Botanical Impact Assessment, Erf 3122 Mossel Bay (Hartenbos Garden Estate), Mossel Bay Municipality Western Cape Province

Bobartia robusta

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Prepared for Cape EAPrac and Hartenbos Garden Estate

AUGUST 2022; MAY 2023

National Legislation and Regulations governing this report

This is a 'specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014.

Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by Cape EAPrac to provide specialist botanical consulting services for the proposed development of Erf 3122, Mossel Bay (Hartenbos Hills Garden Estate), Western Cape Province. The consulting services comprise a study of the vegetation to determine botanical 'Red Flags' and to provide a constraints analysis, scoping assessment and finally an impact assessment in terms of the flora and vegetation.

Details of Specialist

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Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 40 years' experience in the field of Vegetation Science
- Founded Bergwind Botanical Surveys & Tours CC in 2006
- Has conducted over 600 specialist botanical / ecological studies
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request)

Conditions relating to this report

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Bergwind Botanical Surveys & Tours CC, its staff, and appointed associates, reserve the right to modify the report in any way deemed fit should new, relevant, or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field, or pertaining to this investigation.

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

Declaration of Independence:

The views expressed in the document are the objective, independent views of Dr McDonald and the survey was carried out under the aegis of, Bergwind Botanical Surveys and Tours CC. Neither Dr McDonald nor Bergwind Botanical Surveys and Tours CC have any business, personal, financial or other interest in the proposed development apart from fair remuneration for the work performed.

I David Jury McDonald, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity;
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the specialist:
Company: Bergwind Botanical Surveys & Tours CC Date: 30 August 2022; 18 May 2023

Curriculum Vitae: Appendix 4.

CONTENTS

1. Introduction

Since prior to 2006 there have been plans to develop Erf 3122, Mossel Bay at Hartenbos. Initially, it was the intention of ATKV Sake (Pty) Ltd, the original applicant for Environmental Authorisation, to develop the property that was called Hartenbos Heuwels. Bergwind Botanical Surveys & Tours CC (Bergwind) [Dr D.J. McDonald] has been involved with botanical scoping studies and constraints analysis almost from the outset. The project has been transferred to new owners, Hartenbos Hills Propco (Pty) Ltd (HH Propco) and the project name has been changed to Hartenbos Garden Estate. CapeEAPrac has been, and continues to be, the environmental consultant company responsible for the environmental compliance applications. Note that the May 2023 revisions are given in blue type.

The botanical studies that have been concluded are: McDonald 2006; Helme 2016; McDonald, 2018.

Now that many iterations of proposed development layouts and constraints have been considered, Bergwind Botanical Surveys & Tours CC has once again been appointed to carry out the final phase of the assessment process, namely the botanical impact assessment and the terrestrial biodiversity impact assessment (the latter as a separate report).

This botanical impact assessment takes careful note of the requirements and recommendations of CapeNature and the Botanical Society of South Africa for proactive assessment of the biodiversity of proposed development sites and follows published guidelines for evaluating potential impacts on the natural vegetation in an area earmarked for some form of development (Brownlie 2005, Cadman *et al.* 2016). The requirements and recommendations of CapeNature for assessment of biodiversity of proposed development sites have also been considered and the 2020 Species Environmental Assessment Best Practice Guideline and protocols for terrestrial biodiversity specialists (Government Gazette, 2020; Enviro Insight, 2020) have been applied.

CapeNature (Landscape East – Conservation Intelligence Management Unit) and Department of Environment and Development Planning (George Office) have commented on the environmental application and more specifically the botanical impact assessment. This report is a revised botanical impact assessment where responses are given to the questions and challenges of the veracity of the botanical assessment (dated August 2022), particularly by CapeNature (Letter Reference: LE14/2/6/1/6/6/ERF3122_Development_Hartenbos, dated 6 March 2023).

2. Terms of Reference

- Consider the existing botanical reports that were used to inform the development of a layout that would accommodate the identified constraints ;
- Conduct a botanical impact assessment of the proposed Hartenbos Garden Estate development that take the following into consideration:
    1. Sensitive habitats and / or plant communities;
    2. Any plant species of conservation concern (SCC);
    3. Relevant environmental regulations / policies / plans stipulated by the Department of Environmental Affairs and CapeNature in terms of, amongst others, the National Environmental Management Act (NEMA) and the National Environmental Management Biodiversity Act (NEMBA);
    4. Comments from Cape Nature.

3. Location and Physiography

3.1 Location

Erf 3122, Mossel Bay is located on the moderate elevation inland hills to the west and above Hartenbos, near Mossel Bay, on the Garden Route of the Southern Cape Coast, Mossel Bay Local Municipality, Garden Route District Municipality, Western Cape Province (Figure 1). It lies west of the N2 national road through Hartenbos, immediately west of the existing Hartenbos Heuwels suburb and to the southwest of the R328 road between Hartenbos and Oudtshoorn.

Figure 1. Locality of Erf 3122 Mossel Bay

Erf 3122, Mossel Bay, is approximately 310 ha in extent and is presently zoned for agriculture but it has not been used for agriculture for some time. The proposed development would take up approximately 50 ha of the erf, situated mainly on the high-lying plateau.

There are two points of access to the site. One is situated at the gate on the southeast side (S 34° 07' 41.4" E 22° 05' 41.4"; elevation 99 m a.m.s.l.) and the second is from the R328 road on the north side of the property at S 34° 06 50.1 E 22° 04' 57.9. The southern access point was used for this study and would be used as the official entrance to the envisaged development.

3.2 Topography

Erf 3122 Mossel Bay, has a central plateau area that is fairly flat and has an average elevation of 120 m a.m.s.l. To the south, the plateau drops away as uniform slopes with a moderate gradient to the

southern boundary near the railway line. On the southeast to northeast side the landscape is dissected by some valleys that are not very deep but do have slopes with distinctly north- and south-facing aspects. The elevation in the valleys is around 60 m a.m.s.l. so the difference in altitude between the deepest valley floor and the central plateau is approximately 60 m. The Hartenbos water reservoir is situated at the highest point on the property at 139.6 m a.m.s.l. The slopes north of the reservoir, with a northerly aspect, are moderately steep, dropping evenly to the northern boundary of the property near the R328. The western slopes drop away from the central plateau also with a moderate gradient, and also have a series of valleys that drain to the west into a stream which eventually flows into the Hartenbos River.

The exposure of the central plateau is uniform but the slopes and valleys that drain from the central plateau to the east, north and west result in some complexity to the topography. Together with the variability of the soils the complexity of the topography produces a terrain with a variety of habitats and microclimates to which the vegetation responds. Watercourses and limited 'wetlands' occur mainly on the south- and east-facing slopes.

A series of gravel roads and tracks that are aligned mainly on the central plateau and along the ridges and crests above the valleys link the different parts of the area and provide ready access to them. Some of the tracks have been constructed to provide access for the maintenance of the high voltage power line that traverses the property from south to north close to the eastern boundary. The roads and tracks are in good condition and there is no evidence of erosion resulting from them.

3.3 Geology

Erf 3122, Mossel Bay lies on sediments of the Kirkwood Formation, Uitenhage Group. These sediments consisting of variegated mudstone, lithic sandstone and sporadic conglomerates were deposited under fluvial conditions at or near the sea. The Kirkwood Formation lies above the Enon Formation that consists of silty mudstones interspersed with rounded cobbles of quartz and gravels that were deposited by rivers into a marine environment on the coastline during the Cretaceous (Figure 4) (Norman & Whitfield 2006). The geology over the whole of the study area is fairly uniform and erosion through the gravely conglomerates has resulted in the valleys that are seen in the area today.

Figure 2. Erf 3122, Mossel Bay is underlain entirely by sediments of the Uitenhage Group, Kirkwood Formation.

3.4 Soils

The soils found at Erf 3122, Hartenbos are central to determining the vegetation that grows on them. The profile of the soil on the upland plateau consists of a clay-rich A-horizon underlain by a horizon composed of rounded pebbles and small boulders. The lower stratum is thought to represent denatured conglomerate of the Kirkwood Formation (Figure3). The upper stratum is the soil layer that was sought after for agriculture hence it was ploughed extensively over the upland, relatively flat plateau.

The date of the agriculture at Erf 3122, Hartenbos, is not known by the author, but is thought to have been in the 1970's or possibly the 1980's but it appears to have not been cultivated for a long period. Admittedly, this speculation but no other information is available that would suggest otherwise. No aerial photos with clear definition are available of the period during which the land was ploughed and cultivated.

Piles of boulders of variable size (Figure 4) and scattered large boulders (Figure 5) are found on the north-western side of the erf, having been ploughed up and removed from the cultivated area.

Figure 3. A soil profile at Erf 3122, Mossel Bay, with an A-horizon of clay-rich soil and a B-horizon of rounded pebbles and cobbles.

Figure 4. Calcrete rocks that were ploughed up during the period of active agriculture at Erf 3122, Mossel Bay.

Figure 5. Large sandstone boulders that were moved from the ploughed lands at Erf 3122, Mossel Bay.

3.4 Climate

Erf 3122, Hartenbos, has a climate transitional between the Mediterranean-type climate of the far Western Cape Province and the zone of all-year-round rainfall along the Garden Route. The climate is like that of nearby Mossel Bay. The average annual rainfall is 425--460 mm *per annum*. The distribution of rainfall shows a tendency towards being bimodal with peaks in April and August. Average temperatures do not range widely with the June, July and August being the coolest months (daily minimum ± 0° C, daily maximum ± 7° C) and December and January the hottest (daily minimum ± 16° C, daily maximum ± 27° C) (Figures 6a & 6b).

Average temperature and precipitation: Hartenbos

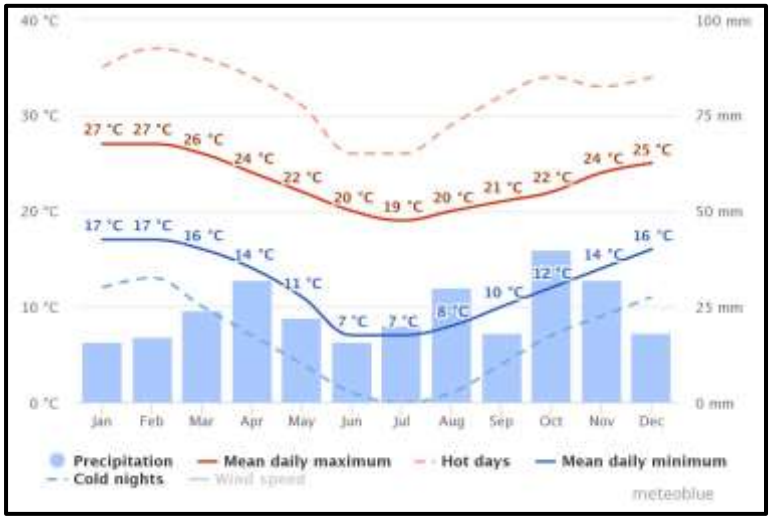


Figure 6a. Average temperature (°C) and average rainfall (mm) for Hartenbos.

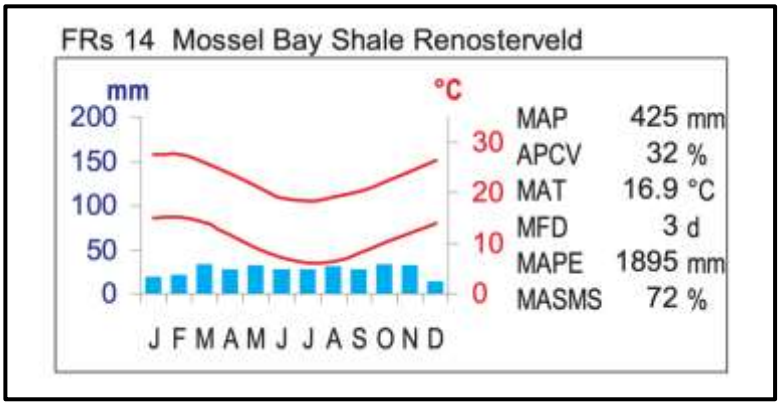


Figure 6b. Climate diagram of Mossel Bay Shale Renosterveld. Blue bars show the median monthly precipitation. The upper and lower red lines show the mean daily maximum and minimum temperature respectively. MAP: Mean Annual Precipitation; APCV: Annual Precipitation Coefficient of Variation; MAT: Mean Annual Temperature; MFD: Mean Frost Days (days when screen temperature was below 0°C); MAPE: Mean Annual Potential Evaporation; MASMS: Mean Annual Soil Moisture Stress (% of days when evaporative demand was more than double the soil moisture supply) (Rebelo *et al.* 2006 in Mucina & Rutherford, 2006).

4. Methods

Erf 3122, Hartenbos was first visited and surveyed by the author in December 2006. At that time there was an ambitious scheme to develop more than only Erf 3122, so the survey included areas to the north-east of the municipal reservoir as well, outside the boundaries of Erf 3122. Later, the proposed development was restricted to Erf 3122 and so for the purposes of the scoping study, Erf 3122, Hartenbos, was re-visited for two days on 24 and 25 August 2017 and records collected at 19 sample waypoints accessed on foot. Some of those waypoints were outside the boundary of the proposed area of development on Erf 3122 so the latter are excluded from the map in Figure 7. The records included of lists of plant species, descriptions of the physiognomy of the respective waypoint sites, photographs of the sites as well as any specific plant species that were of importance.

For the 2006 study (McDonald, 2006), colour aerial photography and Google Earth ™ satellite imagery was used to interpret the distribution of plant communities. This method was repeated in 2017 when a sequence of satellite images was available which showed changes in the vegetation of the site over time. One of the important revelations that was not noted in 2006 and that could be determined from the 2011 satellite image (after a fire had burnt the site) was the historical ploughing of the site. This agriculture has had long-lasting effects on the vegetation.

Erf 3122 Hartenbos was revisited from 7—11 March 2023. Admittedly, this was NOT a spring survey but the conclusions from previous fieldwork were confirmed. A discussion of the question of 'season of sampling' is addressed below. During the site visit, ten waypoints were recorded merely as reference points, whereas the site was once again covered extensively on foot with plant species being recorded, as well as any changes in the vegetation. Sampling of vegetation to determine various metrics such as diversity indices etc. have been covered at length in classical texts such as Mueller-Dombois & Ellenberg (1974) and more recent literature such as the text on vegetation description and analysis by Kent (2012). In classical plot-based phytosociological methods of the Zürich-Montpellier School, one of the tenets is that plot or relevé samples should be placed in homogeneous stands of vegetation. To quote Kent (2012), *"This means that the particular assemblage of species which are believed to be representative of the community type being described should exist over a sizeable local area, without any detailed variations within it. Thus, local micro-environmental and micro-habitat variations should be either avoided or ignored. The existence of such uniform or homogeneous plots in all vegetation types is highly questionable, particularly if there are mosaics with the vegetation."* Kent's questioning of this approach is valid but at Erf 3122, Hartenbos, in the formerly cultivated area, the existence of homogeneous vegetation is seen, even to the untrained eye.

A plot-sampling method would be too time-consuming for most botanical impact assessment purposes where there is a premium on available time and the objective is **not** to conduct a research project. Consequently, the author has developed and applied a plotless sampling method with waypoints merely as reference points in the landscape that assist with mapping. The method is to walk through the 'study area' and record plant species encountered, making notes where necessary as to the dominance (abundance) of particular species, and /or the absence of species at the other end of the presence-absence spectrum. With experience, a stand of vegetation consisting of one or more plant communities may be quickly characterized without detailed plot sampling. Changes in the vegetation i.e., from one plant community to the next can be quickly determined (by noting a sudden change in a species clustering) and recorded without arduous, time-consuming plot-based methods.

It has been found, in several hundred studies, over the 17 years that the author has conducted botanical surveys for impact assessments, that the approach of what has been called a **Rapid Survey Method**, is more than adequate for botanical assessments required for impact assessment purposes. The methodology is discussed further below as it pertains to this project.

The sampling of the vegetation in successive surveys carried out by the author in 2006, 2017 and 2023 is shown in Figure 7 (only those waypoints recorded within Erf 3122, Hartenbos for the 2006 survey are mapped; secondly, the track followed in 2006 is not displayed). It is submitted that the sampling has more than adequately covered the possibilities of plant communities found in the study area and provides enough observations of high-enough quality upon which to base sound conclusions.

The extent of the fire at Erf 3122 in 2011 has been **re-examined** and is mapped in Figure 8.

A shortcoming of interpretation and mapping using aerial photos from Google Earth Pro ™ was pointed out by CapeNature and much has been made of discrepancies between the botanical impact assessment of March 2018 / April 2021 and the assessment done in September 2022. This is rectified in this report where all conclusions supersede those in **any and all** previous reports by the author for Erf 3122, Mossel Bay. In other words, no reference should be made to reports prior to this report which is a revision of the report submitted with the EIA submission by CapeEAPrac in May 2023, and accommodates all previous reports. The impact assessment made here is definitive and previous assessments have been updated. Like the rider of CapeNature in all their correspondence, the author reserves the right to revise initial assessments based on additional information or new insights.

The aerial photography of 15 February 2019 has been examined (as suggested by CapeNature) and the extent of the fire that occurred in 2018/2019 is mapped in Figure 9.

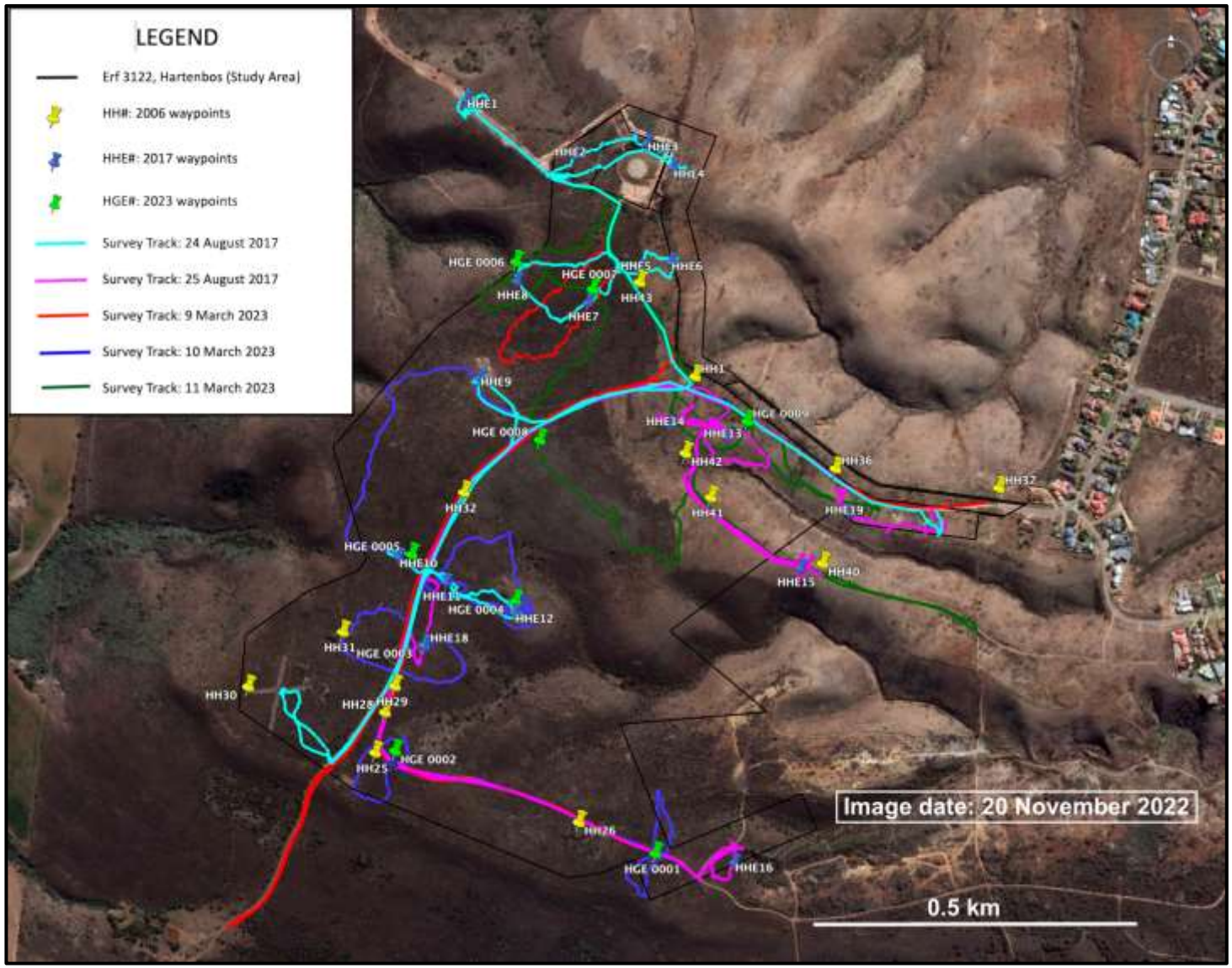


Figure 7. Satellite image (Google Earth Pro ™) of Erf 3122, Mossel Bay, showing all the tracks and waypoints recorded in the study area (excluding iNaturalist records).

In addition to the data collected by the author during three separate survey events in autumn (two surveys) and spring to early summer (one survey), data has been extracted from iNaturalist for the study area of Erf 3122, Mossel Bay. Records outside the boundary of Erf 3122 have been excluded. The samples – records of individual plant species – are shown in Figure 8. Those records have been reduced to 'points' on the maps in figures 9 and 10 where they can be compared with the sample locations of the surveys of 2006, 2017 and 2023. The species recorded by Helme, 2016 have also been included in a plant species list (Appendix 3) but were not plotted on a map since no co-ordinates were available.

Figure 8. Plant species distribution data extracted from iNaturalist for Erf 3122, Mossel Bay.

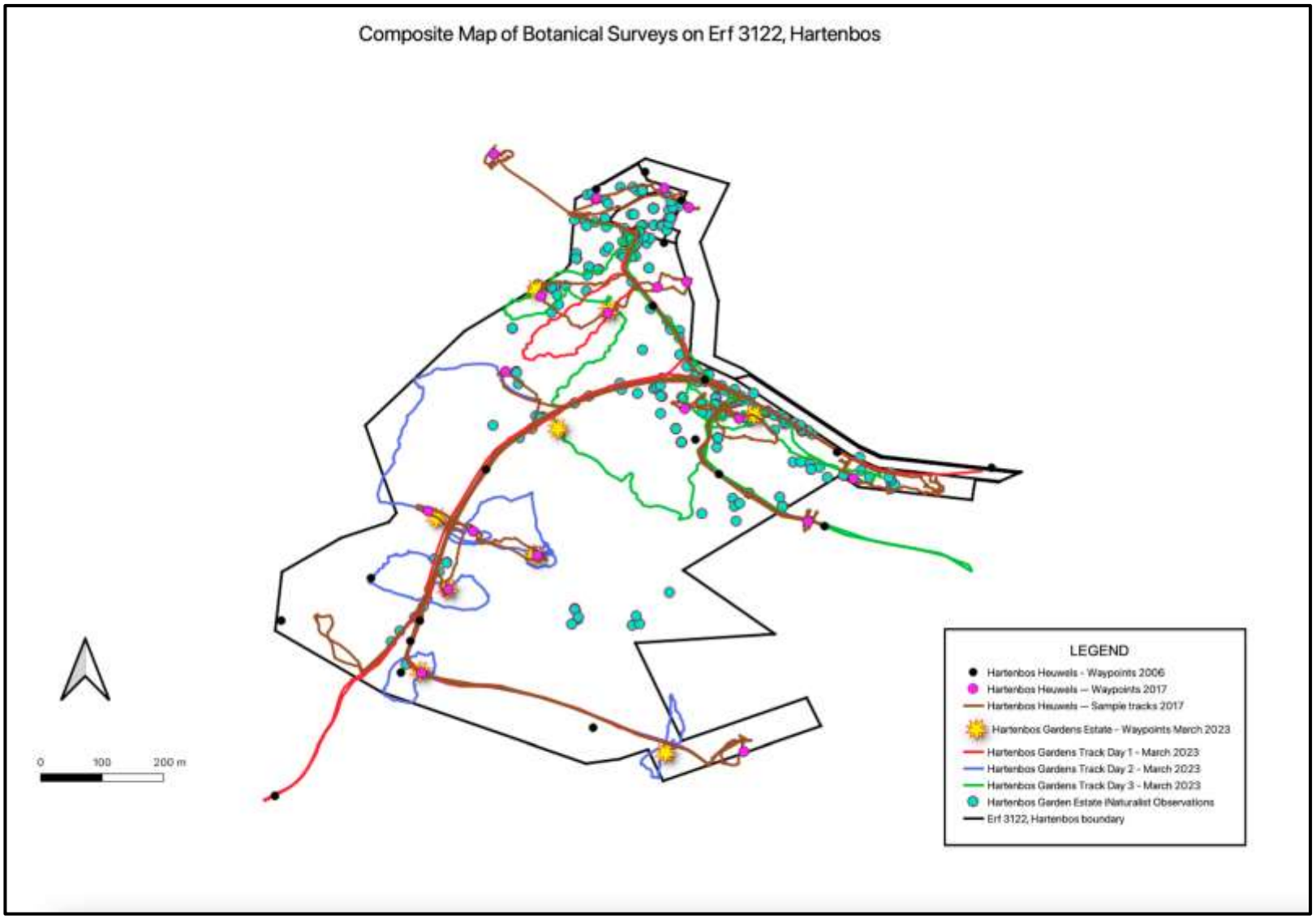


Figure 9. Composite map of all recorded tracks and waypoints, with locations of plant species records from iNaturalist.

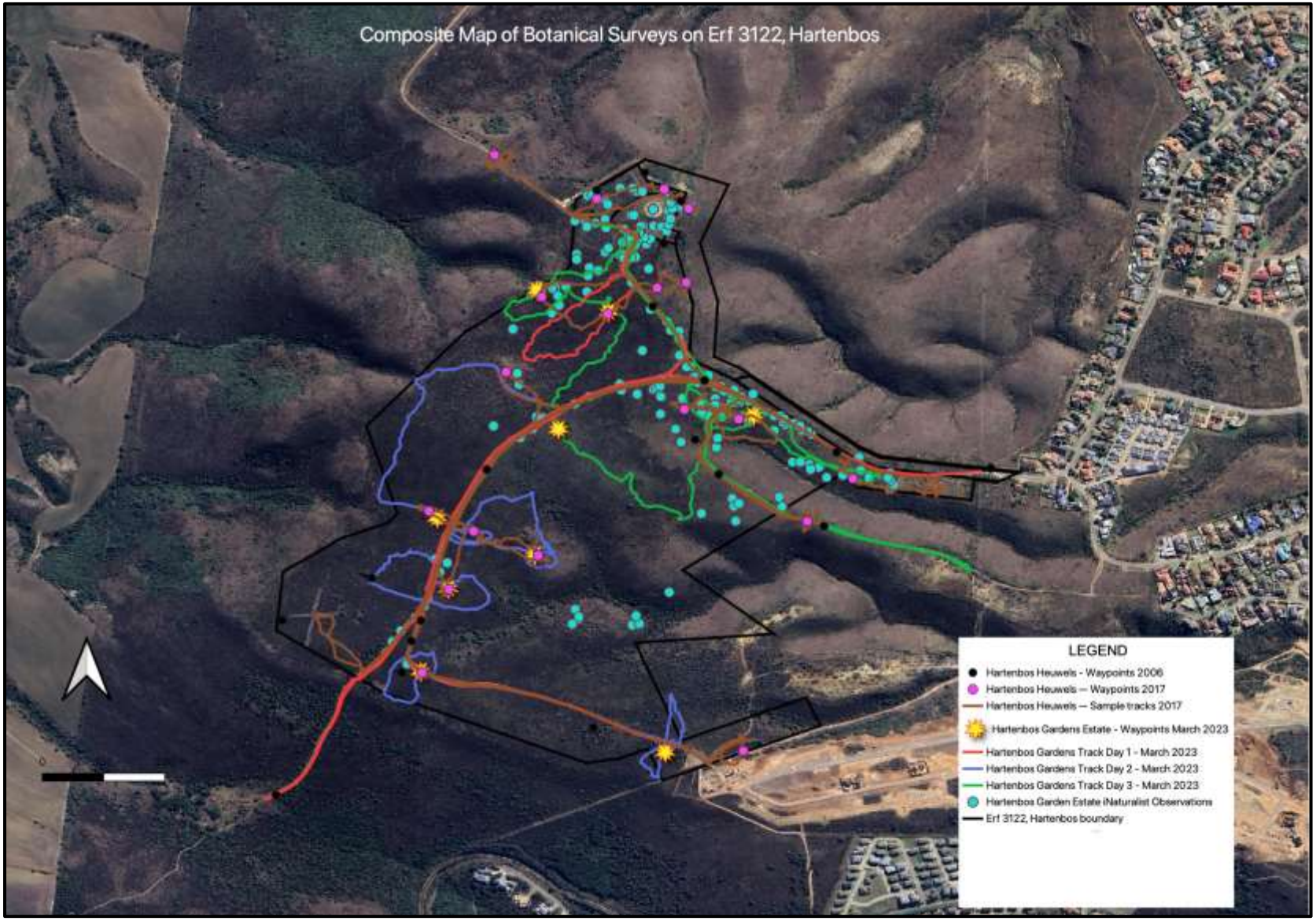


Figure 10. Composite map of all recorded tracks and waypoints, with locations of plant species records from iNaturalist overlaid on a satellite image (Google Earth ™)

5. Disturbance regime

The disturbance history is central to interpretation of the patterns found in the vegetation at Erf 3122, Mossel Bay. Examination of the satellite imagery from Google Earth Pro ™ provided evidence of historical agriculture and fires.

5.1 Historical ploughing

Owing to the exposure of the soil surface by fire in 2010 / 2011 it has been possible, using the Google Earth Pro ™ image of 19 March 2011, to determine the extent of the historical ploughing. The ploughing and associated agriculture was confined to the 'upland plateau' of Erf 3122, Mossel Bay, with the cultivation transgressing the property boundary in several places (Figure 11). Virtually the entire, relatively flat, upland was ploughed, and the steep slopes were avoided. This agricultural activity is thought to have occurred in the 1970's and 1980's, but perhaps much earlier in the 20th Century.

Figure 11. The extent of the former agriculture on Erf 3122, Mossel Bay. It exceeded the actual property boundary in some places.

5.2 Fires

Within the past 20 years, two fires have occurred that have influenced Erf 3122, Mossel Bay. The first occurred in 2010 / 2011 and was extensive, completely burning all of Erf 3122 except for an area of 3.2 ha that was unburnt. This was determined using the satellite image from Google Earth Pro ™ of 19 March 2011 (Figure 12). (As described above, this fire permitted the mapping of the extent of historical cultivation of Erf 3122).

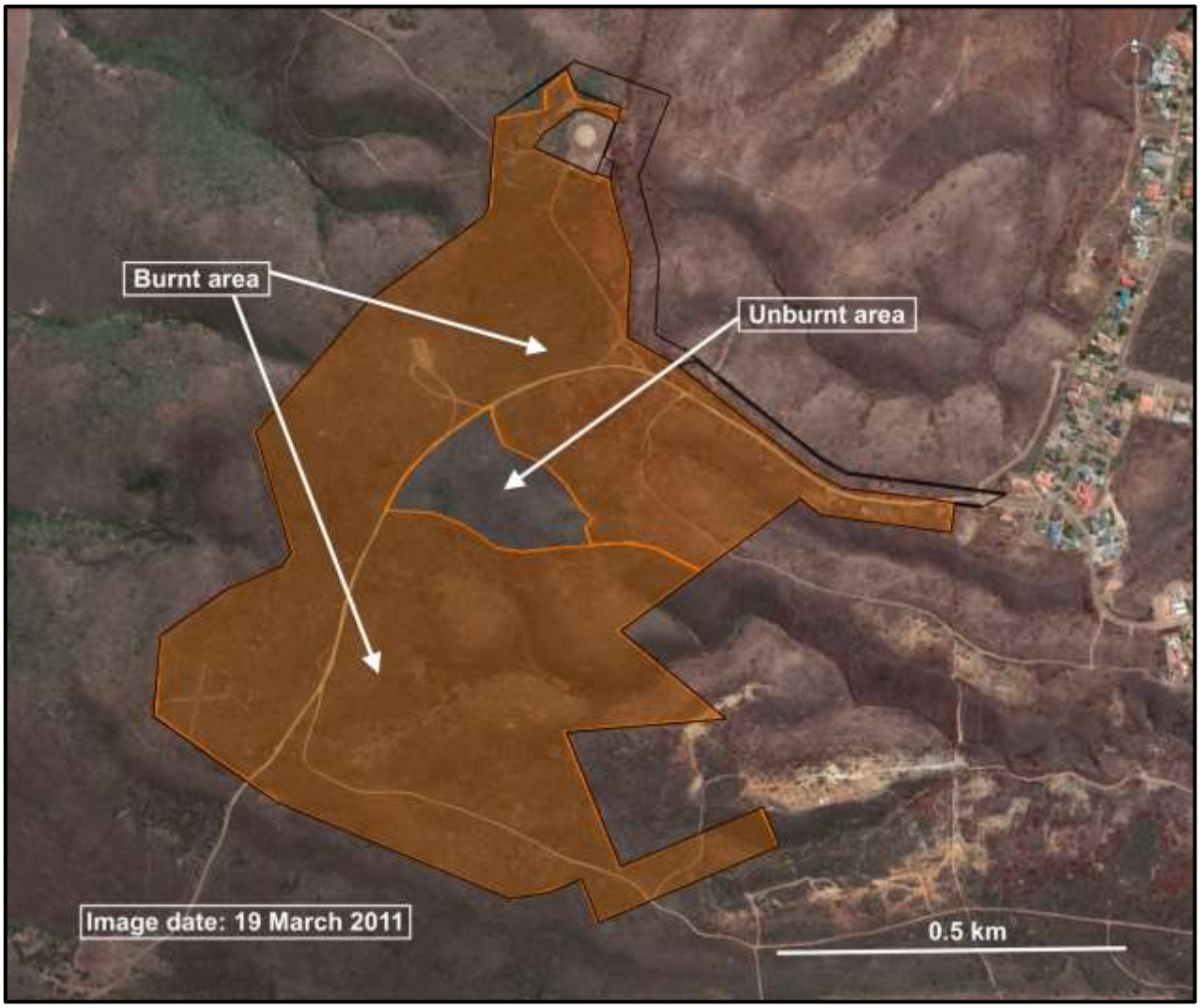


Figure 12. Aerial image of Erf 3122, Mossel Bay (Hartenbos Garden Estate) (black boundary). The satellite image from Google Earth Pro ™ was taken on 19 March 2011 and shows the areas of the property that were burnt in the prior year.

Another fire occurred in 2018/2019 that affected only the north-eastern area of the property, composed mostly of grassy fynbos, as determined from the Google Earth Pro ™ satellite image of 6 September 2019 (Figure 13). Figure 14 shows the well-defined boundary between the burnt and unburnt vegetation, visible in March 2023.

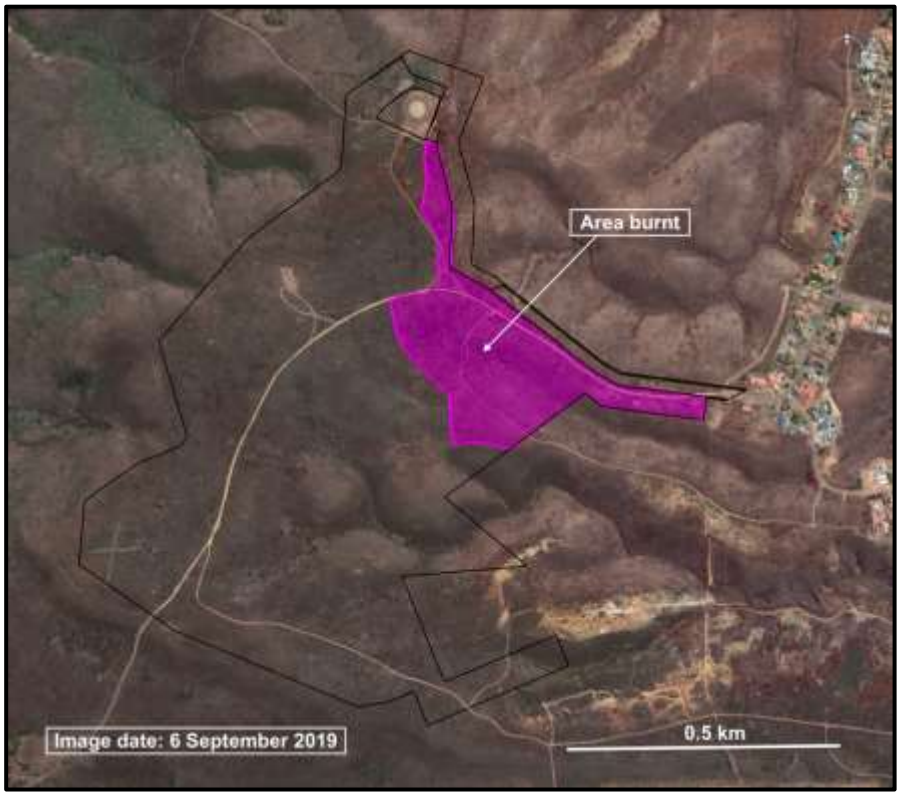


Figure 13. Satellite image of Erf 3122, Mossel Bay with the area burnt in 2018 / 2019 shaded magenta.

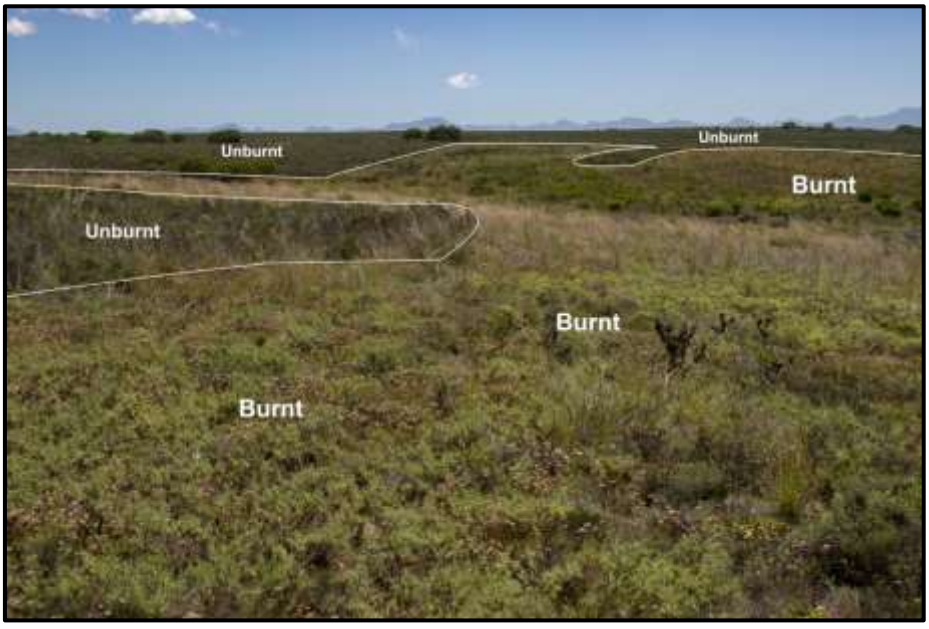


Figure 14. Some of the area burnt in 2018 / 2019 indicating the distinction in the vegetation of different ages.

5.3 Other disturbance

5.3.1 Alien invasive plant species

Alien invasive plant species are found throughout the study area but not in large numbers or concentrations. The most common species found is *Acacia cyclops* (rooikrans) which is found as scattered individuals or as small, dense clusters. *Acacia mearnsii* (black wattle) has been recorded at a few localities, mainly as single trees are small localised dense stands. A few plants of manatoka (*Myoporum tenuifolium*) were also recorded, mainly associated with *Acacia cyclops*. Manatoka has probably reached the site through bird-dispersed seed.

Acacia cyclops is an aggressive invader along the pipeline servitude at the eastern side of the study area where it has effectively ousted a population of *Protea lanceolata*.

Hakea sericea was recorded in low numbers in the eastern part of the study area in the part referred to as grassy fynbos.

5.3.2 Dumping of refuse

At one time, when access to Erf 3122, Hartenbos was possible, before the entrance gate was locked, a small area was used for dumping of refuse. This has left a disturbance scar on a relatively small area, that is now revegetating since the refuse disposal was stopped.

6. The Vegetation

According to the national vegetation classification published in 2005 (Mucina, Rutherford & Powrie 2005) the vegetation occurring inland of the coast at Hartenbos is Groot Brak Dune Strandveld. This broad classification was not accurate and was subsequently changed to Mossel Bay Shale Renosterveld (SANBI, 2018) (Figure 15). From field-observations this classification appears to be inadequate to describe the variation in the vegetation of Erf 3122, Mossel Bay, despite it being more accurate than the 2005 classification. Low & Rebelo (1996) refer to the vegetation as South Coast Renosterveld, which would be more in keeping with what was found on Erf 3122, Hartenbos. Low & Rebelo point out that the major difference between South Coast Renosterveld and other renosterveld vegetation types is the high proportion of grasses. Cowling *et al*. (1999), refer to this vegetation as Riversdale Coast Renosterveld which was adopted by C.A.P.E. (Cape Action for People and the Environment) for fine-scale planning. Cowling & Heijnis (2001) referred to Coastal Renosterveld as forming part of the Fynbos/Renosterveld Mosaic. A more detailed local classification could be made

based on the type of substrate and the topography of the land units but what is critical is that at a broad scale the vegetation is renosterveld, not strandveld.

In the work of Vlok & de Villiers (2007) for the Gouritz Initiative project, the vegetation from the Breede River to the Groot Brak River was surveyed and the vegetation at Erf 3122, Mossel Bay was included in the unit *PetroSa Fynbos / Renosterveld Mosaic*, and more specifically mainly in Herbertsdale Renoster Thicket (Figure 16a). The investigation at Erf 3122, Hartenbos in 2017 indicates that the vegetation found fits well with the definition of this mosaic vegetation type. However, Helme (2016) pointed out that Erf 3122, Mossel Bay actually lies within the vegetation unit Brandwag Fynbos – Renoster Thicket, delimited by Vlok & De Villiers (2007) according to the map extracted from Helme's (2016) report (Figure 16b).

Although there may be some confusion about the naming of the vegetation unit concerned, in essence all the more recent classifications recognize this unit as predominantly renosterveld in a mosaic with fynbos communities.

The renosterveld at Erf 3122, Mossel Bay, occurs on the warmer, drier north- and west-facing slopes and the plateau whereas on the cooler and moister, south- and south-east-facing slopes fynbos communities are found. On the mesic north- to north-east-facing slopes there are also remnant stands of very dense and thorny scrub that Acocks (1988) described as part of 'Coastal Renosterveld' but related to the Gouritz River Scrub.

For purposes of this project the vegetation units recognized follow those of Vlok & de Villiers (2007) but with the distinction that there is grassy fynbos akin to that of North Langeberg Sandstone Fynbos on the south-facing slopes. The latter vegetation is more sensitive than the renosterveld, which at Erf 3122, Hartenbos, is largely secondary, due to the historical cultivation. Renosterbos (*Dicerothamnus rhinocerotis*, formerly *Dicerothamnus rhinocerotis*), strongly colonizes disturbed substrates, particularly shale substrates, once they have been disturbed e.g., by ploughing. The result is that what is now mostly seen at Erf 3122, Mossel Bay, is **secondary vegetation** (renosterveld) where *D. rhinocerotis* is the dominant shrub. **The plant community is not diverse since many of the other plant species were lost due to the historical ploughing and have not returned.**

Details of the vegetation found at the waypoints in the re-survey of the site in August 2017 are given in Table 1. The reason for the inclusion of Table 1 is to provide a datum of a set of information about the site in 2017 for the sake of the historical record. Table 2 is a record of the waypoints recorded during the site visit in March 2023.

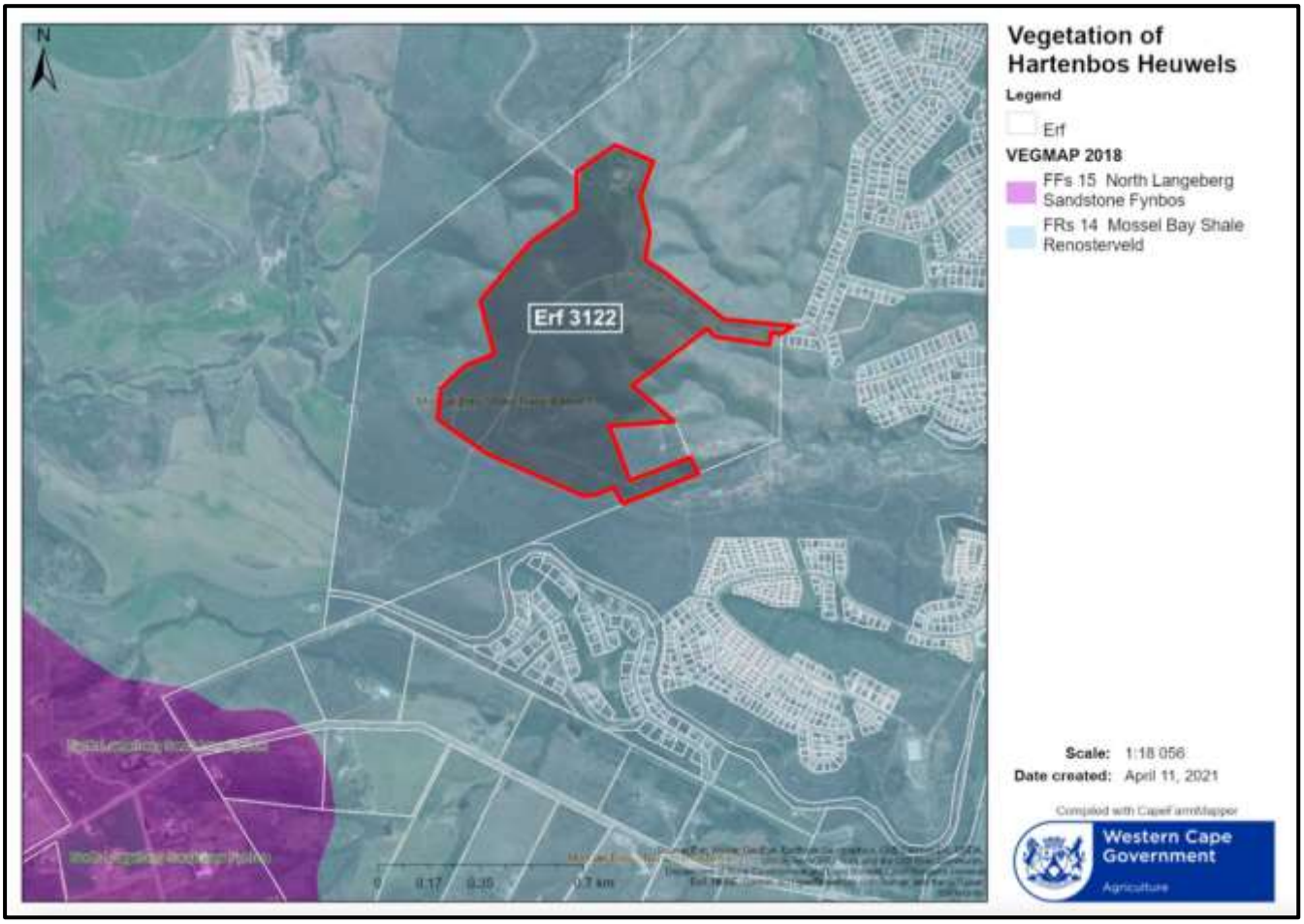


Figure 15. Portion of the Vegetation Map of South Africa, Lesotho & Swaziland (SANBI, 2018) overlaid on aerial imagery using Cape Farm Mapper. It shows that according to this classification, Erf 3122, Mossel Bay (red outline) is in Mossel Bay Shale Renosterveld.

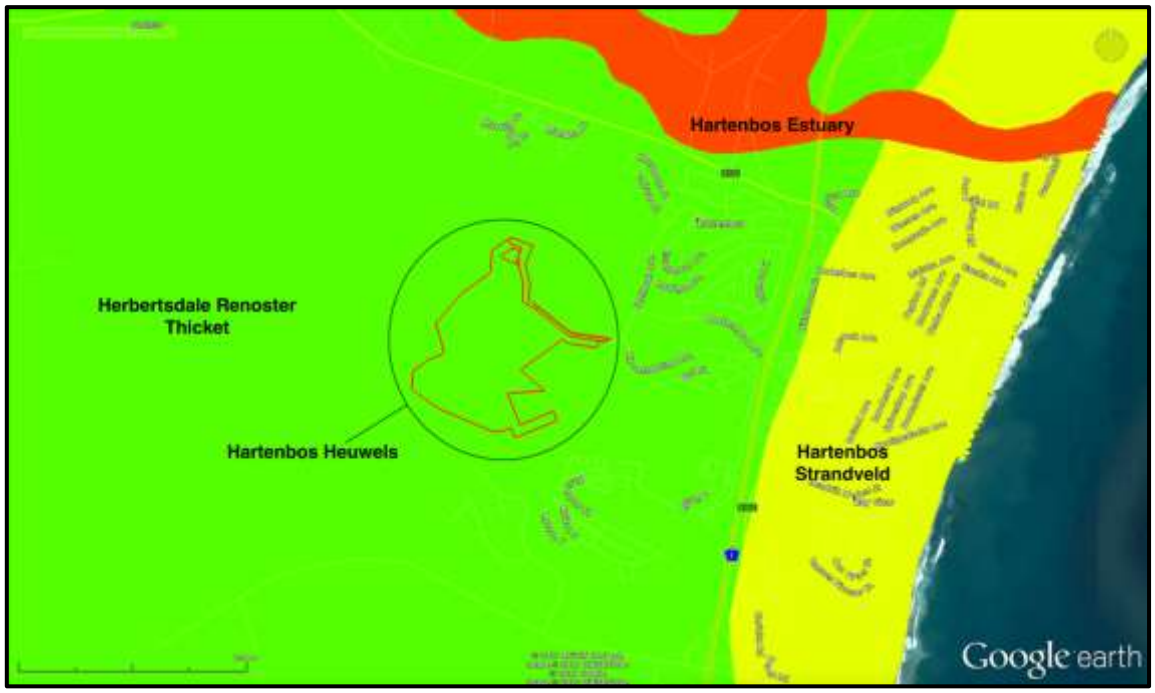


Figure 16a. Portion of the fine-scale map for the Gouritz Initiative (Vlok) showing that Erf 3122, Mossel Bay (red outline) is located in Herbertsdale Renoster Thicket.

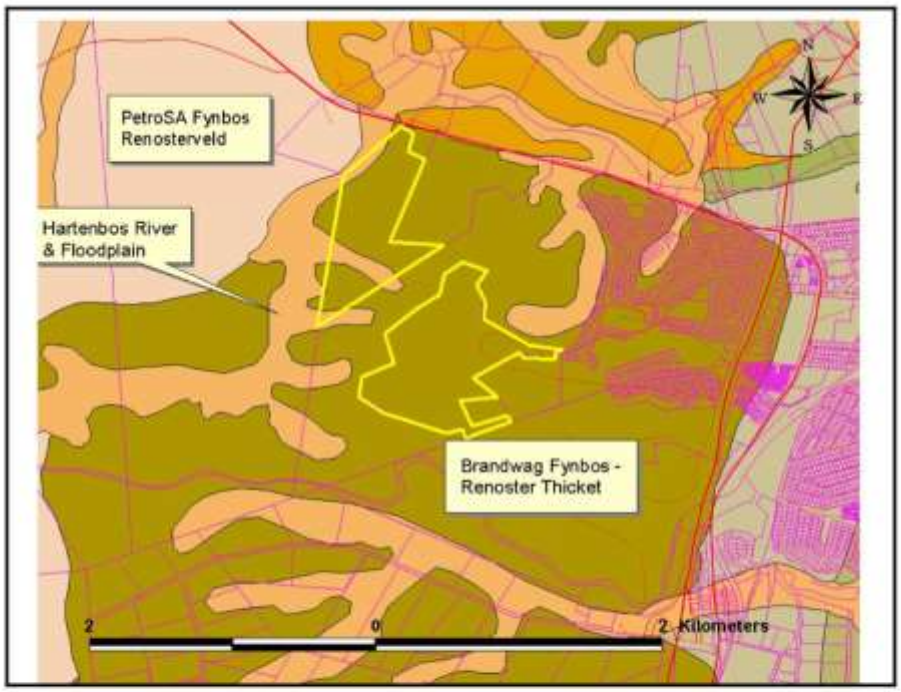


Figure 4: Extract of the Fine Scale Vegetation Map for the Riversdale Plain (Vlok & de Villiers 2007), showing the two Helme (2012) study area properties (yellow outline). Brandwag Fynbos Renoster Thicket is the primary vegetation type within the study areas, and the only vegetation unit in the proposed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

Figure 16b. The map referred to by Helme (2016: Figure 4) indicating that Erf 3122, Mossel Bay lies in a vegetation unit described by Vlok & De Villiers (2007) as Brandwag Fynbos – Renoster Thicket.

6.1 Renosterveld

6.1.1 Renosterveld on the central plateau and warm, dry west- and north-facing slopes

Renosterveld is the dominant vegetation type on Erf 3122, Hartenbos (Hartenbos Garden Estate). It is found on the central plateau and on the upper warm, dry westerly and northerly slopes. The soils are gravelly and have a clay-rich matrix. This vegetation type has a grey-green appearance due to the colour of the dominant shrub species, *Dicerothamnus rhinocerotis*, the renosterbos. Shrubs of this species are from 1—1.5 m tall and generally, but not always, form a mid-dense to dense canopy over other lower shrubs. The cover of renosterbos is from 80 – 90 % with other shrubs forming a much lower proportion of the cover. Low & Rebelo (1996) describe the physiognomy of South Coast Renosterveld as 'open to mid-dense, cupressoid and small-leaved, low to mid-high shrubland, with emergent shrubs generally absent', and the renosterveld vegetation at Hartenbos fits this description well.

The understorey of the renosterveld can range from being a sparse covering of low shrubs, forbs and grasses to a dense grassy sward with some shrublets and forbs. The pattern in the renosterveld at Erf 3122 is that dominance can change and renosterbos can be completely absent in which case grasses, particularly *Hyparrhenia hirta,* dominate. This results in either a patchy mosaic of small, grass-dominated patches, within larger renosterbos-dominated stands of vegetation or the opposite where grasses dominate over wide areas with renosterbos either absent completely or occurring in varying density but usually sparsely.

Renosterveld, wherever it occurs, is well-known for its diversity of species. When the author surveyed Erf 3122, Hartenbos in 2006, it was found to have a fair species richness. An exhaustive species list was not compiled for the renosterveld at Erf 3122 but genera and species that were found to occur include, *Asparagus africanus*, *Asparagus* cf. *falcatus*, *Berkheya* sp., *Blepharis capensis*, *Boophone disticha*, *Brachiaria serrata*, *Bulbine* sp., *Carissa bispinosa*, *Carpobrotus acinaciformis*, *Chrysocoma ciliata*, *Commelina africana*, *Cynanchum viminale, Dianthus caespitosus*, *Digitaria eriantha*, *Dicerothamnus rhinocerotis, Ehrharta* sp., *Eragrostis curvula*, *Eriocephalus africanus, Euclea undulata*, *Glottiphyllum longum*, *Gnidia* cf. *polystachya*, *Hermannia flammea, Hermannia lavandulifolia, Hibiscus sp., Indigofera* sp., *Jamesbrittennia argentea*, *Lobelia* sp., , *Ornithogalum dubium*, *Osteospermum moniliferum, Polygala myrtifolia*, *Pteronia* spp*., Searsia (Rhus) glauca*, *Ruschia* cf. *hamata*, *Selago* spp., *Tenaxia (Merxmuellera) stricta*, *Tephrosia capensis*, *Themeda triandra* and *Ursinia* cf. *nudicaulis*.

One misinterpretation of McDonald (2006) was that the lack of geophytes found in the 2006 survey was attributed to season. Subsequently, in 2017, it was realized that the lack of geophytes is due to a large area of the central plateau having been cultivated and the geophytic flora lost.

In 2017 the author wrote:

The grassveld encountered at Erf 3122, Hartenbos is considered to be a 'sub-community' of the renosterveld. Species composition of the grassveld is very similar to that of the renosterveld proper except that there is a dominance of grasses, especially *Hyparrhenia hirta.* The grassveld has a different signature on aerial photographs and is clearly distinguishable in the field from the 'true renosterveld'. The grassveld tends to occur on well-drained north-facing, east-facing, and some west-facing slopes where it occurs as pure stands over fairly large areas as opposed to the renosterveld which has its best expression on the relatively flat table-land or plateau. As described above the grassveld can also be in a patchy mosaic with renosterveld. This is particularly so when the renosterveld has been disturbed and the renosterbos is removed either mechanically, such as alongside roads or by fire. Grasses aggressively colonize these gaps in the renosterveld. Additional

species found in the grassveld that were not noted by McDonald (2006) in the renosterveld include *Albuca* sp., *Aristida junciformis*, *Aspalathus* spp., *Berkheya armata*, *Brunsvigia* sp. (cf. *orientalis*), *Crassula* sp. (2), *Ehrharta scabra*, *Eragrostis capensis*, *Pentaschistis eriostoma*, *Senecio* sp. (succulent leaves).

The type of vegetation promoted as grassveld, or grassy fynbos above has been reconsidered and a different conclusion has been reached. Careful re-examination of satellite aerial images and the species composition of the plant communities sampled indicates that the vegetation on the 'upland plateau' referred to as renosterveld is, as has been previously asserted, secondary vegetation with the caveat now that the original vegetation of the upland plateau was actually the same as that found on the slopes surrounding the plateau; a graminoid shrubland where grass is strongly dominant and shrubs play a subordinate role. It is believed that the historical ploughing caused an extreme conversion of the land from a grass-dominated plant community to what is seen now, a shrub-dominated plant community where *Dicerothamnus rhinocerotis* and *Oedera genistifolia* (both in the family Asteraceae) are strongly dominant. In this process, it is contended that many plant species, particularly geophytes, were lost from their former habitat on the 'upland plateau'. So instead of the grassland / grassy fynbos being a sub-community of renosterveld, it is the exact opposite where the renosterveld represents a **greatly transformed, secondary plant community**. This is central to the evaluation of the sensitivity of the now species-poor renosterbos-dominated plant community that hardly deserves the designation '*Renosterveld*'.

6.2 Scrub thicket

Both Acocks (1988) and Low & Rebelo (1996) recognized the incidence of thicket patches within the renosterveld. Acocks judged that these thickets were probably relics of a once more widespread vegetation type whereas Low & Rebelo suggested that thicket occurs where the relief is greater, rainfall is low, and fire cannot spread easily into these protected microhabitats.

The thicket vegetation is dense, thorny and impenetrable and at Erf 3122, Hartenbos (Hartenbos Garden Estate) the thicket community includes species such as, *Aloe ferox*, *Bulbine* sp., *Carissa bispinosa* (Num num), *Crassula* sp. *Cussonia spicata* (Cabbage tree), *Cynanchum viminale, Diospyros lycioides*, *Gymnosporia buxifolia* (Common spike-thorn), *Olea europaea* subsp. *africana* (Wild Olive), *Searsia (Rhus) lucida*, *Schotia afra* (Boerboon), *Sideroxylon inerme* (Milkwood).

6.3 Fynbos on the cool, south- to south-east-facing slopes

In contrast to the renosterveld on the dry slopes, the cooler south-facing slopes, that are probably also moister, support fynbos vegetation. Even though certain elements of fynbos such as some

restios (Restionaceae) and *Bobartia robusta* (Iridaceae) occur in the renosterveld, the clue to the presence of true fynbos communities is the presence of Ericaceae, Restionaceae and Proteaceae growing together. The substrate is like that on which the renosterveld is found; the surface of the soil is covered (80%) with round pebbles of varying sizes (10 mm – 200 mm) but is probably gravellier, with a lower clay fraction, than where renosterveld is found. This, however, was not confirmed. The fynbos community has a cover of 80% with two layers and emergent shrubs up to 2 m. *Erica peltata* is dominant in the upper stratum, <1 m high, with a cover of 60 %. The lower stratum < 50 cm high is graminoid and dominated by grasses and restios. Depending on the location, emergent shrubs such as *Leucadendron salignum*, *Protea lanceolata* and *Erica discolor* var. *speciosa* have variable cover. *L. salignum* and *E. discolor* var. *speciosa* generally have a low cover, whereas *P. lanceolata* can form dense stands of many individuals. Another striking aspect of the fynbos vegetation is the occurrence of many plants of *Bobartia robusta* (Iridaceae) which have a relatively low cover but high abundance and are obvious in the overall appearance of the fynbos in this area.

The bright red geophyte, *Tritoniopsis antholyza*, was in flower at the time of sampling in December 2006. At that time, it was abundant, and from the evidence of porcupine digging it was concluded that the corms are obviously much sought after by these animals. No other geophytes were found while searching through the fynbos and it was concluded that this was most likely because the season was well advanced into summer (December) as opposed to historical ploughing as in the renosterveld.

The most important aspect of the fynbos vegetation is the occurrence of *Protea lanceolata* (Lance-leaved Protea). According to Rebelo (1995) this species occurs on Potberg (De Hoop) and the Riversdale Flats and at the fynbos / thicket ecotone at Mossel Bay on gravels from 0 – 200 m. It was listed in the Red Data list as VULNERABLE (Hilton-Taylor 1996; Raimondo *et al.* 1999) and Rebelo (1995) attributed this to the invasion of its habitat by rooikrans (*Acacia cyclops*). However, in the most recent appraisal (http://redlist.sanbi.org/species.php?species=799-68) it is Least Threatened. At Erf 3122, Hartenbos, three distinct stands of *P. lanceolata* were found on south-facing slopes in fynbos vegetation by McDonald (2006). At one of these sites the stand of *P. lanceolata* is being heavily impacted by invasive rooikrans (*A. cyclops*) and this situation needs to be remedied. Only one part of the current study area i.e., near the eastern entrance gate, supports *P. lanceolata*.

6.4 Vegetation recorded at specific waypoints

6.4.1 The vegetation recorded in August 2017

The vegetation recorded at 19 waypoints in August 2017 is described in the descriptive notes in Table 1. Some of the waypoints were purposefully recorded outside Erf 3122, Hartenbos to provide context to the data collected. The table is included as a reference to what the vegetation was like in 2017. It is notable how grey, and sometimes dead, the vegetation appeared in August 2017, in spring, when it should have been more luxuriant. This is ascribed to the long drought prevailing in 2016 and 2017.

Table 1. Vegetation found at 19 sample waypoints during the survey of Erf 3122, Hartenbos, in August 2017.

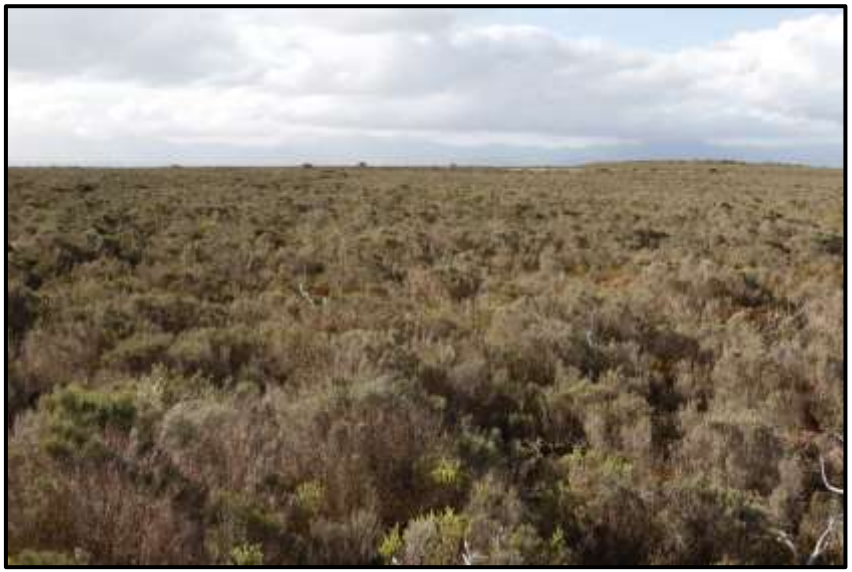
Waypoints and Co-ordinates	Descriptive Notes	Illustration
HHE1 **S 34° 07' 21.2"** **E 22° 04' 59.8"**	Dense grassy slope. Grasses < 30 cm tall with emergent shrubs to 50 cm. Soil gravelly, conglomerate-derived. Species: *Acacia cyclops*, Acacia mearnsii*, Aspalathus* sp. (low, grey shrub), *Asparagus* cf. *aethiopicus, Asparagus rubicundus, Bobartia robusta, Commelina africana*, *Crassula muscosa, Crassula* sp. (1), *Crassula* sp. (2), *Cynodon dactylon, Diospyros dichrophylla, Drosanthemum cf. hispidum, Dicerothamnus rhinocerotis, Eragrostis curvula, Erica* sp., *Eriospermum* sp., *Euphorbia* sp., *Ficinia filiformis, Helichrysum* cf. *cymosum, Hermannia lavandulifolia*, *Hermannia saccifera, Hermannia flammea*, *Hypoxis* sp., *Indigofera* sp. (1), *Indigofera* sp. (2), *Ischyrolepis* cf. *capensis, Metalasia* sp. (2), *Metalasia* sp. (dominant), *Oedera genistifolia, Oxalis* sp., *Pentaschistis eriostoma, Satyrium* sp., *Searsia* sp. (low shrub), *Senecio* sp. (succulent), *Tenaxia stricta, Themeda triandra.* *Note: This waypoint is outside the study area but is representative of the north-west-facing slopes.*	

HHE2 **S 34° 07' 23.92"** **E 22° 05' 06.3"**	On NW-facing slope below the reservoir approximately at the boundary of the study area. The location has been disturbed by dumping of rubble which appears to have caused a thicket to form.	
HHE 3 **S 34° 07' 23.3"** **E 22° 05' 10.6"**	Dense thicket of *Acacia cyclops* with thicket species. Abundant *Eriocephalus africanus*. This waypoint is located just below the reservoir.	

HHE4 **S 34° 07' 24.68"** **E 22° 05' 12.29"**	On SE side of reservoir. *Acacia cyclops* found on mid-dense stands. *Dicerothamnus rhinocerotis* is dominant with *Polygala myrtifolia* common.	
HHE5 **S 34° 07' 29.6"** **E 22° 05' 10.2"**	On plateau south of the reservoir, along the track, i.e. between the track and the pipeline route which is heavily infested with *Acacia cyclops*. This area is dominated by *Dicerothamnus rhinocerotis* with emergent, scattered shrubs of *Osteospermum moniliferum*. Pteronia sp. is co-dominant with *D. rhinocerotis.* Other species recorded include: *Cymbopogon marginatum*, *Ehrharta* sp., *Eragrostis curvula, Helichrysum pandurifolium, Hermannia lavandulifolia, Hermannia saccifera, Metalasia densa, Oxalis* sp., *Oxalis* sp. – very small, *Searsia pterota* and *Tenaxia stricta.*	

HHE6 **S 34° 07' 29.3"** **E 22° 05' 12.0"**	The waypoint is amongst mid-dense to dense Acacia cyclops on the pipeline route from the reservoir. Understorey shrubs include *D. rhinocerotis, Hermannia lavandulifolia, Hermannia saccifera, Oedera genistifolia, Osteospermum moniliferum, Oxalis* sp., *Oxalis* sp. (2) and *Pteronia* sp. Grasses are also present but were not identified.	
HHE7 **S 34° 07' 31.3"** **E 22° 05' 07.0"**	On upland plateau covered with renosterveld. The shrubland is < 1m tall with a few emergent *Osteospermum moniliferum* shrubs. *D. rhinocerotis* is dominant, forming a mid-dense to closed stratum with uniform appearance. The soil is reddish clay-loam. Species include: *Drosanthemum* sp., *Hermannia lavandulifolia, Hermannia saccifera, Metalasia densa, Oedera genistifolia, Pentaschistis eriostoma, Pteronia* sp. (common) and *Searsia pterota.* This entire area burnt as indicated by skeletons of burnt shrubs.	

HHE8 **S 34° 07' 30.2"** **E 22° 05' 02.8"**	This waypoint is at the edge of the plateau where the slope breaks (132 m above mean sea level). This is the transition zone from renosterveld to 'grassy fynbos'. It is recommended that no development should occur below this elevation.	
HHE9 **S 34° 07' 35.0"** **E 22° 05' 00.5"**	An old (closed) land-fill or dump is located at this waypoint. The area is highly disturbed and visible on aerial photographs.	

HHE10 **S 34° 07' 43.8"** **E 22° 04' 55.6"**	Renosterveld on upland plateau. This area was ploughed historically but has reverted to shrubland dominated by D. rhinocerotis which was burnt in 2009 or 2010. The location has an abundance of *Muraltia* sp. as well as *Asparagus aethiopicus, Erica peltata*, *Hermannia lavandulifolia*, *Hermannia saccifera, Metalasia densa, Oedera genistifolia*, *Oxalis* sp. and *Pteronia* sp. The vegetation has a low species diversity and is generally not sensitive.	
HHE11 **S 34° 07' 45.1"** **E 22° 04' 58.5"**	This waypoint is on the SE side of the 'main track'. This area did not burn in the last fire. The renosterbos is much taller – up to 1.2 m – than on the NW side of the track. A dense grassy sward is found under the renosterbos with some open grassy patches present. The species complement is the same as that at waypoint HHE10 with a few additional species such as *Achyranthemum paniculatum* and *Satyrium* sp.	

HHE12 **S 34° 07' 46.7"** **E 22° 05' 02.6"**	Waypoint HHE12 is located on a convex crest that is visible on aerial photos. The dominant species is an unidentified tussock grass. Other species include, *Babiana ambigua*, *Bobartia robusta, Brunsvigia orientalis, Bulbine* sp., cf. *Acrodon bellidiflorus*, *Diospyros* sp. (low shrub), *Drosanthemum sp, D. rhinocerotis, Indigofera* sp. (dwarf shrub), *Eriospermum* sp., *Ehrharta* sp., *Eragrostis curvula*, *Erica* sp., *Helichrysum* cf. *cymosum, Hermannia lavandulifolia, Ischyrolepis* sp. and *Muraltia* sp.,	
HHE13 **S 34° 07' 38.0"** **E 22° 05' 15.4"**	South-east side of main track on south-facing slopes. The veld is 'grassy fynbos' in good condition – low grassy shrubland with dense cover. Species recorded here include *Aspalathus sp., Asparagus aethiopicus, Babiana ambigua, Bobartia robusta, Diospyros dichrophylla, E. rhinocerotis, Ehrharta cf. scabra, Erica discolor, Erica peltata, Hakea sericea*, Hermannia lavandulifolia, Hermannia saccifera, Hermannia flammea*, *Indigofera* sp. (low shrub), *Ischyrolepis* sp., *Metalasia densa* (dominant shrub), *Metalasia sp. (2), Oedera genistifolia, Osteospermum moniliferum, Searsia pterota, Tarchonanthus littoralis, Tenaxia stricta* and Tussock grass – unidentified.	

HHE14 **S 34° 07' 37.3"** **E 22° 05' 11.9"**	Waypoint HHE14 is in an area where there is abundant invasive exotic *Hakea sericea* present. The shrubs are estimated to be 10 to 12 years old. This area also has *D. rhinocerotis* dominant, however, it is fynbos in general character	
HHE15 **S 34° 07' 44.5"** **E 22° 05' 19.7"**	Waypoint HHE15 was recorded as a 'checkpoint' to sample grassy fynbos on the ridge. *Erica hispidula* is dominant on the south-facing slope. Other species recorded include, *Babiana ambigua*, *Bobartia robusta, D. rhinocerotis, Erica discolor, Hermannia lavandulifolia, Hermannia lavandulifolia, Hermannia saccifera, Indigofera* sp. (low shrub), *Ischyrolepis* sp., *Leucadendron salignum, Metalasia densa, Metalasia* sp. (2), *Oedera genistifolia, Osteospermum moniliferum, Satyrium* sp., *Selago* sp., *Senecio* sp. – succulent leaves, *Syncarpha* sp. and Tussock grass – unidentified. Thicket elements such as *Aloe ferox* and *Schotia afra* were also recorded here.	

HHE16 **S 34° 07' 59.1"** **E 22° 05' 15.7"**	At the edge of a highly eroded area heavily invaded by *Acacia cyclops*. An apparent quarry is found at this location and the upper, relatively flat, are above the eroded valley supports shrubland dominated by renosterbos. Species recorded include, *Aspalathus* sp. – low grey shrub, *Babiana ambigua*, *Bulbine* sp., *Crassula* sp. – rugose leaves, *Drosanthemum* sp., *E. rhinocerotis* – dominant, *Eragrostis curvula, Eriospermum* sp. *Hermannia lavandulifolia, Metalasia* sp. (2), *Osteospermum moniliferum, Pteronia* sp. – abundant, *Ruschia* sp. and *Searsia pterota.*	
HHE17 **S 34° 07' 54.1"** **E 22° 04' 55.2"**	Shrubland dominated by *E. rhinocerotis* with skeletons of *Osteospermum moniliferum* from the last fire. The vegetation has the same complement of species as recorded elsewhere in the renosterveld at the site.	

HHE18 **S 34° 07' 48.8"** **E 22° 04' 56.9"**	Renosterveld dominated by *D. rhinocerotis*. *Pteronia* sp. is prominent. Skeletons of shrubs burnt in the last fire are commonly found. Species recorded include, *Aspalathus* sp. – low grey shrub, *Berkheya armata, Eragrostis curvula, Hermannia lavandulifolia, Hermannia saccifera, Metalasia* sp. (2), *Muraltia* sp., *Satyrium* sp. *Themeda triandra* and Tussock grass – unidentified.	
HHE19 **S 34° 07' 41.8"** **E 22° 05' 22.6"**	Waypoint HHE19 was located in an area of fynbos along the SW side of the entrance road to the site. The soil is pebbly with round cobbles and gravel. The vegetation is mid-high, mid-dense to closed shrubland. Species recorded include *Aspalathus* sp. – erect shrublet, *Bobartia robusta, E. rhinocerotis, Ehrharta scabra, Erica discolor* – dominant, *Erica peltata* – dominant, *Leucadendron salignum, Lobelia* cf. *coronopifolia, Metalasia densa,* Metalasia sp. (2), *Muraltia* sp., *Oedera genistifolia, Osteospermum moniliferum, Phylica* sp., *Syncarpha paniculata* and *Tenaxia stricta.*	

Table 2. Vegetation recorded at and near ten (10) waypoints on Erf 3312, Hartenbos, in March 2023.

Waypoints and Co-ordinates	Descriptive Notes	Illustration
HGE0001 **S 34° 07' 59.17"** **E 22° 05' 10.69"**	The original point HH31 was outside the erf boundary so a new point near but inside the boundary was chosen. The remains of a soil pit was found at this location. The vegetation is knee-high shrubland dominated by renosterbos (*D. rhinocerotis*). A wide circuit was walked to north and south of the track and it was noted that the vegetation is uniform throughout. Apart from renosterbos, species recorded include: *Acacia cyclops*, Anthospermum* cf. *spathulatum, Argyrolobium lunare, Babiana ambigua, Berkheya rigida, Bobartia robusta, Cyphia digitata, Digitaria eriantha, Diospyros dichrophylla, Drosanthemum* cf. *hispidum, Eragrostis capensis, Eragrostis curvula, Erepsia* sp., *Erica peltata, Eriocephalus africanus, Hermannia lavandulifolia, Hermannia saccifera, Hibiscus trionum*, Indigofera heterophylla, Linum* sp., *Metalasia densa, Oedera genistifolia, Osteospermum moniliferum, Oxalis imbricata subsp. violacea, Oxalis ciliata, Searsia pterota,* Selago cf. *glutinosa, Tephrosia capensis, Ursinia* sp.	

HGE0002 **S 34° 07' 54.03"** **E 22° 04' 55.10"**	In the vicinity of waypoint HHE17. The vegetation is uniformly dominated by *D. rhinocerotis* with *Oedera genistifolia* co-dominant. Other species recorded include: *Acacia cyclops*, Argyrolobium lunare, Athanasia quinquedentata* subsp. *quinquedentata Brachiaria serrata, Carpobrotus acinaciformis, Crassula sp., Cynodon dactylon, Cyperus sp., Dolichos hastiformis, Drosanthemum cf. hispidum, Ehrharta cf. scabra, Eragrostis curvula, Eragrostis sp., Erepsia sp., Erica peltata, Hermannia lavandulifolia, Hermannia saccifera, Hibiscus trionum, Hyparrhenia hirta, Hypoxis sp., Indigofera heterophylla, Indigofera nigromontana, Metalasia densa, Myoporum tenuifolium (exotic), Osteospermum moniliferum, Oxalis sp. – white flowers, Pennisetum clandestinum, Polygala pubiflora, Selago ramosissima, Stachys aethiopica , Tephrosia capensis, Themeda triandra.*	

HGE0003 **S 34° 07' 48.77"** **E 22° 04' 56.85"**	The shrubland is dominated by knee-high *D. rhinocerotis* and *O. genistifolia*. Other plant species include: *Acacia cyclops*, Acacia mearnsii*, Anthospermum sp., Argyrolobium lunare, Aspalathus sp. , Asparagus sp. Asparagus sp. (2), Boophone disticha, Brachiaria serrata Bulbine sp., Crassula* sp., *Dolichos hastiformis., Drimia capensis, Drosanthemum cf. hispidum, Eragrostis capensis, Eragrostis curvula, Eragrostis plana, Erepsia sp., Erica peltata, Felicia sp. white flowers, Freesia sp., Helichrysum sp., Hermannia lavandulifolia, Hermannia saccifera, Hyparrhenia hirta, Hypoxis sp., Indigofera heterophylla, Melinis nerviglumis, Metalasia densa, Metalasia sp., Osteospermum moniliferum, Oxalis imbricata subsp. violacea, Oxalis sp. – pale pink, Oxalis ciliata, Satyrium sp., Selago ramosissima, Struthiola ciliata, Tephrosia capensis, Ursinia sp.*	
HGE0004 **S 34° 07' 46.61"** **E 22° 05' 02.36"**	This location in the vicinity of HHE12 has low grassland with a few scattered emergent shrubs of *D. rhinocerotis*. It is more 'grassy fynbos' than pure renosterveld. Other plant species include, *Acacia cyclops**, *Acrodon bellidiflorus*, *Anthospermum* sp., *Aspalathus sp. Aspalathus* sp., *Asparagus* cf. *capensis, Babiana ambigua, Bobartia robusta, Boophone disticha, Crassula sp., Crassula muscosa, Cyphia sp., Diospyros dichrophylla, Dolichos hastiformis*, *Drosanthemum* sp., *Ehrharta cf. scabra*, *Eragrostis capensis, Eragrostis curvula, Erica peltata,* Grass – tussock – dominant, *Hermannia saccifera, Hibiscus sp. – pale pink flower, Indigofera nigromontana*, *Melinis nerviglumis, Metalasia sp., Metalasia densa, Montinia caryophyllacea, Othonna* sp., *Polygala*	

	pubiflora, Restio sp., Ruschia sp. Selago ramosissima, Senecio sp. (succulent), *Themeda triandra.*	
HGE0005 **S 34° 07' 45.24"** **E 22° 04' 59.004"**	In the vicinity of HHE11. This is typical secondary renosterveld shrubland on the historically ploughed area. The renosterbos is waist-high to chest-high and is the dominant shrub. *Oedera genistifolia* is common but no co-dominant here. Other species include: *Argyrolobium lunare, Aspalathus* sp., *Bromus catharticus*, *Bulbine* sp., *Crassula* sp., *Dolichos hastiformis, Eragrostis curvula, Eragrostis plana, Erepsia* sp. *Erica peltata* (one plant!), *Gazania krebsiana*, *Hermannia lavandulifolia*, *Hermannia saccifera, Hyparrhenia hirta, Indigofera heterophylla, Metalasia densa, Osteospermum moniliferum, Oxalis imbricata subsp. violacea*, *Oxalis* sp. – pale pink, *Oxalis ciliata*, *Polygala pubiflora, Massonia* sp., *Selago ramosissima, Tephrosia capensis.*	

HGE0006 **S 34° 07' 44.27"** **E 22° 04' 56.14"**	This waypoint was recorded in the vicinity of waypoint HHE10 (previous survey). The vegetation is knee- to waist-high renosterveld uniformly over a wide area. Apart from *D. rhinocerotis*, other species are: *Acacia cyclops*, Agathosma ovata, Argyrolobium lunare, Asparagus sp., Babiana ambigua, Berkheya armata, Boophone disticha, Bromus cf. catharticus, Conyza scabrida* – near old refuse tip, *Digitaria eriantha, Dolichos hastiformis, Eragrostis curvula, Erepsia sp , Erica peltata, Hermannia lavandulifolia, Hermannia saccifera, Hyparrhenia hirta, Indigofera heterophylla, Metalasia sp. Oedera genistifolia – co-dominant, Osteospermum moniliferum, Oxalis imbricata subsp. violacea, Oxalis sp.- pale pink, Pteronia sp., Satyrium sp., Searsia pterota, Selago ramosissima, Stachys aethiopica, Tarchonanthus littoralis, Tephrosia capensis.*	

HGE0007 **S 34° 07' 29.77"** **E 22° 05' 02.49"**	This waypoint was recorded at the interface between the 'grassy fynbos' and the renosterveld. Renosterbos is common and dominant here and forms an open upper stratum approximately waist-high. The slopes is covered with round, alluvial boulders that have been deposited here having been removed from the ploughed area. The lower stratum is strongly grassy. Other plants species include: *Acacia cyclops* Anthospermum cf. spathulatum, Aspalathus* sp., *Asparagu*s sp., *Berkheya armata, Boophone disticha, Bromus* cf. *catharticus, Commelina africana, Crassula* sp*., Cymbopogon marginatus, Digitaria eriantha, Drosanthemum cf. hispidum, Ehrharta scabra, Eragrostis curvula, Euclea undulata, Helichrysum* sp., *Hermannia saccifera, Hibiscus trionum, Indigofera nigromontana, Lyperia violacea, Osteospermum moniliferum, Oxalis ciliata, Polygala pubiflora, Searsia pterota, Searsia Selago ramosissima, Tarchonanthus littoralis, Tephrosia capensis.*	

HGE0008 **S 34° 07' 31.14"** **E 22° 05' 07.08"**	This waypoint is close to HHE7, in typical renosterveld. *D rhinocerotis* is 1m tall or less and together with *O. genistifolia* is co-dominant and together they form a mid-dense upper stratum. Plant species recorded include: *Brachiaria serrata, Bromus* cf. *catharticus, Cymbopogon marginatus, E. peltata, Erepsia* sp., *H. lavandulifolia, H. saccifera* (not much!)=, *Hyparrhenia hirta, Indigofera heterophylla, Massonia* sp., *Metalasia densa, Metalasia* sp., *Osteospermum moniliferum, Oxalis ciliata, Oxalis* sp. white, *Searsia* sp., *Selago ramosissima, Themeda triandra.*	
Walk through renosterveld from HGE0008 and HGE0009	The following is a general list of plant species recorded along a random walk through the renosterveld: *Abutilon sonneratianum, Asparagus sp., Crassula* sp., *D. rhinocerotis, Dolichos hastiformis, Eragrostis capensis, Eragrostis plana, Erepsia sp., Hermannia lavandulifolia, Hermannia saccifera, Hyparrhenia hirta, Indigofera heterophylla, Massonia sp., Muraltia cf. ericoides, Oedera genistifolia, Oxalis* – white, *Oxalis imbricata* subsp. *violacea, Selago ramosissima, Tephrosia capensis.*	 Flowers of *Dolichos hastiformis*

HGE0009 **S 34° 07' 38.61"** **E 22° 05' 03.86"**	On east to south-east side of the road opposite where the old rubbish tip is located. This area has very old renosterveld that has not been burnt for a long time (It did not burn in 2010/2011 nor in 2018/2019. I speculate that this area has not been burnt since the ploughed lands were allowed to lie fallow.) There are numerous *D. rhinocerotis* shrubs but many plants have died. The dead stems and branches are covered with lichen. Unlike the *D. rhinocerotis*, the *Oedera genistifolia* is not dying, but the vegetation is moribund. Apart from *D. rhinocerotis* and *O. genistifolia* that are co-dominant, other plant species recorded include: *Argyrolobium lunare, Berkheya armata, Commelina africana, Crassula* sp. new Photo 549, 566, *Crassula* sp. Ph 551,552, *Cymbopogon marginatus, Diospyros dichrophylla, Eragrostis curvula, Erica discolor, Erica peltata, Eriospermum pubescens,* Grass - unidentified, *H. lavandulifolia in patches, H. saccifera, Hibiscus trionum*, *Indigofera heterophylla, Indigofera nigromontana, Lyperia violacea, Melinis nerviglumis, Metalasia densa, Oxalis* sp. – white, *Searsia pallens, Selago ramosissima, Senecio cf. acaulis*.	

HGE0010 **S 34° 07' 37.74"** **E 22° 05' 16.31"**	This location is in what has previously been described as 'grassy fynbos' (in the vicinity of HHE13). This vegetation stretches from the entrance road (actually from over the hill to the east), through the valley to where HHE15 is located. There is strong uniformity in the distribution which may be as a result of past fires. Species recorded include: *Acacia cyclops*, Achyranthemum paniculatum, Aspalathus sp., Aspalathus sp. dwarf shrub with fine leaves*, *Asparagus* sp., *Babiana ambigua, Berkheya armata, Bobartia robusta, Clutia* sp., *Crassula muscosa*, *Crassula* sp., *Cymbopogon marginatus, Diospyros dichrophylla, Ehrharta scabra, Eragrostis capensis, Erepsia, Erica discolor, Erica peltata, Erica* sp. -dwarf shrub, *Gnidia sp., Hakea sericea**, *Hermannia flammea, Hermannia lavandulifolia, Hermannia saccifera, Hibiscus* sp. ,- pale pink flower, *Hyparrhenia hirta, Indigofera nigromontana, Leucadendron salignum, Lobelia coronopifolia, Lyperia violacea, Melinis nerviglumis, Metalasia sp., Metalasia* cf. *pungens, Metalasia densa, Montinia caryophyllacea, Oedera capensis, Osteospermum moniliferum, Polygala pubiflora, Prismatocarpus candolleanus, Pteronia sp., Restio capensis, Searsia pterota, Searsia lucida, Searsia rosmarinifolia, Selago ramosissima, Selago mauve, Senecio, Stachys aethiopica, , Tenaxia stricta, Tephrosia capensis, Tulbaghia sp.,*	

5.5 Vegetation Map of Erf 3122, Mossel Bay.

In order to simplify the appraisal of the vegetation at Erf 3122, Mossel Bay, a vegetation map was compiled that recognizes only two vegetation types, renosterveld and grassy fynbos (Figure 17). The renosterveld, as mentioned above, is **secondary**, having 'restored' on areas that were once cultivated. This vegetation is considered to have **low sensitivity,** whereas the grassy fynbos that occurs on steeper slopes, and has not been historically cultivated, is considered to be mostly of **highly sensitivity.** The area along the road leading to the reservoir, and the area in the vicinity of the reservoir itself, have moderate sensitivity (Figure 18).

Figure 17. Simplified vegetation map for Erf 3122, Mossel Bay.

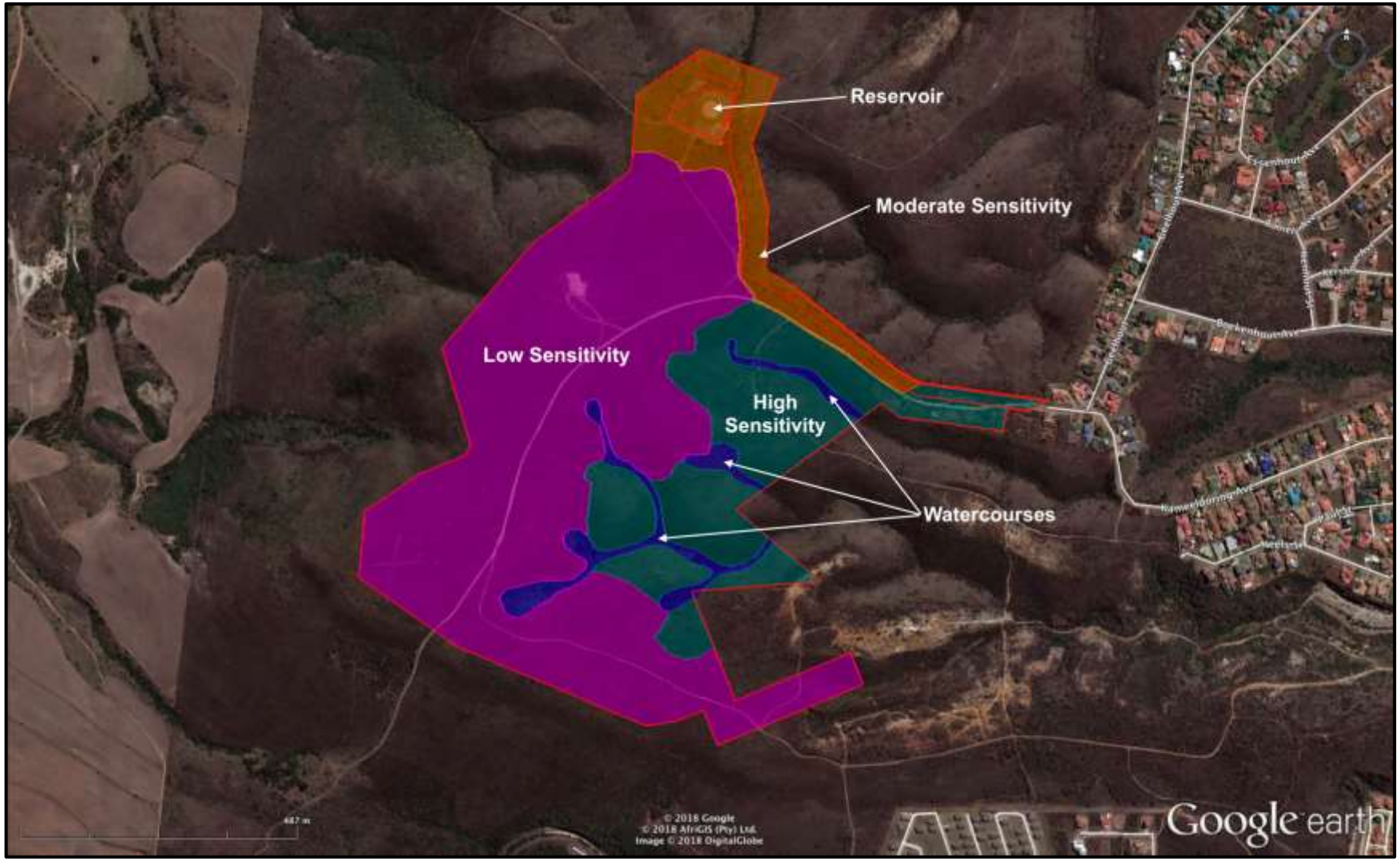


Figure 18. Habitat sensitivity map for Erf 3122, Mossel Bay.

6. Conservation Status

6.1 The Western Cape Biodiversity Spatial Plan

The Western Cape Biodiversity Spatial Plan [WCBSP] (CapeNature 2017, Pool-Stanvliet *et al.* 2017) was consulted for determination of conservation status and critical biodiversity areas. The required shapefiles were obtained from the South African National Biodiversity Institute (SANBI) BGIS website and then the critical biodiversity areas (CBA) map for the Hartenbos Hills Garden Estate study area was overlaid on a Google Earth ™ image and carefully examined to compare what was observed in the field with the aerial image when overlaid with the CBA map. The presence of CBAs (and ESAs -- Ecological Support Areas) suggests that areas where they have been mapped are ecologically sensitive. However, that is not always the case. Part of the objective of the ground-truthing was to determine the veracity of the units mapped as CBAs and ESAs in the WCBSP as applicable to Erf 3122, Mossel Bay.

Virtually the entire area of Erf 3122, Mossel Bay is mapped as CBA1 with small areas mapped as CBA2 and even fewer areas mapped as ESA1 (Figure 19). From field observations there is poor correlation between the WCBSP map and the sensitivity of the vegetation. The areas covered by renosterveld are, in my opinion, **not botanically sensitive** and have low plant species diversity. I thus contend that the renosterveld area should be mapped as ESA1 and not CBA1 or CBA2. This contention is taken into account when determining the constraints on the site (see Figure 22).

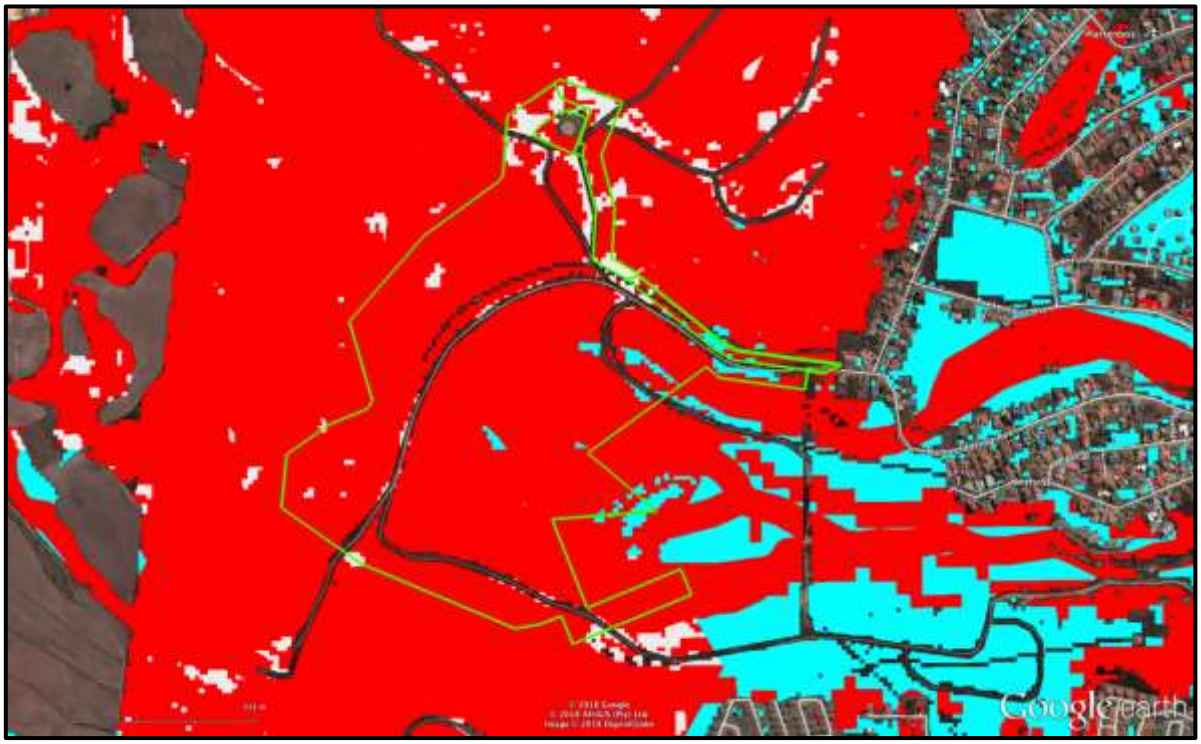
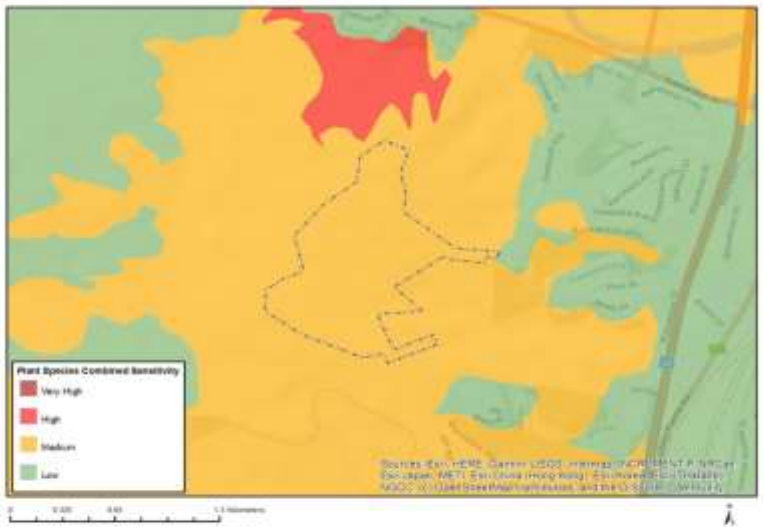


Figure 19. Critical Biodiversity Areas map for Erf 3122, Mossel Bay (green boundary). Red=CBA1; White = CBA2 and Light blue = ESA1.

6.2 The National Web-based Environmental Screening Tool

The National We-based Screening Tool was applied for Erf 3122, Mossel Bay and the result was that the site has a **MEDIUM** sensitivity with respect to the relative plant species theme (Figure 20). There are also not many sensitive species and regarded as sensitive in the species list (the names of those species not listed were obtained from SANBI but as per protocol are not published here). However, it is known that *Hermannia lavandulifolia* is an important species since it is the food plant for the rare endemic butterfly *Aloeides trimeni southeyae* (Dr Dave Edge pers. comm.) As for other plants of conservation concern, a number of those listed in Figure 11 were not recorded in the study area and that is attributed to the historical disturbance of the site.

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



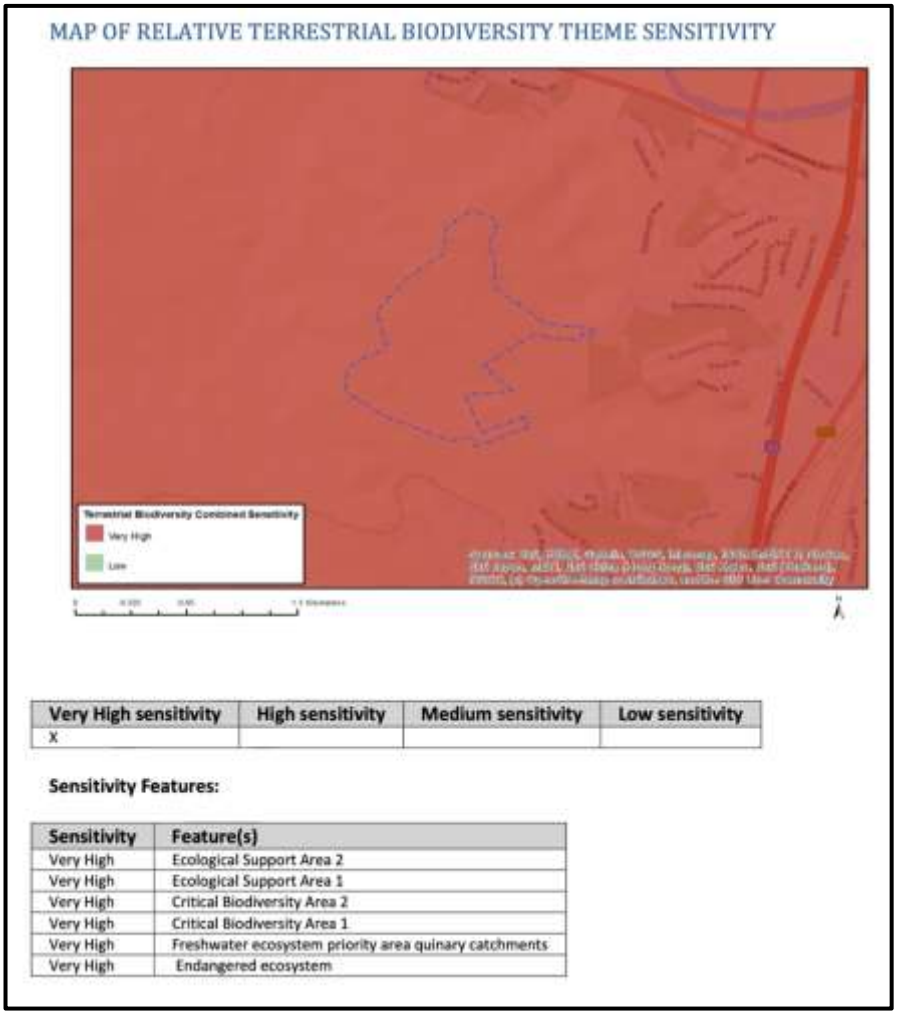
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Ruschia leptocalyx
Medium	Aspalathus campestris
Medium	Selago ramosissima
Medium	Freesia fergusoniae
Medium	Hermannia lavandulifolia
Medium	Sensitive species 633
Medium	Sensitive species 268
Medium	Marsilea schelpeana
Medium	Sensitive species 1024
Medium	Athanasia cochlearifolia
Medium	Relhania garnotii
Medium	Muraltia cliffortiifolia
Medium	Polygala pubiflora
Medium	Sensitive species 980
Medium	Ruellia pilosa
Medium	Sensitive species 516
Medium	Sensitive species 800
Medium	Sensitive species 763
Medium	Diosma passerinoides
Medium	Agathosma microcarpa

Figure 20. Extract from the report generated for the Relative Plant Species Theme Sensitivity for Erf 3122, Mossel Bay.

The relative terrestrial biodiversity theme sensitivity is given as VERY HIGH in Figure 21. Both Helme (2016) and this author do not agree with the assigning of CBA1 to Erf 3122, Mossel Bay in the Western Cape Biodiversity Spatial Plan (Pence, 2017; Pool-Stanvliet, 2017). The sensitivity of the erf is overestimated, and this has been drawn down into the National Web-based Screening Tool where the 'error' has been perpetuated (Figure 12). The sensitivity is more realistically **MEDIUM**.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Ecological Support Area 2
Very High	Ecological Support Area 1
Very High	Critical Biodiversity Area 2
Very High	Critical Biodiversity Area 1
Very High	Freshwater ecosystem priority area quinary catchments
Very High	Endangered ecosystem

Figure 21. Extract from the report generated for the Relative terrestrial Biodiversity Theme Sensitivity for Erf 3122, Mossel Bay (blue dotted polygon).

6.3 The Red Listed Ecosystems

An appraisal of remnants of important ecosystems of South Africa was carried out by Skowno *et al.* (2019) and published by SANBI (2021) as the 'Red List of Ecosystems' (RLE). The available shapefile was overlaid and a Google Earth Pro ™ image together with a boundary outline of the proposed Hartenbos Hills Garden Estate development footprint and an outline with shading of the areas mapped as having been ploughed in the past. The resulting composite image (Figure 22) shows that the proposed development footprint is mostly within or in places marginally outside the historically ploughed areas. The Critically

Endangered Mossel Bay Shale Renosterveld RLE as mapped by SANBI (2021) overlaps on the ploughed area at the areas enclosed by the ovals at '1' and '2' in Figure 22. At the oval labeled '3' the RLE overlaps with the entrance corridor to the proposed development. In addition, the greater part of the area within Oval 1 is to be set aside as a conservation area for the endangered butterfly, *Aloeides trimeni southeyae.*

It must be concluded, therefore, that the proposed development at Erf 3122, Mossel Bay would have a very low impact, and practically speaking, very little impact at all, on the mapped RLE.

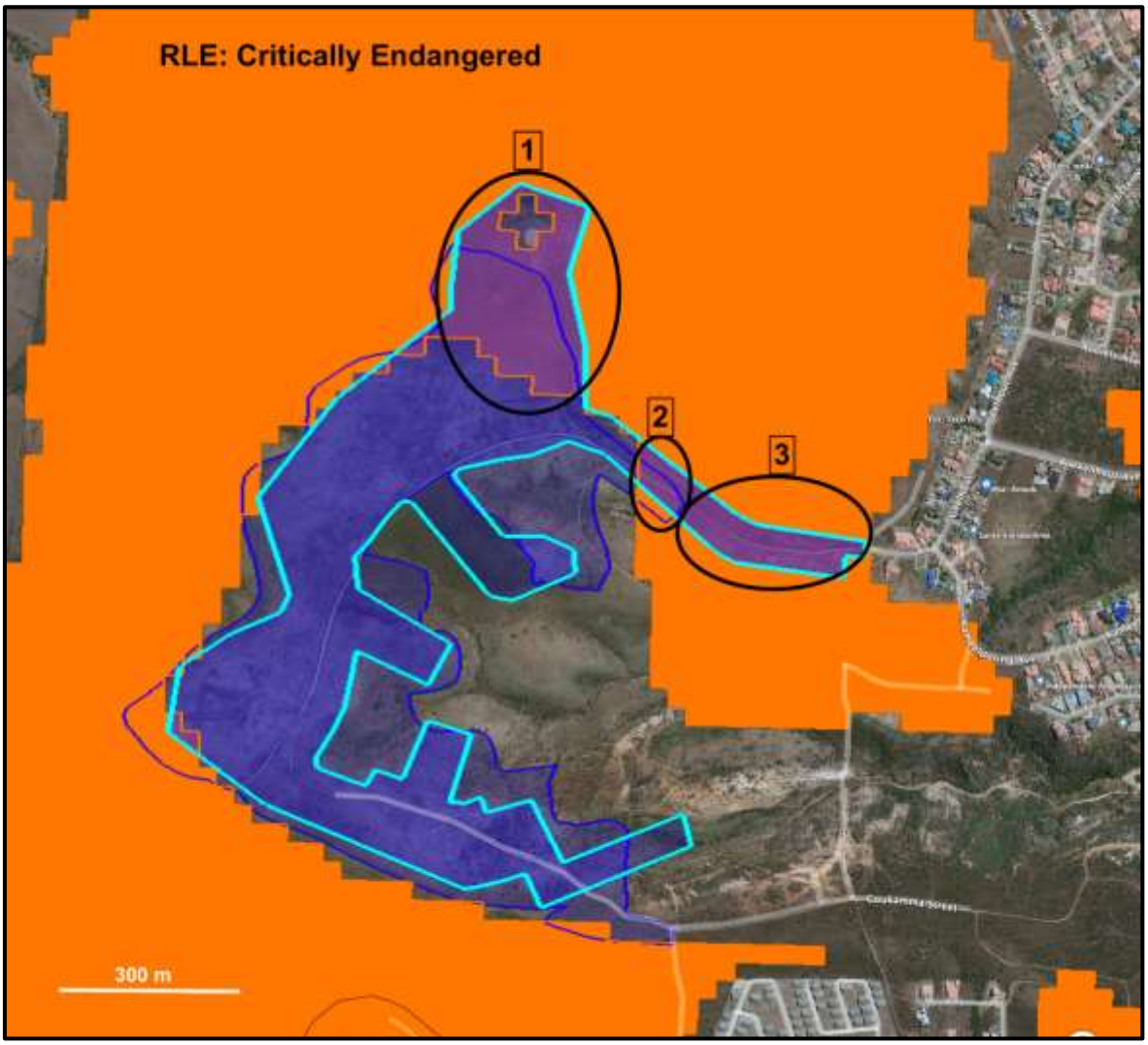


Figure 22. Google Earth Pro ™ with the mapped historically ploughed areas at Erf 3122, Mossel Bay (dark blue outline with dark blue shading); the development footprint, light blue outline and the Red List Ecosystem (RLE) [Critically Endangered] mapped as orange shading. Ovals 1, 2 & 3 are overlap zones of the three indicators; historical ploughing, development footprint and RLE.

6.4 Plant Species of Conservation Concern

As for the study by Helme (2016) no species of conservation concern were found on the site in this study. Helme (2016) made observations of endangered species and regional endemics that occur in the near vicinity of the study area. He speculated that these species could occur on the site but that the probability of their occurrence is low. The following is an extract from Helme (2016):

"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 *Lotononis* (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."

7. Botanical Constraints

Notwithstanding the classification of the entire Erf 3122, Mossel Bay, as CBA1 in the Western Cape Biodiversity Spatial Plan (Pence 2017) (Figure 19), the field observations indicate differently. Taking all the relevant indicators into consideration, a constraints map was compiled. The constraints map reflects my view that the renosterveld has **low sensitivity** and the grassy fynbos has **high sensitivity** with consequent low and high constraints as mapped in Figure 23.

The constraints map was used to inform the iterative process of the site layout. It was recommended at a team workshop (31 October 2017) that any proposed development of Erf 3122, Mossel Bay, should only take place in areas identified as 'Low Constraints'; mostly areas occupied by **secondary renosterveld**.

Figure 23. Botanical constraints for Erf 3122, Mossel Bay.

8. Responses to Cape Nature's comments

The comments in the letter from Cape Nature dated 08 March 2022, Ref LE14/2/6/1/6/6/ERRF3122_development_hartenbos, have been thoroughly considered. If the constraints of Critical Biodiversity Areas and Ecological Support Area are applied as intimated in this letter, the development as proposed at Erf 3122, Mossel Bay, may as well be halted immediately. Notwithstanding the comments about the merits or demerits of CBAs and ESAs, and the respective definitions and objectives of these classifications, a considerable effort has been made on the part of numerous specialists over a long period of time to arrive at an acceptable development proposal. The proponents of the development proposal, under the guidance of biological specialists, has sought to address the constraints published in the Western Cape Biodiversity Spatial Plan, with respect to botanical, entomological, faunal, and fresh-water considerations in great detail. In addition, a 'fire study' to develop a fire management plan has also been carried out.

The comments and recommendations in the letter are, in essence, a summarised version of all the aspects that have been thoroughly investigated and do not bear repeating. Reference is also made to

Hartenbos Heuwels Erf 1852; Erf 1853; Portion 59 of Farm 217 and Portion 4 of Farm 217 and the recommendation of Biodiversity Stewardship and involvement with Cape Nature's Protected Area Expansion Strategy. The above properties are not of concern in the Hartenbos Hills Garden Estate development and so this is completely irrelevant to this project and is not considered any further here, suffice to say that the Hartenbos Hills Garden Estate aspires to be as eco-friendly as possible e.g. to allow for corridors, and for ecosystem processes to persist.

9. Impact assessment of the proposed development

The process followed to reach an 'acceptable' site development plan (SDP - 2018 version – Figure 14) and, it must be strongly emphasized, has taken numerous factors, not only vegetation and habitat, into account. There is an intentional strong relationship between the first iteration of the SDP (Figure 14, referred to further as **Alternative 1**) and the botanical constraints map (Figure 13). The SDP has responded to the landscape and ecology (secondary renosterveld that has returned after historical ploughing) and it is predicted that with further mitigation, the resultant impact on the vegetation is likely to be **low negative** (Table 2) since only the low sensitivity areas would be directly affected. There are likely to be very low indirect impacts on areas covered by fynbos but little, if any, direct negative impact.

Further refinement of the SDP took place between February 2018 and December 2020 (Figure 25). This happened under a directive from Hartenbos Hills Propco (Pty) Ltd and this iteration was the preferred alternative (Alternative 2) until November 2021. Alternative 2 made allowance for a conservation area near the reservoir, essentially to conserve the habitat of an endangered butterfly species, *Aloeides trimeni southeyae* (Edge, 2021). In November 2021, a further layout iteration was considered which became the preferred alternative (Alternative 3) (Figure 26). After comments had been received from CapeNature in early 2023, the biodiversity specialists met with the EAP, town planner and project proponent to examine where the 'wildlife corridors' that were called for by CapeNature could be located. The result is the layout in Figure 27

9.1 Direct Impacts

The 'No Go' Alternative would result in no change to the *status quo*. Direct impacts of the Preferred Alternative (Alternative 1) are given in Table 2. Direct impacts would be **Low Negative** in the construction phase and **Very Low Negative** in the operational phase. No irreplaceable resources would be lost but once the development is in place, any direct impacts would be irreversible.

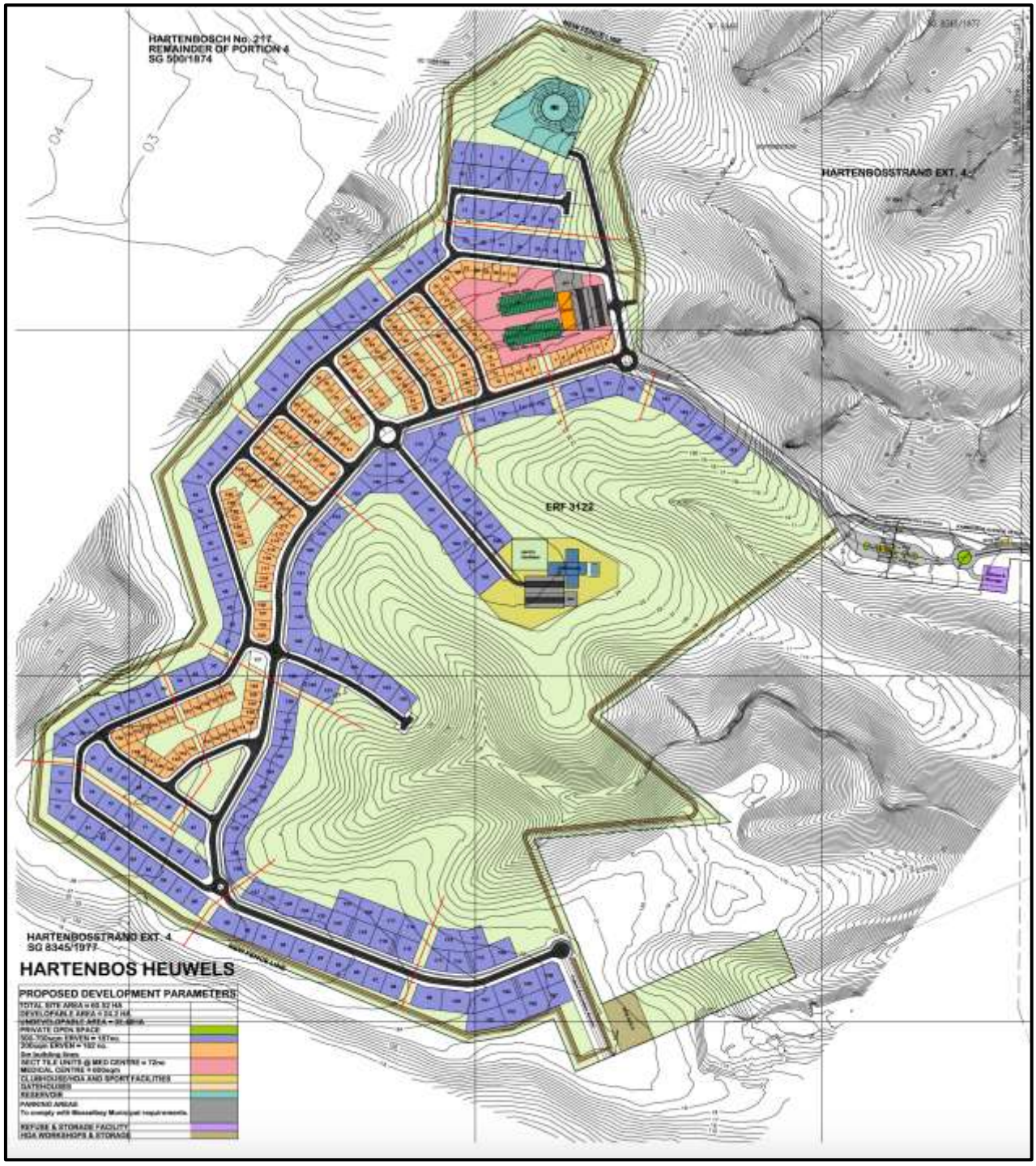


Figure 24. Proposed site development plan (SDP) for Erf 3122 Mossel Bay, (Diagram: Concept 23 (3) 27 February 2018, prepared by AJK Projects).

Figure 25. The SDP for Erf 3122, Mossel Bay dated 20 December 2020.

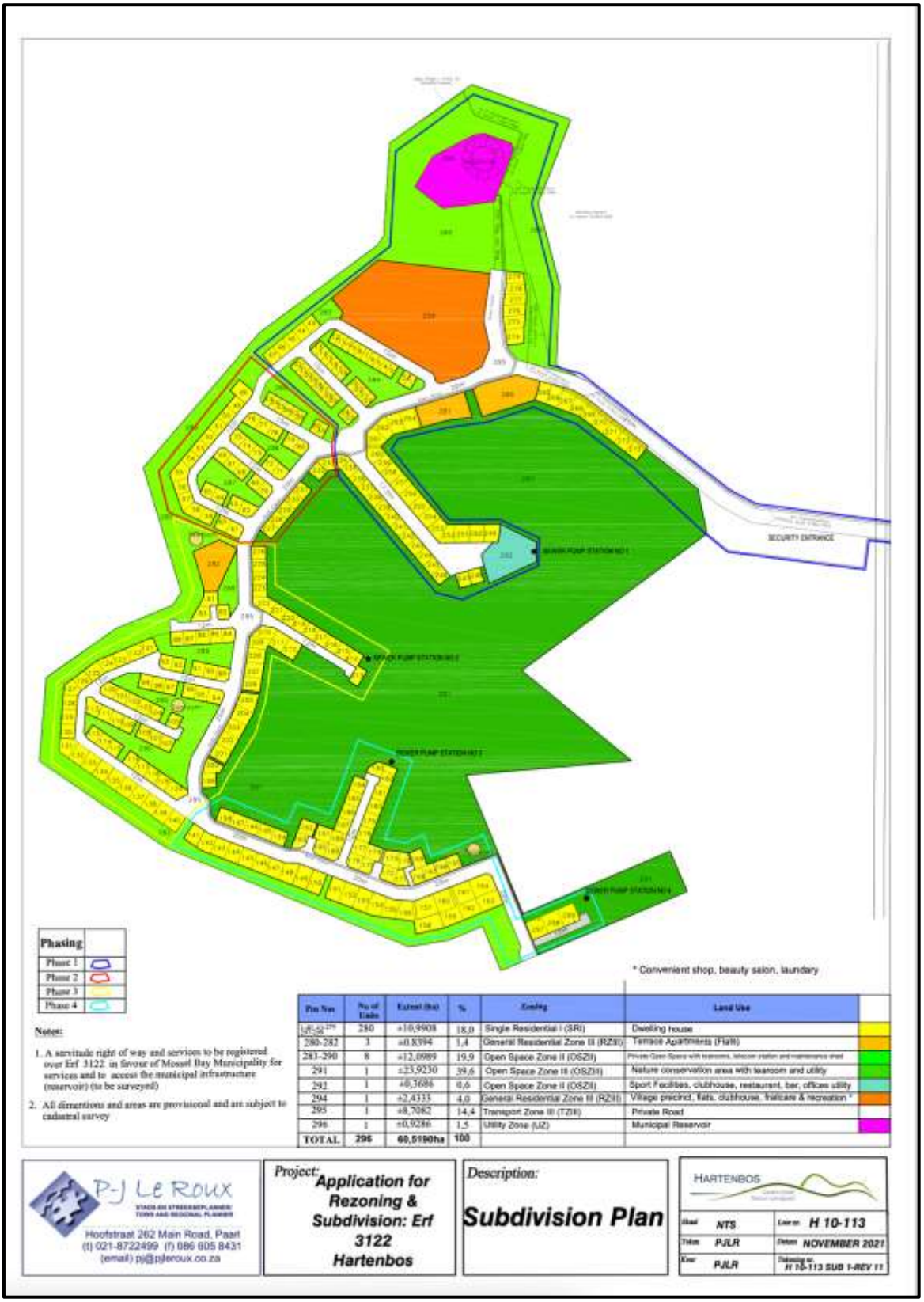


Figure 26. The Refined SDP for Erf 3122, Mossel Bay dated 21 November 2021. It is a refinement, with detail, of Figure 25.

Figure 27. The revised layout (March 2023) for Hartenbos Garden Estate incorporating corridors (white arrows) for movement of wildlife.

Table 2. Impact of the loss of degraded Mossel Bay Shale Renosterveld due to the development of Hartenbos Hills Garden Estate (Alternative 2 – preferred alternative).

LOSS OF VEGETATION				
PROJECT PHASE	*Construction Phase*			
DIRECT IMPACT	*Removal of natural vegetation: degraded Mossel Bay Shale Renosterveld*			
INDIRECT IMPACT	*None determined*			
CUMULATIVE IMPACT	Loss of degraded Mossel Bay Shale Renosterveld			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*4*	*The duration of the activity associated with the impact will be phased with each year estimated to take 3—4 years.*	*-10*	*3*
EXTENT	*1*	*The impacts will be localized to the designated footprint as described*		
SEVERITY	*-2*	*The severity of the potential impact will be moderate (medium) negative.*	***Slightly Detrimental***	***Definite***
IMPACT ON IRREPLACEBLE RESOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-30***	***Low - negative***		
PROPOSED MITIGATION MEASURES				
The mitigation measures necessary would be the relocation of *geophytes from the development footprint. Ideally the bulbs should be lifted when they dormant (summer) but that would mean traversing the entire area of the proposed development in the preceding winter and marking every occurrence of these plants. A more practical approach would be to unearth the bulbs during the construction phase and to then relocate and plant them soon after removal. (**Note: A clearing permit as well as a permit for removal of and relocation of plants would be required from Cape Nature**).*				

Secondly, all construction activities must take place within the footprint of the development. Areas outside the development footprint (except for access roads) MUST be avoided. Any areas within the development footprint that will not be used later should rehabilitated wit natural vegetation native to the area.				
POST-MITIGATION				
DURATION	4	*The duration of the activity associated with the impact will last at least 5 years and therefore it is considered to be Long Term.*	*-10*	*3*
EXTENT	3	*The extent of the impact is treated as 'Site' as it affects the development area and adjacent properties*		
SEVERITY	-2	*The severity of the impact is rated as **Moderate negative** as the impact would affect the environment in such a way that it would mostly be restricted to secondary renosterveld – i.e. the veld that returned after ploughing and then being left fallow.*	***Slightly Detrimental***	***Definite***
IMPACT ON IRREPLACEBLE RESOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-30**	**Low - negative**		
CONFIDENCE LEVEL				
High				

Table 3. Impact of the loss of Mossel Bay Shale Renosterveld in the operational phase of Hartenbos Hills Garden Estate.

LOSS OF VEGETATION				
PROJECT PHASE	*Operational Phase*			
DIRECT IMPACT	*Removal of natural vegetation: degraded Mossel Bay Shale Renosterveld*			
INDIRECT IMPACT	--			
CUMULATIVE IMPACT	Loss of degraded Mossel Bay Shale Renosterveld			
DIMENSION	**RATING**	**MOTIVATION**	**CONSEQUENCE**	**LIKELIHOOD**
PRE-MITIGATION				
DURATION	*4*	*The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term*	*-6*	*3*
EXTENT	*2*	*The extent of the impact is rated as 'footprint' as it will only affect the area in which the proposed activity will occur.*		
SEVERITY	*-1*	*The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected*	***Negligible***	***Likely***
IMPACT ON IRREPLACEBLE RESOURCES	*0*	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	***-18***	***Very Low negative***		
PROPOSED MITIGATION MEASURES				
Undertake vegetation clearing during the dry season; Keep vegetation cut low but not eradicated along firebreaks.				
Only clear vegetation where absolutely necessary.				

POST-MITIGATION				
DURATION	4	*The duration of the activity associated with the impact will last > 5 years and as such is rated as Long term*	*-2*	*1*
EXTENT	1	*The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur*		
SEVERITY	-1	*The severity of the impact is rated as Low negative since the impact during the operational phase will not affect the environment in such a way that natural, cultural and social functions and processes will be affected any more than in the construction phase.*	***Negligible***	***Unlikely***
IMPACT ON IRREPLACEBLE RESOURCES	0	*No irreplaceable resources will be impacted.*		
SIGNIFICANCE	**-2**	**Very Low negative**		
CONFIDENCE LEVEL				
Medium				

9.2 Indirect impacts

By definition, indirect impacts occur away from the 'action source' i.e., away from the development site. The impact assessed here is specifically how the proposed Hartenbos Hills Garden Estate would have negligible and insignificant indirect impacts on vegetation and flora away from the development area.

9.3 Cumulative impacts

The proposed development of the Hartenbos Hills Garden Estate would be in an area of the Garden Route known for its natural beauty. It will also be placed in an area mapped as CBA1. However, as has been demonstrated above, the footprint of the development would be restricted to substrates that were historically ploughed. The actual loss of undisturbed renosterveld would be limited and there would be no further loss of any undisturbed Mossel Bay Shale renosterveld in the future due to the development. Cumulative impacts would thus be Very Low Negative (Table 2 & 3).

10. General Assessment and Recommendations

- A single vegetation type, Mossel Bay Shale Renosterveld, is found in the footprint of the proposed Hartenbos Hills Garden Estate. A second, poorly described vegetation type, named here as grassy fynbos, lies outside the development footprint but still on erf 3122, Mossel Bay.
- Mossel Bay Shale Renosterveld is Critically Endangered and not conserved in any formal conservation area.
- No rare or threatened plant species were found during the survey. The probability of the occurrence of species of conservation concern (SCC) in the development footprint is low due to historical disturbance by ploughing.
- The National Web-based Environmental Screening Tool for the vegetation overestimates the sensitivity specifically of the development footprint which has been determined by on-site evaluation to have low sensitivity.
- The sensitivity of terrestrial biodiversity according to the National Web-based Environmental Screening Tool is **Very High**. This is based on there being CBA1 areas within and adjacent to the development footprint. The data collected in this study does not support the output of the screening tool and the terrestrial biodiversity sensitivity is rated here as **Medium** at the most.
- Base on the data collected and analyzed for the target area for the development of Hartenbos Hills Garden Estate, no fatal flaws or any other obstacles were found with respect to the flora, vegetation as a whole and terrestrial biodiversity.

11. Conclusions

From a botanical perspective Erf 3122, Mossel Bay can be divided into two main vegetation types, low sensitivity renosterveld and high sensitivity grassy fynbos. These vegetation types occupy two distinct areas with the renosterveld being found on the upland plateau. It was historically ploughed and this disturbance has carried through despite the area having apparently restored to 'good' vegetation. Analyses of collected data shows that the renosterveld is relatively poor in plant species with a significant complement of the original species having been lost. The fynbos, on the other hand, is relatively undisturbed and has high sensitivity. The latter vegetation would be completely unaffected by the proposed development.

Despite virtually the entire area of Erf 3122, Mossel Bay (Hartenbos Garden Estate) being classified as CBA1 in the WCBSP (2017), it has been determined from field studies (ground-truthing) that the ***development area specifically*** is occupied by renosterveld that should at best be re-classified as ESA1. The renosterveld in the proposed development area has low botanical constraints.

The results of this detailed impact assessment show that the proposed development would have low negative direct and cumulative impacts before and after mitigation, due to the low sensitivity of the terrain that would be displaced by the development. (**This does not apply to areas outside the development footprint**). Therefore, the proposed Hartenbos Hills Garden Estate development is supported from a botanical perspective.

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Appendix 1: Impact Assessment Methodology (from GIBB Environmental)

The objective of the assessment of potential impacts is to identify and assess all the significant, potential impacts that may arise as a result of the project.

For each of the main project phases the existing and potential future impacts and benefits (associated only with the project) will be described using the criteria listed below. The assignment of ratings has been undertaken based on past experience of the team, as well as through research. Subsequently, mitigation measures will be identified and considered for each impact and the assessment repeated in order to determine the significance of the residual impacts (the impact remaining after the mitigation measure has been implemented).

Table 1: Impact Assessment Criteria

Criteria	Rating Scales	Notes
Nature	Positive	An evaluation of the effect of the impact related to the proposed development
	Negative	
Extent	Footprint	The extent of the impact is rated as footprint as it only affects the area in which the proposed activity will occur
	Site	The extent of the impact is rated as site as it will affect only the development area
	Local	The extent of the impact is rated as Local as it affects the development area and adjacent properties
	Regional	The extent of the impact is rated as Regional as the effects of the impact extends beyond municipal boundaries
	National	The extent of the impact is rated as National as the effects of the impact extends beyond more than 2 regional/ provincial boundaries
	International	The extent of the impact is rated as International as the effect of the impact extends beyond country borders
Duration	Temporary	The duration of the activity associated with the impact will last 0-6 months and as such is rated as Temporary
	Short term	The duration of the activity associated with the impact will last 6-18 months and as such is rated as Short term
	Medium term	The duration of the activity associated with the impact will last 18 months-5 years and as such is rated as Medium term
	Long term	The duration of the activity associated with the impact will last more than 5 years and as such is rated as Long Term
Severity	High negative	The severity of the impact is rated as High negative as the natural, cultural or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected.

Criteria	Rating Scales	Notes
	Moderate negative	The severity of the impact is rated as Moderate negative as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected
	Low negative	The severity of the impact is rated as Low negative as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected
	Low positive	The severity of the impact is rated as Low positive as the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally improved
	Moderate positive	The severity of the impact is rated as Moderate positive as the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are positively affected
	High positive	The severity of the impact is rated as High positive as the natural, cultural or social functions and processes are altered to the extent that valued, important, sensitive or vulnerable systems or communities are substantially positively affected.
Potential for impact on irreplaceable resources	No	No irreplaceable resources will be impacted.
	Yes	Irreplaceable resources will be impacted.
Consequence	Extremely detrimental	A combination of extent, duration, intensity and the potential for impact on irreplaceable resources
	Highly detrimental	
	Moderately detrimental	
	Slightly detrimental	
	Negligible	
	Slightly beneficial	
	Moderately beneficial	
	Highly beneficial	
	Extremely beneficial	
Likelihood of the impact occurring	Unlikely	It is highly unlikely or less than 50 % likely that an impact will occur.
	Likely	It is between 50 and 75 % certain that the impact will occur.
	Definite	It is more than 75 % certain that the impact will occur or it is definite that the impact will occur.
Significance	Very high - negative	A function of Consequence and Likelihood
	High - negative	

Criteria	Rating Scales	Notes
	Moderate - negative	
	Low - negative	
	Very low	
	Low - positive	
	Moderate - positive	
	High - positive	
	Very high - positive	

Table 2: Impact Assessment Criteria and Rating Scales

Duration		Extent		Irreplaceable Resources		Severity		Consequence = (Duration + Extent + Irreplaceable Resources) x Severity		Likelihood		Significance (Consequence x Likelihood)		Confidence
1	Temporary	1	Footprint	1	Yes	-3	High - negative	-25 to -33	Extremely detrimental	1	Unlikely	-73 to -99	Very high - negative	Low
2	Short term	2	Site	0	No	-2	Moderate - negative	-19 to -24	Highly detrimental	2	Likely	-55 to -72	High - negative	Medium
3	Medium term	3	Local			-1	Low -negative	-13 to -18	Moderately detrimental	3	Definite	-37 to -54	Moderate - negative	High
4	Long term	4	Regional					-7 to -12	Slightly detrimental			-19 to -36	Low - negative	
		5	National			1	Low -positive	0 to -6	Negligible			0 to -18	Very low - negative	
		6	International			2	Moderate - positive							
						3	High - positive	0 to 6	Negligible			0 to 18	Very Low - positive	
								7 to 12	Slightly beneficial			19 to 36	Low - positive	
								13 to 18	Moderately beneficial			37 to 54	Moderate - positive	
								19 to 24	Highly beneficial			55 to 72	High - positive	
								25 to 33	Extremely beneficial			73 to 99	Very high - positive	

Ascribing Significance for Decision-Making

The best way of expressing these cost benefit implications for decision-making is to present them as risks. Risk is defined as the consequence (implication) of an event multiplied by the probability (likelihood)1 of that event. Many risks are accepted or tolerated on a daily basis because even if the consequence of the event is serious, the likelihood that the event will occur is low. A practical example is the consequence of a parachute not opening, is potentially death but the likelihood of such an event happening is so low that parachutists are prepared to take that risk and hurl themselves out of an airplane. The risk is low because the likelihood of the consequence is low even if the consequence is potentially severe.

It is also necessary to distinguish between the event itself (as the cause) and the consequence. Again, using the parachute example, the consequence of concern in the event that the parachute does not open is serious injury or death, but it does not necessarily follow that if a parachute does not open that the parachutist will die.

Various contingencies are provided to minimise the likelihood of the consequence (serious injury or death) in the event of the parachute not opening, such as a reserve parachute. In risk terms this means distinguishing between the inherent risk (the risk that a parachutist will die if the parachute does not open) and the residual risk (the risk that the parachutist will die if the parachute does not open but with the contingency of a reserve parachute) i.e., the risk before and after mitigation.

Consequence

The ascription of significance for decision-making becomes then relatively simple. It requires the consequences to be ranked and likelihood to be defined of that consequence.

In **Table 3** below a scoring system for consequence ranking is shown. Two important features should be noted in the table, namely that the scoring doubles as the risk increases and that there is no equivalent 'high' score in respect of benefits as there is for the costs. This high negative score serves to give expression to the potential for a fatal flaw where a fatal flaw would be defined as an impact that cannot be mitigated effectively and where the associated risk is accordingly untenable. Stated differently, the high score on the costs, which is not matched on the benefits side, highlights that such a fatal flaw cannot be 'traded off' by a benefit and would render the proposed project to be unacceptable.

Table 3: Ranking of Consequence

Environmental Cost	Inherent risk
Human health – morbidity/ mortality, loss of species	High
Material reductions in faunal populations, loss of livelihoods, individual economic loss	Moderate – High
Material reductions in environmental quality – air, soil, water. Loss of habitat, loss of heritage, amenity	Moderate
Nuisance	Moderate – Low
Negative change – with no other consequences	Low
Environmental Benefits	**Inherent benefit**
Net improvement in human health and welfare	Medium – High
Improved environmental quality – air, soil, water. Improved individual livelihoods	Moderate
Economic development	Moderate – Low

[1] Because 'probability' has a specific mathematical/empirical connotation the term 'likelihood' is preferred in a qualitative application and is accordingly the term used in this document.

Positive change – with no other benefits	Low

Likelihood

Although the principle is one of probability, the term 'likelihood' is used to give expression to a qualitative rather than quantitative assessment, because the term 'probability' tends to denote a mathematical/empirical expression. A set of likelihood descriptors that can be used to characterise the likelihood of the costs and benefits occurring, is presented in **Table 4** below.

Table 4: Likelihood Categories and Definitions

Likelihood Descriptors	Definitions
Highly unlikely	The possibility of the consequence occurring is negligible
Unlikely but possible	The possibility of the consequence occurring is low but cannot be discounted entirely
Likely	The consequence may not occur but a balance of probability suggests it will
Highly likely	The consequence may still not occur but it is most likely that it will
Definite	The consequence will definitely occur

It is very important to recognise that the likelihood question is asked twice. The first time the question is asked is the likelihood of the cause and the second as to the likelihood of the consequence. In the tables that follow the likelihood is presented of the cause and then the likelihood of the consequence is presented. A high likelihood of a cause does not necessarily translate into a high likelihood of the consequence. As such the likelihood of the consequence is not a mathematical or statistical 'average' of the causes but rather a qualitative estimate in its own right.

Residual Risk

The residual risk is then determined by the consequence and the likelihood of that consequence. The residual risk categories are shown in **Table 5** below where consequence scoring is shown in the rows and likelihood in the columns. The implications for decision-making of the different residual risk categories are shown in **Table 6** below.

Table 5: Residual Risk Categories

Consequence	High	Moderate	High	High	Fatally flawed	
	Moderate – high	Low	Moderate	High	High	High
	Moderate	Low	Moderate	Moderate	Moderate	Moderate
	Moderate – low	Low	Low	Low	Low	Moderate
	Low	Low	Low	Low	Low	Low
		Highly unlikely	Unlikely but possible	Likely	Highly likely	Definite
		Likelihood				

Table 6: Implications for Decision-Making of the different Residual Risk Categories

Rating	Nature of implication for Decision – Making
Low	Project can be authorised with low risk of environmental degradation
Moderate	Project can be authorised but with conditions and routine inspections
High	Project can be authorised but with strict conditions and high levels of compliance and enforcement
Fatally Flawed	The project cannot be authorised

Appendix 2: Minimum Content Requirements for Botanical and Terrestrial Biodiversity Specialist Reports as per Protocol for the Specialist Assessment of Environmental Impacts on Terrestrial Biodiversity (GN 320 of 20 March 2020)

Protocol ref	**Botanical and Terrestrial Biodiversity Specialist Assessment Report Content**	**Section / Page**
3.1.1.	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Cover & Pages 2 & 4
3.1.2.	a signed statement of independence by the specialist;	Page 4
3.1.3.	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Pages 12 & 13
3.1.4.	a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Pages 12 & 13
3.1.5.	a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	N/A
3.1.6.	a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Pages 56--64
3.1.7.	additional environmental impacts expected from the proposed development;	N/A
3.1.8.	any direct, indirect and cumulative impacts of the proposed development;	Pages 56-65
3.1.9.	the degree to which impacts and risks can be mitigated;	Pages 56-64
3.1.10.	the degree to which the impacts and risks can be reversed;	Pages 56-64
3.1.11.	the degree to which the impacts and risks can cause loss of irreplaceable resources;	Pages 56-64
3.1.12.	proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	N/A
3.1.13.	a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	N/A
3.1.14.	a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Pages 65 & 66
3.1.15.	any conditions to which this statement is subjected.	N/A

Appendix 3. Alphabetical List of Plant Species for Erf 3122 Mossel Bay and immediate surrounds

Plant species in black type are records extracted from iNaturalist for the Hartenbos Garden Estate and immediate surrounds. Plant species in red type are those recorded by Helme, 2016. Plant species in green type are plant species recorded by the author in 2006, 2017 and 2023.

Scientific name
Abutilon sonneratianum
Abutilon sonneratianum
Acacia cyclops
Acacia mearnsii
Acacia mearnsii
Acacia saligna
Acacia saligna
Achyranthemum paniculatum
Acrodon bellidiflorus
Acrodon bellidiflorus
Acrodon bellidiformis
Agathosma
Agathosma ovata
Aizoon cymosum
Albuca canadensis
Albuca sp.
Aloe ferox
Aloe ferox
Anthospermum galioides
Anthosperumum sp.
Arctotheca calendula
Arctotheca prostrata
Argyrolobium lunare
Aristida junciformis
Aristida junciformis
Aspalathus acuminata
Aspalathus acuminata acuminata
Aspalathus ciliaris
Aspalathus sp.
Asparagus aethiopicus
Asparagus africanus
Asparagus c f. falcatus
Asparagus capensis
Asparagus rubicundus

Asparagus striatus
Asparagus suaveolens
Athanasia quinquedentata
Athanasia quinquedentata quinquedentata
Athanasia quinquedentata quinquedentata
Azima tetracantha
Babiana ambigua
Babiana fourcadei
Babiana sp.
Barleria pungens
Barleria pungens
Berkheya armata
Berkheya armata
Berkheya armata
Berkheya carlinoides
Berkheya sp.
Blepharis capensis
Blepharis capensis
Blepharis capensis
Bobartia robusta
Bobartia robusta
Bobartia robusta
Boophone disticha
Boophone disticha
Brachiaria serrata
Brachiaria serrata
Bromus catharticus
Brunsvigia orientalis
Bulbine frutescens
Bulbine frutescens
Bulbine lagopus
Bulbine sp.
Carissa bispinosa
Carissa bispinosa
Carpobrotus acinaciformis
Carpobrotus mellei
Carpobrotus mellei
Chaenostoma africana
Chaenostoma caeruleum
Chascanum cuneifolium
Cheilanthes contracta
Chironia baccifera

Chrysocoma ciliata
Chrysocoma ciliata
Chrysocoma ciliata
Commelina africana
Commelina africana
Conyza scabrida
Conyza scabrida
Corymbium africanum
Cotula laxa
Crassula capitella thyrsiflora
Crassula ericoides
Crassula fascicularis
Crassula muscosa
Crassula muscosa
Crassula nudicaulis nudicaulis
Crassula sp.
Crassula subulata
Crassula tetragona
Crassula tetragona tetragona
Crossyne guttata
Crossyne guttata
Cussonia spicata
Cymbopogon marginatum
Cynanchum viminale
Cynanchum viminale
Cynodon dactylon
Cynodon dactylon
Cyphia digitata
D. rhinocerotis
Delosperma litorale
Delosperma neethlingiae
Delosperma sp.
Dianthus caespitosus
Dicerothamnus rhinocerotis
Dicerothamnus rhinocerotis
Digitaria eriantha
Diospyros dichrophylla
Diospyros dichrophylla
Diospyros lycioides
Dodonaea viscosa
Dolichos hastiformis
Drimia capensis
Drimia elata
Drosanthemum hispidum

Drosanthemum intermedium
Drosera zeyheri
Ehrharta scabra
Empodium gloriosum
Eragrostis capensis
Eragrostis curvula
Eragrostis curvula
Eragrostis plana
Erepsia sp.
Erica discolor subsp. discolor
Erica discolor var. speciosa
Erica peltata
Erica peltata
Erica versicolor
Eriocephalus africanus
Eriocephalus africanus
Eriocephalus africanus africanus
Eriospermum capense
Eriospermum dielsianum molle
Eriospermum paradoxum
Eriospermum pubescens
Eriospermum pubescens
Euclea undulata
Eulophia cochlearis
Euphorbia procumbens
Euphorbia procumbens
Falkia repens
Falkia repens
Felicia muricata
Ficinia filiformis
Freesia refracta
Gasteria carinata glabra
Gazania krebsiana
Gazania krebsiana
Gerbera tomentosa
Glottiphyllum depressum
Glottiphyllum longum
Glottiphylum longum
Gnidia cf. polystachya
Gnidia nodiflora
Gnidia sp.
Grewia occidentalis
Gymnosporia buxifolia
Haemanthus coccineus

Haemanthus sanguineus
Hakea sericea
Hakea sericea
Hakea sericea
Helechyrsum teretifolium
Helichrysum cymosum
Helichrysum pandurifolium
Helichrysum patulum
Helichrysum rosum
Heliophila subulata subulata
Hermannia alnifolia
Hermannia althaeifolia
Hermannia conglomerata
Hermannia flammea
Hermannia flammea
Hermannia flammula
Hermannia holosericea
Hermannia lavandulifolia
Hermannia lavandulifolia
Hermannia lavandulifolia
Hermannia saccifera
Hermannia saccifera
Hermannia saccifera
Hermannia salviifolia
Hibiscus sp.
Hibiscus sp.
Hibiscus trionum
Holothrix burchellii
Hyparrhenia hirta
Hyparrhenia hirta
Hypoxis sp.
Hyppoxis sp.
Indigofera heterophylla
Indigofera heterophylla
Indigofera nigromontana
Indigofera nigromontanum
Indigofera sp.
Jamesbrittenia argentea
Jamesbrittenia calciphila
Kedrostis africana
Lachenalia ensifolia
Lachenalia judithiae
Lachenalia sessiliflora
Lampranthus elegans

Lantana rugosa
Lepidum africanum
Lessertia frutescens frutescens
Leucadendron salignum
Leucadendron salignum
Lobelia coronopifolia
Lobelia coronopifolia
Lobelia sp.
Lobelia tomentosa
Lobostemon fruticosus
Lotononis pungens
Lotononis umbellata
Lycium ferocissimum
Lyperia violacea
Massonia
Massonia sp.
Melinis nerviglumis
Mesembryanthemum aitonis
Metalasia acuta
Metalasia acuta
Metalasia acuta
Metalasia cf. pungens
Metalasia densa
Metalasia densa
Metalasia pungens
metalasia pungens
Montinia caryophyllacea
Montinia caryophyllacea
Montinia caryophyllacea
Moraea gawleri
Moraea polyanthos
Moraea setifolia
Moraea unguiculata
Muraltia
Muraltia cf. ericoides
Muraltia ericifolia
Muraltia ononidifolia
Myoporum tenuifolia
Oeder genistifolia
Oedera calycina
Oedera genistifolia
Oedera genistifolia
Oedera pungens
Olea europaea subsp. cuspidata

Opuntia ficus-indica
Opuntia stricta
Ornithogalum dubium
Osteospermum calendulaceum
Osteospermum moniliferum
Osteospermum moniliferum moniliferum
Osteospermum polygaloides
Osteospremum moniliferum
Othonna auriculifolia
Oxalis ciliaris
Oxalis ciliata
Oxalis confertifolia
Oxalis fergusonae
Oxalis imbricata subsp. violacea
Oxalis imbricata violacea
Oxalis pardales
Oxalis pes-caprae
Oxalis pes-caprae
Pelargonium abrotanifolium
Pelargonium alchemilloides
Pelargonium candicans
Pelargonium longicaule longicaule
Pelargonium multicaule multicaule
Pennisetum clandestinum
Pennisetum clandestinum
Pentaschistis eriostoma
Phylica axillaris
Plantago lanceolata
Polygala myrtifolia
Polygala myrtifolia
Polygala myrtifolia myrtifolia
Polygala pubiflora
Polygala pubiflora
Prismatocarpus candolleanus
Protea lanceolata
Pteronia hirsuta
Pteronia hirsuta
Pteronia sp.
Restio albotuberculatus
Restio capensis
Restio capensis
Restio capensis
Restio helenae
Rhynchosia ciliata

Ruellia pilosa
Ruschia
Ruschia cf. hamata
Ruschia lineolata
Ruschia tenella
Satyrium membranaceum
Scabiosa columbaria
Scabiosa columbaria
Schizaea pectinata
Schotia afra
Schotia afra afra
Searsia glauca
Searsia glauca
Searsia incisa effusa
Searsia lucida
Searsia lucida
Searsia lucida
Searsia pallens
Searsia pallens
Searsia pterota
Searsia rosmarinifolia
Searsia rosmariniformis
Selago
Selago glutinosa
Selago ramosissima
Senecio burchellii
Senecio sp.
Sideroxylon inerme
Stachys aethiopica
Stachys aethiopica
Stachys aethiopica
Stachys sublobata
Struthiola ciliata
Struthiola parviflora
Tarchonanthus littoralis
Tenaxia stricta
Tenaxia stricta
Tenaxia stricta
Tephrosia capensis
Tephrosia capensis
Tephrosia capensis
Tephrosia capensis angustifolia
Tetragonia decumbens
Teucrium africanum

Themeda triandra
Themeda triandra
Themeda triandra
Themeda triandra
Thesium funale
Thesium nigroperianthum
Trachyandra revoluta
Trichodiadema barbatum
Trichodiadema burgeri
Tritoniopsis antholyza
Tritoniopsis antholyza
Tritoniopsis antholyza
Tulbaghia capensis
Ursina discolor
Ursinia discolor
Ursinia discolor
Ursinia nudicaulis
Wahlenbergia sp.
Watsonia aletroides
Withania somnifera

Appendix 4. Curriculum Vitae

Dr David Jury McDonald Pr.Sci.Nat.

Name of Firm: Bergwind Botanical Surveys & Tours CC. (Independent consultant)

Work and Home Address: 14 A Thomson Road, Claremont, 7708

Tel: (021) 671-4056 **Mobile:** 082-8764051 **Fax:** 086-517-3806

E-mail: dave@bergwind.co.za

Website: www.bergwind.co.za

Profession: Botanist / Vegetation Ecologist / Consultant / Tour Guide

Date of Birth: 7 August 1956

Employment history:

- 19 years with National Botanical Institute (now SA National Biodiversity Institute) as researcher in vegetation ecology.
- Five years as Deputy Director / Director Botanical & Communication Programmes of the Botanical Society of South Africa
- Seventeen years as private independent Botanical Specialist consultant (Bergwind Botanical Surveys & Tours CC)

Nationality: South African (ID No. 560807 5018 080)
Languages: English (home language) – speak, read and write
Afrikaans – speak, read and write

Membership in Professional Societies:

- South Africa Association of Botanists
- International Association for Impact Assessment (SA)
- South African Council for Natural Scientific Professions (**Ecological Science, Registration No. 400094/06**)
- Field Guides Association of Southern Africa

Key Qualifications :

- Qualified with a M. Sc. (1983) in Botany and a PhD in Botany (Vegetation Ecology) (1995) at the University of Cape Town.
- Research in Cape fynbos ecosystems and more specifically mountain ecosystems.
- From 1995 to 2000 managed the Vegetation Map of South Africa Project (National Botanical Institute)

- Conducted botanical survey work for AfriDev Consultants for the Mohale and Katse Dam projects in Lesotho from 1995 to 2002. A large component of this work was the analysis of data collected by teams of botanists.
- **Director: Botanical & Communication Programmes** of the Botanical Society of South Africa (2000—2005), responsible for communications and publications; involved with conservation advocacy particularly with respect to impacts of development on centres of plant endemism.

- Further tasks involved the day-to-day management of a large non-profit environmental organisation.

- **Independent botanical consultant** (2005 – to present) over 300 projects have been completed related to environmental impact assessments in the Western, Southern and Northern Cape, Karoo and Lesotho. A list of reports (or selected reports for scrutiny) is available on request.

Higher Education

Degrees obtained
and major subjects passed:

B.Sc. (1977), University of Natal, Pietermaritzburg
Botany III
Entomology II (Third year course)

B.Sc. Hons. (1978) University of Natal, Pietermaritzburg
Botany (Ecology /Physiology)

M.Sc. - (Botany), University of Cape Town, 1983.
Thesis title: 'The vegetation of Swartboschkloof, Jonkershoek, Cape Province'.

PhD (Botany), University of Cape Town, 1995.
Thesis title: 'Phytogeography endemism and diversity of the fynbos of the southern Langeberg'.

Certificate of Tourism: Guiding (Culture: Local)
Level: 4 Code: TGC7 (Registered Tour Guide: WC 2969).

Employment Record:

January 2006 – present: Independent specialist botanical consultant and tour guide in own company:
Bergwind Botanical Surveys & Tours CC
August 2000 - 2005 : Deputy Director, later Director Botanical & Communication Programmes, Botanical Society of South Africa
January 1981 – July 2000 : Research Scientist (Vegetation Ecology) at National Botanical Institute
January 1979—Dec 1980 : National Military Service

Further information is available on website: www.bergwind.co.za