

Plant Species Compliance Statement

prepared in accordance with the
"Protocol for the Specialist Assessment and minimum report content requirements for environmental impacts on Terrestrial Plant Species"

Leeuwbosch Pv 3 Solar Photovoltaic (PV) Plant and Associated Infrastructure near Leeudoringstad in North West Province



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Terrestrial Plant Species Compliance Statement Report for Leeuwbosch Pv 3 Solar Photovoltaic (PV) Plant and Associated Infrastructure near Leeudoringstad in North West Province

22 November 2022

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SPECIALIST DETAILS & DECLARATION

This report has been prepared in accordance with the "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity", as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020. It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows –

Table 1: Details of Specialist

Specialist	Qualification and accreditation
Dr David Hoare (Pr.Sci.Nat.)	<ul style="list-style-type: none">• PhD Botany• SACNASP Reg. no. 400221/05 (Ecology, Botany)

Declaration of independence:

David Hoare Consulting (Pty) Ltd in an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by David Hoare Consulting (Pty) Ltd is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

Disclosure:

David Hoare Consulting (Pty) Ltd undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to David Hoare Consulting (Pty) Ltd by the client and in addition to information obtained during the course of this study, David Hoare Consulting (Pty) Ltd present the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practise.



Dr David Hoare

22 November 2022
Date

TERMS OF REFERENCE

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL PLANT SPECIES

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Plant Species. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

Protocol For The Specialist Assessment And Minimum Report Content Requirements For Environmental Impacts On Terrestrial Plant Species

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

General information

1.1 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**very high**" or "**high**" sensitivity for terrestrial plant species, must submit a Terrestrial Plant Species Specialist Assessment Report.

1.2 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**medium** sensitivity" for terrestrial plant species, must submit either a Terrestrial Plant Species Specialist Assessment Report or a Terrestrial Plant Species Compliance Statement, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.

1.3 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of "**low**" sensitivity for terrestrial plant species, must submit a Terrestrial Plant Species Compliance Statement.

1.4 Where the information gathered from the site sensitivity verification differs from the screening tool designation of "very high" or "high" for terrestrial plant species sensitivity on the screening tool, and it is found to be of a "low" sensitivity, then a Terrestrial Plant Species Compliance Statement must be submitted.

1.5 Where the information gathered from the site sensitivity verification differs from the screening tool designation of "low" terrestrial plant species sensitivity and it is found to be of a "very high" or "high" terrestrial plant species sensitivity, a Terrestrial Plant Species Specialist Assessment must be conducted.

1.6 If any part of the development falls within an area of confirmed "very high" or "high" sensitivity, the assessment and reporting requirements prescribed for the "very high" or "high" sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol, means the area on which the proposed development will take place and includes the area that will be disturbed or impacted.

1.7 The Terrestrial Plant Species Specialist Assessment and the Terrestrial Plant Species Compliance Statement must be undertaken within the study area.

1.8 Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.

1.9 Where the nature of the activity is expected to have an impact on SCC beyond boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline, and the study area must include the PAOI, as determined.

Terrestrial Plant Species Specialist Assessment

2.1 The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professions (SACNASP), within a field of practice relevant to the taxonomic groups ("taxa") for which the assessment is being undertaken.

2.2 The assessment must be undertaken within the study area.

2.3 The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline and must:

2.3.1 Identify the SCC which were found, observed or are likely to occur within the study area;

2.3.2 provide evidence (photographs) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);

2.3.3 identify the distribution, location, viability and detailed description of population size of the SCC identified within the study area;

2.3.4 identify the nature and the extent of the potential impact of the proposed development to the population of the SCC located within the study area;

2.3.5 determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases including the IUCN Red List of Threatened Species, Red List of South African Plants, and/or other relevant databases;

2.3.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;

2.3.7 include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, a motivation for the deviation;

2.3.8 identify any dynamic ecological processes occurring within the broader landscape, that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;

2.3.9 identify any potential impact on ecological connectivity within the broader landscape, and resulting impacts on the identified SCC and its long term viability;

2.3.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC; and

2.3.11 discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species; and

2.3.12 identify any alternative development footprints within the preferred development site which would be of "low" sensitivity" or "medium" sensitivity as identified by the screening tool and verified through the site sensitivity verification.

2.4 The findings of the assessment must be written up in a Terrestrial Plant Species Specialist Assessment Report.

Terrestrial Plant Species Specialist Assessment Report

3.1 This report must include as a minimum the following information:

3.1.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;

3.1.2 a signed statement of independence by the specialist;

3.1.3 a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;

3.1.4 a description of the methodology used to undertake the site sensitivity verification and impact assessment and site inspection, including equipment and modelling used where relevant;

3.1.5 a description of the assumptions made and any uncertainties or gaps in knowledge or data;

3.1.6 a description of the mean density of observations/number of samples sites per unit area of site inspection observations;

3.1.7 details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;

3.1.8 the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the study area;

3.1.9 the location of areas not suitable for development and to be avoided during construction where relevant;

3.1.10 a discussion on the cumulative impacts;

3.1.11 impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);

3.1.12 a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not, of the development related to the specific theme considered, and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and

3.1.13 a motivation must be provided if there were any development footprints identified as per paragraph 2.3.12 above that were identified as having "low" or "medium" terrestrial plant species sensitivity and were not considered appropriate.

3.2 A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

Terrestrial plant species compliance statement

Where the sensitivity in the Screening Report from the web-based Online Screening Tool has been confirmed to be LOW, a Plant Species Compliance Statement is required, either (1) for areas where no natural habitat remains, or (2) in natural areas where there is no suspected occurrence of SCC.

The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Botanical Science or Ecological Science).

The compliance statement must:

1. be applicable within the study area
2. confirm that the study area is of "low" sensitivity for terrestrial plant species; and
3. indicate whether or not the proposed development will have any impact on SCC.

The compliance statement must contain, as a minimum, the following information:

1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;
2. a signed statement of independence by the specialist;
3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
4. a baseline profile description of biodiversity and ecosystems of the site;
5. the methodology used to verify the sensitivities of the terrestrial biodiversity and plant species features on the site including the equipment and modelling used where relevant;
6. in the case of a linear activity, confirmation from the terrestrial biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;
7. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;
8. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data; and
9. any conditions to which this statement is subjected.

A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

INTRODUCTION

Site location

The project is located on Portion 37 of the Farm Leeuwbosch No. 44, approximately 6km north-east of the town of Leeudoringstad in the North West Province (Figure 5). The site is just off the R502 (Orkney to Leeudoringstad) road. Refer to Figure 1 below for the general location.

The site is currently natural grassland that is used for grazing. There is no infrastructure on site, except for a small reservoir on the northern edge of the proposed project site..

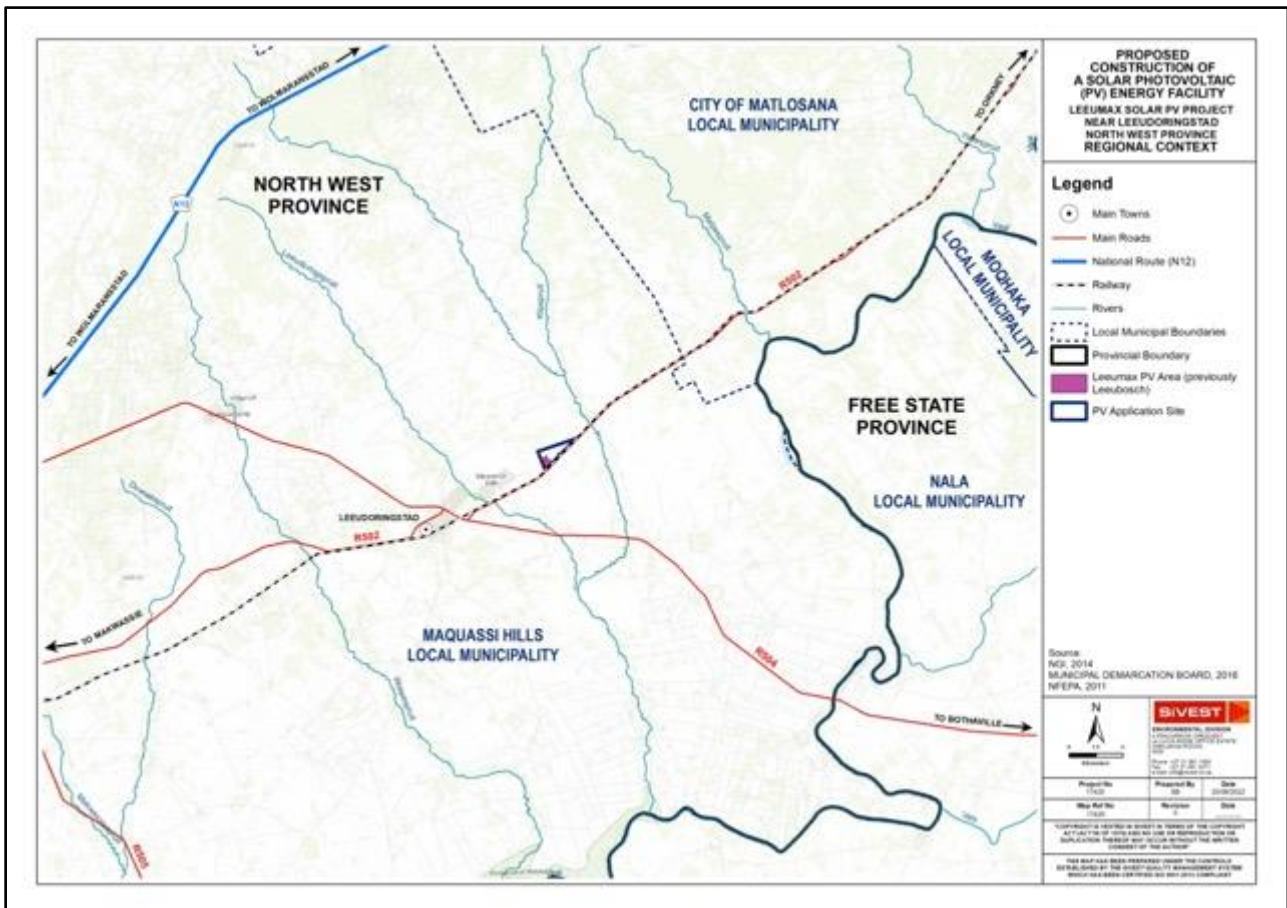


Figure 1: Location of the site.

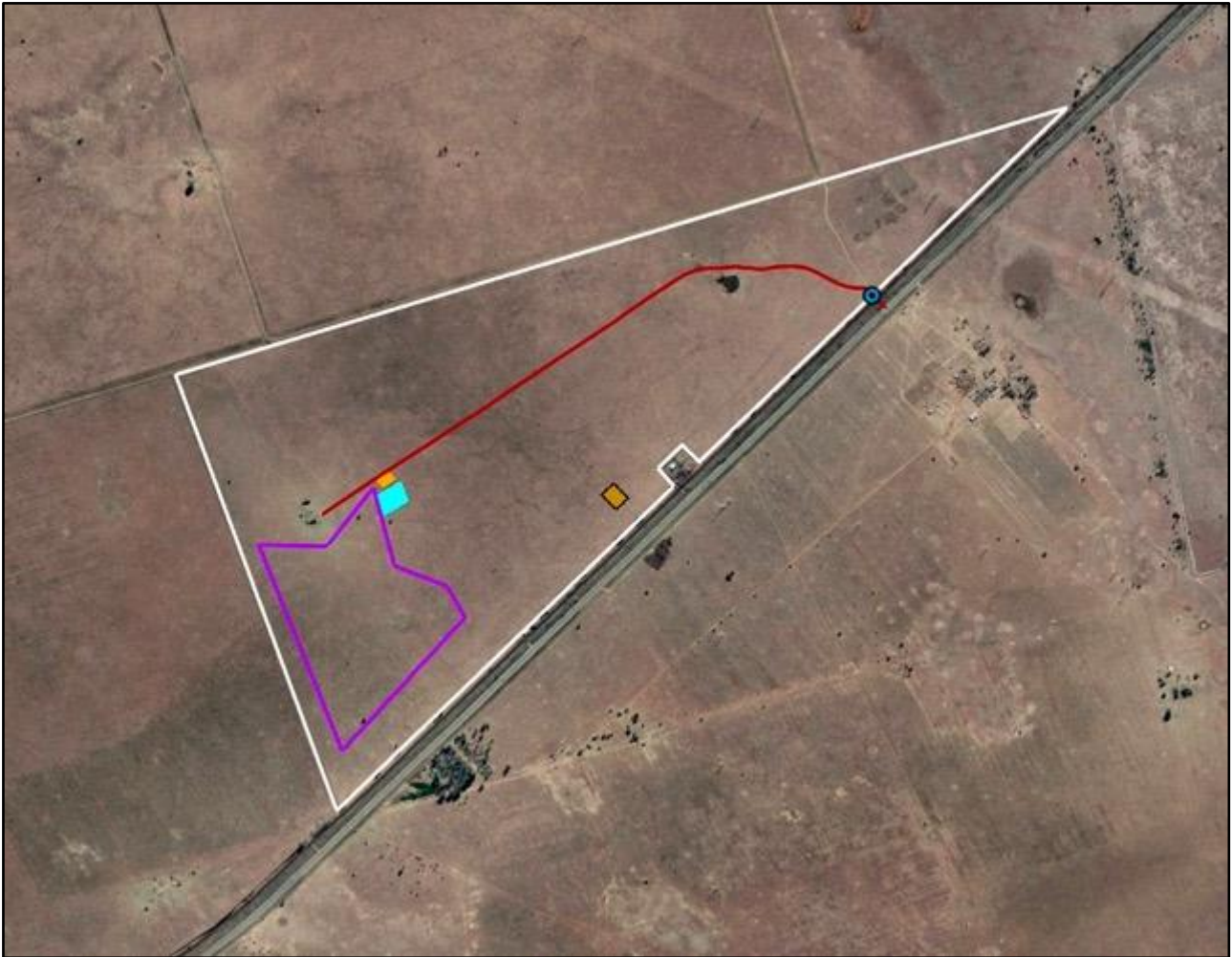


Figure 2: Aerial image of the site and surrounding areas.

Identified Theme Sensitivities

A sensitivity screening report from the DEA Online Screening Tool was requested in the application category: Transformation of land | Indigenous vegetation. The DEA Screening Tool report for the area, dated 30/05/2022, indicates the following sensitivities (see Figure 3):

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Plant Species Theme			X	

Plant Species theme

Sensitivity features are indicated as follows:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 1261



Figure 3: Map of relative plant species theme sensitivity.

Survey timing

The study commenced as a desktop-study followed by site-specific field study on 29 April 2021 and 27 October 2021. The site is within the Grassland Biome with a peak rainfall season in summer, which occurs from October to March. There is, however, a delay between rainfall and vegetation growth, which means the peak growing season is from November to May (Figure 5). A more accurate indication of rainfall seasonality, which drives most ecological processes, is shown in Figure 6, which shows that Klerksdorp has peak rainfall from October to April. The timing of the survey is therefore suitable in terms of assessing the habitat of the site. The overall condition of animal habitat was possible to be determined with a high degree of confidence.

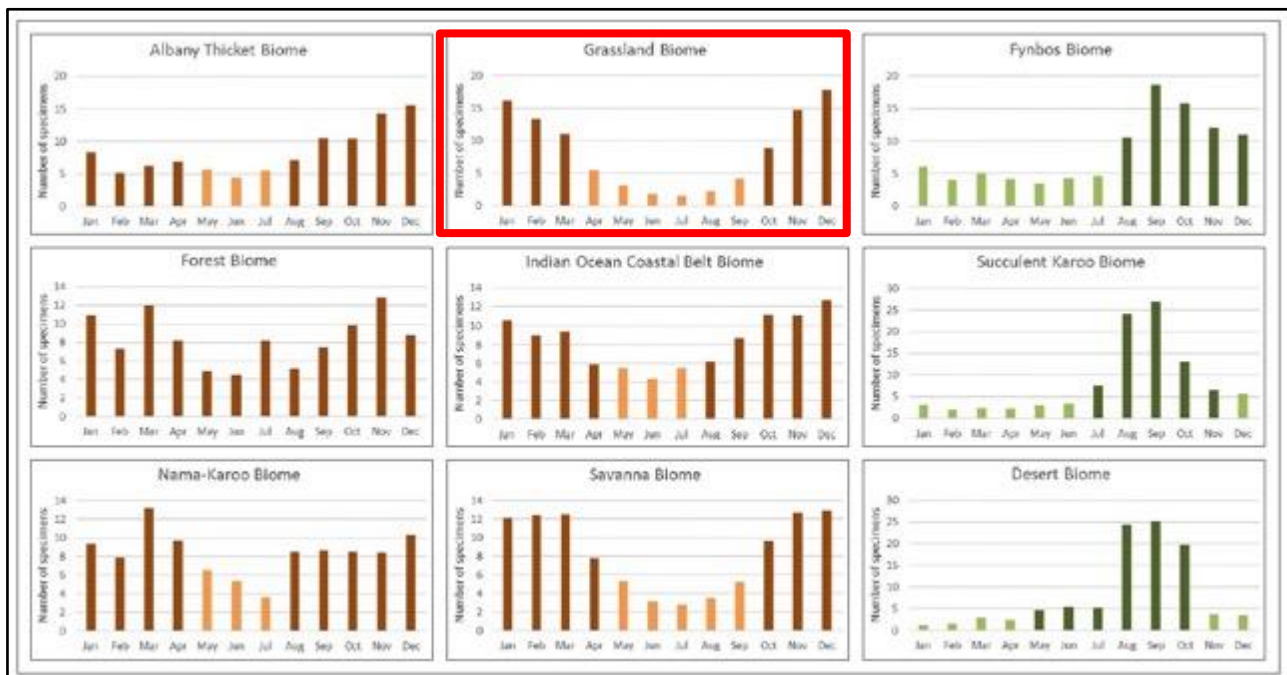


Figure 5: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines). The site is within the Fynbos Biome.

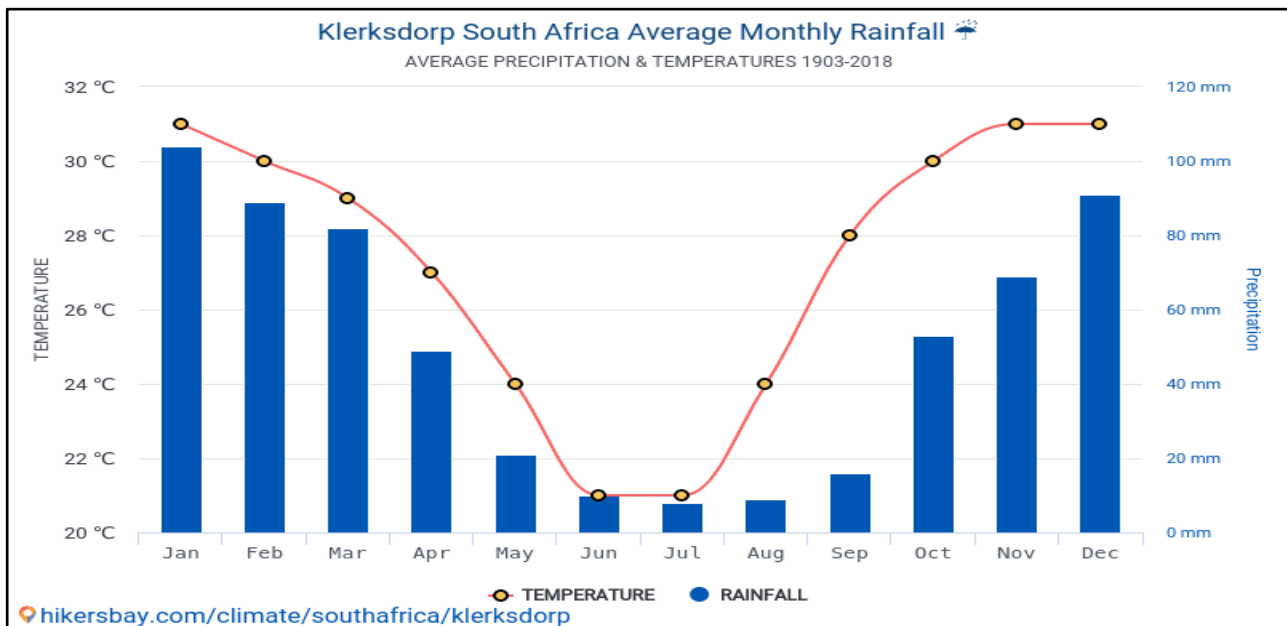


Figure 6: Climate diagram showing average monthly rainfall and temperature for Klerksdorp.

Field survey approach

The study commenced as a desktop-study followed by a site-specific field study. During the field survey of habitats on site, the entire site was assessed on foot. Field surveys included both meander searches of general areas, and active searching in habitats that were considered to be suitable for specific groups or species. Meander surveys were undertaken with no time restrictions - the objective was to comprehensively examine all natural areas. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made (Figure 7). Digital photographs were taken of features and habitats on site, as well as of all plant species that were seen. All plant and animal species recorded were uploaded to the iNaturalist website (<https://www.inaturalist.org>) and are accessible by viewing the observations for the site (use the Explore menu, zoom and pan until the desired study area is within the browser window, click the button "Redo search in map", and all observations for that area will be shown and listed).

Aerial imagery from Google Earth was used to identify and assess habitats on site. This included historical imagery that may show information not visible in any single dated image. Patterns identified from satellite imagery were verified on the ground. Digital photographs were taken at locations where features of interest were observed. During the field survey, particular attention was paid to ensuring that all habitat variability was covered physically on the ground.

Sources of information

Vegetation and plant species

- Plant species that could potentially occur on in the general area was extracted from the NewPosa database of the South African National biodiversity Institute (SANBI) for the quarter degree grid/s in which the site is located.
- The IUCN Red List Category for plant species, as well as supplementary information on habitats and distribution, was obtained from the SANBI Threatened Species Programme (Red List of South African Plants, <http://redlist.sanbi.org>).
- Lists were compiled specifically for any species at risk of extinction (Red List species) previously recorded in the area. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute (<http://posa.sanbi.org>) for the quarter degree square/s within which the study area is situated. Habitat information for each species was obtained from various published sources. The probability of finding any of these species was then assessed by comparing the habitat requirements with those habitats that were found, during the field survey of the site, to occur there.
- Regulations published for the National Forests Act (Act 84 of 1998) (NFA) as amended, 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. The distribution of species on this list were obtained from published sources (e.g. van Wyk & van Wyk 1997) and from the SANBI Biodiversity Information System website (<http://sibis.sanbi.org/>) for quarter degree grids in which species have been previously recorded. Species that have been recorded anywhere in proximity to the site (within 100 km), or where it is considered possible that they could occur there, were listed and were considered as being at risk of occurring there.

Limitations

The following assumptions, limitations, uncertainties are listed regarding the assessment of the site:

- The assessment is based on a single site visit. The current study is based on an extensive site visit as well as a desktop study of the available information. The time spent on site was adequate for understanding general patterns across affected areas.
- Compiling the list of species that could potentially occur on site is limited by the paucity of collection records for the area. The list of plant species that could potentially occur on site was therefore taken from a wider area and from literature sources that may include species that do not occur on site and may miss species that do occur on site. In order to compile a comprehensive site-specific list of the biota on site, studies would be required that would include different seasons, be undertaken over a number of years and include extensive sampling. Due to legislated time constraints for environmental authorisation processes, this is not possible.
- Rare and threatened plant species are, by their nature, usually very difficult to locate and can be easily missed.

OUTCOME OF THE ASSESSMENT

Regional vegetation patterns

There is one regional vegetation type occurring on site, namely Vaal-Vet Sandy Grassland (Figure 6). There are small patches of Highveld Salt Pans in nearby areas. These two vegetation types that occur on site and nearby are briefly described below according to published information. The description is from Mucina & Rutherford (2006), extracted from the SANBI BGIS website (<http://bgis.sanbi.org/vegmap>).

Vaal-Vet Sandy Grassland

This vegetation type occurs in the North-West and Free State Provinces in the area south of Lichtenburg and Ventersdorp, stretching southwards to Klerksdorp, Leeudoringstad, Bothaville and to the Brandfort area north of Bloemfontein. It occurs on plains-dominated landscapes with some scattered, slightly irregular undulating plains and hills.

The vegetation is mainly a low-tussock grassland with an abundant karroid element (Mucina et al. 2006). The dominance of *Themeda triandra* is an important feature of this vegetation type. Locally low cover of *Themeda triandra* and the associated increase in *Elionurus muticus*, *Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall.

Important taxa include the grasses, *Antheophora pubescens* (d), *Aristida congesta* (d), *Chloris virgata* (d), *Cymbopogon caesius* (d), *Cynodon dactylon* (d), *Digitaria argyrograpta* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. lehmanniana* (d), *E. plana* (d), *E. trichophora* (d), *Heteropogon contortus* (d), *Panicum gilvum* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Tragus berteronianus* (d), *Brachiaria serrata*, *Cymbopogon pospischilii*, *Digitaria eriantha*, *Eragrostis curvula*, *E. obtusa*, *E. superba*, *Panicum coloratum*, *Pogonarthria squarrosa*, *Trichoneura grandiglumis* and *Triraphis andropogonoides*, the herbs, *Stachys spathulata* (d), *Barleria macrostegia*, *Berkheya onopordifolia* var. *onopordifolia*, *Chamaesyce inaequilatera*, *Geigeria aspera* var. *aspera*, *Helichrysum caespititium*, *Hermannia depressa*, *Hibiscus pusillus*, *Monsonia burkeana*, *Rhynchosia adenodes*, *Selago densiflora*, *Vernonia oligocephala*, the geophytic herbs, *Bulbine narcissifolia* and *Ledebouria marginata*, the succulent Herb, *Tripteris aghillana* var. *integrifolia*, the low shrubs, *Felicia muricata* (d), *Pentzia globosa* (d), *Anthospermum rigidum* subsp. *pumilum*, *Helichrysum dregeanum*, *H. paronychioides* and *Ziziphus zeyheriana*.

Natural habitats on site

Natural habitats on site match the landcover map for the area (Figure 8). The majority of the solar PV area is within a previously cultivated area that currently contains secondary grassland. Remaining areas are natural grassland. A broad classification of the habitat units on site, which also reflects relatively uniform plant species compositional units, is as follows:

Natural habitats:

1. **Natural grassland** (open grassland on undulating plains – the condition is not indicated in the habitat map although there is a gradient from heavily grazed poor condition to moderate condition);

Transformed and degraded areas:

2. **Old lands** (secondary grasslands on previously cultivated areas);

NATURAL VERSUS SECONDARY GRASSLAND	
Natural grassland	Areas of original vegetation in which the soil has not been mechanically disturbed, including areas that are in poor condition due to overgrazing, trampling, invasion by weeds or alien invasive species, inappropriate fire regimes , or any other factor that drives natural change in species composition or vegetation structure. The key factor is that the original plants continue to exist, often resprouting after defoliation from sub-surface stems or other storage organs.
Secondary grassland	Areas of vegetation where the original grassland vegetation has been lost through direct disturbance of the soil that results in physical removal of the original plants, the most common cause of which is ploughing, but could be other mechanical factors. The vegetation that then develops is as a result of recolonization of the area through propagation.

The natural grassland on site is characterised by medium-height grassland that appears to be overgrazed at times. The presence of scattered termite mounds throughout the site indicates that the grassland is in a natural state (not ploughed). There were also no plough lines in these grasslands on the aerial imagery for the site. Significant parts of the site have been cultivated at some point in history, which is also clearly evident from the vegetation structure and species composition on site. The topography within these grassland areas is relatively flat. Common and dominant species in the natural areas include *Themeda triandra*, *Digitaria erianthe*, *Eragrostis chloromelas*, *Aristida congesta* subsp. *congesta*, *Cymbopogon pospischilii*, *Eragrostis superba*, *Setaria sphacelata* var. *torta*, *Eragrostis obtusa*, *Trichoneura grandiglumis*, *Cynodon dactylon*, *Felicia muricata*, *Hermannia depressa*, *Arctotis arctotoides*, *Anthospermum rigidum*, *Walafrida densiflora* and *Barleria* species. A total of 25 species per 100m² was recorded in these natural grasslands, which is moderately diverse relative to other Highveld grasslands. In comparison, the previously cultivated areas had only 17 species per 100m². Common and dominant species in the previously cultivated areas were *Aristida congesta* subsp. *congesta*, *Eragrostis lehmanniana*, *Themeda triandra*, *Eragrostis superba*, *Melinis repens*, *Trichoneura grandiglumis*, *Cynodon dactylon*, *Arctotis arctotoides*, *Anthospermum rigidum*, *Hermannia depressa* and *Pentzia* species.

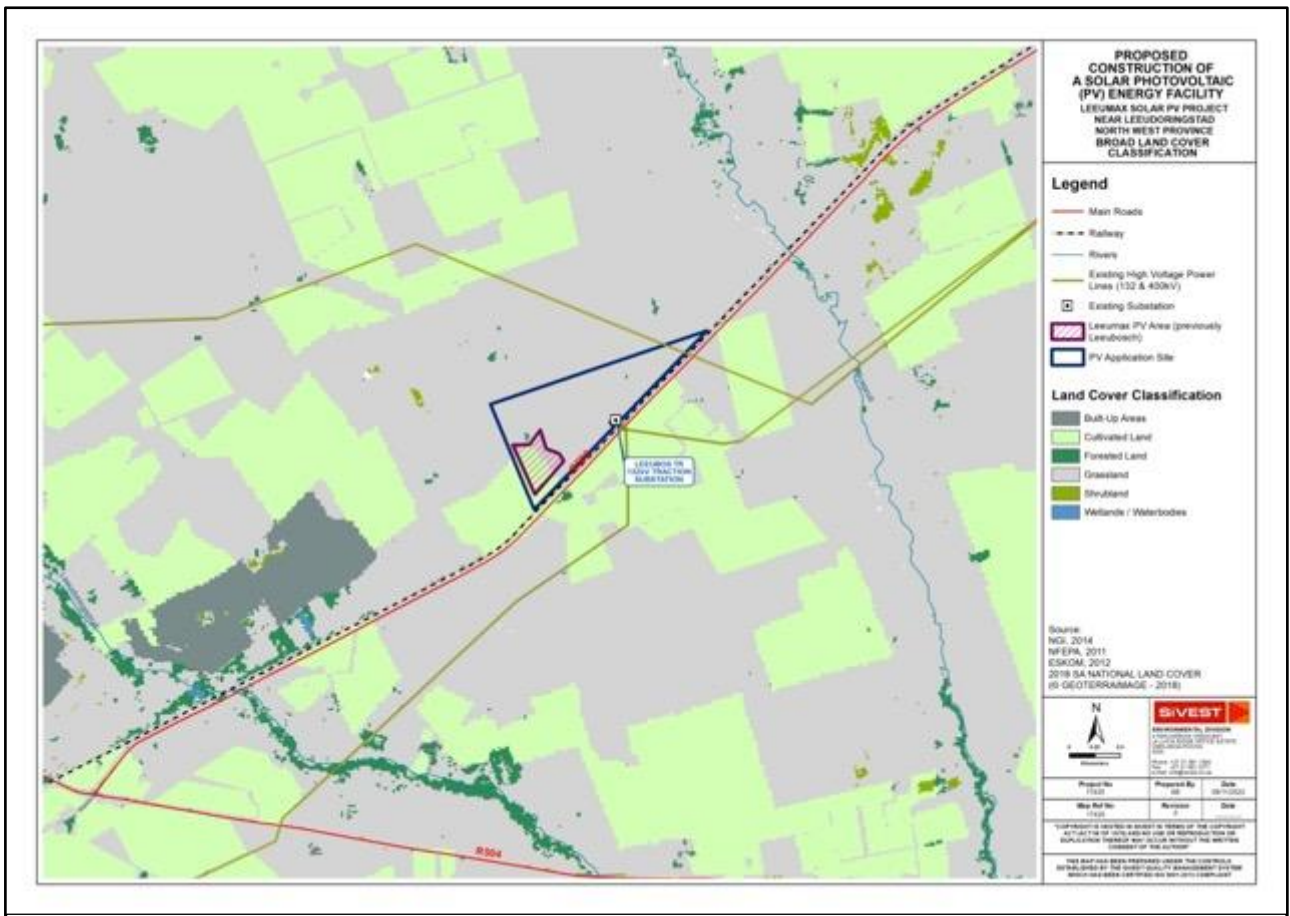


Figure 7: Habitats on site match the landcover classification.



Figure 9: View of the site at the existing small reservoir (northern edge of solar array).



Figure 8: Grassland on site.

Red List plant species of the study area

According to the National Web-Based Environmental Screening Tool (DFFE), there is one plant species of concern flagged for the site (see previous section of this report). This is a sensitive species for which the details are not allowed to be presented in a public document.

Lists of plant species previously recorded in the quarter degree grids in which the study area is situated as well as all surrounding grids 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.

There is one species that may occur in the study area, the geophyte, *Eucomis autumnalis* subsp. *clavata*, listed as Declining. *Eucomis autumnalis* subsp. *clavata* is found in damp, open grassland and sheltered places from the coast to 2450 m. The species has been recorded in the current grid near to the current site and the possibility of it occurring in the study area is therefore considered to be high. The habitat on site is potentially suitable, but no individuals were found there.

Protected plants (NEMBA)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in Appendix 4. Two plant species that appear on this list that could potentially occur in the general region, although they have not previously been recorded in the grids of the study area, are *Crinum bulbispermum* and *Harpagophytum procumbens*.

Crinum bulbispermum

Crinum bulbispermum occurs from the Northern Cape eastwards to Mpumalanga and KwaZulu-Natal. It also occurs in Lesotho. It is found in grasslands and savanna near rivers, streams, seasonal pans and in damp depressions. There is a moderate to low probability that it occurs in the general study area, but it was not found on site, although habitat suitability suggests it could potentially occur there.

Harpagophytum procumbens

Harpagophytum procumbens occurs in Angola, Botswana, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe. Within South Africa this species occurs in the Northern Cape, North West, Free State, and Limpopo Provinces and the largest populations are found in the communally owned areas of the North West Province and the north eastern parts of the Northern Cape. The species is found in well drained sandy habitats in open savanna and woodlands. It has been previously recorded in this general area in which the site is located. It is considered possible that this species could occur on site, but it was not found there.

Summary

No flagged, sensitive or protected plant species were found on site, therefore none will be affected by the proposed development.

There are no threatened, near threatened or rare species that occur in or close to the proposed development area. It is therefore verified that the Plant Species Theme has LOW sensitivity for the development footprint.

SITE ECOLOGICAL IMPORTANCE

The Species Environmental Assessment Guidelines require that a Site Ecological Importance (SEI) is calculated for each habitat on site, and provides methodology for making this calculation. The SEI is assessed separately for each biodiversity theme and is assessed below specifically for the Terrestrial Plant Species theme.

As per the Species Environmental Assessment Guidelines, Site Ecological Importance (SEI) is calculated as a function of the Biodiversity Importance (BI) of the receptor and its resilience to impacts ($SEI = BI + RR$). The Biodiversity Importance (BI) in turn is a function of Conservation Importance (CI) and Functional Integrity (FI), i.e. $BI = CI + FI$.

An assessment of habitats on site is provided below (Table 2) specifically for the Plant Species Theme.

Table 2: Site ecological importance for habitats found on site

Habitat	Conservation importance	Functional integrity	Receptor resilience	Site Ecological Importance (BI)
Grassland	Low No confirmed or highly likely populations of SCC.	Medium Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types.	Low Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.	Medium (BI = Low)
Secondary vegetation	Low < 50% of receptor contains natural habitat with limited potential to support SCC.	Medium Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora)	Medium Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor	Low (BI = Low)

		and a few signs of minor past disturbance. Moderate rehabilitation potential..	functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	
Degraded & transformed	Very low No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)

Guidelines for development activities within different importance levels are given in the Table below (Table 8).

Table 3: Guidelines for interpreting SEI in the context of the proposed development activities

Site ecological importance	Interpretation in relation to proposed development activities
Very high	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/ not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/ unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities
Very low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

CONCLUSION

Desktop information, field data collection and mapping from aerial imagery provides the following verifications of patterns for the plant species theme:

1. Large parts of the site consists of secondary grassland within previously cultivated areas. There are remnants of the original natural grassland vegetation in the area.
2. One sensitive plant species is flagged for the site but it was not found there. For all other plant SCC, based on the available habitat, it is considered unlikely that any occur there. The site is therefore confirmed to have low sensitivity for the plant species theme. The proposed development is therefore supported.

REFERENCES

- Germishuizen, G., Meyer, N.L., Steenkamp, Y And Keith, M. (eds.) (2006). A checklist of South African plants. Southern African Botanical Diversity Network Report No. 41, SABONET, Pretoria.
- IUCN (2001). *IUCN Red Data List categories and criteria: Version 3.1*. IUCN Species Survival Commission: Gland, Switzerland.

APPENDICES:

Appendix 1: Plant species of conservation importance (Threatened, Near Threatened and Declining) that have historically been recorded in the study area.

Sources: South African National Biodiversity Institute in Pretoria.

Family	Taxon	Status	Habitat	Likelihood of occurrence in study area
AMARYLLIDACEAE	<i>Crinum bulbispermum</i>	Declining	Near rivers, streams, seasonal pans and in damp depressions	MEDIUM
HYACINTHACEAE	<i>Eucomis autumnalis</i> subsp. <i>clavata</i>	Declining	Damp open grassland and sheltered places from the coast to 2450 m.	LOW
APOCYNACEAE	<i>Brachystelma incanum</i>	Vulnerable	Lichtenburg to Wolmaransstad and Sasolburg. Sandy loam soils in thornveld and themeda-grassland. Previously recorded near Wolmaransstad 25 km to west of site, and near Bakerville to the west of Lichtenburg.	HIGH
BRASSICACEAE	<i>Cleome conrathii</i>	Near Threatened	Kuruman to Pretoria. Stony, quartzite slopes, usually in red sandy soil, grassland or deciduous woodland, all aspects.	LOW
HYACINTHACEAE	<i>Drimia sanguinea</i>	Near threatened	Northern Cape to Limpopo and Mpumalanga. Open veld and scrubby woodland in a variety of soil types.	HIGH
ASTERACEAE	<i>Gnaphalium nelsonii</i>	Near threatened	Pretoria to Vereeniging and Wolmaransstad. Seasonally wet places in grassland and savanna, and along dry watercourses.	HIGH
AIZOACEAE	<i>Lithops leslei</i> subsp. <i>leslei</i>	Near threatened	From Douglas in the Northern Cape to central Limpopo Province and south-eastern Botswana. Primarily in arid grasslands, usually in rocky places, growing under the protection of forbs and grasses.	MEDIUM
AMARYLLIDACEAE	<i>Nerine gracilis</i>	Vulnerable	Belfast and Ermelo to Wolmaransstad. Undulating grasslands in damp areas.	HIGH

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

Appendix 2: List of protected tree species (National Forests Act).

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

Vachellia erioloba and *Boscia albitrunca* have a geographical distribution that coincides with the study area.

Appendix 3: Plant species previously recorded in the general area. Those recorded on site are highlighted in green.

Acanthosicyos naudinianus	Brachystelma stenophyllum
Achyranthes aspera var. sicula*	Bulbine abyssinica
Acrotome inflata	Bulbine capitata
Achyropsis leptostachya	Bulbine frutescens
Achyropsis sp.	Bulbine narcissifolia
Ornithogalum prasinum	Bulbostylis hispidula subsp. pyriformis
Albuca setosa	Cadaba aphylla
Albuca shawii	Celtis africana
Albuca virens subsp. arida	Chamaecrista blensis
Albuca virens subsp. virens	Chascanum adenostachyum
Alectra pumila	Chascanum pinnatifidum var. pinnatifidum
Aloe greatheadii	Chasmatophyllum musculinum
Amellus strigosus	Cheilanthes parviloba
Andropogon appendiculatus	Chenopodium album
Anthepphora pubescens	Chenopodium carinatum
Anthospermum rigidum	Chloris gayana
Antizoma angustifolia	Chlorophytum angulicaule
Aponogeton rehmannii	Chlorophytum fasciculatum
Aptosimum indivisum	Ciclospermum leptophyllum*
Aptosimum elongatum	Clematis brachiata
Arctotis arctotoides	Coccinia sessilifolia
Arctotis venusta	Colchicum melanthoides subsp. melanthoides
Argemone ochroleuca* (Declared weed category 1)	Commelina africana var. krebsiana
Aristida canescens	Commelina livingstonii
Aristida congesta subsp. barbicollis	Commicarpus pilosus
Aristida congesta subsp. congesta	Convolvulus aschersonii
Aristida diffusa subsp. burkei	Convolvulus dregeanus
Aristida junciformis subsp. junciformis	Convolvulus sagittatus
Aristida stipitata subsp. graciliflora	Convolvulus sp.
Aristida stipitata subsp. stipitata	Conyza canadensis*
Asclepias aurea	Corchorus asplenifolius
Asclepias brevipes	Crabbea acaulis
Asclepias densiflora	Crassula capitella subsp. nodulosa
Asclepias gibba var. gibba	Crassula lanceolata subsp. lanceolata
Asclepias fruticosus	Crotalaria sphaerocarpa subsp. sphaerocarpa
Asclepias sp.	Crotalaria sp.
Asparagus larinicus	Croton gratissimus var. subgratissimus
Asparagus suaveolens	Cucumis zeyheri
Atriplex nummularia subsp. nummularia*	Cullen tomentosum
Atriplex semibaccata var. typica*	Cuscuta campestris
Berkheya heterophylla	Cymbopogon caesius
Bidens bipinnata	Cymbopogon dieterienii
Blepharis squarrosa	Cymbopogon pospischilli
Bolusia acuminata	Cynodon dactylon
Boscia albitrunca (Protected tree species)	Cyperus assimilis
Brachiaria eruciformis	Cyperus capensis
Brachiaria nigropedata	Cyperus decurvatus
Brachiaria serrata	Cyperus difformis
	Cyperus eragrostis*

Cyperus longus var. tenuiflorus
 Cyperus margaritaceus var. margaritaceus
 Cyperus rupestris var. rupestris
 Cyperus sphaerospermus
 Cyperus usitatus
 Cyphia assimilis
 Cyphia sp.
 Cyphia stenopetala
*Datura ferox** (Declared weed Cat 1)
 Delosperma sp.
Denekia capensis
 Deverra burchellii
 Diandrochloa sp. (prob. namaquensis)
 Dianthus micropetalus
 Dianthus mooiensis subsp. kirkii
 Dicoma anomala subsp. gerrardii
Dicoma zeyheri
Digitaria erianthe
 Diheteropogon amplexans
Diopsiros lycioides subsp. lycioides
 Diospyros austro-africana var. microphylla
 Dipcade viride
 Drimia elata (DDT)
 Duthieastrum linifolium
 Dyschoriste transvaalensis
 Echinochloa colona
Echinochloa holubii
 Ehretia alba
 Elephantorrhiza elephantina
Elionurus muticus
*Emex australis**
 Eragrostis biflora
Eragrostis chloromelas
Eragrostis curvula
Eragrostis gummiflora
 Eragrostis lappula
Eragrostis lehmanniana var. lehmanniana
Eragrostis obtusa
 Eragrostis pallens
Eragrostis plana
 Eragrostis pseudobtusa
 Eragrostis stapfii
Eragrostis superba
Eragrostis trichophora
 Eragrostis viscoa
*Eucalyptus camaldulensis** (Declared invader category 2)
 Euclea undulata
 Eucomis autumnalis subsp. clavata (Declining)
Euphorbia inaequilatera var. inaequilatera
 Euphorbia pseudotuberosa
 Evolvulus alsinoides
Falkia oblonga
Felicia muricata
*Ficus carica**
*Flaveria bidentis**
 Fockia angustifolia
Gazania krebsiana
 Geigeria burkei subsp. burkei var. burkei
 Gisekia pharnacoides var. pharnacoides
 Gladiolus permeabilis subsp. edulis
Gnaphalium filagopsis
 Gnidia sericocephala
 Gomphocarpus fruticosus subsp. fruticosus
 Gomphostigma virgatum
*Gomphrena celosioides**
 Grewia flava
*Guilleminea densa**
 Gymnosporia buxifolia
 Gymnosporia tenuispina
 Haemanthus humilis subsp. hirsutus
 Harpagophytum procumbens subsp. procumbens (Protected)
 Helichrysum argyrosphaerum
Helichrysum caespitium
Helichrysum callicomum
Helichrysum nudifolium
 Helichrysum sp.
 Helichrysum zeyheri
 Heliotropium ciliatum
 Heliotropium nelsonii
 Hemarthria altissima
Hermannia depressa
 Hermannia stellulata
 Hermannia tomentosa
 Hermstaedtia odorata var. aurantiaca
 Hermstaedtia odorata var. odorata
Heteropogon contortus
 Hibiscus microcarpus
 Hibiscus pusillus
 Hillardiella oligocephala
 Hypertelis salsoloides var. salsoloides
 Indigofera commixta
 Indigofera cryptantha
 Indigofera daleoides var. daleoides
 Indigofera heterotricha
 Indigofera rhytidocarpa subsp. rhytidocarpa
Indigofera vicioides var. vicioides
 Ipomoea albivenia
 Ipomoea bathycolpos
 Ipomoea bolusiana
Ipomoea oenotheroides
 Ipomoea ommaneyi
 Jamesbrittenia aurantiaca
 Jamesbrittenia sp.
 Juncus rigidus

Justicia orchioides subsp. *glabrata*
Kalanchoe rotundifolia
Kohautia amatymbica
Kohautia caespitosa subsp. *brachyloba*
Kyllinga alba
Kyllinga erecta
Kyphocarpa angustifolia
Lactuca inermis
Lantana rugosa
Lasiosiphon burchellii
Lasiosiphon capitatus
Ledebouria sp.
Leptochloa fusca
Lippia javonica
Lippia scaberrima
Leobordea carinata
Leobordea adpressa subsp. *adpressa*
Listia heterophylla
Lobelia flaccida
Lobelia thermalis
Lycium arenicola
Lycium cinereum
Lycium hirsutum
Lycium horridum
Malva parviflora
Marsilea macrocarpa
Melhania prostrata
Melinis repens
Mestoklema arboriforme
Michrochloa caffra
Momordica balsamina
Monsonia angustifolia
Nerine frithii
Nerine laticoma
*Nicotiana glauca**
Nidorella anomala
Nidorella hottentotta
Nidorella resedifolia subsp. *resedifolia*
Ocimum angustifolium
Ophioglossum polyphyllum var. *polyphyllum*
*Opuntia microdasys**
Orbea sp.
Ornithogalum juncifolium var. *juncifolium*
Ornithogalum flexuosum
Ornithoglossum vulgare
Oropetium capense
Orthanthera jasminiflora
*Oxalis corniculata**
Oxygonum dregeanum subsp. *canescens* var. *canescens*
Panicum kalaharensis
Panicum schinzii
Papaver aculeatum
Pappea capensis
Paspalum distichum
*Paspalum urvillei**
Pavetta zeyheri subsp. *zeyheri*
Pavonia burchellii
Pellaea calomelanos var. *calomelanos*
Pentzia globosa
*Persicaria lapathifolia**
Pharmaceum brevicaule
Phyllanthus parvulus var. *parvulus*
*Plumbago zeylanica**
Pogonarthria squarrosa
Polygala hottentotta
Polygala uncinata
Portulaca hereroensis
Portulaca kermesina
Portulaca quadrifida
Potamogeton pectinatus
Protea roupelliae subsp. *roupelliae*
Pseudognaphalium luteo-album
Raphionacme hirsuta
Requienia sphaerosperma
Rhynchosia venulosa
*Richardia scabra**
Ruellia setosa
*Rumex lanceolatus**
Ruschia sp.
Salsola glabrescens
Salvia disermas
Salvia runcinata
Salvia stenophylla
Scabiosa columbaria
Scizocarpus nervosus
Schmidtia pappophoroides
*Schkuhria pinnata**
Schoenoplectus corymbosus
Schoenoplectus species
Searsia ciliate
Searsia lancea
Searsia leptodictya forma *leptodictya*
Searsia magalismsontana subsp. *magalismsontana*
Searsia pyroides var. *pyroides*
Searsia rigida var. *margaretae*
Seddera capensis
Selaginella dregei
Selago densiflora
Selago welwitschii var. *australis*
Senecio inaequidens
Senecio species
Senegalia caffra
Senna italica subsp. *arachoides*
Sericorema remotiflora
Seriphium plumosum

Sesbania bispinosa var. bispinosa*
Setaria incrassata
Setaria sphacelata var. torta
Sida chrysantha
Silene undulata
Solanum lichtensteinii
Solanum rubetorum
Solanum supinum var. supinum
Solanum tomentosum*
Sonchus dregeanus
Sporobolus discosporus
Sporobolus fimbriatus
Stachys spathulata
Stipagrostis uniplumis var. neesii
Stipagrostis uniplumis var. uniplumis
Tagetes minuta
Tarchonanthus camphoratus
Tephrosia lupinifolia
Teucrium trifidum
Themeda triandra
Thesium gracilarioides
Thunbergia neglecta
Thunbergia sp.
Trachyandra asperata var. asperata
Trachyandra laxa var. rigida
Trachyandra saltii var. saltii
Tragia rupestris

Tragia sp.
Tragus racemosus
Tribulus terrestris
Trichodesma angustifolium subsp. angustifolium
Trichoneura grandiglumis
Tristachya rehmannii
Tulbaghia acutiloba
Vachellia karroo
Vahlia capensis subsp. vulgaris var. linearis
Vachellia erioloba
Vachellia hebeclada subsp. hebeclada
Vachellia robusta subsp. robusta
Verbesina encelloides var. encelloides*
Verbena bonariensis*
Verbena officinalis*
Vernonia oligocephala
Viscum rotundifolium
Wahlenbergia androsacea
Wahlenbergia banksiana
Wahlenbergia denticulata var. denticulata
Wahlenbergia denticulata var. transvaalensis
Wahlenbergia undulata
Ziziphus mucronata subsp. mucronata
Ziziphus zeyheriana
Zornia milneana

Appendix 4: Flora species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

(as updated in R. 1187, 14 December 2007)

CRITICALLY ENDANGERED SPECIES

Flora

Adenium swazicum
Aloe pillansii
Diaphanathe millarii
Dioscorea ebutsniorum
Encephalartos aemulans
Encephalartos brevifoliolatus
Encephalartos cerinus
Encephalartos dolomiticus
Encephalartos heenanii
Encephalartos hirsutus
Encephalartos inopinus
Encephalartos latifrons
Encephalartos middelburgensis
Encephalartos nubimontanus
Encephalartos woodii

ENDANGERED SPECIES

Flora

Angraecum africae
Encephalartos arenarius
Encephalartos cupidus
Encephalartos horridus
Encephalartos laevifolius
Encephalartos lebomboensis
Encephalartos msinganus
Jubaeopsis caffra
Siphonochilus aethiopicus
Warburgia salutaris
Newtonia hilderbrandi

VULNERABLE SPECIES

Flora

Aloe albida
Encephalartos cycadifolius
Encephalartos Eugene-maraisii
Encephalartos ngovanus
Merwillia plumbea
Zantedeschia jucunda

PROTECTED SPECIES

Flora

Adenia wilmsii
Aloe simii
Clivia mirabilis

Disa macrostachya
Disa nubigena
Disa physodes
Disa procera
Disa sabulosa
Encephelartos altensteinii
Encephelartos caffer
Encephelartos dyerianus
Encephelartos frederici-guilielmi
Encephelartos ghellinckii
Encephelartos humilis
Encephelartos lanatus
Encephelartos lehmannii
Encephelartos longifolius
Encephelartos natalensis
Encephelartos paucidentatus
Encephelartos princeps
Encephelartos senticosus
Encephelartos transvenosus
Encephelartos trispinosus
Encephelartos umbeluziensis
Encephelartos villosus
Euphorbia clivicola
Euphorbia meloformis
Euphorbia obesa
Harpagophytum procumbens
Harpagophytum zeyherii
Hoodia gordonii
Hoodia currorii
Protea odorata
Stangeria eriopus

Appendix 5: Flora species protected under the North West Biodiversity Management Act, No. 4 of 2004

(Published in Provincial Gazette No. 7721, 3 January 2017)

KINGDOM PLANTAE

Aloe braamvanwykii (CR)

Anacampseros decapitate (VU)

Barleria media (VU)

Blepharis angusta (endemic to NW)

Brachystelma (all species) – those recorded near to the site include the following: burchellii var. burchellii, circinatum, cupulatum, dimorphum subsp. gratum (CR), foetidum, **incanum** (VU), nanum, ramosissimum, stenophyllum

Ceropegia insignis (EN)

Ceropegia stentiae (EN)

Cineraria austrotransvaalensis (NT)

Cineraria exilis (DDT)

Cleome conrathii (NT)

Commelina bella (DDT)

Cynodon polevansii

Delosperma leendertziae (NT)

Dicliptera magaliesbergensis (VU)

Drimia sanguinea (NT)

Euphorbia (all species, except E. ingens) – those recorded near to the site include **davyi**, duseimata, **hirta**, **inaequilatera**, indica, **prostrata**, **serpens**, **spartaria**

Pteridophyta, all species except Pteridium aquilinum

Frithia pulchra (rare)

Gladiolus filiformis (NT)

Gnaphalium nelsonii (NT)

Indigofera commixta

Kniphofia typhoides (NT)

Ledebouria atrobrunnea

Ledebouria confusa

Lessertia phillipsiana (DDD)

Lithops leslei subsp. leslei (NT)

Lobelia cuneifolia var. ananda (critically rare)

Miraglossum laeve (CR PE)

Nerine gracilis (VU)

Nuxia glomerulata

Rennera stellata (now Pentzia stellata) (NT)

Searsia maricoana (VU)

Senecio holubii (CR PE)

Spirostachys africana

Sporobolus oxyphyllus

Stenostelma umbelluliferum (NT)

Appendix 6: Curriculum vitae: Dr David Hoare

Education

Matric - Graeme College, Grahamstown, 1984

B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993

B.Sc (Hons) (Botany) - Rhodes University, 1994 with distinction

M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction

PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation

- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands.
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Membership

Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005
– present. Reg. no. 400221/05 (Ecology, Botany)

Member, International Association of Vegetation Scientists (IAVS)

Member, Ecological Society of America (ESA)

Member, International Association for Impact Assessment (IAIA)

Member, Herpetological Association of Africa (HAA)

Employment history

1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.

1 January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.

1 January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.

1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

Experience as consultant

Ecological consultant since 1995. Author of over 380 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

Publication record:**Refereed scientific articles (in chronological order):****Journal articles:**

- HOARE, D.B.** & BREDENKAMP, G.J. 1999. Grassland communities of the Amatola / Winterberg mountain region of the Eastern Cape, South Africa. *South African Journal of Botany* 64: 44-61.
- HOARE, D.B.**, VICTOR, J.E., LUBKE, R.A. & MUCINA, L., 2000. Vegetation of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 87-96.
- VICTOR, J.E., **HOARE, D.B.** & LUBKE, R.A., 2000. Checklist of plant species of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 97-101.
- MUCINA, L, BREDENKAMP, G.J., **HOARE, D.B** & MCDONALD, D.J. 2000. A National Vegetation Database for South Africa *South African Journal of Science* 96: 1-2.
- HOARE, D.B.** & BREDENKAMP, G.J. 2001. Syntaxonomy and environmental gradients of the grasslands of the Stormberg / Drakensberg mountain region of the Eastern Cape, South Africa.. *South African Journal of Botany* 67: 595 – 608.
- LUBKE, R.A., **HOARE, D.B.**, VICTOR, J.E. & KETELAAR, R. 2003. The vegetation of the habitat of the Brenton blue butterfly, *Orachrysops niobe* (Trimen), in the Western Cape, South Africa. *South African Journal of Science* 99: 201–206.
- HOARE, D.B** & FROST, P. 2004. Phenological classification of natural vegetation in southern Africa using AVHRR vegetation index data. *Applied Vegetation Science* 7: 19-28.
- FOX, S.C., HOFFMANN, M.T. and HOARE, D. 2005. The phenological pattern of vegetation in Namaqualand, South Africa and its climatic correlates using NOAA-AVHRR NDVI data. *South African Geographic Journal*, 87: 85–94.
- Pfab, M.F., Compaan, P.C., Whittington-Jones, C.A., Engelbrecht, I., Dumalisile, L., Mills, L., West, S.D., Muller, P., Masterson, G.P.R., Nevhutalu, L.S., Holness, S.D., **Hoare, D.B.** 2017. The Gauteng Conservation Plan: Planning for biodiversity in a rapidly urbanising province. *Bothalia*, Vol. 47:1. a2182. <https://doi.org/10.4102/abc.v47i1.2182>.

Book chapters and conference proceedings:

- HOARE, D.B.** 2002. Biodiversity and performance of grassland ecosystems in communal and commercial farming systems in South Africa. Proceedings of the FAO's Biodiversity and Ecosystem Approach in Agriculture, Forestry and Fisheries Event: 12–13 October, 2002. Food and Agriculture Organisation of the United Nations, Viale delle Terme di Caracalla, Rome, Italy. pp. 10 - 27.
- STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. In: Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. da (eds.) *Hotspots revisited*. CEMEX, pp.218–229. ISBN 968-6397-77-9
- STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. **Error! Hyperlink reference not valid..**
- HOARE, D.B.**, MUCINA, L., RUTHERFORD, M.C., VLOK, J., EUSTON-BROWN, D., PALMER, A.R., POWRIE, L.W., LECHMERE-OERTEL, R.G., PROCHES, S.M., DOLD, T. and WARD, R.A. *Albany Thickets*. in Mucina, L. and Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.
- MUCINA, L., **HOARE, D.B.**, LÖTTER, M.C., DU PREEZ, P.J., RUTHERFORD, M.C., SCOTT-SHAW, C.R., BREDENKAMP, G.J., POWRIE, L.W., SCOTT, L., CAMP, K.G.T., CILLIERS, S.S., BEZUIDENHOUT, H., MOSTERT, T.H., SIEBERT, S.J., WINTER, P.J.D., BURROWS, J.E., DOBSON, L., WARD, R.A., STALMANS, M., OLIVER, E.G.H., SIEBERT, F., SCHMIDT, E., KOBISI, K., KOSE, L. 2006. *Grassland Biome*. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.
- RUTHERFORD, M.C., MUCINA, L., LÖTTER, M.C., BREDENKAMP, G.J., SMIT, J.H.L., SCOTT-SHAW, C.R., **HOARE, D.B.**, GOODMAN, P.S., BEZUIDENHOUT, H., SCOTT, L. & ELLIS, F., POWRIE, L.W., SIEBERT, F., MOSTERT, T.H., HENNING, B.J., VENTER, C.E., CAMP, K.G.T., SIEBERT, S.J., MATTHEWS, W.S., BURROWS, J.E., DOBSON, L., VAN ROOYEN, N., SCHMIDT, E., WINTER, P.J.D., DU PREEZ, P.J., WARD, R.A., WILLIAMSON, S. and HURTER, P.J.H. 2006. *Savanna Biome*. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

- MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., **HOARE, D.B.**, BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P. 2006. *Nama-Karoo Biome*. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.
- MUCINA, L., SCOTT-SHAW, C.R., RUTHERFORD, M.C., CAMP, K.G.T., MATTHEWS, W.S., POWRIE, L.W. and **HOARE, D.B.** 2006. *Indian Ocean Coastal Belt*. In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Conference Presentations:

- HOARE, D.B. & LUBKE, R.A. *Management effects on diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994
- HOARE, D.B., VICTOR, J.E. & LUBKE, R.A. *Description of the coastal fynbos south of George, southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994
- HOARE, D.B. & LUBKE, R.A. *Management effects on fynbos diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995
- HOARE, D.B. & BOTHA, C.E.J. *Anatomy and ecophysiology of the dunegrass Ehrharta villosa var. maxima*; Poster presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995
- HOARE, D.B., PALMER, A.R. & BREDENKAMP, G.J. 1996. *Modelling grassland community distributions in the Eastern Cape using annual rainfall and elevation*; Poster presentation, South African Association of Botanists Annual Congress, Stellenbosch, January 1996
- HOARE, D.B. *Modelling vegetation on a past climate as a test for palaeontological hypotheses on vegetation distributions*; Paper presentation, Randse Afrikaanse Universiteit postgraduate symposium, 1997
- HOARE, D.B., VICTOR, J.E. & BREDENKAMP, G.J. *Historical and ecological links between grassy fynbos and afro-montane fynbos in the Eastern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998
- LUBKE, R.A., HOARE, D.B., VICTOR, J.E. & KETELAAR, R. *The habitat of the Brenton Blue Butterfly*. Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998
- HOARE, D.B. & PANAGOS, M.D. *Satellite stratification of vegetation – structure or floristic composition?* Poster presentation at the 34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999.
- HOARE, D.B. & WESSELS, K. *Conservation status and threats to grasslands of the northern regions of South Africa*, Poster presentation at the South African Association of Botanists Annual Congress, Potchefstroom, January 2000.
- HOARE, D.B. *Phenological dynamics of Eastern Cape vegetation*. Oral paper presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.
- HOARE, D.B., MUCINA, L., VAN DER MERWE, J.P.H. & PALMER, A.R. *Classification and digital mapping of grasslands of the Eastern Cape* Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.
- HOARE, D.B. *Deriving phenological variables for Eastern Cape vegetation using satellite data* Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.
- MUCINA, L., RUTHERFORD, M.C., HOARE, D.B. & POWRIE, L.W. 2003. *VegMap: The new vegetation map of South Africa, Lesotho and Swaziland*. In: Pedrotti, F. (ed.) Abstracts: Water Resources and Vegetation, 46th Symposium of the International Association for Vegetation Science, June 8 to 14 – Napoli, Italy.
- HOARE, D.B. 2003. *Species diversity patterns in moist temperate grasslands of South Africa*. Proceedings of the VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa. *African Journal of Range and Forage Science*. 20: 84.

Unpublished technical reports:

- PALMER, A.R., HOARE, D.B. & HINTSA, M.D., 1999. Using satellite imagery to map veld condition in Mpumalanga: A preliminary report. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Grahamstown.
- HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: methodology for mapping the vegetation communities of the South African savanna at a scale of 1:250 000. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.
- HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: size and coverage of field data that exists on the database of vegetation data for South African savanna. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.
- THOMPSON, M.W., VAN DEN BERG, H.M., NEWBY, T.S. & HOARE, D.B. 2001. Guideline procedures for national land-cover mapping and change monitoring. Report no. ENV/P/C 2001-006 produced for Department of Water Affairs and Forestry, National Department of Agriculture and Department of Environment Affairs and Tourism. Copyright: Council for Scientific and Industrial Research (CSIR) and Agricultural Research Council (ARC).
- HOARE, D.B. 2003. Natural resource survey of node O R Tambo, using remote sensing techniques, Unpublished report and database of field data for ARC Institute for Soil, Climate & Water, ARC Range and Forage Institute, Grahamstown.
- HOARE, D.B. 2003. Short-term changes in vegetation of Suikerbosrand Nature Reserve, South Africa, on the basis of resampled vegetation sites. Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, Conservation Division.
- BRITTON, D., SILBERBAUER, L., ROBERTSON, H., LUBKE, R., HOARE, D., VICTOR, J., EDGE, D. & BALL, J. 1997. The Life-history, ecology and conservation of the Brenton Blue Butterfly (*Orachrysops niobe*) (Trimen) (*Lycaenidea*) at Brenton-on-Sea. Unpublished report for the Endangered Wildlife Trust of Southern Africa, Johannesburg. 38pp.
- HOARE, D.B., VICTOR, J.E. & MARNEWIC, G. 2005. Vegetation and flora of the wetlands of Nylsvley River catchment as component of a project to develop a framework for the sustainable management of wetlands in Limpopo Province.

Consulting reports:

Total of over 380 specialist consulting reports for various environmental projects from 1995 – present.

Workshops / symposia attended:

- International Association for Impact Assessment Annual Congress, Durban, 16 – 19 May 2018.
- Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.
- VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.
- BioMap workshop, Stellenbosch, March 2002 to develop strategies for studying vegetation dynamics of Namaqualand using remote sensing techniques
- South African Association of Botanists Annual Congress, Grahamstown, January 2002.
- 28th International Symposium on Remote Sensing of Environment, Somerset West, 27-31 March 2000.
- Workshop on Vegetation Structural Characterisation: Tree Cover, Height and Biomass, 28th International Symposium on Remote Sensing of Environment, Strand, 26 March 2000.
- South African Association of Botanists Annual Congress, Potchefstroom, January 2000
- National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.
- Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.
- WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.
- 34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999
- Expert Workshop on National Indicators of Environmental Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.
- South African Association of Botanists Annual Congress, Cape Town, January 1998

Randse Afrikaanse Universiteit postgraduate symposium, 1997.
South African Association of Botanists Annual Congress, Bloemfontein, January 1995.