Impact Assessment for the Proposed Development of Dwelling(s) on Porition 76/216 Uitzicht Farm, Knysna.

Specialist Plant Species and Terrestrial Biodiversity Report

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ABBREVIATIONS

BPA	Biodiversity Priority Area
BSP	Biodiversity Spatial Plan
CBA	Critical Biodiversity Area
CD:NGI	Chief Directorate: National Geo-spatial Information
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
DFFE	Department of Forestry, Fisheries and the Environment
EIA	Environmental Impact Assessment
EMPr	Ecological Management Programme
ESA	Ecological Support Area
NEM:BA	National Environmental Management: Biodiversity Act
PAOI	Project Area of Influence
POSA	Plants of Southern Africa
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SDP	Site Development Plan (areas of direct disturbance)
SEI	Site Ecological Importance
SSVR	Site Sensitivity Verification Report

DECLARATION OF SPECIALIST INDEPENDENCE

The consulting services comprise an assessment of the potential sensitivity of the ecosystems and flora that fall within the development footprint for the site. The following declaration is given by the appointed specialist:

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP).
- At the time of conducting the field assessment and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this report has reference to, except for financial compensation for work done in a professional capacity.
- Work performed for this site was done in an objective manner. Even if this results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public.
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data.
- I do not have any influence over decisions made by the governing authorities.
- I undertake to disclose 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 a competent authority to such a relevant authority and the applicant.
- I have the necessary qualifications and guidance from professional experts in conducting specialist reports relevant to this application, including knowledge of the relevant Act, regulations and any guidelines that have relevance to the proposed activity.
- This document and all information contained herein is and will remain the intellectual property of Confluent Environmental. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigators.
- All the particulars furnished by me in this document are true and correct.

Signed: 22 July 2024

BIANKE FOUCHÉ ABRIDGED CV

Qualifications

- B.Sc. Environmental Sciences,
- B.Sc. Honours (Botany),
- M.Sc. Conservation Biology 2022-2023 (currently completing at the University of Cape Town. Graduation is 15 December 2023).

SACNASP Registration No: 141757 (Candidate Botanical Scientist)

Skills and Core Competencies

- My MSc research will add to our understanding of plant community niche construction and Alternative Stable State (ASS) theory. The knowledge gained will be used to advise landscape stewardship practices, especially regarding reforestation initiatives in the Overstrand.
- I have worked closely with the conservation team of the Grootbos Foundation, where I assisted with vegetation surveys, mounting voucher specimens in the Grootbos herbarium, and taken part in controlled fynbos fires in the Overberg.
- Postgraduate studies of mine included assessing the allelopathic effects of *Eucalyptus* leaves on garden peas and leeks and assessing the accuracy of the climate leaf analysis multivariate programme (CLAMP) in predicting the climate of fynbos vegetation.
- In Cape Town I regularly took part in alien clearing activities and helped to identify relevant listed invasive plants.
- I am currently a member of the Botanical Society of South Africa and the custodians for rare and endangered wildflowers (CREW) in George.

References

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1. INTRODUCTION

1.1 Background

Confluent Environmental was contracted by the Applicant on the recommendation of Eco Route Environmental to undertake a Site Sensitivity Verification Report (SSVR) for botanical and terrestrial sensitivity of Portion 76/216 Uitzicht Farm located just west of Brenton on Sea. This farm portion covers a total area of 21.01 ha. according to Cape Farm Mapper. According to the Department of Forestry, Fisheries, and the Environment (DFFE) Screening Tool, the SSVR is required because the terrestrial plant species theme has been highlighted as having a **Medium and High** sensitivity over different areas of the site, and the terrestrial biodiversity has an overall **Very High** sensitivity (Fig. 1).

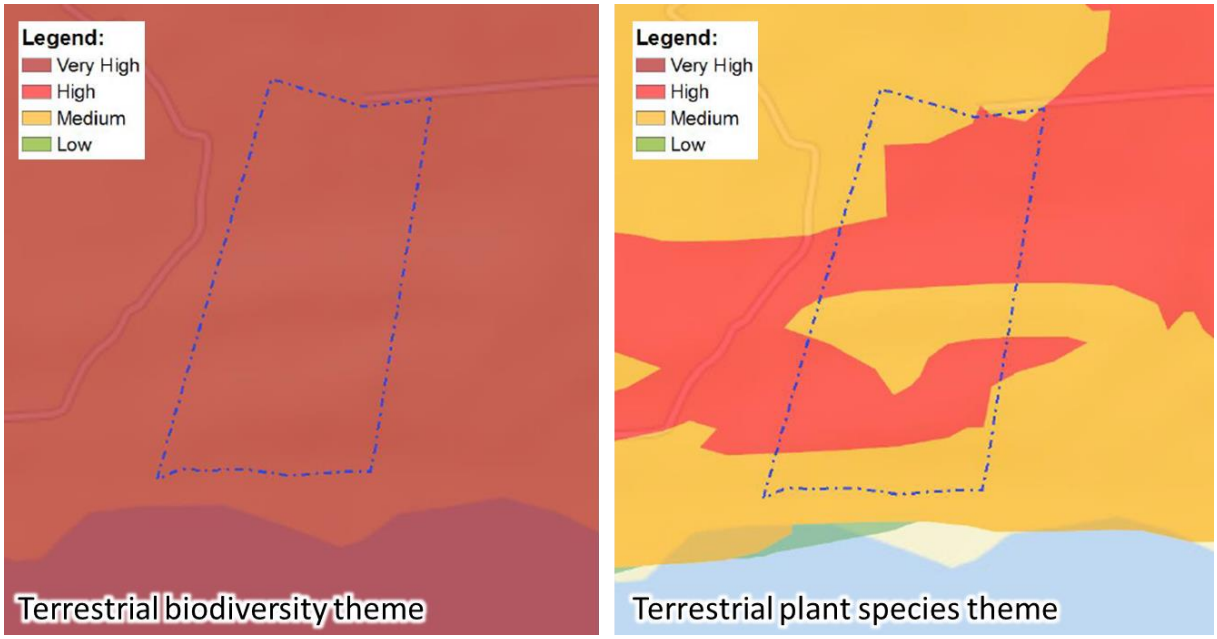


Figure 1: The screening sensitivity maps provided by the Screening Tool report for terrestrial biodiversity (left) and terrestrial plant species (right) themes.

These screening tool sensitivities apply to the entire Portion 76/216. The plant species theme is triggered due to several species of conservation concern (SCC) that are confirmed and that are potentially present in the area (these species are listed later in this report). The terrestrial biodiversity theme sensitivity is due to the Portion 76/216 covering areas mapped as:

- Terrestrial critical biodiversity areas (CBA1)
- A SAN Parks buffer area for the Garden Route National Park
- Part of the Knysna National Lake Area
- Part of a critically endangered (CR) ecosystem, namely Knysna Sand Fynbos
- A Freshwater Ecosystem Priority Area (FEPA) sub-catchment. Assessment of this trigger falls outside of the scope of a terrestrial biodiversity and plant species report. Refer to the aquatic specialist report.
- A part of the Outeniqua strategic water source area for surface water (SWSA-sw). Assessment of this trigger falls outside of the scope of a terrestrial biodiversity and plant species report. Refer to the aquatic specialist report.

1.2 General Site Location

Portion 76/216 is located west of Brenton on Sea and south of the Knysna lagoon and estuary. The southern boundary of the site is against the coastline (Fig. 2). The site can be accessed via the road on the western neighbouring farm portion which splits off from C.R. Swart Drive. Currently there is minimal to no development on the surrounding farms, and the farm portion forms part of the larger Garden Route Biosphere Reserve and Knysna National Lake Area. Other protected areas within approximately 5km of the site includes the Brenton Blue Butterfly Special Nature Reserve (proclaimed July 2003) for a species that is considered Critically Endangered (CR PE), Skuilte Private Nature Reserve, Featherbed Private Nature Reserve, Pledge Nature Reserve, and the large coastal area west of the site forming the Goukamma Provincial Nature Reserve and its associated Marine Protected Area.

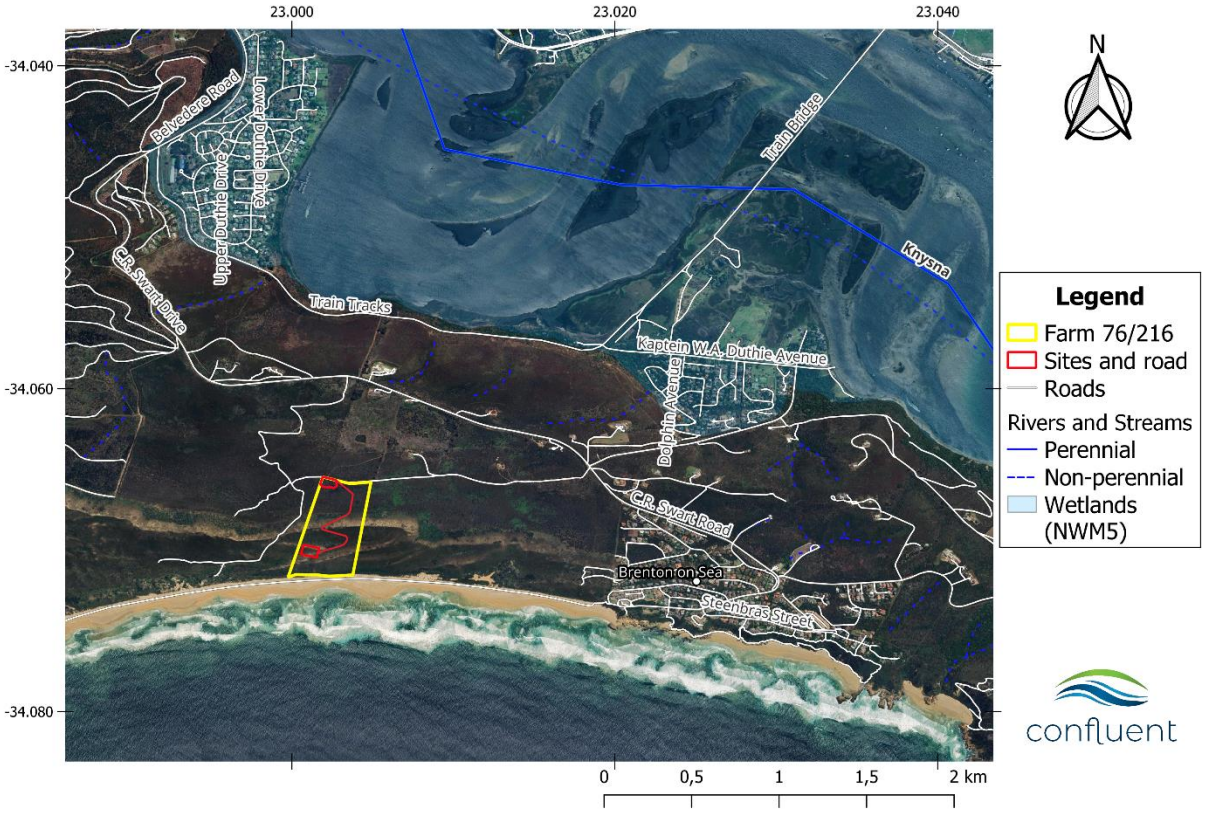
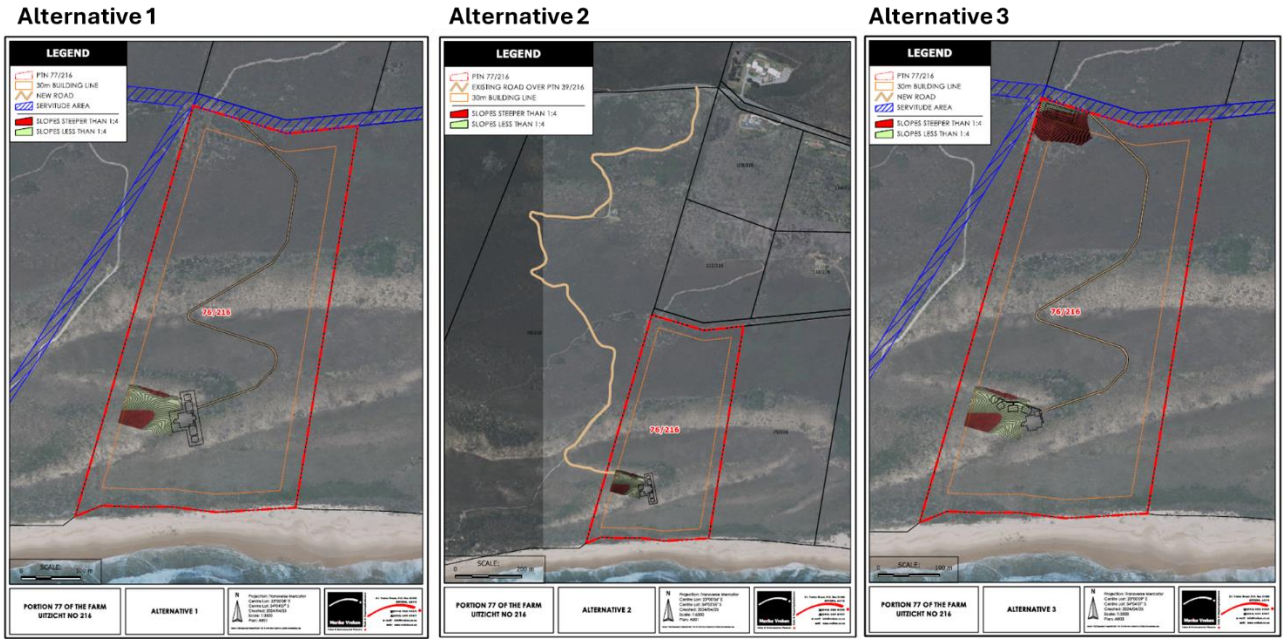


Figure 2: The general location of Portion 76/216, called Uitzicht.

1.3 Site Development Plan

The site development plans (SDP; Fig. 3) on the property include three Alternative options for consideration in this report. The main plan is for a primary dwelling in the southern section of the site over the dunes. A secondary dwelling in the north-western corner of the property is included in Alternative option number three. A new road is also proposed to connect these two dwellings under Alternative 1, while the neighbouring property road is proposed as an access road under Alternative option 2. An indication of the proposed sewer system and electricity supply to the site is not included in the site development plan, however it is assumed these will not significantly alter the disturbance footprint proposed. The area of the entire Portion 76/216 is ca. 21 ha. A brief description of the disturbance footprints under each of the three Alternative development scenarios is provided as part of Figure 3.



Alternative 1 Description

- New access road from northern section to southern proposed dwelling.
- One proposed dwelling on the southern section of the property.

Alternative 2 Description

- Utilises existing access road through neighbour's property (requires permission from neighbour).
- Proposed short road extension from the access road to the proposed dwelling in the southern section.
- One proposed dwelling on the southern section of the property.

Alternative 3 Description

- New road from proposed northern dwelling to the proposed southern dwelling.
- Two dwellings proposed: One in the north and the second in the south of the property.
- Southern dwelling has a different layout to that in Alternatives 1 and 2.
- Requires permission from town planning for a second dwelling.

Figure 3: Three alternative layouts proposed for Portion 76/216 near Brenton on Sea.

According to the services report for Portion 76 of 216, the developer will be held responsible for the construction and/or upgrading of bulk services required to service the development. The main building will also make provision for 110kl rainwater/borehole storage. In terms of fire, this development is categorized as low-risk, however the effect of landscape

fragmentation and fire management may be more significant (see the impact assessment section of this report). The services report also states the proposed pool with a capacity of 160kl will be the main storage capacity for fire extinguishing purposes. Currently there aren't any municipal bulk sewer services available in this area. The Technical Department of Knysna Municipality has been consulted and it was agreed that septic tanks with soakaways may be utilized to manage the effluent. In terms of roads the services report states:

"*The development will have one vehicular access on the northern boundary, from the road reserve. All roads inside the property will be private roads consisting of 2.5m strip, reinforced concrete roads. Passing lanes will be provided at suitable intervals. The design methodology will be to have the smallest disturbance footprint possible*."

No formal storm water system exists in the immediate vicinity of the development. The services report also states that a water filtration system is recommended, and that waste management should be undertaken responsible, where all waste produced should be transported to approved disposal sites.

2. TERMS OF REFERENCE

This screening tool sensitivity verification report provides information on Terrestrial and Botanical diversity and sensitivity of the habitats on the property to the proposed development. The results presented are based on a desktop and field assessment, which includes a consideration of historical photographic records of the site. The assessment presented in this report follows the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity, and Terrestrial Plant Species themes.

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), which includes:
    - The protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial plant species (28 July 2023).
    - The protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity (20 March 2020).
- Additional guidelines for the terrestrial biodiversity theme:
    - Ecosystem Guidelines for Environmental Assessment in the Western Cape (de Villiers et al., 2016).
    - The Western Cape Biodiversity Spatial Plan Handbook and summary booklet (CapeNature, 2017; Pool-Sandvliet et al., 2017).
    - The Subtropical Thicket Ecosystem Programme Handbook: Integrating the natural environment into land-use decisions at the municipal level: towards sustainable development (Pierce & Mader, 2006). This guideline provides more information about Goukamma Dune Thicket.
- Additional guidelines for the terrestrial plant species theme:

- Species Environmental Assessment Guideline: Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa (Verburgt et al., 2020).

The assessment was undertaken by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with relevant expertise in the field of Botanical and/or Ecological science.

2.1 Online Screening Tool

The Department of Forestry, Fisheries, and the Environment (DFFE) screening tool report for the development footprint has identified the terrestrial plant species theme as having a **Medium and High sensitivity**, and the **terrestrial biodiversity theme as having a Very High sensitivity**. The reasons for the terrestrial plant sensitivity theme are the possible and confirmed occurrence of species of conservation concern (SCC) on the site. The following definitions are given in the Species Environmental Assessment Guideline (Verburgt et al., 2020) for the High and Medium plant species theme sensitivities respectively:

Terrestrial plant species theme High sensitivity

"Recent occurrence records for all threatened (CR, EN, VU) and/or Rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2002) that have a spatial confidence level of less than 250 m with segments of remaining natural habitat. For birds, species distribution models (SDMs) and SABAP2 data (http://sabap2.birdmap.africa/) were combined to delineate the 'high' sensitivity areas."

Terrestrial plant species theme Medium sensitivity

"Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level."

A Very High sensitivity rating for terrestrial biodiversity according to the screening tool is triggered for all Biodiversity Priority Areas (BPAs) and other sensitive features (Stewart et al., 2021). BPAs triggered here include the various management layers of the Western Cape Biodiversity Spatial Plan (WC BSP), as well as the other sensitive features listed in Table 1 below.

Table 1: Sources of BPA data for the Terrestrial Biodiversity Theme sensitivity (Stewart et al., 2021).

Sensitivity layer	Data included and source
Critical Biodiversity Areas (CBAs)	Most recent terrestrial CBA spatial footprint for metros, provinces, or bioregional plans, combined to create a national data set. The entire site is a CBA 1 area.
National Priority Areas for Protected Areas Expansion	The latest priority expansion areas for each province, as well as the expansion footprint for national parks as per the approved management plan for national parks.
SAN Parks Buffer Areas	A buffer area for a National Park is defined in the February 2012 schedule on Biodiversity Policy and Strategy for South Africa's Strategy on Buffer Zones of National Parks. The buffer applicable here is the 10km wide buffer for the Garden Route National Park.
Strategic Water Source Areas (SWSAs) (terrestrial)	Surface strategic water source areas, delineated by Mervyn Lotter in October 2020 with substantial input from the SWSA spatial task team as part of the SWSA spatial task team. Note that the protocol only applies to the terrestrial parts of the SWSAs.
Freshwater Ecosystem Catchments (terrestrial)	Freshwater ecosystem catchments, determined through the National Freshwater Ecosystem Priority Area (NFEPA) process. This trigger is best assessed in an aquatic specialist report for the site.
Lakes	National Lake Areas area also part of the trigger for terrestrial site sensitivity. In this case the Knysna National Lake Area applies.
Red Listed Ecosystems	Any ecosystem that is listed as Vulnerable, Endangered, or Critically Endangered according to the "Revised National List of Ecosystems that are Threatened and in Need of Protection (NEM:BA Act no.10 of 2004, as amended in November 2022)

3. METHODOLOGY

3.1 Desktop Assessment

The desktop assessment was performed using Cape Farm Mapper and QGIS version 3.28.3 "Firenze". Plant species data was sourced from the following sources:

- The DFFE screening tool listed SCC.
- Information on plant occurrence prior to the site visit was sourced from SANBIs Botanical Research and Herbarium Management System (BRAHMS) for the Plants of Southern Africa (POSA) database.
- iNaturalist observations of the property and surrounding areas.

Ecosystem/ vegetation type data was sourced from:

- The 2018 updated South African National Vegetation Map from SANBIs Biodiversity GIS (BGIS) database, and the National Biodiversity Assessment report of 2018 (Skowno et al., 2018).
- Shapefiles for the Western Cape Biodiversity Spatial Plan (WC-BSP) i.e., information on PAs, CBAs, ESAs, and ONAs were downloaded from BGIS database (CapeNature, 2017; Pool-Sandvliet et al., 2017).
- Cape Farm Mapper for additional spatial information required for the site.
- Chief Directorate: National Geo-spatial Information (CD: NGI) Geospatial Portal and Google Earth for the acquisition of historical aerial imagery of the site.

- The conservation status of ecosystems was found in the Revised National List of Ecosystems that are Threatened and in need of protection, published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004, as revised in Nov. 2022), and also using the Vegetation of South Africa, Lesotho, and Swaziland (Mucina & Rutherford, 2006).

3.2 Field Assessment

Field work on the property was undertaken on the 11th of October 2023. The method for identifying species was similar to a BioBlitz, also described as a "timed meander", where the specialist especially keeps an eye out for rare and threatened species, as well as other dominant species or species that play an important ecological role on the site. Some Red Listed Plant species are also more easily detected during a site survey than other species. This timed meander survey method is an attempt to account for the short and single survey period, where detection probability of some seasonal, rare and threatened species (e.g., geophytes, small succulents, small perennials etc.) are low (Garrard et al., 2008; Wintle et al., 2012). Observations of individual species and environmental characteristics were documented using an android app "Spot Lens". A provisional species list and plant species accumulation curve is provided in Appendix 11.1.

3.3 Assumptions & Limitations

This assessment is subject to a few assumptions, uncertainties, and limitations, as listed below:

- Only one survey took place during spring on the 11th of October 2023. The season of the assessment and survey timing always play a role in limiting the findings of a terrestrial habitat and plant species specialist report.
- Some rare and threatened plant species are difficult to locate and easily overlooked in the field (e.g., geophytes, small succulents, small shrubs, and cryptic spp.). The species list for the area is limited to the findings of the one field assessment, as well as past records on iNaturalist and the Plants of Southern Africa (POSA) database for the proposed development site and its surrounding areas. It is very likely that the species list and SCC reported are not exhaustive (Perret et al., 2023). Luckily, numerous members of the custodians for rare and endangered wildflowers (CREW) have visited the site in the recent past, which adds to the data generated for this assessment.
- Some species may have been entirely "invisible" at the time of the assessment (e.g., some geophytes, annuals, plants constrained to certain successional stages in the post fire environment, and parasitic plants). Many plant species flower seasonally and are therefore difficult to identify outside of their flowering season. Environmental factors such as the prevailing fire regime and level of alien invasion influence the successional stage of the vegetation present at the site, and therefore the species visible at the time of assessment (Cowling et al., 2010; Privett et al., 2001).
- Denser vegetation always makes it hard to gain access to some sections of the site. It is possible that the impenetrable nature of the vegetation in some places caused an SCC/ several SCC to be missed on the site.

4. RESULTS: DESKTOP ASSESSMENT

4.1 Terrestrial Biodiversity

4.1.1 Climate

Knysna Sand Fynbos, which is mapped over the northern half of the site, is found in a climate where rainfall is relatively evenly spread between the four seasons. The climate of Brenton on Sea, which is close to the property, is characterised as being warm and temperate. The average annual temperature for Brenton on Sean is about 16.6 ˚C (Fig. 4). The hottest month of the year is usually February, which is also the month with the highest average humidity (ca. 78%). The coldest month of the year is usually in June, and the lowest humidity (ca. 70%) is usually recorded in July.

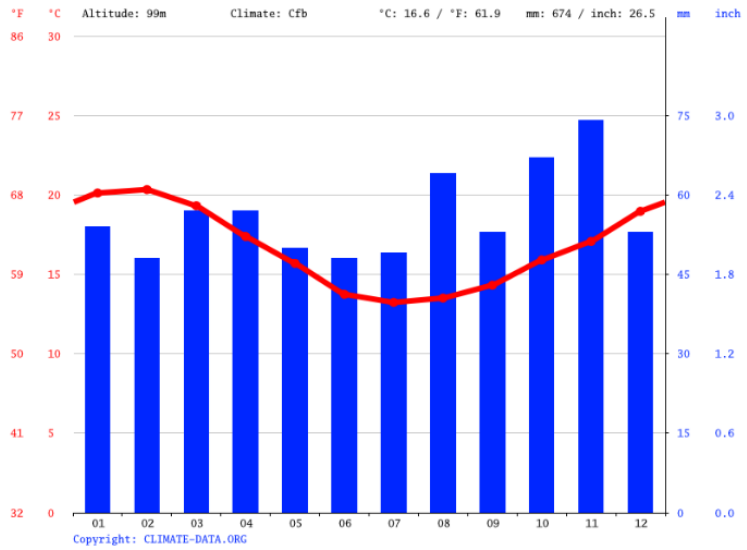


Figure 4: A summary graphic of average monthly rainfall and temperature for Brenton on Sea.

4.1.2 Geology and soil

The geology on the site forms part of the Bredasdorp group, which is characterised by calcareous sandstone and aeolianite, as well as sand dunes. The site contains a dune barrier system, which includes interesting and complex geology (Bateman et al., 2011; Fig. 5). Due to the fact that the Wilderness area is both geologically and climatically stable, and has been for thousands of years, a complex series of sedimentary accretion processes have occurred, which can be used to reach back in time and understand some of the palaeo-history of the region (Bateman et al., 2011). The erodibility of soils here is considered High (with a Cape Farm Mapper erodibility factor of 0.62). Soils here are not well formed and are sandy, composed largely of sand and dune rock. The soils, because they are essentially sand, are very well drained and are usually very deep.

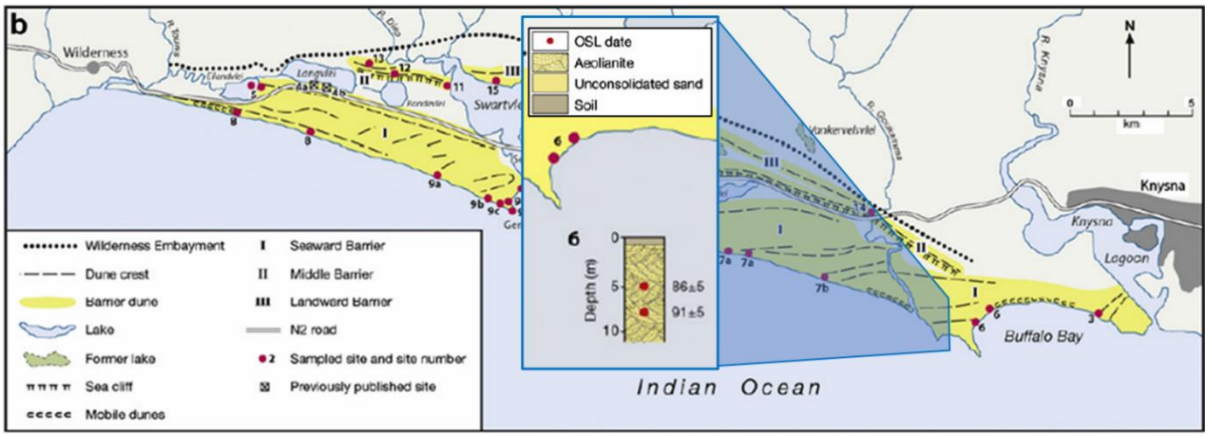


Figure 5: A modified Figure taken from (Bateman et al., 2011), which illustrates the Wilderness dune barrier system. The inset map illustrates profiles taken near The property, where aeolianite is the majority of the profile, with a thin section of sandy soil on top. The red dots in the inset map represent the approximate age of the profile at that depth in thousands of years.

4.1.3 Vegetation type(s)

According to the National Vegetation map of South Africa of 2018 (VEGMAP 2018; Dayaram et al., 2019; Grobler et al., 2018; Mucina & Rutherford, 2006), the property is mapped with two vegetation types (Fig. 6). The northern half of the site, above the large dune, is mapped as **Knysna Sand Fynbos (FFd 10)** which is a critically endangered (CR) vegetation type (NEM:BA Act, 2022). The southern half of the site is mapped as **Goukamma Dune Thicket (AT 36)** which is not listed on the revised version of threatened ecosystems, indicating it has a status of Least Threatened (LT). Right against the shore the vegetation is mapped as Cape Seashore Vegetation, which will not be impacted by the development. According to the Vlok vegetation map, the southern half of Portion 76/216 is mapped largely as “Sedgefield Sandplain Fynbos” & “Sedgefield Thicket Fynbos”, with depressions in the landscape mapped as “Wilderness Forest-Thicket” (Fig. 6). The southernmost dune is mapped as “Hartenbos Primary Dune”. The northern half of the site is mapped as “Hoogekraal Sandplain Fynbos”, which corresponds to the National Vegetation Map category Knysna Sand Fynbos.

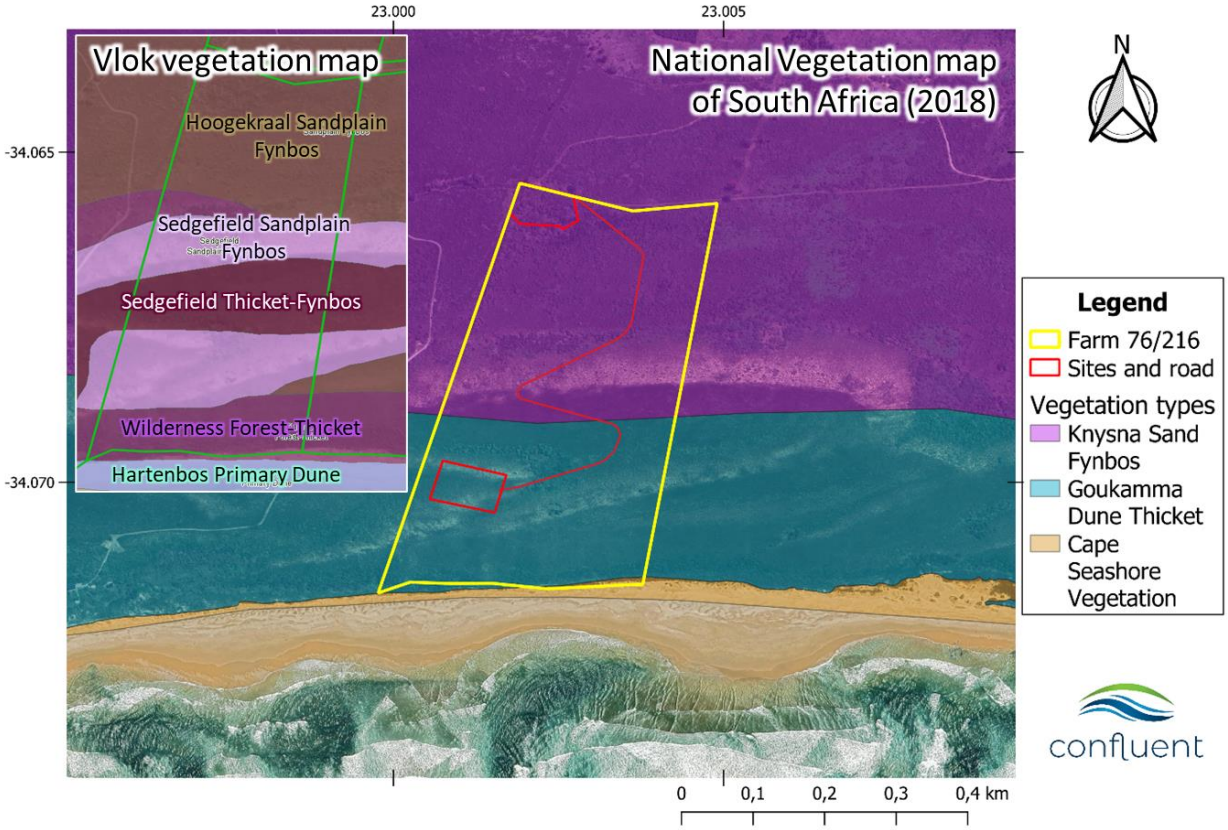


Figure 6: A) The mapped vegetation types according to the 2018 National Vegetation Map of South Africa (Dayaram et al., 2019; Mucina & Rutherford, 2006), and the Vlok vegetation map categories (inset map) for Portion 76/216 and the surrounding area.

The full extents of Knysna Sand Fynbos and Goukamma Dune Thicket are illustrated in Fig. 7 in terms of the 2020 land use land cover (LULC) dataset for South Africa. It is easy to see from the figure that both of these vegetation types cover a very small area (i.e., the total mapped original extent for Goukamma Dune Thicket is ca. 9176 ha, and for Knysna Sand Fynbos is ca. 15207 ha). The majority of Knysna Sand Fynbos has been transformed. Both vegetation types face the most significant threat from plantations (orange areas in Fig. 7) and urban expansion (yellow areas is Fig. 7). Over 80% of Knysna Sand Fynbos is already transformed (so that less than ca. 152 ha of the mapped extent of this of this vegetation type remains). The conservation status of Goukamma Dune Thicket is not included in the revised NEM:BA list of threatened ecosystems, but in the 2nd edition STEP handbook it is listed as Vulnerable, however the assessment criteria used is uncertain in the STEP handbook (Pierce & Mader, 2006).

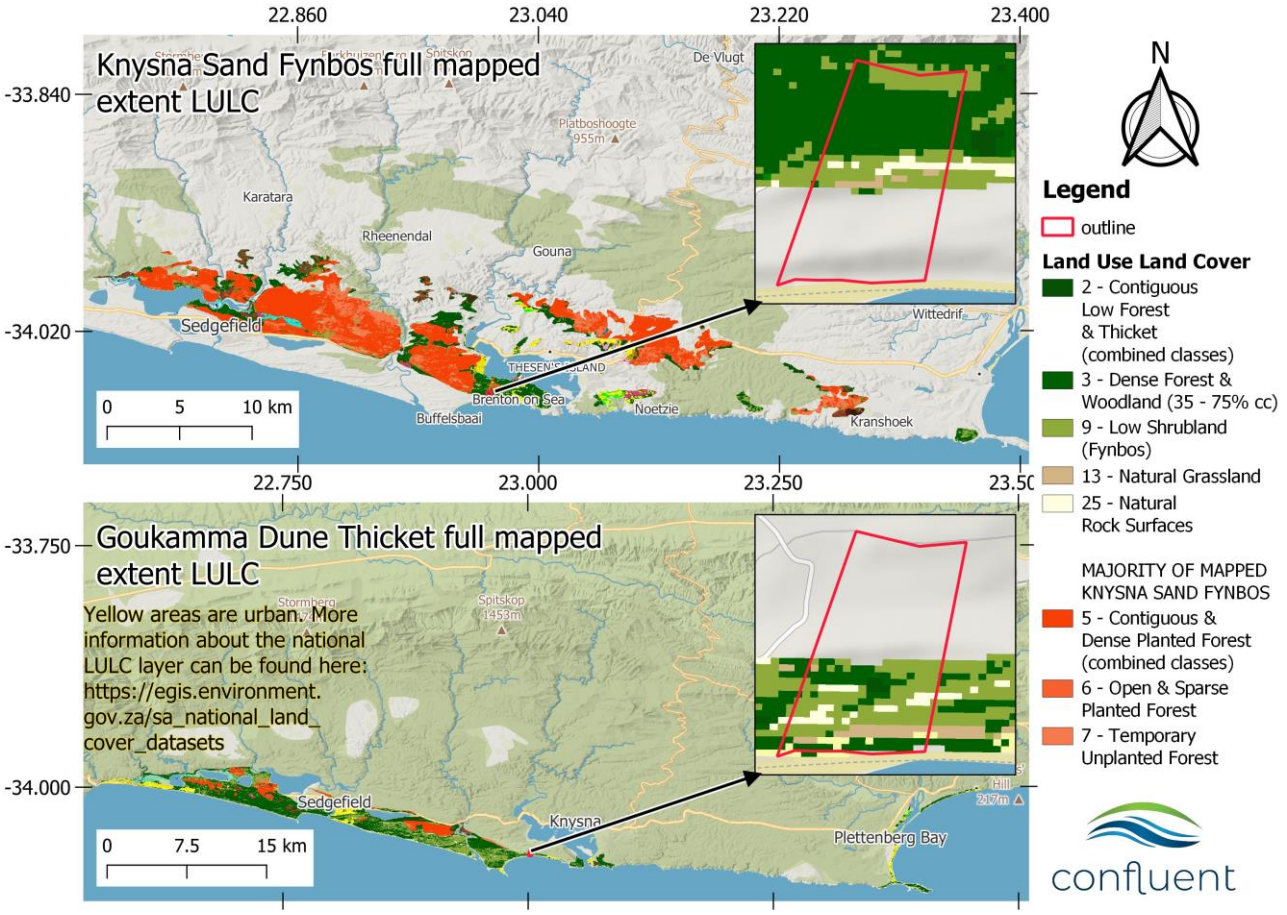


Figure 7: The extracted land use land cover (LULC) for the full extent of both of the mapped VEGMAP vegetation types on Portion 76/216.

4.1.3.1 Knysna Sand Fynbos (CR)

This is the mapped vegetation type for the northern half of the property.

Knysna Sand Fynbos (FFd 10) is found only in the Western Cape Province in the Garden Route. It is associated with coastal areas in the Wilderness area. The majority of this vegetation type was historically found around the Knysna lagoon, with some other patches eastward toward Plettenberg Bay. The landscape home to this vegetation is characterised by undulating gentle hills at 40-300m above sea level. Some of the important taxa associated with the vegetation type includes (blue entries mean the genus was present on the site and nearby, and green indicates species that were found on the site and nearby):

Small Trees: *Widdringtonia nodiflora*.

Tall Shrubs: *Cliffortia linearifolia*, *Leucadendron eucalyptifolium*, *Metalasia densa*, *Passerina corymbosa*.

Low Shrubs: *Anthospermum aethiopicum*, *Berzelia intermedia*, *Cliffortia drepanoides*, *Clutia rubricaulis*, *Erica diaphana*, *E. glandulosa* subsp. *fourcadei*, *E. glumiflora*, *E. sessiliflora*, *Helichrysum asperum* var. *asperum (*var. *glabrum* recorded for The property*)*, *Lachnaea diosmoides*, *Leucadendron salignum*, *Leucospermum cuneiforme*, *Lobelia coronopifolia*, *Morella quercifolia*, *Muraltia squarrosa*, *Oedera imbricata*, *Protea cynaroides*, *Stoebe plumosa*, *Tephrosia capensis*.

Herbs: *Geranium incanum*, *Helichrysum felinum*.

Graminoids: *Aristida junciformis* subsp. *galpinii*, *Brachiaria serrata*, *Cynodon dactylon*, *Eragrostis capensis*, *Ficinia bulbosa*, *Heteropogon contortus*, *Ischyrolepis eleocharis*, *Tetraria cuspidata*, *Thamnochortus cinereus*, *Themeda triandra*, *Tristachya leucothrix*.

4.1.3.2 Goukamma Dune Thicket (LT)

This is the mapped vegetation type for the southern half of the property.

This vegetation type is only found in the Western Cape along coastal areas in the Wilderness area. It follows a similar east-west extent to Knysna Sand Fynbos but covers a narrower area. It is associated with undulating coastal dunes and is composed of a mosaic of vegetation communities. Typically, thicket species are found in fire refugia, such as at the base of dunes, in landscape valleys, or sometimes dune crests. Between the thicket mosaic, a matrix low asteraceous fynbos can be found, with succulents making an appearance in more rocky and exposed areas. Some of the most important taxa associated with this vegetation type includes (blue entries mean the genus was present on the site and nearby, and green indicates species that were found on the site and nearby):

Small trees: *Pterocelastrus tricuspidatus, Schotia afra, Sideroxylon inerme, Tarchonanthus littoralis*

Tall tree: *Afrocarpus falcatus, Calodendrum capense, Celtis africana, Ekebergia capensis, Olea capensis, Searsia chirendensis*

Succulent shrub: *Carpobrotus acinaciformis, Cotyledon orbiculata, Crassula nudicaulis, Euphorbia muirii, Gasteria acinacifolia, Zygophyllum morgsana*

Low shrub: *Eriocephalus paniculatus, Felicia echinata, Helichrysum patulum, Indigofera erecta, Muraltia spinosa, Salvia africana-lutea, Muraltia knysnaensis, Selago burchellii*

Graminoid: *Restio eleocharis, Stenotaphrum secundatum, Thamnochortus insignis*

Tall Shrub: *Azima tetracantha, Carissa bispinosa, Mystroxylon aethiopicum, Cassine peragua, Cussonia thyrsiflora, Erica glandulosa subsp. fourcadei, Euclea racemosa, Grewia occidentalis, Gymnosporia capitata, Lauridia tetragona, Maytenus procumbens, Metalasia muricata, Morella cordifolia, Mystroxylon aethiopicum* subsp. *aethiopicum, Olea exasperata, Osteospermum moniliferum, Ptaeroxylon obliquum, Passerina rigida, Putterlickia pyracantha, Robsonodendron maritimum*, *Scutia myrtina, Searsia crenata, Searsia glauca, Searsia lucida, Searsia pterota, Zanthoxylum capense*

Herb: *Indigofera erecta*

Woody Succulent Climber: *Cynanchum viminale*

Herbaceous Climber: *Cynanchum ellipticum, Rhoicissus digitata, Solanum africanum*

4.1.4 Western Cape Biodiversity Spatial Plan

The Biodiversity Spatial Plan for the Western Cape (WC BSP) contains several conservation planning layers that are used to set priority areas for conserving biodiversity. The definition and objectives of the WC BSP layer mapped on Portion 76/216 is given in BOX 1. Appendix 11.2 illustrates the recommended land-uses associated with the various BSP layers. The entire Portion 76/216 is mapped as a terrestrial and CBA 1 (i.e., natural Critical Biodiversity Area; Fig. 8). The reasons for its assignment of the BSP layers in this area are listed below (grey reasons are outside of the scope of this study to comment on):

- **Coastal Resource Protection – Eden, Foredune, & Coastal Habitat Type**. The habitats and vegetation here are important to maintain our valuable coastline. The close proximity to the coast makes this site an important for maintaining healthy beach and dune systems that provide a variety of biodiversity and physical resources.
- **Critically Endangered (CR) Knysna Sand Fynbos**. This vegetation is mapped along the northern half of the property, covering ca. 11 ha of the remaining ca. 152 ha (i.e., about 7% of the remaining vegetation type).
- **Rondevlei Sandplain Fynbos (Vlok variant)**. This is the same as the Sedgefield Sandplain Fynbos that is mapped in Fig. 8.
- **Southern Cape Dune Fynbos**. This refers to the Goukamma Dune Thicket in the southern half of Portion 76/216.
- **Water source protection- Knysna & Watercourse protection- South Eastern Coastal Belt**. This BSP trigger falls outside of the scope of this study. Refer to the aquatic specialist study for comment.

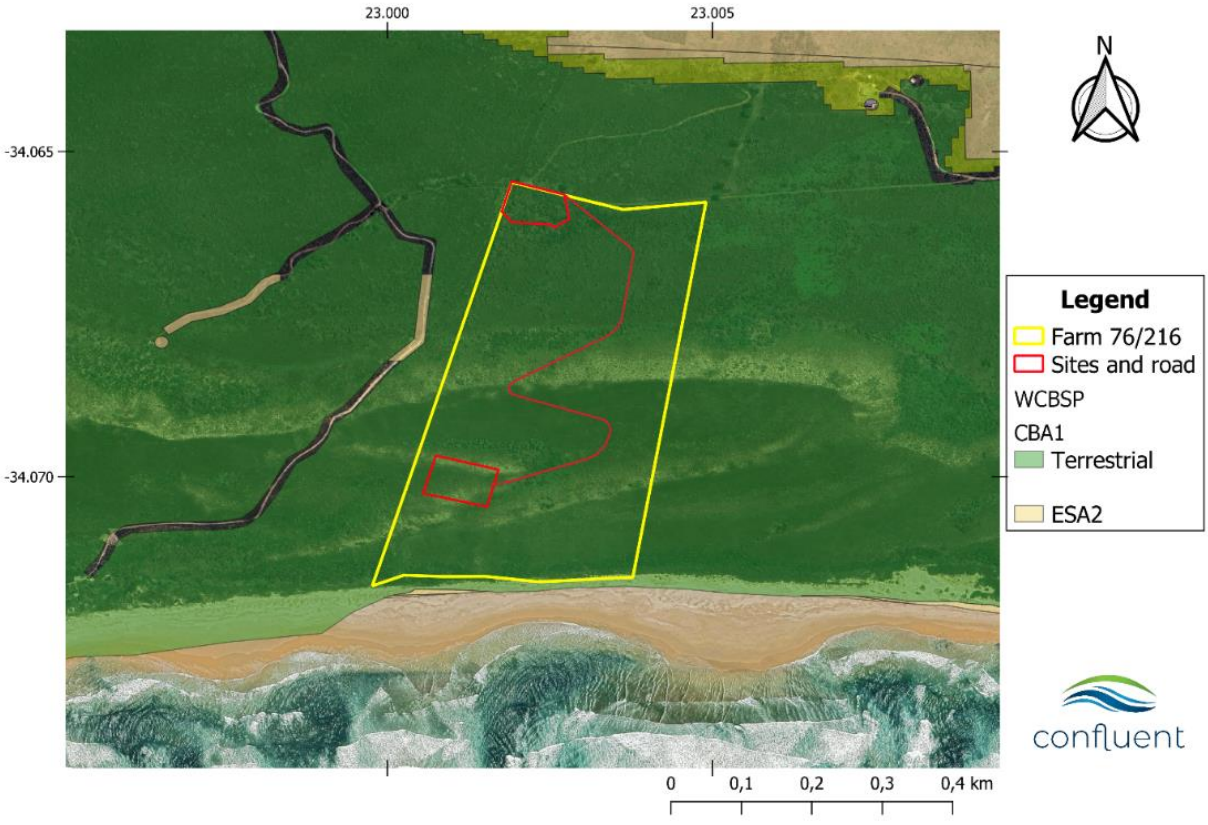


Figure 8: The mapped Western Cape Biodiversity Spatial Plan (WC BSP) categories that have been mapped for Portion 76/216 and adjacent surrounding landscape.

BOX 1: The Biodiversity Spatial Plan

Critical Biodiversity Area 1

Definition: Areas in a natural condition. Required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure.

Objective: Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.

4.1.5 Historical Aerial Imagery

A summary of the historical imagery illustrated in Fig. 9 is given below:

1936

In 1936, minimal disturbance is visible on Portion 76/216. The only strange feature in the landscape at this time are clumps / stands of darker woody vegetation visible on the north-facing dune slope that divides the site into the northern and southern sections.

1958

By 1958 more anthropogenic forestry expansion is seen in the wider landscape around Portion 76/216, however no forestry is visible on the property itself. The darker vegetation patches are still visible on the north facing dune slope. The section of land north of the property seems to be modified at this time too, with planted woody growth visible.

1973

More areas of land are being utilised as plantations west of the property, while urban densification is starting further east at Brenton on Sea. The planted section directly north of the property is also covered with a closed canopy alien forest at this time.

1989 - 1998

More disturbance from plantations, vegetation clearing, and from urban densification is observed in the landscape surrounding Portion 76 / 216, but the farm portion remains undisturbed. By 1998, however, it seems as if some of the woody invasive species (likely mostly *Pinus*) has spread into the north-western corner of the property. This invasive patch remains the most invaded spot on the property to this day.

2014

By 2014, some of the nearby plantations have been partially harvested, and the invasion on the property is still visible, especially in that north-western corner. This most invaded corner is indicated with the blue line in Fig. 9.

2017 onwards

In 2017, fires moved through the landscape (May-June), burning everything south of the large dune on the site, and also causing a reduction to the established invasive woody stand north of the property. A dotted line to indicate the burned area is indicated in Fig. 9. Some vegetation had recovered by February of 2018, but the fire path over the landscape is still visible at this time. The vegetation on the property had mostly recovered by 2019, and the space previously occupied by invasives north of the farm remained mostly open canopy and modified. The nearest plantation to the west of the property had also been cleared by 2019. In 2023 the

invasive patch in the north-western corner of the property remains problematic, and old plantation areas are also becoming increasingly invaded over time. Although the property was never directly affected by forestry, it is still very susceptible to ongoing plant invasions.

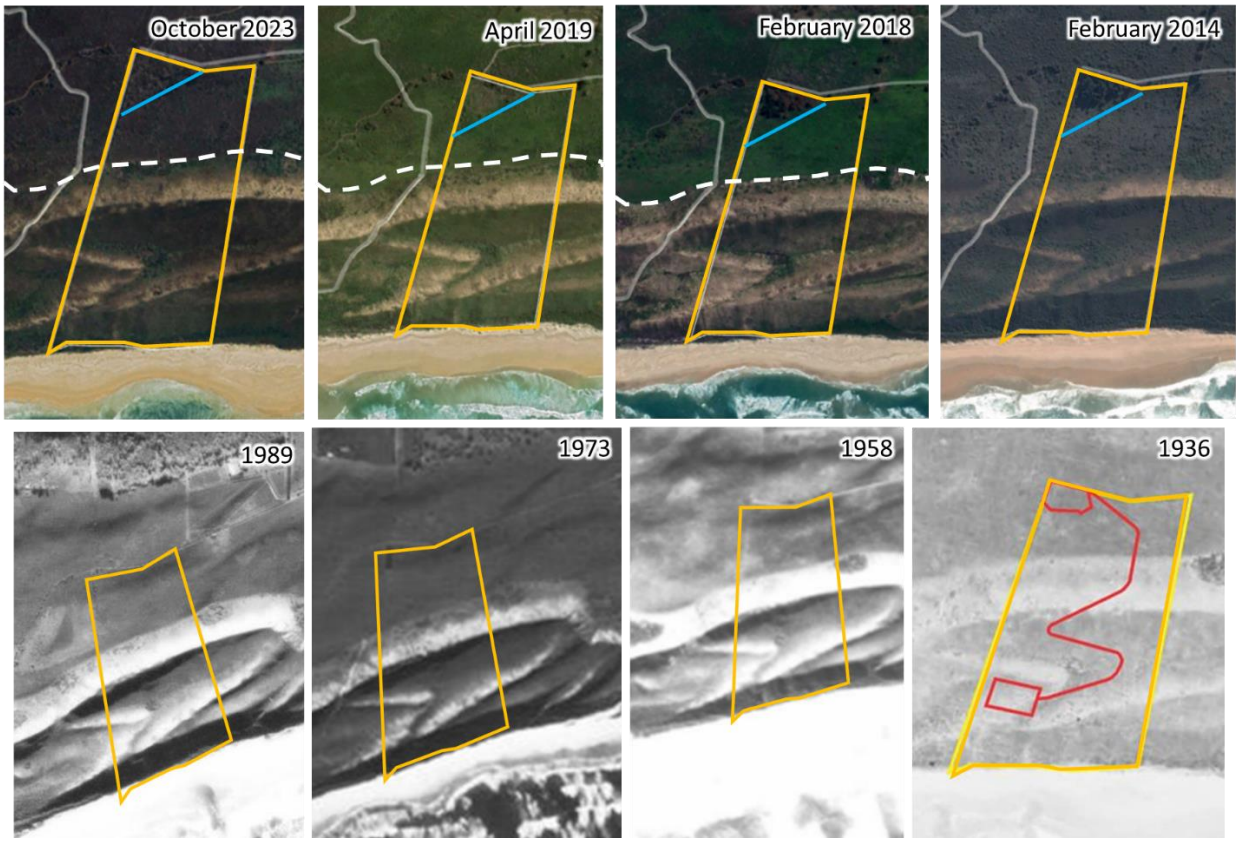


Figure 9: A series of historical imagery sourced from the CD: NGI geospatial portal (top row) and Google Earth (bottom row). The yellow polygons highlight the position of Portion 76/216.

4.2 Plant Species

The plant species theme sensitivity of Medium is dependent on the presence, or likely presence, of several plant species of conservation concern (SCC). The Red List categories are discussed later.

4.2.1 Species of Conservation Concern (SCC) Listed in the Screening Tool

Several SCC have the potential to occur on the site. The SCC listed in the screening tool report are illustrated in Fig. 10 below. The SCC that were confirmed and that are likely present on the site are discussed later in the report.

Sensitivity	Feature(s)
High	Erica glandulosa subsp. fourcadei
High	Sensitive species 1032
Medium	Lampranthus fergusoniae
Medium	Lampranthus pauciflorus
Medium	Ruschia duthiae
Medium	Lebeckia gracilis
Medium	Wahlenbergia polyantha
Medium	Selago burchellii
Medium	Selago villicaulis
Medium	Pentameris barbata subsp. orientalis
Medium	Sensitive species 419
Medium	Erica chloroloma
Medium	Erica glandulosa subsp. fourcadei
Medium	Hermannia lavandulifolia
Medium	Sensitive species 657
Medium	Sensitive species 1024
Medium	Sensitive species 1032
Medium	Agathosma muirii
Medium	Acmadenia alternifolia
Medium	Muraltia knysnaensis
Medium	Nanobubon hypogaeum
Medium	Sensitive species 800
Medium	Erica glumiflora
Medium	Sensitive species 500
Medium	Sensitive species 53
Medium	Sensitive species 763
Medium	Pterygodium cleistogamum

Figure 10: The listed SCC as triggered by the Screening Tool report for Portion 76/216.

5. RESULTS: FIELD ASSESSMENT

5.1 Refined vegetation map

A refined vegetation map for the property was made following the field assessment (Fig. 11). Vegetation on the north facing dune slopes were distinct from the vegetation on the south facing slopes. For example, sensitive species 1032 and *Brunsvigia orientalis* thrived on the south facing slopes but was nearly absent on the north facing slopes. The valleys between dunes were dominated by *Euclea racemosa*, *Olea exasperata*, and in some places also by *Tarchonanthus littoralis* and *Cassine peragua peragua*. Sadly, large sections of the valley thicket was also badly invaded with large Rooikrans (*Acacia cyclops*) stands. North of the last dune on the site, a relatively high plant species turnover was observed, indicating a shift toward a different vegetation type. The northern section of the property was more invaded by pine trees than the southern half of the site south of the large dune. The Pine tree (*Pinus pinaster*) invasion was worst in the north-western corner, which is consistent with observations from the historical imagery for the site (see the imagery of the site in Table 2).

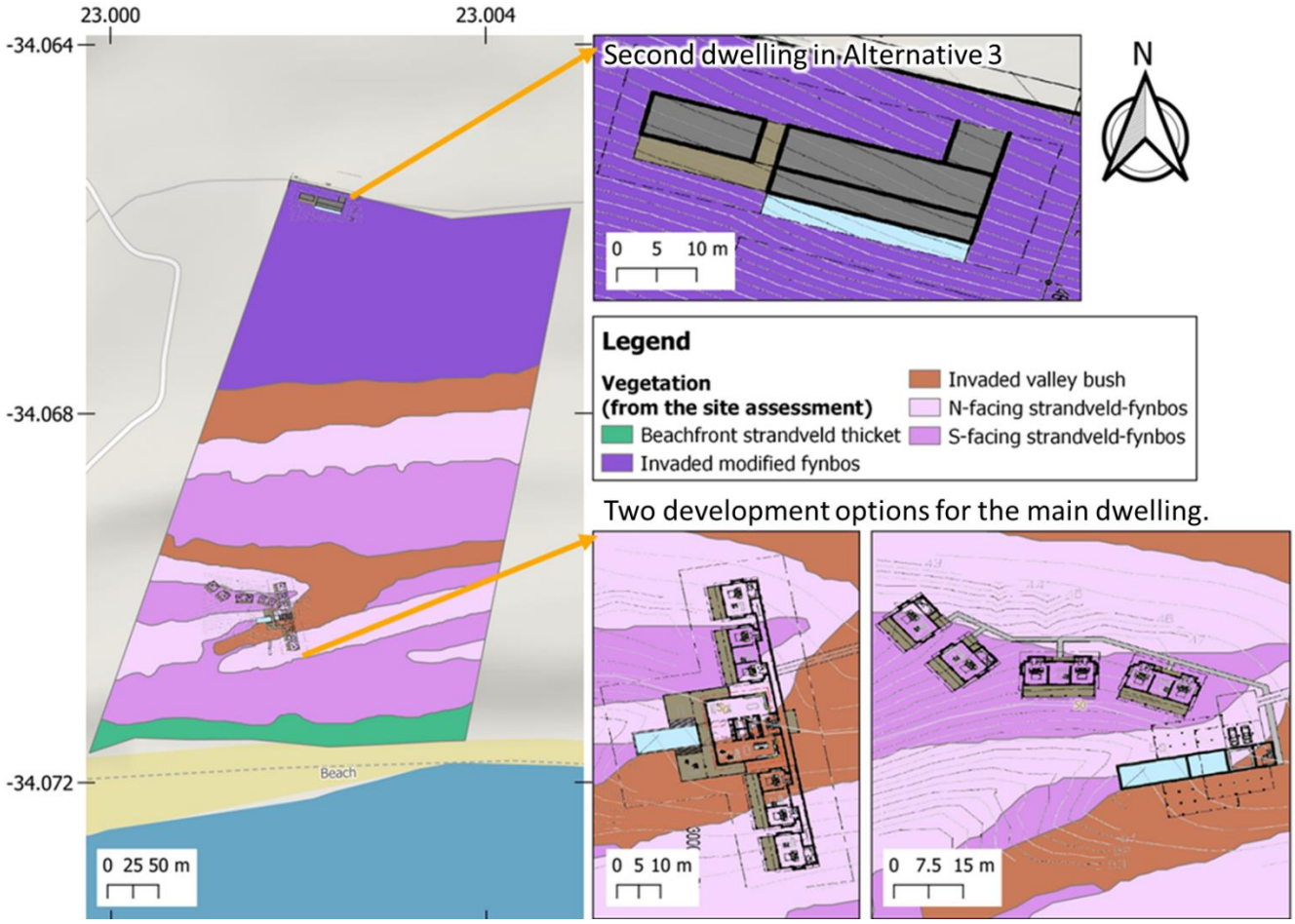


Figure 11: A revised vegetation map for the entire Portion 76/216 with the proposed site development plans for the dwellings provided by the architects overlaid. Note that no access road is indicated due to the differences indicated in the various alternative development options.

Table 2: Images taken of the landscape during the site assessment on Portion 76 / 216

Photo	GPS location	Vegetation & Notes
	-34.06915 S 22. 99912 E 5m accuracy	Existing gravel road in strandveld-fynbos. The road is well maintained, and the roadsides are natural, with minimal observed edge effects.
	-34.06921 S 22.99872 E 4m accuracy	Visible here is “Invaded valley bush”, “N-facing strandveld-fynbos”, and “S-facing strandveld-fynbos”. A view of the southern section of the property. It is clear that the majority of the site here is uninvaded and in a pristine state, apart from the valleys that contain Rooikrans.
	-34.06978 S 23.00062 E 5m accuracy	Visible here is “Invaded valley bush” in the middle of the photo, “N-facing strandveld-fynbos” along the bottom of the photo, and “S-facing strandveld-fynbos” in the top half of the photo. The valley vegetation is distinct from the surrounding fynbos on the dune slopes.
	-34.07024 S 23.00169 E 4m accuracy	Visible here is “Invaded valley bush” (middle of the photo), “N-facing strandveld-fynbos” (bottom of the photo), and “S-facing strandveld-fynbos” (top half) Another perspective showing the valley thicket within the fynbos mosaic

	-34.07072 S 23.00159 E 6m accuracy	Visible here is “N-facing strandveld-fynbos” A view of the foredune and ocean. The foredune is very steep.
	-34.07072 S 23.00195 E 4m accuracy Ca. 101m elevation	Dune top thicket & fynbos / strandveld A little section of thicket at the very top of the foredune.
	-34.06869 S 23.00201 E 5m accuracy Ca. 106m elevation	Visible here is “Invaded valley bush” (middle of the photo), “N-facing strandveld-fynbos” (top of the photo, below the ocean), and “S-facing strandveld-fynbos” (bottom half of photo). The N-facing slopes are more sparsely vegetated than the south facing slopes. *Brunsvigia orientalis* and *Satyrium princeps* were not found on north facing slopes but were very common on south facing slopes.
	-34.06842 S 23.00189 E 5m accuracy Ca. 94m elevation	Visible here is “N-facing strandveld-fynbos” along the right side of the photo, and “Invaded modified fynbos” along the left side of the photo The last steeps dune system is depicted in this photo. After this dune there was high species turnover, suggesting a different vegetation type.

	Drone image -34.065536 S 23.002616 E Ca. 137m elevation	Visible here is “N-facing strandveld-fynbos” along the top of the photo, “Invaded valley bush”, and “Invaded modified fynbos” along the south of the photo This drone image illustrates the northern half of the property. The valley before the dune in the top of the photo has a substantial Rooikrans invasion, and the invaded fynbos has a high density of Pine trees.
	-34.06575 S 23.0022 E 6m accuracy Ca. 106m elevation	Visible here is “Invaded modified fynbos” This represents a section of densely invaded vegetation dominated by *Pinus pinaster*. Some pine clearing was observed in the **north-western section of** the property, but the invasion is still dominant.
	Drone image -34.065534 S 23.002616 E Ca. 137m elevation.	Visible here is “Invaded modified fynbos” An aerial photo showing that although some sections of the north-western part of the site is badly invaded with pines, some sections of secondary fynbos is returning in-between in cleared and remaining open areas.

5.2 Species of Conservation Concern

The property is a near natural site with minimal past disturbance. Several SCC were observed on the property during the site assessment, as well as before the assessment by various members of CREW (the Custodians for Rare and Endangered Wildflowers). The parasitic cats nail’s (*Hyobanche sp*.) plant on the site could possibly be the EN species, namely *Hyobanche robusta*, however it is also likely a LC species *H. sanguinea*. The precautionary principle must be followed, assuming that the species on the site is the Red Listed EN *H. robusta*. Of all of the species listed in Fig. 12, the following were observed nearby but not within the development footprint (see the upcoming section on probability of occurrence): *Gladiolus vaginatus*, *Lebeckia gracilis*, and *Oxalis pendulifolia*.

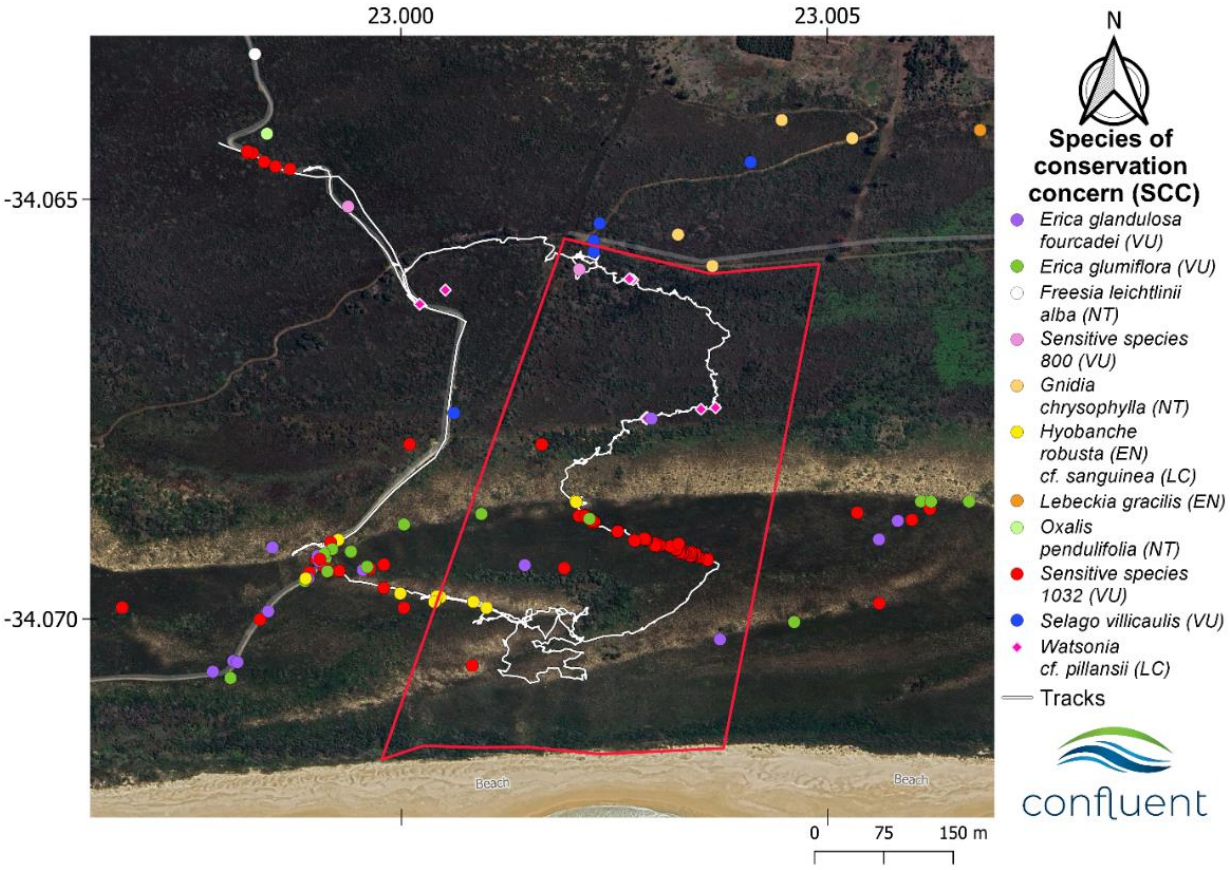


Figure 12: A map showing iNaturalist observations made of the various SCC on Melkhoutefontein during the site assessment late in September of 2023.

Some of the SCC, excluding the sensitive species observed, are also illustrated in Figure 13 below. Species that do not have a photo author name associated with the photo were taken by the author of this report. *Watsonia pillansii* is also illustrated, as this species was largely found along the base of the north facing section of the northernmost dune on the site.

Figure 13: Photos of the species of conservation concern that were observed within the proposed development footprint and in the nearby surrounding vegetation within the same vegetation types. *Watsonia pillansii* was observed at the base of the northernmost dune on the site.

5.3 Alien and invasive plant species

The invasive and naturalised exotic plant species that were found on Portion 76/216 are listed in the full species list for the site in Appendix 11.1. The southern section of the site contained high densities of *Acacia cyclops* (Rooikrans) only in the valleys between dunes, while the surrounding vegetation on both south and north facing dune slopes was natural and uninvaded, save for the occasional pine tree. The northern half of the site above the large dune was different and more invaded from the vegetation to the south. The most abundant invasive species observed in the northern half of the site was *Pinus pinaster*. A large stand of *Corymbia ficifolia* was observed to the west of Portion 76/216, however this species was not observed within the proposed development footprint on the site. Several exotic weeds, as well as blackwood wattle (*Acacia melanoxylon*), black wattle (*Acacia mearnsii*), and oak trees (*Quercus robur*) were not observed on Portion 76/216 during the site assessment, but they are present in landscapes adjacent to the property, and it is therefore important to ensure that they do not spread and establish here. BOX 2 below briefly summarises the different NEMBA categories for invasive species on the site and those observed in the surrounding landscape, as listed in Appendix 11.1.

BOX 2: NEMBA categories for listed invasive alien plants.

Category 1b

- Species which must be controlled.
- Property owners and organs of state must control the listed invasive species within their properties.
- If an Invasive Species Management Programme has been developed, a person must control the listed invasive species in accordance with such programme.
- Authorised officials must be permitted to enter properties to monitor, assist with or implement the control of listed species.
- Any Category 2 listed species (where permits are applicable) which fall outside of containment and control, revert to Category 1b and must be controlled.
- Any Category 3 listed species which occur within a Protected Area or Riparian (wetland) revert to Category 1b and must be controlled.
- The Minister may require any person to develop a Category 1b Control Plan for one or more Category 1b species occurring on a property.

Category 2

Requires a permit issued by the Department of Forestry, Fisheries and the Environment (DFFE) to carry out a restricted activity (See Permit Applications.)

- A person in control of a Category 2 listed species must take all necessary measures to ensure that specimens of the species do not spread outside of the land or area, such as an aviary) specified in the permit.
- A permit is required to carry out any restricted activity.
- No person may carry out a restricted activity in respect of a Category 2 listed invasive species without a permit.
- A person in control of a Category 2 listed species must take all necessary measures to ensure that specimens of the species do not spread outside of the land or area, such as an aviary) specified in the permit.

5.4 Additional SCC that may be found

All SCC that may be present on the site have been identified using the screening tool report for the site, iNaturalist nearby observations, and the POSA database (Table 3). It is always possible that a species assessed as having a low probability of occurrence (meaning the habitat seems unsuitable for the species to occur there) can still occur on the site, and therefore the list of species in Table 3 below must only be used as a guideline only. The IUCN Red List reasons for different Red List categories are presented in Appendix 11.3.

Table 3: Plant SCC probability of occurrence within the disturbance footprints on the property.

Species	Common name	Family	SANBI Red List status	Probability of occurrence
Erica glandulosa subsp. fourcadei	Ridges glandular heath	Ericaceae	Vulnerable B1ab(ii,iii,iv,v)	**Confirmed** This species was found on the site, and is relatively abundant south of the large dune. It was more common on south facing slopes.
Erica glumiflora	Gloomy heath	Ericaceae	Vulnerable B1ab(i,ii,iii,iv,v)	**Confirmed** This species was found on the site, especially in the dune system nearer to the coast
Gnidia chrysophylla	Gold capesaffron	Thymelaeaceae	Near Threatened B1ab(i,ii,iii,iv,v)	**Confirmed** This species was found in the northern half of the site, i.e., above the last large dune.
Selago villicaulis	Dune bitterbush	Scrophulariaceae	Vulnerable B1ab(ii,iii,iv,v)	**Confirmed** This species was found in the northern half of the site, i.e., above the last large dune.
Sensitive species 1032	-	Orchidaceae	Vulnerable C2a(i)	**Confirmed** This species was found in high densities along south facing dune slopes.
Sensitive species 800	-	Iridaceae	Vulnerable B1ab(iii)	**Confirmed** This species was found
Hyobanche robusta	Cat's nails plant	Orobanchaceae	Endangered B1ab(ii,iii,v)	**Likely confirmed.** The species observed was given a preliminary ID of *H. sanguinea*, but it could be *H. robusta.* This genus is currently undergoing a revision.
Freesia leichtlinii	Dune kammetjie	Iridaceae	Near Threatened B1ab(ii,iii,iv,v)	**Very High** Found nearby in the recent past
Sensitive species 1081	-	Iridaceae	Endangered B1ab(i,ii,iii,iv,v)	**Very High** Found nearby in the recent past
Lebeckia gracilis	Slender ganna	Fabaceae	Endangered A2bc; B1ab(ii,iii,iv,v)	**Very High** Found nearby in the recent past
Acmadenia alternifolia	Harkerville porcelainflower	Rutaceae	Vulnerable B1ab(ii,iii,iv)+2 ab(ii,iii,iv)	**High** Following the precautionary approach, it is likely that this species could be present
Disa procera	Orchid species	Orchidaceae	Endangered B2ab(i,ii,iii,iv,v) ; C2a(i); D	**High** Following the precautionary approach, it is likely that this species could be present
Erica chloroloma	Greensepal heath	Ericaceae	Vulnerable B1ab(ii,iii,iv,v)+ 2ab(ii,iii,iv,v)	**High** Following the precautionary approach, it is likely that this species could be present

Hermannia lavandulifolia	Lavender dollrose	Malvaceae	Vulnerable A2c	**High** Following the precautionary approach, it is likely that this species could be present
Lampranthus pauciflorus	Beach brightfig	Aizoaceae	Endangered B1ab(ii,iii,iv,v)	**High** Following the precautionary approach, it is likely that this species could be present
Muraltia knysnaensis	Knysna butterflybush	Polygalaceae	Endangered B1ab(ii,iii,iv,v)	**High** Following the precautionary approach, it is likely that this species could be present
Nanobubon hypogaeum	Rubber-root firecarrot	Apiaceae	Endangered B1ab(i,ii,iii,iv,v)	**High** Following the precautionary approach, it is likely that this species could be present
Oxalis pendulifolia	Hangleaf sorrel	Oxalidaceae	Near Threatened B1ab(ii,iii,iv,v)+ 2ab(ii,iii,iv,v)	**High** Following the precautionary approach, it is likely that this species could be present
Pterygodium cleistogamum	Blind bonnet	Orchidaceae	Vulnerable B1ab(ii,iii)	**High** Following the precautionary approach, it is likely that this species could be present
Ruschia duthiae	Tentfigs	Aizoaceae	Vulnerable B1ab(ii,iii,iv,v)+ 2ab(ii,iii,iv,v)	**High** Following the precautionary approach, it is likely that this species could be present
Selago burchellii	Garden Route tentfig	Scrophulariaceae	Vulnerable B1ab(ii,iii,iv,v)	**High** Following the precautionary approach, it is likely that this species could be present
Sensitive species 1024	-	Orchidaceae	Endangered B1ab(iii,v)+2ab (iii,v); C2a(ii)	**High** Following the precautionary approach, it is likely that this species could be present
Sensitive species 419	-	Dioscoraceae	Vulnerable B1ab(iii,v)+2ab (iii,v)	**High** Following the precautionary approach, it is likely that this species could be present
Sensitive species 500	-	Orchidaceae	Endangered C2a(i)	**High** Following the precautionary approach, it is likely that this species could be present
Sensitive species 763	-	Orchidaceae	Vulnerable A2c	**High** Following the precautionary approach, it is likely that this species could be present
Wahlenbergia polyantha	Capebells	Campanulaceae	Vulnerable B1ab(ii,iii,iv,v)	**High** Following the precautionary approach, it is likely that this species could be present
Agathosma muirii	Heart buchu	Rutaceae	Vulnerable A4abc	**Medium** It is conceivable that this species may be present on the site.

Lampranthus fergusoniae	Limestone brightfig	Aizoaceae	Vulnerable B1ab(ii,iii,iv,v)	**Medium** It is conceivable that this species may be present on the site.
Leucadendron conicum	Garden Route Conebush	Proteaceae	Near Threatened A4c	**Medium** It is conceivable that this species may be present on the site.
Leucospermum glabrum	Outeniqua pincushion	Proteaceae		**Medium** It is conceivable that this species may be present on the site.
Merwilla plumbea	Blue squill	Hyacinthaceae	Near Threatened A2bd	**Medium** It is conceivable that this species may be present on the site.
Pentameris barbata subsp. orientalis	Grass	Poaceae	Critically Endangered B1ab(i,ii,iii,iv,v) +2ab(i,ii,iii,iv,v) ; D	**Medium** It is conceivable that this species may be present on the site.
Protea susannae	Stink-leaf sugarbush	Proteaceae	Near Threatened A2c+3c+4c	**Medium** It is conceivable that this species may be present on the site.
Selago ramosissima	Bitterbushes	Scrophulariaceae	Endangered B1ab(iii)	**Medium** It is conceivable that this species may be present on the site.
Sensitive species 53	-	Orchidaceae	Vulnerable B2ab(ii,iii,iv,v)	**Medium** It is conceivable that this species may be present on the site.
Sensitive species 657	-	Amaryllidaceae	Endangered B2ab(iii,v)	**Medium** It is conceivable that this species may be present on the site.
Watsonia aletroides	Renoster watsonia	Iridaceae	Near Threatened A2cb	**Medium** It is conceivable that this species may be present on the site.
Curtisia dentata	Assegai tree	Curtisiaceae	Near Threatened A2d	**Low** Habitat requirements not met.
Dioscorea mundii	Elephantsfoot species	Dioscoreaceae	Near Threatened B1ab(ii,iii,iv,v)	**Low** Habitat requirements not met.
Dioscorea sylvatica	Forest Elephantsfoot	Dioscoreaceae	Vulnerable A2cd	**Low** Habitat requirements not met.
Limonium linifolium	Line leaf Sea lavender	Plumbaginaceae	Near Threatened B2b(ii,iii)	**Low** Habitat requirements not met.
Ocotea bullata	Stinkwood	Lauraceae	Protected tree 118; Endangered A2bd	**Low** Habitat requirements not met.
Agathosma acutissima	Buchu species	Rutaceae	Vulnerable D2	**Very Low** This species is not found nearby.
Watsonia borbonica	Bugle lily	Iridaceae	Endangered B1ab(ii,iii,iv)+2ab(ii,iii,iv)	**Very Low** This species is not found nearby.

6. SITE SENSITIVITY VERIFICATION

6.1 Terrestrial Biodiversity

The sensitivity of the terrestrial biodiversity theme for the site is confirmed as **Very High** as the site contains a significant area of remaining natural vegetation of a CR vegetation type (Knysna Sand Fynbos) north of the large barrier dune on the site, which is threatened by invasive plants, especially pines. The southern section of the site is also sensitive habitat, characterised by a strandveld-fynbos mosaic with thicket patches in fire refugia on the site (i.e., the base of dunes, and some sections on the dune crests). Furthermore, the whole site is a CBA1, and forms part of an area that served an important corridor function along the coastline.

6.2 Botanical Diversity

The site sensitivity in terms of the terrestrial plant species theme is confirmed as **High**, as the site is home to several SCC, and there is some spatial heterogeneity over the site in terms of the distribution of the SCC found.

7. SITE ECOLOGICAL IMPORTANCE

The site ecological importance (SEI) assessment is a function of biodiversity importance (BI) and receptor resilience (RR), which is defined as:

"The intrinsic capacity of the receptor (i.e., habitat type in question) to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention."

The function is as follows: SEI = BI + RR. BI is a function of conservation importance (CI) and habitat functional integrity (FI), so that BI = CI + FI. The definition of CI given by the Species Environmental Assessment Guideline of 2022 is:

"The importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes."

Most features included in CI are provided by the screening tool but needs to be evaluated at a finer scale from the field work assessment. FI is defined as:

"A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts."

The criteria for defining RR, CI and FI are provided in the Species Environmental Assessment Guidelines of 2022. BI can be derived from a simple matrix of CI and FI, as illustrated in Table 4 below.

Table 4: The matrix that defines the biodiversity importance (BI) of a given habitat type, as identified from a desktop and field assessment.

Biodiversity Importance		**Conservation Importance**				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

SEI can then be derived from a second matrix, as depicted in Table 5. SEI is specific to the proposed development and can therefore only be compared between alternative layouts for the same proposed development, but not between developments.

Table 5: The matrix that defines the site ecological importance (SEI) of a given habitat type, as identified from a desktop and field assessment.

Site Ecological Importance		Biodiversity Importance				
		Very High	High	Medium	Low	Very Low
Receptor Resilience	Very High	Very High	Very High	High	Medium	Low
	High	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	Low	High	Medium	Low	Very Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

The overall SEI score is intended to provide a more refined overview of the sensitivity of the various habitats that have been identified on the site. The benchmark for "fully natural" vegetation is defined according to the Vegetation Assets, States, and Transitions (VAST) framework, which considers natural vegetation to be the state pre-European conditions (i.e., period prior to the 1700s or 1600s). The habitats and ecosystems of the property are therefore defined according to the VAST framework, which acts as an aid for the SEI calculation, especially in determining the appropriate RR to assign. The VAST framework categories are summarised in Appendix 4 below, and is an aid for the SEI calculation as it helps to (Thackway & Lesslie, 2006):

- Describe and accounts for changes in the condition and status of vegetation.
- Make explicit links between land management (current) and vegetation modification.
- Provide a mechanism for describing the consequences of certain land management on vegetation.
- Contribute to the analysis of terrestrial ecosystem services that are provided by vegetation, including comparison between various land-use

The SEI map that was produced for Portion 76/216 reflects the sensitivity of the site (Fig. 14). The reasoning behind the map is provided in Table 6.

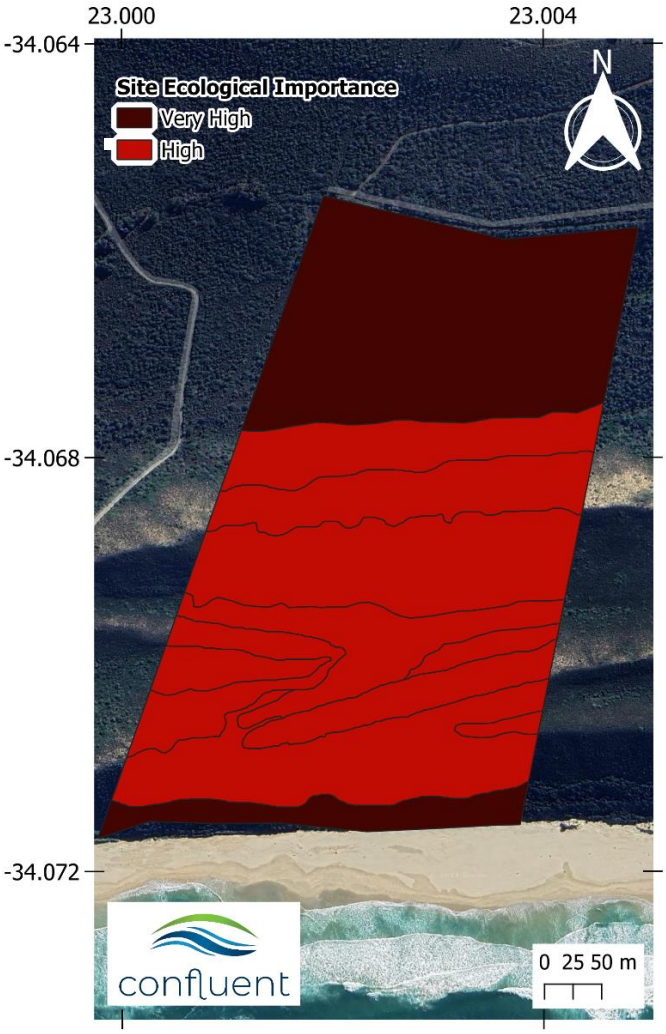


Figure 14: The SEI map for Portion 76/216.

Table 6: The evaluation of the SEI for the vegetation / habitats present within and surrounding the proposed development.

Land use / Land cover	Conservation Importance (CI)	Functional Integrity (FI)	Receptor Resilience (RR)	Site Ecological Importance (SEI)
Beachfront Strandveld Thicket (includes the Western Heads classification for "Fore Dune" & "Primary Dune Cliff Vegetation")	**High** Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2, and that are not listed under criterion A.	**Very High** High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.	**Medium** VAST class I Habitat that could recover over a long period (more than 10 years) to restore about 75% of the species composition and functionality of the ecosystem.	**Very High** BI: Very High RR: Medium

Invaded modified fynbos (includes the Western Heads classification for "Moist Dune Thicket". This is also the section flagged as CR Knysna Sand Fynbos)	**Very High** Any area of natural habitat of a CR ecosystem type.	**High** Only minor current negative ecological impacts and good rehabilitation potential.	**Medium** VAST class II to III Habitat that could recover over a long period (more than 10 years) to restore about 75% of the species composition and functionality of the ecosystem.	**Very High** BI: Very High RR: Medium
Invaded valley bush / thicket (includes the Western Heads classification for "Goukamma Dune Thicket")	**High** Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2, and that are not listed under criterion A.	**High** Only minor current negative ecological impacts and good rehabilitation potential.	**Medium** VAST class II Habitat that could recover over a long period (more than 10 years) to restore about 75% of the species composition and functionality of the ecosystem.	**High** BI: High RR: Medium
North facing strandveld – fynbos (includes the Western Heads classification for "Arid Dune Fynbos")	**High** Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2, and that are not listed under criterion A.	**High** Only minor current negative ecological impacts (sparse presence of invasive species) and good rehabilitation potential.	**Medium** VAST class I to II Habitat that could recover over a long period (more than 10 years) to restore about 75% of the species composition and functionality of the ecosystem.	**High** BI: High RR: Medium
South facing strandveld – fynbos (Includes the Western Heads classifications for "Primary Dune Slack" & "Brenton Dune Fynbos Vegetation")	**High** Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2, and that are not listed under criterion A.	**High** Only minor current negative ecological impacts and good rehabilitation potential.	**Medium** VAST class I to II Habitat that could recover over a long period (more than 10 years) to restore about 75% of the species composition and functionality of the ecosystem.	**High** BI: High RR: Medium

8. PROJECT AREA OF INFLUENCE

The Project Area of Influence (PAOI) is defined according to ecosystem services and processes that are likely to be affected by the proposed development on Portion 76 of 216. The PAOI calculation is first calculated by the Environmental Assessment Practitioner (EAP), and then independently also worked out by the specialists that have been appointed. Specialist defined PAOIs are then consolidated by the EAP after these first two steps in the process of identifying its area. The PAOI is larger than the site development plan (SDP), as the SDP only indicates the direct disturbance footprint of the proposed project. The PAOI, In this case, was defined using two principles. The first principle was allowing for an additional 2m disturbance envelope around all proposed roads and dwellings, as per the three alternative layouts (Fig. 15). The second principle was mostly applied to the second layout of the main dwelling in Alternative three, where small edges in the buffered area was made slightly more smooth, in order to account for edge effects more accurately.

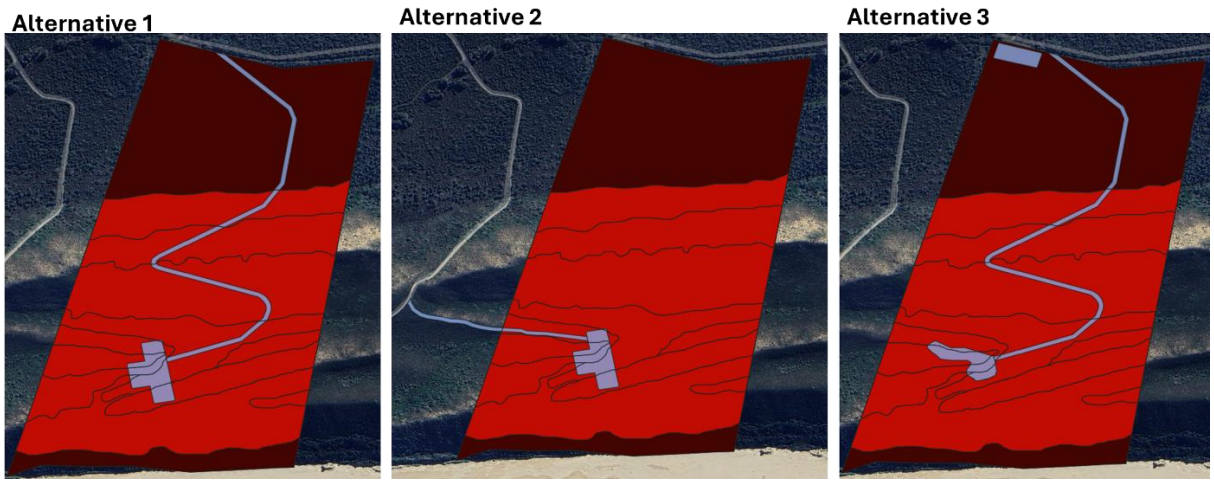


Figure 15: The three proposed alternative development options for Portion 76/216.

The area calculations for each of the vegetation categories presented in this report are in Table 7 below. This illustrates the amount of area the proposed development will cover in square meters (sqm), as well as the % of vegetation in relation to the property that will be lost due to the development. The total area of Portion 76/216 used was ca. 21 ha. The total area that Alternative one will cover with its defined PAOI here is 8842 sqm, which is about 4.21% of the entire property. For Alternative two the total PAOI is 5177 sqm, which is about 2.46% of the property. Alternative three will have a PAOI of about 9229 sqm, which is about 4.4% of the area of Portion 76/216. The second dwelling, which is proposed in the most invaded, albeit most sensitive habitat, is located very close to an existing servitude, and if assessed in isolation will have a PAOI of 1463 sqm, which is ca. 0.7% of the property's total area. The area occupied by the second dwelling in Alternative option three is therefore assessed as the fourth alternative, due to the smaller footprint size in relation to the other three alternative options being assessed.

Table 7: An area calculation table for the different parts of the defined PAOI as it relates to the vegetation units identified.

Habitat	Invaded Valley Bush	North-facing Strandveld-Fynbos	South-facing Strandveld-Fynbos	Invaded Modified Fynbos (Knysna Sand Fynbos)	Total
SEI	High	High	High	Very High	NA
Main Dwelling					
Alternative 1 (sqm)	1119	1933	561	0	3613
% of Property	0.533	0.920	0.267	0	1.720
Alternative 2 (sqm)	1119	1933	561	0	3613
% of Property	0.533	0.920	0.267	0	1.720
Alternative 3 (sqm)	440	797	1262	0	2499
% of Property	0.209	0.379	0.601	0	1.189
Road					
Alternative 1 (sqm)	1560	718	1302	1649	5229
% of Property	0.742	0.342	0.620	0.785	2.489
Alternative 2 short road(sqm)	0	691	0	0	691
% of Property	0	0.329	0	0	0.329
Alternative 2 short road section west of property (sqm)	0	873	0	0	873
% of Property	0	0.415	0	0	0.415
Alternative 3 (sqm)	1558	753	1307	1649	5267
% of Property	0.741	0.358	0.622	0.785	2.507
Second Dwelling					
Alternative 3 & 4 (sqm)	0	0	0	1463	1463
% of Property	0	0	0	0.696	0.696

9. IMPACT ASSESSMENT

The impact assessment of Portion 76/216 is required due to the high sensitivity and SEI that was calculated for both the Terrestrial Biodiversity, and Plant Species Themes assessed in this report. For any impact assessment, the mitigation hierarchy is important (Brownlie et al., 2023; Ekstrom et al., 2015). If mitigation measures are likely to be ineffective at minimising large impacts, then avoidance mitigation must be implemented (Fig. 16). If an impact cannot be prevented, then minimisation is preferred. The methods used for this impact assessment is provided in Appendix 11.5.

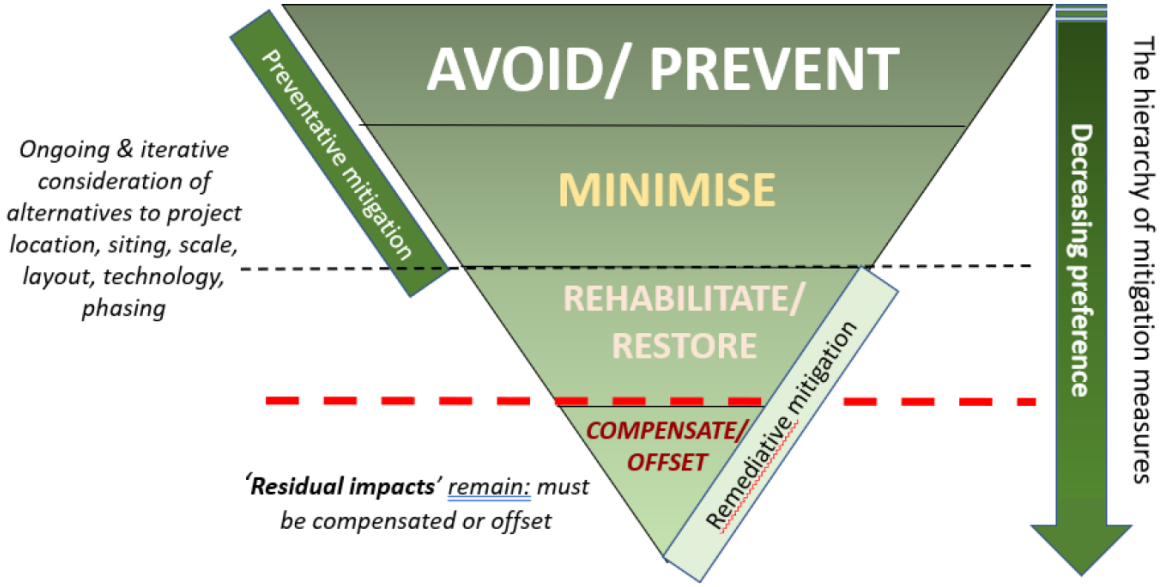


Figure 16: The mitigation hierarchy as presented in (Brownlie et al., 2023). Mitigation steps are illustrated in a hierarchy. The lower steps in the diagram should only be considered once the steps above have been duly considered.

It was also revealed, after the completion of the SSV report, that a vegetation assessment, including a botanical impact assessment for the site had been completed some seven years prior to this report (Ebersohn, 2017). The impact assessment presented there differs from the impact assessment presented in the original botanical report. The original botanical report did not present the same methods as this report to come up with the impact significance and to differentiate between pre- and post-mitigation measures. A new impact assessment is provided in this report.

9.1 Current Impacts

A summary of some of the negative impacts on the site are:

- There currently exists large stands of Rooikrans (*Acacia cyclops*) in the valleys and bases of dunes.
- The northern half of the property is also invaded by several invasive species, especially *Pinus radiata*.
- The existing roads north and east of the farm portion have an effect on habitat connectivity and the risk of introducing invasive plant species on the site.
- It is likely that more development in the surrounding landscape is causing increased fire suppression in the wider landscape in an ecosystem that requires fire to maintain its function and biodiversity. The Knysna fires of 2017 represents the last major fire here, and this means the fynbos here would technically require another burn around the year 2030. It seems unlikely that planned controlled burns & fire management will be undertaken unless it becomes a condition in the environmental authorisation (EA).

9.2 Layout and Design Phase

This is an important part of any project and relates to the very first step in the mitigation hierarchy – consideration for impact avoidance. This phase includes steps such as site analysis, land-use planning, infrastructure & layout planning, impact assessments, stakeholder engagement, and the integration of feedback.

9.2.1 Layout & Design Impact 1 – Fragmentation of habitats & plant populations

Description: Fragmentation of a wider connected heterogeneous landscape with a unique set of ecosystems & high biodiversity value due to the planning for permanent structures over the site during the planning & layout phase. Planning is important to avoid barrier effects and negative alterations to a critical biodiversity area (CBA 1). Fragmentation of the landscape has already started due to existing invasive plants spreading across the wider landscape, roads that have already been built on adjacent properties etc. However, the landscape is still relatively free from other effects, like fences, gardens, and domesticated animals.

Mitigation:

1. Planning (considerations of the alternatives are important here): The most important mitigation measure for Portion 76/216 is a strategic placement of the dwelling.
    a. The aim should be to minimise the disturbance footprint and to
    b. keep the perimeter to area ratio as small as possible for the proposed dwelling/s.
    c. The selection of the site should consider past disturbances on the site.
    d. The selection of the development site must take fire risk into consideration.
        i. Identify fire hazards (Esler et al., 2014), such as the presence of invasive flora. Contact a fire chief nearby to find out about or establish a fire risk assessment for the property & surrounding landscape. The development must not reduce the ability of fynbos to burn in the future.
        ii. This should also assist in informing the location of the proposed dwelling/s. Do not build on a hilltop, plan for development on flat areas (Esler et al., 2014)
        iii. Wherever possible, plan buildings away from pristine veld. Despite the best management intentions, dwellings in pristine veld will cause habitat fragmentation.
2. A background process throughout the project lifetime: Establish an ecological corridor across the property.
    a. Most of the remaining natural vegetation outside of the defined PAOI is rezoned to become a conservation space under stewardship agreements with conservation authorities like Cape Nature.
    b. Limit fencing on Portion 76 of 216. While fences around the dwelling might be considered, the fencing of the property will result in numerous negative ecological effects, including long-term altered ecosystem structure functioning.

Discussion of the Alternatives: Only residual (post-mitigation) impacts that have a significance of Low or Negligible are acceptable. Where impacts are Moderate post-mitigation, offset requirements may be triggered for this development. This means that the most feasible development options on Portion 76 of 216 would be Alternative 2 and 4, in order to make appropriate allowance for fragmentation avoidance (Table 8). Alternatives 1 and 3 both have a residual fragmentation impact that remains moderate despite the mitigation proposed above.

Table 8: Layout and Design Phase impact 1 - Fragmentation of habitats & plant populations

LAYOUT & DESIGN Impact no. 1	**Alternative 1:** One dwelling & new access road		**Alternative 2:** One dwelling & neighbours existing road (with a small new section) used for access.		**Alternative 3:** Two dwellings & new access road		**Alternative 4:** One dwelling in the north-western corner of the property	
Mitigation	Without	With	Without	With	Without	With	Without	With
Duration	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent
Extent	Limited	Very limited	Limited	Very limited	Limited	Very limited	Very limited	Very limited
Intensity	High	Low	Moderate	Very low	High	Low	Low	Very low
Probability	Certain	Certain	Certain	Certain	Certain	Certain	Almost certain	Almost certain
SCORE	Moderate negative: -98	Moderate negative: -77	Moderate negative: -91	Minor negative: -70	Moderate negative: -98	Moderate negative: -77	Minor negative: -66	Minor negative: -60
Confidence	High	High	High	High	High	High	High	High
Reversibility	Low	Low	Low	Low	Low	Low	Low	Low
Resource irreplaceability	High	High	High	High	High	High	High	High

9.3 Construction Phase

Construction on Portion 76 of 216 will include several activities that relate to the specific themes assessed in this report. The construction phase is the most intense phase of the proposed development and will result in a permanent loss of habitat and vegetation on the site, including SCC. The impacts presented in this section are shown from the most significant to least significant in terms of the Terrestrial Biodiversity and Plant Species Themes assessed. An Environmental Control Officer (ECO) needs to be appointed to oversee and ensure compliance with management plans and mitigation measures throughout the construction phase.

9.3.1 Construction Impact 1 – Permanent Loss of Terrestrial Biodiversity

Description: The permanent loss of knysna sand fynbos (CR) and goukamma dune thicket (LT) as a result of earthworks and other construction related activities for the proposed development.

Mitigation:

1. Prior to construction: The disturbance footprint of proposed developments should be clearly defined and demarcated to prevent unnecessary damage to the surrounding environment.
    a. The proposed development must have a maximum disturbance envelope of 2m around the proposed development (this is already illustrated in the PAOI presented in this report.
    b. Construction netting and fencing must be used to clearly indicate construction areas. Shade cloth used as fencing should be hammered into the ground using wooden pegs.
    c. Clear signs for “no-go” areas for vehicles and personnel should be placed strategically on the site. No-go areas are anywhere outside of the direct area of influence of the construction phase.
    d. A turning and parking area for construction and delivery vehicles may only take place in areas that are already cleared or part of the permanent disturbance footprint of the development plan
2. Prior to construction: With the aid of a botanist, install protective barriers around protected tree stands (Milkwood*, Sideroxylon inerme inerme*) and other significant stands of SCC to prevent damage from construction activities
3. Prior to construction: Schedule vegetation clearance during the winter in order to minimize impact on plant life cycles & pollination.
4. During construction: Protection and re-use of topsoil.
    a. The topsoil will be vital for the success of rehabilitation of fynbos vegetation following construction processes and must therefore be treated with care.
    b. Topsoil from fynbos vegetation on the site (excluding topsoil under dense stands of invasive plants) in new excavation areas must be stripped to a depth of ca. 30cm and kept in designated piles.

c. Topsoil piles must be suitably covered and bunded (e.g., with sandbags). This will prevent the material from washing away and contaminating the substrate of the site which likely still contains useful seeds and soil organisms.

d. If the SDP of a proposed development does not have enough space for the storage and protection of topsoil within the disturbance envelope, then the Contractor must identify an alternative temporary stockpile area that is already transformed and where it can easily be retrieved for post-construction rehabilitation.

a. The topsoil piles must be clearly labelled so that it does not mix with subsoils excavated or any other construction material for the site

5. During construction: New roads need to be made using the same / similar materials and methods as the neighbouring road. See the photo taken on the neighbouring property in Fig. 17.

Figure 17: An image of the road & minimal edge eddect adjacent to the road on the neighbouring property west of Portion 76 / 216.

Discussion of the Alternatives: The impact assessment Table 9 shows that Alternative 2 and 4 have acceptable residual impacts. Alternative options 1 and 3 have residual impacts that remain moderately negative, even with the implementation of the proposed mitigation measures.

Table 9: Construction Impact 1 – Permanent Loss of Terrestrial Biodiversity.

CONSTRUCTION Impact no. 1	**Alternative 1:** One dwelling & new access road		**Alternative 2:** One dwelling & neighbours existing road (with a small new section) used for access.		**Alternative 3:** Two dwellings & new access road		**Alternative 4:** One dwelling in the north-western corner of the property		**No-go Alternative**
Mitigation	Without	With	Without	With	Without	With	Without	With	Without
Duration	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Immediate
Extent	Limited	Very limited	Limited	Very limited	Limited	Very limited	Limited	Very limited	Very limited
Intensity	Moderate	Low	Low	Very low	Moderate	Low	Low	Very low	Negligible
Probability	Certain	Certain	Certain	Certain	Certain	Certain	Certain	Certain	Highly unlikely
SCORE	Moderate negative: -91	Moderate negative: -77	Moderate negative: -84	Minor negative: -70	Moderate negative: -91	Moderate negative: -77	Moderate negative: -84	Minor negative: -70	Negligible negative: -3
Confidence	High	High	High	High	High	High	High	High	
Reversibility	Low	Low	Low	Low	Low	Low	Low	Low	
Resource irreplaceability	High	High	High	High	High	High	High	High	

9.3.2 Construction Impact 2 – Permanent Loss of Populations of Important Plant Species

Description: The permanent loss of SCC and other important plant species of the property as a result of earthworks and other construction related activities for the proposed development.

1. Prior to construction: A plant search and rescue must be conducted (with a botanist / ecologist on the site to provide guidance on best practice).
    a. Plants with a high likelihood of survival in the 2m disturbance strip must be rescued, and specific important sections in the permanent disturbance footprint must be identified and added to the rescue operation prior to the commencement construction.
    b. Stands of plants could be removed carefully with an excavator to preserve as much as possible of the soil around the roots of the plants. These could then be temporarily planted elsewhere for the duration of the construction phase.
    c. The rescued plants must be kept in a nursery that should preferably be set up on the site in an existing disturbed area. Alternatively, arrangements with a suitable nursery / available receptor site should be made to keep and care for removed plants during the construction phase of the project.
    d. The rescued plants must be planted back with the aid of botanists and / or horticultural specialists within the 2m disturbance footprint around the permanent disturbance footprints. This will promote the regeneration of natural fynbos abound the developments and reduce the possibility of negative edge effects on the site.
    e. Any additional SCC and plants with a high survival likelihood that are observed during construction within a development footprint must be rescued (soil in-tact) and added to the rescued plants in the indigenous nursery.
2. During construction: Materials used during construction must be sourced and transported responsibly to minimise the risk new invasive plants.
3. During construction: Staff, if suspected may be checked when they leave to ensure no plants have been poached from the natural surrounding environment. Staff should also be told that plants may not be collected outside of the search and rescue operation.
    a. Geophytes are at a large risk of poaching, and this is an important reason why SANBI has a list of sensitive species for plants (i.e., their identities are unknown) in South Africa.
    b. However, some LC and Near Threatened species, especially geophytes, can also be targeted by plant poachers despite not being listed as sensitive species.
4. Post construction: Undertake revegetation of the disturbance envelope outside of the permanent disturbance footprint.
    a. Start with the plants that have been rescued on the site
        i. Site preparation – remove all non-native weeds from the site of revegetation to reduce competition with native plant species.

ii. Planting - Plant during the cooler, wetter months to reduce transplant shock and ensure moisture availability. This would ideally be during winter (June, July). Space plants according to their natural distribution & spacing, which will be visible in the surrounding remaining natural vegetation on the site. So not add any additional organic matter to the soil, as some fynbos species are sensitive to nutrient stress in a way most typical garden species are not.

iii. Post planting care - Regularly water & monitor the newly planted fynbos, particularly during the establishment phase. Apply a thin layer of mulch to conserve moisture and suppress weeds. Continue removing any invasive species that may reappear.

b. If more plants are required for successful coverage of disturbed areas, augmentation with sourced plants can be done.

i. Prior & during construction: Collect seeds from healthy fynbos populations, ensuring a diverse genetic pool. Consult with horticulturalists (e.g., Kirstenbosch) to obtain the best methods & timing for this). This is an optional step, as this will require a lot of effort, cost, & planning.

ii. Species selection – Choose a mix of pioneer species and slower-growing species to ensure quick coverage and long-term sustainability. Some species that could be considered include: *Helichrysum petiolare, Metalasia muricata, Osteospermum moniliferum, Searsia crenata, Senecio elegans, Tetragonia decumbens, Thamnochortus insignis, Agathosma apiculata, A. capensis, Chironia baccifera, Watsonia pillansii, Chasmanthe aethiopica, Restio leptoclados, Passerina corymbosa*, etc.

iii. Adaptive management – Be prepared to adapt strategies based on monitoring results and environmental conditions.

Discussion of the Alternatives: The residual impacts on the loss of plant species, considering the SCC diversity on the property, can be reduced below Moderate for alternative options (Table 10), given the mitigation proposed above. Alternative option 4 is the only alternative where species loss can be reduced to a Negligible negative impact, and this is because the north-western corner, despite being in the most sensitive habitat on the property, has been invaded for several decades. By building there, that established invasive stand will be vanquished, and incentive to clear the remaining Knysna Sandstone Fynbos is also likely.

Table 10: Construction Impact 2 – Permanent Loss of Populations of Important Plant Species.

CONSTRUCTION Impact no. 2	**Alternative 1:** One dwelling & new access road		**Alternative 2:** One dwelling & neighbours existing road (with a small new section) used for access.		**Alternative 3:** Two dwellings & new access road		**Alternative 4:** One dwelling in the north-western corner of the property		**No-go Alternative**
Mitigation	Without	With	Without	With	Without	With	Without	With	Without
Duration	Long term	Medium term	Medium term	Short term	Long term	Medium term	Short term	Brief	Immediate
Extent	Limited	Very limited	Limited	Very limited	Limited	Very limited	Limited	Very limited	Very limited
Intensity	Moderate	Low	Moderate	Low	Moderate	Low	Low	Very low	Negligible
Probability	Certain	Certain	Certain	Certain	Certain	Certain	Certain	Certain	Highly unlikely
SCORE	Moderate negative: -77	Minor negative: -56	Minor negative: -70	Minor negative: -49	Moderate negative: -77	Minor negative: -56	Minor negative: -56	Negligible negative: -35	Negligible negative: -3
Confidence	High	High	High	High	High	High	High	High	
Reversibility	Low	Low	Low	Low	Low	Low	Low	Low	
Resource irreplaceability	High	High	High	High	High	High	High	High	

9.4 The Conclusion of the Construction Phase

The conclusion of any project is an essential, but often overlooked aspect of projects. This relates primarily to the cleaning up of the site once construction has concluded. This is not a separate impact, but it is important enough to warrant a section in this report. The conclusion of the construction phase is technically still included in the construction phase, but unlike other construction impacts, impacts that could occur here are less predictable.

1. All of the mitigation measures proposed above are only meaningful if construction is properly concluded.
2. Construction sites must be cleared of all waste material, rubble, and debris associated with the construction phase at regular intervals during, and at the conclusion of the construction phase.
3. Revegetation of bare soil following construction is an essential part of concluding the construction phase of the project. Some recommendations for revegetation are included in the second construction phase impact above.
4. Drainage structures must be checked to ensure that there are no blockages or pollution that is blocking the free flow of water over the site; these checks will prevent erosion during and after the construction phase that could have potentially far-reaching implications beyond the direct area of influence for the proposed development.

9.5 Operational Phase

The operational phase of the project refers to the state of the site after the construction phase has been concluded, when the proposed developments are ready for, or are in use.

9.5.1 Operational Phase Impact 1 – Landscaping effects on Habitats and Plant Species

Description: Fynbos / strandveld / thicket and SCC populations in these habitats negatively affected by inappropriate permanent landscaping & landscape management resulting in water attenuation problems, genetic pollution, and potential long-term biodiversity loss from the cultivation of species that are not indigenous to the vegetation type and surrounding landscape. An increase in hard surfaces is also problematic, as it causes changes in microclimate and the interaction of water with the substrate adjacent to the built environment.

Mitigation:

1. Protection of biodiversity beyond the permanent disturbance footprint on Portion 76 of 216, especially where the habitat is becoming increasingly invaded in CR Knysna Sand Fynbos.
    a. The rehabilitation of the 2m disturbance footprint with topsoil and plants rescued on the site ,must occur as soon as possible after the conclusion of construction.
    b. Control of alien & invasive plant species according to a management plan. This is a requirement by law.
        i. Contact an invasive unit (such as Stellenbosch University's "Centre for Invasion Biology") if alien clearing efforts are not progressing as desired.

ii. The infographic below (Fig. 18) is a conceptual framework that was made by the Centre for Invasion Biology (Van Wilgen et al., 2014) which may assist in the level of management required in different areas across Portion 76 of 216.

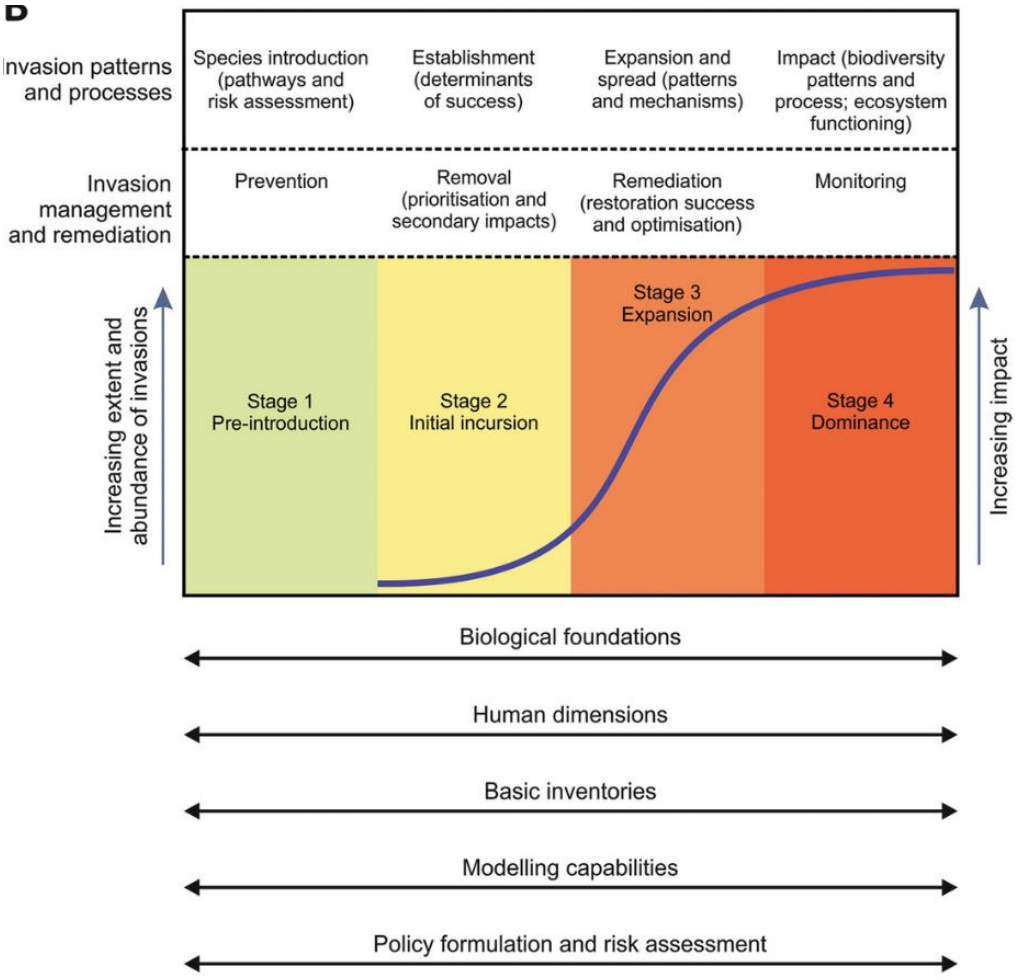


Figure 18: An imforgraphic from the Centre for Invasion Biology showing how invasive alien plants should be managed depending on the degree of invasion severity (Van Wilgen et al., 2014).

2. If gardens need to be considered, they can be designed to be water wise (avoid erosion) and friendly to wildlife and the greater natural habitat. Fynbos Life in Cape Town is an inspirational indigenous landscaping project with very useful tips allowing a garden to add biodiversity value, instead of detract value.
    a. Gardens & the built environment should be planned with rainfall, slope/aspect, wind direction, & microclimates in mind. Gardens could be planned to capture rainfall & slow water loss. Create a grey-water wetland if there is a need for water filtration & absorption of extra nutrients.
    b. No garden waste may be dumped in any remaining natural area and must be disposed of in a responsible manner.
    c. Make sure not to plant NEMBA listed invasive plants (e.g., kikuyu grass) in your garden.
    d. Select locally indigenous plants for gardens, making use of as many of the rescued plant species as possible. Avoid plants that are hybrids and cultivars.

e. Plant during the rainy season (early winter May/June) and add a 10cm thick layer of wood chip to keep in moisture.

f. Reduce or replace lawns with water-wise groundcovers or enlarging shrub beds.

g. Add local edible and aromatic plants to avoid water & nutrient intensive vegetable gardens

h. Ensure soft landscaping is used as opposed to hard landscaping (Box 3)

BOX 3: Landscaping

Soft landscaping

Soft landscaping refers to natural spaces around constructed buildings that contain plants. The plants used are often trees, shrubs, and herbs that perform valuable ecosystem functions and services. Soft landscapes support biodiversity if local indigenous species are planted, or better yet, if the natural vegetation is left to recover and grow with minimal to no planting of man-made gardens. Grasses and shrubs are as effective at converting Carbon dioxide as are trees. Keeping fynbos & strandveld vegetation allows groundwater attenuation and minimisation of erosion risk.

Hard landscaping

Hard landscaping are spaces around buildings that have been transformed into impermeable surfaces, such as pavements, and concrete driveways. Hard landscapes have negative impacts on the natural environment. Hard landscaping results in the absorption and reflection of heat, which makes them hotter than the surrounding natural areas. Furthermore, they speed up the flow of rainwater. No plants can really grow on these surfaces making groundwater attenuation problematic.

3. Fire-proof hedges (Esler et al., 2014) can be made with indigenous species to reduce fire risk around the built enviornment. Some of the species that could be planted for this purpose include *Osteospermum moniliferum* (Bietou), *Diospyros dichrophylla*, *Searsia glauca*, *Pterocelastrus tricuspidatus* (Candlewood), *Ekebergia capensis* (Cape Ash), *Grewia occidentalis* (Crossberry), *Carissa bispinosa*, and *Euclea racemosa* (Gwarrie).

4. Clearly delineate maintenance zones and employ low-impact maintenance techniques

    a. Schedule major maintenance activities to avoid critical periods such as flowering, seed dispersal, and pollination periods (for most species this is during spring between September to November).

    b. Minimize soil disturbance and compaction, such as using hand tools instead of heavy machinery. Use specialized equipment designed to reduce environmental footprint, like lightweight mowers or trimmers.

    c. When chemical treatments are necessary, use targeted applications that minimize exposure to non-target species.

    d. Stabilize disturbed soils promptly with native vegetation or erosion control materials. Erosion control measures are discussed in more detail in the aquatic specialist report.

Discussion of the Alternatives: The residual impacts for all four alternatives here are Minor negative (Table 11). Alternatives 2 and 4 are marginally better than 1 and 3 for this specific impact.

Table 11: Operational Phase Impact 1 – Landscaping effects on Habitats and Plant Species

OPERATIONAL Impact no. 1	**Alternative 1:** One dwelling & new access road		**Alternative 2:** One dwelling & neighbours existing road (with a small new section) used for access.		**Alternative 3:** Two dwellings & new access road		**Alternative 4:** One dwelling in the north-western corner of the property		**No-go Alternative**
Mitigation	Without	With	Without	With	Without	With	Without	With	Without
Duration	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Permanent	Immediate
Extent	Limited	Very limited	Limited	Very limited	Limited	Very limited	Limited	Very limited	Very limited
Intensity	High	Low	Moderate	Very low	High	Low	Low	Very low	Negligible
Probability	Certain	Almost certain	Certain	Almost certain	Certain	Almost certain	Certain	Almost certain	Highly unlikely
SCORE	Moderate negative: -98	Minor negative: -66	Moderate negative: -91	Minor negative: -60	Moderate negative: -98	Minor negative: -66	Moderate negative: -84	Minor negative: -60	Negligible negative: -3
Confidence	High	High	High	High	High	High	High	High	
Reversibility	Low	Low	Low	Low	Low	Low	Low	Low	
Resource irreplaceability	High	High	High	High	High	High	High	High	

10. CONCLUSION

The proposed development on Portion 76/216 will have an impact on pristine fynbos and strandveld vegetation. The habitats here are biodiverse and support a host of plant species of conservation concern (SCC). The property is also part of a wider open corridor that is part of a CBA 1. The impact assessment presented makes it clear that Alternative 4 is the most acceptable layout for the proposed dwellings on the property. Alternative 2 can also be considered without potentially triggering a requirement for an offset. This is because the residual impacts for Alternatives 2 and 4 are reduced to Minor or Negligible negative for all of the impacts that were assessed. Given the highly sensitive nature of the vegetation here, all effort should be made to limit the total PAOI of the development.

Offset requirements will likely also be triggered for this development should Alternative options 1 or 3 be followed, due to the Moderate residual impacts that can't be reduced with the mitigation proposed in this report. Areas with a Very High SEI (not calculated in the first botanical report but presented in this report) may be developed where the residual impact is Minor or Negligibly negative. Even though avoidance mitigation is preferred in Very High SEI areas (Verburgt et al., 2020), the Alternative 4 is a viable option to be considered given:

1. The layout of the property and servitudes, which allows for a small project footprint & perimeter to surface ratio in the north-western corner,
2. Long-term disturbances and invasion in the north-western corner of the site (see historical imagery).
3. The relative reduction in fire risk (assuming alien clearing will be taken seriously on the property) which can be achieved by building in the north-western corner.
4. A reduction in landscape fragmentation, which means more natural processes, including fire regimes, can persist and won't be supressed in the landscape.
5. The overall PAOI of Alternative 4 is the only development option that will result in less than 1% transformation of the property, where all the other options result in at least 2% transformation.

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12. APPENDIX

12.1 Provisional Plant Species List

A species accumulation curve for all the species recorded on the site during the assessment are presented in Fig. 19. All species that were observed during the site visit are in Table 12. The site assessment species list is not exhaustive.

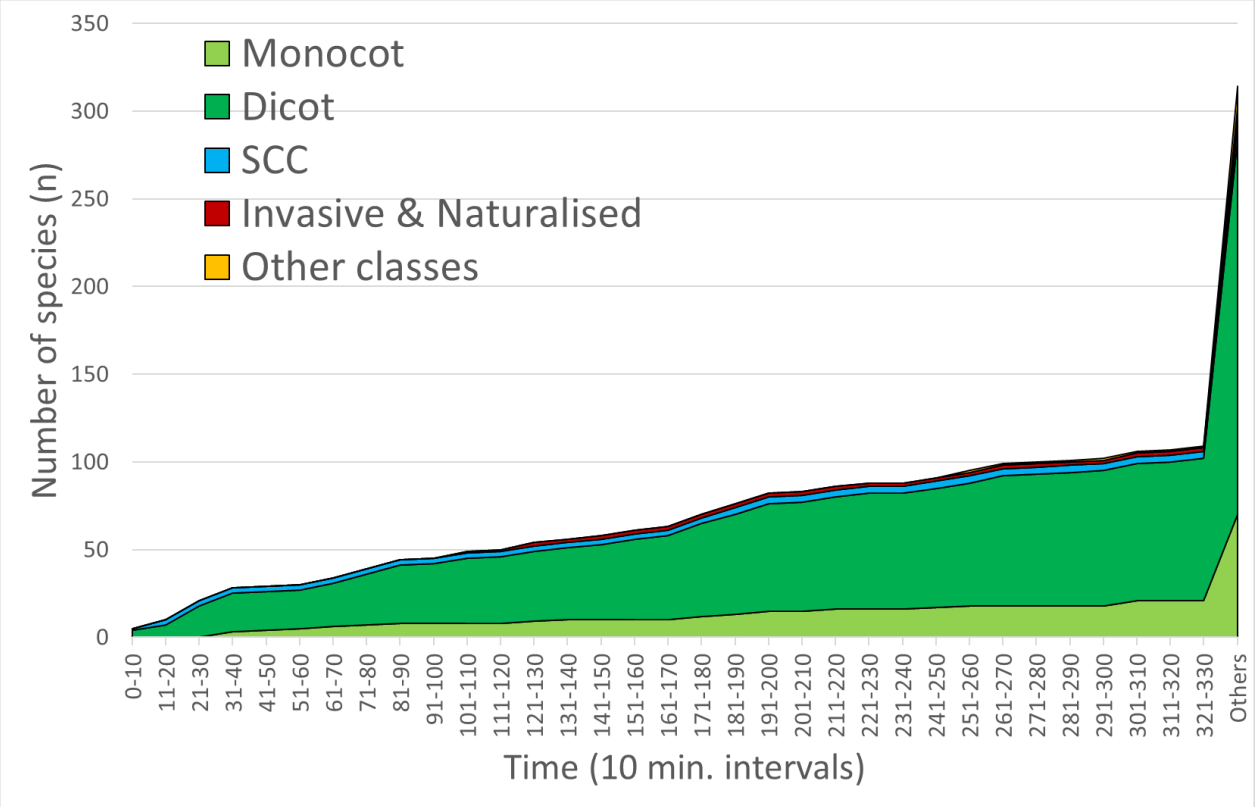

Figure 19: A plant species accumulation curve for the site assessment, as well as observations made by other observers on iNaturalist (“others” on the right-hand side of the curve).

Table 12: A provisional species list made for the site assessment on Portion 76/216. Light red entries indicate the invasive and naturalised exotic species that were observed. The green entries indicate the species of conservation concern (SCC) that were found on the site.

Family	Species	Common name	Comment
Class Bryopsida			
Bartramiaceae	*Bartramia hampeana*	Moss species	
Bryaceae	*Ptychostomum capillare*	Capillary Thread-moss	
Bryaceae	*Ptychostomum torquescens*	Moss species	
Ditrichaceae	*Ceratodon purpureus*	Redshank	
Funariaceae	*Funaria hygrometrica*	Bonfire moss	
Pottiaceae	*Trichostomum brachydontium*	Moss species	
Class Liliopsida (Monocots)			
Amaryllidaceae	*Apodolirion lanceolatum*	Crocus species	
Amaryllidaceae	*Brunsvigia orientalis*	candelabra lily	
Amaryllidaceae	*Haemanthus sanguineus*	Smooth Bloodlily	
Asparagaceae	*Albuca cooperi*	Dainty Soldier-in-a-Box	
Asparagaceae	*Albuca flaccida*	Slime Soldier-in-a-Box	
Asparagaceae	*Asparagus africanus*	Bush Asparagus	
Asparagaceae	*Asparagus asparagoides*	Cape Smilax	
Asparagaceae	*Asparagus rubicundus*	Redstem Asparagus	
Asparagaceae	*Asparagus suaveolens*	Catthorn Asparagus	
Asparagaceae	*Eriospermum dielsianum molle*	Woolseed species	
Asparagaceae	*Ornithogalum dubium*	Yellow Chincherinchee	
Asparagaceae	*Ornithogalum graminifolium*	Grass Chink	
Asphodelaceae	*Kniphofia uvaria*	Red Hot Poker	
Colchicaceae	*Colchicum capense*	White Men-in-a-Boat	

Colchicaceae	*Colchicum eucomoides*	Green Men-in-a-Boat	
Colchicaceae	*Colchicum longipes*	Men-in-a-Longboat	
Commelinaceae	*Commelina africana*	African Yellow Dayflower	
Cyperaceae	*Chrysitrix sp.*	Sedge species	
Cyperaceae	*Cyperus brevis*	Sedge species	
Cyperaceae	*Cyperus polystachyos*	Bunchy flat-sedge	
Cyperaceae	*Ficinia acuminata*	Long Clubrush	
Cyperaceae	*Ficinia albicans*	Clubrush species.	
Cyperaceae	*Ficinia bulbosa*	Bulbous Sedge	
Cyperaceae	*Ficinia deusta*	Fire Clubrush	
Cyperaceae	*Ficinia laciniata*	Clubrush species.	
Cyperaceae	*Ficinia nigrescens*	Black Clubrush	
Cyperaceae	*Ficinia oligantha*	Clubrush species.	
Cyperaceae	*Ficinia ramosissima*	Branch Clubrush	
Cyperaceae	*Ficinia secunda*	Comb Clubrush	
Cyperaceae	*Hellmuthia membranacea*	Helmet Sedge	
Cyperaceae	*Schoenus adnatus*	Flat Veldrush	
Cyperaceae	*Schoenus graciliculmis*	Delicate Veldrush	
Cyperaceae	*Schoenus sp.*	Bogrushes	
Cyperaceae	*Tetraria robusta*	Massive Tetrar	
Haemodoraceae	*Wachendorfia paniculata*	Common Butterflylily	
Hypoxidaceae	*Hypoxis sobolifera sobolifera*	Hypoxis species	
Hypoxidaceae	*Hypoxis villosa*	Shaggy Stargrass	
Iridaceae	*Aristea pusilla*	Capeblue species	
Iridaceae	*Bobartia aphylla*	Garden Route Rushiris	
Iridaceae	*Chasmanthe aethiopica*	Cobra Lily	
Iridaceae	*Freesia leichtlinii alba*	White Kammetjie	Near Threatened B1ab(ii,iii,iv,v)
Iridaceae	*Gladiolus carinatus*	Blue Afrikaner	

Iridaceae	*Gladiolus rogersii*	Riversdale Bluebell	
Iridaceae	*Gladiolus vaginatus*	White Afrikaner	Vulnerable B1ab(iii)
Iridaceae	*Hesperantha falcata*	Sickle Eveninglily	
Iridaceae	*Ixia orientalis*	Eastern Kalossie	
Iridaceae	*Moraea polyanthos*	Manyflower Tulp	
Iridaceae	*Romulea dichotoma*	Froetang species	
Iridaceae	*Romulea flava viridiflora*	Thinleaf Greenbract Froetang	
Iridaceae	*Romulea rosea*	Rosy sandcrocus	
Iridaceae	*Romulea rosea rosea*	Common Rosy Froetang	
Iridaceae	*Romulea setifolia*	Palerim Froetang	
Iridaceae	*Watsonia pillansii*	Orange Watsonia	
Orchidaceae	*Disa bracteata*	Bract Disa	
Orchidaceae	*Eulophia speciosa*	Golden Harlequin	
Orchidaceae	*Holothrix*	Hair Orchids	
Orchidaceae	*Holothrix villosa*	Hairy Thread Orchid	
Orchidaceae	*Satyrium princeps*	Red Satyre	Vulnerable C2a(i)
Poaceae	*Ehrharta calycina*	Perennial Veldtgrass	
Poaceae	*Eragrostis*	Lovegrasses	
Poaceae	*Eragrostis plana*	Fan Love Grass	
Poaceae	*Imperata cylindrica*	Cogon Grass	
Poaceae	*Pentameris calcicola*	Grass species	
Poaceae	*Stipagrostis zeyheri*	Grass species	
Poaceae	*Themeda triandra*	Kangaroo Grass	
Restionaceae	Restio	True Capereeds	
Restionaceae	*Restio eleocharis*	Beach Pegreed	
Restionaceae	*Restio leptoclados*	Whorl Pegreed	
Restionaceae	*Thamnochortus glaber*	Thatching Reeds	
Restionaceae	*Thamnochortus insignis*	True Thatchreed	
Class Magnoliopsida (Dicots)			
Aizoaceae	*Acrodon bellidiflorus*	Common Tiptoothfig	
Aizoaceae	*Aizoaceae*	Stone plants	

Aizoaceae	*Carpobrotus deliciosus*	Delicious Sourfig	
Aizoaceae	*Carpobrotus edulis edulis*	Common Sourfig	
Aizoaceae	*Delosperma inconspicuum*	White Gardenroute Sheepfig	
Aizoaceae	*Delosperma litorale*	White Trailing Iceplant	
Aizoaceae	*Tetragonia fruticosa*	Sprawling Seacoral	
Anacardiaceae	*Schinus terebinthifolia*	Brazilian pepper	Invasive. NEMBA & CARA cat. 3 in the Western Cape
Anacardiaceae	*Searsia crenata*	Crowberry	
Anacardiaceae	*Searsia glauca*	Blue Kunibush	
Anacardiaceae	*Searsia laevigata*	Dune Currantrhus	
Anacardiaceae	*Searsia lucida*	Glossy Currantrhus	
Anacardiaceae	*Searsia pyroides*	Common currant-rhus	
Anacardiaceae	*Searsia tomentosa*	Wild currant	
Apiaceae	*Anginon difforme*	Common Finkel	
Apiaceae	*Annesorhiza macrocarpa*	Wild Aniseroot	
Apiaceae	*Centella tridentata litoralis*		
Apiaceae	*Notobubon ferulaceum*	Wild Blisterbush	
Apocynaceae	*Astephanus triflorus*	Western Klimop	
Apocynaceae	*Astephanus zeyheri*	Garden Route Klimop	
Apocynaceae	*Carissa bispinosa*	num-num	
Apocynaceae	*Carissa bispinosa bispinosa*	Forest Num-num	
Apocynaceae	*Cynanchum obtusifolium*	Roundleaf Buckhorn	
Araliaceae	*Cussonia thyrsiflora*	Cape Coast Cabbagetree	
Asteraceae	*Arctotheca prostrata*	Prostrate Capeweed	
Asteraceae	*Artemisia afra*	African wormwood	
Asteraceae	*Athanasia dentata*	Tooth Kanniedood	
Asteraceae	*Athanasia quinquedentata*	Fivetooth Kanniedood	
Asteraceae	*Athanasia trifurcata*	Three-tooth Kanniedood	
Asteraceae	*Crassothonna*		
Asteraceae	*Crassothonna cacalioides*		

Asteraceae	*Crassothonna capensis*	Little Pickles	
Asteraceae	*Cullumia decurrens*	Sprawling Snakethistle	
Asteraceae	*Cullumia setosa*	Bristly Snakethistle	
Asteraceae	*Disparago anomala*	Strange Desperado	
Asteraceae	*Erigeron sumatrensis*	tropical horseweed	Naturalised exotic
Asteraceae	*Eriocephalus*	Kapokbushes	
Asteraceae	*Eriocephalus africanus*	Cape Snow Bush	
Asteraceae	*Eriocephalus racemosus racemosus*	Kapkap Kapok	
Asteraceae	*Felicia amoena*	Soft Felicia	
Asteraceae	*Felicia echinata*	Dune Felicia	
Asteraceae	*Gerbera piloselloides*	Blacktea Gerbera	
Asteraceae	*Helichrysum asperum glabrum*		
Asteraceae	*Helichrysum cymosum cymosum*	Fume Everlasting	
Asteraceae	*Helichrysum dasyanthum*	Fynbos Everlasting	
Asteraceae	*Helichrysum foetidum foetidum*	Stinking Everlasting	
Asteraceae	*Helichrysum litorale*	Dune Everlasting	
Asteraceae	*Helichrysum niveum*	Sand Everlasting	
Asteraceae	*Helichrysum patulum*	Honey Everlasting	
Asteraceae	*Helichrysum petiolare*	Licorice plant	
Asteraceae	*Helichrysum teretifolium*	Needle Everlasting	
Asteraceae	*Metalasia muricata*	White bristle bush	
Asteraceae	*Osteospermum moniliferum moniliferum*	Bietou	
Asteraceae	*Osteospermum polygaloides*	Common Boneseed	
Asteraceae	*Othonna undulosa*	Clambering Babooncabbage	
Asteraceae	*Printzia polifolia*		
Asteraceae	*Senecio burchellii*	Kill Ragwort	
Asteraceae	*Senecio coronatus*	Woolly Grassveld Ragwort	
Asteraceae	*Senecio elegans*	Red-purple Ragwort	
Asteraceae	*Senecio glastifolius*	Woad-leaved ragwort	
Asteraceae	*Senecio purpureus*	Purple Ragwort	

Asteraceae	*Seriphium plumosum*	Bankrupt Bush	
Asteraceae	*Sonchus oleraceus*	Common Sow-thistle	Naturalised exotic
Asteraceae	*Tarchonanthus littoralis*	Coastal Camphorbush	
Asteraceae	*Ursinia chrysanthemoides*	Creeping Paraseed	
Asteraceae	*Ursinia scariosa*	Paper Paraseed	
Asteraceae	*Ursinia scariosa scariosa*		
Brassicaceae	*Heliophila linearis*	Sunsorrels	
Brassicaceae	*Heliophila subulata subulata*	Common Sunspurge	
Campanulaceae	*Lobelia*	Lobelias	
Campanulaceae	*Lobelia neglecta*	Rough Lobelia	
Campanulaceae	*Wahlenbergia androsacea*	Hare-Bell	
Campanulaceae	*Wahlenbergia desmantha*		
Campanulaceae	*Wahlenbergia thunbergii*		
Caprifoliaceae	*Scabiosa columbaria*	Small Scabious	
Caryophyllaceae	*Dianthus albens*	White Pink	
Caryophyllaceae	*Silene crassifolia primuliflora*	Eastern Beach Catchfly	
Celastraceae	*Cassine peragua peragua*	Forest spoonwood	
Celastraceae	*Maytenus procumbens*	Dune Koko Tree	
Celastraceae	*Mystroxylon aethiopicum aethiopicum*	Cape Koobooberry	
Celastraceae	*Pterocelastrus tricuspidatus*	Candlewood	
Convolvulaceae	*Convolvulus sagittatus*	arrow bindweed	
Convolvulaceae	*Cuscuta appendiculata*	Warty Dodder	
Crassulaceae	*Crassula atropurpurea*	purple crassula	
Crassulaceae	*Crassula expansa filicaulis*	Fine Stonecrop	
Crassulaceae	*Crassula nudicaulis*	Karoo Stonecrop	
Crassulaceae	*Crassula subulata*	Bihair Stonecrop	
Crassulaceae	*Crassula subulata fastigiata*		
Crassulaceae	*Crassula subulata subulata*		
Cucurbitaceae	*Zehneria scabra*	Wild Cucumber	

Droseraceae	*Drosera natalensis*	Natal Sundew	
Ebenaceae	*Diospyros dichrophylla*	Poison Starapple	
Ebenaceae	*Euclea racemosa racemosa*	Dune Gwarrie	
Ebenaceae	*Euclea undulata*	Gwarrie	
Ericaceae	*Erica discolor discolor*	Garden Route Discolorous Heath	
Ericaceae	*Erica glandulosa*	Glandular Heath	
Ericaceae	*Erica glandulosa fourcadei*	Ridged Glandular Heath	Vulnerable B1ab(ii,iii,iv,v)
Ericaceae	*Erica glumiflora*	Gloomy Heath	Vulnerable B1ab(i,ii,iii,iv,v)
Ericaceae	*Erica leucopelta leucopelta*		
Ericaceae	*Erica scabriuscula*	Grit Heath	
Ericaceae	*Erica sessiliflora*	Bottle Green Heath	
Euphorbiaceae	*Adenocline pauciflora*		
Fabaceae	*Acacia cyclops*	western coastal wattle	Invasive. NEMBA cat. 1b; CARA cat. 2
Fabaceae	*Acacia mearnsii*	black wattle	Invasive. NEMBA & CARA cat. 2
Fabaceae	*Acacia melanoxylon*	blackwood	Invasive. NEMBA & CARA cat. 2
Fabaceae	*Aspalathus alopecurus*	Foxtail Capegorse	
Fabaceae	*Aspalathus biflora longicarpa*	Longpod Twin Capegorse	
Fabaceae	*Aspalathus hirta*	Eina Capegorse	
Fabaceae	*Aspalathus hispida albiflora*	White Bristle Capegorse	
Fabaceae	*Aspalathus kougaensis*	Misunderstood Capegorse	
Fabaceae	*Aspalathus spinosa*	Spiny Capegorse	
Fabaceae	*Aspalathus spinosa spinosa*	Common Spiny Capegorse	
Fabaceae	*Bolusafra bituminosa*	Tar Pea	
Fabaceae	*Dipogon lignosus*	Okie bean	
Fabaceae	*Indigofera candicans*	Canary Indigo	
Fabaceae	*Indigofera erecta*	Moertjie Indigo	
Fabaceae	*Indigofera priorii*	Squashed Indigo	
Fabaceae	*Indigofera verrucosa*	Warty Indigo	
Fabaceae	*Lebeckia gracilis*	Slender Ganna	Endangered A2bc; B1ab(ii,iii,iv,v)
Fabaceae	*Lessertia carnosa*		

Fabaceae	*Lessertia stenoloba*	Longstalk Bubblepod	
Fabaceae	*Lotononis sp.*	Lotononises	
Fabaceae	*Ornithopus pinnatus*	Orange Bird's-foot	
Fabaceae	*Rhynchosia caribaea*	Caribbean snoutbean	
Fabaceae	*Rhynchosia chrysoscias*	Goldhair Snoutbean	
Fabaceae	*Rhynchosia leucoscias*	Shiny Snoutbean	
Fabaceae	*Tephrosia capensis*	Cape Hoarypea	
Fabaceae	*Vicia hirsuta*	Hairy tare	
Fabaceae	*Virgilia divaricata*	Gardenroute Keurboom	
Fagaceae	*Quercus robur*	English oak	Naturalised exotic
Gentianaceae	*Chironia baccifera*	Christmas Berry	
Gentianaceae	*Chironia tetragona*	Coastal Chiron	
Geraniaceae	*Geranium incanum*	carpet crane's-bill	
Geraniaceae	*Geranium incanum incanum*	Pale Carpet Cranes-bill	
Geraniaceae	*Pelargonium betulinum*	Camphor Storksbill	
Geraniaceae	*Pelargonium caffrum*	Storkbill species	
Geraniaceae	*Pelargonium capitatum*	rose-scented geranium	
Geraniaceae	*Pelargonium cordifolium*	Heartleaf Storksbill	
Geraniaceae	*Pelargonium dipetalum dipetalum*	Storkbill species	
Geraniaceae	*Pelargonium lobatum*	Vineleaf Storksbill	
Goodeniaceae	*Scaevola plumieri*	coastal inkberry	
Lamiaceae	*Salvia aurea*	Sages	
Lamiaceae	*Stachys aethiopica*	African Stachys	
Lauraceae	*Cassytha ciliolata*	devil's tresses	
Lauraceae	*Ocotea bullata*	Stinkwood	
Linaceae	*Linum africanum*	Half-mast Flax	
Malvaceae	*Grewia occidentalis occidentalis*	Bowwood	
Malvaceae	*Hermannia diffusa*	Dollsrose species	
Malvaceae	*Hermannia hyssopifolia*	Fat Dollsrose	
Malvaceae	*Hermannia salviifolia salvifolia*	Sage Dollsrose	
Malvaceae	*Hibiscus aethiopicus*	Cape Hibiscus	
Malvaceae	*Hibiscus aethiopicus aethiopicus*	African HIbiscus	
Menispermaceae	*Cissampelos capensis*	Cape Moonseed Vine	

Montiniaceae	*Montinia caryophyllacea*	Pepperbush	
Myricaceae	*Morella cordifolia*	Dune Waxberry	
Myricaceae	*Morella quercifolia*	Oak Waxberry	
Myrtaceae	*Corymbia ficifolia*	Red-flowering gum	Naturalised exotic
Oleaceae	*Olea exasperata*	Dune olive	
Onagraceae	*Oenothera sp.*	Primrose species	
Orobanchaceae	*Hyobanche sanguinea* cf. *robusta*	Inkblom	*H. sanguinea* is LC, *H. robusta* is Endangered B1ab(ii,iii,v)
Oxalidaceae	*Oxalis ciliaris ciliaris*	Woodsorrel species	
Oxalidaceae	*Oxalis depressa*	Early Sorrel	
Oxalidaceae	*Oxalis imbricata*	Tile Sorrel	
Oxalidaceae	*Oxalis pendulifolia*	Hangleaf Sorrel	
Oxalidaceae	*Oxalis stellata*	Star Sorrel	
Peraceae	*Clutia laxa*	Twiggy Clut	
Peraceae	*Clutia pulchella*	Warty Clut	
Phyllanthaceae	*Phyllanthus heterophyllus*	Leafflower species	
Phytolaccaceae	*Phytolacca octandra*	Inkweed	Invasive. NEMBA category 1b; not on CARA
Plumbaginaceae	*Limonium scabrum*	Cape Sea-Lavender	
Polygalaceae	*Muraltia alopecuroides*	Foxy Purplegorse	
Polygalaceae	*Muraltia satureioides*	Sand Purplegorse	
Polygalaceae	*Muraltia squarrosa*	Hornless Purplegorse	
Polygalaceae	*Polygala fruticosa*	Heartleaf Falsepea	
Polygalaceae	*Polygala myrtifolia*	Sweet Pea Shrub	
Proteaceae	*Leucadendron salignum*	Common Sunshine Conebush	
Proteaceae	*Leucospermum cuneiforme*	Wartstem Pincushion	
Proteaceae	*Protea cynaroides*	King Protea	
Proteaceae	*Protea neriifolia*	Oleander-leaf Protea	
Ranunculaceae	*Knowltonia vesicatoria humilis*	Common Burnleaf	
Rhamnaceae	*Phylica axillaris*	Axil Hardleaf	
Rhamnaceae	*Phylica litoralis*	Beach Hardleaf	
Rhamnaceae	*Phylica purpurea*	Purple Hardleaf	
Rhamnaceae	*Trichocephalus stipularis*	Dogsface	
Rosaceae	*Cliffortia falcata*	Curly Caperose	

Rosaceae	*Cliffortia filifolia*	Thread Caperose	
Rosaceae	*Rubus rigidus*	White Bramble	
Rubiaceae	*Anthospermum aethiopicum*	Tall Flowerseed	
Rubiaceae	*Carpacoce spermacocea*	Stinky Poepgras	
Rubiaceae	*Rubia petiolaris*	Madder species	
Rutaceae	*Agathosma apiculata*	Garlic Buchu	
Rutaceae	*Agathosma capensis*	Cape Buchu	
Rutaceae	*Agathosma imbricata*	Tile Buchu	
Rutaceae	*Agathosma sp.*	Buchus	
Rutaceae	*Clausena anisata anisata*	Clausena	
Rutaceae	*Zanthoxylum capense*	Small knobwood	
Santalaceae	*Colpoon compressum*	Cape Sumach	
Santalaceae	*Thesium fragile*	Beach Rootthug	
Santalaceae	*Thesium virgatum*	Branched Rootthug	
Sapotaceae	*Sideroxylon inerme*	white milkwood	
Sapotaceae	*Sideroxylon inerme inerme*	Southern White Milkwood	
Scrophulariaceae	*Chaenostoma caeruleum*	Blue Skunkbush	
Scrophulariaceae	*Chaenostoma campanulatum*	Short Skunkbush	
Scrophulariaceae	*Chaenostoma cordatum*	Bacopa	
Scrophulariaceae	*Chaenostoma integrifolium*	Skunkbush species	
Scrophulariaceae	*Chaenostoma polyanthum*	Skunkbush species	
Scrophulariaceae	*Dischisma ciliatum*	Fringe Falseslugwort	
Scrophulariaceae	*Dischisma ciliatum erinoides*	Toothy Fringe Falseslugwort	
Scrophulariaceae	*Hebenstretia integrifolia*	Summer Slugwort	
Scrophulariaceae	*Nemesia*	Lionfaces	
Scrophulariaceae	*Selago corymbosa*	Stiff Bitterbush	
Scrophulariaceae	*Selago villicaulis*	Dune Bitterbush	Vulnerable B1ab(ii,iii,iv,v)
Scrophulariaceae	*Zaluzianskya capensis*	Cape Drumsticks	
Solanaceae	*Solanum africanum*	drunken berry	
Solanaceae	*Solanum linnaeanum*	Yellow Bitter-apple	
Solanaceae	*Solanum retroflexum*	Wonderberry	

Stilbaceae	*Halleria lucida*	African honeysuckle	
Thymelaeaceae	*Gnidia chrysophylla*	Gold Capesaffron	Near Threatened B1ab(i,ii,iii,iv,v)
Thymelaeaceae	*Gnidia juniperifolia*	Yellow Capesaffron	
Thymelaeaceae	*Passerina corymbosa*	Common Gonna	
Thymelaeaceae	*Passerina rigida*	Beach Gonna	
Thymelaeaceae	*Struthiola argentea*	Evening Capespray	
Thymelaeaceae	*Struthiola hirsuta*	Shaggy Capespray	
Class Pinopsida (Cone bearing plants)			
Pinaceae	*Pinus pinaster*	Maritime pine	Invasive 2 (plantations & wind-rows); 1b elsewhere
Class Polypodiopsida (Ferns with spores)			
Aspleniaceae	*Asplenium adiantum-nigrum*	Black spleenwort	
Dennstaedtiaceae	*Pteridium aquilinum capense*	Southern bracken	
Dryopteridaceae	*Rumohra adiantiformis*	Leatherleaf fern	
Pteridaceae	*Cheilanthes viridis viridis*	Common lip fern	
Schizaeaceae	*Schizaea pectinata*	Toothbrush fern	

12.2 Land use recommendations according to the WC BSP

Recommended acceptable land-uses for each BSP layer is outlined and summarised in Table 13 below.

Table 13: The land-use planning proposed by the Western Cape Biodiversity Spatial Plan

LAND USE CATEGORIES		Conservation		Agriculture		Tourism and Recreational Facilities		Rural Accomodation		Urban			Business & Industrial				Infrastructure Installations			
LAND USE SUB-CATEGORIES (Refer to table 4.7 for descriptions)		Proclaimed Protected Areas	Other Nature Areas	Intensive Agriculture	Extensive Agriculture	Low Impact Facilities	High Impact Facilities	Agri-worker Accommodation	Small holdings	Urban Development & Expansion	Community Facilities & Institutions	New Settlements	Rural Business	Non-place-bound Industry (low-moderate impact)	Non-place-bound Industry (high impact)	Extractive Industry (incl. Prospecting)	Linear - roads & rail	Linear - pipelines & canals	Linear - powerlines	Other Utilities
MAP CATEGORY	DESIRED MANAGEMENT OBJECTIVE	Y = Yes: Permissible land uses that are not likely to compromise the biodiversity objective						R = Restricted: Land uses that may compromise the biodiversity objective are only permissible under certain conditions (refer to Table 4.7 for conditions)					N = No: Land uses that will compromise the biodiversity objective and are not permissible							
Protected Area	Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity.	Land use within proclaimed protected areas are subject to management plan drawn up for that specific protected area.																		
Critical Biodiversity Area 1	Keep natural, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.	Y	Y	N	R	N	N	N	N	N	N	N	N	N	N	N	N	N	R	N
Critical Biodiversity Area 2	Keep natural, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.	Y	Y	N	R	R	N	N	N	N	N	N	N	N	N	N	R	R	R	N
Ecological Support Area 1: Terrestrial	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	Y	Y	N	R	R	N	N	N	N	N	N	R	R	N	N	R	R	R	R
Ecological Support Area 1: Aquatic	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	Y	Y	N	R	R	N	N	N	N	N	N	N	N	N	N	R	R	R	N
Ecological Support Area 2	Restore and/or manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services.	Y	Y	N	R	R	N	N	R	N	N	N	N	N	N	N	R	R	R	R
ONA: Natural to Near-Natural	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high impact land uses.	Y	Y	R	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
ONA: Degraded	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high impact land uses.	R	R	R	Y	Y	R	R	Y	R	R	R	R	R	R	R	Y	Y	Y	Y
No Natural Remaining	These areas are suitable for development but may still provide limited biodiversity and ecological infrastructure functions and should be managed in a way that minimises impacts on biodiversity and ecological infrastructure.	R	R	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

12.3 The IUCN Species Red List Criteria Summary

This section contains an extra summary explaining the very basics of the five Red List criteria used when assessing the Red List status of species. Note that this summary sheet does not provide detail on the "Near Threatened" category (sometimes also called an "Orange List" category) which comes before the "Vulnerable" category. These are the criteria that are used by the IUCN to assign the extinction threat status for individual plant species. In South Africa there are additional criteria (not shown on Fig. 20) for Rare and Critically Rare plant species.

SUMMARY OF THE FIVE CRITERIA (A-E) USED TO EVALUATE IF A TAXON BELONGS IN AN IUCN RED LIST THREATENED CATEGORY (CRITICALLY ENDANGERED, ENDANGERED OR VULNERABLE).[1]

A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%

A1 Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased.

A2 Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years) *[(a) cannot be used for A3]*.

A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

based on any of the following:

(a) direct observation *[except A3]*
(b) an index of abundance appropriate to the taxon
(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality
(d) actual or potential levels of exploitation
(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)

	Critically Endangered	Endangered	Vulnerable
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented **OR** Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals			
(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals			

C. Small population size and decline

	Critically Endangered	Endangered	Vulnerable
Number of mature individuals	< 250	< 2,500	< 10,000
AND at least one of C1 or C2			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:			
(a) **(i)** Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(ii) % of mature individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals			

D. Very small or restricted population

	Critically Endangered	Endangered	Vulnerable
D. Number of mature individuals	< 50	< 250	**D1.** < 1,000
D2. *Only applies to the VU category* Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	**D2.** typically: AOO < 20 km² or number of locations ≤ 5

E. Quantitative Analysis

	Critically Endangered	Endangered	Vulnerable
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

1 Use of this summary sheet requires full understanding of the *IUCN Red List Categories and Criteria* and *Guidelines for Using the IUCN Red List Categories and Criteria*. Please refer to both documents for explanations of terms and concepts used here.

Figure 20: The IUCN summary for the five assessment criteria used during the species Red Listing process.

12.4 Vegetation Assets, States, and Transitions (VAST)

Vegetation Assets, States, and Transitions (VAST) framework with columns representing states. Shifts between states are defined as transitions, as laid out in (Lesslie et al., 2010; Thackway & Lesslie, 2006).

Increasing modification

		Native vegetation cover Dominant plant species indigenous to the locality and spontaneous in occurrence, i.e. a vegetation community described using definitive vegetation types relative to estimated pre 1750 types				**Non-native vegetation cover** Dominant structuring plant species indigenous to the locality but cultivated; alien to the locality and cultivated; or alien to the locality and spontaneous		
Vegetation cover classes		**Class 0:** **RESIDUAL BARE**	**Class I:** **RESIDUAL**	**Class II:** **MODIFIED**	**Class III:** **TRANSFORMED**	**Class IV:** **REPLACED -ADVENTIVE**	**Class V:** **REPLACED -MANAGED**	**Class VI:** **REMOVED**
		Areas where native vegetation does not naturally persist	Native vegetation community structure, composition, and regenerative capacity intact —no significant perturbation from land use or land management practice. Class I forms the benchmark for classes II to VI	Native vegetation community structure, composition and regenerative capacity intact—perturbed by land use or land management practice	Native vegetation community structure, composition and regenerative capacity significantly altered by land use or land management practice	Native vegetation replacement—species alien to the locality and spontaneous in occurrence	Native vegetation replacement with cultivated vegetation	Vegetation removed
Diagnostic criteria	Current regenerative capacity	Natural regenerative capacity unmodified—ephemerals and lower plants	Natural regenerative capacity unmodified	Natural regeneration tolerates or endures under past and or current land management practices	Natural regenerative capacity limited or at risk under past and or current land use or land management practices. Rehabilitation and restoration possible through modified land management practice	Regeneration of native vegetation community has been suppressed by ongoing disturbances of the natural regenerative capacity; limited potential for restoration	Regeneration of native vegetation community lost or suppressed by intensive land management; limited potential for restoration	Nil or minimal
	Vegetation structure	Nil or minimal	Structural integrity of native vegetation community is very high	Structure is predominantly altered but intact, e.g. a layer or strata and or growth forms and or age classes removed	Dominant structuring species of native vegetation community significantly altered, e.g. a layer or strata frequently removed	Dominant structuring species of native vegetation community removed or predominantly cleared or extremely degraded	Dominant structuring species of native vegetation community removed	Vegetation absent or ornamental
	Vegetation composition	Nil or minimal	Compositional integrity of native vegetation community is very high	Composition of native vegetation community is altered but intact	Dominant structuring species present—species dominance significantly altered	Dominant structuring species of native vegetation community removed	Dominant structuring species of native vegetation community removed	Vegetation absent or ornamental

12.5 Impact Assessment Methods

Individual impacts for the construction and operational phase were identified and rated according to criteria which include their intensity, duration, and extent. The criteria and their associated ratings are shown in Table 14. The ratings were then used to calculate the consequence of the impact which can be either negative or positive as follows:

Consequence *= type x (intensity + duration + extent)*

Where type is either negative (i.e., -1) or positive (i.e., 1). The significance of the impact was then calculated by applying the probability of occurrence to the consequence as follows:

Significance *= consequence x probability*

Table 14: Categorical descriptions for impacts and their associated ratings.

Rating	Intensity	Duration	Extent	Probability
1	Negligible	Immediate	Very limited	Highly unlikely
2	Very low	Brief	Limited	Rare
3	Low	Short term	Local	Unlikely
4	Moderate	Medium term	Municipal area	Probably
5	High	Long term	Regional	Likely
6	Very high	Ongoing	National	Almost certain
7	Extremely high	Permanent	International	Certain

Categories assigned to the calculated significance ratings are presented in Table 15.

Table 15: Value ranges for significance ratings, where (-) indicates a negative impact and (+) indicates a positive impact

Significance Rating	Range	
Major (-)	-147	-109
Moderate (-)	-108	-73
Minor (-)	-72	-36
Negligible (-)	-35	-1
Neutral	0	0
Negligible (+)	1	35
Minor (+)	36	72
Moderate (+)	73	108
Major (+)	109	147

Each impact was considered from the perspective of whether losses or gains would be irreversible or result in the irreplaceable loss of biodiversity of ecosystem services. The level of confidence was also determined and rated as low, medium, or high (Table 16).

Table 16: Definition of reversibility, irreplaceability, and confidence ratings.

Rating	Reversibility	Irreplaceability	Confidence
Low	Permanent modification, no recovery possible.	No irreparable damage and the resource isn't scarce.	Judgement based on intuition.
Medium	Recovery possible with significant intervention.	Irreparable damage but is represented elsewhere.	Based on common sense and general knowledge
High	Recovery likely.	Irreparable damage and is not represented elsewhere.	Substantial data supports the assessment