Proposed Residential Development on Erven 7594, 2924 and 2925, Knysna, Western Cape

Terrestrial Animal Species Specialist Assessment:

Site Sensitivity Verification Report

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DECLARATION OF SPECIALIST INDEPENDENCE

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;
- I do not have any influence over decisions made by the governing authorities;
- I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant;
- I have the necessary qualifications and guidance from professional experts in conducting specialist reports relevant to this application, including knowledge of the relevant Act, regulations and any guidelines that have relevance to the proposed activity;
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- All the particulars furnished by me in this document are true and correct.

Monica Leitner (MSc)

May 2024

SUMMARY OF EXPERIENCE AND ABRIDGED CV - MONICA LEITNER

Core skills

- MSc. Zoology (University of Pretoria) and 5 years of work experience (project management and field work) for ecological research projects aimed at invertebrate diversity, ecological functioning, and large mammal ecology.
- Extensive ecological and field work experience (before, during and after postgraduate degrees) across a range of environments (mesic to arid savanna, grasslands and mountain terrain, sub-Antarctic) and taxa (invertebrates, avifauna, amphibians, reptiles, small mammals and large mammals).
- Two overwintering years on Marion Island, with extensive field work as Environmental Conservation Officer and seabird monitor (2018-2019), and a marine mammal ecologist (2022-2023).

Work experience

- 2022-2023: Marine mammal field assistant on sub-Antarctic Marion Island (Marion Island Marine Mammal Programme, University of Pretoria)
- 2016-2018; 2019-2022: Project Coordinator (University of Pretoria) for international Soil Fauna in Africa consortium (funded by the United Kingdom's Royal Society and Department for International Development).
- 2019-2022: Research assistant for Marion Island Marine Mammal Programme (University of Pretoria).
- 2018-2019: Environmental Conservation Officer on sub-Antarctic Marion Island (Department of Environmental Affairs).
- 2016-2018: Research assistant for Sani Pass (Drakensburg) long term invertebrate and ecosystem monitoring project (Centre for Invasion Biology, University of Pretoria).

Qualifications

- BSc. Environmental Sciences (2011, University of Pretoria)
- BSc. Honours Zoology (with distinction, 2012, University of Pretoria)
- MSc. Zoology (with distinction, 2015, University of Pretoria)

Publications

- Trisos MO, Parr CL, Davies AB, Leitner M & February EC. 2021. Mammalian herbivore movement into drought refugia has cascading effects on savanna insect communities. Journal of Animal Ecology, https://doi.org/10.1111/1365-2656.13494
- Leitner M, Davies AB, Robertson MP, Parr CL & Van Rensburg BJ. 2020. Termite mounds create heterogeneity in invertebrate communities across a savanna rainfall gradient. Biodiversity and Conservation, 29(4), pp.1427-1441
- Leitner M, Davies AB, Parr CL, Eggleton P & Robertson MP. 2018. Woody encroachment slows decomposition and termite activity in an African savanna. Global change biology, 24(6), pp.2597-2606

SACNASP Registration - Professional Natural Scientist (Ecological Sciences), 166055.

References

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ABBREVIATIONS AND ACCRONYMS

CBA	Critical Biodiversity Area
CD:NGI	Chief Directorate: National Geo-spatial Information
DFFE	Department of Forestry, Fisheries, and the Environment
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
NEMA	National Environmental Management Act
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SDP	Site Development Plan
SSVR	Site Sensitivity Verification Report
WCBSP	Western Cape Biodiversity Spatial Plan

1. INTRODUCTION

Confluent Environmental Pty (Ltd) was appointed by Eco Route Environmental Consultancy to provide Terrestrial Animal Specialist inputs for the proposed residential development on three adjacent Erven in Knysna, Western Cape: Erf 7594 (0.85 ha in extent), Erf 2924 (2.4 ha in extent), Erf 2925 (2.4 ha in extent). The site is approximately 3.4 km west of Knysna Central, adjacent to the N2 highway and overlooks the Knysna estuary (Figure 1).

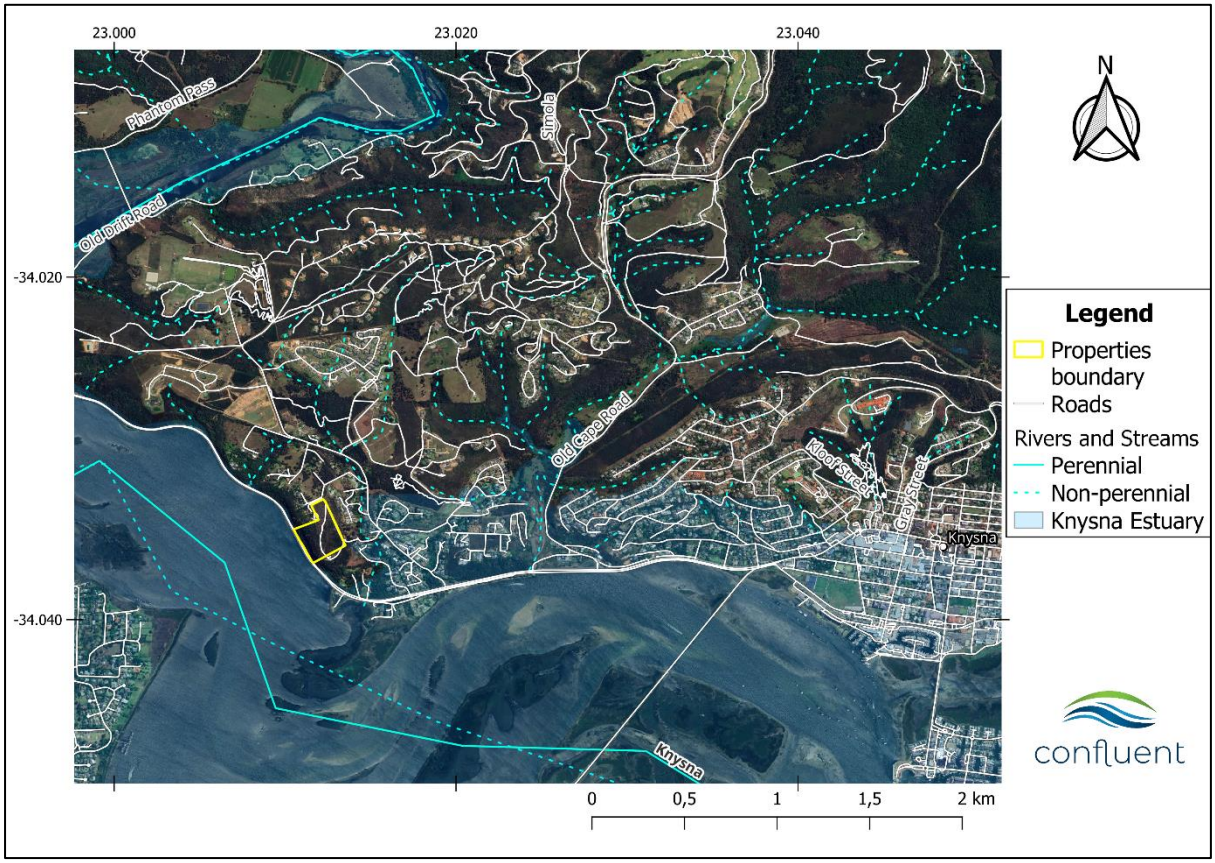

Figure 1. Erven 7594, 2924 and 2925 in Knysna, Western Cape.

1.1 Development Layout

At the time of writing this report, separate developments are proposed for each property:

- Erf 7594: High-density residential development. Property to be subdivided, with 8 portions used for housing developments (footprint of approx. 6267m^2), access roads and servitude roads, with one portion designated as Open Space. Given the Site Development Plan (SDP) and taking servitude roads into account, the total disturbance footprint on the property is 7500 m^2, and approx. 1000 m^2 (12% of property size) will be designated to the Open Space Portion 8 (Figure 2);
- Erf 2924: One large single dwelling (footprint of 789m^2), including an access road, swimming pool, fencing, areas to be cut and filled, and a septic tank. The total disturbance footprint is estimated at approx. 5616m^2 (Figure 3);
- Erf 2925: A single dwelling and access road stemming from Erf 2924 (Figure 4). The exact size of the footprint has not been provided, but based on drawings provided it is

estimated that the total disturbance footprint of the SDP is approx. 1573 m^2 on the property.

- Across all three properties, the total disturbance footprint is estimated to be 1.47 ha (26%) of the total 5.65 ha available area.

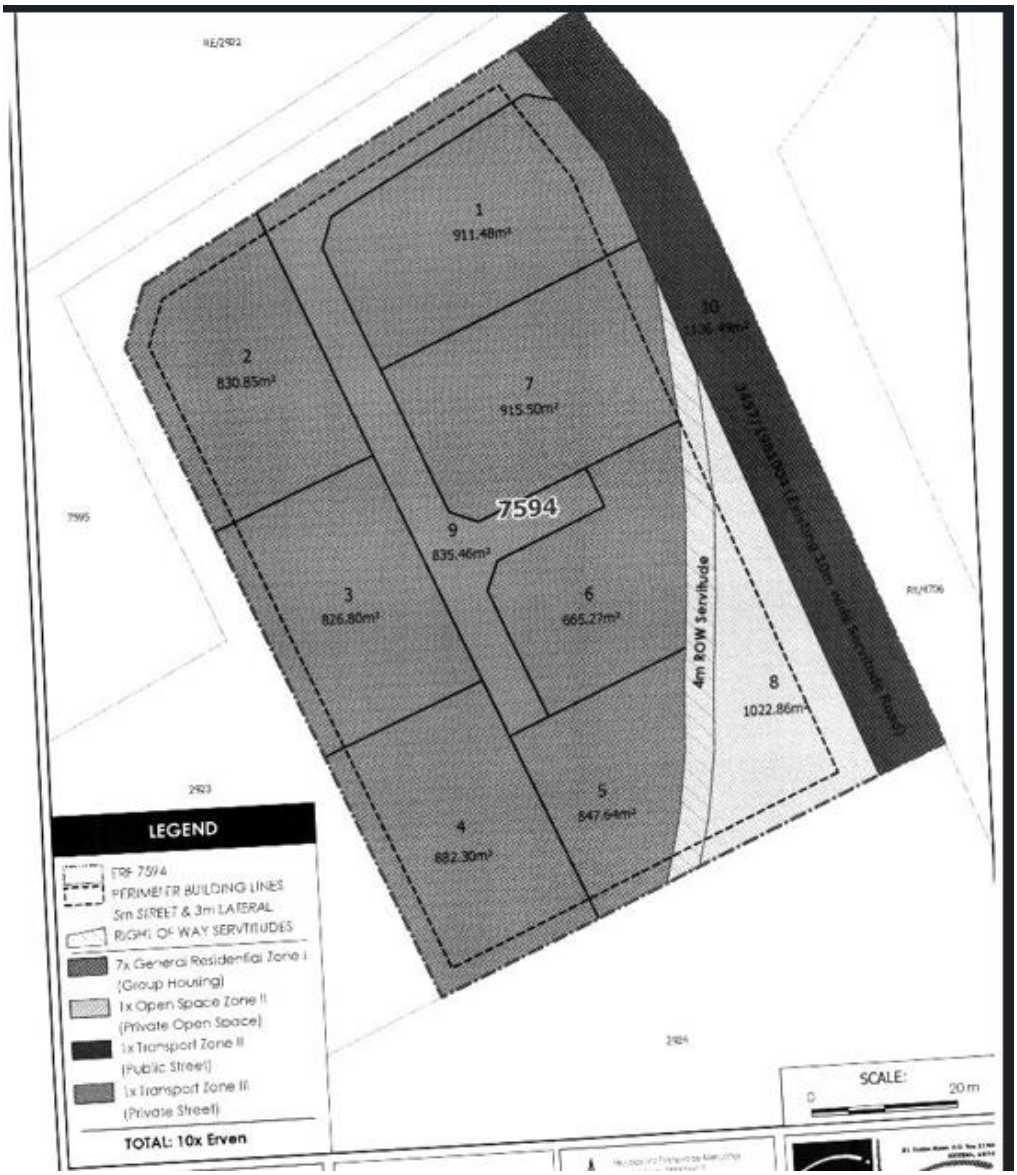

Figure 2. Site Development Plan for Erf 7594.

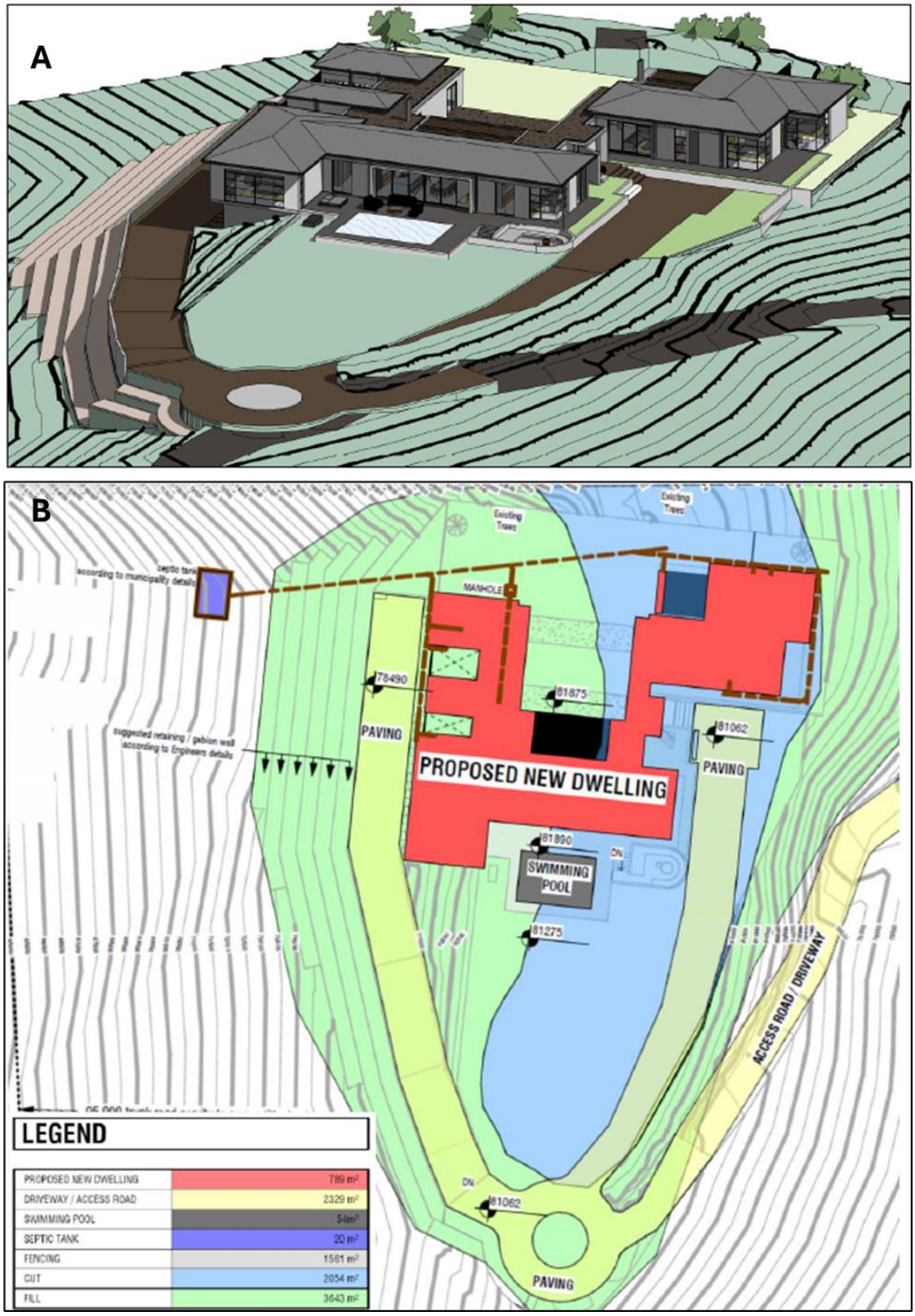

Figure 3. Site Development Plan for Erf 2924.

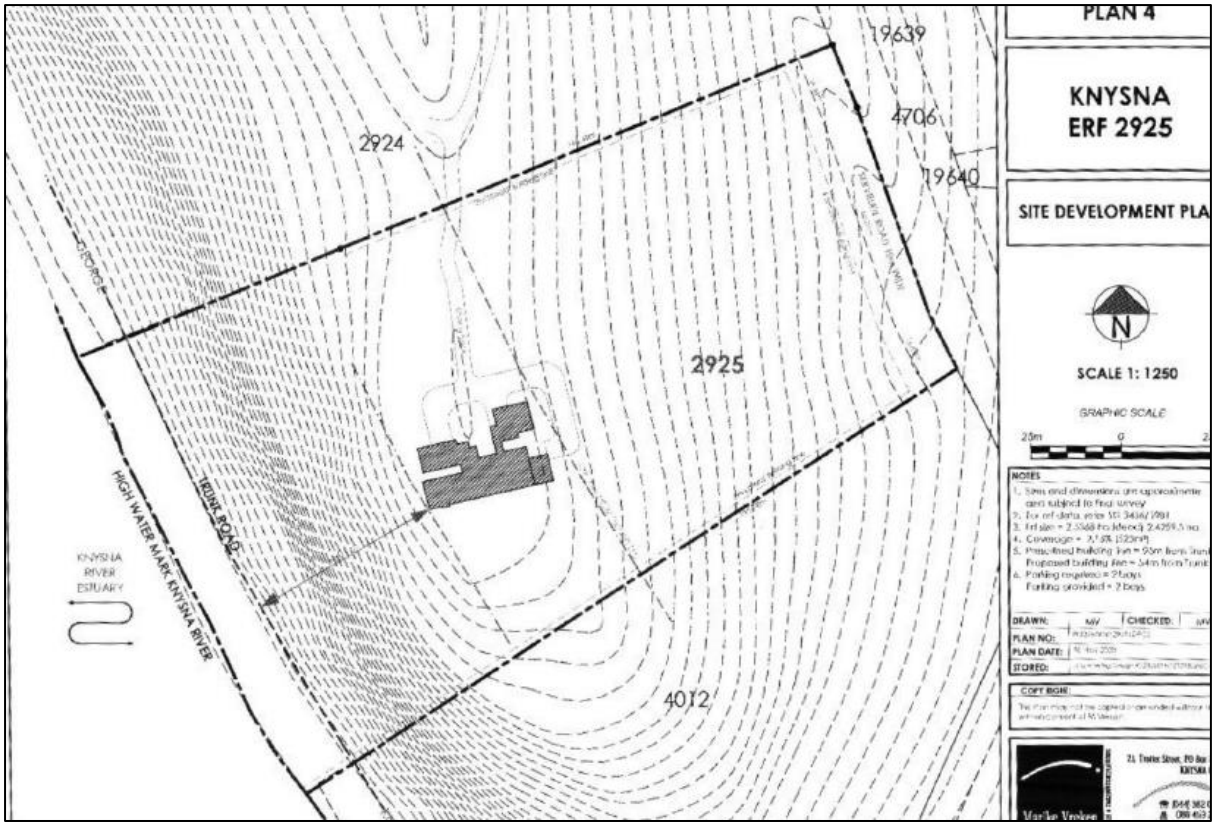

Figure 4. Site Development Plan for Erf 2925.

2. TERMS OF REFERENCE

2.1 Online Screening Tool

The scope of work for this report is guided by the legislative requirements of the National Environmental Management Act (NEMA; Act 107 of 1998), and the Animal Species Protocols in the Published Government Notice No. 1150, Government Gazette 43855 (30 October 2020). As such, the Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool is used to assess the site sensitivity for the property.

The DFFE Screening Tool revealed HIGH and MEDIUM sensitivities for the terrestrial animal species theme across the properties (Figure 5), with several animal Species of Conservation Concern (SCC) highlighted (Table 1).

A **HIGH** sensitivity rating indicates:

- Confirmed habitat for SCC.
- SCC are listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable, according the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare.

A **MEDIUM** sensitivity rating indicates:

- Suspected habitat for SCC based either on historical records (prior to 2002) or being a natural area included in a habitat suitability model for this species.

- SCC listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable according to the IUCN Red List 3.1. Categories and Criteria and under the national category of Rare.

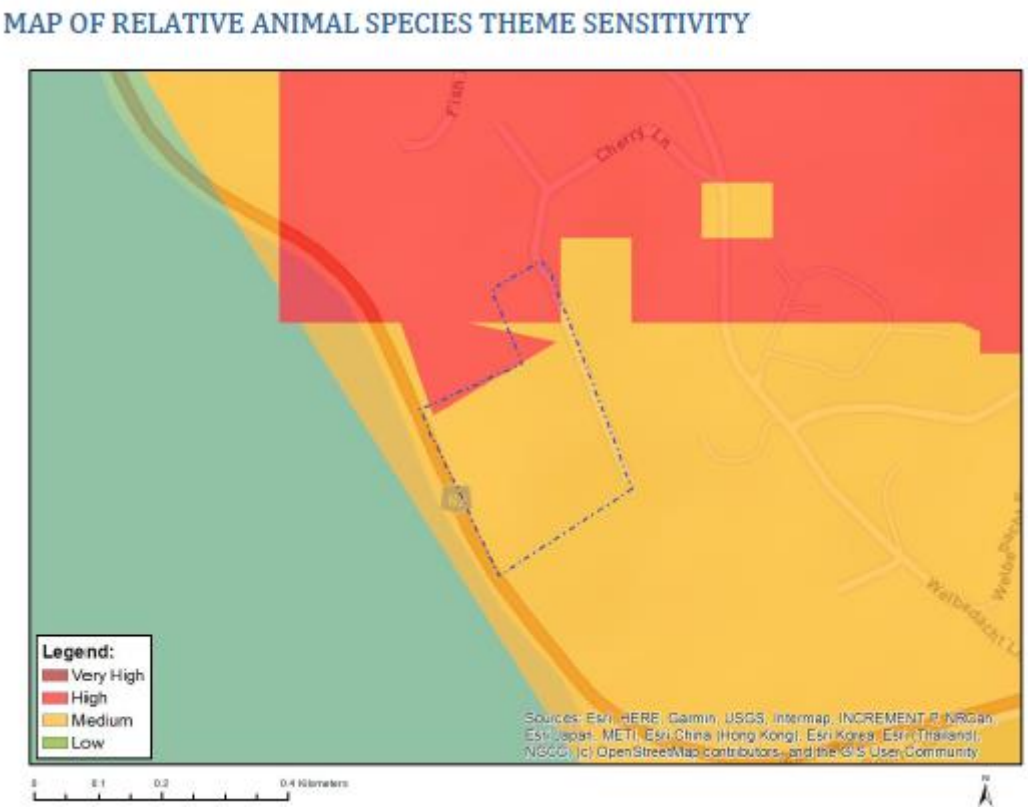

Figure 5. DFFE Online Screening Tool outcome for the terrestrial animal species theme for the proposed project area. The combined property boundaries for Erven 7594, 2924 and 2925 are indicated by the blue dashed line.

Table 1. Animal Species of Conservation Concern highlighted by the DFFE Online Screening Tool for Erf 21266.

Sensitivity	Classification	Scientific name	Common name	Red list status
High	Avifauna	*Stephanoaetus coronatus*	Crowned Eagle	Vulnerable
High	Avifauna	*Bradypterus sylvaticus*	Knynsa Warbler	Vulnerable
High	Avifauna	*Hydroprogne caspia*	Caspian Tern	Vulnerable
Medium	Amphibian	*Afrixalus knysnae*	Knysna Leaf-folding Frog	Endangered
Medium	Mammal	*Chlorotalpa duthieae*	Duthie's Golden Mole	Vulnerable
Medium	Mammal	*Sensitive species 8*	-	Vulnerable
Medium	Invertebrate	*Aneuryphymus montanus*	Yellow-winged Agile Grasshopper	Vulnerable

2.2 Scope of work

The purpose of this report is to verify the site sensitivity of the project area (Erven 7594, 2924, 2925) for the terrestrial animal species theme in accordance with the protocols specified in the Published Government Notice No. 1150, Government Gazette 43855 (30 October 2020).

The site sensitivity verification includes:

- A desktop assessment, to:
    - Characterize the vegetation, climate, general habitat features and topography of the property.
    - Assess the property's location within the context of the Western Cape Biodiversity Spatial Plan (WCBSP).
    - Conduct a historical assessment of the property and immediate surroundings for any disturbances, development and changes in land use or habitat characteristics over time.
    - Provide information on the habitat requirements for Species of Conservation concern highlighted by the DFFE online screening tool, in addition to other SCC indicated through online resources (e.g. Virtual Museum, iNaturalist) for the property and surrounding areas.
- On-site inspection(s) and field assessments to:
    - Verify the current land use and identify current impacts or disturbances on the property.
    - Characterize faunal habitats, determine the habitat suitability and the likelihood of SCC occurring on the property.
    - Conduct taxa-specific sampling for SCC in suitable habitats.
- Any other available and relevant information from
    - Discussions with landowners/neighbours.
    - Previous report findings for the property or surrounding areas.

Should the site sensitivity verification indicate a **LOW** sensitivity, then a Terrestrial Animal Species Compliance Statement will be issued.

Should the site sensitivity verification indicate a **HIGH** sensitivity, then a Terrestrial Animal Species Specialist Assessment will be compiled.

3. DESKTOP ASSESSMENT

3.1 Vegetation, Climate and General Habitat

Knysna in the Western Cape is situated within the Fynbos biome and experiences a temperate climate year-round (Mucina & Rutherford, 2006; Rebelo, Boucher, Helme, Mucina, & Rutherford, 2006). Vegetation on the site is mapped as Garden Route Shale Fynbos (Endangered), and a Terrestrial Biodiversity Assessment is available (G. Nicolson & A. Labuschange, Capensis Ecological Consulting, March 2024). Average temperatures range

between 28℃ and 8℃, with the hottest days experienced from January to March, peaking around 38℃, and the coldest days experienced from June-August not falling below 2℃ (Figure 6). Rain occurs throughout the year in a bimodal pattern with peaks in autumn (April) and spring (October-November) (Figure 6).

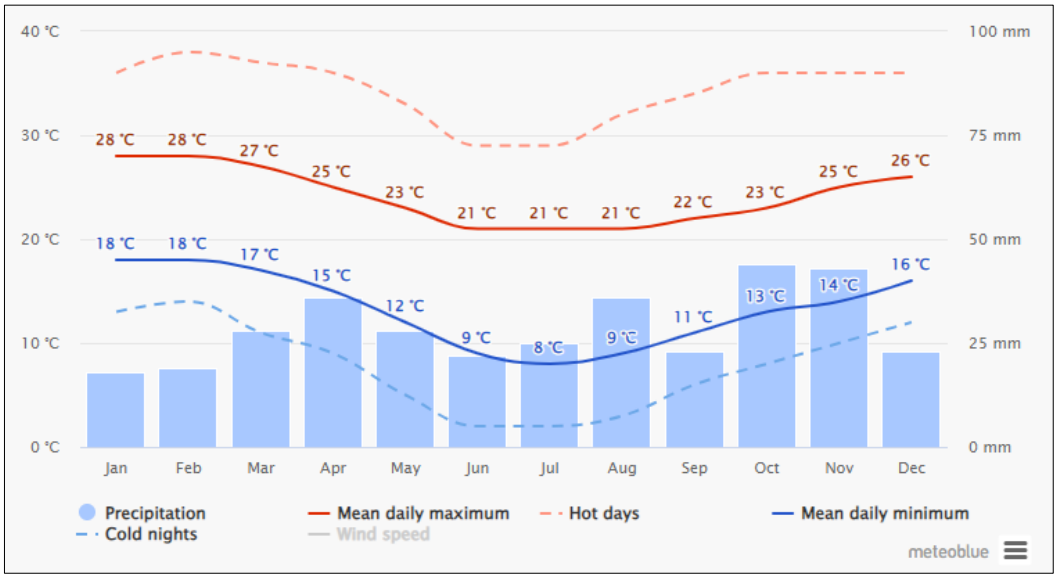

Figure 6. Summary of historical climate (modelled) for Knysna (www.meteoblue.com).

Satellite imagery from Google Earth and Cape Farm Mapper was used to assess general vegetation structure, elevational gradients and water bodies within the project area (Figure 7). The project area (where all the developments are planned) is situated on the crest and upper portions of a hill overlooking the Knysna lagoon. Erven 2924 and 2925 include a steep cliff towards the south-westerly portions as well as a narrow stretch of thicket/forest vegetation at the base of the cliff adjacent to the N2 highway. The houses/dwellings on Erven 2924 and 2925 are above the cliff (on the hill crest) overlooking this south-western area with views of the lagoon, while the development on Erf 7594 is on the northern slope of the hilltop and faces inland. The hilltop area consists of elements of fynbos vegetation but with moderate to high levels of alien plant invasion. No waterbodies are observed on the erven (Figure 7).

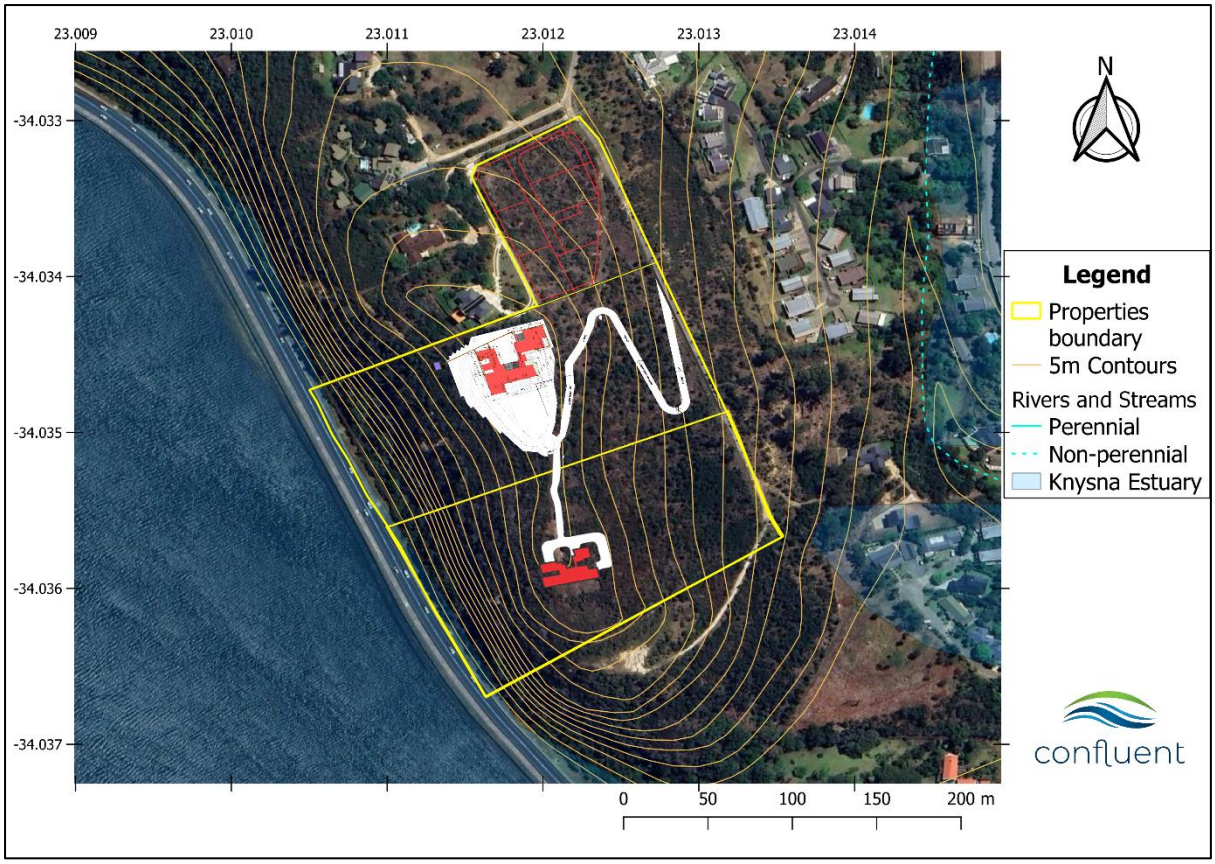

Figure 7. Satellite imagery for the developments (red and white outlines) on Erven 7594, 2924, 2925 in Knysna, showing topography (5m contours) and vegetation structure. There are no mapped watercourses present on the erven.

3.2 Western Cape Biodiversity Spatial Plan

Additional mapping layers were applied to the project area to include the Western Cape Biodiversity Spatial Plan (CapeNature, 2017), with Critical Biodiversity Areas (CBAs) assessed in Figure 8 , with the definitions and associated management objectives explained in Table 2. The northern sections of the erven contain CBA1 areas, with Erven 2924 and 2925 having the largest areas present. The reason for the CBA1 assignment is due to the site containing key vegetation and aquatic zones flagged for protection:

- Eastern Fynbos Renosterveld Shale Fynbos Depression Wetland
- Eastern Fynbos Renosterveld Shale Fynbos Flat Wetland
- Eastern Fynbos Renosterveld Shale Fynbos Floodplain Wetland
- Garden Route Shale Fynbos (EN)
- Knysna (Core) Estuary
- Water source protection- Knysna
- Watercourse protection- South Eastern Coastal Belt

No mapped wetlands or watercourses were found on the properties – see also Aquatic Specialist Report (F. de Ridder & J. Dabrowski, Confluent Environmental, May 2024) for further information.

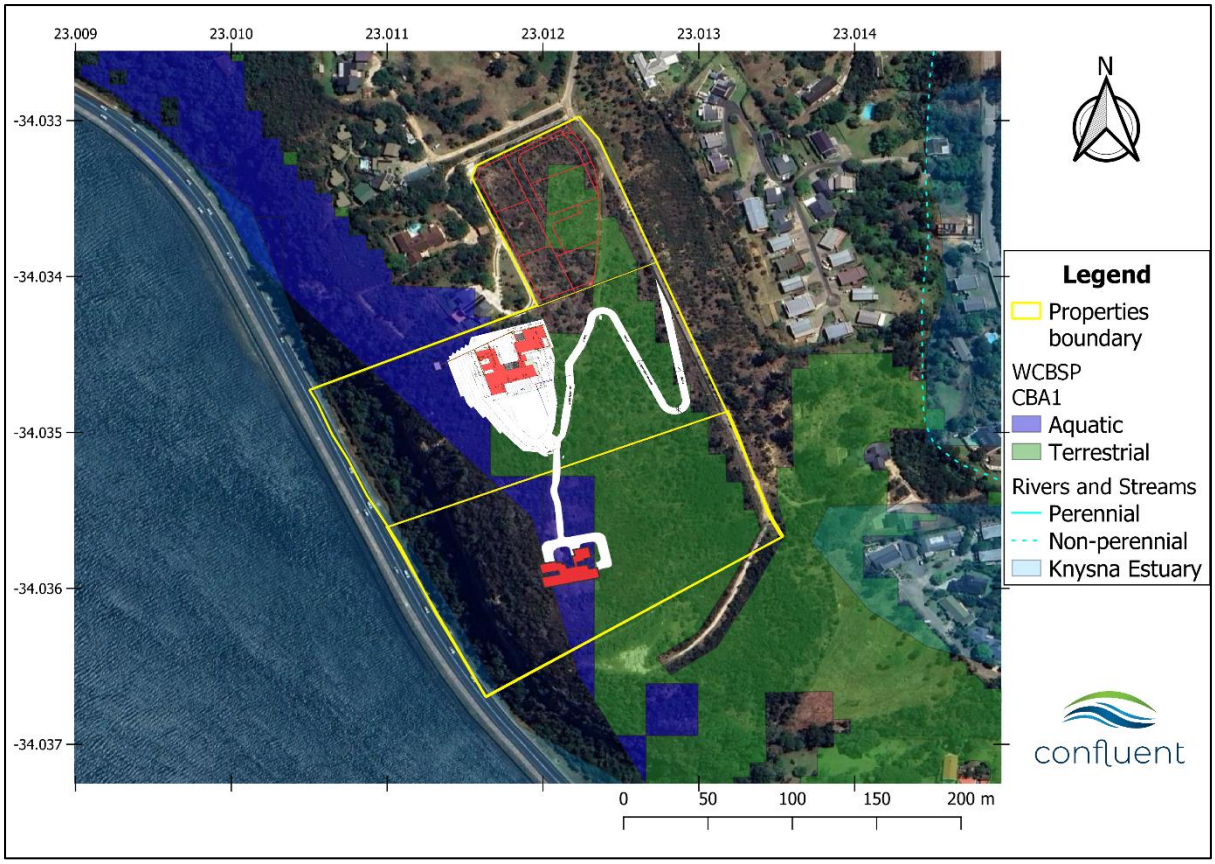

Figure 8. Site map of Erven 7594, 2924 and 2925 with layers for the Western Cape Biodiversity Spatial Plan's Critical Biodiversity Areas (CBA1) and Ecological Support Areas (ESA2).

Table 2. Definition and objectives for conservation category identified in the Western Cape Biodiversity Spatial Plan (CapeNature, 2017).

WCBSP Category	Definition	Management Objective
Critical Biodiversity Area 1 (CBA1)	Areas in a natural condition. Required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.

3.3 Historical Assessment of Project Area

Erven 2924, 2925 and 7594 have undergone no major anthropogenic changes throughout the past 66 years since 1958, although high levels of alien plant invasions and associated impacts are seen through time (Figure 9). In 1958 the eastern hilltop sections of the properties seems to have been cleared of vegetation with some bare ground exposed as well, indicating some anthropogenic disturbance. By 1998 these areas are densely vegetated with trees, suggestive of alien plant invasions having taken place over the subsequent decades. Alien vegetation is clearly evident and extensive throughout the properties in the 2016 imagery, which was then all severely burnt during the 2017 the Knysna fires that cleared almost all vegetation on the

hilltop. The properties have since revegetated mostly with alien plants again, with a few patches still comprising slightly more open vegetation (Figure 10).

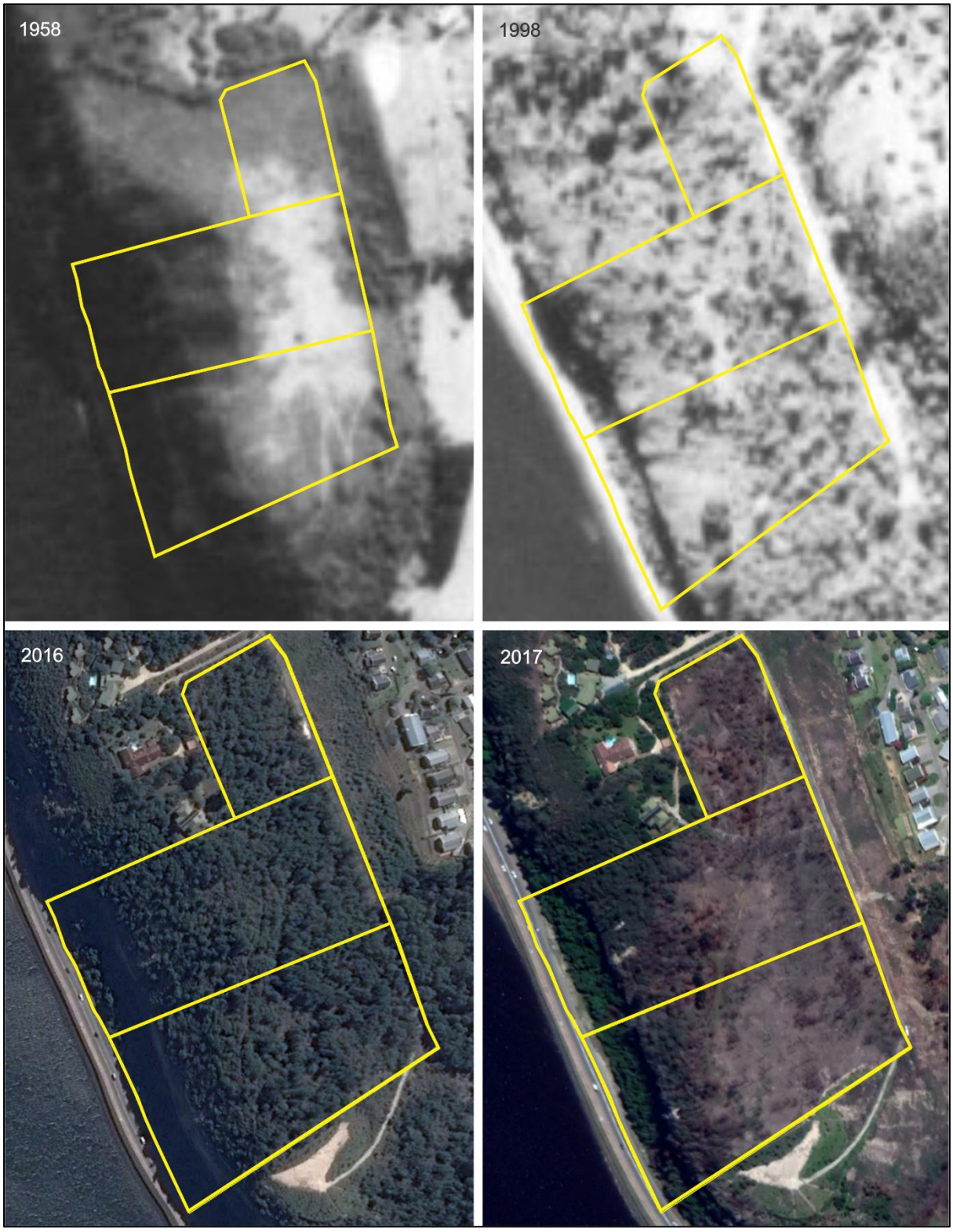

Figure 9. Historical imagery of Erven 7594, 2924 and 2925, sourced from the CD: NGI geospatial portal and Google Earth. The property boundaries are indicated by the yellow line.

Figure 10. Satellite imagery from 2024 of Erven 7594, 2924, 2925 in Knysna sourced from Google Earth.

3.4 Species of Conservation Concern

In addition to the SCC highlighted by the DFFE screening tool (Table 1), the following public resources were consulted to provide additional SCC for the property and its immediate surroundings:

1. iNaturalist (all taxa) within 2 km x 1 km area of the project area (URL for iNaturalist search area).
2. Virtual Museum for herpetofauna, mammals and invertebrate taxa within the Quarter Degree Squares (QDS) 3423AA: DungBeetleMAP, FrogMAP, LacewingMAP, LepiMAP, MammalMAP, OdonataMAP, ReptileMAP, ScorpionMAP, SpiderMAP.
3. South African Bird Atlas Project (SABAP2) for pentad 3400_2300.

Some SCC reported on the platforms were highly unlikely to occur the site given either clearly unsuitable habitat or being deemed a vagrant/transient animal. For example, given that the property does not contain any waterbodies, all animals reliant on such habitat features for their existence are highly unlikely to occur on site. For the purposes of this report these animals were excluded from further assessment (see also Section 4.2 and Appendix 1 for additional information).

The combined list of SCC (from DFFE Screening Tool and public resources) possibly occurring in the project area, along with their habitat, breeding and feeding requirements are listed in Table 3. The information for each SCC presented in Table 3 stems largely from the online SANBI Red List of South African Species (http://speciesstatus.sanbi.org) in addition to a few key resources for each taxa:

1. Avifauna: Roberts Birds of Southern Africa VII (Roberts, Hockey, Dean, & Ryan, 2005)

2. Mammals: The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005)
3. Invertebrates:
    - Field guide to the insects of South Africa (Picker, Griffiths, & Weaving, 2019)
    - Field guide to the butterflies of South Africa (Woodhall, 2005)
    - Field guide to the spiders of South Africa (Dippenaar-Schoeman, 2023)
4. Amphibians: A complete guide to the frogs of Southern Africa (Du Preez & Carruthers, 2015)
5. Reptiles: A guide to the reptiles of Southern Africa (Alexander, 2013)

Any information presented from different sources is cited in the text.

Table 3. Summary of habitat, breeding and feeding requirements for animal SCC potentially occurring on Erven 7594, 2924, 2925. Bold text indicates SCC highlighted by DFFE Online Screening Tool.

Red list status	Species	Habitat	Breeding	Feeding
Vulnerable A3c; B2b(ii,iii,v); C1+2a(i)	***Bradypterus sylvaticus*** **Knysna warbler**	Inhabits dense understorey vegetation along riverbanks in fynbos forest patches, riverine woodland and afromontane forest and has even adapted to thickets of non-native brambles (e.g. *Rubus*). (BirdLife International, 2016).	Breeds from August and December coinciding with the greatest abundance of invertebrate species. (BirdLife International, 2016).	Mostly on ground, creeping through dense, matted vegetation and scratches in humus. Eats mostly grasshoppers, insect larvae, spiders, slugs, worms.
Vulnerable A2a;C1; D1, D2	***Hydroprogne caspia*** **Caspian Tern**	Concentrated at estuaries and sheltered bays along the coastline and at large, permanent inland waterbodies (natural and artificial). The primary threats to this species are during the breeding period when it is highly susceptible to human disturbance, predation by domestic dogs and kelp gulls, and extreme weather events.	Coastal breeding habitat is primarily offshore islands but increasingly uses sandy beaches. Inland breeding habitat includes small islets in dams/pans. Monogamous, pair bonds lasting from year to year. Defends territory around nest site. Nest is shallow scrape on ground lined with dead vegetation. Laying dates in Western Cape are October - January. 1-3 eggs laid, incubation lasting 22-24 days.	Forages in clear, shallow water. Feeds throughout the day but most active the mornings. Diet almost entirely of fish, swallowed in flight.

Vulnerable C1; D1	***Stephanoaetus coronatus*** **Crowned eagle**	Forest (including gallery forest), dense woodlands and forested gorges in savannas and grasslands. Also in Eucalyptus and Pine plantations. Perches for long periods, resting in canopy. Sometimes soars high over territory, then descends vertically to perch. Manoeuvres agilely through thick forest, can take off vertically from forest floor.	Monogamous, possibly long-term pair bond. Territorial (at least 10 km2), solitary nester. Tallest trees used to build large stick platform nest (sticks/branches up to 1.5m long, 3cm thick). Nest copiously lined with beachwood (*Faurea saligna*), Pine or *Eucalyptus* leaves/needles. Nest often reused and added to in consecutive years, can reach up 2-3m diameter, 3m high. Nest trees often at the base of cliff/ravine or at the edge of plantation. Nest trees usually White-stinkwood (*Celtis africana*), yellowwoods (*Podocarpus spp*.), Cabbage tree (*Cussonia spicata*) but also *Eucalytus* and Pine. Incubation 49-51 days.	Predominantly feeds on mammals (96% diet) and mostly on hyrax, antelope and primates. Will also take porcupine, hares, mongoose, sometimes domestic stock and domestic cats/dogs. Avian prey includes Hadeda Ibis, Egyptian geese and domestic chickens. Reptile prey mainly monitor lizards. Most prey taken on ground, but occasionally crashes into dense foliage in pursuit. Frequently still-hunts (stalks prey) and hunts from concealed perches frequently above waterholes in evening waiting for antelope to drink. Pair sometimes hunt monkeys cooperatively. Prey struck with downward blow of open foot, massive hind claw penetrates the skull killing instantly. Large prey that cannot be lifted are partly eaten and dismembered on the ground and then cached in trees.
Near Threatened C1	*Campethera notata* Knysna Woodpecker	Territorial, occurring in thornveld, *Euphorbia* thickets, riparian and montane evergreen forests. Marginal occurrence in Protea communities, coastal white Milkwood (*Sideroxylon inerme*) thickets and alien trees	Monogamous, solitary nester Hole in trunk/branch of tree, usually in a dead stem 1.2-6m off the ground. Holes infrequently reused in successive years, but a new hole can be excavated in the same branch. Laying from August-November	Forages at all levels of trees, especially mid-canopy. Pecks and probes for ants and termites on dead branches, but occasionally forages on ground.

Least Concern (Regional), Near Threatened (Global)	*Buteo trizonatus* Forest Buzzard	Afromontane forests and plantations (mainly Pine, but also *Eucalyptus*). Generally unobtrusive, perching on large branches partially concealed under canopy, sometimes perching in open at the edge of forest edge.	Monogamous, territorial, solitary nester. Nest is platform of sticks, cup-lined with green leaves. Nests in plantations are smaller than in native forests. Laying dates from August-November. Breeding is confined to the Western Cape and Eastern Cape Provinces.	Forages along forest edges and within (also plantations). Hunts mainly from perch. Diet consists of small mammals (mice and moles), small birds, snakes, lizards, frogs and invertebrates.
Vulnerable B1ab(iii)+2ab(iii)	***Chlorotalpa duthieae*** **Duthie's Golden Mole**	Occur on alluvial sands and sandy loams in southern Cape Afrotemperate forests (Bronner, 2014). Preference for forest vegetation over fynbos. Narrow coastal band 275 km long between Wilderness and Port Elizabeth with fairly disjunct populations. Can occur in gardens and pastures adjoining forests. Mainly active at night.	Little is known but a female was recorded with a litter of two young in November (Bronner, 2014).	Shallow subsurface foraging tunnels radiate outwards from beneath the roots of trees. Forages at night in tunnels and through the leaf litter. Diet includes earthworms.
Vulnerable B2ab(ii,iii,v)+C2a(i)	**Sensitive Species 8**	Specialised habitat requirements within a home range of approximately 0.75 ha. Strong habitat preference for dense vegetation with good undergrowth providing good cover in which to retreat. Forest, thicket, dense coastal bush, independent of water. Can inhabit forest edges and transitional zones. Requires diverse plant community with variety of tree and shrub species. Can adapt to fragmented habitat given sufficient cover and food availability. Actively avoids open grasslands, and areas with human disturbance.	This species can breed throughout the year. Males establish territories and exhibit aggressive behaviours towards other males and to attract females.	Highly selective feeders, often feeding on food below troops of monkeys or frugivorous birds which drop lots of material. Preference for fruit, but also fallen leaves, flowers and insects. Seldom actively browse. Active in the early morning and late afternoon, foraging for around 8 hours a day within their territory.

Near Threatened B2b(iii)	*Amblysomus corriae* Fynbos Golden Mole	Sandy soils and soft loams in Mountain Fynbos, Grassy Fynbos and Renosterveld of South West Cape. Also Afromontane forest and southern African moist savanna along the southern Cape coast. Favours richer and wetter soils (Broom 1907) preferring forest fringes and associated fynbos. Thrives in gardens, cultivated lands, golf courses and livestock paddocks. Present also in exotic plantations, but apparently at lower densities (Bronner 2013).	Fynbos Golden Moles probably breed a seasonally because pregnant females have been captured in August, May, and December. Mean litter size is two; young are altricial and hairless at birth.	Insectivorous, mainly feeding on earthworms and insects
Vulnerable B2ab(iii,v)	**Aneuryphymus montanus** ***Yellow-winged Agile Grasshopper***	Very low area of occupancy between 100 and 1 000 km2. Threatened by declining habitat due to invasion by aliens and habitat transformation. Strong association with sclerophyllous fynbos vegetation on the southern slopes of the Outeniqua mountains, post-fire. Threats to the species include habitat transformation and invasion by alien plants.	Not known	Not known

Vulnerable	*Circellium bacchus* Flightless dung beetle	Endemic to South Africa, on the Southern coastline in the winter and bimodal rainfall regions. Habitat types include the Albany Thicket and Fynbos biome, including vegetation units in Shale Renosterveld (FRs), Limestone Fynbos (FFl), Sandstone Fynbos (FFs), Sand Fynbos (FFd), Strandveld (FS). No association known for particular soil type (Davis et al. 2020). Abundant in dense shrub/woodland on sandy soils; most uncommon in adjacent disturbed open vegetation (Davis et al. 2020). Flightless, ectothermic and diurnal with maximal activity between 18–26°C, particularly after rainfall (Davis et al. 2020).	In Addo Elephant National Park: Buffalo and cattle dung preferred for breeding, but also recorded on dung of monkey, human, rhinoceros, hare, ostrich (Davis et al. 2020).	Elephant dung preferred for feeding but also recorded on dung of monkey, human, rhinoceros, hare, ostrich (Davis et al. 2020).
Near Threatened	*Aloeides pallida littoralis* Knysna Pale Copper Butterfly	Endemic taxon to the Western Cape Province. Relatively flat terrain near the coast, coastal Fynbos	Little known, but *Lepisiota capensis* ants are hosts for subspecies *A. p. grandis.*	Little is known, but larval food for the subspecies *A. p. pallida* and A. *p. jonathani* feed on *Aspalathus* species. The larvae of subspecies *A. p. grandis* are fed by trophallaxis by *Lepisiota capensis* ants and feed on these ant eggs.

Endangered B1ab(i,ii,iii,v)+ 2ab(i,ii,iii,v)	***Afrixalus knysnae*** **Knysna Leaf-folding Frog**	Typically inhabit endorheic (inward draining) wetlands with shallow water (< 50cm), high clarity, and sufficient vegetation suitable for breeding (De Lange & Du Preez, 2018). No streaming or running water recorded at any of the sites where they've been recorded. The frog is associated with vegetation it can use for breeding which includes indigenous and exotic species. For example, slender knotweed (*Persicaria decipiens*) and kikuyu grass (*Pennisetum clandestinum*). Requires a habitat with diverse plant species, including shrubs, grasses, and ferns, providing shelter and breeding sites (Lange and Preez, 2018).	Females lay eggs on leaves which are folded and sealed by males, creating a protected environment (Du Preez & Carruthers, 2017). Breeding occurs during warmer wetter months such as September to November (De Lange, 2019). Breeding takes place near deeper parts of the waterbody, but still close to the water's edge.	The Knysna Leaf-folding Frog is an insectivorous amphibian feeding on small invertebrates found in its habitat (e.g. insects and spiders). Foraging behaviour includes actively searching for prey on the forest/fynbos floor and in the leaf litter. The frog uses its sticky, projectile tongue to capture and quickly ingest prey. It is primarily active at night, relying on its vision to locate and capture prey in the darkness.

4. FIELD ASSESSMENT

4.1 Methods

Following the Species Environmental Assessment Guidelines (SANBI, 2020) and Table 3, taxa-specific sampling techniques were conducted in habitats where SCC were likely to occur. Taxa-specific sampling was interspersed with a meander across the project area to collect additional opportunistic data for all fauna and inspect all habitat types (Table 4).

Table 4. Sampling techniques conducted for potential SCC occurring on the project area.

Taxa	Field methods	Public platform where observations were reported
Avifauna	• Meander* across site for direct observations. • 7 point counts (5-minute bird counts).	Birdlasser (species lists), iNaturalist (photos)
Mammals	• Meander* across site for direct observations, tracks, scats and signs.	iNaturalist (photos)
Invertebrates	• Meander* across site for direct observations. • Active searching. • Sweep netting.	iNaturalist (photos)

* Meandering involved slow walking across the site through various habitat types and key landscape features. Active observations took place for all fauna throughout this walk which was then supplemented by taxa specific sampling methods in habitats deemed most suitable for SCC.

4.2 Assumptions and Limitations

1. While the public platforms mentioned in Section 3.4 are excellent sources of additional information for animal species occurring within an area, these results require some expert interpretation to determine which of the SCC are relevant to include in the faunal assessment of the project area. For example, the coarse spatial scale of reporting within the Virtual Museum platforms (Quarter Degree Square level (27km x 27km) or SABAP2 pentad level (9km x 7 km)) can result in species records from habitats quite different to those present on site. Additionally, these platforms include sightings of vagrant or transient animals upon which an assessment cannot reasonably be based. Expert interpretation is therefore applied to the full list of SCC identified by the various public platforms (see Appendix 1) and some species are then excluded from further assessment due to the project area clearly lacking suitable habitat or the species clearly representing a vagrant or transient animal outside its normal range. The SCC assessed in this report therefore represent those which may reasonably occur on site. However, there is always the possibility that some SCC (although highly unlikely to occur on site) are overlooked in this process.
2. One field visit took place to the site for the faunal assessment. This only represents a “snap-shot” in time and it is possible that SCC occurring on site were not observed during this visit. These results should therefore be interpreted with this in mind and not be treated as an exhaustive list of species occurring on site.
3. The site visit took place during daylight hours so the likelihood of encountering nocturnal species was limited.

4. The site visit coincided with autumn on the site. This may be of consequence for species showing seasonal variation in breeding and activity patterns, and therefore alters their likelihood of detection. For the butterfly SCC (*Aloeides pallida littoralis*) this timing falls outside the adult activity periods (Aug-Jan) thereby substantially decreasing its detectability. The precautionary principle is therefore applied where appropriate to suspected habitat.
5. Evidence of animals in the form of tracks, scats and signs always brings with it a level of uncertainty, but best efforts were made in this regard and uncertainties are highlighted in the report.

4.3 Site Inspection Details

One site visit took place to the three erven on the 19th April 2024, with misty weather experienced on arrival that later cleared and became hot and sunny. Habitat types found on the sites consisted of a section of thicket habitat along the bottom of the cliffs along the south-western property boundaries of Erven 2924 and 2925 bordering the N2 highway, and fynbos habitat experiencing varying degrees of alien plant invasion on the top of the hill where Erf 7594 and the majority of Erven 2924 and 2925 are situated. Figure 11 shows habitat types present on the properties and Figure 12 gives an aerial perspective of the sites. Alien trees observed on the property include Blackwood (*Acacia melanoxylon*), *Eucalyptus* and Pine trees, with some very dense stands having formed in the northern sections of the properties. Some areas had been previously cleared of alien trees, with dead plant material left in place, making sweep netting and walking across the site challenging. An effort was made to cover the project area with the meander and to conduct taxa specific sampling techniques across a range of suitable habitats for potential SCC (Figure 13).

Figure 11. Site photos from Erven 7594, 2924, 2925. Narrow stretch of thicket habitat along the N2 highway of Erven 2924 and 2925 (A1, A2), separated from the rest of the site by a cliff (A3). Fynbos habitat with moderate levels of alien plant invasion evident on all three erven (B). Dense stands of alien plant invasion with some areas previously cleared but the dead vegetation left in place on all properties (C).

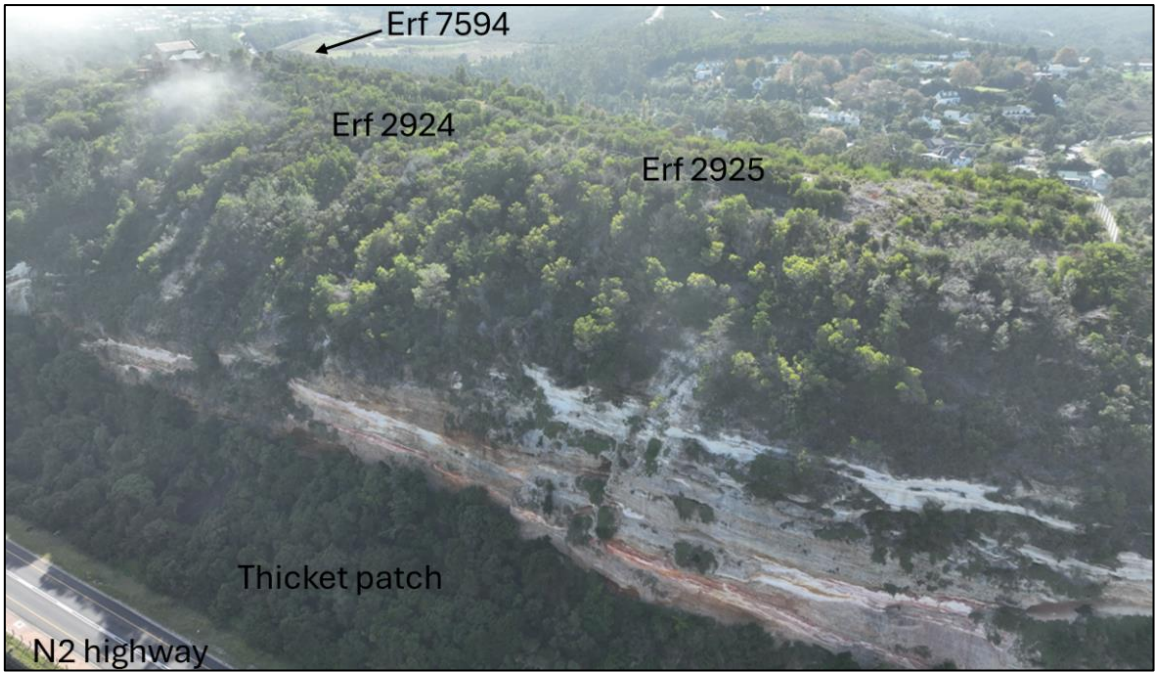

Figure 12. Drone image of project areas showing the N2 highway and thicket patch at the bottom of the cliff within Erven 2924 and 2925. Erf 7594 is indicated as well, placed further away from the cliff side. High levels of alien plant invasion evident on hilltop areas.

Figure 13. Habitats, GPS track and field work on Erven 7594, 2924, 2925 from field visit in April 2024.

4.4 Results

4.4.1 Avifauna

No SCC were encountered during the site visit. Seven bird counts were conducted across the properties, in addition to opportunistic sightings noted throughout the meander and searching for nests/roosting sites in suspected habitat. A total of 10 bird species were identified during the site visit (See Appendix 2).

4.4.2 Mammals

Subterranean tunnels typical for the Golden Mole SCC were found on the hilltop areas of all three erven during the site visit (Figure 14). While not possible to identify the species present based on the tunnels alone, the habitat suggests the more likely occurrence of the Fynbos Golden Mole (*A. corriae*) rather than Duthie's Golden Mole (*C. duthieae*, Vulnerable) which is typically associated with more forested habitat. However, the DFFE Screening Tool predicted suitable habitat for Duthie's Golden Mole on all three properties and therefore the precautionary approach is followed for this SCC as well. Mole tunnels were found in all vegetation/habitats in the hilltop and northern sections of the properties regardless of the level of alien plant invasion. One mole tunnel was also observed to cross beneath the fence of the north-western neighbouring property, indicating their movement across the entire hilltop landscape (Figure 14).

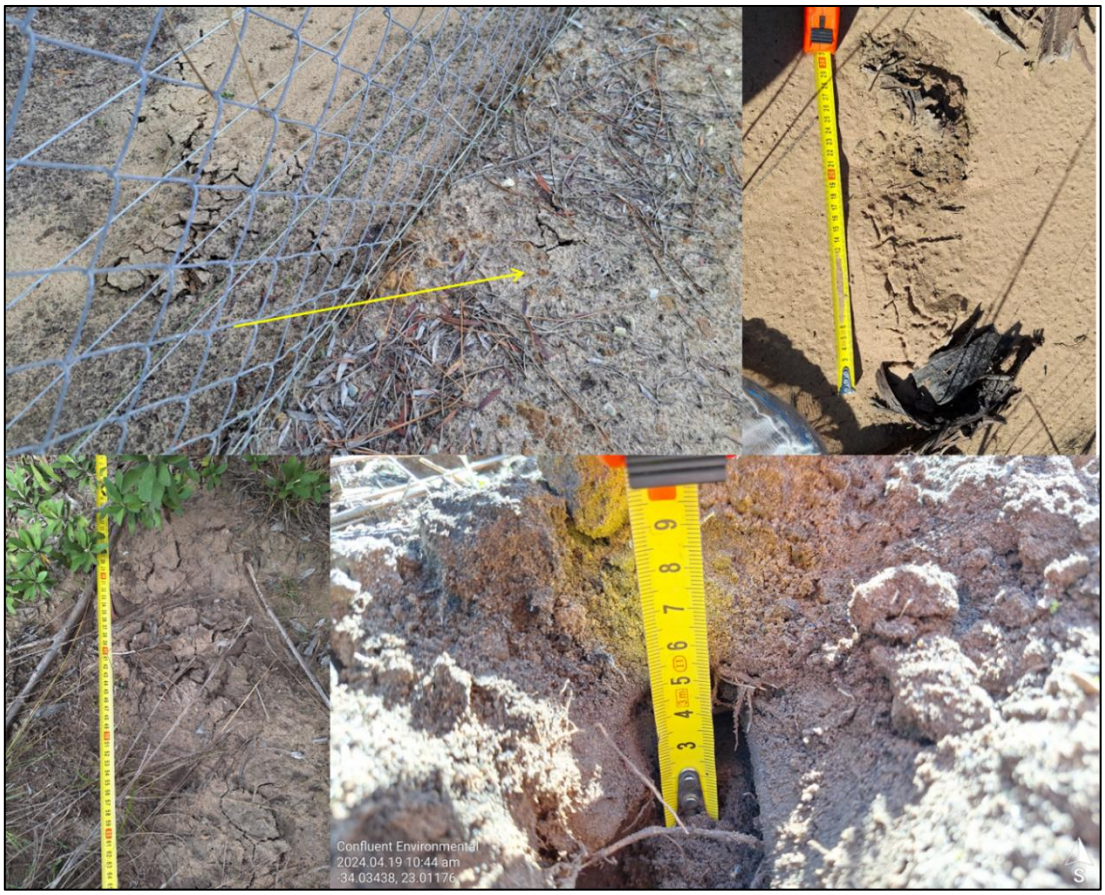

Figure 14. Golden mole tunnels seen on Erven 7594, 2924 and 2925. Top left image shows tunnel crossing a fence line (yellow arrow shows the crossing). Lengths of the tunnels seen are indicated by tape measure, as is the height (size) of one excavated tunnel in the bottom right image.

Antelope dung was found in the thicket section near the N2 highway and Bushbuck are suspected to be using this as a corridor. Some Mole-rat activity was also seen adjacent to the N2 highway along the mowed edges of the roads (see Appendix 3 for full list of mammals seen).

Some fencing was evident on Erf 2925 presumably indicating the edge of the development area on this property (Figure 15). The neighbouring property to Erven 7594 and 2924 also has a fence and this has numerous tightly spaced electric wires (Figure 15, top right image). While intended for security purposes, the numerous strands, narrow spacing and low to the ground placement of electric wires poses a significant threat fauna (especially small animals) which frequently get caught, stunned and electrocuted to death in such designs (see Figure 16). It is suggested that if properties are considering electric fencing for security purposes, that consideration is given the number of strands necessary (reduce where possible) and that a minimum distance above the ground for an electric strand is set to at least 30cm to decrease risks for wildlife (Pieterson, 2022).

Figure 15. Fencing seen along some sections of Erf 2925, extending to Erf 2924 on the hilltop (top left and bottom image). The neighbouring property to Erven 7594 and 2924 also has a fence line with numerous and very tightly spaces electric wires (top right image).

Figure 16. Extract from popular article[1] based on research on the unintended negative effects of electric fencing on wildlife in South Africa (Pieterson, 2022).

4.4.3 Terrestrial Invertebrates

No SCC was found during the site inspection and the limited fynbos elements combined with moderate to high levels of alien plant invasion would generally decrease the habitat quality/suitability for most invertebrate SCC. The site did however contain plants in the genus *Aspalathus,* which is the host plant genus for the butterfly SCC: *Aloeides pallida littoralis* (Near Threatened). Given that the site visit fell outside the peak activity period for this SCC (August-January), the precautionary approach is followed and the habitat deemed possibly suitable. In total, invertebrates from 6 Families were photographed and identified from site (Figure 17, Appendix 4).

[1] https://africageographic.com/stories/shock-value-the-animal-toll-of-electric-fences/

Figure 17. Some invertebrate species seen on Erven 7594, 2924, 2925 during the site visit in April 2024.

4.4.4 Likelihood of Occurrence for SCC

Following the terrestrial fauna surveys and site inspection, the possible SCC occurring on Erven 7594, 2924 and 2925 were evaluated according to their likelihood of occurrence. It is always possible that a species assessed as having a low probability of occurrence can still occur on the site, and therefore this table should only be used as a guideline.

Table 5. Likelihood of occurrence for terrestrial fauna SCC on Erven 7594, 2924 and 2925.

Red list status	Species	Observed	Suitable habitat	Likelihood of occurrence
Vulnerable A3c; B2b(ii,iii,v); C1+2a(i)	***Bradypterus sylvaticus*** **Knysna warbler**	No	No	**LOW** No suitable river/stream habitat.
Vulnerable A2a;C1; D1, D2	***Hydroprogne caspia*** **Caspian Tern**	No	No	**LOW** No suitable habitat on site. Likely to use wider landscape around Knysna lagoon but unlikely to occur on site.
Vulnerable C1; D1	***Stephanoaetus coronatus*** **Crowned eagle**	No	No	**LOW** No suitable or extensive forest or sufficient large tree habitat on site. Habitat near N2 highway is too small and isolated to be suitable for SCC. No suitable forest habitat is likely to act as core area in surrounding landscape.
Near Threatened C1	*Campethera notata* Knysna Woodpecker	No	Possible	**LOW** Some possible habitat along thicket near the property boundary with N2 highway. This is separated with a cliff from the project area on the top of the hill. SCC unlikely to occur in project/hilltop area given unlikely habitat with little to no suitable indigenous tree habitat.
Least Concern (Regional), Near Threatened (Global)	*Buteo trizonatus* Forest Buzzard	No	Possible	**LOW** Limited but possible habitat along thicket near the N2 highway. This is separated with a cliff from the project areas on the top of the hill. SCC could occur within the stands of larger alien trees in vicinity of site, but no suitable large trees are present on site. Properties contain smaller shrubby vegetation with limited perching/hunting opportunities.
Vulnerable B1ab(iii)+2ab(iii)	***Chlorotalpa duthieae*** **Duthie's Golden Mole**	Possibly. Unable to identify species but typical subterranean tunnels observed	Unlikely	**MEDIUM** Possible habitat exists in the thicket along the N2 highway, however this is separated from project area by a cliff and would isolate the SCC. No mole tunnels observed in thicket vegetation. Mole tunnels seen in project areas along top of hill, extending across all three properties and present in all vegetation (invasion and more natural). Habitat mapped as fynbos, and not typical forest habitat for SCC but given the presence of tunnels, the lack of ability to identify species based on tunnels alone

Red list status	Species	Observed	Suitable habitat	Likelihood of occurrence
				and the Screening Tool mapping this as potential habitat, the precautionary principle is applied, and SCC given medium likelihood of occurrence.
Vulnerable B2ab(ii,iii,v)+C2a(i)	**Sensitive Species 8**	No	No	**LOW** No suitable or extensive forest habitat on site. Habitat near N2 highway is too small and isolated to be suitable for SCC. No suitable forest habitat is likely to act as core area in surrounding landscape.
Near Threatened B2b(iii)	*Amblysomus corriae* Fynbos Golden Mole	Possibly. Unable to identify species but typical subterranean tunnels observed	Yes	**HIGH** Mole tunnels seen in project areas along top of hill, extending across all three properties and in all habitats (invaded and more natural). Habitat mapped as fynbos, which is suitable and typical habitat for SCC.
Vulnerable B2ab(iii,v)	**Aneuryphymus montanus *Yellow-winged Agile Grasshopper***	No	No	**LOW** Past and current levels of alien plant invasion on site make this unlikely habitat for SCC. Limited to no suitable sclerophyllous fynbos habitat.
Vulnerable	*Circellium bacchus* Flightless dung beetle	No	Possible	**LOW** Past and current levels of alien plant invasion in project area make this unlikely habitat for SCC. Limited large animal activity and lack of dung observed in project areas on hilltop reduce the likelihood of occurrence of the SCC. Some animal activity and dung found in thicket near N2 highway, but SCC not known from forest habitat. SCC deemed unlikely to occur in area given its limited dispersal ability (flightless) and nearest report of SCC is > 2km away along the Brenton-On-Sea peninsula.
Near Threatened	*Aloeides pallida littoralis* Knysna Pale Copper Butterfly	No	Possible	**MEDIUM** Current and past alien plant invasions as well as hill topography (not flat terrain preferred by SCC) likely limits the habitat suitability for SCC. However, some limited open space and flat areas with elements of fynbos do exist on the project area and the larval host plant genus

Red list status	Species	Observed	Suitable habitat	Likelihood of occurrence
				Aspalathus was seen on site. Given that little is known about the SCC as well as the presence of some fynbos and a host plant observed on site, the precautionary principle is applied and SCC given medium likelihood of occurrence.
Endangered B1ab(i,ii,iii,v)+ 2ab(i,ii,iii,v)	***Afrixalus knysnae*** **Knysna Leaf-folding Frog**	No	No	**LOW** No suitable wetland habitat on property,

5. SITE SENSITIVITY VERIFICATION

After the site visit and fauna surveys, it is determined that the site sensitivity for the terrestrial animal theme of Erven 7594, 2924 and 2925 is **HIGH**. Based on the information in this report during the desktop and field assessment, the following reasons support this finding:

- The finding of subterranean tunnels typical of Golden Moles seen across all three erven indicating the highly likely occurrence of the SCC. While not possible to identify the species based on the tunnels alone, the habitat on the property is more typical of the Fynbos Golden Mole (*A. corriae,* Near Threatened) SCC. However, the DFFE Online Screening Tool indicated suitable habitat for Duthie's Golden Mole (*C. duthieae,* Vulnerable) and therefore the precautionary principle is also applied to this SCC.
- The habitat on all three erven containing limited but possibly suitable habitat and the larval host plant for the butterfly SCC *Aloeides pallida littoralis* (Near Threatened).

As per the Published Government Notice No. 1150, Government Gazette 43855 (30 October 2020), the **HIGH** sensitivity ratings of the site requires a Terrestrial Animal Species Specialist Assessment to be conducted.

6. SITE ECOLOGICAL IMPORTANCE

Site Ecological Importance (SEI) is a standardised metric used to highlight areas of importance for species within a development site/property. It allows for transparent and comparable reporting of the site-based ecological importance of various areas/habitats and indicates the potential impacts of the development on associated SCC (SANBI, 2020).

The Site Ecological Importance (SEI) is determined for habitats within the property, taking associated fauna SCC likely to occur on the properties into account (Table 5). Table 6 provides the SEI calculations for each habitat type (see Appendix 5 for SEI methods) and Figure 18 illustrates the SEI results for the property. It is important to note that the SEI reported here is specific to the proposed development and associated activities of this report and can only be used to compare multiple layouts and/or locations for the development.

All three properties have a MEDIUM SEI rating with regards to terrestrial fauna. According to the guidelines for interpreting SEI ratings (Table 7, (SANBI, 2020)), development in medium SEI areas should focus on minimizing and restoring impacts. In this case, the development of two dwellings on Erven 2924 and 2925 are considered compliant with these guidelines (provided mitigation measures are adhered to) given that large portions of the erven are left undeveloped, while the development proposed for Erf 7594 covers the majority of the property area and at the erven level could be considered high impact due to high levels of habitat loss. Erf 7594 would therefore need to focus efforts on reducing footprints where possible and maintaining connectivity to the other erven with more open space available. When viewed collectively (across the three erven), the impact could be considered medium, since areas left undisturbed by the development footprints can retain connectivity for the SCC (given suitable fencing (i.e. Golden Moles and butterfly)) and ultimately 24% the combined erven area will be developed (1.35 ha developed of the total 5.6 ha area).

Table 6. Site Ecological Importance assessment for Erven 7594, 2924 and 2925, Knysna. Conservation status for SCC is abbreviated to indicate Critically Rare/Endangered (CR), Endangered (EN), Vulnerable (VU) or Near Threatened (NT). When relevant, the extent of occurrence (EOO) is indicated as part of the justification for the conservation importance (CI) metric.

Habitat and associated SCC	Conservation Importance (CI)	Functional Integrity (FI)	Biodiversity Importance	Receptor Resilience (RR)	Site Ecological Importance (SEI)
Thicket vegetation SCC: *A. corriae* *C. duthieae*	**HIGH** Possible occurrence of *C. duthieae* (VU, EOO > 10km^2). **MEDIUM** Possible occurrence of *A. corriae* (NT).	**MEDIUM** Narrow corridor of good connectivity, very narrow habitat shape and size. Minimal current negative ecological impacts within habitat, but next to busy road (noise disturbance and vehicles posing collision threats).	**MEDIUM**	**MEDIUM** Narrow habitat and proximity to busy road increases likelihood of alien plant invasion, habitat has a moderate likelihood of returning after disturbance. SCC have some tolerance for disturbance, but are limited in mobility (soil-dwelling) and have a moderate likelihood of remaining or returning after disturbance.	**MEDIUM** BI = Medium RR = Medium
Moderately and highly invaded fynbos SCC: *A. corriae* *C. duthieae* *A. pallida littoralis*	**HIGH** Possible occurrence of *C. duthieae* (VU, EOO > 10km^2). **MEDIUM** Highly likely occurrence of *A. corriae* (NT) and possible occurrence of *A. pallida littoralis* (NT).	**MEDIUM** Moderate to high levels of alien plant invasion but connectivity remains possible for mole SCC that adapt can adapt to modified environments. **LOW** Butterfly SCC is negatively impacted by alien plant invasions, which are present at moderate-high levels across the site.	**MEDIUM**	**MEDIUM** Golden mole SCC has moderate likelihood of remaining on site during and after disturbance. Butterfly SCC, if present on site is able to tolerate the current moderate to high levels of alien invasion (disturbance) and will then also has a moderate likelihood of remaining on site during the disturbance or returning thereafter.	**MEDIUM** BI = Medium RR = Medium

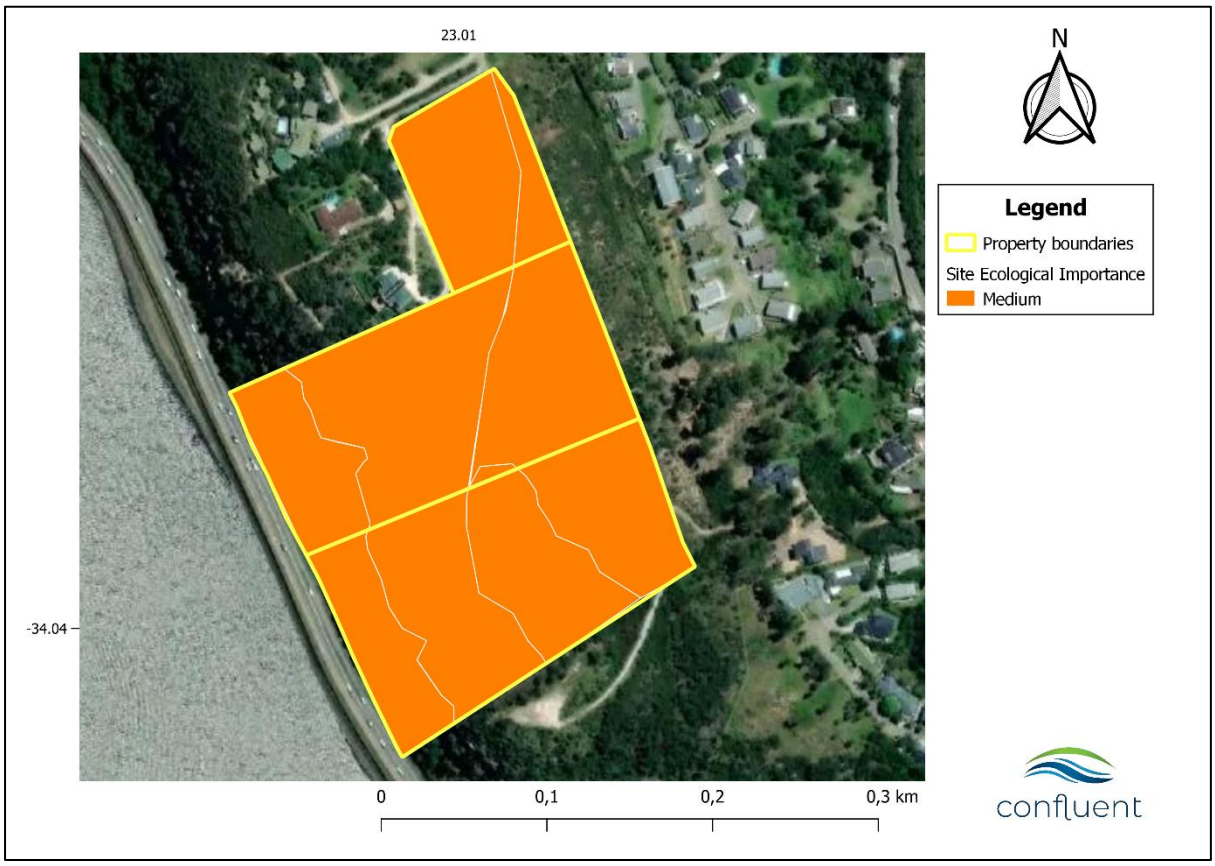

Figure 18. Site Ecological Importance map with regards to fauna for Erven.

Table 7. Guidelines for interpreting Site Ecological Importance for proposed developments (SANBI, 2020).

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.

7. IMPACT ASSESSMENT

This impact assessment is based on the SDPs provided for the erven at the time of writing this report and will need to be reassessed if these change in the future. The impacts and associated mitigation measures for each development phase are discussed in the following sections. For ease of reference, a checklist is provided in Appendix 6 to ensure environmental compliance in accordance with the relevant mitigation measures discussed in this report for the construction phase of the developments. Impacts (pre- and post-mitigation) are evaluated

for each property separately and presented in Table 8, Table 9 and Table 10, and the methods explained in Appendix 7.

7.1 Mitigation hierarchy

The principles of the mitigation hierarchy (Ekstrom *et al.*, 2015) are applied during an impact assessment. Potential impacts on biodiversity are preferentially managed through preventative, rather than remediative, measures (Figure 19). This is achieved by suggesting avoidance or minimization methods wherever possible. Alternatively, if the impacts of a development cannot be adequately managed through the preventative measures of avoidance and minimization, then restoration and, as a last resort, offsets are considered.

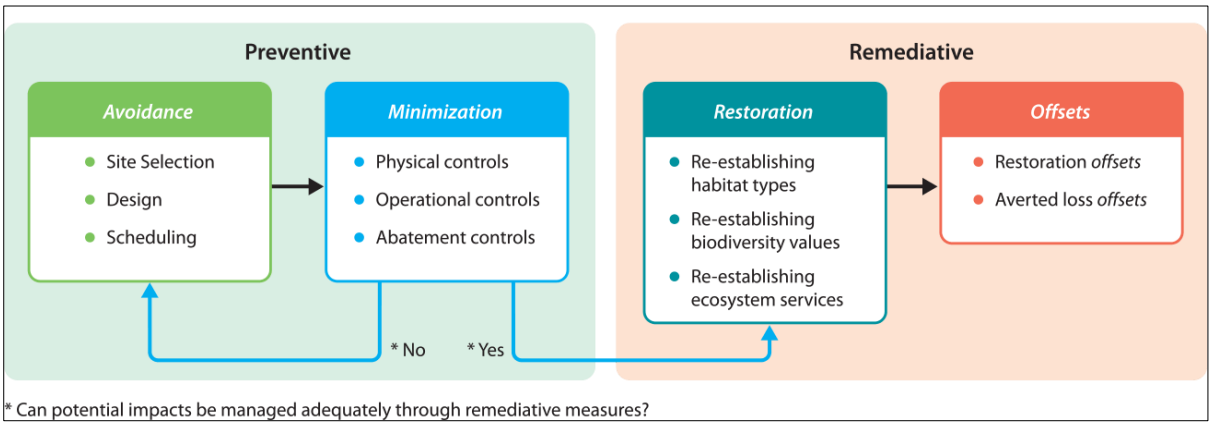

Figure 19. The iterative process of minimising predicted impacts on biodiversity and ecosystem services, as described in the mitigation hierarchy (Ekstrom et al., 2015).

7.2 Current Impacts

Erven 7594, 2924 and 2925 have remained undeveloped with minimal anthropogenic disturbances over time. However, alien plant invasions have been prevalent on the sites in recent times with density peaking at the time of the Knysna fires in 2017, during which the majority of the sites were burnt bare. Since the 2017 fires, alien plants have reestablished and densified on all three erven. The current impact is described below:

1. Moderate to high levels of alien plant invasions by multiple species (Pine, *Eucalyptus*, Black Wattle, Rooikrans) has led to habitat transformation from the natural state, which impacts fauna through altered fire regimes (increased frequency and intensity), loss of suitable habitat (open habitat converted to thickets) and typically a reduction in food resources (plants and prey species).

It is highly recommended that the current impacts are addressed, and that an alien plant management plan be developed and implemented on all the properties before any development is permitted to take place. This pre-construction mitigation measure will benefit habitat quality and aid in reducing fire risk on the property as well as in the greater landscape.

7.3 Layout and design phase

While SDPs have been put forward for each property and are assessed within this report, there are some additional considerations within the layout and design phase of the projects which can reduce the impact of the development on fauna and their habitat within the property.

1. Keep artificial lighting along roads and around infrastructure to a minimum and consider lighting colour, brightness and design options with minimal impact on biodiversity. Light pollution is of global concern given that our night skies are getting lighter due to urban development and that many animals are specifically adapted to dark night skies for navigation, foraging and behavioural aspects (i.e. sleep, hunting). A common impact is that many insects are attracted to or disorientated by artificial lights, leading to aggregations at such point sources. This interferes with their natural behaviour (i.e. feeding), associated ecosystem services they provide (e.g. pollination) and often has fatal consequences for individuals unable to escape the 'light trap'. There is also the cumulative impact of attracting predators to light sources (e.g. birds, frogs, small mammals) and exposing them to risks in these areas as well.
    a. Wherever possible in the designing phase consider 'no lighting' options to encourage dark areas and reduce light pollution.
    b. Where this is not possible, the impacts of lighting can be reduced through the selection of the colour/brightness (select yellow, dim lights which are less attractive to insects than bright white or blue lights) and design elements (lights facing down towards the ground rather than facing up towards the sky).
2. Design considerations can minimise the permanent footprint of the developments thereby limiting the loss of ground/habitat space for the Golden Mole SCC found on site. This can be done through changes in layouts and housing designs where possible to minimise permanent footprints i.e. build double storey rather than a single storey houses, design a smaller houses, place house on stilts to allow for natural vegetation to grow underneath and allow fauna to move underneath, use the under-house area as a parking area negating the need for additional habitat loss for this purpose. Specifically in the case for these erven the following suggestions are made:
    a. The SDP for Erf 7594 currently converts 75% of property space to a permanent footprint, leaving 25% open for the Golden Mole SCC occurring on the property. While the Open Space portion of the Erf does connect to other open sections on the adjacent Erf 2924, consideration should be given for the use of gardens, natural space or areas without hardened surfaces within the housing layout design on Erf 7594 to allow additional space for use by the SCC where possible.
    b. The SDP for Erf 2924 currently has a new access road planned from the north of the property towards the main dwelling, which also acts as an access route for the dwelling on Erf 2925. Rather than constructing a new access road as currently planned, consideration should be given to the use of the existing servitude road stemming from Erf 7594 as an access to the house on Erf 7594. Making use of existing infrastructure (an existing road from the neighbour's property) will result in less disturbance and loss of natural habitat (reduce the development's footprint) and prevent fragmenting the erven by additional roads which may limit the movement of the Golden Mole SCC.
3. The proposed development will be situated within fynbos vegetation which is fire-prone and the surrounding areas (including the properties currently) have high levels of alien plant invasions further increasing the fire risk. While not likely to be avoided in these erven, it should be understood that the current placement of the houses/infrastructure on the top of the hill has increased fire risks as fires move upslope more readily than

downslope (Figure 20). It is therefore highly recommended that alien plant eradication measures are implemented before construction takes place, not only to benefit the natural environment but also to manage fire risk to these developments. Mitigation measures to reduce fire risks to this house should therefore also seriously be considered in terms of design, for example: use non-flammable materials for gutters and roofing (i.e. no plastic gutters or thatch roofing); plant a fire-proof hedge/vegetation around the developments (see Appendix 8). It is also imperative that a comprehensive fire management plan be developed and implemented on the property.

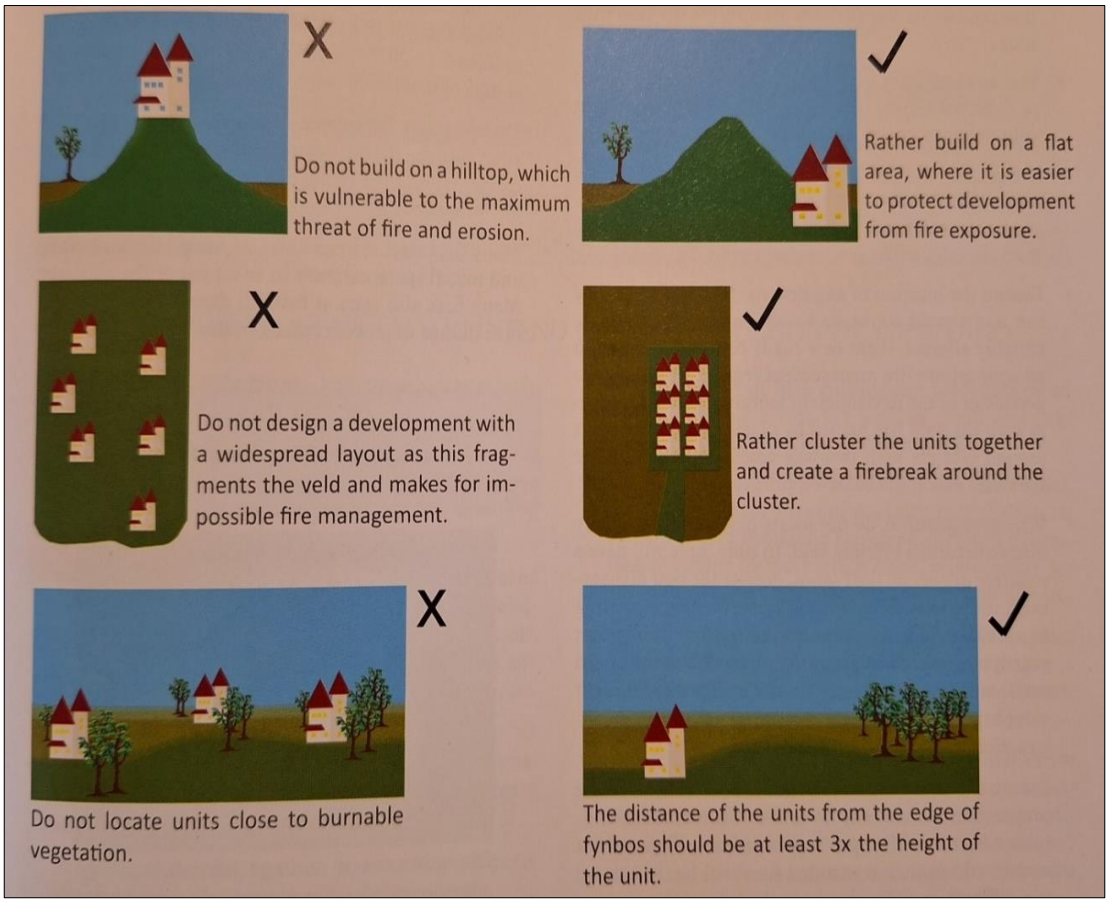

Figure 20. Considerations for house placements when building in fire-prone habitats *(Esler, Pierce, & de Villiers, 2014)*

4. Access roads and parking spaces for non-heavy machinery could make use of open pavers that are planted with non-invasive grasses, like *Cynodon dactylon* (the Cape Royal variety), or *Stenotaphrum secundatum* (Buffalo grass). Open pavers should also be considered around any areas where water might be channelled and cause erosion around the houses (i.e. at the base of gutter outlets or overflow zones around water tanks). Open pavers reduce surface water runoff intensity through improved infiltration and can reduce erosion often associated with infrastructure (Figure 21).

Figure 21. Examples of open pavers to use for parking areas, access roads or underneath gutters/water tank overflow areas to improve water infiltration and prevent soil erosion.

7.4 Construction Phase Impacts

The construction phase will have the highest impacts on fauna species due to increased moving vehicles, noise and habitat destruction associated with these activities. It is imperative that an Environmental Control Officer (ECO) be appointed for the duration of the construction phase and ensure compliance with mitigation measures that aim to minimize impacts on fauna. It is imperative that an ECO is present on site at the onset of a new construction phase, at the start of any earthworks and once a week thereafter during the construction phase.

7.4.1 Loss of habitat for fauna within the footprint of the proposed houses and roads due to construction related activities.

Description: The proposed developments and associated access roads will result in the permanent loss of habitat space on the property. The current development footprint where permanent infrastructure is placed and permanent loss of habitat occurs (including servitude roads, drive ways and all infrastructure) on each property, translates to:

- Erf 7594 (0.85 ha in extent) will develop a total of 88% of property size, leaving 0.1 ha natural/undeveloped (Figure 2);
- Erf 2924 (2.4 ha in extent) will develop a total of approx. 23% of the property size, leaving 1.8 ha natural/undeveloped (Figure 3);
- Erf 2925 (2.4 ha in extent) will develop a total of approx. 6.5% of the property size, leaving 2.2 ha natural/undeveloped

Collectively, the total development footprints across all properties will leave approx. 4.18 ha undeveloped (approx. 73% of the 5.65 ha total extent of all three erven will be undeveloped). While the collective undeveloped space on the erven is substantial, it is imperative that these areas are managed appropriately and collectively (i.e. alien plant control; retain connectivity) for them to be considered ecologically useful and beneficial for fauna SCC.

Consequences of impact:

1. Loss of suitable habitat for fauna SCC to live, forage and breed.

2. Loss of species with which SCC have obligatory relationships (i.e. host plants for butterfly larva).

Mitigation measures:

1. Prior to construction, the disturbance footprint of proposed roads and houses should be clearly defined and demarcated to prevent unnecessary additional damage to the surrounding environment:
    a. Construction netting or fencing must be used to clearly indicate construction areas (see example in Figure 22). Access roads must be clearly marked so there is no confusion as to where the tracks are or how wide the road is.
    b. Clear signs for “no-go” areas for vehicles and personnel should be placed strategically on the site and along access roads. No-go areas are anywhere outside of the direct area of influence of the construction phase.
    c. All vehicles, construction or inspection, must only access the house sites via the planned, single track access roads as per the SDP (no additional roads, tracks to be made in the environment). These access roads are to be clearly marked to prevent drivers getting lost and creating additional tracks or unnecessarily widening the access road. A turning area for construction vehicles should be demarcated within the existing footprint of the house.
    d. For any adhoc deliveries or visitors to site, clear signs should be put up to guide drivers to the construction sites, thus avoiding drivers getting lost and causing unnecessary damage to the environment.

Figure 22. Example of construction fencing to be used to demarcate construction areas.

2. Prior to construction, and once demarcated, the entire footprint area of the house construction site and access roads needs to be assessed by a Botanical Specialist for the presence of butterfly larval host plant: *Aspalathus spp.*
    a. If located, a botanical specialist needs to oversee the transplanting of these species from the development footprint into an appropriate natural environment (outside the development footprint) closest to where the plant was originally found. By limiting the distance that the plant is moved from its original location,

impacts on associated faunal communities and changes to its growing conditions (microclimate, soil texture, soil moisture) are reduced.

b. Transplanting should follow best practice guidelines and on-going monitoring and maintenance (i.e. watering, temporary shading, etc.) of each transplanted plant needs to occur to ensure the best chances of survival. The new location of each plant needs to be marked (GPS point and a physical marker next to the plant) to allow the plant to be revisited for monitoring and maintenance purposes, which can cease once a Botanical Specialist considers the plant well established within its new environment.

3. Where vegetation will be cleared to make way for construction, filled sandbags, silt socks or a silt fence must be used to reduce the intensity of water runoff and flow over the site and thereby reduce erosion potential (Figure 23). This should be placed around the perimeter of the downslope disturbance footprint and needs regular inspection and adaptive management to ensure the integrity of the system for reducing erosion.

Figure 23. Examples of silt socks (left) and a silt fence (right) placed perpendicular to the flow of water. These methods reduce the force of water flow, erosion and can prevent unwanted sedimentation a site.

4. Protection and reuse of topsoil can be critical for the success of rehabilitation of vegetation following construction processes as it contains valuable seedbank of indigenous plants that regenerate after the soil is replaced. Topsoil removed during construction should be treated with care for all the proposed developments on the property.

    a. Topsoil from fynbos vegetation on the site (excluding topsoil under dense stands of alien invasive plants) in new excavation areas must be stripped to a depth of 30cm, or in cases where the bedrock is shallower than this, then the entire soil layer is to be removed. Topsoil is to be kept in designated piles of maximum 1 m in height, to prevent anaerobic conditions from smothering seeds and rendering them inviable, and must be suitably covered with shade cloth (or another breathable material with a fine mesh) to prevent any additional invasive species seeds from falling in and establishing in the soil.

    b. If the SDP of a proposed development does not have enough space for the storage and protection of topsoil within the disturbance footprint, then the ECO must identify an alternative temporary stockpile area that is already

transformed and where it can easily be retrieved for post-construction rehabilitation.

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

d. The top soil from all three erven will contain alien plant seeds as well as indigenous seeds. It will be imperative during the rehabilitation phase that these alien plants are controlled as early as possible, and this strategy will need to be included in the alien plant management plan for the properties. Nevertheless, the indigenous species seeds in the top soil will prove valuable to the rehabilitation of the sites.

7.4.2 Habitat and fauna negatively affected by the management of the construction site (i.e., staff, stockpiles, and equipment).

Description: The management of materials and staff on the site is also an important impact of development. If managed properly, many accidents and unanticipated negative impacts on fauna and the surrounding environment can be avoided.

Consequences:

1. Loss of habitat or harm to fauna outside of designated construction areas.
2. Litter and pollution of natural environment.
3. Potential health and safety hazards (for staff and fauna) on the site and in the surrounding environment.

Mitigation measures:

1. All new staff must be briefed about the layout of the construction site and must be made aware of the no-go areas as the surrounding environment is sensitive and must not be disturbed. Staff must report all fauna occurring on site to the ECO. Weekly site meetings should be held, during which the ECO should remind all staff of ecological requirements and any questions/concerns can be raised and addressed.
2. Construction vehicles should be checked daily, prior to construction at the start of each day for leaks and other faults.
    a. Sandbags or sawdust should be available and accessible on the site to ensure that any accidental oil spills are contained and stopped quickly.
    b. Any contaminated soil on the site must be removed by a registered hazardous waste service provider (e.g. Spill Tech, Interwaste, EnviroServ., etc.).
    c. Vehicles with leaks and other problems are not allowed to operate on the site until they have been repaired.
3. No littering, waste dumping or burning is allowed on the site or in the surrounding environment. All waste is to be collected in designated bins with lids that can be secured or stored in a secure area when construction is not taking place (evenings, weekends, holidays, etc.) to prevent interference by animals (i.e. baboons). All waste is to be transported to a registered waste disposal facility off site.
4. Adequate ablution facilities must be provided for every construction project.

a. Portable toilets will likely need to be used on site, and these must be placed on a level platform before construction starts within the footprint of the access roads or housing sites.

b. Ablution facilities must be regularly maintained and cleaned.

c. At least one toilet per ten to fifteen construction staff should be available – refer to SHEQ guidelines.

5. Concrete, cement, plastering, and painting:

   a. Mixing areas be clearly defined on the site and must be surrounded by an impermeable material (i.e. create a temporary coffer dam with sandbags and thick plastic sheeting) to prevent any runoff and absorption into the surrounding soils.

   b. The designated mixing areas should be limited to areas that will become future hard surfaces on the site, or that are already transformed and likely to remain transformed.

   c. No concrete and cement mixing is allowed in areas outside the site development plans (SDPs).

   d. Cleaning of cement, plastering & paint equipment must be done into a designated, bunded & lined slurry sump or container to avoid contaminating the environment.

6. All stockpiles of fine textured building materials and soils must be covered by a geotextile or plastic covering, which must also be bunded (e.g. with sandbags) when not in use (Figure 24). This will prevent material being lost to the environment and fauna from accessing stockpiles and possibly subjecting them to harm during construction.

Figure 24. Stockpiles of fine textured building materials and soils covered with geotextile/plastic covering and bunded with sandbags when not in use.

7. Any small items or building materials which can be carried away by medium-large animals (i.e. baboons) should be safely stored in containers or locked away in a

designated area to prevent interference from animals, causing possible harm to them and preventing them from removing such items from site.

8. All food waste (leftovers, bones, pips, apple cores) are to be disposed of in designated bins and NOT to be disposed of in the surrounding environment within or outside the designated construction areas. Food sources serve as a major attractant for fauna and will expose them to unnecessary harm in the vicinity of the construction site. All food waste should be removed from site on a daily basis and disposed of appropriately.
9. Construction should take place during daylight hours so that the site can be adequately monitored for fauna during work hours, and also to prevent the use of artificial lighting at night which attracts many animal species (predominantly insects and associated predators) and subjects them to the risks of construction.

7.4.3 Harm/Death of fauna, particularly invertebrates and soil dwelling mammal SCC, due to earthworks and construction related activities.

Description: Fauna may occur on site and be killed or seriously harmed during construction related activities. Cryptic and ground-dwelling species, like the golden mole SCC, are difficult to detect and are limited in their mobility, rendering them vulnerable to earthmoving and construction activities.

Consequences of impact:

1. Loss of threatened species and a shift towards a negative change in the conservation status of the SCC and other indigenous species affected by the development.
2. Loss of genetic diversity from remaining fauna populations.
3. General loss of biodiversity.

Mitigation measures:

1. Construction should happen in phases, such that construction related activities are confined to one area at a time on the property and can be monitored for faunal impacts appropriately.
2. Before construction commences for any new earthworks at the start of new phase, an ECO should do a walk-through of the demarcated area and access roads that will be used to look for signs of fauna with limited mobility. These animals should be removed from the demarcated area to an adjacent safe location, and where appropriate a Fauna Specialist contacted for assistance or guidance. Construction/Earthworks for this new phase can commence thereafter.
    a) At any point during construction, if an animal with limited mobility is observed on site, this should be reported to the ECO and construction temporarily halted. Construction can commence once the ECO is satisfied that all such fauna are removed from the construction area.
3. Speed limits should be imposed and monitored during construction phase, as collisions with vehicles (roadkill) pose a significant threat to many fauna species. Given the narrow access roads recommended for this development, speed limits should be restricted at the discretion of the ECO to appropriate speeds to allow for driver alertness and ability to avoid collisions with fauna. Recommended speeds include 40

km/hour on main access roads with good visibility into the road verges, and 20 km/hour on smaller access roads with narrow or overgrown verges where visibility is reduced. Signs should be put up along the roads to remind people of speed limits, as well as warnings to look out for small animals on the roads (see examples in Figure 25).

Figure 25. Road sign reminding drivers to look out for fauna with limited mobility: dung beetles (left) and tortoises (tight). Can be applied to all sensitive fauna and temporary signs can be used during the construction phases.

7.5 Conclusion of construction phase

The conclusion of any project is an essential, but often overlooked aspect of projects. This relates primarily to the cleaning up of the site once construction has concluded.

1. Construction sites must be cleared of all waste material, rubble, and debris associated with the construction phase at regular intervals during, and at the conclusion of the construction phase.
2. Revegetation of bare soil following construction is an essential part of concluding the construction phase of the project. This should be done with indigenous plant species that occur naturally in the surrounding environment (examples are given in Appendix 8).
3. All drainage structures must be checked to ensure that there are no blockages or pollution that is blocking the free flow of water over the site; these checks will prevent erosion during and after the construction phase that could have potentially far-reaching implications beyond the footprint for the proposed development.

7.6 Operational Phase Impacts

7.6.1 Loss of fynbos habitat for fauna during maintenance activities for roads and housing infrastructure.

Description: The development on the site can alter the disturbance regime the property through changes in fire regimes and vegetation clearing associated with the maintenance and operation of housing and road infrastructure. If the management adopts ecologically friendly

approaches in the long-term, the development can have many positive (rather than only negative) outcomes for the environment.

Consequences of impact:

1. A general loss of habitat for plants and fauna by vegetation clearing around houses and roads.
2. The mismanagement of materials during routine maintenance of infrastructure can also cause habitat loss (i.e. stockpiling/long term storage of materials on site rather than removing from site).
3. In areas which are natural or undeveloped, the exclusion of fire can lead to vegetation thickening or senescent plants (many fynbos species rely on fires for germination).

Mitigation measures:

1. Vegetation clearing along road verges should be kept to a minimum, and avoided in areas where it poses no risk to vehicles. Where essential, vegetation along the road verges should only be cleared up to a maximum width of 1m on either side of the road. Cut vegetation should not be consolidated (gathered into piles) and left next to the side of the road where clearing took place. Instead, the cut vegetation should either be removed from site, or disposed of in a scattered/spread-out manner within the immediate surrounding of where it was cut, so as not to smother other plants or create concentrated fuel loads for fire.
2. During routine maintenance of infrastructure on the property, adequate management of materials should be implemented to reduce any unnecessary habitat loss. For example, all new building materials should be stored in areas within the disturbance footprint of the developments as far as possible to reduce additional damage to the natural (undisturbed) surroundings. Any old/removed building materials or rubble should be removed from site as soon as possible during maintenance activities and disposed of appropriately off-site. This will reduce the amount of additional space (natural surrounding habitat) lost or damaged for unnecessary storage of materials (Figure 26).

Figure 26. Inappropriate disposal or storage of pavers used during road maintenance activities.

3. No insect zappers should be allowed on site, nor the general application of insecticides around infrastructure. Ecofriendly repellents are readily available (i.e. citronella oil/lotions) and should be used instead.
4. Emergency & cleaning supplies for waste spillage or fires should be accessible at each development proposed development on the property (e.g., keep lime, spades, first aid, fire extinguishers, etc. handy). Rainwater tanks can also be a useful source of water to aid in extinguishing fires, provided the water is readily accessible.
5. All staff and guests to the property must be properly trained and made aware of activities that are not allowed on the property.
6. Limited additional vegetation clearing should take place on the property for activities, even if these are low impact, as the cumulative effects can be substantial (i.e. camping grounds, mountain biking/hiking trails, picnic areas).
7. Consideration should be given to small, contained and controlled burns in some areas of the properties to maintain and promote natural biodiversity. This should be included in the fire management plan and a botanical specialist consulted to advise on an appropriate burn frequency for the vegetation type present on site.

7.6.2 Disturbance of fauna due to lighting associated with residential units.

Description: The development on the site will alter the disturbance regime of the largely natural area on the property through changes in noise and artificial lighting levels. This can have a significant impact on biodiversity and alter the way fauna use the landscape (i.e. insects attracted to lights decreases their survival, negatively impacts on the ecosystem services they provide and has negative knock-on consequences for their associate predators).

Consequences of impact:

1. Light pollution, as discussed in Layout and Design Phase 7.3 above, acts as an attractant to many insects and associated predators, putting all at risk.

Mitigation measures:

1. Light pollution must be reduced and avoided wherever possible during the operational phase of the project. White LED lights have the worst negative effects for the environment, therefore dimmer lights with more natural warm light colours must be used.
2. Consider the use of motion-sensor lighting for security purposes rather than the use of permanent lighting, especially along permitter walls/fencing. This will reduce the impact on invertebrate fauna attracted to light.
3. For Erven 2924 and 2925, permanent lighting along roads must be avoided as far as possible. Given the low traffic volumes expected for this development, road-side lighting along the access roads is unnecessary and will cause avoidable impacts on biodiversity, particularly increasing the risk of roadkill.

7.6.3 Human-wildlife conflict

Description: Some wild animals are attracted to human developments, usually due to the presence of a resource that has become available within the footprint of the development (i.e. food attracting baboons, leftover scraps attracting wild animals if disposed in the surrounding environment). If any animal becomes habituated or loses their fear of humans, they risk becoming pests and problem animals (sometimes even posing a risk to humans) and often require control, in severe cases resulting in their harm or death. Keeping pets on the premises can also increase the potential for human-wildlife conflict as pets can fight or kill animals (i.e. cats are known to be devastating for indigenous wildlife, especially birds, small mammals and reptiles). Pets also run the risk of being harmed by wildlife (i.e. snake bites) which can lead to owners wanting to control or harm the natural fauna of the area.

Consequences of impact:

1. Intentional harm or death of problem or pest animals due to their negative effects on the people (or pets) living on the property.
2. Unintentional harm or death of animals due to them consuming waste/food products which are bad for their health.
3. Pets causing death/harm to indigenous wildlife.
4. Changes in natural foraging and movement patterns of fauna across habitats within the landscape due to the presence of a favourable resource (usually food) near the development. This can have knock-on effects for the ecosystem services they provide and their associated predators.

Mitigation measures:

1. No feeding of wildlife is permitted, and no disposal/discarding of any food waste (bones, scraps, fruit pips/cores) within the surrounding environment is allowed.
2. All food waste or general waste should be kept in a secure location (i.e. a lockup cage or sealed outside room) which is not accessible to any wildlife.

3. All waste should be stored in a double-container fashion, in such a way that it does not serve as an attractant to wildlife attempting to access the secure location (i.e. all waste products put into closed/sealed rubbish bags and then placed within larger sealed containers/bins).
4. Given that the waste area is secured against wildlife accessing it, allowances should still be made for the unlikely event that an animal does access the waste storage area, so that the waste is not easily accessed (i.e. use wildlife-proof dustbins/containers or lock the lids of larger containers). The double-container storage of waste (mentioned above) also prevents easy access of waste products to fauna, with all rubbish bags to be stored inside more solid containers. Examples of wildlife-proof bins are suggested in Figure 27.
5. All waste, particularly food waste, should be regularly removed from the property and disposed of appropriately to prevent the scent of old products increasing the attractiveness to the disposal area and surrounding development for wildlife.
6. Residents on the property should be limited in their ability to keep pets (i.e. how many pets and what types of pets). It is highly recommended that either no cats be allowed on the properties or they should not be allowed to roam freely across the properties as they are known to actively hunt small animals and can have detrimental effects on the wildlife of an area (see Figure 28).

Figure 27. Wildlife-proof garbage disposal container options. Large containers with a one-way shoot to dispose of garbage (left): the top lid is connected to a smaller container which swivels up when the lid is opened to block access to the larger bin and its contents below, but when the lid is closed this bin swivels down to drop the garbage into the larger container. Locking mechanisms and handles on bins (middle and right) can also be used to successfully keep wildlife out.

Figure 28. Animals killed by one house cat in one year. Article published in National Geographic (https://www.nationalgeographic.co.uk/animals/2020/09/the-232-animals-in-this-photo-were-killed-by-house-cats-in-just-one-year).

7.6.4 Alien plants altering habitat structure, resource availability and fire regimes

Description: Currently all properties experience high levels of alien plant invasions which pose a fire risk and have negative consequences for the ecological functioning of the properties. If managed and implemented appropriately alien plant management can have positive impacts for the properties as well as the broader surrounding landscape.

Consequences of impact:

1. Uncontrolled alien plants can completely transform natural habitats leading to a loss in associated flora and fauna biodiversity.
2. Loss of indigenous plant species for fauna (i.e. butterfly larva host plants, food resources).
3. Alien plants increase fire frequency and intensity, which negatively impacts biodiversity either directly through hotter more frequent fires, or indirectly though changes in habitat (vegetation) structure.
4. Increased invasion potential (acting as a source of seeds) and fire risk to surrounding areas and greater landscape.

Mitigation measures:

1. It is a requirement by law than an alien and invasive plant management plan be developed and implemented on the properties - refer to the National Environmental Management: Biodiversity Act (NEMBA, Act No. 10 of 2004) and the Conservation of Agricultural Resources Act (CARA, Act No. 43 of 1983).

2. A fire management plan can greatly aid in managing fire risks, with controlled, planned burns effectively promoting biodiversity and preventing damage to infrastructure. It is highly recommended that properties join a local Fire Protection Association (as advised by the National Veld and Forest Fires Act No. 101 of 1998), which aids in sound fire management protocols and can have insurance benefits through removing the presumption of guilt through negligence in the event of a fire spreading to neighbouring properties.
3. The establishment of indigenous gardens or the complete absence of gardens (i.e. fully rehabilitating any disturbed areas) within the footprints of the development will promote natural biodiversity. It is highly recommended that indigenous fire resistant vegetation be planted around the infrastructure/houses to aid in protecting buildings in the event of an uncontrolled fire (i.e. some indigenous species can be planted to form a fire-proof hedge). Some commercially available indigenous and locally occurring plant species, including those to be used as part of fire-proof hedges, are suggested in Appendix 8. Indigenous gardens should be promoted as far as possible, or at the very least all gardens should avoid the use of invasive plant species that have the potential to spread into the surrounding areas. Non-invasive grass species should be used for lawns i.e. *Cynodon dactylon* (the Cape Royal variety), or *Stenotaphrum secundatum* (Buffalo grass).

Table 8. Impact assessment for Erf 7594.

Impact	Without mitigation						With mitigation					
	Nature	Duration	Extent	Intensity	Probability	Significance	Nature	Duration	Extent	Intensity	Probability	Significance
7.4.1 Loss of habitat within development footprint	Negative	Permanent	Limited	High	Certain / definite	Moderate - negative	Negative	Permanent	Limited	Moderate	Certain / definite	Moderate - negative
7.4.2 Fauna and habitat negatively affected by construction management	Negative	Short term	Limited	High	Likely	Minor - negative	Negative	Immediate	Very limited	Negligible	Rare / improbable	Negligible - negative
7.4.3 Harm to fauna from earthworks and construction	Negative	Short term	Limited	Moderate	Probable	Minor - negative	Negative	Immediate	Very limited	Negligible	Unlikely	Negligible - negative
7.6.1 Loss of habitat for fauna during maintenance activities	Negative	Permanent	Limited	Moderate	Almost certain / Highly probable	Moderate - negative	Negative	Immediate	Very limited	Negligible	Unlikely	Negligible - negative
7.6.2 Disturbance of fauna due to lighting	Negative	On-going	Limited	Moderate	Likely	Minor - negative	Negative	Brief	Very limited	Very low	Unlikely	Negligible - negative
7.6.3 Human-wildlife conflict	Negative	On-going	Limited	Moderate	Almost certain / Highly probable	Minor - negative	Negative	Immediate	Very limited	Negligible	Unlikely	Negligible - negative
7.6.4 Alien plants altering habitat and fire regimes	Negative	Permanent	Local	Very high	Almost certain / Highly probable	Moderate - negative	Positive	Immediate	Limited	Moderate	Almost certain / Highly probable	Minor - positive

Table 9. Impact assessment for Erf 2924.

Impact	Without mitigation						With mitigation					
	Nature	Duration	Extent	Intensity	Probability	Significance	Nature	Duration	Extent	Intensity	Probability	Significance
7.4.1 Loss of habitat within development footprint	Negative	Permanent	Limited	High	Certain / definite	Moderate - negative	Negative	Permanent	Very limited	Moderate	Certain / definite	Moderate - negative
7.4.2 Fauna and habitat negatively affected by construction management	Negative	Short term	Limited	High	Likely	Minor - negative	Negative	Immediate	Very limited	Negligible	Highly unlikely / none	Negligible - negative
7.4.3 Harm to fauna from earthworks and construction	Negative	Short term	Limited	Moderate	Probable	Minor - negative	Negative	Immediate	Very limited	Negligible	Unlikely	Negligible - negative
7.6.1 Loss of habitat for fauna during maintenance activities	Negative	Permanent	Limited	Moderate	Almost certain / Highly probable	Moderate - negative	Negative	Immediate	Very limited	Negligible	Unlikely	Negligible - negative
7.6.2 Disturbance of fauna due to lighting	Negative	On-going	Limited	Moderate	Likely	Minor - negative	Negative	Brief	Very limited	Very low	Unlikely	Negligible - negative
7.6.3 Human-wildlife conflict	Negative	On-going	Limited	Moderate	Almost certain / Highly probable	Minor - negative	Negative	Immediate	Very limited	Negligible	Unlikely	Negligible - negative
7.6.4 Alien plants altering habitat and fire regimes	Negative	Permanent	Local	Very high	Almost certain / Highly probable	Moderate - negative	Positive	Immediate	Limited	Moderate	Almost certain / Highly probable	Minor - positive

Table 10. Impact assessment for Erf 2925.

Impact	Without mitigation						With mitigation					
	Nature	Duration	Extent	Intensity	Probability	Significance	Nature	Duration	Extent	Intensity	Probability	Significance
7.4.1 Loss of habitat within development footprint	Negative	Permanent	Very limited	High	Certain / definite	Moderate - negative	Negative	Permanent	Very limited	Moderate	Certain / definite	Moderate - negative
7.4.2 Fauna and habitat negatively affected by construction management	Negative	Short term	Limited	Moderate	Almost certain / Highly probable	Minor - negative	Negative	Immediate	Very limited	Negligible	Highly unlikely / none	Negligible - negative
7.4.3 Harm to fauna from earthworks and construction	Negative	Short term	Very limited	High	Probable	Minor - negative	Negative	Brief	Very limited	Negligible	Unlikely	Negligible - negative
7.6.1 Loss of habitat for fauna during maintenance activities	Negative	Permanent	Limited	Moderate	Almost certain / Highly probable	Moderate - negative	Negative	Immediate	Very limited	Negligible	Unlikely	Negligible - negative
7.6.2 Disturbance of fauna due to lighting	Negative	On-going	Limited	Moderate	Likely	Minor - negative	Negative	Brief	Very limited	Very low	Unlikely	Negligible - negative
7.6.3 Human-wildlife conflict	Negative	On-going	Limited	Moderate	Almost certain / Highly probable	Minor - negative	Negative	Immediate	Very limited	Negligible	Unlikely	Negligible - negative
7.6.4 Alien plants altering habitat and fire regimes	Negative	Permanent	Local	Very high	Almost certain / Highly probable	Moderate - negative	Positive	Immediate	Limited	Moderate	Almost certain / Highly probable	Minor - positive

8. DISCUSSION AND CONCLUSION

Erven 7594, 2924 and 2925 have remained undeveloped over time, however the natural habitats in the northern sections of Erven 2924 and 2925 and the entire 7594 have experienced high levels of alien plant invasions and associated impacts over time: invasion density highest peaking at the time of the 2017 Knysna fires, intense/severe burning during the 2017 Knysna fires and subsequent re-invasion by alien vegetation since.

Three fauna SCC were likely to occur on all three properties (Golden Moles and a Butterfly), and a medium SEI rating was applied to all. As per the guidelines for developing in medium SEI areas, minimizing footprints and restoring natural habitat should be a priority. For all three erven, restoration of the natural habitat will involve the development and implementation of an Alien and Invasive Plant Management Plan, which will greatly benefit natural biodiversity and reduce fire risks associated with alien vegetation on the property and surrounding areas. It is highly recommended that this plan be adopted and implemented prior to the commencement of development on all the erven.

When considered collectively, the proposed residential development on the three erven adhere to the guidelines for medium SEI ratings (provided mitigation measures are adhered to), as ultimately 73% of the combined property area will remain undeveloped. However, these undeveloped areas need to be actively managed (i.e. control alien plant invasions), indigenous vegetation promoted and connectivity maintained as far as possible between the open/natural spaces on the different properties to ensure they are ecologically functional and beneficial to the SCC and fauna occurring here.

The high-density residential development on Erf 7594 will have the greatest impact on fauna through habitat loss given that 88% of the property area will be developed. It is imperative therefore that connectivity is maintained between the Open Space portion on Erf 7594 with larger open spaces available on Erven 2924 and 2925. It is recommended that if a fence is to be constructed between the properties, that the base of the fence is the same as that in Figure 14, given that Golden Mole tunnels were seen crossing this fence line and therefore connectivity will remain intact for the SCC (see also recommendations regarding electric wires being 30m above ground to prevent additional impacts to fauna in Section 4.4.2).

One additional reduction in footprint to consider on the erven is the access road on Erf 2924. If possible, consideration should be given to rather use the existing servitude stemming from 7594 as an access road to Erf 2924 and 2925, since this will further reduce the footprint of development and natural habitat loss on the properties.

Provided the mitigation measures are adhered to, the proposed developments are considered favorable by the specialist in terms of fauna. By mitigating the current negative impacts caused by the high levels of alien plant invasions on the properties, the habitat quality will be improved (ultimately increasing indigenous biodiversity) and fire-risk will be minimized on the erven and the greater surrounding areas.

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APPENDIX 1: SCC IDENTIFIED FROM PUBLIC PLATFORMS FOR ERVEN 7594, 2924, 2925 KNYSNA

SCC were included or excluded from further analysis in this report based on expert interpretation for the presence/absence of key landscape and habitat features on site. See Section 4.2 Assumptions and Limitations for more information.

Species	Common name	Regional, Global Assessment status	Source	Assessed in report Y/N
AMPHIBIANS				
Afrixalus knysnae	Knysna Leaf-folding Frog	EN	Virtual Museum	Y
AVIFAUNA				
Alcedo semitorquata	Half-collared Kingfisher	NT, LC	SABAP2	N
Bradypterus sylvaticus	Knysna Warbler	VU, VU	SABAP2	Y
Buteo trizonatus	Forest Buzzard	LC, NT	SABAP2	Y
Calidris ferruginea	Curlew Sandpiper	LC, NT	SABAP2	N
Campethera notata	Knysna Woodpecker	NT, NT	SABAP2	Y
Circus maurus	Black Harrier	EN, EN	SABAP2	N
Circus ranivorus	African Marsh Harrier	EN, LC	SABAP2	N
Coracias garrulus	European Roller	NT, LC	SABAP2	N
Falco biarmicus	Lanner Falcon	VU, LC	SABAP2	N
Grus paradisea	Blue Crane	NT, VU	SABAP2	N
Hydroprogne caspia	Caspian Tern	VU, LC	SABAP2	Y
Leptoptilos crumenifer	Marabou Stork	NT, LC	SABAP2	N
Morus capensis	Cape Gannet	VU, EN	SABAP2	N
Mycteria ibis	Yellow-billed Stork	EN, LC	SABAP2	N
Numenius arquata	Eurasian Curlew	NT, NT	SABAP2	N
Oxyura maccoa	Maccoa Duck	NT, EN	SABAP2	N
Phalacrocorax capensis	Cape Cormorant	EN, EN	SABAP2	N
Phoenicopterus roseus	Greater Flamingo	NT, LC	SABAP2	N
Polemaetus bellicosus	Martial Eagle	EN, EN	SABAP2	N
Procellaria aequinoctialis	White-chinned Petrel	VU, VU	SABAP2	N
Spheniscus demersus	African Penguin	EN, EN	SABAP2	N
Stephanoaetus coronatus	Crowned Eagle	VU, NT	SABAP2	Y
Stercorarius antarcticus	Brown Skua	EN, LC	SABAP2	N
INVERTEBRATES				
Aloeides pallida littoralis	Knysna Pale Copper	NT	Virtual Museum	Y
Aloeides thyra orientis	Rooi-Kopervlerkie, Brenton	EN	Virtual Museum	N
Chrysoritis thysbe mithras	Brenton Sparkling Opal	CR	Virtual Museum	N
Circellium bacchus	Cape Flightless Dung Beetle	VU	Virtual Museum	Y
Ecchlorolestes nylephtha	Queen Malachite	NT	Virtual Museum	N
Orachrysops niobe	Brenton-bloutjie	CR	Virtual Museum	N

Thestor brachycerus brachycerus	Strand-Skollie	CR	Virtual Museum	N
MAMMALS				
Amblysomus corriae	Fynbos Golden Mole	NT	Virtual Museum	Y
Chlorotalpa duthieae	Duthie's Golden Mole	VU	Virtual Museum	Y
Kogia breviceps	Pygmy Sperm Whale	DD	Virtual Museum	N
Leptailurus serval	Serval	NT	Virtual Museum	N
Mesoplodon layardii	Strap-toothed Whale	DD	Virtual Museum	N
Myosorex longicaudatus	Long-tailed Forest Shrew	EN	Virtual Museum	N
Panthera pardus	Leopard	VU	Virtual Museum	N
Poecilogale albinucha	African Striped Weasel	NT	Virtual Museum	N
Sensitive Species 8	-	VU	Virtual Museum	Y

APPENDIX 2: AVIFAUNA SPECIES OBSERVED DURING SITE VISIT TO ERVEN 7594, 2924, 2925 KNYSNA

Common name	Scientific name
African Firefinch	*Lagonosticta rubricata*
Cape Robin-Chat	*Cossypha caffra*
Hadada Ibis	*Bostrychia hagedash*
Karoo Prinia	*Prinia maculosa*
Kelp Gull	*Larus dominicanus*
Red-winged Starling	*Onychognathus morio*
Sombre Greenbul	*Andropadus importunus*
Southern Double-collared Sunbird	*Cinnyris chalybeus*
Southern Grey-headed Sparrow	*Passer diffusus*
Speckled Mousebird	*Colius striatus*

APPENDIX 3: MAMMAL SPECIES OBSERVED DURING SITE VISITS TO ERVEN 7594, 2924, 2925 KNYSNA

Order	Family	Common name	Scientific name	Notes
Afrosoricida	Chrysochloridae	Golden mole	*Amblysomus corriae* OR *Chlorotalpa duthieae*	Typical sub-terranean tunnels seen on all three properties.
Artiodactyla	Bovidae	Cape Bushbuck	*Tragelaphus sylvaticus*	Suspected from dung

APPENDIX 4: INVERTEBRATE SPECIES OBSERVED DURING SITE VISITS TO ERVEN 7594, 2924, 2925 KNYSNA

Order	Family	Common name	Scientific name
Araneae	Salticidae	Jumping Spider	-
Coleoptera	Lampyridae	Fireflies & Glowworms	-
Hymenoptera	Formicidae	Big-headed Ants	*Pheidole sp.*
Hymenoptera	Formicidae	Sugar Ants	*Camponotus sp.*
Lepidoptera	Nymphalidae	Cape Autumn Widow	*Dira clytus*
Orthoptera	Acrididae	Short-horned Grasshoppers	-
Orthoptera	Acrididae	Bandwing grasshoppers	*Acrotylus subfamily*
Stylommatophora	Achatinidae	Zebra Agate Snail	*Cochlitoma zebra*

APPENDIX 5: SITE ECOLOGICAL IMPORTANCE METHODS

The site ecological importance (SEI) is defined and calculated as highlighted as per the Species Environmental Assessment Guideline (SANBI, 2020), where SEI is a function of biodiversity importance (BI) and receptor resilience (RR) such that: SEI = BI + RR.

BI is further defined as a function of conservation importance (CI) and habitat functional integrity (FI), with BI = CI + FI, and is determined by means of a matrix (Table 11).

SEI can therefore be fully understood as SEI = (CI + FI) + RR, where:

Conservation Importance (CI): The importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes. *Most features included in CI are provided by the screening tool but are evaluated at a finer scale following field work at the site.

Functional Integrity (FI): A measure of the ecological condition of the impact receptor (i.e., habitat type) as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts.

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

Table 11. Matrix to calculate the biodiversity importance (BI) of a given habitat type identified from desktop and field assessments.

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

The SEI is derived for each habitat type or SCC within a project site by making use of two matrixes: first to calculate the BI (using Table 11) and then the SEI (Table 12).

SEI is therefore specific to the proposed development and can only be compared between alternative layouts for the same proposed development, but not between different developments.

Table 12. Matrix to calculate site ecological importance (SEI) of a given habitat type identified from desktop and field assessments.

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

APPENDIX 6: ENVIRONMENTAL COMPLIANCE OFFICER (ECO) CHECKLIST FOR FAUNA MITIGATION MEASURES DURING PRECONSTRUCTION, CONSTRUCTION AND THE CONCLUSION OF CONSTRUCTION PHASES OF DEVELOPMENT.

While this checklist is designed to assist ECOs in compliance monitoring, it is a summary only and it is imperative that the details of each mitigation measure are read, fully understood and implemented as described in the text of this report. References to the relevant impact and full methods for each mitigation measure is made in the table below.

Mitigation measure	Relevant impact; details of methods	Checklist √
Pre-construction phase:		
The footprint of proposed roads and houses should be clearly defined and demarcated.	See Section 7.4.1; Mitigation measure 1	
Botanical Specialist to assess the demarcated footprint of development to search for (and rescue) any butterfly host plant species before construction commences.	See Section 7.4.1; Mitigation measure 2	
Construction to happen in phases, such that all activities are confined to one area at a time on the property. A plan should be developed and communicated to all staff as to which construction phase is currently underway, and which areas are therefore off-limits until further notice.	See Section 7.4.3; Mitigation measure 1	
Construction phase:		
Before excavations/earthworks commence at the start of a new phase, ECO to do a walk-through of the demarcated footprint to check for (and remove if necessary) all animals with limited mobility. Contact the Fauna Specialist if necessary for assistance/guidance.	See Section 7.4.3 Mitigation measure 2	
Where vegetation will be cleared during construction, erosion control measures need to be put in place downslope of disturbance footprint.	See Section 7.4.1; Mitigation measure 3	
Topsoil removed during construction, treated with care and stored appropriately for future use and rehabilitation purposes.	See Section 7.4.1; Mitigation measure 4	
Regular staff orientation and information sessions.	See Section 7.4.2; Mitigation measure 1	
Check construction vehicles on a daily basis (prior to the commencement of operations) for leaks and other faults.	See Section 7.4.2; Mitigation measure 2	
Implement appropriate waste management, storage and disposal to minimize pollution on site and in surrounding natural areas.	See Section 7.4.2; Mitigation measure 3	
Provision, cleaning and maintenance of adequate ablution facilities on site.	See Section 7.4.2; Mitigation measure 4	
Manage concrete, cement, plastering, and painting activities to prevent pollution or contamination of surrounding environment.	See Section 7.4.2; Mitigation measure 5	

Mitigation measure	Relevant impact; details of methods	Checklist √
All stockpiles of fine textured building materials and soils covered by a geotextile or plastic covering and bunded (e.g. with sandbags) when not in use.	See Section 7.4.2; Mitigation measure 6	
Storage of all small items/building materials in containers or locked away in a designated area to prevent interference from animals.	See Section 7.4.2; Mitigation measure 7	
All food waste disposed into designated bins and removed from site on a daily basis.	See Section 7.4.2; Mitigation measure 8	
Construction only to take place during daylight hours to ensure adequate monitoring for fauna and to prevent the use of artificial lighting.	See Section 7.4.2; Mitigation measure 9	
Implement and enforce speed limits on all roads. Put up and maintain signs with speed limits and to warn drivers of wildlife at risk of becoming roadkill.	See Section 7.4.2; Mitigation measure 3	
Conclusion of construction phase:		
Site to cleared of all waste material, rubble, and debris associated with the construction phase at regular intervals during, and at the conclusion of the construction phase.	See Section 7.5; Mitigation measure 1	
Revegetate bare soil areas with indigenous plants.	See Section 7.5; Mitigation measure 2	
Check all drainage structures and remove blockages or pollutants.	See Section 7.5; Mitigation measure 3	

APPENDIX 7: IMPACT ASSESSMENT METHODS

Criteria are ascribed for each predicted impact. These include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criterion based on a seven-point scale (Table 13) and the significance is auto-generated using a spreadsheet through application of the calculations.

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **intensity** (size or degree scale), which also includes the **nature** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (intensity + duration + extent)

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

When assessing impacts, broader considerations are also considered. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in (Table 14, Table 15, and Table 16), respectively.

Table 13. Assessment criteria for the evaluation of impacts

Criteria	Numeric Rating	Category	Description
Duration	1	Immediate	Impact will self-remedy immediately
	2	Brief	Impact will not last longer than 1 year
	3	Short term	Impact will last between 1 and 5 years
	4	Medium term	Impact will last between 5 and 10 years
	5	Long term	Impact will last between 10 and 15 years
	6	On-going	Impact will last between 15 and 20 years
	7	Permanent	Impact may be permanent, or in excess of 20 years
Extent	1	Very limited	Limited to specific isolated parts of the site
	2	Limited	Limited to the site and its immediate surroundings
	3	Local	Extending across the site and to nearby settlements
	4	Municipal area	Impacts felt at a municipal level
	5	Regional	Impacts felt at a regional level
	6	National	Impacts felt at a national level
	7	International	Impacts felt at an international level
Intensity	1	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
	2	Very low	Natural and/ or social functions and/ or processes are slightly altered

Criteria	Numeric Rating	Category	Description
	3	**Low**	Natural and/ or social functions and/ or processes are somewhat altered
	4	**Moderate**	Natural and/ or social functions and/ or processes are moderately altered
	5	**High**	Natural and/ or social functions and/ or processes are notably altered
	6	**Very high**	Natural and/ or social functions and/ or processes are majorly altered
	7	**Extremely high**	Natural and/ or social functions and/ or processes are severely altered
Probability	**1**	**Highly unlikely / None**	Expected never to happen
	2	**Rare / improbable**	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	**Unlikely**	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	**Probable**	Has occurred here or elsewhere and could therefore occur
	5	**Likely**	The impact may occur
	6	**Almost certain / Highly probable**	It is most likely that the impact will occur
	7	**Certain / Definite**	There are sound scientific reasons to expect that the impact will definitely occur

Table 14. Definition of confidence ratings.

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 15. Definition of reversibility ratings.

Category	Description
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 16. Definition of irreplaceability ratings.

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is damaged irreparably and is not represented elsewhere

APPENDIX 8: LIST OF INDIGENOUS PLANT SPECIES AVAILABLE AT LOCAL NURSARIES

Commercially available indigenous plant species that also occur within the Knysna area. This list can be used as a guide for rehabilitation purposes, especially around the housing infrastructure on site. While this species list was compiled based on availability from one nursery (Kraaibosch Nursaries, George), these plants, in addition to any other indigenous species can be sourced from any local vendor for rehabilitation purposes. Particular focus should be given to the species also listed as “Fire-proof” since these can be planted to form a hedge around the buildings/infrastructure to aid in fire protection (Esler, Pierce, & de Villiers, 2014).

Plant species	Fire-proof?
Artemisia afra	
Athanasia dentata	
Dipogon lignosus	
Eriocephalus africanus	
Felicia echinata	
Grewia occidentalis	Yes
Halleria lucida	
Helichrysum cymosum	
Helichrysum teretifolium	
Linum africanum	
Metalasia muricata	
Morella cordifolia	
Phylica axillaris	
Polygala myrtifolia	
Searsia crenata	Yes
Selago corymbosa	
Selago villicaulis	