A Vegetation Impact Study of a Proposed Retirement Village Development on Erf 657, Stilbaai, Western Cape, South Africa

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chepri (Pty) Ltd
Scientific Services

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Abbreviations and Terms

Biome	A distinct biological community that have formed in response to a shared physical climate and similar disturbance regimes.
Anthropogenic	Resulting from human activity.
Critical Biodiversity Area (CBA)	Areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan.
Critically endangered (CR)	A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
Critically endangered: possibly extinct (CR PE)	Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.Critically Endangeredr (CR),A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
Data Deficient: Insufficient Information (DDD)	A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.
Ecological Support Areas (ESA)	Areas that play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. They are not essential for meeting biodiversity targets.
Endangered (EN)	A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
Forb	Herbaceous, non-woody flowering plant.
Geoxylic suffrutice	An underground tree with large stem structures below ground and only leaves and fruit protruding from the soil surface.
Habitat specialist	Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km^2.
Irreplaceable areas	Important and necessary areas in terms of meeting targets for biodiversity pattern and process, and large enough and connected enough to be functional and persist in the long term.
Least concern	A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.

Low density of individuals	Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area
Near Threatened (NT)	A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
Orange Listed Species	A species categorised under one of the following red list categories: Near Threatened (NT), Critically Rare, Rare or Data Deficient - Insufficient Information (DDD).
Passive restoration	Restoration that occassionally occurs without intentional active human interference.
Rare	A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria.
Red list category	A scientific system designed to measure species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action.
Red listed species	A species categorised under one of the following red list categories: Critically Endangered (CR), Endangered (EN),Vulnerable (VU).
Restoration trajectory	A change over time within an ecosystem towards a state more characteristic of its so-called 'climax' or historical state.
Restricted range	Extent of Occurrence (EOO) < 500 km^2.
Small global population	Less than 10 000 mature individuals.
Species of conservation concern (SOCC)	A species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient: Insufficient Information (DDD).
Threatened species	Species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered, Endangered or Vulnerable is a threatened species.
Vulnerable (VU)	A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.

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1 Executive Summary

Chepri (Pty) Ltd. was appointed by CapeEAPrac (Pty) Ltd to conduct a vegetation impact assessment of a Proposed Retirement Village Development on Erf 657, Stilbaai, Western Cape, South Africa (hereafer PRVD or the study site), Gauteng. The site was visited on the 24 July 2019, and a comprehensive search of the proposed area was conducted for species of conservation concern (SOCC). The site is situated in Hartenbos Dune Thicket, as identified by the National Vegetation Map. Two distinct vegetation types were found, based on structure and composition. The difference between them is a consequence of regular mowing, presumably by the municipality, perhaps with the view to control fire. The unmowed portion of the study area covers an area of approximately 1.6 ha of the study site, and is classified as *Osteospermum monilifera - Thamnochortus insignis* Strandveld. The mowed section is referred to here as 'Mowed Strandveld' or *Brachylaena serrata - Raphanus raphanistrum* Mowed Strandveld and covers around 3.7 ha of the study site. A comprehensive search for species of conservation concern (SOCC) of the study site revealed the presence of six larger specimens of the protected 'White Milkwood' tree species (*Sideroxylon inerme* subsp. *inerme*). No other plant species of conservation concern (SOCC) were found. The overall impact of the proposed development on the existing ecosystem, and particularly its currently manifested vegetation patterns is considered low-medium. Four major potential impacts have been identified should the proposed development take place:

1. the destruction of individual plants of conservation concern (SOCC) status (here it is six mature individuals of the White Milkwood (*Sideroxylon inerme subsp. inerme*), and
2. the destruction of local habitat for valuable species and those of conservation concern.
3. the loss of local ecosystem services mostly that associated with the harvesting of the abundant Albertinia Thatching Reed (*Thamnochortus insignis*) in the smaller intact part of the study area.
4. the closure of a potential ecological corridor that stretch from the Goukou river in the northeast, to natural areas outside the town to the southwest.

As a mitigation measure in terms of managing the species of conservation concern, it is recommended that the Milkwood trees be kept and incorporated into the building plans of the proposed retirement village development, or alternatively, new milkwood saplings be planted where suitable on the development area as part of its gardens. Without such mitigation the overall envisaged impact on biodiversity remains low and restricted to a local scale. The loss of habitat and ecosystem services is inevitable should the development be approved, but its impact is also considered relatively low and localised. Cumulatively, the impacts of housing developments on biodiversity can be severe, and is part of a fast growing trend in coastal down development, particularly in the Southern Cape. Here this impact is considered low, due to the location of the study area in the centre of town, adjacent to municipal buildings and a relatively busy road.

In terms of the obstruction of a potential ecological corridor, the proposed development would add to the already existing blockage of this corridor by the municipal buildings on the southwestern edge of its boundaries and the busy road that already cuts through this potential corridor in front of the municipal buildings. Therefore the proposed development is considered to have a low impact and would not constitute the only development that blocks this potential corridor, which is already compromised by existing developments and infrastructure.

It is recommended that the proposed development be approved on account of its relatively low and localised impacts on existing ecosystem function and services.

2 Introduction

CapeEAPrac (Pty) Ltd contracted CHEPRI (PTY) LTD to conduct a botanical/vegetation impact assessment for a proposed retirement village development in accordance with all the relevant guidelines (Brownlie et al.,

2005; Villiers et al., 2005) for Biodiversity Impact Studies on Erf 657, Stilbaai, Western Cape (henceforth the study area). According to the relevant guidelines, this includes

(i) Mapping of the location and extent of all plant communities on the study site, with a description provided for each with the area (in hectares) and ecological sensitivity of each plant community indicated.

(ii) Mapping of all good condition natural vegetation and all primary grassland (even if it is in a poor/degraded condition) and designated as ecologically sensitive.

(iii) A plant species list for each plant community with invasive/exotic species indicated.

(iv) A general Red Data plant species survey.

(v) A sensitivity and constraints map of the affected area including and adjacent 200 m radius of its area.

[i] According to the terms of Appendix 6(1)(1) of the EIA Regulations (2014) (amended 2017) a specialist report must contain:

1. an indication of the scope of, and the purpose for which, the report was prepared;
2. an indication of the quality and age of base data used for the specialist report;
3. a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;
4. the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;
5. a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;
6. a description of any assumptions made and any uncertainties or gaps in knowledge;
7. a description of any consultation process that was undertaken during the course of preparing the specialist report;
8. a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and
9. any other information requested by the competent authority.

2.1 Site location and ecological context

The study area is situated within the town of Stilbaai on an area adjacent to a municipal building complex to the south and southwest. and show the location of the proposed development area. On its western side the area is bordered by a housing development similar to the one proposed here. To the North it is bordered by a patch of intact strandveld, approximately 9.9 ha in extent. This intact vegetation extends into Erf 657, Stilbaai (the proposed development), and here its estimated area measures around 0.16 ha. At a wider scale this relatively small intact patch of natural vegetation left on erf 657 is connected to a patch of intact vegetation associated with a valley in terms of topography, which is connected to the river. It is only a relatively low-traffic load road that divides these two intact areas on a narrow stretch that together constitutes a continuous intact ecological corridor towards the river to the northeast. This corridor also extends from the north of Erf 657 to the northwest. The remaining intact patch of vegetation on Erf 657 is the southernmost limit of this corridor. Due to the presence of the municipal buildings to the southwest of the study area, and the busy road that runs in front of it, this potential ecological corridor is already cut-off from relatively intact areas to the southwest of the study area.

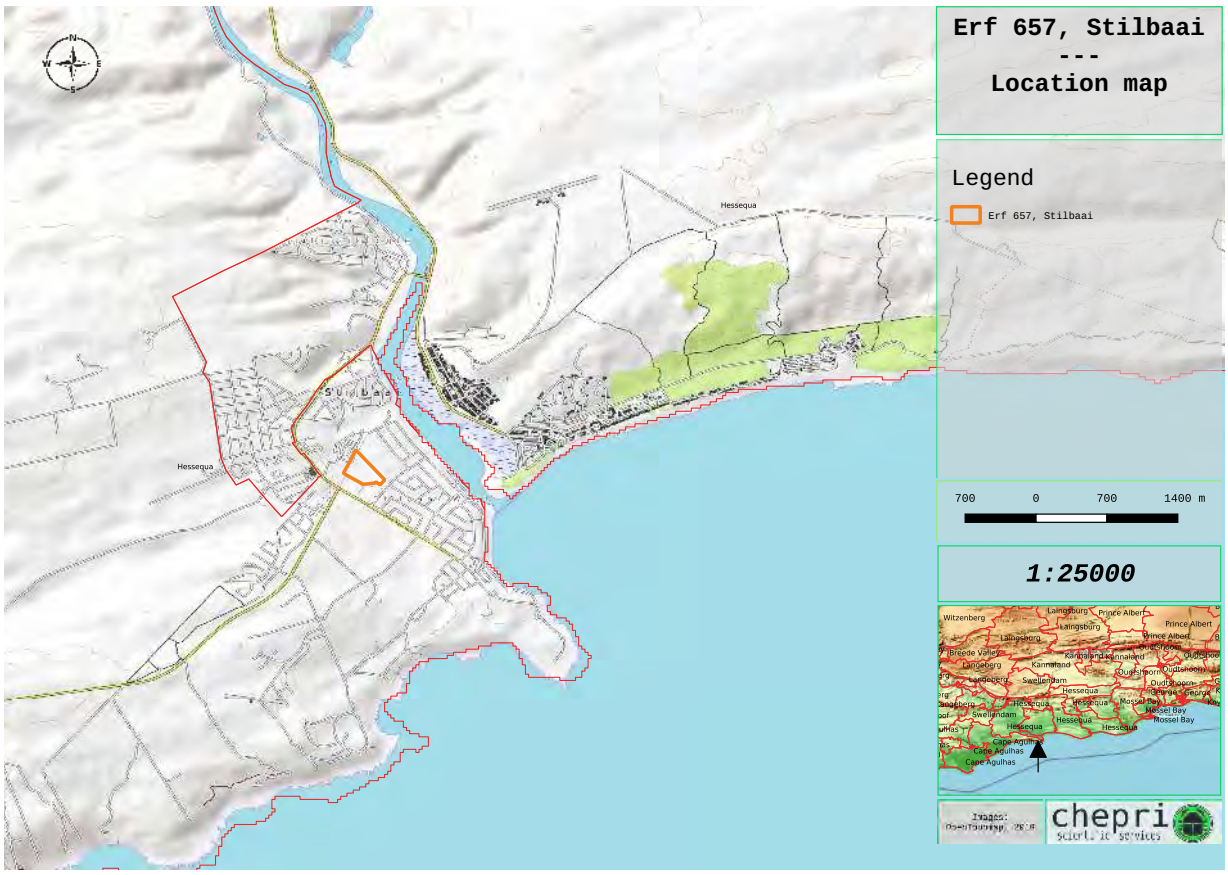

Figure 1: A location map at 1:25000 scale of the Proposed Stilbaai Retirement Village Development (PSRVD).

2.1.1 Climate and topography

The site is located within 500m of the Goukou river which flows into the ocean within a distance of just over a kilometre as the crow flies. Consequently, the site is situated on white dune sands that are calcium-rich with abundant shell fragments. Mean Annual Precpitation for Stilbaai is measured between 230-620 mm (with a mean of 430 mm). The rainfall pattern does not show any significant peaks, and a slight low trough during December-January (Mucina, Rutherford, et al., 2006).

2.1.2 Hartenbos Dune Thicket

The intact vegetation identified on this site, which comprises an approximate area of hectares (roughly % are representative of the Hartenbos Strandveld community as identified by (Vlok and Euston-Brown, 2002). This community is also referred to here as Gouritz Dune Thicket Mosaic with Sand Fynbos. Together with Still Bay Dune Thicket and Robberg Dune Thicket it is classified as a sub-tropical thicket mosaic vegetation under the name Gouritz Dune Thicket.

As a fynbos-thicket mosaic, the matrix vegetation is Fynbos with often abundant geophytes (e.g. *Brunsvigia orientalis*, *Chasmanthe saethiopica*, Freesia leichtinii ssp. alba, *Haemanthus coccineus*, *Ixia orientalis*, etc.) and succulents (eg. *Carpobrotus edulis*, *Conicosia pugioniformis*, *Dorotheanthus bellidiformis*, *Jordaaniella dubia*, etc.) (Vlok and Euston-Brown, 2002). On this site,

2.2 Vegetation community and conservation status

According to the National Vegetation Map the study area falls within the Hartenbos Dune Thicket community (see Figure 3), and is here designated as an ecosystem of **Least Concern** in terms of conservation status. There are no Critical Biodiversity Areas (CBA) identified that overlaps the area of the proposed development as shown in Figure 5.

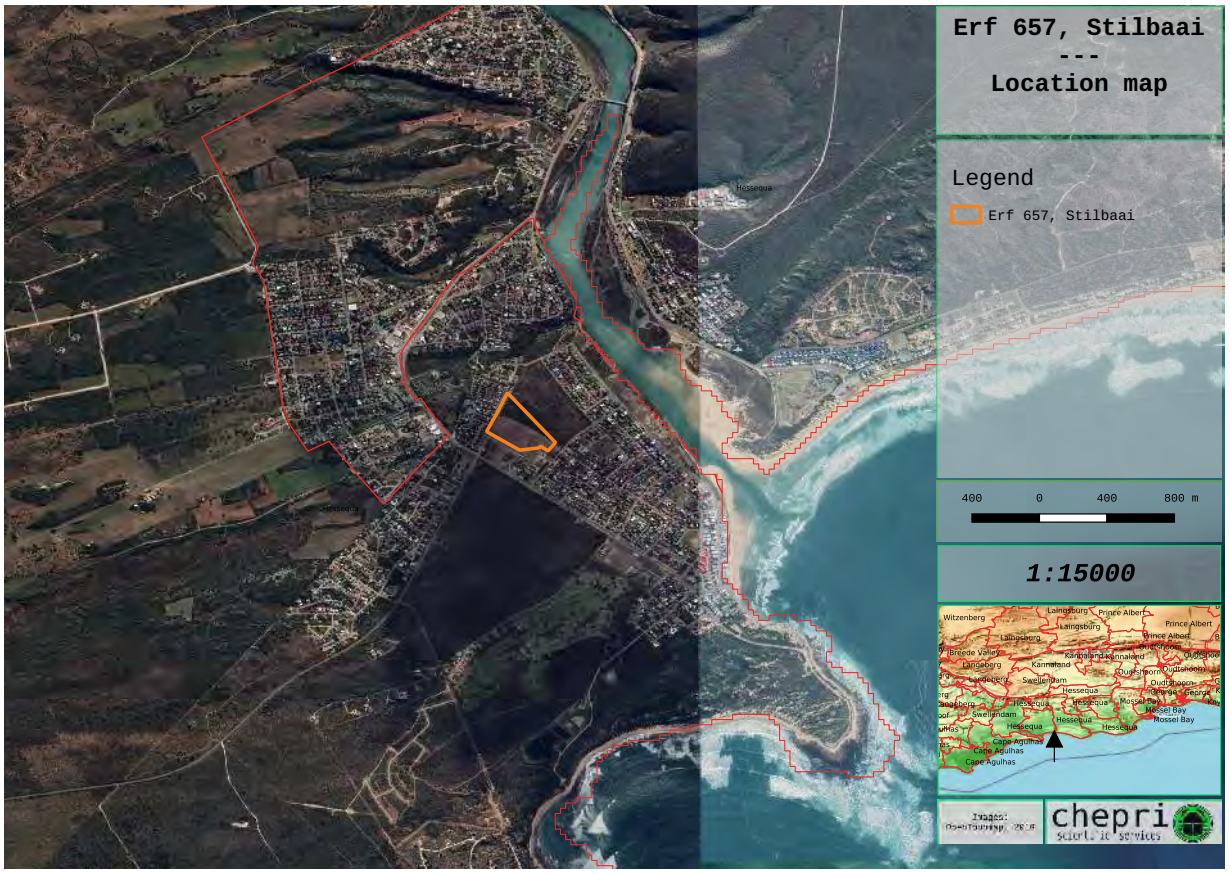

Figure 2: A location map at 1:25000 scale of the Proposed Stilbaai Retirement Village Development (PSRVD).

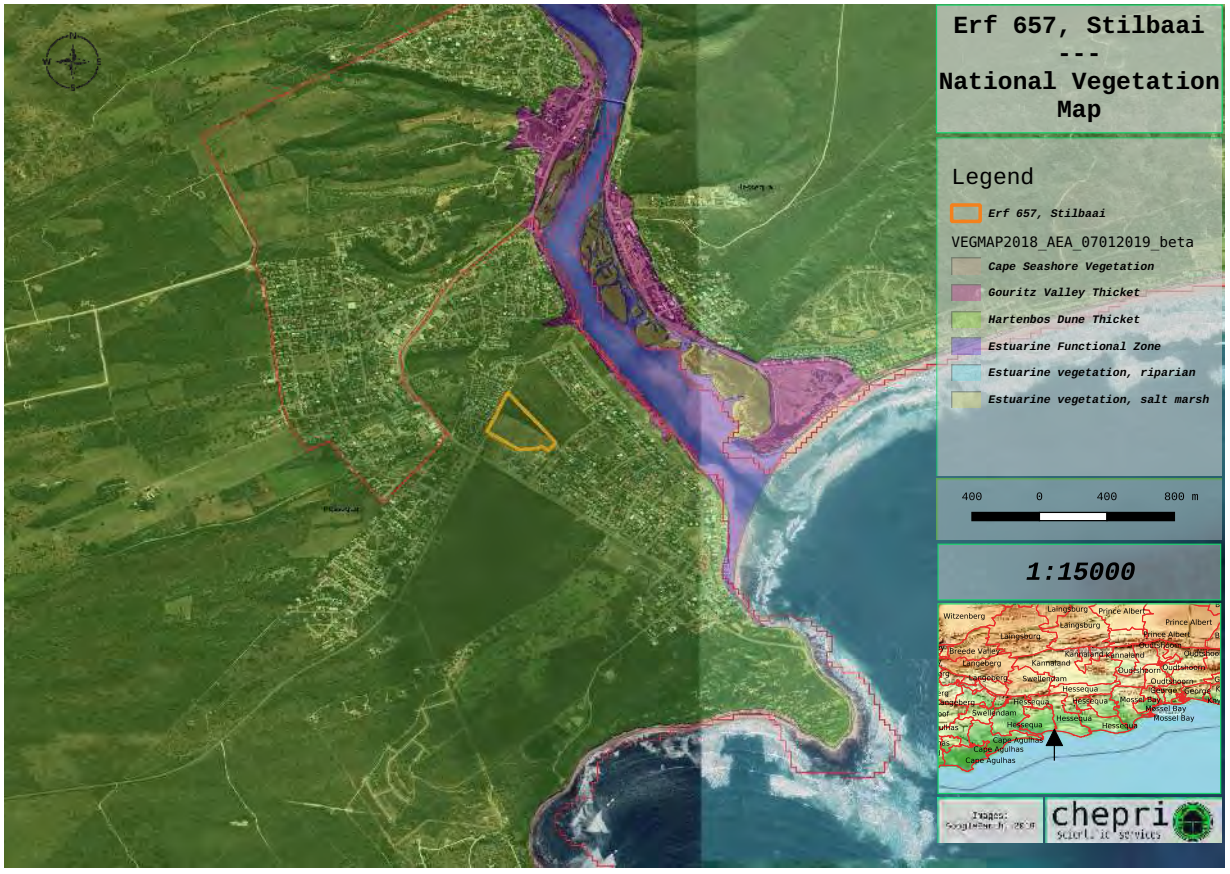

Figure 3: National Vegetation Map (1:15000) around the Proposed Stilbaai Retirement Village Development (PSRVD).

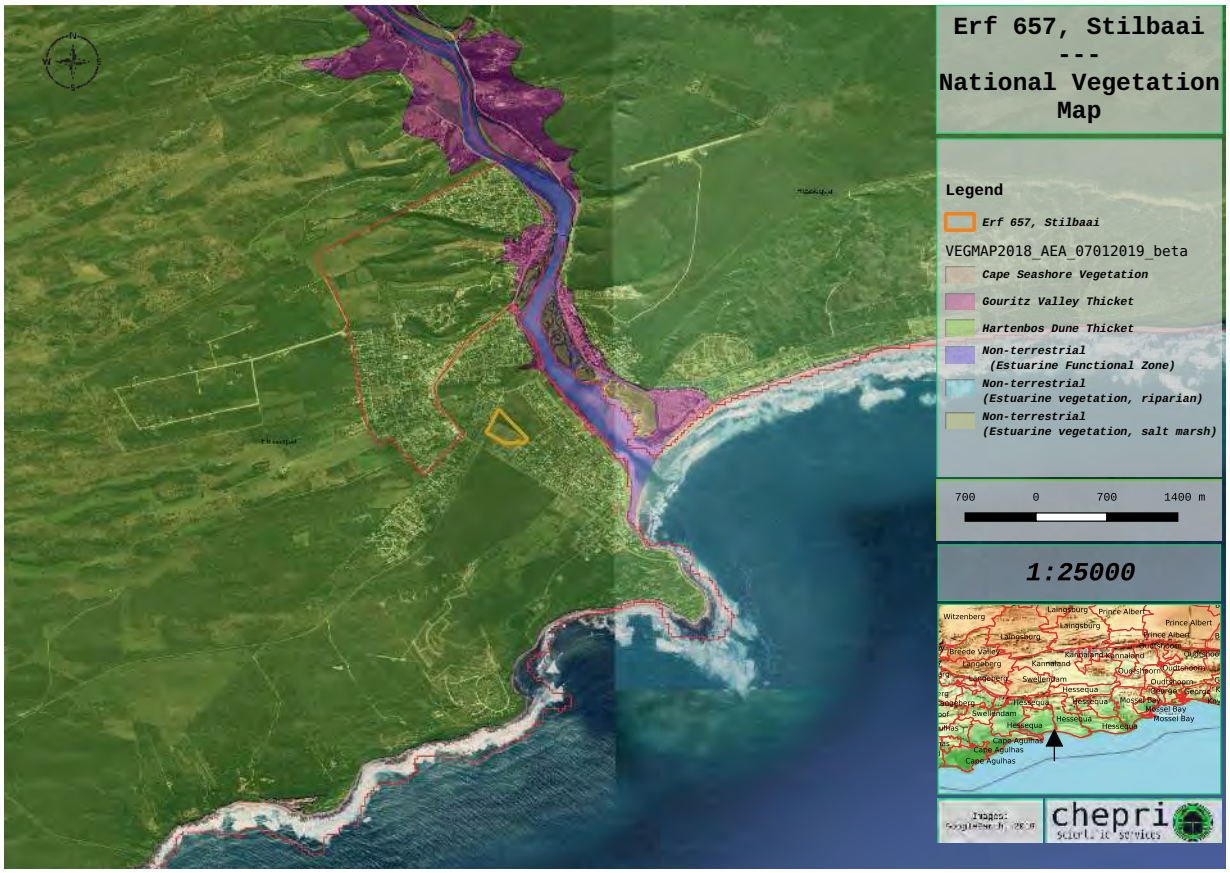

Figure 4: National Vegetation Map (1:25000) around the Proposed Stilbaai Retirement Village Development (PSRVD).

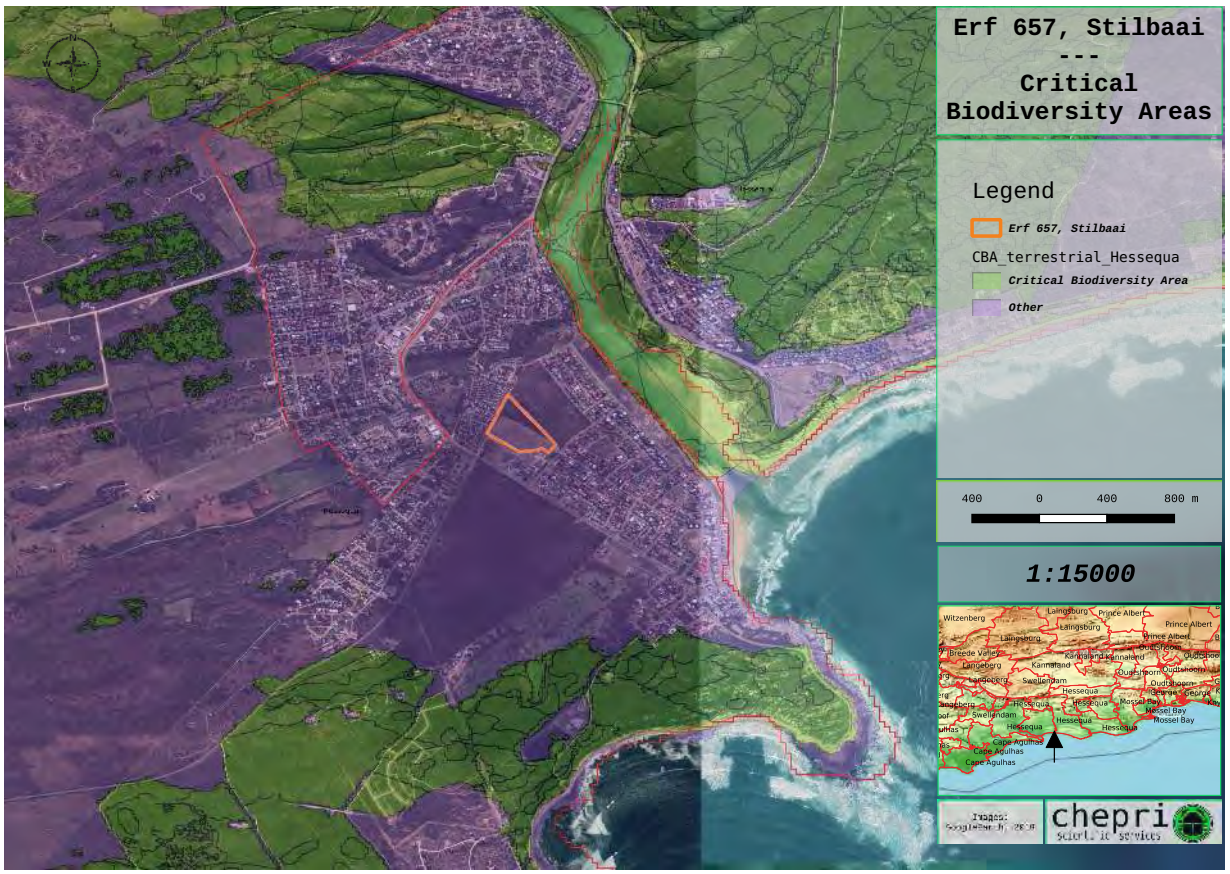

Figure 5: Critical Biodiversity Area Map around the Proposed Stilbaai Retirement Village Development (PSRVD).

2.3 Site Vegetation description

The site falls within the more open dune crests and slopes where salty sea winds from the southern ocean and past fires from inland have kept it relatively free from large trees and other woody thicket elements. Instead, in the remaining intact and unmowed patch present on the proposed development area, the vegetation is dominated by Bietou (*Osteospermum* (= *Chrysanthemum*) *moniliferum*) and Albertinia Thatching Grass (*Thamnochortus insignis*, 'Dekriet' in Afrikaans). The intact vegetation is slighty invaded by Prickly Pear (*Opuntia ficus-indica*). The site, prior to most of it being mowed, may have encountered fire sometime in the past 25 years or a combination of thicket-clearing and fire. Only individual clumps of milkwood (*Sideroxylon inerme*) remain in terms of woody thicket clump elements, both in the intact and mowed strandveld units. There is clear evidence of Albertinia Thatcing Reed (*Thamnochortus insignis*) being harvested in the intact area on the site. It is an important species used in thatch roof construction.

2.4 Nature of the Proposed Development

The proposed development is a typical retirement village complex, designed to take up the entire footprint of Erf 657, Stilbaai. Figure 6 shows a detailed plan of the proposed development. This proposed high-density housing complex is consistent with the main economic drivers of the town of Stillbay which involves tourism and also functions as a retirement destination. The proposed site on which the proposed development is planned is already largely (69%) transformed and directly adjacent to municipal buildings in town.

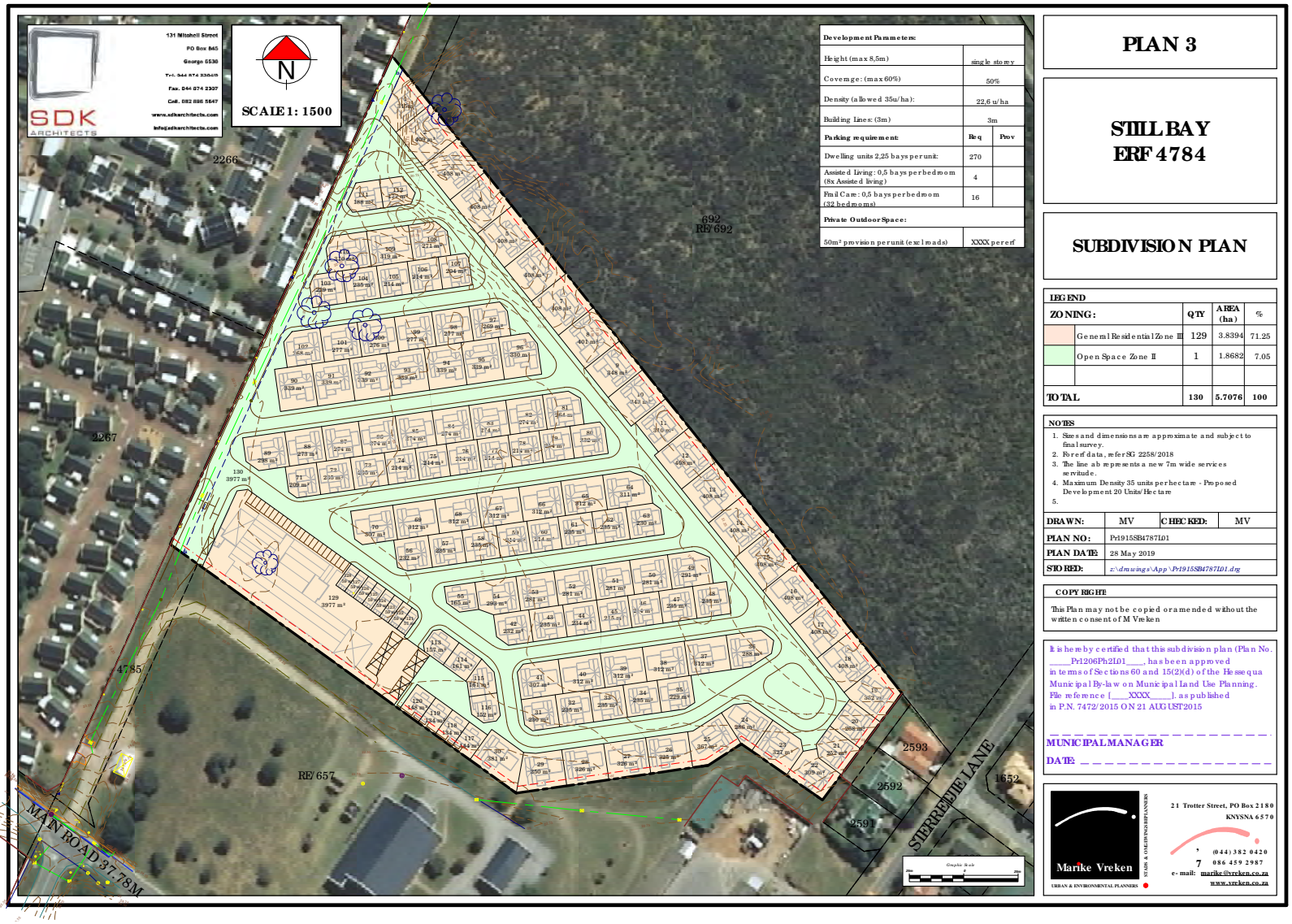

Figure 6: The Proposed Stilbaai Retirement Village Development layout plan

3 Method

3.1 Site survey

The Western Cape Biodiversity Spatial Plan Handbook (Pool-Stanvliet et al., 2017) was used as guideline in preparing this report. Prior to the field survey, I studied recent (2019) Google Earth^{TM} satelite images of the proposed development footprint, its host property and the surrounding area (study area). Homogenous vegetation units within the study site were delineated based on patterns observed from these satellite images.

I conducted the field survey on 24 July 2019. Each of the pre-identified homogenous vegetation units were surveyed in terms of species composition. The survey involved randomly transversing each of the identified vegetation units and recording species composition up to a point where no more new species were found. No formal transects were surveyed, and only visual estimates of species abundances were recorded. Based on the species composition and abundance, with surrounding landscape factors taken into account, adjustments were made to the pre-groundtruthed delineation as required.

Extensive notes on veld condition and disturbance factors such as recent or previous fires, cultivation/harvesting practices, artificial channels, dams or ditches, evidence of herbivory and its severity, evidence of anthropogenic harvesting of plant material were made for each of the homogenous vegetation units identified. Rockiness, soil characteristics and underlying geology was noted and various photographs were taken. A list of all plant species encountered with their conservation status, according to the habitat in which they were recorded was compiled.

The field guides by Manning (2018), Moriarty and Snijman (1997), Dorrat-Haaksma (2012), Smith et al. (1998), Manning et al. (2010), Manning et al. (2002) Van Oudtshoorn (1992), Van Wyk (2013) and Bromilow et al. (2003) were used to identify species encountered.Recent updates to the local state of biodiversity report for the Western Cape (Pool-Stanvliet et al., 2017), and the updated national vegetation map (Mucina et al., 2018).

A list of red list category species and other species of conservation concern were recorded for the Quarter Degree Square (QDS:2527DD) was obtained from SANBI's older records, in addition to records from the new POSA website. An extensive targeted search of the site for the presence of potential red list category species was conducted. The positions of all relevant plants were marked with GPS coordinates.

3.2 Impact assessment

The Impact Assessment (IA) was performed according to the CSIR's IA methodology (DEAT, 2002), which takes into account:

1. Impact nature (direct, indirect and cumulative);
2. Impact status (positive, negative or neutral);
3. Impact spatial extent (Table 2);
4. Impact duration (Table 3)
5. Potential impact intensity (Table 4)
6. Impact reversibility (high, moderate, low or irreversible);
7. Irreplaceability of the impacted resource (high, moderate, low or replaceable);
8. Impact probability (Table 5);
9. Confidence in the ratings (high, moderate or low);

Overall impact significance (I_S, Table 6) is calculated as:

$$I_S = I_M \times I_P$$

where I_M and I_P are Impact magnitude and Impact probability respectively.

Impact magnitude (I_M) is calculated as:

$$I_M = I_I + I_D + I_E$$

where I_I is impact intensity, I_D is impact duration, and I_E is impact extent.

Table 2: A categorisation of the extent of an impact

Extent.Description	Score
Site specific	1
Local (< 2 km from site)	2
Regional (within 30 km of site)	3
National	4
Global	5

Table 3: A categorisation of the duration of an envisaged impact

Duration	Score
Temporary (< 2 yrs) or duration of construction period. This impact is reversible	1
Short term (2-5 yrs). Impact is reversible	2
Medium term (5-15 yrs) The impact is reversible with appropriate mitigation and management	3
Long term (> 15 yrs but where the impact will cease with the operational life of the activity). The impact is reversible with the implementation of appropriate mitigation and management action	4
Permanent (i.e. mitigation will not occur in such a way or in such a timespan that the impact can be considered transient). The impact is irreversible	5

Table 4: A categorisation of the intensity of an envisaged impact

Description	Effect	Rating	Score
Potential to severely impact human health, or lead to loss of species	Negative	Fatal flaw	16
Potential to reduce fauna/florapopulation or to lead to severe reduction/alteration of natural process, loss of livelihoods, quality of life and economic loss	Negative	High	8
Potential to reduce environmental quality - air, soil, water. Potential loss of habitat, loss of heritage, reduced amenity	Negative	Medium	4
Nuisance	Negative	Medium-Low	2
Negative change - no other consequence.	Negative	Low	1
Potential net improvement in human welfare	Positive	High	8
Potential to improve environmental quality - air, soil, water, improved livelihoods	Positive	Medium	4
Potential to lead to economic development	Positive	Medium-Low	2
Potential positive change - with no other consequence	Positive	Low	1

Table 5: A categorisation of the probability of an envisaged impact

Probability	Score
Improbably (little to no chance of occurring)	0.10
Low probability (10-25% chance of occurring)	0.25
Probable (25-50% chance of occurring)	0.50
Highly probable (50-90% chance of occurring)	0.75
Definite (> 90% chance of occurring)	1.00

Table 6: Categories of overall significance of an envisaged impact

Score	Rating	Description
18-26	Fatally flawed	The project cannot be authorised unless major changes to the design are carried out to reduce the significance rating
10-17	High	The impacts will result in major alteration to the environment even with the implementation of the appropriate mitigation measures and will have an influence on decision-making
5-9	Medium	The impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an impact on decision-making if not mitigated
<5	Low	The impact may result in minor alterations of the environment andf can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making

Cumulative Impact Assessment Potential impacts of the development were cumulatively assessed using the guidelines provided by (DEAT, 2004; Kotze, 2001). DEAT (2004) provides a list of generic questions to ask in order to assess a potential cumulative impact on a particular study area. These questions are:

1. Is the proposed action one of several similar past, present or future actions in the same geographic area?
2. Do other activities (whether state or private) in the region have environmental effects similar to those of the proposed action?
3. Will the proposed action (in combination with other planned activities) affect any natural resources, cultural resources, socio or economic units, or ecosystems of local, regional or national concern?
4. Have any recent environmental studies of similar actions identified important adverse or beneficial cumulative effects issues?
5. Has the impact been historically significant, such that the importance of the resource is defined by past loss, gain or investments to restore resources?
6. Does the proposed action involve any of the following?
    - Long range transport of air pollution;
    - Air emissions resulting in the degradation of regional air quality;
    - Loading large water bodies with discharges of sediment, thermal or toxic pollutants;
    - Contamination of ground water supplies;
    - Changes in hydrological regimes of major rivers and estuaries;
    - Long-term disposal of hazardous wastes;
    - Mobilisation of persistent bioaccumulated substances through the food chain;
    - Decreases in quantity and quality of soils;
    - Loss of natural habitats or historic character through residential, commercial and industrial development;
    - Social, economic or cultural effects on marginalised communities resulting from ongoing development; and
    - Loss of biological diversity.

4 Results

4.1 Vegetation Communities present

A total of two vegetation communities were delineated on the study area. Table 7 provides approximate area calculations of each of the identified vegetation units delineated with their status and sensitivity ratings, and Figure 7 shows their location and extent on the vegetation unit map.

Table 7: Area (m^2) estimates of the two vegetation units identified on the study site

Vegetation Unit	Status	Sensitivity	Area
Mowed Strandveld	Transformed	Least sensitive	37083.86
Om - Ti Strandveld	Intact	Least sensitive	16333.40

Note:
Transformed = Original ecological functions lost, potentially recoverable by intensive restoration action; Intact = Mostly natural vegetation and significant ecological function retained

A short description of each follows.

4.1.1 *Brachylaena serrata - Raphanus raphanistrum* Mowed Strandveld

The *Brachylaena serrata - Raphanus raphanistrum* Mowed Strandveld community is around 3.71 ha in size. It is regularly mowed, presumably by the municipality and consequently consists of a very low herbaceous layer, with a few bush-clumps distributed across the area. It is dominated by Red Signal Grass *Brachiara serrata* and Wild Raddish (*Raphanus raphanistrum*), with a range of species able to persist under regular mowing pressure. Figure 10 contains some photographs taken of this community and Table 8 list the plant species and their conservation status encountered here.

4.1.2 *Osteospermun moniliferum - Thamnochortus insignis* Strandveld

This section refers to the small area identified on Figure 7 inside the proposed development property and extends to the north onto the adjacent property. The vegetation is dominated by Bietou (*Osteospermum* (= *Chrysanthemum*) *moniliferum*) and Albertinia Thatching Grass (*Thamnochortus insignis*, 'Dekriet' in Afrikaans), and slighty invaded by Prickly Pear (*Opuntia ficus-indica*).

The species diversity is relatively poor, and if left untouched may be conducive to the development of more woody thicket elements. Figure 11

Figure 7: A map of the Vegetation Units identified on Erf 657, the proposed development site.

Figure 8: Four photographs of the Mowed Strandveld community.

Table 8: List of plants encountered in the Mowed Strandveld vegetation unit.

Family	*Species*	Names	Status
AIZOACEAE	*Carpobrotus edulis*	Sour fig	LC
AIZOACEAE	*Conicosia pugioniformis ssp. muiri*	Varkslaai	LC
AIZOACEAE	*Disphyma crassifolium*	Purple dewplant	LC
AIZOACEAE	*Dorotheanthus bellidiformis*	Livingstone daisy	LC
AIZOACEAE	*Drosanthemum intermedium*	Dewfig	LC
AIZOACEAE	*Mesembryanthemum aitonis*	Angled Iceplant	LC
AIZOACEAE	*Tetragonia fruticosa*	Kinkelbossie	LC
AMARYLLIDACEAE	*Brunsvigia orientalis*	Chandelier/Candelabra Lily	LC
APOCYNACEAE	*Carissa bispinosa*	Noem-noem	LC
APOCYNACEAE	*Cynanchum africanum*	Bokhoring	LC
ASPHODELACEAE	*Trachyandra ciliata*	Veldkool	LC
ASTERACEAE	*Arctotis hirsuta*	Gousblom	LC
ASTERACEAE	*Dimorphotheca pluvialis*	Reenblommetjie	LC
ASTERACEAE	*Osteospermum moniliferum*	Bietou	LC
ASTERACEAE	*Senecio burchelli*	Geelgifbossie	LC
ASTERACEAE	*Sonchus oleraceus*	Common Sowthistle	N
BRASSICACEAE	*Capsella bursa-pastoris*	Shepherd's purse	E
BRASSICACEAE	*Capsella bursa-pastoris*	sheperd's purse / herderstassie	N
BRASSICACEAE	*Raphanus raphanistrum*	Wild radish/ramenas	E
FABACEAE	*Acacia saligna*	Port Jackson Willow	1b
FABACEAE	*Medicago polymorpha*	bur clover, klitsklawer	N
IRIDACEAE	*Babiana cf. ambigua*	Bobbejaantjie	LC
IRIDACEAE	*Freesia leichtinii ssp. alba*	White Freesia	LC
IRIDACEAE	*Romulea rosea var. rosea*	Froetang	LC
OXALIDACEAE	*Oxalis pes-caprae*	Geelsuring/Bermuda buttercup	E
OXALIDACEAE	*Oxalis polyphylla*	Geeloogsuring	LC
POACEAE	*Brachiaria serrata*	Velvet Signal Grass	LC
POACEAE	*Bromus diandrus*	Rip-gut Brome	N

Table 8: List of plants encountered in the Mowed Strandveld vegetation unit. *(continued)*

Family	*Species*	Names	Status
POACEAE	*Cynodon dactylon*	Kweekgras	LC
POACEAE	*Festuca scabra*	Munniksgras	LC
POACEAE	*Lolium perenne*	Perennial Rye-grass	N
POACEAE	*Pentameris pallida*	Cape Ricegrass	LC
RESTIONACEAE	*Restio cf. vimineus*	Biesie	LC
RESTIONACEAE	*Thamnochortus insignis*	Dekriet	LC
SAPOTACEAE	*Sideroxylon inerme*	Milkwood	LC
SCROPHULARIACEAE	*Manulea cf. cheiranthus*	Vingertjies	LC
SCROPHULARIACEAE	*Nemesia affinis*	Leeubekkie	LC
SCROPHULARIACEAE	*Nemesia bicornis*	Leeubekkie	LC
SCROPHULARIACEAE	*Nemesia cf. versicolor*	Leeubekkie	LC

Note:
Status: LC = Least Concern; E = Exotic; N = Naturalised; 1b = Invasive category 1b (NEMBA)

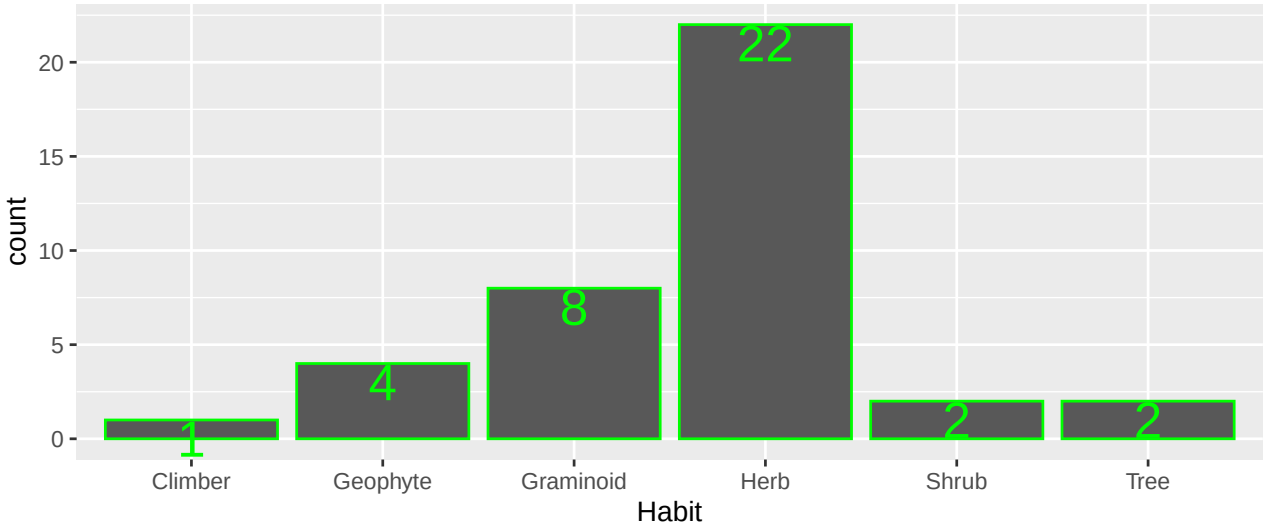

Figure 9: A Species count within the Mowed Strandveld Vegetation Unit by habit.

(a) *Freesia leichtinii ssp. alba*

(b) *Dimorphotheca pluvialis*

(c) *Raphanus raphanistrum*

(d) *Brunsvigia orientalis*

(e) *Oxalis pes-caprae*

(f) *Babiana cf. ambigua*

(g) *Dorotheanthus bellidiformis*

(h) *Arctotis hirsuta*

Figure 10: Species found within the Mowed Strandveld community.

Table 9: List of plants encountered in the *Osteospermum moniliferum - Thamnochortus insignis* Strandveld vegetation unit.

Family	*Species*	Names	Status
AIZOACEAE	*Carpobrotus edulis*	Sour fig	LC
AIZOACEAE	*Conicosia pugioniformis ssp. muiri*	Varkslaai	LC
AIZOACEAE	*Disphyma crassifolium*	Purple dewplant	LC
AIZOACEAE	*Dorotheanthus bellidiformis*	Livingstone daisy	LC
AIZOACEAE	*Drosanthemum intermedium*	Dewfig	LC
AIZOACEAE	*Mesembryanthemum aitonis*	Angled Iceplant	LC
AIZOACEAE	*Tetragonia fruticosa*	Kinkelbossie	LC
AMARANTHACEAE	*Atriplex vestita var. appendiculata*	Brakbos	LC
AMARYLLIDACEAE	*Brunsvigia orientalis*	Chandelier/Candelabra Lily	LC
ANACARDIACEAE	*Searsia glauca*	Blue kunibush	LC
ANACARDIACEAE	*Searsia laevigata*	Dune taaibos	LC
APOCYNACEAE	*Cynanchum africanum*	Bokhoring	LC
ASPARAGACEAE	*Asparagus rubicundus*	Red-stemmed Asparagus	LC
ASPARAGACEAE	*Asparagus suavolens*	Cat's tail Asparagus	LC
ASPHODELACEAE	*Trachyandra ciliata*	Veldkool	LC
ASTERACEAE	*Arctotis hirsuta*	Gousblom	LC
ASTERACEAE	*Dimorphotheca pluvialis*	Reenblommetjie	LC
ASTERACEAE	*Osteospermum moniliferum*	Bietou	LC
ASTERACEAE	*Senecio burchelli*	Geelgifbossie	LC
ASTEREAE	*Metalasia densa*	Coast Metalasia, White bristle bush	LC
CACTACEAE	*Opuntia ficus-indica*	Turksvy, Prickly Pear	1b
CELASTRACEAE	*Cassine peragua*	Cape saffron	LC
EBENACEAE	*Diospyros dichrophylla*	Common Star-apple	LC
FABACEAE	*Acacia saligna*	Port Jackson Willow	1b
GERANIACEAE	*Pelargonium grossularioides*	Gooseberry-leaved Geranium	LC
IRIDACEAE	*Babiana cf. ambigua*	Bobbejaantjie	LC
IRIDACEAE	*Freesia leichtinii ssp. alba*	White Freesia	LC
IRIDACEAE	*Romulea rosea var. rosea*	Froetang	LC
MYRICACEAE	*Myrica cordifolia*	Waxberry	LC
OROBANCHACEAE	*Hyobanche sanguinea*	Scarlet Broomrape, Katnaels, Wolwekos	LC
OXALIDACEAE	*Oxalis pes-caprae*	Geelsuring/Bermuda buttercup	E
OXALIDACEAE	*Oxalis polyphylla*	Geeloogsuring	LC
POACEAE	*Brachiaria serrata*	Velvet Signal Grass	LC
POACEAE	*Bromus diandrus*	Rip-gut Brome	N
POACEAE	*Cynodon dactylon*	Kweekgras	LC
POACEAE	*Festuca scabra*	Munniksgras	LC
POACEAE	*Panicum deustum*	Broad-leaved Panicum	LC
POACEAE	*Pentameris pallida*	Cape Ricegrass	LC
POACEAE	*Sporobolus africanus*	Rat-tail dropseed	LC
RESTIONACEAE	*Hypodiscus sp.*	Pineapple reed	LC
RESTIONACEAE	*Restio cf. vimineus*	Biesie	LC
RESTIONACEAE	*Thamnochortus insignis*	Dekriet	LC
SALVADORACEAE	*Azima tetracantha*	Bee-sting bush	LC
SAPOTACEAE	*Sideroxylon inerme*	Milkwood	LC
SCROPHULARIACEAE	*Nemesia affinis*	Leeubekkie	LC
SCROPHULARIACEAE	*Nemesia bicornis*	Leeubekkie	LC
SCROPHULARIACEAE	*Nemesia cf. versicolor*	Leeubekkie	LC
SOLANACEAE	*Solanum sodomaeodes*	Apple of Sodom	LC
ZYGOPHYLLACEAE	*Zygophyllum morgsana*	Slaaibos	LC

Note:
Status: LC = Least Concern; E = Exotic; N = Naturalised; 1b = Invasive category 1b (NEMBA)

Figure 11: *Osteospermun moniliferum - Thamnochortus insignis* Strandveld

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(a) *Sideroxylon inerme* subsp. *inerme*0.

(b) *Hyobanche sanguinea*

(c) *Conicosia pugioniformis*

(d) *Tetragonia fruticosa*

(e) *Zygophyllum morgsana*

(f) *Trachyandra ciliata*

(g) *Nemesia affinis*

(h) *Diospyros dichrophylla*

Figure 12: Plant species found within the *Osteospermum monilifera* - *Thamnochortus insignis* Strandveld community.

4.2 Endangered and Important species

Apart from six larger Milkwood (*Sideroxylon inerme subsp. inerme*) individuals, which is a protected species according to the National Forest Act, 1998 (Act No. 84 of 1998), no other species populations of conservation concern were found on the site. Figure 14 shows the location of each of these individuals. Dekriet (*Thamnochortus insignis*) is an important species used in thatching and grass weaving. Some of the plants in the unmowed strandveld community on the study site was clearly harvested likely for this purpose.

4.3 Ecosystem sensitivity

The bulk of the property (circa 69%) is being mowed regularly and thus mostly transformed. The intact community is relatively species-poor. The milkwood clumps scattered across the property provides some refuge for species like *Cassine peragua* that germinate and grow under the canopy shade. On a larger scale, the variant of Hartenbos strandveld found on the study site is representative of the more open dune crests and slopes, where woody thicket clumps are rare. Apart from the horticultural value of some of the bulbous plants found, only one economically important species, namely the Albertinia Thatching Reed (*Thamnochortus insignis*) is found here and it is evident that it is being harvested on site at a small scale (see Figure 15).

4.4 Alien and Declared Invader Plants

A number of plants considered exotic or naturalised and two declared invader plants were found on the study site. Table 10 provides a list of these among other exotic and naturalised species recorded on Erf 657, Stilbaai.

Table 10: Alien plants recorded on the study area

Family	*Species*	*Names*	Status	Habit
ASTERACEAE	*Sonchus oleraceus*	*Common Sowthistle*	N	Herb
BRASSICACEAE	*Capsella bursa-pastoris*	*Shepherd's purse*	E	Herb
BRASSICACEAE	*Capsella bursa-pastoris*	*sheperd's purse / herderstassie*	N	Herb
BRASSICACEAE	*Raphanus raphanistrum*	*Wild radish/ramenas*	E	Herb
CACTACEAE	*Opuntia ficus-indica*	*Turksvy, Prickly Pear*	1b	Shrub
FABACEAE	*Acacia saligna*	*Port Jackson Willow*	1b	Tree
FABACEAE	*Medicago polymorpha*	*bur clover, klitsklawer*	N	Herb
OXALIDACEAE	*Oxalis pes-caprae*	*Geelsuring/Bermuda buttercup*	E	Herb
POACEAE	*Bromus diandrus*	*Rip-gut Brome*	N	Graminoid
POACEAE	*Lolium perenne*	*Perennial Rye-grass*	N	Graminoid

Note:
Status: E = Exotic; N = Naturalised; 1b = Invasive category (NEMBA).

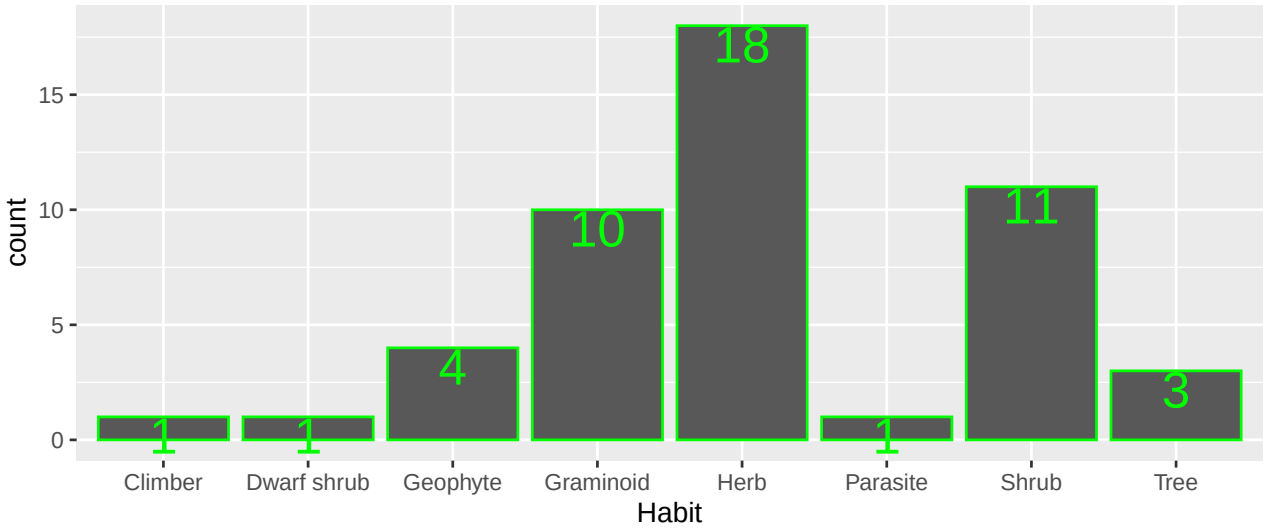

Figure 13: A Species count within the *Osteospermum monilifera* - *Thamnochortus insignis* Strandveld Vegetation Unit by habit.

Figure 14: Constraints map: Milkwood trees (*Sideroxylon inerme*) on the Proposed Stilbaai Retirement Village Development site.

Figure 15: *Thamnochortus insignis* harvested on study site.

(a) Prickly Pear (*Opuntia ficus-indica*)

(b) *Acacia saligna* (Port Jackson Willow)

Figure 16: NEMBA categorised and listed Alien Invasive Plants present on the study site

4.5 Impact Assessment

The following potential impacts on plant biodiversity and ecosystem services on the study site have been identified should the proposed development take place:

1. the destruction of individual plants of conservation concern (SOCC) status (here it is only six individuals of the White Milkwood (*Sideroxylon inerme subsp. inerme*), and
2. the destruction of local habitat for valuable species and those of conservation concern.
3. the loss of ecosystem services locally, especially that associated with the harvesting of the abundant Albertinia Thatching Reed (*Thamnochortus insignis*) in the smaller intact part of the study area.
4. compromising a potential ecological corridor that links the Goukou river with the natural areas to the southwest of the town of Stillbay.

As a mitigation measure in terms of managing the species of conservation concern, it is recommended that the Milkwood trees be kept and incorporated into the building plans of the proposed retirement village development. An alternative is to plant at least six saplings of Milkwood in the gardens of the proposed development after construction has been completed. Without such mitigation the overall envisaged impact on biodiversity remains low and restricted to a local scale.

Table 11 show an assessment of the risk associated with the planned development on Erf 657, Stilbaai and Table 12 show the significance of identified impacts after possible mitigation factors.

Note that these risks apply in the construction and established phases of the project.

Table 11: Impact assessment significance without mitigation

Impact	Extent	Duration	Intensity	Probability	Score	Significance
Destruction of individual plants of conservation concern (SOCC)	1	4	3	1.0	8.0	Medium
Destruction of local habitat for species of conservation concern.	1	3	2	0.8	4.8	Low
Loss of ecosystem services	1	1	2	1.0	4.0	Low
Compromising a potential ecological corridor	1	4	2	0.4	2.8	Low

Table 12: Post-mitigation impact assessment significance

Impact	Mitigation	Extent	Duration	Intensity	Probability	Score	Significance
Destruction of individual plants of conservation concern (SOCC)	Plan development around existing trees, or plant new Milkwood seedlings post-construction	1	1	1	0.1	0.3	Low
Destruction of local habitat for valuable species and those of conservation concern.	None	1	3	2	0.8	4.8	Low
Loss of ecosystem services	None	1	2	1	1.0	4.0	Low
Compromising a potential ecological corridor	None	1	4	2	0.4	2.8	Low

Cumulative Impact Assessment The development is one of a number retirement villages in the town of Stilbaai. The economy of Stilbaai depends mostly on tourism, with a large economic injection over the school holidays, but also benefits from the relatively large component of retired people settled there. The town continues to be an important destination for retired people. The proposed development caters for that need. Such intensive housing developments such as retirement villages have a negative impact on biodiversity, particularly on vulnerable vegetation types close to the ocean.

Housing developments and urban expansion is a major threat to biodiversity and natural habitat - specifically around coastal towns in the Western Cape. The Hartenbos Dune Thicket vegetation type has been impacted by this type of development, but currently it is still regarded as of Least Concern (Pool-Stanvliet et al., 2017). The proposed development is situated near the centre of town, on a property that has 69% of its natural vegetation area transformed by regular mowing. The remaining 31% of intact vegetation is relatively species-poor and thus the cumulative effect this development will have on the overall destruction of habitat and loss of biodiversity of Hartenbos Dune Thicket is considered low.

5 Discussion

5.1 Limitations to this study

The study was based on a single site visit on the 24th of July 2019 that took place over 4 hours. It is unlikely that some important plant species were overlooked during the field visit. Around 69% of the proposed development area is regularly mowed and thus transformed. It is possible that some bulb species not visible during this site visit may have survived the repeated mowing, but unlikely. Of the remaining 31% of intact natural vegetation likewise some bulb species may have remained undetected. Since fynbos geophytes typically retain their underground storage reserves by limiting aboveground growth during summer months, at least the leaves of most of the geophytes present must have emerged during the time the site visit was conducted. However, the intact vegetation is densely covered with two dominant species with relatively large growth forms, and thus it is unlikely that other additional bulb species is present than the relatively few individuals found here.

5.2 Impact assessment

Overall the impacts on the ecology and more specifically the vegetation of the study area is considered relatively low, despite the medium impact rating obtained for one identified impacts, namely:

- Destruction of individual plant species of conservation concern (SOCC)

This is mainly due to the likely destruction of six larger (canopy diameter of a minimum of 2m) specimens of the White Milkwood (*Siderocylon inerme subsp. inerme*, which is protected by the National Forest Act, 1998 (Act No. 84 of 1998), as envisaged by the proposed development. The other impacts identified are all ranked as low potential impacts according to the method used here.

The proposed retirement village would take up all of the study area, and thus the relatively intact area on circa 31% of the study area, (i.e. 1.6 ha of functional Hartenbos strandveld habitat) would be lost for the long term. With the mitigation measure proposed, i.e. through the incorporation of the milkwood trees within the planning design or the planting of at least six Milkwood saplings, the first of these impacts can be successfully mitigated from a medium envisaged impact to a low impact. Where the location of the standing milkwood trees are not conducive to efficient development plans, other options such as the replacement of the number of trees destroyed with new milkwood seedlings on more appropriate locations on the development as part of the landscaping phase may be acceptable.

Should the full extent of the property be developed as is planned, it would impact only slightly on a probable

ecological corridor area that extends from the Goukou river and marginally link the areas of natural vegetation to the southwest of the town of Still bay. This potential corridor is already compromised by the municipal buildings to the southwest of the study area and the traffic-laden road that runs adjacent to these municipal grounds and through this potential corridor.

The proposed development would also likely impact on the ecosystem services the relatively intact natural vegetation still remaining on approximately 31% of the study area provide. This small area is occassionally used as a low-impact harvesting site for Albertinia Thatching Grass (*Thamnochortus insignis*). Since the area to the northeast of the study area is still more than 9 hectares of intact undeveloped strandveld, it is likely that this area or other natural areas outside of town will still provide this service, although the harvesting intensity is likely to be higher in these alternative harvesting areas.

The larger part 69% of the study area is already transformed by regular mowing that maintains a highly disturbed form of strandveld which allows some establishment of low-growing herbs, graminoids, geophytes and the occasional dwarf-shrub, and a host of alien plants. Despite this, some attractive plants of horticultural value are able to persist as the mowed strandveld simulates some aspects of an open piece of strandveld after fire. These species include *Freesia leichtinii* subsp. *alba*, *Brunsvigia orientalis* and *Babiana ambigua*. It would be conscientuous of the developer and residents to cultivate these species in the gardens planned for the proposed development. The study area is a habitat for very attractive native plants, such as *Freesia leichtinii* subsp. *alba*, *Dorotheanthus bellidiformis*, *Nemesia affinis*, *Brunsvigia orientalis* and *Babiana ambigua*.

Cumulative Impact Assessment The proposed housing development is one of a number of such developments already established in the town of Stilbaai, and will likely increase in the coming years due to the towns' popularity as a retirement destination. This particular site is in the middle of town and adjacent to the municipal buildings. A similar development has already been established adjacent to this property. Although the mowed portion of the land has some potential for restoration, with the existing busy roads and the requirement of the municipality to mow the study area, likely as a fire-control measure, it is unlikely to have a persisitent corridor and biodiversity function in the long run without active rehabilitation. The cumulative impacts of biodiversity loss and loss of suitable habitat by the proposed development on the larger study area, and the town of Stilbaai is considered low.

5.3 Recommendations

It is recommended that the proposed development be approved. This recommendation is founded on the relatively low impact the proposed development is envisaged to exert on intact plant biodiversity (approximately 31%) still remaining on the study area. It is further recommended that all NEMBA categorized alien invasive plants be controlled during the construction and post-construction phases. Either existing mature milkwood trees will need to be incorporated into the development plan or at least six milkwood saplings need to be planted post-construction. Post-construction landscaping should preferably incorporate plant species from the site into the gardens if at all possible. Should any of the identified protected plants on the property be destroyed or pruned, it must be done only after obtaining a premit from the National Department of Environment, Forestry and Fisheries.

6 Conclusion

The study area, comprising Erf 657, Stilbaai, as delineated in this report, does not fall within any of the critical biodiversity areas (CBAs) as identified by national, provincial and municipal spatial biodiversity plans. In this context it is thus considered of least concern for conservation purposes although all areas with natural vegetation and those likely to be restored relatively successfully should be valued highly. An extensive search for potential red data species were conducted and none were found to occur on the study area. There are however six large

specimens of the White Milkwood (*Sideroxylon inerme subsp. inerme*) present. This species is protected in terms of the National Forest Act, 1998 (Act No. 84 of 1998). The overall impacts of the development is considered low - medium. The potential medium impact is primarily related to the presence of these protected individuals. Overall, the proposed development impact is considered low if the mitigation recommendations are adhered to, if not it is considered medium-low. This recommended mitigation strategy relates to the destruction of milkwood trees. It would entail either the incorporation of the existing plants into the development design, or plant new Milkwood seedlings for each of the plants to be destroyed after construction is completed. Permits from the National Department of Environmental Affairs, Forestry and Fisheries are required before cutting or pruning these individual trees. In the light of these overall low envidaged impacts, it is recommended that the development be approved. It is further recommended that some of the plant species present on site be incorporated into the landscaping or garden design of the development after construction.

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A Author details

Marius van der Vyver holds a PhD in Botany from Nelson Mandela University and has more than 15 years' experience as an ecologist and botanist. He is registered with the South African Council of Natural Scientific Professions (SACNASP) as an ecological scientist (reg.no. 118303) and a member of the South African Association of Botanists (SAAB).

Table 13: Project experience table: Dr. M.L. van der Vyver

Client	Name	Location	Description	Role	Year
Nelson Mandela University	Associate Researcher – NRM Restoration Research Group	Eastern and Western Cape	Research manager of a restoration team to investigate and promote spekboom restoration with funding from the Department of Environmental Affairs, Forestry and Fisheries' Natural Resoiuorce Management (NRM) division.	Project Scientist	2019
BMK consulting engineers	Rehabilitation Management Guidelines: Diepsloot Footbridge construction	Diepsloot, Johannesburg	Guidelines for rehabilitation after construction of a pedestrian footbridge over a wetland, Diepsloot, Gauteng	Restoration Ecologist	2019
Envirobalance (Pty) Ltd	Biodiversity Impact Assessment with specialist Vegetation and Mammal Studies for Calmera Estate, Cradel of Mankind.	Cradle of Mankind, Muldersdrift, Gauteng	Biodiversity Impact Study including a specialist Vegetation (botanical) and Mammal study for assessing the impacts of a low-impact residential development	Biodiversity Scientist	Ongoing
Wild Summit Group, Kamala Game Reserve	Ecological Risk Assessment for the introduction of Red Deer (Cervus elaphus) on Kamala Game Reserve.	Eastern Cape, South Africa	Determine the ecological risk involved with the introduction of a population of Red Deer on Kamala Game Reserve.	Ecological Scientist	2019
Integrated Data Management (IDM) (Pty.) Ltd.	Determining trends in Electricity usage from data provided by Maputo Hospital	Maputo, Mozambique	Statistical analyses of energy usage of electricity monitoring data	Statistical analyst	2018
IDM, Arcellor Mittal	Energy usage analysis from a steel factory, Arcellor Mittal	Port Elizabeth, South Africa	Statistical analyses of energy usage of electricity monitoring data	Statistical analyst	2018

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
Wild Summit Group, Kamala Game Reserve	Ecological Risk Assessment for the maintenance of an existing population of Barbary Sheep on Kamala Game Reserve.	Eastern Cape, South Africa	Determine the ecological risk involved with the maintenance of an existing population of Barbary sheep on Kamala Game Reserve.	Ecological Scientist	2018
Resilience Environmental Advice, Enviro-mining, Suralco LCC	Monitoring system for the Revegetation Index – Suralco LCC Mine Closure Project.	Surinam, South America	Develop a monitoring system for the rehabilitation and revegetation of ferro-bauxite mines, based on the inputs of various Biodiversity specialists.	Restoration ecologist, Statistical analyst	2018
CSIR	Biomass estimation of subtropical thicket vegetation in Addo Elephant National Park for calibration with LiDAR and radiometric sensor data.	Addo Elephant National Park, Eastern Cape.	Biomass estimation of aboveground vegetation across Addo Elephant National Park for calibration with LiDAR and radiometric sensor data	Botanical specialist, Statistical analyst	2018
African Centre of Coastal Paleosciences, NMU	Vegetation community identification and plant species list for phytolith research on specific extant vegetation types in the Garden Route and Klein Karoo area	Southern Cape including Garden Route and Little Karoo	Botanical input to a post-doc researching phytolith composition in relation to extant vegetation types.	Botanical specialist	2018
Bothalia (academic journal)	Peer-review of a research paper on restoration ecology for publication in the academic journal Bothalia	NA	Peer-review of a research paper on restoration ecology for publication in the academic journal Bothalia	Restoration ecologist	2018

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
Rhodes University	Develop allometric models for estimating Biomass of Honeybush tea plants	NA	Specialist assistance to develop allometric models from commercially planted and wild honeybush plants sampled	Statistical analyst	2017
C4ES (Pty) Ltd	Statistical analysis and R code development for applying boundary line analysis to various soil datasets	NA	Develop new and debug existing R code to implement the boundary line analysis method and quantile regression to various soil datasets	Statistical analyst	2017
Envirobalance (Pty) Ltd	Biodiversity Screening Report for a proposed township development, Dunottar, Gauteng	Dunnottar, Gauteng	Biodiversity impact screening report on a closed-down gold mine site.	Biodiversity scientist	2017
KDS Consortium (Pty) Ltd	Biodiversity Screening Report for a proposed township development, Tshivhazwaulu Extension 1	Makhado area, Limpopo	Biodiversity impact screening report for township development	Biodiversity scientist	2017
Envirobalance (Pty) Ltd	Wetland delineation for Calmera Estate, Cradle of Mankind.	Cradle of Mankind, Muldersdrift, Gauteng	Wetland delineation for a proposed Basic Assessment for a housing development	Wetland specialist	2017
Journal of Applied Ecology (academic journal)	Peer-review of a research paper on restoration ecology for publication in the academic Journal of Applied Ecology	NA	Peer-review of a research paper on restoration ecology for publication in the academic Journal of Applied Ecology	Restoration ecologist	2017

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
Arid Land Research and Management (academic journal)	Peer-review of a research paper on restoration ecology for publication in the academic Journal of Arid Land Research and Management	NA	Peer-review of a research paper on restoration ecology for publication in the academic Journal of Arid Land Research and Management	Restoration ecologist	2016
Sigwela and Associates (Pty) Ltd / DEA (National Resource Management Programmes)	Restoration of Forest Vegetation in Matiwane, near Port St. Johns, Eastern Cape	Port St. Johns area, Eastern Cape.	Monitoring of ongoing forest restoration project and establish research sites to ascertain the feasibility of different clearing protocols and treatments for the restoration of grassland habitat after alien plant clearing by WfW teams.	Restoration ecologist	2016
PeerJ (academic journal)	Peer-review of a research paper on restoration ecology for publication in the academic journal PeerJ	NA	Peer-review of a research paper on restoration ecology for publication in the academic journal PeerJ	Restoration ecologist	2015
Forests, Trees and Livelihoods (academic Journal)	Peer-review of a research paper on restoration ecology for publication in the academic journal Forests, Trees and Livelihoods	NA	Peer-review of a research paper on restoration ecology for publication in the academic journal Forests, Trees and Livelihoods	Botanical specialist	2014
Gamtoos Irrigation Board	Develop allometric models for biomass estimation of 5 major alien invasive plants in the Nelson Mandela Metropolitan area.	Port Elizabeth	Develop allometric models by destructively harvesting a number of prominent Invasive Alien Plant Species	Botanical specialist, Statistical analyst	2013-2014

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
USK Consulting (Pty) Ltd	Ecological Impact Assessment for the proposed Swartwater Solar Energy Facility, Northern Cape	Swartwater, Northern Cape	Botanical and Fauna specialist study	Biodiversity scientist	2013
USK Consulting (Pty) Ltd	Ecological Impact Assessment for the proposed Wesley Wind Energy Facility, Eastern Cape	Wesley, Eastern Cape	Biodiversity (Flora and Fauna) impact specialist study of a proposed Wind Energy Project	Biodiversity scientist	2012
Envirobalance (Pty) Ltd	Ecological Impact Assessment for the proposed Albert Luthuli (Badplaas) Landfill Site	Badplaas, Mpumulanga	Biodiversity (Flora and Fauna) impact specialist study for a proposed landfill site	Biodiversity scientist	2012
Envirobalance (Pty) Ltd	Ecological Screening Report – Kuruman Housing Development and Wastewater Treatment Works	Kuruman, Northern Cape	Biodiversity (Flora and Fauna) screening study for a proposed landfill site	Biodiversity scientist	2012
USK Consulting (Pty) Ltd	Air Quality monitoring at East London Port Harbour	East London, Eastern Cape	Procure, install maintain and manage air quality monitoring instruments and weather stations and analyse data	Environmental scientist	2010-2011
NMU Restoration Research Group	Active restoration of woody canopy dominants in degraded south african semi-arid thicket is neither ecologically nor economically feasible	Krompoort, Rhinosterhoek Eastern Cape	Experiment with planting nursery-grown propagules in spekboom restoration stands of diffent ages. Analysis and reporting on the ecological and economic implications of results. Publish results in Journal of Applied Vegetation Science.	Restoration ecologist	2011-2012

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
NMU Restoration Research Group, DEA	Spontaneous return of biodiversity in restored subtropical thicket: Portulacaria afra as an ecosystem engineer.	Krompoort, Rhinosterhoek Eastern Cape	Survey plant biodiversity and above and belowground carbon pools in different stands ranging from 0-50 years under spekboom restoration treatment and intact stands, and compare results to gauge restoration success in terms of biodiversity. Publish results in the journal Restoration Ecology.	Restoration ecologist	2011-2012
USK Consulting (Pty) Ltd / BCM	Water quality monitoring at Roundhill municipal landfill site in Buffalo City Municipality	East London, Eastern Cape	Water sampling from various locations around and inside the municipal landfill site and lab analysis interpretation and reporting against norms and allowable limits.	Environmental scientist	2010-2011
DEA (National Resource Management Programmes), NMU	Habitat and herbivory impact efficient ecological restoration of spekboom (Portulacaria afra)-rich subtropical thicket.	Various locations within the Southern and Eastern Cape	Assessment of local environmental and management factors affecting spekbooom restoration efficacy on 275 experimental restoration plots on a biome-wide scale (Thicket-wide Plot Experiment)	Restoration ecologist, Statistical analyst	2011-2017
DEA (National Resource Management Programmes), NMU	Plant larger truncheons deeper: more effective spekboom (Portulacaria afra) thicket restoration protocol.	Various locations within the Southern and Eastern Cape	Assessment of various propagule treatments and planting protocols affecting spekbooom restoration efficacy on 275 experimental restoration plots on a biome-wide scale (Thicket-wide Plot Experiment)	Restoration ecologist, Statistical analyst	2011-2017

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
DEA (National Resource Management Programmes), NMU	Contrasted aboveground carbon pool estimations of intact and degraded (Portulacaria afra)-rich subtropical thicket show terrestrial carbon offset potential.	Various locations within the Southern and Eastern Cape	I developed 40 different species-specific allometric models for estimating abovegroound biomass of subtropical thicket vegetation	Botanical specialist, Statistical analyst	2011-2017
C4ES (academic journal) / PrimaKlima (academic journal)	Monitoring of aboveground carbon pools on rehabilitated spekboomveld for three sites in the Eastern Cape.	Kaboega, Klipplaat, Jansenville and Uitenhage areas, Eastern Cape	Monitor and quantify aboveground carbon of spekboom restoration plots as terrestrial carbon offsets	Restoration ecologist	2011-2014
USK Consulting (Pty) Ltd	Strategic Environmental Assessment (SEA) for Mnquma Municipality, Eastern Cape.	Mnquma Municipality, Transkei, Eastern Cape	I was responible for the biodiversity (Fauna and Flora) component including extensive mapping and verification/ground-truthing of areas delineated by the Eastern Cape Biodiversity Plan. I managed the GIS component of the project.	Biodiversity scientist and GIS analyst	2011
Envirobalance (Pty) Ltd	Weltevreden Park Wetland Delineation Study, Centurion.	Weltevreden Park, Gauteng	Wetland delineation and map for a BA for proposed housing development	Wetland specialist	2011

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
USK Consulting (Pty) Ltd / Afrisam	Biodiversity Management Plan for Afrisam Dudfield Mine, Lichtenburg	Lichtenburg, North West	A biodiversity management plan including a vegetation map an alien plant control plan and an ecological management plan of a small protected area adjacent to the mining area with plant checklist, botanical baseline, veld condition assessment, game and stocking rate recommendation	Biodiversity scientist	2010
Envirobalance (Pty) Ltd	Vegetation Screening Report: Kuruman Housing development and Wastewater treatment works	Kuruman, Northern Cape	Botanical screening study for a proposed landfill site	Botanical specialist	2010
Envirobalance (Pty) Ltd	Ecological Impact Assessment: Ga-Oria to Tsate road – Sekhukhuneland, Limpopo	Steelpoort area, Mpumulanga	Biodiversity (Flora and Fauna) impact study for a proposed road.	Biodiversity scientist	2010
Envirobalance (Pty) Ltd	Karino Wetland Rehabilitation and Management Plan.	Nelspruit, Mpumulanga	Wetland delineation and rehabilitation plan	Wetland specialist	2010
USK Consulting (Pty) Ltd	Ecological Screening for Tsolo Junction Development, Eastern Cape	Tsolo, Transkei, Eastern Cape	Biodiversity (Flora and Fauna) screening study for a proposed road	Biodiversity specialist	2010
USK Consulting (Pty) Ltd	A number of Basic Assessments Reports	East London Area, Eastern Cape	Standard Basic Assessments and various inputs to EIA reports.	Environmental consultant	2009-2011
USK Consulting (Pty) Ltd	Ecological screening report - Riverland Orchard Farm 799/37 Gonubie	Gonubie, Eastern Cape	Biodiversity (Flora and Fauna) screening study for a proposed agricultural clearing	Botanical specialist	2008

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
Savannah Environmental (Pty) Ltd / Eskom	Scoping report: Ankerlig Power Station Conversion and transmission integration project, Western Cape.	Mossel Bay LM	I co-authored the scoping report and made two site visits and attended public meetings.	Environmental consultant	2008
Savannah Environmental (Pty) Ltd / Eskom	Environmental Management Plan for Ingula Transmission line	Ingula, Ladysmith area, KwaZulu Natal	I developed an environmental management plan for the construction of a large transmission line across sensitive ecologal communities in the KwaZulu Natal midlands.	Environmental scientist	2008
Savannah Environmental (Pty) Ltd / Eskom	Environmental Impact Assessment for building water infrastructure at Medupi Power Plant	Medupi, Limpopo Province	EIA and scoping for a proposed water infrastructure including extensive pipelines and reservoirs	Environmental consultant	2008
Savannah Environmental (Pty) Ltd / Eskom	Environmental Compliance Officer (ECO) for construction of pipeline for disposal of waste water and ash at Duvha Power Station, Witbank	Witbank, Mpumulanga	Environmental compliance project auditing the construction activities of a pipeline for the disposal of waste water and ash at Duvha Power Station, Witbank.	Environmental Compliance Officer	2008
Savannah Environmental (Pty) Ltd / DWAF	On-site ECO for construction of the De Hoop Dam and realignment of the provincial road	Steelpoort area, Mpumulanga	Independent Environmental Compliance Monitoring of a large dam construction project (DWAF) and an associated project involving the consequent realignment of the provincial road	Environmental Compliance Officer	2007-2008

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
Pidwa Conservation Projects (Pty) Ltd	Research and Monitoring support to Pidwa Reserve Management, part of the Greater Makalali Conservation Area, with paying volunteers.	Greater Makalali Conservation Area near Gravelotte, Limpopo	Research and monitoring within a large big-5 game reserve, specifically in terms of Elephant impacts on vegetation, leopard population and home range study, game monitoring and census, alien plant control, predation preferences of lions and management of international paying volunteers and post graduate students	Project and research manager	2006-2007
Siyafunda Conservation Projects (Pty) Ltd	Research and Monitoring support to Makalali Reserve Management, part of the Greater Makalali Conservation Area, with paying volunteers.	Greater Makalali Conservation Area near Hoedspruit, Limpopo	Research and monitoring within a large big-5 game reserve, specifically elephant group behaviour with regards to the reserve immuno-contraception program, predation preferences of predators on reserve, hyaena monitoring and home range calculations, elephant impacts on vegetation, leopard population and home range study, game monitoring and census, alien plant control and management of international paying volunteers and post graduate students	Volunteer facilitator, Monitoring officer	2004-2006
Tshwane University of Technology	Botanical surveys, vegetation condition assessments and game stocking recommendation on tribal lands in view of the potential establishment of a reserve.	Greater Giyani region, Limpopo	Botanical surveys, vegetation condition assessments and game stocking recommendation on tribal lands in view of the potential establishment of a reserve (3-month contract).	Botanical specialist	2004

Table 13: Project experience table: Dr. M.L. van der Vyver *(continued)*

Client	Name	Location	Description	Role	Year
Cambridge University, Kalahari Meerkat Project	International research station on small reserve focussed mostly on the behavioural ecology of Meerkats.	Kuruman River Reserve, Van Zylsrus, Northern Cape	Reserve management and research technician	Research technician, Reserve infrastructure manager.	2003-2004
SANParks	Field ranger	Kgalagadi Transfrontier Park	Reserve management duty, 4x4 trail guide, field guide	Field ranger, Field guide, 4x4 trail guide	2003

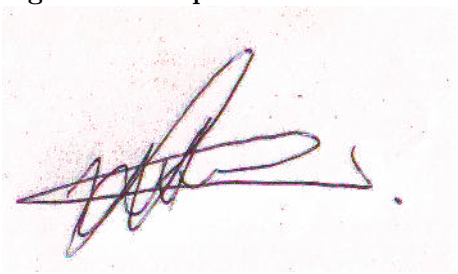
B Declaration of Independence

I, Dr. Marius L van der Vyver, hereby declare that I

- Act as the independent specialist in this application;
- Will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant and that there are no circumstances that may compromise my objectivity in performing such work;
- Have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- Will comply with the Act, regulations and all other applicable legislation;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.

I further declare that all the particulars furnished by me in this form are true and correct; and acknowledge that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Name of Company
CHEPRI (PTY) LTD SCIENTIFIC SERVICES
Name of Specialist Consultant
DR. ML VAN DER VYVER
Signature of Specialist Consultant



Date
SEPTEMBER 15, 2020

C NEMBA classifications for invader species

Last Updated (2019-02-13) with latest NEMBA classifications in accordance with the NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004) ALIEN AND INVASIVE SPECIES LISTS, 2016

C.1 Category 1a (PROHIBITED) : Listed Invasive Species

A person in control of a Category 1a Listed Invasive Species must comply with the provisions of section 73(2) of the Act; immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.

C.2 Category 1b (PROHIBITED / Exempted if in Possession or Under control) : Listed Invasive Species

A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act. A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

C.3 Category 2 (PERMIT REQUIRED): Listed Invasive Species

Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit. Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3. Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

C.4 Category 3 (PROHIBITED): Listed Invasive Species

Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the Act, as specified in the Notice. Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

D Terrestrial and Aquatic Biodiversity Protocols

Although this project has been completed (Oct 2019) before the new Terrestrial and Aquatic Biodiversity Protocols were gazetted (20 March 2020), this appendix serve to address the biodiversity related themes highlighted as sensitive by the new screening tool for this proposed development. Below each relevant potential concern is highlighted and addressed.

The screening tool identifies the need for a Terrestrial Biodiversity Impact Assessment, an Animal or Fauna species assessment and a Plant species assessment.

D.1 Terrestrial Biodiversity

This report addresses that requirement and concludes that the area is identified as of Least Concern in terms of conservation status (Pool and Stanvliet, 2017) and does not overlap with any identified CBA areas (see Figure 5 in the report). Importantly, most (69%) of the proposed development site that falls within the area identified as of very high terrestrial biodiversity importance by the EIA screening tool has already been transformed through regular mowing, and therefore the actual terrestrial biodiversity sensitivity of the site is considered low.

D.2 Animal Species (Fauna)

The screening tool identifies the area as of high animal species combined sensitivity. In particular this applies to the following birds: *Bradypterus sylvaticus* (Knysna Warbler)

Species	Common name	Sensitivity	L.O. *
Bradypterus sylvaticus	Knysna Warbler	High	Medium
Neotis denhami	Stanley's bustard	High	Low
Certhilauda brevirostris	Agulhas long-billed lark	High	Medium
Campethera notata	Knysna Wood-pecker	High	Medium

* Likelihood of occurrence on site

Since the development involves the establishment of a retirement village on the site where most of the natural vegetation has already been transformed due to regular mowing, it is unlikely that any would be nesting on site. Should any be present, the disappearance locally from site would most likely be only temporary, i.e. during the construction phase, if the recommendations outlined in the report is adhered to.

There is a number of invertebrate species identified by the screening tool as of Medium concern (see the screening report). Since most of the natural habitation of the site has been transformed by regular mowing, the likelihood of a meaningful impact on these species populations, should they be present, is considered low.

D.3 Plant Species

None of the plant species designated by the online screening tool as of Medium sensitivity were found to be present on the site, which is not surprising, given that 69% of the site is already transformed by regular mowing. This current report gives a full description of the plant species encountered on site. Therefore the risk of impacting any of these plant species populations is considered very low.