Terrestrial Biodiversity Assessment

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

Erf 3991, Hartenbos near Mossel Bay in the Western Cape Province

David Hoare Consulting (Pty) Ltd

David Hoare
Consulting (Pty) Ltd

Address:
Postnet Suite #116
Private Bag X025
Lynnwood Ridge
0040

41 Soetdoring Avenue
Lynnwood Manor
Pretoria

Cell: 083 284 5111
david@davidhoareconsulting.co.za

Terrestrial Biodiversity Assessment Report for Erf 3991, Hartenbos near Mossel Bay in the Western Cape Province

29 September 2022

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SPECIALIST DETAILS & DECLARATION

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

The details of Specialists are as follows –

Table 1: Details of Specialist

Specialist	Qualification and accreditation
Dr David Hoare (Pr.Sci.Nat.)	• PhD Botany • SACNASP Reg. no. 400221/05 (Ecology, Botany)

Declaration of independence:

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

Disclosure:

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

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

_____ 29 September 2022

Dr David Hoare Date

TERMS OF REFERENCE

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

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

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

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

General information

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

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

1.3. However, where the information gathered from the site sensitivity verification differs from the designation of "very high" terrestrial biodiversity sensitivity on the screening tool and it is found to be of a "low" sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.

1.4. Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a "low" terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.

1.5. If any part of the proposed development footprint falls within an area of "very high" sensitivity, the assessment and reporting requirements prescribed for the "very high" sensitivity apply to the entire footprint, ***excluding linear activities*** *for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase*, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.

Terrestrial Biodiversity Specialist Assessment

2.1. The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.

2.2. The assessment must be undertaken on the preferred site and within the proposed development footprint.

2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:

2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these;

2.3.2. ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;

2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;

2.3.4. the description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;

2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including:

(a) main vegetation types;
(b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified;
(c) ecologicalconnectivity,habitatfragmentation,ecologicalprocesses and fine-scale habitats; and
(d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;

2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and

2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:

2.3.7.1. terrestrial critical biodiversity areas (CBAs), including:

(a) the reasons why an area has been identified as a CBA;
(b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;
(c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);
(d) the impact on ecosystem threat status;
(e) the impact on explicit subtypes in the vegetation;
(f) the impact on overall species and ecosystem diversity of the site; and
(g) the impact on any changes to threat status of populations of species of conservation concern in the CBA;

2.3.7.2. terrestrial ecological support areas (ESAs), including:

(a) the impact on the ecological processes that operate within or across the site;
(b) the extent the proposed development will impact on the functionality of the ESA; and
(c) loss of ecological connectivity (on site, and in relation to the

broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;

2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including-

(a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;

2.3.7.4. priority areas for protected area expansion, including-

(a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;

2.3.7.5. SWSAsincluding:

(a) the impact(s) on the terrestrial habitat of a SWSA; and

(b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);

2.3.7.6. FEPAsubcatchments,including-

(a) theimpactsoftheproposeddevelopmentonhabitatconditionand species in the FEPA sub catchment;

2.3.7.7 indigenous forests, including:

(a) impact on the ecological integrity of the forest; and

(b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.

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

Terrestrial Biodiversity Specialist Assessment Report

3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:

3.1.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;

3.1.2. a signed statement of independence by the specialist;

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

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

3.1.5. a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;

3.1.6. a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);

3.1.7. additional environmental impacts expected from the proposed development;

3.1.8. any direct, indirect and cumulative impacts of the proposed development;

3.1.9. the degree to which impacts and risks can be mitigated;

3.1.10. the degree to which the impacts and risks can be reversed;

3.1.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;

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

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;

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

3.1.15. any conditions to which this statement is subjected.

3.2.The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.

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

INTRODUCTION

Site location

The site is Erf 991 Hartenbos near Mossel Bay to the east of the N2 national road near to the Hartenbos Interchange. Refer to Figure 1 below for the general location.

The site is accessed from Beach East Boulevard that branches from the R102 road (Louis Fourie Road) that connects Mossel Bay to Groot Brakrivier along the coast (Figure 2). The railway line is the western boundary of the site and property boundaries the remaining boundaries (Figure 2). The site is currently vacant land, whereas all surrounding areas are developed.

The scope of this report is the entire property, although parts are planned to be omitted from the development. The entire site is 89045.1 m^2.

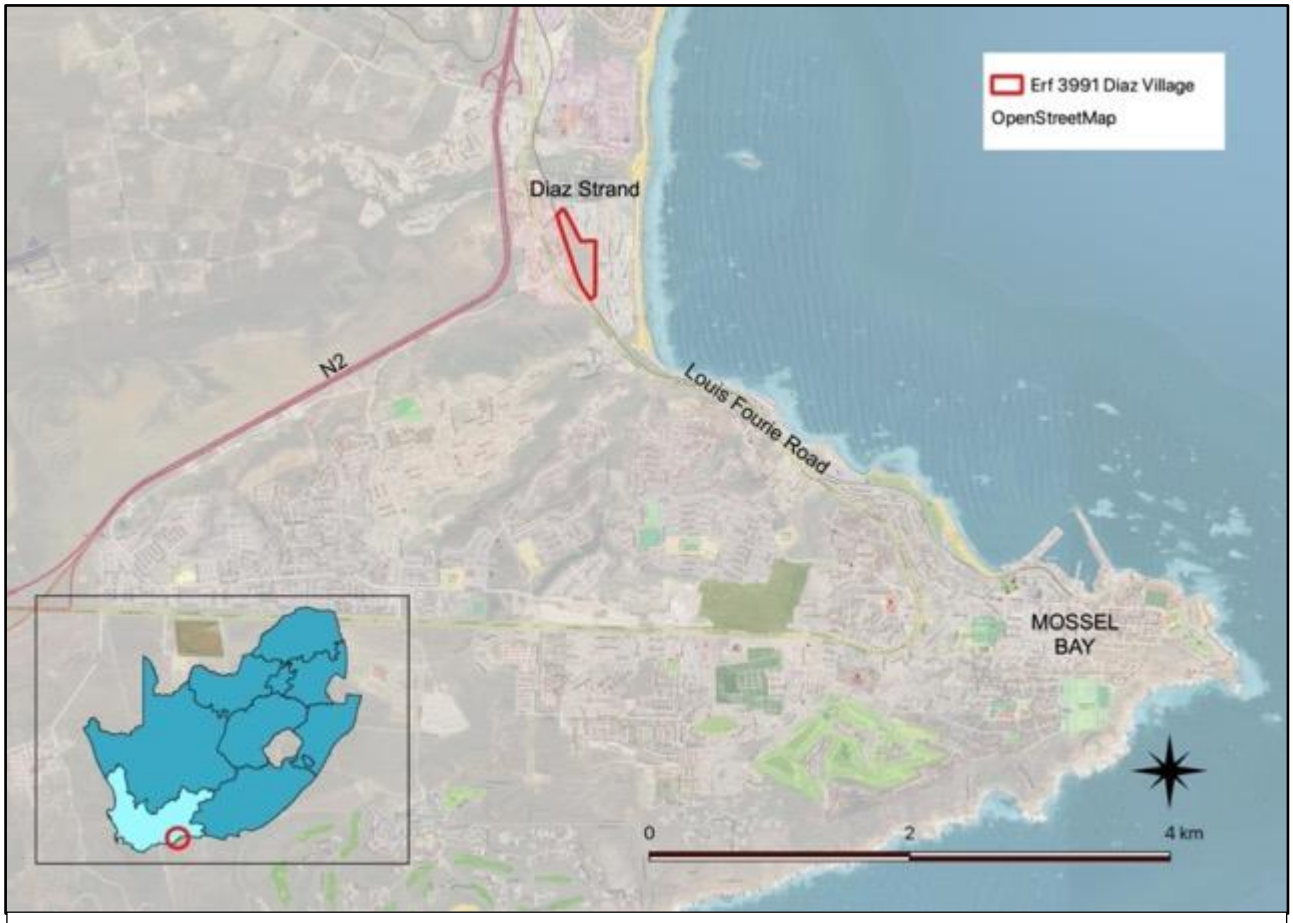

Figure 1: Location of the site.

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

Identified Theme Sensitivities

A sensitivity screening report from the DEA Online Screening Tool was requested in the application category: Transformation of land | Indigenous vegetation. The DEA Screening Tool report for the area, dated 02/11/2021, indicates the following sensitivities (see Figure 3):

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Terrestrial Biodiversity Theme	X			

Terrestrial Biodiversity theme

Sensitivity features are indicates as follows:

Sensitivity	Feature(s)
Very High	Ecological support area 1
Very High	FEPA Subcatchments
Very High	Endangered Ecosystem

Figure 3: Map of relative terrestrial biodiversity theme sensitivity.

ASSESSMENT METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

Project Area of Influence (PAOI)

The proposal is to develop the site for residential purposes. This will include stands for free-standing houses, dupexes, and aprtments (Figure 4). Anticipated impacts will mostly occur during the construction phase. These impacts are not expected to extend beyond the boundaries of the study area. The PAOI is therefore treated here as the development footprint within which direct impacts will occur (Figure 4).

Figure 4: Proposed development.

Survey timing

The study commenced as a desktop-study followed by site-specific field study on 21 November 2021. The site is within the Fynbos Biome with an all-year rainfall season with a slight dip in early winter (Figure 5). A more accurate indication of rainfall seasonality, which drives most ecological processes, is shown in Figure 6, which shows that Mossel Bay has peak rainfall from August to November, with another smaller peak in March to April. The timing of the survey in November is therefore ideal in terms of assessing the flora and vegetation of the site. The overall condition of the vegetation was possible to be determined with a high degree of confidence.

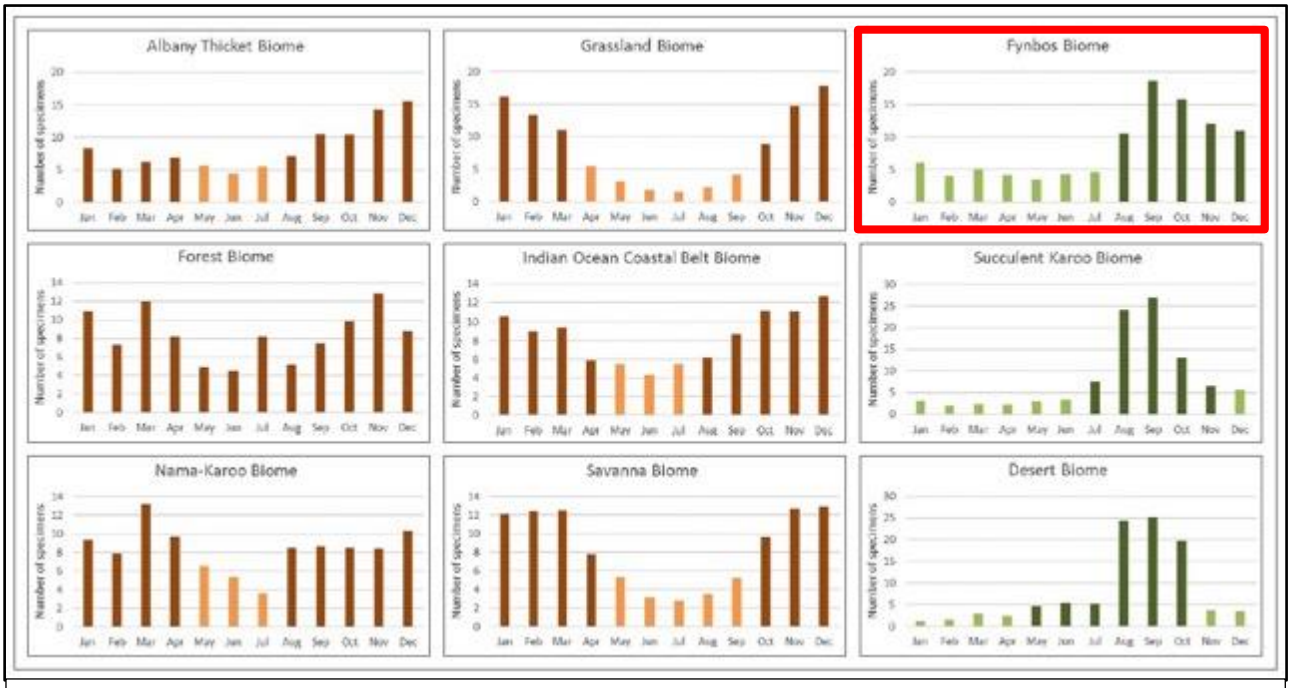

Figure 5: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines). The site is within the Fynbos Biome.

Figure 6: Climate diagrams showing monthly rainfall for Mossel Bay (left), Knysna (centre) and Plettenberg Bay (right).

Field survey approach

The study commenced as a desktop-study followed by a site-specific field study. During the field survey of habitats on site, the entire site was assessed on foot. Field surveys included both meander searches of general areas, and active searching in habitats that were considered to be suitable for specific groups or species. Meander surveys were undertaken with no time restrictions - the objective was to comprehensively examine all natural areas. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made (Figure 7). Digital photographs were taken of features and habitats on site.

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

Figure 7: GPS track log of areas walked in the course of undertaking this assessment.

Sources of information

Regional Vegetation

- Broad vegetation types occurring on site were obtained from Mucina and Rutherford (2006), with updates according to the SANBI BGIS website (http://bgis.sanbi.org), as follows:
    - Mucina, L. and Rutherford, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. Strelitzia 19, South African National Biodiversity Institute, Pretoria.
    - South African National Biodiversity Institute 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland [Vector] 2018. Available from the Biodiversity GIS website, downloaded on 23 September 2021.

Threatened Ecosystems

- The conservation status of the vegetation types were obtained from Mucina and Rutherford (2006) and the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).
- The plant species checklist of species that could potentially occur on site was compiled from a plant species checklist extracted from the NewPosa database of the South African National biodiversity Institute (SANBI) for the quarter degree grids 3422AA.
- The IUCN Red List Category for plant species, as well as supplementary information on habitats and distribution, was obtained from the SANBI Threatened Species Programme (Red List of South African Plants, http://redlist.sanbi.org).

Regional plans

- Information from the National Protected Areas Expansion Strategy (NPAES) was consulted for possible inclusion of the site into a protected area in future (available on http://bgis.sanbi.org).).
- The 2017 Western Cape Biodiversity Spatial Plan (WCBSP) Maps were consulted for inclusion of any parts of the site into any Critical Biodiversity Areas or Ecological Support Areas (CapeNature. 2017 WCBSP Bitou [Vector] 2017. Available from the Biodiversity GIS website (biodiversityadvisor.sanbi.org)).

Limitations

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

- The assessment is based on a single site visit. The current study is based on an extensive site visit as well as a desktop study of the available information. The time spent on site was adequate for understanding general patterns across affected areas.

Impact assessment methodology

The Impact Assessment Methodology assists in evaluating the overall effect of a proposed activity on the environment. Impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). The rating system is applied to the potential impact on the receptor. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 2: Rating of impact assessment criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).

2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.

43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

OUTCOME OF THE ASSESSMENT

Broad vegetation patterns

There is one regional vegetation type in the study area, namely Hartenbos Dune Thicket (Figure 8). This vegetation type for the site and surrounding areas is described below, as given in Mucina and Rutherford (2006). Note that this is a desktop description of the vegetation type and is not necessarily what occurs on site, only what may be expected to occur there in the event that the vegetation is in a natural state.The vegetation type that occurs on site and nearby areas, according to the national map, is briefly described below.

Hartenbos Dune Thicket

Distribution

This vegetation type occurs in the Western Cape Province in coastal stretches from the Duiwenhoks River Mouth eastward to Glentana near the Great Brak River.

Vegetation & Landscape Features

It is found on flat to moderately undulating coastal dunes. A mosaic of low (1 - 3 m) thicket, occurring in small bush clumps dominated by small trees and woody shrubs, in a mosaic of low (1 - 2 m) asteraceous fynbos. Thicket clumps are best developed in fire-protected dune slacks, and the

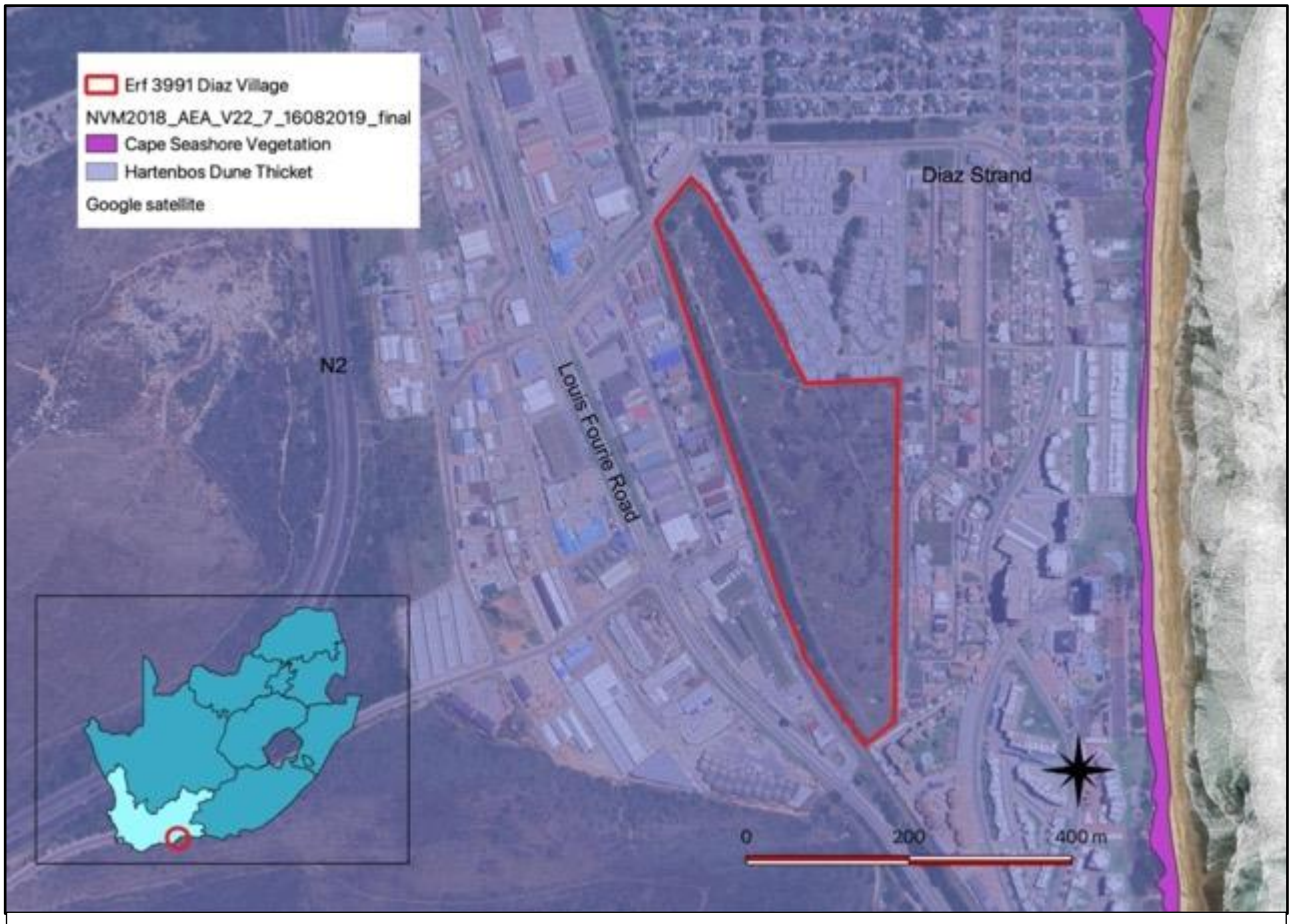

Figure 8: Regional vegetation types of the site and surrounding areas.

fynbos shrubland occurs on upper dune slopes and crests. Succulent karroid elements (*Aloe ferox*, *A. arborescens*, *Eriocephalus africanus*) occur along bands of mudstone and shale.

Geology & Soils
Predominantly occurs in Wankoe and Strandveld Formations. The most important land types are Fc, Hb, Ha.

Climate
Non-seasonal rainfall dominates the region, with MAP between 261 mm and 666 mm. Frost is present for approximately 3 days per year. The mean monthly maximum is 25.19 °C in February and the mean monthly minimum is 6.47 °C in July. Altitude ranges from 0 - 273 masl.

Important Taxa

Growth form	Species
Small tree	*Pterocelastrus tricuspidatus* (d), *Sideroxylon inerme* (d)
Succulent tree	*Aloe ferox*
Succulent shrub	*Aloe arborescens, Carpobrotus acinaciformis* (d), *Carpobrotus edulis, Conicosia pugioniformis, Cotyledon orbiculata, Crassula nudicaulis, Cleretum bellidiforme,, Euphorbia burmannii, Euphorbia caput-medusae, Jordaaniella dubia, Roepera morgsana* (d)
Succulent herb	*Carpobrotus muirii, Haworthia mirabilis var. paradoxa, Euphorbia bayeri*
Geophytic herb	*Brunsvigia orientalis, Chasmanthe aethiopica, Freesia leichtlinii, Haemanthus coccineus, Ixia orientalis*
Low shrub	*Eriocephalus africanus, Eriocephalus africanus* var. *paniculatus, Felicia echinata, Helichrysum patulum, Muraltia spinosa, Salvia africana-lutea* (d), *Agathosma apiculata* (d), *Agathosma muirii, Athanasia cochlearifolia, Athanasia quinquedentata subsp. rigens, Diosma aristata, Euchaetis albertiniana, Hermannia muirii, Muraltia barkerae, Muraltia depressa*
Graminoid	*Restio eleocharis* (d), *Sporobolus fimbriatus, Stenotaphrum secundatum* (d), *Thamnochortus insignis* (d), *Themeda triandra* (d)
Tall shrub	*Azima tetracantha, Carissa bispinosa, Cassine peragua, Cussonia thyrsiflora, Euclea racemosa* (d), *Grewia occidentalis, Lauridia tetragona, Maytenus procumbens* (d), *Metalasia muricata* (d), *Morella cordifolia, Mystroxylon aethiopicum, Olea exasperata* (d), *Osteospermum moniliferum* (d), *Passerina rigida* (d), *Putterlickia pyracantha, Robsonodendron maritimum, Scutia myrtina, Searsia crenata* (d), *Searsia glauca, Searsia lucida, Searsia pterota, Leucospermum praecox*
Herbaceous climber	*Cynanchum ellipticum, Rhoicissus digitata, Solanum africanum*

Listed threatened ecosystems

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists ecosystems, which are often national vegetation types, that are afforded protection on the basis of rates of transformation. The site is within a listed ecosystem called Groot Brak Dune Strandveld (see Figure 9).

Groot Brak Dune Strandveld

Distribution
Western Cape Province: Coastal stretches between the mouth of the Gouritz River as far east as Victoria Bay near the Wilderness, with by far the largest area covering the flats north of Mossel Bay (along the lower reaches of the Groot Brak, Klein Brak and Hartenbos Rivers) and extending up to 17 km from the coast. Altitude 0–180 m.

Vegetation & Landscape Features
Flats, undulating landscapes (stabilised dunes) and steep coastal slopes, covered by dense and tall (up to 3 m), spiny, sclerophyllous scrub with gaps supporting shrublands with ericoids or succulent-leaved shrubs. The graminoid layer is sparse and short.

Important Taxa
Small Trees: *Chionanthus foveolatus, Clausena anisata*.
Tall Shrubs: *Azima tetracantha, Cussonia thyrsiflora, Diospyros dichrophylla, Euclea racemosa subsp. racemosa, Grewia occidentalis, Gymnosporia buxifolia, Maytenus procumbens, Metalasia muricata, Morella cordifolia, Myrsine africana, Mystroxylon aethiopicum, Olea exasperata, Pterocelastrus tricuspidatus, Putterlickia pyracantha, Rhus crenata, R. glauca, R. longispina, R. lucida, Schotia afra var. afra, Sideroxylon inerme, Tarchonanthus littoralis*.
Low Shrubs: *Asparagus suaveolens, Ballota africana, Carissa bispinosa subsp. bispinosa, Chironia baccifera, Clutia daphnoides, Eriocephalus africanus var. africanus, Helichrysum teretifolium, Lauridia tetragona, Phylica axillaris, Polygala myrtifolia*.
Succulent Shrubs: *Aloe arborescens (d), Cotyledon orbiculata var. dactylopsis, Crassula perforata, C. pubescens subsp. pubescens, Euphorbia burmannii, E. mauritanica, Tetragonia fruticosa, Zygophyllum morgsana*.
Woody Climbers: *Asparagus aethiopicus, Cissampelos capensis, Rhoicissus digitata*.
Woody Succulent Climber: *Sarcostemma viminale*.
Semiparasitic Shrubs: *Osyris compressa, Thesidium fragile*.
Soft Shrub: *Hypoestes aristata.*
Herb: *Commelina africana*.
Geophytic Herbs: *Brunsvigia orientalis, Chasmanthe aethiopica, Hesperantha falcata*.
Succulent Herbs: Carpobrotus *edulis, Crassula expansa subsp. expansa, Senecio radicans*.
Herbaceous Climbers: *Astephanus triflorus, Cynanchum obtusifolium, Kedrostis nana*.

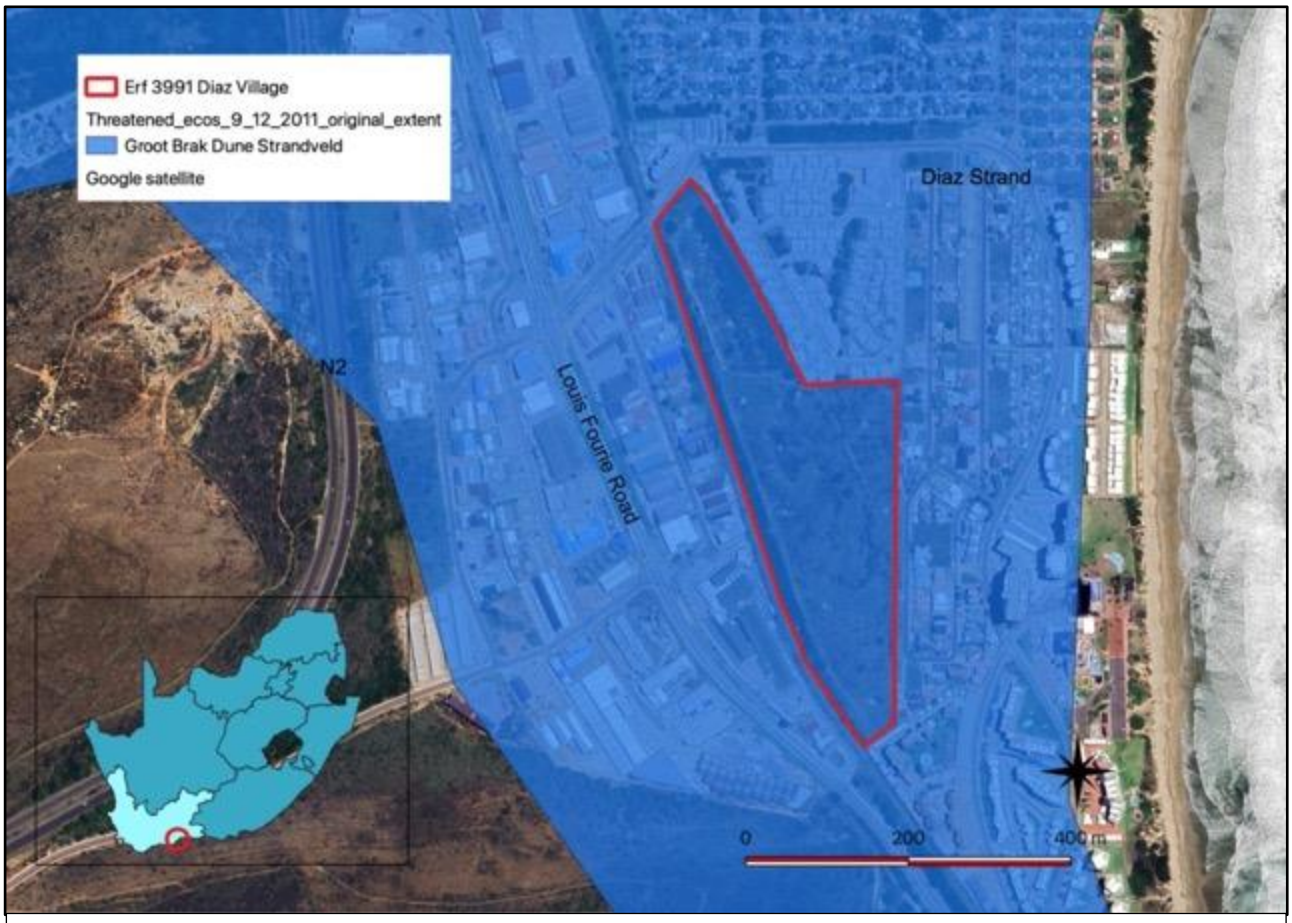

Figure 9: Distribution of listed ecosystems relative to the study area.

Herbaceous Succulent Climber: *Pelargonium peltatum*.
Graminoids: *Cynodon dactylon, Ehrharta erecta, Ficinia indica, Panicum deustum, Stipa dregeana*.

Note that this is a desktop description of what could possibly occur on site, based on mapped vegetation types. The on-site habitat assessment, described in a section below, determines whether any such vegettion occurs on site or not: although mapped as occurring within Hartenbos Dune Thicket / Groot Brak Dune Strandveld, such vegetation does not necessarily occur on site.

Conservation status of broad vegetation types

Hartenbos Dune Thicket is a newly described vegetation type (Grobler et al. 2018) resulting from ongoing review of the National Vegetation Map. This newly described vegetation type has been assessed as being **Least Concern** (Table 2).

The vegetation at this location was **previously mapped as Groot Brak Dune Strandveld**, which is currently what it is classified as in the National Ecosystem List. According to the 2018 National Ecosystem List (Driver *et al*., 2005; Mucina *et al*., 2006), as shown in Table 2, the ecosystem is listed as **Endangered** and need of protection (GN1002 of 2011).

Table 3: Conservation status of different vegetation types occurring in the study area.

Vegetation Type	**Conservation status**		
	Driver *et al*. 2005 ; Mucina *et al*., 2006	**2018 NBA (Skowno et al. 2019)**	**National Ecosystem List (NEM:BA) (2018)**
Hartenbos Dune Thicket	None	Least Concern	None
Groot Brak Dune Strandveld	Endangered	Vulnerable	Endangered

Note that this is a desktop description of what could possibly occur on site, based on mapped ecosystems. The on-site habitat assessment, described in a section below, determines whether any such vegettion occurs on site or not. It is verified that the site occurs within a mapped Listed Ecosystem, as listed in The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

However, the characteristics of the on-site vegetation, as described in the on-site habitat assessment below, determine whether vegetation of a listed ecosystem occurs on site or not – if there is no natural habitat remaining on site then the sensitivity is LOW with respect to this attribute, or, if natural habitat occurs on site then those areas would have VERY HIGH sensitivity with respect to this attribute.

Biodiversity Conservation Plans

The Western Cape Biodiversity Spatial Plan (WCBSP) classifies the habitats of the province according to conservation value in decreasing value, as follows:

1. Protected Areas (PA);
2. Critical Biodiversity Areas 1 (CBA1);
3. Critical Biodiversity Areas 2 (CBA2);
4. Ecological Support Area 1 (ESA1);
5. Ecological Support Area 2 (ESA2);

The WCBSP map for Mossel Bay shows that most of the site is within an **ESA1** area (Figure 10). This indicates that the **remaining habitat on site is considered to be important for maintaining ecological patterns in the landscape.**

Note that the purpose of the specialist study, as undertaken here, is to verify **whether the vegetation on site meets the standards** for inclusion in a conservation zone or not. Provincial-level conservation assessments make use of remote methods for mapping and do not ground-truth all locations. It is

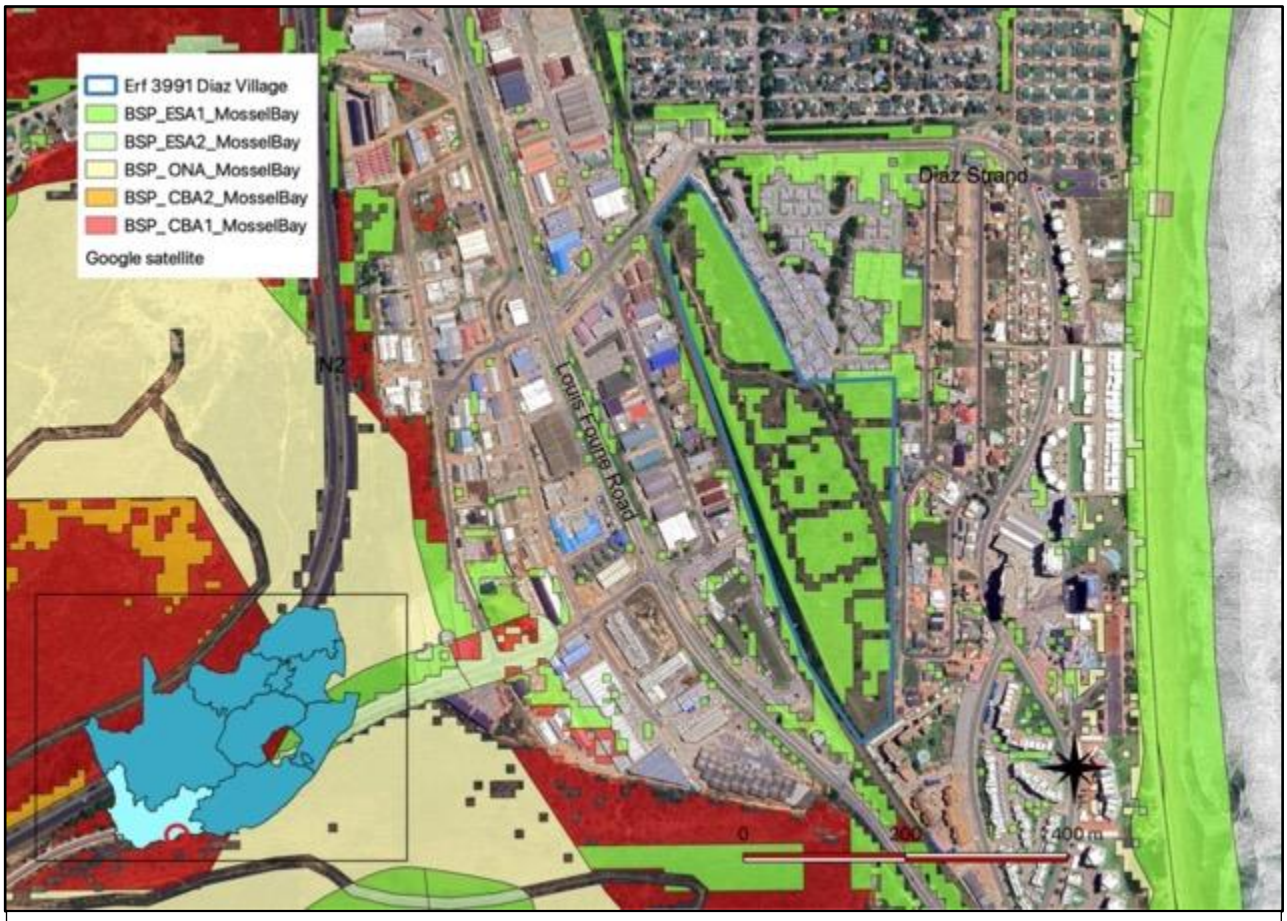

Figure 10: Western Cape Biodiversity Spatial Plan of the site and surrounding areas.

necessary to verify on the ground whether natural habitat occurs on site or not in order to determine whether the inclusion in a conservation zone is justified.

This desktop description verifies that the site is included in conservation zones and that an on-site assessment is required to verify the sensitivity of the site with respect to this attribute.

Historical disturbance on site

A 1957 aerial photograph shows the entire site to be in a natural state at that date. By 1974 this had changed and clearing occurred in the southern two-thirds of the site. A 1989 aerial photograph of the site (Figure 11) shows that the southern two-thirds of the site were cleared, but that the northern section was still natural. By 1991, an additional strip was cleared into the northern section, leaving the pattern that is currently in place. The patterns of clearing on site appear to be related to the general development of the surrounding areas.

Figure 11: Historical aerial photo of the site, dated 6 June 1989.

Natural habitats on site

Based on a detailed field survey to verify conditions on site, it was determined that, with the exception of some bands of dune thicket, **only secondary habitat remains** on site (Figure 12). A series of photographs are provided below that give various views on site (Figures 13 - 16). The habitat assessment is important for understanding the status of habitat on site, which is important for determining site sensitivity with respect to terrestrial biodiversity.

Dune Thicket

There is a strip of dune thicket running down the western boundary of the site, parallel to the railway line. It is dominated entirely by milkwoods, *Sideroxylon inerme* (protected tree species), which form a continuous narrow canopy. These trees were mostly of a significant size that suggests that they have been there for many decades at least and indicates that this is a naturally occurring area of vegetation.

There is also a wider band of the trees in the northern part of the site, along the eastern boundary. This is more structurally diverse, with areas of closed canopy and other more open areas. This area has a wider diversity of woody tree and shrub species, including *Aloe arborescens*, *A. maculata, Asparagus aethiopicus, Azima tetracantha, Brachylaena discolor, Brunsvigia orientalis, Capparis sepiaria, Carissa bispinosa, Cussonia thyrsiflora, Euclea racemosa, Euphorbia mauritanica, Grewia occidentalis, Gymnosporia buxifolia, Lauridia tetragona, Olea europaea* subsp. *cuspidata,*

Figure 12: Map of habitats on site.

Putterlickia pyracantha, Rhoicissus digitata, Schotia afra, Searsia glauca, Searsia pterota, and *Tarchonanthus littoralis*.

Dune Thicket is natural habitat that is representative of the listed ecosystem on site. It also represents ecologically functional areas that co-incide with the Ecological Support Areas designated for the site.

Disturbed areas and secondary vegetation

Most of the vegetation on site is in **previously cleared areas**, where there has also been significant dumping of rubble in large mounds. Thee vegetation is therefore either **secondary, or dominated by weeds.** Plant species occurring in these areas include *Carpobrotus deliciosus, Carpobrotus edulis, Cynodon dactylon, Ehrharta calycina, Eragrostis curvula, Felicia muricata, Leonotis ocymifolia, Malva arborea, Mesembryanthemum aitonis, Oncosiphon pilulifer, Osteospermum moniliferum, Pelargonium peltatum* and *Plantago lanceolata*, as well as the exotic species, *Lolium perenne**, *Ricinus communis** (NEMBA Category 1b), *Schinus terebinthifolia** (NEMBA Category 3 in WC) and *Solanum linnaeanum**.

These areas are **not in a natural state and do not represent natural ecosystems**. Rehabilitating them to a functional ecological state would require significant effort and financial commitment. They therefore do not currently function as Ecological Support Areas.

Figure 13: Band of thicket along western boundary.

Figure 14: Mixed thicket in northern part of site.

Figure 16: General view of secondary vegetation on site.

Figure 15: Areas on site dominated by alien invasive *Acacia cyclops*.

SITE ECOLOGICAL IMPORTANCE

The Species Environmental Assessment Guidelines require that a Site Ecological Importance is calculated for each habitat on site, and provides methodology for making this calculation.

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

An assessment of habitats on site is provided below (Table 7).

Table 4: Site ecological importance for habitats found on site

Habitat	Conservation importance	Functional integrity	Receptor resilience	Site Ecological Importance (BI)
Dune Thicket	High Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type	Low Small (> 1 ha but < 5 ha) area. Several minor and major current negative ecological impacts.	Low Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.	High (BI = Medium)
Degarded & secondary vegetation	Very low No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)

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

Table 5: Guidelines for interpreting SEI in the context of the proposed development activities

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

Summary of site sensitivity

The only remaining natural habitat on site is the **band of milkwoods along the railway line** that mark the **western boundary of the site**, as well as the **larger area of dune thicket in the northern part** of the site, which consists of a more **mixed area of thicket**.

All other vegetation on site is **secondary or disturbed** and does **not qualify as original natural vegetation**.

Based on the "Site Ecological Importance" assessment, the **Dune Thicket** is mapped as having **HIGH sensitivity**, and other parts of the site as having **VERY LOW sensitivity** (Figure 17).

The Screening Tool output desgnates the entire site as having Very High sensitivity due to being within a listed ecosystem, as well as being mostly within Ecological Support Areas.

The Site Ecological Importance derives a **much lower sensitivity rating** primarily because habitat on site is **small, fragmented, isolated and has been impacted** uppn by historical activities on site and in the surrounding areas.

The functional integrity is therefore **lower than would be expected** in an area of natural habitat, which consequently leads to a **lower sensitivity score**.

Figure 17: Habitat sensitivity on site.

IMPACT ASSESSMENT

Proposed development

The proposal is to develop residential areas on site. An indication of the areas earmarked on site for development are shown in Figure 4. This shows that the development will be located within habitats in the very low sensitivity class.

Affected sensitivities

All remaining natural vegetation on site is within mapped ESAs (Ecological Support Areas) on site, as well as within a listed Endangered ecosystem (Groot Brak Dune Strandveld). The remaining vegetation may possibly be classified as forest (Western Cape Milkwood Forest) under the National Forests Act 84 of 1998.

The impacts assessed here are therefore as follows:

1. DIRECT LOSS OF NATURAL DUNE THICKET HABITAT WITHIN ESA / LISTED ECOSYSTEM.
2. INVASION BY ALIEN INVASIVE PLANT SPECIES.

Assessment of impacts

Direct loss of habitat within ESA / Listed Ecosystem

Extent of impact
The impact will occur at the local scale but potentially affects the entire provincial conservation plan / entire listed ecosystem extent. ESA areas are supportive in terms of maintaining ecosystem processes. Depending on local circumstances, there is therefore the opportunity to replace lost support roles at alternative locations, or through some other intervention. For the current site, the affected habitat is isolated and separated from other natural areas by urban development and roads that carry high traffic volumes. They therefore provide very little ecological support to other natural areas or to populations of any plant and/or animal species. The impact is therefore scored as SITE.

Duration of impact
Clearing of natural vegetation will result in a PERMANENT impact (cannot be reversed).

Probability of occurrence
Based on the proposed development plan and the known location of natural habitats found on site, the impact will be PROBABLE and mostly due to secondary impacts.

Reversibility of impact
Loss of habitat is irreversible.

Degree to which resources will be irreplaceably lost
Due to being isolated, small and already impacted, marginal loss of resources will take place.

Intensity or magnitude of impact

At a site scale, possible secondary impacts may result in system components continuing to function in a moderately modified way, therefore impacts will be of MEDIUM magnitude.

Significance of impact
The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

On this basis, the impact is calculated as [(Extent = 1) + (Probability = 3) + (Reversibility = 4) + (Irreplaceability = 2) + (Duration = 4)] x (Intensity = 2)

Score = 28 = MEDIUM negative significance

Possible mitigation measures:
According to the guidelines for interpreting Site Ecological Importance in the context of proposed development activities, avoidance and minimisation mitigation is required in habitats with High sensitivity, with offsets required for impacts that cannot be avoided. The following mitigation measures are therefore proposed:

1. Protect areas of dune thicket and, through ecological management, attempt to enhance the condition of thicket on site.
2. Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.
3. Use indigenous and site-appropriate plant species in any rehabilitation and landscaping.
4. No additional clearing of vegetation should take place without a proper assessment of the environmental impacts, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.
5. Limit access to thicket to appropriate low-impact activities, for example, walking trails.
6. Obtain permits for any protected trees that may need to be pruned or removed.

Post-mitigation impact is calculated as [(Extent = 1) + (Probability = 2) + (Reversibility = 4) + (Irreplaceability = 2) + (Duration = 4)] x (Intensity = 1)

Score = 13 = LOW negative significance

Issue	Loss of natural habitat within ESA / listed ecosystem	
Description of Impact		
Construction activities may result in some clearing of natural habitat, to be replaced by the infrastructure. This will result in permanent local loss of natural thicket areas.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction, Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	Site	Site
Duration	Permanent	Permanent
Probability	Probable	Possible
Degree to which impact may cause irreplaceable loss of resources	Marginal loss of resources	Marginal
Degree to which impact can be reversed	Not reversible - habitat will be permanently lost	Not reversible - habitat will be permanently lost
Intensity	Medium	Low
Significance	Medium -	Low -

Invasion by alien invasive plant species

Extent of impact
The impact will occur at the site scale - there are no adjoining natural areas. The impact is therefore scored as SITE.

Duration of impact
Severe invasion (worst-case scenario) can cause irreversible ecosystem changes that will result in a PERMANENT impact (cannot be reversed).

Probability of occurrence
Based on the presence of several potentially destructive alien invasive species in the region and nearby, it is almost certain that disturbance will lead to invasion, therefore the impact will be PROBABLE.

Reversibility of impact
Loss of habitat is irreversible.

Degree to which resources will be irreplaceably lost
Marginal loss of resources will take place (fragmented & isolated thicket patches).

Intensity or magnitude of impact
In terms of the effect of alien invasive species on indigenous vegetation, severe invasion is potentially an impact that affects the continued viability of the natural ecosystems on site, therefore impacts will be of HIGH magnitude/intensity.

Significance of impact
The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

On this basis, the impact is calculated as [(Extent = 1) + (Probability = 3) + (Reversibility = 4) + (Irreplaceability = 2) + (Duration = 4)] x (Intensity = 3)

Score = 42 = MEDIUM negative significance

Possible mitigation measures:
Early detection and effective management, as well as limiting disturbance to natural areas, are all measures that can effectively prevent and control alien invasions. The following mitigation measures are therefore proposed:

1. Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.
2. Use indigenous and site-appropriate plant species in any rehabilitation and landscaping.
3. Protect natural areas outside of the development footprint from disturbance.
4. Maintain thicket vegetation canopy structure.
5. Minimise vegetation fragmentation due to any factor, for example, pathways, fire-breaks, and other opening of vegetation provides suitable invasion pathways and disturbance regimes that favour invasive species colonisation.

Post-mitigation impact is calculated as [(Extent = 1) + (Probability = 2) + (Reversibility = 2) + (Irreplaceability = 1) + (Duration = 2)] x (Intensity = 1)

Score = 8 = LOW negative significance

Issue	Invasion by alien invasive plant species, leading to degradation of indigenous habitat	
Description of Impact		
Disturbance and clearing of natural habitat leads to conditions that are ideal for alien invasive species to colonise. Once present, they modify the environment in ways that limit recovery of indigenous habitat..		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction, Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	Site	Site
Duration	Permanent	Medium-term
Probability	Probable	Possible
Degree to which impact may cause irreplaceable loss of resources	Marginal	None
Degree to which impact can be reversed	Not reversible - habitat will be permanently lost	Partly reversible
Intensity	High	Low
Significance	Medium -	Low -

SUMMARY & CONCLUSIONS

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

1. Most of the site is within an Ecological Support Area. Any natural habitat therefore has ecological value in terms of supporting ecosystem function in the area. These **natural parts of the site have High sensitivity in terms of the Terrestrial Biodiversity Theme.**

2. The entire site falls within a listed Endangered Ecosystem, Groot Brak Dune Strandveld. All **areas of natural vegetation are therefore representative of this listed ecosystem and must be treated as having high sensitivity**. These specific parts of the site have High sensitivity in terms of the Terrestrial Biodiversity Theme.

3. Most of the site consists of **secondary and/ or degraded areas**, incuding areas heavily invaded by alien invasive shrubs. There is a band of dune thicket running down the western boundary of the site, dominated by milkwood trees, and a wider band of dune thicket in the north-eastern part of the site. **These thicket areas have been designated as having high sensitivity. The remaining degraded areas are designated as having very low sensitivity.**

4. The areas of **milkwood thicket on site are designated as natural forest**, and are also **dominated by a protected tree species, *Sideroxylon inerme*.** The trees, as well as the thicket areas, are **protected** under the National Forests Act.

5. The proposed **development is entirely within areas mapped as degraded / secondary** that have low biodiversity value and sensitivity. The development is therefore supported, on condition areas of high sensitivity are protected.

RECOMMENDATIONS

- Dune thicket should be treated as sensitive. The entire band of vegetation should be protected, especially during construction, and steps taken to avoid breaking the canopy open. Boundary areas should also be protected to maintain understorey microhabitats.

- An ongoing alien invasive management programme should take place on site. This will protect sensitive habitats from degradation and could potentially be the biggest contribution to maintaining and protecting biodiversity on site and in surrounding areas.

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