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Pri.Sci.Nat # 400045/08

# BOTANICAL IMPACT ASSESSMENT OF PROPOSED DEVELOPMENT ON ERF 3122, HARTENBOS, WESTERN CAPE.

Compiled for: Strategic Environmental Focus (Pty) Ltd, Lynnwood Ridge

Client: ATKV, Randburg.

26 January 2016

**DECLARATION OF INDEPENDENCE**

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

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

NA Helme

**Abridged CV:**

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University of Cape Town, South Africa. BSc (Honours) – Botany (Ecology & Systematics). 1990.
SACNASP Registration No: 400045/08 (Pri.Sci.Nat)
BEE Level Four Contributor BE # 1915.

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

A selection of work undertaken over the last few years is as follows:

- Botanical assessment of Diemersfontein, Wellington (Guillaume Nel Consultants 2015)
- Ecological assessment of proposed Arcelor Mittal power station, Saldanha (ERM 2015)
- Ecological assessment of proposed Globeleq power station, Saldanha (ERM 2015)
- Botanical assessment of proposed iGas pipeline Saldanha – Ankerlig (CES/ EOH 2015)
- Botanical baseline of Communicare land, Morningstar (mlh architects 2015)
- Botanical assessment of proposed industrial development, Frankendale (Urban Dynamics 2015)

- Ecological assessment of proposed refurbishment of 11kV powerline from Kleinmond to Arabella, Western Cape (Landscape Dynamics 2015)
- Botanical walkdown study of new Eskom 132kV powerline Ankerlig – Sterrekus (EIMSA 2015)
- Botanical assessment of Remainder of Farm Rietfontein 244, Piketberg (Cederberg Environmental Assessment Practise 2014)
- Botanical assessment of Remainder of Farm Draaihoek 293, Vredendal (Cederberg Environmental Assessment Practise 2013)
- Botanical assessment of Farm Gideonsooord 303, Klawer (Cederberg Environmental Assessment Practise 2013)
- Botanical assessment of Farm Patrysberg 344/1, Citrusdal (Cederberg Environmental Assessment Practise 2013)
- Scoping study of Proposed Wind and Solar Energy Facility near Laingsburg (CSIR 2011)
- Scoping and Impact Assessment of Proposed Wind Energy Facility near Swellendam (CSIR 2010 & 2011)
- Basic Assessment of proposed new Eskom 66kV powerline on the Piketberg (ERM 2010)
- Scoping and Impact Assessment of proposed Wind Energy Facility near Gouda (Savannah Environmental 2010)
- Scoping and Impact Assessment for proposed development on Rheeboksfontein 142, Groot Brak (Sharples Environmental 2010)
- Scoping study of proposed Wind Energy Facility near Kwaggaskloof dam, Worcester (DJ Environmental 2009)
- Scoping and Impact Assessment of proposed Wind Energy Facility near Hopefield (Savannah Environmental 2008 & 2009)
- Assessment of proposed Buffelsfontein sand mine, Albertinia (Tiptrans Resources 2009)
- Botanical Assessment of proposed Eskom Gourikwa – Proteus transmission lines (Savannah Environmental 2008)
- Assessment of proposed new cultivation area on Tandfontein farm, Koue Bokkeveld (Cederberg Environmental Consultancy 2008)
- Botanical Assessment for Eskom powerline Swellendam – Riviersonderend (SHE Cape 2006)
- Scoping and Impact Assessment of Eskom OCGT Mossel Bay site and powerline to Proteus substation (Ninham Shand 2005)

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## 1. INTRODUCTION

This botanical impact assessment was commissioned in order to help inform the environmental authorisation process being followed for a proposed residential development on Erf 3122, in the Hartenbos Heuwels area north of Mossel Bay. The total property is about 60.5ha in extent. Three development layouts were provided for assessment, as per Figures 1-3, with Alternative 3 being the latest layout, developed in response to the recommendations of a wetland baseline study (Lubbe 2014). In Alternative 3 undeveloped land (Special Zone: Conservation) makes up 31.4ha, or 52% of the total site. The most recent botanical baseline study was undertaken in 2012 (Helme 2012).

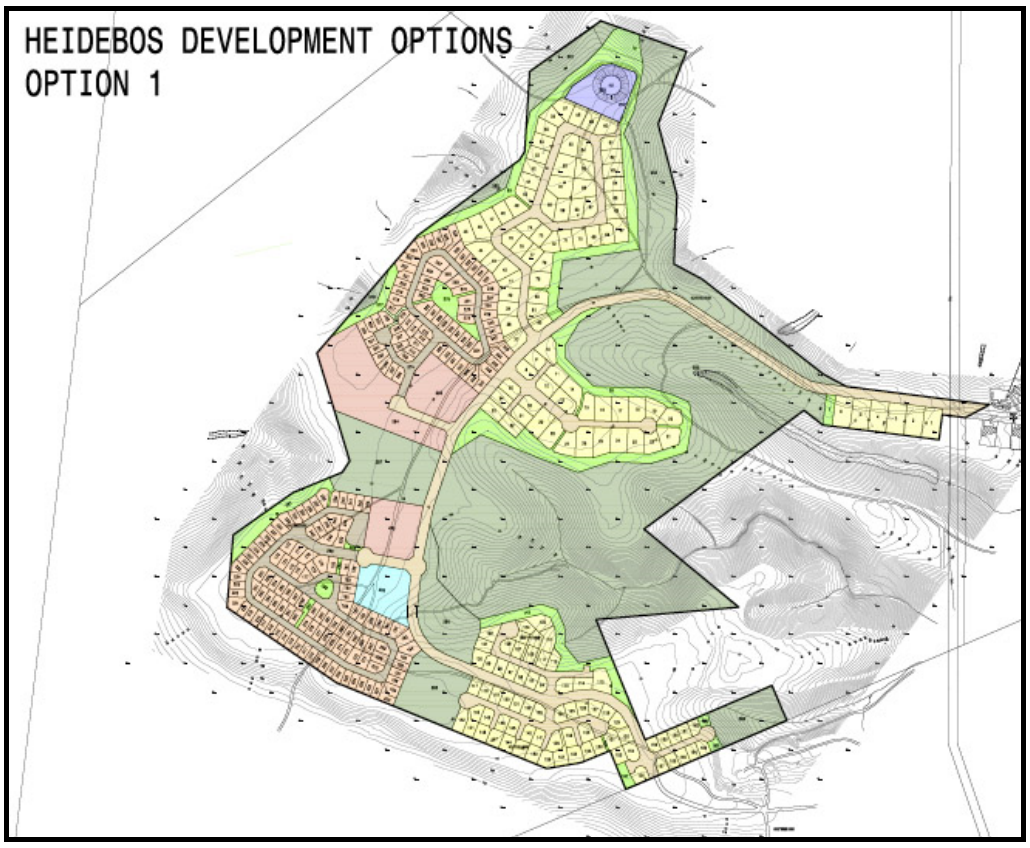


**Figure 1:** Alternative 1 development layout.

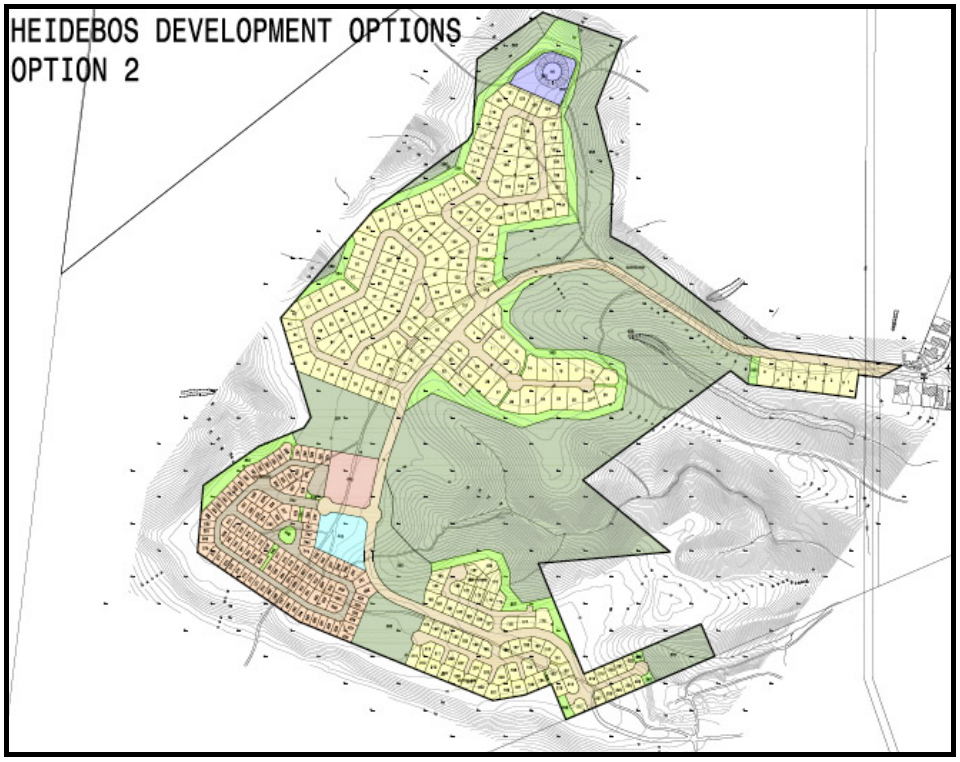


**Figure 2:** Alternative 2 development layout.

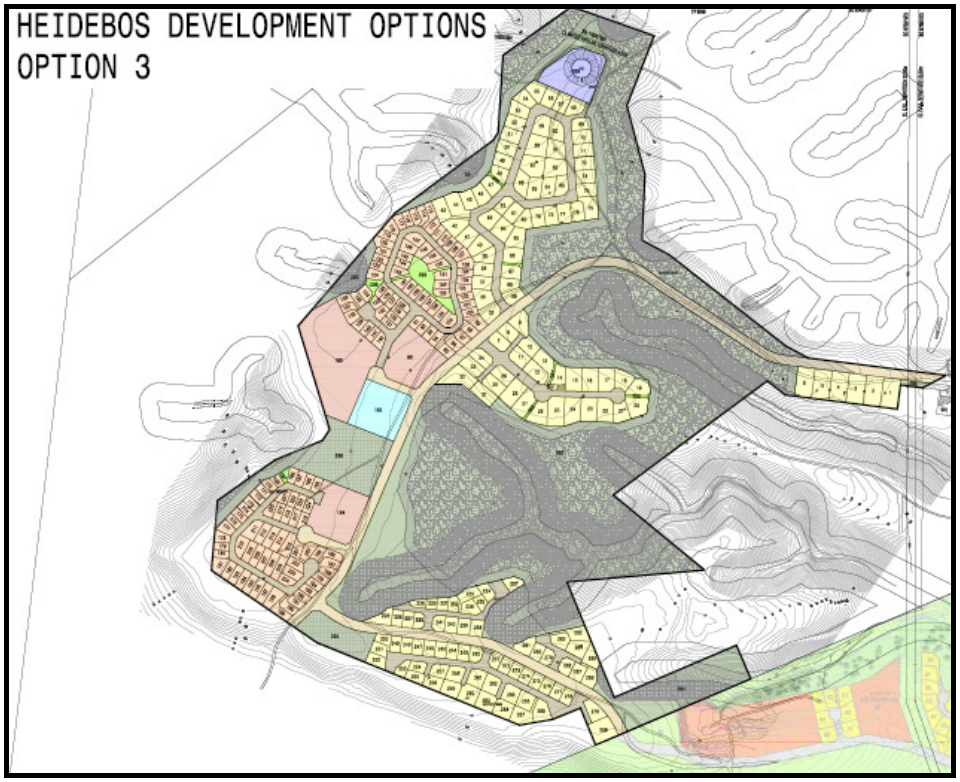


**Figure 3:** Alternative 3 development layout.

## 2. TERMS OF REFERENCE

The terms of reference for this study were as follows:

- Update the findings of botanical assessments previously compiled by Nick Helme (2012) and Dave McDonald (2006) in terms of the following aspects:
    - Description and mapping of the broad vegetation communities identified during the field survey and their ecological connectivity;
    - Mapping of the sensitivity of the plant communities;
    - List of plant species identified during the field survey;
    - List of threatened, rare or protected plant species found on the site as well as those that are likely to occur;
    - Map(s) indicating the locality of confirmed populations and/or suitable habitat of threatened, rare or protected plants;
- Conduct an impact assessment specifically relating to the latest proposed layout plan (Alternative 3) and provide site specific mitigation measures to minimise the impacts on the natural environment during and after construction.
- Propose a botanical offset plan and identify a suitable offset site as part of the mitigation measures.
- Comply with the DEA&DP Guideline for Involving Biodiversity Specialists in the EIA Process (June 2005), with specific reference to the guidelines for specialist biodiversity input in the impact assessment stage of the EIA.

## 3. LIMITATIONS, ASSUMPTIONS AND METHODOLOGY

A site visit was undertaken on 1 and 2 June 2012, with a follow up visit in early January 2016. The author drove all tracks on Erf 3122, and walked transects across representative portions of the erf. Various adjacent areas were also examined during all surveys, including the Remainder of Portion 4 of Farm 217 (until recently also owned by the ATKV, but the lower portion of which has now been approved for development). The study area excluded various areas that were assessed by McDonald (2007) in his botanical study. All identifiable plant species were noted, and digital photographs of certain plants and various features were taken. Voucher specimens of significant plant species were made, and have been lodged in the Compton Herbarium at Kirstenbosch. GPS coordinates were taken at various points and were used together with habitat notes to groundtruth and interpret the available satellite imagery on Google Earth, the most recent of which is dated September 2013.

Although only a portion of the plant species were flowering at the time of the various site visits most species were identifiable. Various geophytes (bulbs) and annuals that are likely to be present were either unidentifiable or not observed, as many of these flower mainly in the spring season (August to October). A number of these unrecorded species may be Species of Conservation Concern. However, sufficient detail was evident to be able to assess the overall conservation value and plant community composition of the site, and confidence in the accuracy of the botanical findings is high.

Reference was made to the GIS based database of rare plant localities maintained by CREW (Custodians of Rare and Endangered Wildflowers, based at Kirstenbosch), to the Red List of South African plants (Raimondo *et al* 2009) and its annual online updates at redlist.sanbi.org, and to various other references noted in the following sections.

Wetland and faunal assessments of the site were conducted by Lubbe (2014) and Van der Walt (2013) and these aspects are thus not directly addressed in the current report. The layouts as shown in Figures 1- 3 are assumed to be accurate representations of final footprints. No bulk service layouts were provided, and it is thus assumed that all bulk service pipelines (water, sewerage) will be located within the designated road reserves. No extents (hectares) of total development footprint were provided for Alternatives 1 and 2.

Conservation value of habitats are a product of species diversity, plant community composition, rarity of habitat, degree of habitat degradation, rarity of species, ecological viability and connectivity, vulnerability to impacts, and reversibility of threats.

## 4. STUDY AREA AND REGIONAL CONTEXT

The site is mapped as part of the Southern Fynbos bioregion (Mucina & Rutherford 2012), and is part of the Fynbos biome, located within what is now known as the Core Region of the Greater Cape Floristic Region (GCFR; Manning & Goldblatt 2012). The GCFR is one of only six Floristic Regions in the world, and is the only one largely confined to a single country (the Succulent Karoo component extends into southern Namibia). It is also by far the smallest floristic region, occupying only 0.2% of the world's land surface, and supporting about 11500 plant species, over half of all the plant species in South Africa (on 12% of the land area). At least 70% of all the species in the Cape region do not occur

elsewhere, and many have very small home ranges (these are known as narrow endemics). Many of the lowland habitats are under pressure from agriculture, urbanisation and alien plants, and thus many of the range restricted species are also under severe threat of extinction, as habitat is reduced to extremely small fragments. Data from the nationwide plant Red Listing process undertaken is that 67% of the threatened plant species in the country occur only in the southwestern Cape, and these total over 1800 species (Raimondo *et al* 2009)! It should thus be clear that the southwestern Cape is a major national and global conservation priority, and is quite unlike anywhere else in the country in terms of the number of threatened plant species.

The original natural vegetation on the site is best classified as Mossel Bay Shale Renosterveld in terms of the SA Vegetation map categories (Mucina & Rutherford 2012). However, the SA Vegetation map is very inaccurate in this particular area and the actual map indicates that Great Brak Dune Strandveld is the vegetation type on site (Mucina & Rutherford 2012), which is clearly incorrect, as this is a thicket vegetation type restricted to coastal sands (which are not present in the study area). No extract of the SA vegetation map is thus included in the current report.

Mossel Bay Shale Renosterveld is listed as Endangered in terms of the national list of Threatened Terrestrial Ecosystems (DEA 2011), as only 49% of its original extent remains and the unit has a national conservation target of 36% of its original extent, with nothing (0%) formally protected (Rouget *et al* 2004). The vegetation type is thus very poorly conserved and is often vulnerable to further loss, usually to agriculture, quarrying, and residential development (Rouget *et al* 2004).

The Fine Scale Vegetation Map for the Riversdale Plain (Vlok & de Villiers 2007) shows that the primary vegetation type in the study area is Brandwag Fynbos Renoster Thicket (see Figure 4). This classification reflects the complex, composite nature of the vegetation in this unit – with Fynbos, Renosterveld and Thicket elements. PetroSA Fynbos Renosterveld is not in fact present on site, contrary to what was stated by McDonald (2007), and this unit occurs just to the west of Portion 4 (see Figure 2).

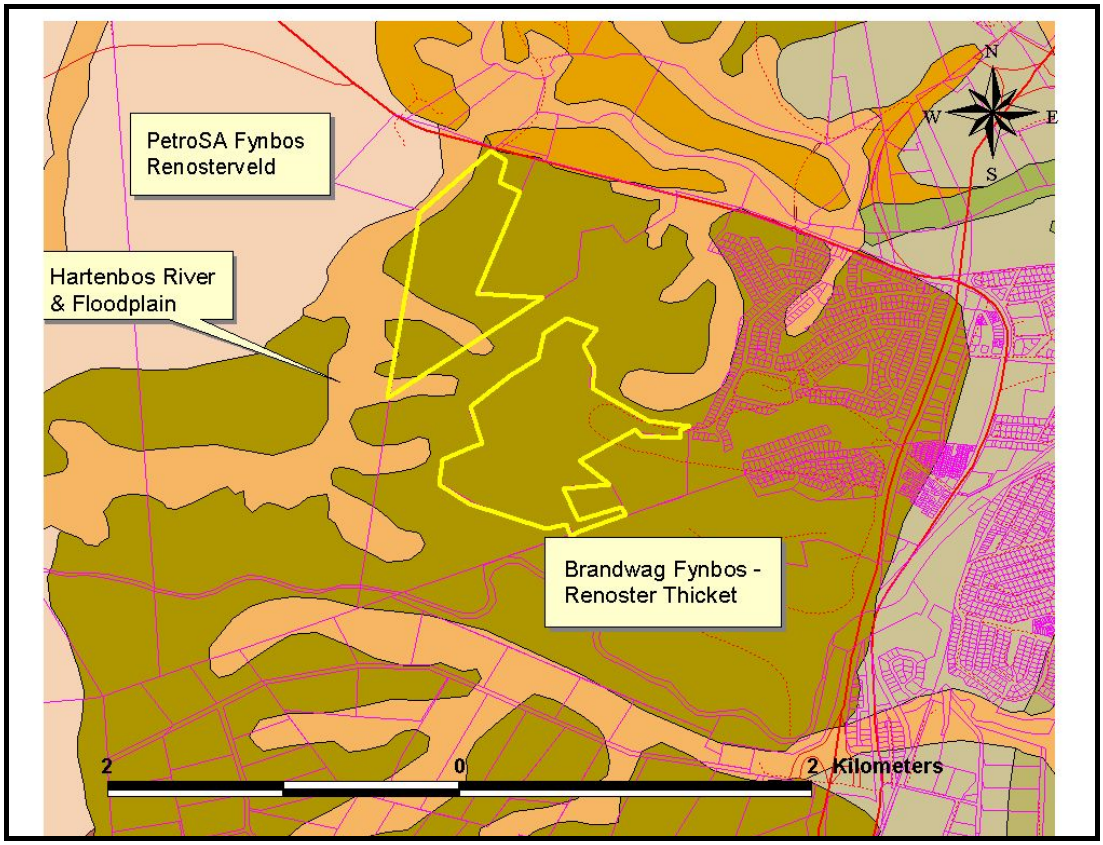


**Figure 4:** Extract of the Fine Scale Vegetation Map for the Riversdale Plain (Vlok & de Villiers 2007), showing the two Helme (2012) study area properties (yellow outline). Brandwag Fynbos Renoster Thicket is the primary vegetation type within the study areas, and the only vegetation unit in the proposed development area here assessed.

The Fine Scale Conservation Plan for the Riversdale Plain (Pence 2008) indicates that most of Erf 3122 is a designated terrestrial Critical Biodiversity Area (CBA; see Figure 5). This is a curious pattern, and in my opinion the CBA mapping in the immediate vicinity of the study area is not always reflective of the true situation on the ground, and this can be attributed to a lack of rare plant point data, incorrect landuse categorisation (misinterpretation of satellite imagery), and in some cases rapid changes in landuse since the Fine Scale Planning was undertaken. I thus believe that the CBA mapping in this area is not at all accurate, and prefer to use my own sensitivity mapping, which is based on real groundtruthing and observed patterns, as discussed in the following sections.

The soils on Erf 3122 are sandy loams, with the underlying geology being Enon conglomerate. This characteristic formation consists of numerous rounded sandstone pebbles and stones, supported in a matrix of silt, clay and loamy sand, and was originally formed by river deposition. Most of the site (about 80%) was

burned in a wildfire in about 2009, judging by historical imagery on Google Earth, and by vegetation patterns on site today. The unburnt vegetation is likely to be at least 20 years old.

It should be noted that the current study area (Erf 3122) was only a portion of the study area defined in the McDonald vegetation report of 2007.

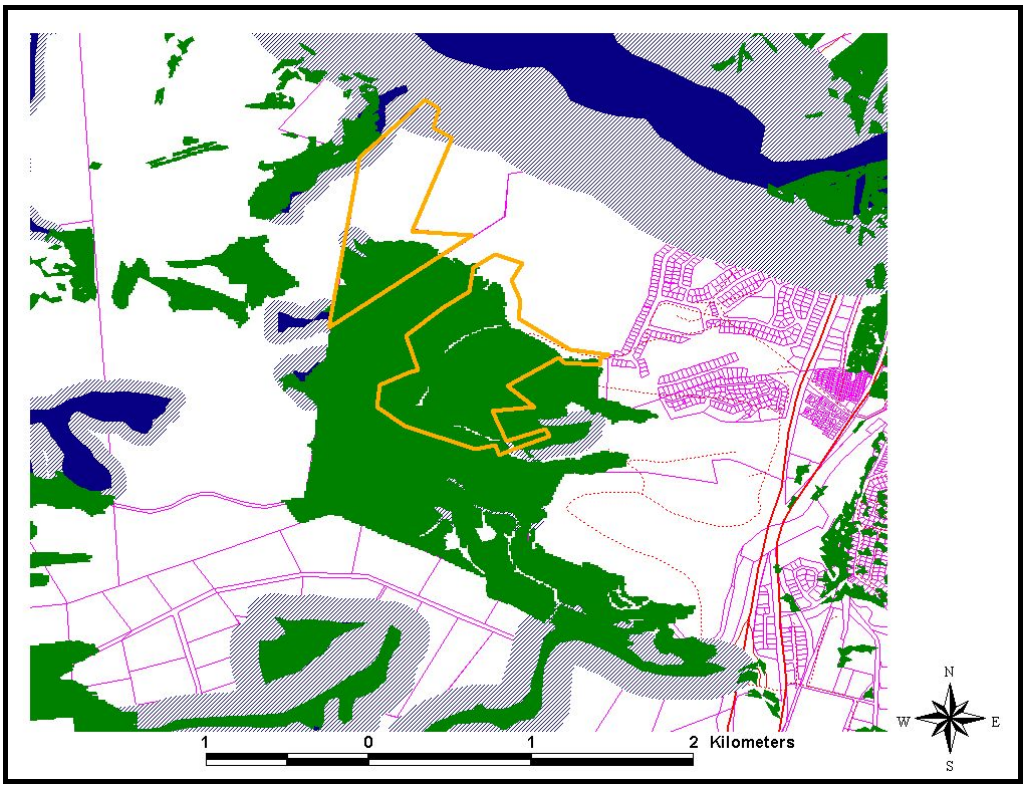


**Figure 5:** Extract of Fine Scale Conservation Plan for the Riversdale Plain (Pence 2008), showing that most of Erf 3122 is a designated terrestrial Critical Biodiversity Area (green shading). Study area (Helme 2012) erven with mustard yellow outlines.

## 5. OVERVIEW OF THE VEGETATION

The vegetation on Erf 3122 might at first glance be mistaken for an undisturbed habitat, but on closer examination there is ample evidence to suggest that about two thirds of the site has been previously disturbed, and that these portions thus support secondary vegetation, being the result of passive (natural) rehabilitation since the cessation of soil disturbance, which is estimated to have been at least forty years ago.

The main plateau is very flat, and the break of slope is very often indicated by a ridge of soil that corresponds to the edge of previous soil disturbance (either

ripping or ploughing). This low ridge is clearly visible on satellite imagery taken just after the fire in 2009, and is also clearly visible on site (see Plate 1). Also clearly visible on the satellite imagery from 2009 are the parallel lines made by ploughing or ripping (Plate 2).

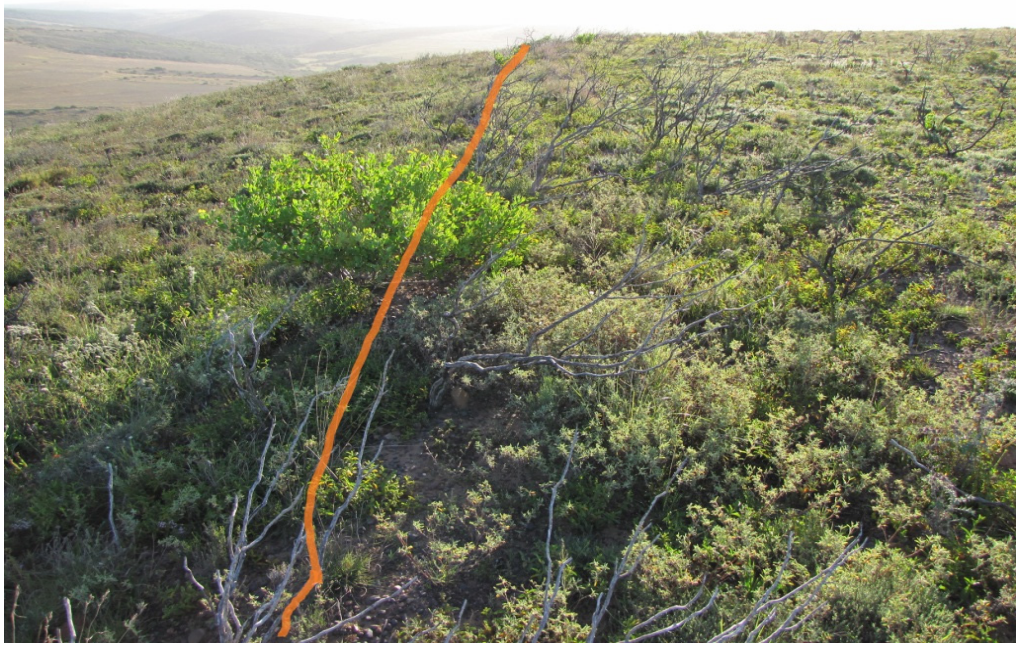

**Plate 1**: The plateau area to the right of the orange line was previously disturbed, perhaps by cultivation, whereas the area to the left has never been cultivated. The burnt sticks are skeletons of *Elytropappus rhinocerotis* (renosterbos), killed in the fire in 2009. View looking west from southwest corner of erf. Bare soil in the middle foreground is part of the ridge marking the edge of previous disturbance.

The soil surface in the disturbed areas is also noticeably different from that in undisturbed areas, being flatter, harder, more homogeneous, and often with numerous small or large stones – all features of an area that were previously cultivated (pers. obs.). The 1: 50 000 topographic map for the area also shows that this area was previously cultivated.


**Plate 2:** Satellite imagery from January 2010 (after the fire), showing a portion of the southwestern corner of the site. The yellow line is the site boundary, and the soil scarification marks within the site are clearly visible, indicating the extent of previous soil disturbance.

The vegetation within the previously disturbed areas is also characteristically different from that found in the undisturbed areas. Firstly, species diversity is significantly lower, being about 15-30% of that which one finds in the undisturbed areas. Secondly, the disturbed areas are heavily dominated by a few species (Plate 3), such as *Elytropappus rhinocerotis* (renosterbos), *Hyparrhenia hirta* (thatching grass), *Falkia repens, Selago glutinosa, Hermmannia saccifera* and *Hermannia lavandulifolia*, all of which are typical indicators of disturbance (pers. obs.). Thirdly, plant community composition is very different, with very few succulents or bulbs in the disturbed areas (these are common in undisturbed areas), and an almost total absence of large woody shrubs such as *Searsia, Euclea* and *Diospyros*, all of which are common in the undisturbed areas. No rare or threatened plant species were found in significant numbers within the disturbed areas.

Additional indigenous species noted in the disturbed areas include *Eragrostis curvula* (lovegrass; possibly originally planted as grazing), *Aristida junciformis* (steekgras), *Cynodon dactylon* (kweekgras, possibly planted for grazing), *Berkheya* sp., *Chrysocoma ciliata* (bitterbos), *Searsia pallens, Hypoxis sp., Bulbine frutescens, Crassula fasicularis, Oedera genistiifolia, Arctotheca calendula, Eriocephalus africanus* (kapokbos), *Ruschia lineolata, Gnidia* sp., *Tephrosia capensis, Metalasia acuta, Ursinia discolor, Senecio burchellii* (hongerblom), *Chrysanthemoides monilifera* (bietou), *Crossyne guttata, Stachys*

*aethiopica, Themeda triandra* (rooigras), *Muraltia ononidifolia, Oxalis pers caprae* (geelsuuring), *Chaenostoma africana* and *Lepidium africanum*.

Woody alien invasive vegetation is largely absent, apart from a few notable patches of *Hakea sericea* (silky hakea), *Acacia mearnsii* (black wattle) and *Acacia saligna* (Port Jackson). These patches (see Figure 6) can and should be removed by trained personnel as soon as possible in order to prevent their spread, whilst it is still cost effective. It should be noted that the *Hakea* was found to be significantly larger and more extensive in 2016 than it was in 2012, and has already set extensive seed, and there has not been any mechanical control of this very invasive species. *Plantago lanceolata* is the commonest alien herb on site, and the alien *Pennisetum clandestinum* (kikuyu grass) is associated with disturbed areas where illegal garden refuse dumping has occurred.

About 67% of Erf 3122 (40ha) has experienced some form of soil disturbance, either by ripping, dumping or cultivation, and the remainder is considered to be pristine, in that no soil disturbance has occurred. This is shown graphically in Figure 6.

**Plate 3**: View of plateau area south of reservoir, looking south, showing homogenous soil surface, lack of plant diversity, and dominance of *Falkia repens* and *Hermannia lavandulifolia*, all features consistent with previous cultivation. This area was burnt in 2009.

**Plate 3b:** View of much the same area (looking south) in January 2016, showing taller vegetation which has grown since the fire in 2009. Renosterbos (*Elytropappus rhinocerotis*) is now dominant.

**Plate 4**: View of unburnt area on site heavily dominated by the woody shrubs *Elytropappus rhinocerotis* (renosterbos) and *Oedera genistiifolia*. This dominance of a few species is typical of previously cultivated areas that have rehabilitated passively.

**Plate 5**: Closeup view of previously cultivated area in 2012, showing typical hard, flat soil surface, and low plant diversity with *Falkia repens, Hermannia saccifera* and *Hyparrhenia hirta* (thatching grass) prominent.

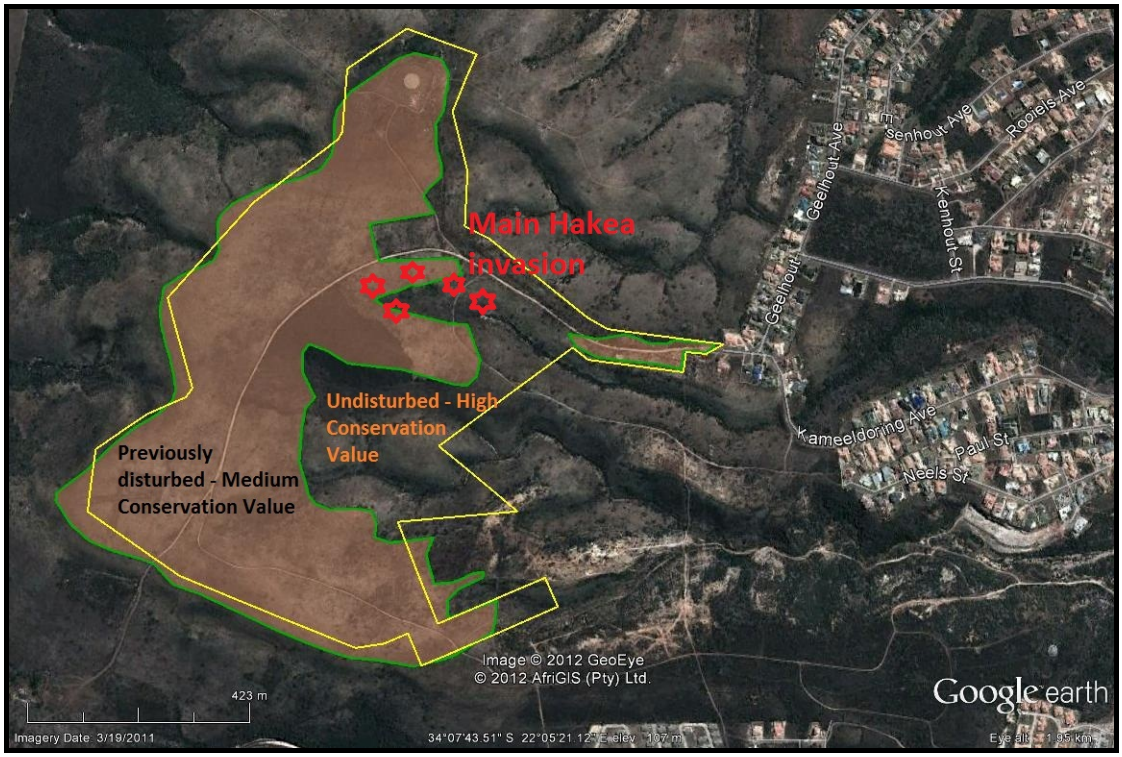


**Figure 6:** Map of Erf 3122 showing the property boundary (yellow outline) and previously disturbed areas (green boundary with brown shading). Undisturbed areas within the erf are unshaded, and are of High conservation value. Previously disturbed areas are usually of Medium conservation value, as some passive rehabilitation has occurred. The main area of *Hakea sericea* invasion is also shown in this map (red stars).

**Undisturbed Areas**

The vegetation in the undisturbed areas is species rich, with a diversity of life forms. Species noted (in addition to most of those found in the disturbed areas) include *Bobartia robusta, Babiana* sp*., Aspalathus acuminata, Aspalathus* sp*., Othonna auriculifolia, Metalasia pungens, Metalasia acuta, Glottiphyllum depressum, Hibiscus* sp*., Beryheya armata, Commelina africana, Gerbera tomentosa, Euphorbia procumbens, Pteronia hirsuta, Polygala pubiflora, Gazania krebsiana, Eriospermum pubescens, Athanasia quinquedentata, Ursinia discolor, Corymbium africanum, Montinia caryophyllacea* (klappers), *Scabiosa columbaria, Crassula tetragona*, *Helichrysum teretifolium, Barleria pungens, Blepharis capensis, Brachiaria serrata* (velvet grass), *Anthospermum galiodes*, *Lobostemon fruticosus, Trichodiadema barbatum, Delosperma* sp*., Acrodon bellidiformis, Restio helenae, R. capensis, Satyrium membranaceum*, *Tritoniopsis antholyza, Erica peltata, Haemanthus coccineus* (poeierkwas), *Conyza scabrida, Tulbaghia capensis, Polygala myrtifolia, Wahlenbergia sp*. and *Lobelia coronopifolia*.

## 5.1 Plant Species of Conservation Concern

No rare or localised plant species were recorded on Erf 3122, but this does not mean that none are present, and there is deemed to be a medium to high likelihood that a few such species are in fact present on site, most likely within the undisturbed parts of the site. The likelihood of there being any such species within the proposed development footprint is low.

Mossel Bay Shale Renosterveld is known to support a number of rare and threatened *Haworthia* species (Bayer 1999; Mucina & Rutherford 2006), and these small, highly cryptic succulent plants could well be present on the undisturbed parts of Erf 3122. *Ruschia leptocalyx* (Plate 6) is a rare succulent Red Listed as Endangered (Raimondo *et al* 2009), and was recorded along the edges of thicket patches some 1km north of the study area, but is not present on site (see Plate 6). A still unidentified *Lotononi*s (Fabaceae) was also recorded just north of the study area, and may prove to be a localised, undescribed species (Dr. S. Boatwright – pers. comm.). *Ruellia pilosa* is a regional endemic (Swellendam to Mossel Bay) and is Red Listed as Vulnerable (Raimondo *et al* 2009), and may be present in low numbers on the undisturbed parts of the site.

**Plate 6**: *Ruschia leptocalyx* is a rare vygie only known from 5 localities in the southern Cape, and is Red Listed as Endangered, and was recorded in low numbers some 1km north of the study area.

### 5.2 Habitat Conservation Value ("Sensitivity")

The previously disturbed parts of Erf 3122 (about 40ha; 67% of the site) have a Medium regional conservation value or "sensitivity" (see Figure 6). These parts of the site correspond well to the flatter ground that was cultivated or worked in some way, probably more than 40 years ago. The vegetation currently present on these areas is all thus the result of passive rehabilitation since the cessation of soil disturbance, which accounts for the lack of species and life form diversity. Even though most of this area is a designated Critical Biodiversity Area (CBA; see Figure 5) I do not believe that this part of the site is essential for achieving regional conservation targets for process or pattern, and its loss would not have more than a Medium negative ecological impact at a regional scale. It is likely that the area was selected as a CBA based on the mistaken assumption (based on satellite imagery) that the vegetation in the area was largely undisturbed. I believe this part of the site offers significant potential for responsible development, provided that it is accompanied by guaranteed ecological management of the High conservation value areas on Erf 3122, and possibly also of additional surrounding areas of High conservation value.

The undisturbed parts of Erf 3122 support viable patches of Mossel Bay Shale Renosterveld, which is an Endangered vegetation type (DEA 2011), and the remaining portions are needed to help achieve regional conservation targets for both process and pattern. These areas have a High local and regional conservation value (Figure 6), and should be buffered from any development by

at least 15m, to help avoid insidious edge effects, such as invasion by alien grasses, and to allow for the development of a maintained firebreak around all development.

### 5.3 Ecological Drivers

**Fire** is acknowledged to be one of the primary drivers of Fynbos ecosystem dynamics, including within Renosterveld (de Villiers *et al* 2005). The vegetation on Erf 3122 does not include any Thicket elements that will not burn, and thus all the vegetation currently on Erf 3122 would benefit from fire once every 12 to 15 years. Most of the study area burned most recently in 2009. In the absence of fire for longer than 15 years the vegetation is likely to become senescent, meaning increased woodiness, lack of flowering opportunities for smaller, faster growing species, and general suboptimal ecological dynamics. The increased fuel load that develops over a long period also makes the risk of a runaway wildfire much higher.

Soil moisture and soil type do not seem to vary significantly across the site, although there are small drainage lines in the east that have slightly higher soil moisture levels than the rest of the site.

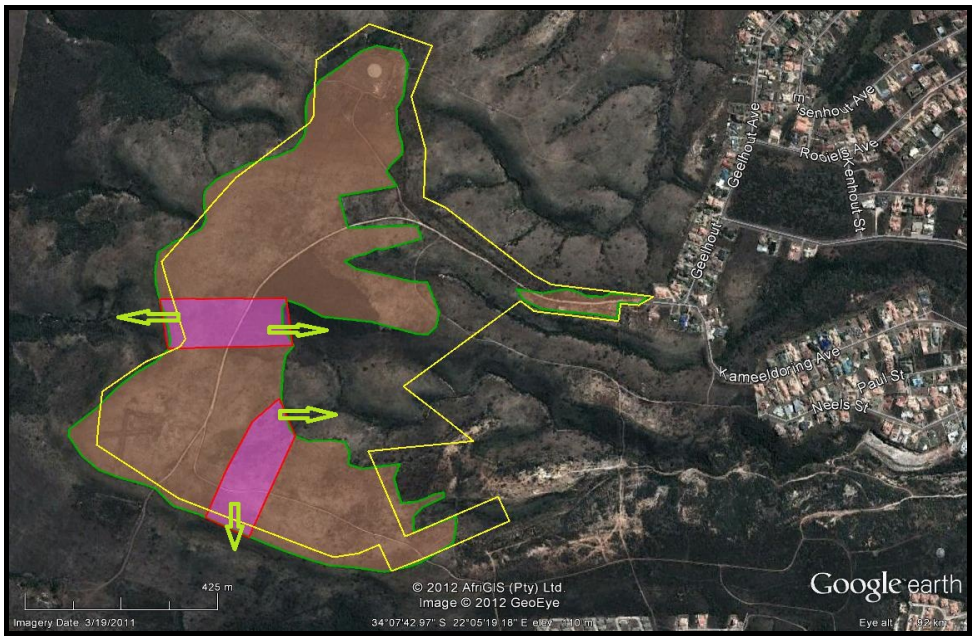


**Figure 7:** Map showing the position and minimum width of the two proposed ecological corridors (pink shading, with arrows) across the plateau on Erf 3122.

**Ecological connectivity** is important for the maintenance of ecological integrity in all natural habitats (de Villiers *et al* 2005), and on this site the High sensitivity

areas east and west of the Medium sensitivity areas should ideally be connected by at least two ecological corridors across the plateau, that are each at least 100m wide (the wider the better). The suggested position of these two corridors is shown in Figure 7, the northern one being the point where the length of the corridor is minimised. A single access road (plus buried bulk services) may cross the corridors, but no other infrastructure should intrude on these corridors.

## 6. ISSUES IDENTIFIED

In terms of the construction of residential development on about 50% of the site the following negative ecological issues have been identified:

- Direct loss and disturbance of about 50ha of Medium and High sensitivity portions of an Endangered vegetation type. This would occur mainly at the construction phase. More than 90% of the development would be in the Medium sensitivity area, and less than 10% in the High sensitivity area.
- Indirect ecological impacts will occur from construction onwards, and will extend into the operational phase, and include fragmentation of natural habitat, loss of current ecological connectivity, disruption of optimal fire regime, and edge effects such as increased ease of alien plant invasion, plus likely invasion of adjacent veld by alien Argentine ants and their associated negative impacts on seed dispersal by indigenous ants.

Positive ecological impacts could be associated with development on the appropriate lower sensitivity portions of Erf 3122, namely the:

- Opportunity to formally conserve most of the High sensitivity habitat on Erf 3122.
- Opportunity to formally conserve additional High sensitivity areas around or near the site, as possible biodiversity offset commitments.
- Opportunity to fund and implement an Operational Environmental Management Plan (OEMP) throughout the remaining natural portions of the site, focussing on alien vegetation control and fire management.

## 8. IMPACT ASSESSMENT

Botanical impacts may be both direct and indirect, with the former occurring mostly at the construction stage and the latter mostly at the operational stage. Direct impacts will be both permanent (>15 years) and short term (<5 years).

In the case of this project the primary construction phase impact is loss and degradation of natural vegetation (mostly of Medium sensitivity) within the site development footprint (likely to be about 47% of the site (28.4ha).

Indirect botanical impacts are most likely to take place during the operational phase, but would commence during the construction phase, and would include habitat fragmentation and loss of current ecological connectivity across the site, the facilitated spread of alien invasive vegetation (typically associated with soil disturbance), introduction of alien invasive Argentine ants and disruption of some seed dispersal, and the disruption or altering of natural fire regime in this fire driven habitat.

### 8.1 Construction Phase Botanical Impacts

About 28.4ha of natural vegetation will be permanently lost during construction on this site (Alternative 3), all of it in Mossel Bay Shale Renosterveld, an Endangered vegetation type. This is the primary construction phase impact, and although it will be of High magnitude (total disruption of ecological processes and pattern in the footprint area) and the extent is relatively large (28ha, or 47% of the site), the overall significance of this impact is reduced by the fact that more than 90% of the loss will occur in previously disturbed areas of Medium botanical sensitivity, and less than 10% will be in High sensitivity areas. Furthermore, no plant Species of Conservation Concern (SCC) have been recorded from within the development footprint. Overall the construction phase impact for Alternative 3 is thus likely to be Medium – High negative, before mitigation, and Medium negative after mitigation.

The construction phase botanical impacts for Alternatives 1 and 2 will be essentially the same, Medium – High negative, before mitigation, and potentially Medium negative after mitigation. The total development footprint is largely identical in all three alternatives, from a botanical perspective, although exact figures for these alternatives are not available.

In addition to the permanent impacts there is likely to be some temporary loss and disturbance to natural vegetation bordering the development, including for the installation of roads, and bulk water and sewer pipelines. Much of this impact is likely to be classified as temporary damage (reversible over 5yrs), as the surrounding natural vegetation should facilitate fairly good passive rehabilitation, and the significance of this is Low to Medium negative.

Most of the development area is a designated Critical Biodiversity Area (CBA) in terms of the Riversdale Plain FSP (Pence 2008; see Figure 5). Loss of any CBA normally means that all other remaining areas of natural vegetation then assume an elevated conservation importance, and best practise is to avoid loss of CBAs, where possible. Loss of natural vegetation within CBAs is usually regarded as having a High negative impact (Maree & Vromans 2010). However, as noted in the current report, I believe that the CBA mapping is fundamentally flawed in this area, as the disturbed parts of the site should not be a CBA, and consequently this loss is of a Low negative impact before mitigation.

The primary mitigation for the direct impacts centre around strict controls on limiting the extent of the disturbance to the approved development area, which will be overseen by an ECO, in accordance with a CEMP.

| **Alternative** | **Extent of impact** | **Duration of impact** | **Intensity** | **Probability of occurrence** | **Degree of confidence** | **Significance before mitigation** | **Significance after mitigation** |
|---|---|---|---|---|---|---|---|
| 1 | Local | Permanent & temporary | High | Definite | High | Medium to High -ve | Medium -ve |
| 2 | Local | Permanent & temporary | High | Definite | High | Medium to High -ve | Medium -ve |
| 3 | Local | Permanent & temporary | High | Definite | High | Medium to High -ve | Medium -ve |
| No Go | Local | Unknown and variable | Probably very low | Medium | Medium to High | Neutral | Neutral |

**Table 1:** Summary table for construction phase botanical impacts associated with the proposed development alternatives. The primary construction phase botanical impact is loss of mostly previously disturbed but Endangered natural vegetation in the 47ha total development footprint.

### 8.2 Operational Phase Botanical Impacts

Loss of ecological connectivity (and associated habitat fragmentation) in this area as a result of the development of about 47% of the site is likely to be an issue, although the deliberate inclusion of two 100m wide ecological corridors (as suggested by Helme 2012) will help reduce the impact, along with the inclusion of

the remaining open space that largely surrounds the development area. The proposed development is thus not likely to completely sever any major existing ecological corridors in any direction, and the significance of this potential impact is deemed to be Low - Medium negative (all alternatives). No further mitigation is possible for this impact.

The soil disturbance associated with construction will provide ideal conditions for the germination and establishment of various alien invasive species, some of which are already present on site, implying that there is likely to be an existing seedbank. This impact (Low – Medium negative, all alternatives) can however be easily managed and mitigated, and could be reduced to Neutral by ongoing alien invasive vegetation control, which would have to be undertaken by a HoA (Homeowners Association) or similar, whomever is tasked with managing this site.

Loss of portions of populations of plant Species of Conservation Concern and consequent reductions in viability of regional populations of these species is not likely to be a factor on this site, as no SCC are likely to be lost on site. Overall significance of this is thus Neutral.

Another, rarely considered impact when locating units in Fynbos systems, is the negative impact of alien invasive Argentine ants (*Linepithema humile*; de Villiers et al 2005). These common, invasive ants are strongly associated with human dwellings and refuse, and may forage up to 50m away from their nests. These ants are very aggressive, and displace most of the existing indigenous ants, with severe negative impacts on seed dispersal for those 30% of species whose seed is solely dispersed and buried by indigenous ants. The alien ants do not bury the seed, but instead leave it on the ground, where rodents are certain to eat and destroy it. The likely impact is Low - Medium negative over time, and cannot be easily mitigated, other than by making sure that there is minimal refuse or food waste stored on site (other than in the houses).

Perhaps the most critical operational phase issue relates to fire. The vegetation type on site is a fire driven vegetation type (de Villiers *et al* 2005), and fires are both a regular and essential feature for optimal ecological functioning. It is almost certain than the owners and managers will attempt to control any wildfires to limit damage to infrastructure (Pool & Van Zyl 2011), and this may have a negative impact on the vegetation in the area, which may be deprived of the fire

it needs for optimal ecological functioning. The fire management plan for the site (Pool & Van Zyl 2011) recommends deliberate ecological burns of the Renosterveld once every 12 years, and I would support this, along with their recommendation to remove all alien invasive vegetation on a regular basis, and to burn all areas not burned in 2009 prior to the start of any development on site. The extent of the likely future fire suppression on site is unknown, but may only extend to within about ten metres from the units and infrastructure. It would be very wise to brushcut the vegetation within ten metres of all units anyway, simply to reduce the fuel load and reduce the risk of property loss in the event of a runaway wildfire, and it is this assumed that this will be the case (this would be the 10m wide firebreak around the development recommended in the fire plan of Pool & Van Zyl 2011). The botanical impact of this brushcutting is likely to be Low negative, and this is assumed to be the post mitigation scenario. In the unlikely event that fire is suppressed in the entire study area this would have a Medium negative botanical impact.

| **Alternative** | **Extent of impact** | **Duration of impact** | **Intensity** | **Probability of occurrence** | **Degree of confidence** | **Significance before mitigation** | **Significance after mitigation** |
|---|---|---|---|---|---|---|---|
| 1 | Local | Temporary, long term and permanent | Medium | Very likely | High | Low to Medium -ve | Low to Medium -ve |
| 2 | Local | Temporary, long term and permanent | Medium | Very likely | High | Low to Medium -ve | Low to Medium -ve |
| 3 | Local | Temporary, long term and permanent | Medium | Very likely | High | Low to Medium -ve | Low to Medium -ve |
| No Go | Local | Probably ongoing | Probably low to moderate | Medium | Medium | Very Low negative | Very Low negative |

**Table 2:** Summary table for operational phase botanical impacts associated with proposed development. The primary indirect botanical impact would be the partial loss of current ecological connectivity across the site, slightly offset by the potential removal of all invasive alien vegetation on site.

There is little difference between the development alternatives in terms of likely operational phase impacts, as all three incorporate the two 100m wide ecological corridors.

### 8.3 Overall botanical impacts

Table 3 shows that there are no clearly preferred development alternatives from a botanical perspective, with botanical impacts for all alternatives likely to be of **Medium to High negative significance before mitigation and of Medium negative significance after mitigation.** Note that this significance post mitigation does not include the positive impact of any potential biodiversity offsets, which could reduce the negative impacts even further.

The primary issues driving the negative impacts for all alternatives are construction phase loss and degradation of about 27ha of Endangered habitat, and the operational phase impacts relating to habitat fragmentation, disruption of natural fire regime, and likely introduction of alien invasive ants and associated likely disruption of ant associated seed dispersal.

### 8.4 The No Go Alternative

The No Go alternative (continuation of the *status quo*) is likely to have a Low negative botanical impact in the long term, driven mainly by unmanaged increases in alien plant density. The No Go alternative would be the preferred alternative from a botanical perspective, as it would not involve any habitat loss or disturbance.

| **Alternative** | **Significance before mitigation** | **Significance after mitigation** |
|---|---|---|
| 1 | Medium to High -ve | Medium -ve |
| 2 | Medium to High -ve | Medium -ve |
| 3 | Medium to High -ve | Medium -ve |
| No Go | Low negative | Low negative |

**Table 3:** Overall summary table of botanical impacts

### 8.5 Cumulative Impacts

The cumulative botanical impacts are in many ways equivalent to the regional botanical impacts, in that the vegetation type to be impacted by the proposed development has been, and will continue to be, impacted by numerous agricultural and urban developments and ongoing alien invasive vegetation (the cumulative impacts) within the region.

The overall cumulative botanical impact of the proposed development at the regional scale is likely to be Low to Medium negative, before and after mitigation, mainly because very little undisturbed vegetation (but of an Endangered vegetation type) is likely to be lost to development (<10% of the development footprint).

### 8.6 Positive Impacts

No positive botanical impacts are expected in the absence of some form of mitigation.

If the undeveloped part of the site (about 50% of the area) is properly cleared of all invasive alien vegetation within one year of any project authorisation, and then kept clear, and if the natural areas are formally conserved, and managed according to an EMP drawn up with professional botanical input, then this would be an important positive impact that would help offset the negative botanical impacts of the proposed development.

Positive impacts could be further enhanced by the implementation of some sort of biodiversity offset, whereby additional conservation worthy natural vegetation in the surrounding area is formally conserved as part of any development approvals for this site. The extent of this positive impact is proportional to the quality and extent of the additional area conserved.

The only way to ensure that the positive impact is achieved would be to audit the site one year after authorisation, and again two years later.

## 9. RECOMMENDATIONS FOR MITIGATION

These recommendations for mitigation apply equally to all 3 development alternatives.

The following mitigation is regarded as both feasible and reasonable, and is factored into the assessment, and should thus be regarded as mandatory:

- All designated and approved development envelopes (including roads and areas for bulk services) must be clearly demarcated prior to any construction on site, ideally by means of temporary fencing, to ensure that no heavy machinery or contractors damage the sensitive vegetation outside the approved development areas. No dumping or storage of building materials, fill or sand should be allowed outside approved development footprints.
- All bulk services must be entirely within the approved road servitudes, in order to minimise soil and vegetation disturbance.
- All alien invasive vegetation (including *Hakea sericea, Acacia mearnsii*, *Acacia cyclops* and *Acacia saligna*) must be removed from the site within one year of any project authorisation, and thereafter on an annual basis. No heavy machinery (such as bulldozers or loaders) should be used for this purpose, and a properly trained alien clearing team should undertake the work. Stems should be cut with chainsaws, saws or loppers (depending on size) at ground level. Cut material should be transported off site to a suitable organic dump, or else all seed capsules must be collected in bags and burnt, to prevent them setting seed on site, and stems can then be stacked on site. Appropriate herbicide, with dye, should be hand painted on to all cut stems within ten minutes of felling, in order to prevent resprouting. No herbicide should be sprayed anywhere within the study area, due to negative impacts on adjacent, indigenous plants.
- No invasive plant species (as per CARA legislation) may be planted anywhere on site. One of the primary threats relates to lawn grass, especially in areas close to drainage lines. In this context it is particularly important that no *Pennisetum clandestinum* (kikuyu grass) be allowed on any erven or public areas bordering natural areas, as it is highly invasive. *Stenotaphrum secundatum* (buffalo grass) or *Cynodon dactylon* (kweek grass) are suitable non-invasive alternatives.
- Roadside kerbs can pose an insurmountable obstacle to small fauna, and thus both kerbs in the sections of road crossing the two ecological

corridors should be gently sloping rather than vertical, to allow for movement of small animals over the roads. There should also be speed humps or similar traffic calming devices at both ends of the corridor crossings to slow vehicles down in these areas.

- Similarly, any perimeter or interior fencing should allow for passage of small animals. In this regard if palisade fences are erected there must be no concrete plinths above ground level, and there must be a gap of 150mm between the top of any plinths and the lowest point of any fencing. For the same reasons there may not be any electric fence strands within 30cm of ground level.
- The proponent must ensure that there is adequate funding to implement all required mitigation, and must ensure that the mitigation is undertaken.
- A construction and operational phase EMP must be prepared, which includes all required mitigation and recommendations (see below), as well as any additional inputs from all specialists. Additional input should include fire management and requirements for ecological burns, which should be undertaken once every 12 years.
- An ECO should be on site at least every second day during the bulk infrastructure construction phase of the project and must be responsible for ensuring compliance with all environmental conditions imposed.
- The alien invasive plant clearing should be audited by either CapeNature staff or an independent botanist one year after project authorisation, and again two years later (three years after authorisation), in order to check that alien invasive vegetation has been properly controlled on site, and other compliance with the EMP. Costs for this auditing must be borne by the applicant.

## 10. CONCLUSIONS AND RECOMMENDATIONS

- The vegetation patterns on about 67% (some 40ha) of Erf 3122 are consistent with previous soil disturbance, and these areas are deemed to be of Medium regional botanical sensitivity. The largely undisturbed parts of the site (mostly on slopes) are of High botanical sensitivity.
- No plant Species of Conservation Concern were recorded in the study area, nor within the proposed development footprint.
- There is no strongly preferred development alternative from a botanical perspective, with botanical impacts for all three alternatives likely to be

of **Medium to High negative significance before mitigation and of Medium negative significance after mitigation.** Note that this significance post mitigation does not include the positive impact of any potential biodiversity offsets, which could reduce the negative impacts even further.

- A biodiversity offset is not deemed to be essential mitigation, as approximately half the site (32ha), and virtually all the High sensitivity vegetation on site will remain intact on site (and will be zoned Conservation Use), functioning as on site conservation contribution. Notwithstanding this, it is strongly recommended that all remaining natural vegetation within 500m of the perimeter of the site (mostly Municipal land) be considered and managed as a formal conservation area. This should be achievable, as much of it is on relatively steep slopes not ideal for development. The highest conservation value portions of land in the vicinity lie northwest, west and southwest of the study area. Unfortunately some of the nearby high sensitivity areas, including a portion until recently owned by the ATKV (Rem. of Ptn. 4 of Hartenbos 217), have recently been approved for urban expansion.
- As recommended in the fire management plan (Pool & van Zyl 2011), an ecological burn of all vegetation on site older than ten years (thus presumably all areas not burnt in 2009) should be undertaken prior to the start of any development on site, as this will reduce the fire risk in the first 8 years of any subsequent development, and make fire management much easier once infrastructure is in place.
- It is recommended that the applicant should brushcut (not bulldoze or spray with herbicide) what is essentially a firebreak around the immediate perimeter of all units. This should be at least 5m wide, and should be maintained at less than 30cm tall, and should be cut twice a year.
- The HoA should be responsible for ensuring that homeowners do not dump unwanted plant material over garden fences or walls into the Open Space areas, as this will degrade the natural habitat in these areas. The HoA should also be responsible for ensuring that all alien invasive vegetation is removed from the conservation areas on an annual basis, and that an ecological burn is implemented in the conservation areas once every 12 years.

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