual Impacts: Despite proposed mitigation measures, it is expected that this impact will still occur to some degree.

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 7: Establishment and spread of declared weeds and alien invader plants

Powerlines are situated primarily in previously disturbed parts of the landscape. It is therefore expected that conditions favouring the establishment and spread of alien invasive plants will be moderately enhanced.

Extent: The impact will occur at the site of the proposed powerline, but could potentially spread into the surrounding landscape, depending on the habitat and the alien species that could potentially invade the site. The impact will therefore be evaluated at a scale of site and surroundings.

Duration: The impact will be of long-term duration.

Magnitude: Due to the current partially disturbed nature of the potentially affected part of the proposed alignments and the severe potential invasive problem that could develop in the absence of control, the impact is likely to be low (will result in a slight impact on ecological processes. This is especially true of larger contiguous areas of vegetation, as occurs in the northern parts of alignment Option A, where the impact is likely to be moderate (will result in processes continuing but in a modified way).

Probability: It is assessed as probable that this impact will occur in the absence of control measures.

Mitigation measures: Disturbance of indigenous vegetation must be kept to a minimum. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be controlled so as to avoid the development of a soil seed bank of alien plants within the stock-piled soil. Any alien plants must be immediately controlled to avoid establishment of a soil seed bank. An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.

Nature: Establishment and spread of declared weeds and alien invader plants		
	Without mitigation	**With mitigation**
Extent	Site & surroundings (2)	Site & surroundings (2)
Duration	Long-term (4)	long-term (4)
Magnitude	low (4) / (moderate (6) (Option A)	low (4)
Probability	probable (3)	improbable (2)
Significance	**medium (30) / medium (36) (Option A)**	**low (20)**
Status (positive or negative)	negative	negative
Reversibility	Reversible	Reversible
Irreplaceable loss of	Yes	Yes

resources?		
Can impacts be mitigated?	To some degree	
Mitigation: (1) keep disturbance of indigenous vegetation to a minimum (2) rehabilitate disturbed areas as quickly as possible (3) do not translocate soil stockpiles from areas with alien plants (4) control any alien plants immediately to avoid establishment of a soil seed bank that would take decades to remove (5) establish an ongoing monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Access roads and underground cables between turbines

Turbines will be linked by a network of internal access roads, which is also the planned position of the underground cables linking the turbines to one another and to the internal substation. The layout of the internal access roads is unknown. An estimate was made of likely road positions, in order to make an assessment of potential impacts. Turbines are mostly within close proximity to existing roads on site. For the purposes of the impact assessment, it was therefore assumed that the shortest distance to the turbine from an existing road will be the preferred route of internal access roads and, where turbines are located close to one another, that internal access roads is likely to link these turbines.

Impact 1: Impacts on bats

There is one near threatened bat species that could potentially be affected by the proposed wind energy facility. This is the Natal long-fingered bat (NT). This is a cave-dwelling species that may form colonies of many hundreds of thousands of individuals. They roam up to 15 km from roosting sites to find prey at night. No caves, mines or rock crevices were found on site. Internal access roads and underground cables will not affect bats except in terms of a small loss in habitat, especially for foraging.

Extent: The impact will occur at the site of the proposed internal access roads.

Duration: The impact will occur during construction and will be permanent.

Magnitude: The impact will be small (will have no impact on processes).

Probability: It is improbable that any impact will occur.

Mitigation measures: None required.

Nature: Impacts on individuals of bat species of conservation concern		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	permanent (5)	permanent (5)
Magnitude	small (0)	small (0)
Probability	improbable (2)	improbable (2)
Significance	**low (12)**	**low (12)**
Status (positive or negative)	negative	negative

Reversibility	Reversible to some degree	Reversible to some degree
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Not required	
Mitigation: (1) None.		
Cumulative impacts: No.		
Residual Impacts: Will not be residual impacts.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 2: Impacts on threatened terrestrial animal species

There are two Near Threatened animal species that may be affected by construction activities on site. One, the Brown Hyaena is mobile and will not be affected by construction or operation of the facility. The other, the Yellow-bellied House Snake, may occur on site, but it is unknown. It has a wide distribution and the conservation status of the species will not be affected by construction on site. Construction of internal access roads will lead to some loss of habitat for these species

Extent: The impact will be local.

Duration: The impact will occur during construction and will be medium-term (if a population is affected, the duration will be until the population has recovered from any potential impact). However, loss of habitat is likely to be permanent.

Magnitude: At a local scale, the impact is likely to result in a slight impact on population processes for the affected species, which is scored as low.

Probability: It is improbable that the impact will occur (it is not known whether the species of concern, the Fynbos Golden Mole, will be affected or not - if they occur it is improbable that they will be affected). Based on the estimated position of internal access roads, no highly suitable habitat will be affected.

Mitigation measures: None

Nature: Impacts on individuals of threatened animal species		
	Without mitigation	**With mitigation**
Extent	local (3)	local (3)
Duration	permanent (5)	permanent (5)
Magnitude	low (4)	low (4)
Probability	improbable (2)	improbable (2)
Significance	**low (24)**	**low (24)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Not required	
Mitigation: (1) None		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions) may exacerbate this impact.		
Residual Impacts: Likely to be residual impacts only if the impact actually occurs, which is considered unlikely.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 3: Impacts on threatened plants

There are four threatened and two near threatened species that could occur in habitats away from the dunes in the southern parts of the site and could therefore be affected by proposed infrastructure. None of these species occur in disturbed habitats, which is where all the turbines are proposed to be placed. One species, *Bobartia macrocarpa*, listed as Vulnerable, was recorded on site on the farm Klip Rug and on the Remainder of farm 678. No infrastructure is proposed for these areas. One species (*Protea coronata*) has been previously recorded at a number of locations close to the national road, although the accuracy of the latitude-longitude positions sourced requires verification considering the number of sitings in and around the study area that are within cultivated lands. Access roads to turbines are therefore unlikely to have an impact on populations of threatened or near threatened plant species, although there are potentially individuals of *Protea coronata* nearby.

Extent: The impact will occur at the site of the proposed internal access roads. The impact will therefore be evaluated at a local scale.

Duration: The impact will be due primarily to construction impacts, which will be permanent.

Magnitude: The magnitude of the impact could potentially be of minor magnitude and loss of one or more individuals will not result in an impact on population processes.

Probability: Given the fact that individuals have been recorded in close proximity to proposed turbines (numbers 1, 2 and 3), the probability of the impact occurring is probable. For all other access roads, it appears possible to approach the turbines without affecting natural habitat or known populations of species of concern.

Mitigation measures: As a precaution, a preconstruction survey for *Protea coronata* should be undertaken at the location of the access roads to turbines 1, 2 and 3 to determine whether this species occurs within the footprint of these roads or not. The species is serotinous and regenerates from seed following fire mortality of adult plants. If any individuals occur there, viable seeds should be collected at the appropriate time of the year and sown within suitable nearby habitats. The best approach would probably be to cut off entire flowering branches and place them within suitable habitat.

Nature: Impacts on plant species of conservation concern		
	Without mitigation	**With mitigation**
Extent	local (1)	local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	minor (2)	minor (1)
Probability	probable (2)	Improbable (2)
Significance	**low (16)**	**Low (14)**
Status (positive or negative)	negative	negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) As a precaution, a preconstruction survey for *Protea coronata* should be undertaken at the location of the access roads to turbines 1, 2 and 3 to determine whether this species occurs within the footprint of these roads or not. (2) If any individuals occur there, viable seeds should be collected at the appropriate time of the year and sown within suitable nearby habitats. The best approach would probably be to cut off entire flowering branches		

and place them within suitable habitat.
Cumulative impacts: None.
Residual Impacts: None

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 4: Loss of individuals of protected tree species

A number of species have a geographic distribution that includes the study area appear on this list, including the following: *Curtisia dentata*, *Ocotea bullata*, *Pittosporum viridiflorum*, *Podocarpus falcatus*, *Podocarpus latifolius* and *Sideroxylon inerme* subsp. *inerme*. Only *Sideroxylon inerme* subsp. *inerme* was found on site, in the dunes area in the southern part of the site. No internal access roads to turbines are proposed for this area and it is considered highly unlikely that any protected trees will be affected by construction of internal access roads. The significance of this impact is rated as zero for this infrastructure component and not assessed further.

Impact 5: Loss or fragmentation of indigenous natural vegetation

The remaining natural vegetation on site is classified as Endangered, Vulnerable or Least Threatened. The site also falls within the Cape Floristic Region and affects areas classified as important corridors or habitats in the ECBCP. Access roads between turbines are not likely to affect areas of remaining natural vegetation. It should be possible to place them in such a way to avoid damage to natural vegetation, although it is possible that incorrect placement could cause an impact of this nature. This potential impact is, therefore, unlikely to occur.

Extent: If an impact occurs, it will occur at the site of the proposed internal access roads. The impact is therefore scored as local.

Duration: The impact will occur during construction, but will be permanent, if it occurs.

Magnitude: At a local scale, the impact will result in processes continuing but in a modified way, which is scored as moderate. The fragmentation effect will also cause ecological processes to continue but in a modified way

Probability: According to the provided layout of turbines, it is considered unlikely that the impact will occur. It is scored as improbable.

Mitigation measures: Internal access roads must make use of existing roads on site, as much as possible. Where new roads are to be constructed, these should follow existing tracks or disturbed areas or the edges of disturbed areas. Where disturbance is unavoidable (considered unlikely), disturbed areas should be rehabilitated as quickly as possible.

Nature: Loss of habitat within indigenous natural vegetation types		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	permanent (5)	permanent (5)
Magnitude	moderate (6)	minor (2)
Probability	improbable (2)	Highly improbable (1)
Significance	**low (24)**	**low (8)**
Status (positive or negative)	negative	negative
Reversibility	Not reversible	Not reversible

Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	No	
Mitigation: (1) Internal access roads must make use of existing roads on site, as much as possible. (2) Where new roads are to be constructed, these should follow existing tracks or disturbed areas or the edges of disturbed areas. (3) Where disturbance is unavoidable (considered unlikely), disturbed areas should be rehabilitated as quickly as possible.		
Cumulative impacts: Soil erosion, alien invasions, damage to wetlands may all lead to additional loss of habitat that will exacerbate this impact.		
Residual Impacts: Some loss of this vegetation type will definitely occur.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 6: Damage to wetlands/watercourses

Internal access roads and underground cable alignments may require wetland crossings between turbines 30 and 31, 5 and 7, 11 and 15, near turbine 8, near turbine 17 and near turbine 25.

Extent: The impact will occur at the site of the proposed internal access roads, but could have downstream impacts. The extent of the potential impact is therefore local and surroundings.

Duration: The impact will occur during construction, but will probably result in impacts that have a permanent effect.

Magnitude: In the long-term, impacts will result in processes continuing but in a modified way, which is scored as moderate.

Probability: According to the provided layout, it is highly probable that the impact will occur.

Mitigation measures: Align internal access roads so that they branch directly from existing roads and go around wetlands as much as possible. If this is not feasible from an engineering perspective and impacts on wetlands cannot be avoided, the following measures will reduce the impacts:

1. Cross watercourses close to existing disturbances.
2. Cross watercourses perpendicularly, where possible, to minimize the construction footprint.
3. Adequate culvert and/or bridge structures are required at crossings.
4. Construction must not cause the width of the watercourse to be narrowed.
5. There is a legal obligation to apply for a Water Use Licence for any wetlands that may be affected, since they are classified in the National Water Act as a water resource.

Nature: Damage to wetland areas resulting in hydrological impacts		
	Without mitigation	**With mitigation**
Extent	local and surroundings (2)	local and surroundings (2)
Duration	Permanent (5)	Medium-term (3)
Magnitude	moderate (6)	low (4)
Probability	Highly probable (4)	Probable (3)

Significance	**medium (52)**	**low (27)**
Status (positive or negative)	negative	negative
Reversibility	Irreversible	Reversible to some degree
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) control stormwater and runoff water and inhibit erosion. (2) Disturbed areas must be rehabilitated as soon as possible. (3) Align internal access roads so that they branch directly from existing roads and go around wetlands as much as possible. If not possible, then the following measures must also be applied: a. obtain a permit from DWAF to impact on any wetland or water resource. b. Cross watercourses close to existing disturbances. c. Cross watercourses perpendicularly, where possible, to minimize the construction footprint. d. Adequate culvert and/or bridge structures are required at crossings. e. Construction must not cause the width of the watercourse to be narrowed.		
Cumulative impacts: Soil erosion, alien invasions, may lead to additional impacts on wetland habitats that will exacerbate this impact.		
Residual Impacts: Despite proposed mitigation measures, it is expected that this impact will still occur to some degree.		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

Impact 7: Establishment and spread of declared weeds and alien invader plants

Internal access roads will create areas of disturbance, but this is within an already disturbed landscape in which aliens have already invaded extensively. It is therefore expected that conditions favouring the establishment and spread of alien invasive plants will be very slightly enhanced, if at all.

Extent: The impact will occur at the site of the proposed internal access roads. The surrounding landscape is already extensively invaded, so the potential to spread into the surrounding landscape is minimal. The impact will therefore be evaluated at a scale of local.

Duration: The impact will occur for the duration of the operation of the facility. This is scored as long-term.

Magnitude: Due to the current disturbed and severe invaded nature of the site, the impact of additional disturbance is unlikely to be enhanced. It is scored as minor. The potential positive impact of clearing aliens from key ecological components of the site could have a moderate positive impact.

Probability: It is assessed as probable that this impact will occur in the absence of control measures.

Mitigation measures: Disturbance of indigenous vegetation must be kept to a minimum. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be controlled so as to avoid the development of a soil seed bank of alien plants within the stock-piled soil. Any alien plants must be immediately controlled, including existing invasions, especially within wetlands and watercourses. An

ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.

Nature: Establishment and spread of declared weeds and alien invader plants		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	minor (2)	moderate (6)
Probability	probable (3)	probable (3)
Significance	**low (21)**	**+medium (33)**
Status (positive or negative)	negative	positive
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	To some degree	
Mitigation: (1) keep disturbance of indigenous vegetation to a minimum (2) rehabilitate disturbed areas as quickly as possible (3) do not translocate soil stockpiles from areas with alien plants (4) control any alien plants, especially within wetlands and watercourses (5) establish an ongoing monitoring programme to detect and quantify any aliens that may become established		
Cumulative impacts: Soil erosion, habitat loss, damage to wetlands may all lead to additional impacts that will exacerbate this impact.		
Residual Impacts: Will probably be very low if control measures are effectively applied		

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

DISCUSSION AND CONCLUSIONS

There are six vegetation type that occurs on site, namely *Tsitsikamma Sandstone Fynbos* (classified as Vulnerable), *Southern Cape Dune Fynbos* (classified as Least Threatened), *Eastern Coastal Shale Band Vegetation* (classified as Endangered), *Garden Route Shale Fynbos* (classified as Endangered), Humansdorp Shale Renosterveld (classified as Endangered), Algoa Dune Strandveld (classified as Least Threatened, but protected under national legislation) and Cape Seashore Vegetation (classified as Least Threatened, but protected under national legislation). The vegetation on site has been classified at a Provincial level, through the Eastern Cape Biodiversity Conservation Plan (ECBCP), as having elevated conservation value. Some parts of the site are considered to have higher conservation value than others. The area is also within the Cape Floristic Region, one of the earth's 25 hotspots. It must be noted that these are broad-level assessments and do not take site-specific conditions into account, for example, the location of remaining areas of natural vegetation. It does, however, provide context in terms of the regional value of such remaining patches.

Factors that may lead to parts of the study area having high ecological sensitivity are the presence of wetlands within the drainage lines on site, potential presence of erodable substrates, the potential presence of various plant and animal species of conservation concern, and protected trees.

Drainage lines, watercourses and wetlands represent particularly vital natural corridors as they function both as wildlife habitat, providing resources needed for survival, reproduction and movement, and as biological corridors, providing for movement between habitat patches. Both functions are potentially critical to conservation of biological diversity as the landscape becomes increasingly fragmented into smaller, more isolated patches (Rosenberg *et al.*, 1997).

The drainage lines on site drain into two main systems that lead to the sea via the Klipdrif and Tsitsikamma Rivers. The site constitutes part of the catchment for these rivers. The mouths of the rivers have an estuary, which is considered to be very sensitive and is shown as having high conservation value and sensitivity in the ECBCP. The potential impacts of activities on site on these river systems need to be carefully managed. It is especially important that the estuaries are not affected by activities on site, for example, increased water turbidity due to erosion of substrates into upper reaches of watercourses.

There are eight tree species that are protected under the National Forests Act that have a geographic distribution that includes this area (*Curtisia dentata, Ocotea bullata, Pittosporum viridiflorum, Podocarpus falcatus, Podocarpus latifolius*, *Prunus africana and Sideroxylon inerme* subsp. *inerme*) (Appendix 3). One species, *Sideroxylon inerme* (white milkwood), occurs in large numbers within the vegetated dune cordon at the southern side of the site as well as scattered individuals in drainage lines and on small rocky outcrops within fynbos areas. Any impacts on individuals of any of these species require a permit from the relevant National Department.

Parts of the site are still in natural condition or considered to be natural vegetation; while a large proportion of the site is transformed by agriculture and dense invasion by alien trees. All transformed and/or degraded areas have been classified as having low ecological sensitivity, whereas natural areas have high or very high sensitivity. The area with very high ecological sensitivity is the vegetated dune cordon in the southern parts of the site, whereas drainage lines and remaining patches of fynbos are classified here as having high sensitivity.

There are fifteen plant species of conservation concern that could occur in available habitats in the study area. This includes one species classified as Critically Endangered, two species classified as Endangered, eight as Vulnerable and four as Near Threatened. The area of dunes in the southern part of the site appears to be key habitat for many of these species, although there are some species that may occur in other localities on site.

There are four animal species of conservation concern that may occur in habitats within the study area that may be affected by the proposed WEF. All four are classified as Near Threatened.

A proposed layout was provided which indicates that turbines will be placed in the northern two-thirds of the site and will not affect remaining areas of natural vegetation on site. The highly sensitive dune cordon in the southern part of the site will not be affected by the proposed project.

A risk assessment was undertaken which identified seven main potential impacts on the ecological receiving environment. The significance of these impacts was assessed after collection of relevant field data. The identified potential negative impacts are the following:

1. Impacts on bats.
2. Impacts on threatened animals.
3. Impacts on threatened plants.
4. Impacts on protected tree species.
5. Impacts on indigenous natural vegetation.
6. Impacts on wetlands and estuary.
7. Establishment and spread of declared weeds and alien invader plants.

A summary of the significance of impacts before and after proposed mitigation measures is provided in Table 5 below. Due to the wise placement of turbines by the developer in the less sensitive parts of the site, there are very few potential impacts of concern. The most important of these are discussed further.

As with all wind energy projects, there is a potential concern due to impacts on bats. The only species of conservation concern for this site is the near threatened Natal Long-fingered Bat. The potential significance of impacts on this species was rated as medium. In order to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site, it is recommended that a preconstruction survey for bats should be undertaken. Further mitigation measures are proposed if this pre-construction survey delivers a positive result with respect to the presence of individuals or roosting sites at a level that may be of concern.

The site is currently heavily invaded by alien plants. This provides a unique opportunity for this project to have a positive impact on the local ecology. Effective clearing and management of alien trees in specific parts of the site could have a net positive impact on the ecological functioning of the site. The areas which could benefit strongly are watercourses and remaining patches of natural vegetation. The developer is encourages to maximise this opportunity, which could be considered to be a biodiversity offset for potential impacts or even a net positive impact.

The proposed powerline could potentially have various impacts, including on plant species of conservation concern, protected trees and natural vegetation, and could result in conditions that favour the introduction and/or spread of alien trees. The eventual impact would be very site-specific and may depend on which alignment is eventually selected. Within this alignment, there would be the opportunity to fine-tune the alignment and the position of tower structures

to avoid many potential impacts. Appropriate measures are proposed to meet these objectives, including the undertaking of a pre-construction survey to identify any specific features of concern and their exact position.

In terms of the different powerline alternatives provided, Option A to the Deep River substation has impacts of slightly greater significance than the other two alignments, although it is shorter. This is due to the single block of natural area in the northern part of the alignment, whereas the other two alignments tend to cross small patches of remaining natural vegetation. Although this alignment scores a slightly worse score than the other two alignments, it is by no means rejected as an alternative. Proposed mitigation measures could reduce impacts along all alignment options to the same significance, all of "low" significance.

Conclusion

The overall impacts of this proposed project are of low or moderate significance. With mitigation measures implemented, it should be possible to reduce all negative impacts to low or zero significance. In addition, there is an opportunity to have a positive impact on the site through judicious clearing of alien vegetation. Taking these factors into consideration, this project is supported from an ecological point of view.

Table 5: Summary of the significance of impacts for different infrastructure components before and after mitigation.

Impact	Wind turbines		Overhead powerline		Underground cables & access roads	
	Without mitigation	With mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation
1. bats	medium (44)	low (27)	low (14)	low (14)	low (12)	low (12)
2. threatened animals	low (24)	low (24)	low (14)	low (14)	low (24)	low (24)
3. threatened plants:	low (12)	low (8)	medium (32)	low (12)	low (16)	low (14)
4. protected trees	zero (0)	zero (0)	medium (40)	low (27)	zero (0)	zero (0)
5. natural vegetation	zero (0)	zero (0)	medium (36)	low (21)	low (24)	low (8)
Powerline Option A			medium (55)			
6. wetlands	low (24)	low (16)	medium (36)	low (21)	medium (52)	low (27)
7. alien plants	low (21)	medium+ (+33)	medium (30)	low (20)	low (21)	medium+ (+33)
Powerline Option A			medium (36)			

*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

MANAGEMENT PLAN

Control measures are only proposed for those impacts where mitigation measures are proposed to reduce the significance of impacts, i.e. some impacts are of low significance and thus no mitigation measures are proposed or no mitigation measures are possible or required.

Impacts on bats

OBJECTIVE: Monitor impacts on bats due to turbine blade collisions	
Project component/s	Turbines
Potential Impact	Loss of individuals of the threatened bat species
Activity/risk source	Operation
Mitigation: Target/Objective	Target: low mortalities within project control area Time period: operation

Mitigation: Action/control	Responsibility	Timeframe
(1) A preconstruction survey for bats should be undertaken to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site. (2) If this preconstruction survey finds that the presence of bats or roosting habitats of concern occur, then a monitoring programme should be implemented to document the effect of wind turbines on bat species of concern. (3) If the turbines are found to have a significant negative impact on bats then further measures will need to be implemented to control the impact, for example, halting operation during low wind conditions.	Management (environmental officer),	operation

Performance Indicator	Number of individuals killed by turbine blades within project area
Monitoring	• Record bat mortalities and, as far as possible, the circumstances surrounding collisions. Standard protocols should be used when undertaking such surveys.

Impacts on protected trees

OBJECTIVE: Monitor impacts on protected trees	
Project component/s	Powerline
Potential Impact	Loss of individuals of protected tree species
Activity/risk source	Construction
Mitigation: Target/Objective	Target: low mortalities within project control area Time period: construction

Mitigation: Action/control	Responsibility	Timeframe
(1) Undertake a walkthrough survey of the selected route, once tower positions are known, in order to determine the exact number of individuals of each species that will be affected. (2) Where possible, re-position infrastructure so that individuals of protected trees are not affected. (3) If it is not possible to avoid destroying trees, a permit is required from Dept. of Forestry for removal of trees or damage to trees. The permit requires the identity, number, size and condition of each tree that will be affected. (4) If large numbers of trees will be affected then additional biodiversity offsets or planting programmes will be required.	Management (environmental officer),	construction

Performance Indicator	Number of individuals lost within project area
Monitoring	• None required.

Impacts on threatened plants

OBJECTIVE: Limit impacts on threatened plants

Project component/s	Any infrastructure or activity that will result in disturbance to habitat suitable for threatened plant species or to populations of threatened plant species
Potential Impact	Loss of habitat suitable for or populations of threatened plant species
Activity/risk source	Construction, environmental management
Mitigation: Target/Objective	Target: no significant impacts on identified suitable habitat or populations of threatened plant species within project control area Time period: construction, operation

Mitigation: Action/control	Responsibility	Timeframe
(1) As a precaution, a preconstruction survey for *Protea coronata* should be undertaken at the location of turbines 1, 2 and 3 and at the location of the access roads to turbines 1, 2 and 3 to determine whether this species occurs within the footprint of these turbines or not. (2) If any individuals occur there, viable seeds should be collected at the appropriate time of the year and sown within suitable nearby habitats. The best approach would probably be to cut off entire flowering branches and place them within suitable habitat. (3) Undertake a pre-construction walk-through survey of the servitude of the selected powerline route to determine whether any individuals of plant species of concern occur there or not. (4) If possible, avoid affected populations by shifting powerline tower structures slightly. (5) Depending on the species potentially affected, other measures appropriate to the ecology of the species may be possible to mitigate impacts, for example collecting seed and sowing it in suitable nearby habitat. A qualified botanist should be consulted in such cases and measures determined in consultation with relevant authorities.	Construction team, management (environmental officer),	construction, operation

Performance Indicator	No loss of individuals or populations of threatened plant species
Monitoring	• On the basis of pre-construction walk-through surveys, determine whether any individuals of affected species were lost to construction activities.

Impacts due to alien invasive plants

OBJECTIVE: Control alien invasive plants

Project component/s	Any infrastructure or activity that will result in disturbance to natural areas
Potential Impact	Invasion of natural vegetation surrounding the site by declared weeds or invasive alien species
Activity/risk source	Construction, environmental management
Mitigation: Target/Objective	Target: no alien plants within project control area Time period: construction, operation

Mitigation: Action/control	Responsibility	Timeframe
(1) avoid creating conditions in which alien plants may become established: a. keep disturbance of indigenous vegetation to a minimum b. rehabilitate disturbed areas as quickly as possible c. do not import soil from areas with alien plants (2) establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act) (3) immediately control any alien plants that become established using registered control methods	Construction team, management (environmental officer),	construction, operation

Performance Indicator	For each alien species: number of plants and aerial cover of plants within project area and immediate surroundings
Monitoring	• Ongoing monitoring of area by environmental control officer during construction • Ongoing monitoring of area by environmental manager during operation • Annual audit of project area and immediate surroundings by qualified botanist. If no species are detected, then this can be stated. If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. The environmental manager should be responsible for driving this process. Reporting frequency depends on legal compliance framework.

Impacts on indigenous natural vegetation

OBJECTIVE: Control loss of indigenous natural vegetation

Project component/s	Any infrastructure or activity that will result in disturbance to natural areas
Potential Impact	Loss of indigenous natural vegetation due to construction activities
Activity/risk source	Construction
Mitigation: Target/Objective	Target: minimal loss of natural vegetation Time period: construction

Mitigation: Action/control	Responsibility	Timeframe
(1) Align the powerline as much as possible near to existing roads and tracks to minimize the need for construction or maintenance of additional service roads. (2) Unnecessary impacts on surrounding natural vegetation must be avoided. (3) Internal access roads must make use of existing roads on site, as much as possible. (4) Where new roads are to be constructed, these should follow existing tracks or disturbed areas or the edges of disturbed areas. (5) The construction impacts must be contained to the footprint or servitude of the infrastructure. (6) Unnecessary impacts on surrounding natural vegetation must be avoided. (7) Rehabilitate any disturbed areas immediately to stabilize landscapes.	Construction team, management (environmental officer),	construction

Performance Indicator	Loss of natural vegetation only within designated footprint or servitude of infrastructure.
Monitoring	• No loss of natural vegetation outside footprint or servitude of infrastructure.

Impacts on wetlands

OBJECTIVE: Limit damage to wetlands & watercourses

Project component/s	Any infrastructure or activity that will result in disturbance to wetlands
Potential Impact	Damage to watercourses areas by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation, dumping of material within wetlands). The focus should be on the functioning of the watercourse as a natural system
Activity/risk source	Construction, operation
Mitigation: Target/Objective	Target: no damage to watercourses within project area Time period: construction, operation

Mitigation: Action/control	Responsibility	Timeframe
(1) Turbine 8 should be moved 30 m westwards along the existing access track and turbine 25 should be moved 20 south-west of its current position. (2) Align internal access roads so that they branch directly from existing roads and go around wetlands as much as possible. If not possible, then the following measures must also be applied: a. obtain a permit from DWAF to impact on any wetland or water resource. b. Cross watercourses close to existing disturbances. c. Cross watercourses perpendicularly, where possible, to minimize the construction footprint. d. Adequate culvert and/or bridge structures are required at crossings. e. Infrastructure (including culverts and/or bridges) should not be placed within drainage line channels but should span them completely. f. Construction must not cause the width of the watercourse to be narrowed. g. rehabilitate any disturbed areas as quickly as possible h. control stormwater and runoff water (3) Powerline tower structures must be placed outside wetland boundaries (a minimum of 50 m away).	Construction team, management, environmental control officer	Construction, operation

Performance Indicator	No impacts on wetland vegetation, natural status of watercourses
Monitoring	• Habitat loss in watercourses should be monitored before and after construction. • The presence and development of erosion features downstream of any construction through wetlands must be monitored.

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APPENDICES:

Appendix 1: Plant species of conservation importance that have historically been recorded in the study area.

*IUCN (3.1) Categories:
VU = Vulnerable
EN = Endangered
CR = Critically Endangered
NT = Near Threatened

Table A: Threatened, Near Threatened and Declining plant species that have been previously recorded in the study area

Taxon	Habitat	Global IUCN (3.1) category*	Likelihood of occurrence
Bobartia macrocarpa	Flat open grassy patches, Kareedouw to Grahamstown. Previously recorded at Kruisfontein on road verge near Kromhout Farm near Oyster Bay. 34° 07'S, 24° 37'E. Cultivated land, grazed, disturbed. Grassy Fynbos. Remnant on road verge, very little habitat left.	VU	**HIGH**, previously recorded just to east of site in similar habitat as that found on site.
Curtisia dentata	At a range of altitudes in evergreen forest, on grassy mountain slopes and as a small bushy tree in coastal scrub forest.	NT	**HIGH**, geographical distribution includes study area. Suitable habitat may occur on site.
Dioscorea elephantipes	Rocky (quartzites and shales) east facing hillsides. In this region it is found in the Gamtoos River valley. In wooded kloof, Duineveld, Slang River. (1877)	Declining	**LOW**
Disa lugens var. lugens	Found in acidic as well as alkaline sands. Sea level to 1450 m. Found on coastal lowlands as well as mountain slopes and plateaus. Cape Peninsula to Cathcart, mountains and coast. Previously found near Oyster Bay in the vicinity of White Point.	EN	**HIGH**, previously recorded from Oyster Bay in dune habitat that is found in southern part of site.
Erica glumiflora	Stabilised sand dunes, often on calcrete (limestone) near coast. Wilderness to East London.	VU	**HIGH**, previously recorded at Klipdrift
Erica zeyheriana	Remnant lowland grassy fynbos on sand, Oyster Bay to Port Elizabeth. Previously recorded at: • Slang Rivier, duine veld • West of Oyster bay, north of Beacon 97. Deep acid soil. Hump in ploughed fields. Locally abundant. • W of Oyster Bay, NW of Beacon 97. Fixed dunes, deep acid sand, short fynbos on S side. • Dunes west of Oyster	VU	**HIGH**, previously recorded near to site in similar habitat as found on site

Taxon	Habitat	Global IUCN (3.1) category*	Likelihood of occurrence
	Bay. Klippe Drift 722. Low ridge SSW of farmstead. S 34°08.753' x E 24°34.035'.		
Erica glandulosa subsp. fourcadei	Humansdorp to Mossel Bay, on coastal forelands and low mountain slopes. Coastal dunes and sandy soils, coastal cliffs and shallow soils on TMS. In study area, found on peaty sandy flats with short fynbos.	VU	**HIGH**, previously recorded near Humansdorp at Kromrivier in habitat similar to that found in the southern part of the site. Found in both grids in which study area is located.
Erica humansdorpensis	Humansdorp. 8km W of Humansdorp turnoff from the N2 and at Clarkson. Appears to occur on low mountain slopes and footslopes on coastal side of Tsitsikamma range.	CR	**MEDIUM**, could occur in area near N2 in northern part of study area.
Eulophia speciosa	Coastal areas from Sedgefield in the Western Cape to KZN north coast and inland from KZN onto the Highveld. In area that includes study area, found on coastal sands.	Declining	**HIGH**, suitable habitat in dune area in south of site.
Gasteria nitida var. armstrongii	Coastal renosterveld of lower Gamtoos valley. Old river bed.	CR	**LOW**, previously recorded 10 km W of Gamtoos River.
Leucadendron conicum	Coastal mountain ranges from Van Stadens Mountain near Port Elizabeth to Langeberg inland of Albertinia.	NT	**LOW**
Osteospermum pterigoideum	Low sandstone slopes near Humansdorp. Previously recorded from Clarkson and Humansdorp. Only two known localities for this species remaining.	EN	**HIGH**, previously recorded 18 miles W of Humansdorp, which is approximately the northern parts of the site.
Pauridia minuta	Langebaan to Riversdale. Previously recorded at: • N of Mpofu Dam & W of road from Humansdorp to the dam wall, situated close to the entrance gate to the dam property. DWAF property • 34°05'03.6" S; 24°41'31.0" E • 11 MI. W. OF HUMANSDORP	NT	**MEDIUM**, previously recorded to east of site in habitat that may be similar to that found on site
Pentaschistis longipes	Restricted to stabilized sand dunes around Humansdorp, usually near trees. Previously found at Brakkeduine near Oyster Bay. 34º10'16"S 24º39'46"E	VU	**HIGH**, previously recorded from Oyster Bay in dune habitat that is the same as that found in the extreme southern part of site.
Protea coronata	Cape Peninsula to Kouga centres of endemism. A variety of habitats, but especially Shale and Granite Fynbos in moist, south-facing situations. WITTE ELS BOSCH	NT	**MEDIUM**, suitable habitat may occur on site.
Psoralea repens	Eastern and Western Cape coastal areas from Saldanha Bay on the Atlantic coast to Alexandria east of Port	NT	**HIGH**, suitable habitat occurs in southern part of site.

Taxon	Habitat	Global IUCN (3.1) category*	Likelihood of occurrence
	Elizabeth. Coastal dunes.		
Rapanea gilliana	From Kliprivier Mouth, or Slangbaai, (just west of Cape St Francis) to Port Alfred. Coastal sand dunes. Duineveld scrub on coast. Slangbaai.	EN	**HIGH**, previously recorded from Slangbaai in dune habitat that is found in southern part of site.
Satyrium princeps	Restricted coastal distribution between Wilderness in the southern Cape to Port Alfred in the Eastern Cape, seldom above altitudes of 150 m. Amongst bushes in open places on fixed dunes close to the shoreline. Previously found at Klipdrift. 34º7'52"S 24º33'27"E	VU	**HIGH**, previously recorded 5 km east of site in dune habitat similar to that found in the southern part of the site.
Selago rotundifolia	Knysna to Port Elizabeth, grassy fynbos flats and possibly also forest margins. Previously found near Klipdrift.	VU	**MEDIUM**, previously recorded from Klipdrift and suitable habitat may occur in southern part of site.

* Conservation Status Category assessment according to IUCN Ver. 3.1 (IUCN, 2001), as evaluated by the Threatened Species Programme of the South African National Biodiversity Institute in Pretoria

Appendix 2: Vertebrate species of conservation concern with a geographical distribution that includes the current study area.
(included are species previously listed, but currently considered to be Least Concern)

MAMMALS

Common name	Order/ Family	Taxon	Habitat[1]	Status[2]	Likelihood of occurrence
ARTIODACTYLA / PERISSODACTYLA					
Oribi	Artiodactyla / Bovidae	*Ourebia ourebi*	Open grasslands with gentle topography at lower altitudes. Mosaic of tall and short grasses required to meet resting and feeding requirements.	LC, (was EN)	**LOW**, previously recorded in grid to east, but no suitable habitat on site
Blue duiker	Artiodactyla / Bovidae	*Philantomba monticola*	Coastal and afromontane forests as well as coastal thickets, selective forager in litter and fruits	LC, (was VU)	**HIGH**, previously recorded in grid to east and north-west
CARNIVORA					
Brown hyena	Carnivora / Hyaenidae	*Hyaena brunnea*	Savanna, urban areas, scavenger	NT	**MEDIUM**, previously recorded in grid to north.
Honey badger	Carnivora / Mustelidae	*Mellivora capensis*	Wide variety of habitats. Probably only in natural habitats.	LC, (was NT)	**HIGH**, previously recorded in grid & neighbouring grids
African weasel	Carnivora / Mustelidae	*Poecilogale albinucha*	Moist grassland or woodland with more than 700 mm rainfall per year and where flourishing populations of small rodents occur. Grassland, scrub woodland. The distribution range of this animal covers the west coast of South Africa from Garies southward into the western Cape coastal belt, east and north-east Northern Cape, and all other provinces	LC, (was DD)	**MEDIUM**, not previously recorded in grids, but overall geographical distribution includes this area.
CHIROPTERA					
Lesser woolly bat	Chiroptera / Vespertilionidae	*Kerivoula lanosa*	Afromontane and riparian forest. Insectivore.	LC, (was NT)	**MEDIUM**, not previously recorded in grid, but overall geographical distribution includes this area.
Lesser long-fingered bat	Chiroptera / Vespertilionidae	*Miniopterus fraterculus*	Savanna, shrubland Afromontane and coastal forest. Cave-dwelling aerial insectivore	LC, (was NT)	**HIGH**, not previously recorded in grid, but overall geographical distribution includes this area.
Natal long-fingered bat	Chiroptera / Vespertilionidae	*Miniopterus natalensis*	Caves and sub-terranean habitats in Fynbos, savanna, woodland, succulent and Nama Karoo, grassland; cave-dwelling aerial insectivore.	NT	**HIGH**, previously recorded in neighbouring grid to north.
Temminck's hairy bat	Chiroptera / Vespertilionidae	*Myotis tricolor*	Caves in forests, shrubland, savanna, grassland, mountains; cave-dwelling aerial insectivore.	LC, (was NT)	**MEDIUM**, site within distribution range, but no

Common name	Order/ Family	Taxon	Habitat[1]	Status[2]	Likelihood of occurrence
					records in grid or neighbouring grids.
Cape horseshoe bat	Chiroptera / Rhinolophidae	*Rhinolophus capensis*	Caves and subterranean habitats; fynbos, shrubland and Nama-karoo in western and south-western parts of South Africa	LC, (was NT)	**HIGH**, previously recorded in grid
Geoffroy's horseshoe bat	Chiroptera / Rhinolophidae	*Rhinolophus clivosus*	Caves and subterranean habitats; fynbos, shrubland, grassland, succulent and Nama-karoo; insectivore	LC, (was NT)	**MEDIUM**, not previously recorded in grid, but overall geographical distribution includes this site & recorded in grid to north.
INSECTIVORA					
Fynbos golden mole	Insectivora / Chrysochloridae	*Amblysomus corriae*	Lowland fynbos and Knysna forest, also in urban areas. Prefers sandy soils with deep litter layer.	NT	**HIGH**, recorded in grid, substrate properties on site suitable for this species.
Hottentott's Golden Mole	Insectivora / Chrysochloridae	*Amblysomus hottentotus*	Subterranean habitats; mainly Eastern Cape and KwaZulu-Natal; savanna, grassland and fynbos.	LC, (was DD)	**LOW**, just outside western edge of distribution, previously recorded in nearby grid (to east)
Duthie's Golden Mole	Insectivora / Chrysochloridae	*Chlorotalpa duthieae*	Alluvial sand and sandy loam with abundant leaf litter. Coastal species that is restricted to forests within its range.	VU (was LC)	**LOW**, previously recorded in grid and neighbouring grid to west and east, substrate properties on site suitable for this species, but indigenous forest absent.
Reddish-grey musk shrew	Insectivora / Soricidae	*Crocidura cyanea*	Wide variety of habitats. Nocturnal, terrestrial.	LC, (was DD)	**MEDIUM**, not previously recorded in grids, but overall geographical distribution includes this area.
Greater musk shrew	Insectivora / Soricidae	*Crocidura flavescens*	Wide variety of habitats, but favours some cover. Also urban areas, disturbed areas.	LC, (was DD)	**MEDIUM**, previously recorded in neighbouring grid.
Forest shrew	Insectivora / Soricidae	*Myosorex varius*	Wide variety of vegetation types, usually primary. Terrestrial habitats adjacent to wetlands; forest	LC, (was DD)	**MEDIUM**, previously recorded in neighbouring grid.
Least dwarf shrew	Insectivora / Soricidae	*Suncus infinitesimus*	Terrestrial, nocturnal	LC, (was DD)	**MEDIUM**, previously recorded in neighbouring grid.

Common name	Order/ Family	Taxon	Habitat[1]	Status[2]	Likelihood of occurrence
Woodland mouse	Insectivora / Soricidae	*Grammomys dolichurus*	Riverine forest, thickets and woodland, terrestrial, arboreal	LC, (was DD)	**MEDIUM**, not previously recorded in grids, but overall geographical distribution includes this area.

[1]Distribution according to Friedmann & Daly 2004.
[2]Status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. (www.iucnredlist.org). Downloaded on 09 November 2010.

AMPHIBIANS

Common name	Species	Habitat	Status[2]	Likelihood of occurrence
Eastern Leopard Toad	*Amietophrynus pardalis*	Thornveld and open savanna in the Eastern Cape. Breed in open water and forage some distance from the water.	Declining	**LOW**, within distribution range, but habitats on site not suitable.

[2]Status according to du Preez & Carruthers 2009.

REPTILES

Common name	Species	Habitat[3]	Status	Likelihood of occurrence
Elandsberg Dwarf Chameleon	*Bradypodion taeniabronchum*	Montane fynbos.	CR	**LOW**, within distribution range, but habitats on site not suitable.
Peringey's Coastal Leaf-toed Gecko	*Craptactites peringueyi*	Livs among clumps of salt marsh vegetation, known from the lower reaches of the Kromme River and Chelsea Point near Port Elizabeth.	DD	**LOW**, within distribution range, but habitats on site not suitable.
Spotted rock snake	*Lamprophis guttatus*	Rocky habitats under exfoliating rock flakes and in narrow rock crevices. Found in fynbos, karoo scrub, grassland, moist savanna and lowland forest.	Rare[3]	**MEDIUM**, within overall distribution range and habitats may be available on site in restricted areas.
Yellowbellied house snake	*Lamprophis fuscus*	Old termitaria and under stones, underground. Found throughout more mesic parts of South Africa (Cape, east coast, Highveld). Appears to favour rocky habitats.	NT[4]	**MEDIUM**, within overall distribution range and habitats may be available on site.

[3]Status according to Branch 1988.
[4]Status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. (www.iucnredlist.org). Downloaded on 09 November 2010.

Appendix 3: List of protected tree species (National Forests Act).

Acacia erioloba	*Acacia haematoxylon*
Adansonia digitata	*Afzelia quanzensis*
Balanites subsp. *maughamii*	*Barringtonia racemosa*
Boscia albitrunca	*Brachystegia spiciformis*
Breonadia salicina	*Bruguiera gymnhorrhiza*
Cassipourea swaziensis	*Catha edulis*
Ceriops tagal	*Cleistanthus schlectheri* var. *schlechteri*
Colubrina nicholsonii	*Combretum imberbe*
Curtisia dentata	*Elaedendron transvaalensis*
Erythrophysa transvaalensis	*Euclea pseudebenus*
Ficus trichopoda	*Leucadendron argenteum*
Lumnitzera racemosa var. *racemosa*	*Lydenburgia abottii*
Lydenburgia cassinoides	*Mimusops caffra*
Newtonia hildebrandtii var. *hildebrandtii*	*Ocotea bullata*
Ozoroa namaquensis	*Philenoptera violacea* (*Lonchocarpus capassa*)
Pittosporum viridiflorum	*Podocarpus elongatus*
Podocarpus falcatus	*Podocarpus henkelii*
Podocarpus latifolius	*Protea comptonii*
Protea curvata	*Prunus africana*
Pterocarpus angolensis	*Rhizophora mucronata*
Sclerocarya birrea subsp. *caffra*	*Securidaca longependunculata*
Sideroxylon inerme subsp. *inerme*	*Tephrosia pondoensis*
Warburgia salutaris	*Widdringtonia cedarbergensis*
Widdringtonia schwarzii	

Curtisia dentata, Ocotea bullata, Pittosporum viridiflorum, Podocarpus falcatus, Podocarpus latifolius and Sideroxylon inerme subsp. *inerme* have a geographical distribution that coincides with the study area.

Appendix 4: Checklist of plant species recorded during previous botanical surveys in the quarter degree in which the study area is located and the immediately adjacent grid to the south.

Family	Species	Threat status
FABACEAE	Acacia longifolia (Andrews) Willd.	Exotic
FABACEAE	Acacia pycnantha Benth.	Exotic
FABACEAE	Acacia saligna (Labill.) H.L.Wendl.	Exotic
EUPHORBIACEAE	Acalypha capensis (L.f.) Prain & Hutch.	LC
POACEAE	Acroceras macrum Stapf	LC
ORCHIDACEAE	Acrolophia capensis (P.J.Bergius) Fourc.	LC
ORCHIDACEAE	Acrolophia micrantha (Lindl.) Pfitzer	LC
EUPHORBIACEAE	Adenocline pauciflora Turcz.	LC
PTERIDACEAE	Adiantum capillus-veneris L.	LC
AGAPANTHACEAE	Agapanthus praecox Willd. subsp. praecox	LC
RUTACEAE	Agathosma apiculata G.Mey.	LC
RUTACEAE	Agathosma cerefolium (Vent.) Bartl. & H.L.Wendl.	LC
RUTACEAE	Agathosma dielsiana Schltr. ex Dummer	LC
RUTACEAE	Agathosma hirta (Lam.) Bartl. & H.L.Wendl.	LC
RUTACEAE	Agathosma ovata (Thunb.) Pillans	LC
HYACINTHACEAE	Albuca nelsonii N.E.Br.	LC
OROBANCHACEAE	Alectra sessiliflora (Vahl) Kuntze var. sessiliflora	LC
APIACEAE	Alepidea capensis (P.J.Bergius) R.A.Dyer var. capensis	LC
FABACEAE	Amphithalea fourcadei Compton	LC
PRIMULACEAE	Anagallis arvensis L. subsp. arvensis	Exotic
BORAGINACEAE	Anchusa capensis Thunb.	LC
POACEAE	Andropogon eucomus Nees	LC
RUBIACEAE	Anthospermum aethiopicum L.	LC
RUBIACEAE	Anthospermum herbaceum L.f.	LC
RUBIACEAE	Anthospermum spathulatum Spreng. subsp. spathulatum	LC
RUBIACEAE	Anthospermum spathulatum Spreng. subsp. uitenhagense Puff	LC
ASTERACEAE	Arctotheca calendula (L.) Levyns	LC
ASTERACEAE	Arctotheca populifolia (P.J.Bergius) Norl.	LC
ASTERACEAE	Arctotis discolor (Less.) Beauverd	LC
FABACEAE	Argyrolobium tuberosum Eckl. & Zeyh.	LC
IRIDACEAE	Aristea bakeri Klatt	LC
IRIDACEAE	Aristea ensifolia J.Muir bis	LC
FABACEAE	Aspalathus angustifolia (Lam.) R.Dahlgren subsp. angustifolia	LC
FABACEAE	Aspalathus asparagoides L.f. subsp. rubro-fusca (Eckl. & Zeyh.) R.Dahlgren	LC
FABACEAE	Aspalathus biflora E.Mey. subsp. biflora	LC
FABACEAE	Aspalathus cerrhantha Eckl. & Zeyh.	LC
FABACEAE	Aspalathus chortophila Eckl. & Zeyh.	LC
FABACEAE	Aspalathus ciliaris L.	LC
FABACEAE	Aspalathus collina Eckl. & Zeyh. subsp. collina	LC
FABACEAE	Aspalathus hispida Thunb. subsp. hispida	LC
FABACEAE	Aspalathus kougaensis (Garab. ex R.Dahlgren) R.Dahlgren	LC

FABACEAE	Aspalathus rubens Thunb.	LC
FABACEAE	Aspalathus setacea Eckl. & Zeyh.	LC
FABACEAE	Aspalathus spicata Thunb.	LC
FABACEAE	Aspalathus spinosa L. subsp. spinosa	LC
FABACEAE	Aspalathus subtingens Eckl. & Zeyh.	LC
FABACEAE	Aspalathus tenuissima R.Dahlgren	LC
FABACEAE	Aspalathus teres Eckl. & Zeyh. subsp. teres	LC
FABACEAE	Aspalathus teres Eckl. & Zeyh. subsp. thodei R.Dahlgren	LC
ASPARAGACEAE	Asparagus scandens Thunb.	LC
ASPLENIACEAE	Asplenium adiantum-nigrum L. var. solidum (Kunze) J.P.Roux	LC
ASPLENIACEAE	Asplenium aethiopicum (Burm.f.) Bech.	LC
ASPLENIACEAE	Asplenium capense (Kunze) Bir, Fraser-Jenk. & Lovis	Exotic
ASPLENIACEAE	Asplenium lunulatum Sw.	LC
ASPLENIACEAE	Asplenium rutifolium (P.J.Bergius) Kunze	LC
APOCYNACEAE	Astephanus zeyheri Turcz.	LC
ASTERACEAE	Aster bakerianus Burtt Davy ex C.A.Sm.	LC
ASTERACEAE	Athanasia dentata (L.) L.	LC
ASTERACEAE	Athanasia linifolia Burm.	LC
ASTERACEAE	Athanasia trifurcata (L.) L.	LC
ASTERACEAE	Athrixia heterophylla (Thunb.) Less. subsp. sessilifolia (DC.) Kroner	LC
POACEAE	Avena fatua L.	Exotic
POACEAE	Avena sativa L.	Exotic
IRIDACEAE	Babiana patersoniae L.Bolus	LC
BRUNIACEAE	Berzelia abrotanoides (L.) Brongn.	LC
BRUNIACEAE	Berzelia intermedia (D.Dietr.) Schltdl.	LC
IRIDACEAE	Bobartia macrocarpa Strid	VU
IRIDACEAE	Bobartia macrospatha Baker subsp. macrospatha	LC
IRIDACEAE	Bobartia orientalis J.B.Gillett subsp. orientalis	LC
ASTERACEAE	Brachylaena glabra (L.f.) Druce	LC
POACEAE	Brachypodium flexum Nees	LC
POACEAE	Bromus catharticus Vahl	Exotic
BRUNIACEAE	Brunia noduliflora Goldblatt & J.C.Manning	LC
AMARYLLIDACEAE	Brunsvigia striata (Jacq.) Aiton	LC
BUDDLEJACEAE	Buddleja salviifolia (L.) Lam.	LC
ASPHODELACEAE	Bulbine frutescens (L.) Willd.	LC
RUBIACEAE	Burchellia bubalina (L.f.) Sims	Exotic
HEMEROCALLIDACEAE	Caesia contorta (L.f.) T.Durand & Schinz	LC
RESTIONACEAE	Cannomois scirpoides (Kunth) Mast.	LC
RESTIONACEAE	Cannomois virgata (Rottb.) Steud.	LC
RUBIACEAE	Canthium inerme (L.f.) Kuntze	LC
RUBIACEAE	Canthium spinosum (Klotzsch) Kuntze	LC
BRASSICACEAE	Cardamine africana L.	LC
APOCYNACEAE	Carissa macrocarpa (Eckl.) A.DC.	LC
RUBIACEAE	Carpacoce spermacocea (Rchb.f.) Sond. subsp. spermacocea	LC
CELASTRACEAE	Cassine parvifolia Sond.	LC
CELASTRACEAE	Cassine schinoides (Spreng.) R.H.Archer	LC

APIACEAE	Centella asiatica (L.) Urb.	LC
APIACEAE	Centella eriantha (Rich.) Drude var. orientalis Adamson	LC
APIACEAE	Centella virgata (L.f.) Drude var. virgata	LC
DIPSACACEAE	Cephalaria humilis (Thunb.) Roem. & Schult.	LC
CARYOPHYLLACEAE	Cerastium capense Sond.	LC
ORCHIDACEAE	Ceratandra grandiflora Lindl.	LC
SOLANACEAE	Cestrum laevigatum Schltdl.	Exotic
SCROPHULARIACEAE	Chaenostoma cordatum (Thunb.) Benth.	LC
SCROPHULARIACEAE	Chaenostoma polyanthum Benth.	LC
ACANTHACEAE	Chaetacanthus setiger (Pers.) Lindl.	LC
IRIDACEAE	Chasmanthe aethiopica (L.) N.E.Br.	LC
SINOPTERIDACEAE	Cheilanthes capensis (Thunb.) Sw.	LC
GENTIANACEAE	Chironia baccifera L.	LC
GENTIANACEAE	Chironia melampyrifolia Lam.	LC
GENTIANACEAE	Chironia peduncularis Lindl.	LC
ANTHERICACEAE	Chlorophytum comosum (Thunb.) Jacques	LC
ASTERACEAE	Chrysanthemoides monilifera (L.) Norl. subsp. pisifera (L.) Norl.	LC
ROSACEAE	Cliffortia burchellii Stapf	LC
ROSACEAE	Cliffortia ferruginea L.f.	LC
ROSACEAE	Cliffortia graminea L.f. var. graminea	LC
ROSACEAE	Cliffortia ilicifolia L. var. ilicifolia	LC
ROSACEAE	Cliffortia linearifolia Eckl. & Zeyh.	LC
ROSACEAE	Cliffortia odorata L.f.	LC
ROSACEAE	Cliffortia ramosissima Schltr.	LC
ROSACEAE	Cliffortia serpyllifolia Cham. & Schltdl.	LC
ROSACEAE	Cliffortia stricta Weim.	LC
EUPHORBIACEAE	Clutia affinis Sond.	LC
RUTACEAE	Coleonema pulchellum I.Williams	LC
MESEMBRYANTHEMACEAE	Conicosia pugioniformis (L.) N.E.Br. subsp. muiri (N.E.Br.) Ihlenf. & Gerbaulet	LC
ASTERACEAE	Conyza bonariensis (L.) Cronquist	Exotic
ASTERACEAE	Corymbium africanum L. subsp. africanum	LC
ASTERACEAE	Cotula coronopifolia L.	LC
ASTERACEAE	Cotula sericea L.f.	LC
ASTERACEAE	Cotula turbinata L.	LC
CRASSULACEAE	Crassula ericoides Haw. subsp. ericoides	LC
CRASSULACEAE	Crassula expansa Dryand. subsp. filicaulis (Haw.) Toelken	LC
CRASSULACEAE	Crassula pellucida L. subsp. marginalis (Dryand. in Aiton) Toelken	LC
CRASSULACEAE	Crassula pellucida L. subsp. pellucida	LC
CRASSULACEAE	Crassula rubricaulis Eckl. & Zeyh.	LC
CRASSULACEAE	Crassula spathulata Thunb.	LC
ASTERACEAE	Cullumia decurrens Less.	LC
ASTERACEAE	Cullumia setosa (L.) R.Br. var. setosa	LC
CUNONIACEAE	Cunonia capensis L.	LC
CORNACEAE	Curtisia dentata (Burm.f.) C.A.Sm.	NT
ARALIACEAE	Cussonia spicata Thunb.	LC
ARALIACEAE	Cussonia thyrsiflora Thunb.	LC

CYPERACEAE	Cyperus congestus Vahl	LC
CYPERACEAE	Cyperus laevigatus L.	LC
CYPERACEAE	Cyperus sphaerospermus Schrad.	LC
CYPERACEAE	Cyperus textilis Thunb.	LC
CYPERACEAE	Cyperus thunbergii Vahl	LC
AMARYLLIDACEAE	Cyrtanthus clavatus (L'Hér.) R.A.Dyer	DDT
AMARYLLIDACEAE	Cyrtanthus loddigesianus (Herb.) R.A.Dyer	LC
APIACEAE	Dasispermum suffruticosum (P.J.Bergius) B.L.Burtt	LC
ACANTHACEAE	Dicliptera extenta S.Moore	LC
IRIDACEAE	Dierama pendulum (L.f.) Baker	LC
DIOSCOREACEAE	Dioscorea elephantipes (L'Hér.) Engl.	Declining
RUTACEAE	Diosma hirsuta L.	LC
FABACEAE	Dipogon lignosus (L.) Verdc.	LC
ORCHIDACEAE	Disa chrysostachya Sw.	LC
ORCHIDACEAE	Disa lugens Bolus var. lugens	EN
ORCHIDACEAE	Disa racemosa L.f.	LC
FUMARIACEAE	Discocapnos mundii Cham. & Schltdl. subsp. mundii	LC
ASTERACEAE	Disparago tortilis (DC.) Sch.Bip.	Exotic
SALICACEAE	Dovyalis rotundifolia (Thunb.) Thunb. & Harv.	LC
MESEMBRYANTHEMACEAE	Drosanthemum candens (Haw.) Schwantes	LC
DROSERACEAE	Drosera aliciae Raym.-Hamet	LC
DROSERACEAE	Drosera cistiflora L.	LC
POACEAE	Ehrharta calycina Sm.	LC
POACEAE	Ehrharta rupestris Nees ex Trin. subsp. tricostata (Stapf) Gibbs Russ.	LC
POACEAE	Ehrharta villosa J.H.Schult. var. maxima Stapf	LC
RESTIONACEAE	Elegia asperiflora (Nees) Kunth	LC
RESTIONACEAE	Elegia fistulosa Kunth	LC
RESTIONACEAE	Elegia thyrsifera (Rottb.) Pers.	LC
POACEAE	Elionurus muticus (Spreng.) Kunth	LC
RUTACEAE	Empleurum unicapsulare (L.f.) Skeels	LC
ONAGRACEAE	Epilobium hirsutum L.	LC
CYPERACEAE	Epischoenus quadrangularis (Boeck.) C.B.Clarke	LC
POACEAE	Eragrostis capensis (Thunb.) Trin.	LC
POACEAE	Eragrostis chloromelas Steud.	LC
POACEAE	Eragrostis curvula (Schrad.) Nees	LC
ERICACEAE	Erica adaequata Tausch	DDT
ERICACEAE	Erica articularis L. var. articularis	LC
ERICACEAE	Erica caffra L. var. caffra	LC
ERICACEAE	Erica canaliculata Andrews	LC
ERICACEAE	Erica cerinthoides L. var. cerinthoides	LC
ERICACEAE	Erica chamissonis Klotzsch ex Benth. var. chamissonis	LC
ERICACEAE	Erica chloroloma Lindl.	LC
ERICACEAE	Erica condensata Benth. var. condensata	LC
ERICACEAE	Erica copiosa J.C.Wendl. var. copiosa	LC
ERICACEAE	Erica cordata Andrews var. arachnoidea (Klotzsch) Dulfer	DDT
ERICACEAE	Erica cubica L. var. cubica	LC

ERICACEAE	Erica curviflora L.	LC
ERICACEAE	Erica curviflora L. var. curviflora	Exotic
ERICACEAE	Erica densifolia Willd.	LC
ERICACEAE	Erica diaphana Spreng.	LC
ERICACEAE	Erica discolor Andrews var. discolor	LC
ERICACEAE	Erica fuscescens (Klotzsch) E.G.H.Oliv.	LC
ERICACEAE	Erica glandulosa Thunb. subsp. fourcadei (L.Bolus) E.G.H.Oliv. & I.M.Oliv.	VU
ERICACEAE	Erica glandulosa Thunb. subsp. glandulosa	LC
ERICACEAE	Erica glumiflora Klotzsch ex Benth.	VU
ERICACEAE	Erica gracilis J.C.Wendl.	LC
ERICACEAE	Erica hispidula L. var. hispidula	LC
ERICACEAE	Erica humansdorpensis Compton	CR
ERICACEAE	Erica inconstans Zahlbr.	VU
ERICACEAE	Erica lanata Andrews	LC
ERICACEAE	Erica leucopelta Tausch var. leucopelta	LC
ERICACEAE	Erica maesta Bolus var. maesta	LC
ERICACEAE	Erica mauritanica L.	LC
ERICACEAE	Erica nabea Guthrie & Bolus	LC
ERICACEAE	Erica nemorosa Klotzsch ex Benth.	LC
ERICACEAE	Erica nutans J.C.Wendl.	LC
ERICACEAE	Erica opulenta (J.C.Wendl. ex Klotzsch) Benth.	LC
ERICACEAE	Erica pectinifolia Salisb. var. pectinifolia	LC
ERICACEAE	Erica peltata Andrews	LC
ERICACEAE	Erica petraea Benth.	LC
ERICACEAE	Erica scabriuscula Lodd.	LC
ERICACEAE	Erica seriphiifolia Salisb.	LC
ERICACEAE	Erica sessiliflora L.f.	LC
ERICACEAE	Erica simulans Dulfer var. simulans	LC
ERICACEAE	Erica simulans Dulfer var. tetragona (Bolus) Dulfer	DDT
ERICACEAE	Erica sparrmanii L.f.	LC
ERICACEAE	Erica sparsa Lodd. var. sparsa	LC
ERICACEAE	Erica speciosa Andrews	LC
ERICACEAE	Erica subdivaricata P.J.Bergius	LC
ERICACEAE	Erica tenella Andrews var. tenella	LC
ERICACEAE	Erica tenuis Salisb.	LC
ERICACEAE	Erica tetragona L.f.	LC
ERICACEAE	Erica thamnoides E.G.H.Oliv.	LC
ERICACEAE	Erica triceps Link	LC
ERICACEAE	Erica uberiflora E.G.H.Oliv.	LC
ERICACEAE	Erica zeyheriana (Klotzsch) E.G.H.Oliv.	VU
ASTERACEAE	Eriocephalus africanus L. var. paniculatus (Cass.) M.A.N.Müll.,P.P.J.Herman & Kolberg	LC
ERIOSPERMACEAE	Eriospermum dielsianum Poelln. subsp. molle P.L.Perry	LC
FABACEAE	Erythrina caffra Thunb.	LC
EBENACEAE	Euclea polyandra (L.f.) E.Mey. ex Hiern	LC
EBENACEAE	Euclea racemosa Murray subsp. macrophylla (E.Mey. ex A.DC.) F.White	LC
ORCHIDACEAE	Eulophia speciosa (R.Br. ex Lindl.) Bolus	Declining

ASTERACEAE	Euryops munitus (L.f.) B.Nord.	LC
ASTERACEAE	Felicia amelloides (L.) Voss	LC
ASTERACEAE	Felicia echinata (Thunb.) Nees	LC
ASTERACEAE	Felicia westae (Fourc.) Grau	DDD
CYPERACEAE	Ficinia acuminata (Nees) Nees	LC
CYPERACEAE	Ficinia deusta (P.J.Bergius) Levyns	LC
CYPERACEAE	Ficinia gracilis Schrad.	LC
CYPERACEAE	Ficinia trispicata (L.f.) Druce	LC
MORACEAE	Ficus sur Forssk.	LC
CYPERACEAE	Fuirena hirsuta (P.J.Bergius) P.L.Forbes	LC
ASPHODELACEAE	Gasteria acinacifolia (J.Jacq.) Haw.	LC
ASPHODELACEAE	Gasteria nitida (Salm-Dyck) Haw. var. armstrongii (Schönland) Van Jaarsv.	CR
ASTERACEAE	Gazania krebsiana Less. subsp. arctotoides (Less.) Roessler	LC
ASTERACEAE	Gazania krebsiana Less. subsp. krebsiana	LC
ASTERACEAE	Gazania rigens (L.) Gaertn. var. uniflora (L.f.) Roessler	LC
IRIDACEAE	Geissorhiza heterostyla L.Bolus	LC
GERANIACEAE	Geranium incanum Burm.f. var. multifidum (Sweet) Hilliard & B.L.Burtt	LC
ASTERACEAE	Gerbera cordata (Thunb.) Less.	LC
ASTERACEAE	Gerbera piloselloides (L.) Cass.	LC
ASTERACEAE	Gerbera tomentosa DC.	LC
IRIDACEAE	Gladiolus gueinzii Kunze	LC
IRIDACEAE	Gladiolus involutus D.Delaroche	LC
IRIDACEAE	Gladiolus permeabilis D.Delaroche subsp. permeabilis	LC
THYMELAEACEAE	Gnidia coriacea Meisn.	LC
APOCYNACEAE	Gomphocarpus physocarpus E.Mey.	LC
APOCYNACEAE	Gonioma kamassi E.Mey.	LC
OROBANCHACEAE	Graderia scabra (L.f.) Benth.	LC
MALVACEAE	Grewia occidentalis L. var. occidentalis	LC
CELASTRACEAE	Gymnosporia nemorosa (Eckl. & Zeyh.) Szyszyl.	LC
ORCHIDACEAE	Habenaria falcicornis (Burch. ex Lindl.) Bolus subsp. falcicornis	LC
OROBANCHACEAE	Harveya capensis Hook.	LC
OROBANCHACEAE	Harveya purpurea (L.f.) Harv. ex Hook. subsp. purpurea	LC
SCROPHULARIACEAE	Hebenstretia robusta E.Mey.	LC
ASTERACEAE	Helichrysum albanense Hilliard	LC
ASTERACEAE	Helichrysum anomalum Less.	LC
ASTERACEAE	Helichrysum asperum (Thunb.) Hilliard & B.L.Burtt var. comosum (Sch.Bip.) Hilliard	LC
ASTERACEAE	Helichrysum asperum (Thunb.) Hilliard & B.L.Burtt var. glabrum Hilliard	LC
ASTERACEAE	Helichrysum aureum (Houtt.) Merr. var. monocephalum (DC.) Hilliard	LC
ASTERACEAE	Helichrysum crispum (L.) D.Don	LC
ASTERACEAE	Helichrysum cymosum (L.) D.Don subsp. cymosum	LC
ASTERACEAE	Helichrysum felinum Less.	LC
ASTERACEAE	Helichrysum gymnocomum DC.	LC
ASTERACEAE	Helichrysum herbaceum (Andrews) Sweet	LC
ASTERACEAE	Helichrysum litorale Bolus	LC
ASTERACEAE	Helichrysum nudifolium (L.) Less. var. nudifolium	LC
ASTERACEAE	Helichrysum petiolare Hilliard & B.L.Burtt	LC

ASTERACEAE	Helichrysum rosum (P.J.Bergius) Less. var. arcuatum Hilliard	LC
ASTERACEAE	Helichrysum spiralepis Hilliard & B.L.Burtt	LC
ASTERACEAE	Helichrysum teretifolium (L.) D.Don	LC
ASTERACEAE	Helichrysum tinctum (Thunb.) Hilliard & B.L.Burtt	LC
BRASSICACEAE	Heliophila elongata (Thunb.) DC.	LC
BRASSICACEAE	Heliophila glauca Burch. ex DC.	LC
MALVACEAE	Hermannia althaeoides Link	LC
MALVACEAE	Hermannia hyssopifolia L.	LC
MALVACEAE	Hermannia velutina DC.	LC
MALVACEAE	Hibiscus diversifolius Jacq. subsp. diversifolius	LC
MALVACEAE	Hibiscus diversifolius Jacq. subsp. rivularis (Bremek. & Oberm.) Exell var. rivularis	Exotic
MALVACEAE	Hibiscus trionum L.	Exotic
ASTERACEAE	Hippia frutescens (L.) L.	LC
ORCHIDACEAE	Holothrix parviflora (Lindl.) Rchb.f.	LC
ORCHIDACEAE	Holothrix schlechteriana Schltr. ex Kraenzl.	LC
OROBANCHACEAE	Hyobanche sanguinea L.	LC
FABACEAE	Hypocalyptus coluteoides (Lam.) R.Dahlgren	LC
FABACEAE	Hypocalyptus oxalidifolius (Sims) Baill.	LC
RESTIONACEAE	Hypodiscus argenteus (Thunb.) Mast.	LC
DENNSTAEDTIACEAE	Hypolepis sparsisora (Schrad.) Kuhn	LC
FABACEAE	Indigofera denudata L.f.	LC
FABACEAE	Indigofera flabellata Harv.	LC
FABACEAE	Indigofera heterophylla Thunb.	LC
FABACEAE	Indigofera pappei Fourc.	LC
FABACEAE	Indigofera poliotes Eckl. & Zeyh.	LC
FABACEAE	Indigofera rhodantha Fourc.	Exotic
FABACEAE	Indigofera stricta L.f.	LC
FABACEAE	Indigofera sulcata DC.	LC
FABACEAE	Indigofera verrucosa Eckl. & Zeyh.	LC
ASTERACEAE	Inulanthera dregeana (DC.) Källersjö	LC
CYPERACEAE	Isolepis cernua (Vahl) Roem. & Schult. var. cernua	LC
CYPERACEAE	Isolepis marginata (Thunb.) A.Dietr.	LC
CYPERACEAE	Isolepis natans (Thunb.) A.Dietr.	LC
CYPERACEAE	Isolepis striata (Nees) Kunth	LC
SCROPHULARIACEAE	Jamesbrittenia microphylla (L.f.) Hilliard	LC
JUNCACEAE	Juncus dregeanus Kunth subsp. dregeanus	LC
JUNCACEAE	Juncus kraussii Hochst. subsp. kraussii	LC
JUNCACEAE	Juncus lomatophyllus Spreng.	LC
CUCURBITACEAE	Kedrostis nana (Lam.) Cogn. var. nana	LC
RANUNCULACEAE	Knowltonia vesicatoria (L.f.) Sims subsp. humilis H.Rasm.	LC
POACEAE	Koeleria capensis (Steud.) Nees	LC
URTICACEAE	Laportea peduncularis (Wedd.) Chew subsp. peduncularis	LC
HALORAGACEAE	Laurembergia repens (L.) P.J.Bergius subsp. brachypoda (Welw. ex Hiern) Oberm.	LC
CELASTRACEAE	Lauridia tetragona (L.f.) R.H.Archer	LC
ANACARDIACEAE	Laurophyllus capensis Thunb.	LC

LAMIACEAE	Leonotis leonurus (L.) R.Br.	LC
MYRTACEAE	Leptospermum laevigatum (Gaertn.) F.Muell.	Exotic
FABACEAE	Lessertia kensitii L.Bolus	DDT
PROTEACEAE	Leucadendron conicum (Lam.) I.Williams	NT
PROTEACEAE	Leucospermum cuneiforme (Burm.f.) Rourke	LC
PLUMBAGINACEAE	Limonium scabrum (Thunb.) Kuntze var. scabrum	LC
LINACEAE	Linum aethiopicum Thunb.	LC
FABACEAE	Liparia hirsuta Thunb.	LC
LOBELIACEAE	Lobelia cuneifolia Link & Otto var. cuneifolia	LC
LOBELIACEAE	Lobelia erinus L.	LC
LOBELIACEAE	Lobelia neglecta Roem. & Schult.	LC
LOBELIACEAE	Lobelia pubescens Dryand. ex Aiton var. pubescens	LC
POACEAE	Lolium multiflorum Lam.	Exotic
POACEAE	Lolium temulentum L.	Exotic
FABACEAE	Lotononis azurea (Eckl. & Zeyh.) Benth.	LC
SCROPHULARIACEAE	Manulea obovata Benth.	LC
CELASTRACEAE	Maytenus oleoides (Lam.) Loes.	LC
CELASTRACEAE	Maytenus peduncularis (Sond.) Loes.	LC
OROBANCHACEAE	Melasma scabrum P.J.Bergius var. scabrum	LC
POACEAE	Merxmuellera cincta (Nees) Conert subsp. cincta	LC
ASTERACEAE	Metalasia muricata (L.) D.Don	LC
ASTERACEAE	Metalasia pungens D.Don	LC
ASTERACEAE	Metalasia trivialis P.O.Karis	LC
IRIDACEAE	Micranthus alopecuroides (L.) Rothm.	LC
LOBELIACEAE	Monopsis acrodon E.Wimm.	LC
LOBELIACEAE	Monopsis simplex (L.) E.Wimm.	LC
LOBELIACEAE	Monopsis unidentata (Dryand.) E.Wimm. subsp. unidentata	LC
GERANIACEAE	Monsonia emarginata (L.f.) L'Hér.	LC
IRIDACEAE	Moraea tricuspidata (L.f.) G.J.Lewis	LC
MYRICACEAE	Morella cordifolia (L.) Killick	LC
MYRICACEAE	Morella quercifolia (L.) Killick	LC
POLYGALACEAE	Muraltia alopecuroides (L.) DC.	LC
POLYGALACEAE	Muraltia ericaefolia DC.	LC
POLYGALACEAE	Muraltia satureioides DC. var. satureioides	LC
POLYGALACEAE	Muraltia squarrosa (L.f.) DC.	LC
ASTERACEAE	Nidorella auriculata DC.	LC
APIACEAE	Notobubon ferulaceum (Thunb.) Magee	Exotic
APIACEAE	Notobubon gummiferum (L.) Magee	Exotic
NYMPHAEACEAE	Nymphaea nouchali Burm.f. var. zanzibariensis (Casp.) Verdc.	LC
ASTERACEAE	Oedera capensis (L.) Druce	LC
ASTERACEAE	Oedera imbricata Lam.	LC
OLEACEAE	Olea capensis L. subsp. capensis	LC
OLEACEAE	Olea europaea L. subsp. africana (Mill.) P.S.Green	LC
OLEACEAE	Olea exasperata Jacq.	LC
OLINIACEAE	Olinia ventosa (L.) Cufod.	LC
APOCYNACEAE	Oncinema lineare (L.f.) Bullock	LC

POACEAE	Oplismenus hirtellus (L.) P.Beauv.	LC
POACEAE	Oplismenus undulatifolius (Ard.) Roem. & Schult.	LC
HYACINTHACEAE	Ornithogalum tenuifolium F.Delaroche subsp. tenuifolium	LC
ASTERACEAE	Osteospermum junceum P.J.Bergius	LC
ASTERACEAE	Osteospermum pterigoideum Klatt	EN
SANTALACEAE	Osyris compressa (P.J.Bergius) A.DC.	LC
FABACEAE	Otholobium carneum (E.Mey.) C.H.Stirt.	Rare
FABACEAE	Otholobium heterosepalum (Fourc.) C.H.Stirt.	Rare
FABACEAE	Otholobium polyphyllum (Eckl. & Zeyh.) C.H.Stirt.	LC
FABACEAE	Otholobium prodiens C.H.Stirt.	LC
FABACEAE	Otholobium stachyerum (Eckl. & Zeyh.) C.H.Stirt.	LC
ASTERACEAE	Othonna quinquedentata Thunb.	LC
OXALIDACEAE	Oxalis caprina L.	LC
OXALIDACEAE	Oxalis corniculata L.	Exotic
OXALIDACEAE	Oxalis imbricata Eckl. & Zeyh. var. violacea R.Knuth	LC
OXALIDACEAE	Oxalis incarnata L.	LC
OXALIDACEAE	Oxalis polyphylla Jacq. var. polyphylla	LC
OXALIDACEAE	Oxalis purpurea L.	LC
OXALIDACEAE	Oxalis smithiana Eckl. & Zeyh.	LC
THYMELAEACEAE	Passerina montivaga C.L.Bredenkamp & A.E.van Wyk	LC
THYMELAEACEAE	Passerina rigida Wikstr.	LC
HYPOXIDACEAE	Pauridia minuta (L.f.) T.Durand & Schinz	NT
GERANIACEAE	Pelargonium alchemilloides (L.) L'Hér.	LC
GERANIACEAE	Pelargonium capitatum (L.) L'Hér.	LC
GERANIACEAE	Pelargonium cordifolium (Cav.) Curtis	LC
GERANIACEAE	Pelargonium graveolens L'Hér.	LC
GERANIACEAE	Pelargonium papilionaceum (L.) L'Hér.	LC
GERANIACEAE	Pelargonium pulverulentum Colvill ex Sweet	LC
GERANIACEAE	Pelargonium radulifolium (Eckl. & Zeyh.) Steud.	LC
PENAEACEAE	Penaea cneorum Meerb. subsp. gigantea R.Dahlgren	LC
PENAEACEAE	Penaea cneorum Meerb. subsp. lanceolata R.Dahlgren	LC
PENAEACEAE	Penaea cneorum Meerb. subsp. ovata (Eckl. & Zeyh. ex A.DC.) R.Dahlgren	LC
POACEAE	Pentaschistis colorata (Steud.) Stapf	LC
POACEAE	Pentaschistis heptamera (Nees) Stapf	LC
POACEAE	Pentaschistis longipes Stapf	VU
POACEAE	Pentaschistis pallida (Thunb.) H.P.Linder	LC
POLYGONACEAE	Persicaria attenuata (R.Br.) Soják subsp. africana K.L.Wilson	LC
RHAMNACEAE	Phylica abietina Eckl. & Zeyh.	LC
RHAMNACEAE	Phylica aemula Schltr. var. multibracteolata Pillans	LC
RHAMNACEAE	Phylica axillaris Lam. var. axillaris	LC
RHAMNACEAE	Phylica axillaris Lam. var. lutescens (Eckl. & Zeyh.) Pillans	LC
RHAMNACEAE	Phylica axillaris Lam. var. microphylla (Eckl. & Zeyh.) Pillans	LC
RHAMNACEAE	Phylica gnidioides Eckl. & Zeyh.	LC
RHAMNACEAE	Phylica humilis Sond.	LC
RHAMNACEAE	Phylica litoralis (Eckl. & Zeyh.) D.Dietr.	LC
RHAMNACEAE	Phylica odorata Schltr.	LC

RHAMNACEAE	Phylica paniculata Willd.	LC
RHAMNACEAE	Phylica pinea Thunb.	LC
RHAMNACEAE	Phylica rubra Willd. ex Roem. & Schult.	LC
RHAMNACEAE	Phylica strigulosa Sond.	VU
RUBIACEAE	Phylohydrax carnosa (Hochst.) Puff	LC
RESTIONACEAE	Platycaulos callistachyus (Kunth) H.P.Linder	LC
RESTIONACEAE	Platycaulos compressus (Rottb.) H.P.Linder	LC
CUNONIACEAE	Platylophus trifoliatus (L.f.) D.Don	LC
ASTERACEAE	Plecostachys serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt	LC
LAMIACEAE	Plectranthus fruticosus L'Hér.	LC
LAMIACEAE	Plectranthus laxiflorus Benth.	LC
POLYPODIACEAE	Pleopeltis macrocarpa (Bory ex Willd.) Kaulf.	LC
POACEAE	Poa annua L.	Exotic
POACEAE	Poa pratensis L.	Exotic
FABACEAE	Podalyria cuneifolia Vent.	LC
FABACEAE	Podalyria glauca DC.	LC
FABACEAE	Podalyria myrtillifolia (Retz.) Willd.	LC
PODOCARPACEAE	Podocarpus falcatus (Thunb.) R.Br. ex Mirb.	LC
PODOCARPACEAE	Podocarpus latifolius (Thunb.) R.Br. ex Mirb.	LC
POLYGALACEAE	Polygala bracteolata L.	LC
POLYGALACEAE	Polygala ericaefolia DC.	LC
POLYGALACEAE	Polygala fruticosa P.J.Bergius	LC
POLYGALACEAE	Polygala myrtifolia L. var. myrtifolia	LC
POLYGALACEAE	Polygala refracta DC.	LC
POLYGALACEAE	Polygala wittebergensis Compton	LC
POLYGONACEAE	Polygonum undulatum (L.) P.J.Bergius	LC
CAMPANULACEAE	Prismatocarpus campanuloides (L.f.) Sond. var. campanuloides	LC
PROTEACEAE	Protea coronata Lam.	NT
PROTEACEAE	Protea cynaroides (L.) L.	LC
PROTEACEAE	Protea eximia (Salisb. ex Knight) Fourc.	LC
PROTEACEAE	Protea mundii Klotzsch	LC
PROTEACEAE	Protea neriifolia R.Br.	LC
PROTEACEAE	Protea tenax (Salisb.) R.Br.	LC
FABACEAE	Psoralea affinis Eckl. & Zeyh.	LC
FABACEAE	Psoralea arborea Sims	LC
FABACEAE	Psoralea oligophylla Eckl. & Zeyh.	LC
FABACEAE	Psoralea oreophila Schltr.	Rare
FABACEAE	Psoralea plauta C.H.Stirt.	LC
FABACEAE	Psoralea repens L.	NT
FABACEAE	Psoralea verrucosa Willd.	LC
RUBIACEAE	Psydrax obovata (Eckl. & Zeyh.) Bridson subsp. obovata	LC
CELASTRACEAE	Pterocelastrus tricuspidatus (Lam.) Walp.	LC
ASTERACEAE	Pteronia stricta Aiton var. longifolia E.Phillips	LC
ASTERACEAE	Pteronia teretifolia (Thunb.) Fourc.	LC
ORCHIDACEAE	Pterygodium alatum (Thunb.) Sw.	LC
ORCHIDACEAE	Pterygodium volucris (L.f.) Sw.	LC

RANUNCULACEAE	Ranunculus multifidus Forssk.	Exotic
MYRSINACEAE	Rapanea gilliana (Sond.) Mez	EN
RESTIONACEAE	Rhodocoma fruticosa (Thunb.) H.P.Linder	LC
RESTIONACEAE	Rhodocoma gigantea (Kunth) H.P.Linder	LC
SANTALACEAE	Rhoiacarpos capensis (Harv.) A.DC.	LC
VITACEAE	Rhoicissus tridentata (L.f.) Wild & R.B.Drumm. subsp. tridentata	Exotic
FABACEAE	Rhynchosia argentea (Thunb.) Harv.	LC
FABACEAE	Rhynchosia capensis (Burm.f.) Schinz	LC
FABACEAE	Rhynchosia microscias Benth. ex Harv.	LC
CAMPANULACEAE	Roella spicata L.f. var. burchellii Adamson	LC
IRIDACEAE	Romulea dichotoma (Thunb.) Baker	LC
IRIDACEAE	Romulea setifolia N.E.Br. var. setifolia	LC
RUBIACEAE	Rubia cordifolia L. subsp. conotricha (Gand.) Verdc.	LC
RUBIACEAE	Rubia petiolaris DC.	LC
ROSACEAE	Rubus affinis Wight & Arn.	Exotic
ROSACEAE	Rubus fruticosus L.	Exotic
ROSACEAE	Rubus pinnatus Willd.	LC
ROSACEAE	Rubus rigidus Sm.	LC
POLYGONACEAE	Rumex acetosella L. subsp. angiocarpus (Murb.) Murb.	Exotic
POLYGONACEAE	Rumex crispus L.	Exotic
POLYGONACEAE	Rumex sagittatus Thunb.	LC
LAMIACEAE	Salvia africana-lutea L.	LC
THEOPHRASTACEAE	Samolus porosus (L.f.) Thunb.	LC
THEOPHRASTACEAE	Samolus valerandi L.	LC
APIACEAE	Sanicula elata Buch.-Ham. ex D.Don	LC
ORCHIDACEAE	Satyrium acuminatum Lindl.	LC
ORCHIDACEAE	Satyrium bracteatum (L.f.) Thunb.	LC
ORCHIDACEAE	Satyrium parviflorum Sw.	LC
ORCHIDACEAE	Satyrium princeps Bolus	VU
DIPSACACEAE	Scabiosa albanensis R.A.Dyer	LC
DIPSACACEAE	Scabiosa columbaria L.	LC
GOODENIACEAE	Scaevola plumieri (L.) Vahl	LC
FABACEAE	Schotia afra (L.) Thunb. var. afra	LC
ANACARDIACEAE	Searsia dentata (Thunb.) F.A.Barkley	LC
ANACARDIACEAE	Searsia glauca (Thunb.) Moffett	LC
ANACARDIACEAE	Searsia laevigata (L.) F.A.Barkley var. laevigata forma laevigata	Exotic
ANACARDIACEAE	Searsia lucida (L.) F.A.Barkley forma lucida	Exotic
ANACARDIACEAE	Searsia lucida (L.) F.A.Barkley forma scoparia (Eckl. & Zeyh.) Moffett	Exotic
ANACARDIACEAE	Searsia tomentosa (L.) F.A.Barkley	LC
GENTIANACEAE	Sebaea stricta (E.Mey.) Gilg	LC
GENTIANACEAE	Sebaea zeyheri Schinz subsp. acutiloba (Schinz) Marais	LC
APOCYNACEAE	Secamone alpini Schult.	LC
SCROPHULARIACEAE	Selago canescens L.f.	LC
SCROPHULARIACEAE	Selago corymbosa L.	LC
SCROPHULARIACEAE	Selago luxurians Choisy	LC
SCROPHULARIACEAE	Selago rotundifolia L.f.	VU

ASTERACEAE	Senecio burchellii DC.	LC
ASTERACEAE	Senecio carnosus Thunb.	LC
ASTERACEAE	Senecio crenatus Thunb.	LC
ASTERACEAE	Senecio glastifolius L.f.	LC
ASTERACEAE	Senecio inaequidens DC.	LC
ASTERACEAE	Senecio lineatus (L.f.) DC.	LC
ASTERACEAE	Senecio madagascariensis Poir.	LC
ASTERACEAE	Senecio oederiifolius DC.	LC
ASTERACEAE	Senecio othonniflorus DC.	LC
ASTERACEAE	Senecio paniculatus P.J.Bergius	LC
ASTERACEAE	Senecio rigidus L.	LC
ASTERACEAE	Senecio thunbergii Harv.	DDT
FABACEAE	Senna multiglandulosa (Jacq.) H.S.Irwin & Barneby	Exotic
POACEAE	Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. sphacelata	LC
POACEAE	Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. torta (Stapf) Clayton	LC
SOLANACEAE	Solanum linnaeanum Hepper & Jaeger	LC
MALVACEAE	Sparrmannia africana L.f.	LC
HYPOXIDACEAE	Spiloxene serrata (Thunb.) Garside var. serrata	LC
POACEAE	Sporobolus africanus (Poir.) Robyns & Tournay	LC
LAMIACEAE	Stachys scabrida Skan	LC
LAMIACEAE	Stachys thunbergii Benth.	LC
THYMELAEACEAE	Struthiola argentea Lehm.	LC
THYMELAEACEAE	Struthiola macowanii C.H.Wright	LC
FABACEAE	Sutherlandia frutescens (L.) R.Br.	LC
ASTERACEAE	Syncarpha argentea (Thunb.) B.Nord.	LC
ASTERACEAE	Syncarpha eximia (L.) B.Nord.	LC
ASTERACEAE	Syncarpha milleflora (L.f.) B.Nord.	LC
ASTERACEAE	Syncarpha striata (Thunb.) B.Nord.	LC
ASTERACEAE	Tarchonanthus littoralis P.P.J.Herman	LC
SCROPHULARIACEAE	Teedia lucida (Sol.) Rudolphi	LC
FABACEAE	Tephrosia grandiflora (Aiton) Pers.	LC
AIZOACEAE	Tetragonia decumbens Mill.	LC
CYPERACEAE	Tetraria bromoides (Lam.) Pfeiff.	LC
CYPERACEAE	Tetraria microstachys (Vahl) Pfeiff.	LC
CYPERACEAE	Tetraria robusta (Kunth) C.B.Clarke	LC
RESTIONACEAE	Thamnochortus cinereus H.P.Linder	LC
POACEAE	Themeda triandra Forssk.	LC
SANTALACEAE	Thesium foliosum A.DC.	LC
SANTALACEAE	Thesium penicillatum A.W.Hill	LC
SANTALACEAE	Thesium virgatum Lam.	LC
POACEAE	Thinopyrum distichum (Thunb.) A.Löve	Exotic
ASPHODELACEAE	Trachyandra affinis Kunth	LC
POACEAE	Tribolium hispidum (Thunb.) Desv.	LC
POACEAE	Tribolium uniolae (L.f.) Renvoize	LC
HAMAMELIDACEAE	Trichocladus crinitus (Thunb.) Pers.	LC

FABACEAE	Trifolium burchellianum Ser. subsp. burchellianum	LC
POACEAE	Tristachya leucothrix Trin. ex Nees	LC
IRIDACEAE	Tritoniopsis antholyza (Poir.) Goldblatt	LC
ALLIACEAE	Tulbaghia violacea Harv. var. violacea	LC
ASTERACEAE	Ursinia anethoides (DC.) N.E.Br.	LC
ASTERACEAE	Ursinia scariosa (Aiton) Poir. subsp. scariosa	LC
ASTERACEAE	Ursinia scariosa (Aiton) Poir. subsp. scariosa	LC
LENTIBULARIACEAE	Utricularia bisquamata Schrank	LC
ASTERACEAE	Vellereophyton vellereum (R.A.Dyer) Hilliard	LC
FABACEAE	Vigna frutescens A.Rich. subsp. frutescens var. frutescens	LC
MENYANTHACEAE	Villarsia capensis (Houtt.) Merr.	LC
FABACEAE	Virgilia divaricata Adamson	LC
HAEMODORACEAE	Wachendorfia thyrsiflora Burm.	LC
CAMPANULACEAE	Wahlenbergia capillacea (L.f.) A.DC. subsp. capillacea	LC
CAMPANULACEAE	Wahlenbergia procumbens (Thunb.) A.DC.	LC
CAMPANULACEAE	Wahlenbergia rubens (H.Buek) Lammers var. rubens	LC
CAMPANULACEAE	Wahlenbergia rubioides (Banks ex A.DC.) Lammers var. rubioides	LC
IRIDACEAE	Watsonia pillansii L.Bolus	LC
IRIDACEAE	Watsonia zeyheri L.Bolus	LC
COLCHICACEAE	Wurmbea stricta (Burm.f.) J.C.Manning & Vinn.	LC
ARACEAE	Zantedeschia aethiopica (L.) Spreng.	LC
CUCURBITACEAE	Zehneria scabra (L.f.) Sond. subsp. scabra	LC