TERRESTRIAL FAUNAL AND AVIFAUNAL SPECIES IMPACT ASSESSMENT REPORT FOR THE UPGRADING OF HEROLD'S BAY SEWER PUMP STATION AND ASSOCIATED RISING MAIN ON REMAINDER OF FARM BRAKFONTEIN 236, PORTION 10 OF FARM BRAKFONTEIN 236 AND ERVEN RE/95 AND 116, HERHOLDS BAY, GEORGE MUNICIPALITY

September 2023

Prepared for:

Sharples Environmental Services cc (SES)

Prepared by:

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Qualifications

- PhD (Zoology), University of Johannesburg (2015 - 2017)
- MSc (Zoology), Stellenbosch University (2011 - 2013)
- BSc Honours (Zoology) cum laude, Stellenbosch University (2010)
- BSc (Biodiversity and Ecology) cum laude, Stellenbosch University (2007 - 2009)

Expertise

- 27 years of in-the-field naturalist experience involving all faunal groups
- Zoologist with 16 years of professional experience
- 14 Peer-reviewed publications in high impact national and international scientific journals on the patterns and processes which drive and maintain faunal biodiversity, as well as on aspects of faunal biology and ecology
- Five IUCN Red List assessments

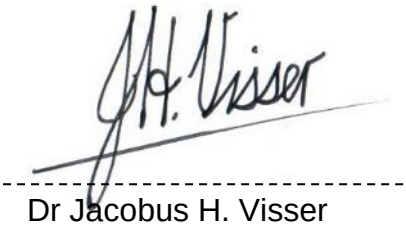
- Involved in the Southern African Bird Atlas Project 2 (SABAP2)
- Contributor on the National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria.

Declaration of independence by the independent person who compiled a specialist report or undertook a specialist process

I, Dr Jacobus Hendrik Visser, as the appointed independent specialist hereby declare that I:

• act/ed as the independent specialist in this application;
• regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
• do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations and any specific environmental management Act;
• have no and will not have any vested interest in the proposed activity proceeding;
• have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations and any specific environmental management Act;
• am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
• have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
• have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;

• have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
• have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
• am aware that a false declaration is an offence.



03 September 2023

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Executive summary

Background

SMEC South Africa (Pty) Ltd has been appointed by the George Local Municipality for the upgrading of the Herold's Bay sewer pump station and associated rising main located on Remainder of Farm Brakfontein 236 and Portion 10 of Farm 236 Brakfontein as well as Erven RE/95 and 116, Herholds Bay, George Municipality, Western Cape. Blue Skies Research was appointed by Sharples Environmental Services cc (SES) on behalf of the applicant to perform the required terrestrial faunal and avifaunal assessment of the study area.

The DFFE Screening Tool Report generated for the proposed project footprint identifies the site as being of an overall "High" sensitivity under the "Relative Animal Species Sensitivity Theme". This follows from the projected and possible occurrence of two avifaunal, one mammal and one invertebrate Species of Conservation Concern (SCC). The current report therefore assesses the presence or likely presence of these mammal, avifaunal and invertebrate SCC within the study area in

accordance with the protocols outlined in the Species Environmental Assessment Guideline (SANBI, 2020)

As such, the aims of this investigation were to:

1.) Assess, define and create a spatial rendering of available faunal habitats across the study area landscape based on information gathered during the field survey as well as through a desktop assessment using the latest satellite imagery,

2.) compile a complete faunal desktop species list (including mammals and avifauna) for the study area based on a thorough desktop assessment so as to assess the presence of any of the listed SCC (Table 1) as well as any additional SCC within these faunal groups,

3.) compile a faunal species list (including mammals, amphibians, avifauna and grasshoppers) within the study area through field surveying so as to assess the possibility of occurrence of the SCC retrieved in the desktop assessment (based on appropriate sampling methods, as well as the presence of suitable habitat for these species), or any additional SCC which are present on the site, and

4.) generate spatial occurrence maps for the recovered faunal species within the study area to assess the spatial extent of areas supporting higher levels of diversity, and SCC subpopulations and habitats which may be of conservation concern.

Study methodology

To assess the possible occurrence of the listed as well as any additional mammal and avifaunal SCC, a desktop assessment was performed to create a representative desktop species list for these faunal groups. To assess the possible occurrence of the recovered terrestrial faunal or avifaunal SCC, as well as sensitive habitats, the study area was surveyed on foot over a single day on the 7th of August 2023, during the Winter season. Surveying included unconstrained point sampling through search meanders, as well active searching under rocks and debris. Terrestrial faunal species (mammals) were identified by direct visual observation, or by their tracks,

burrows, remains or scat. Avifaunal species were identified by visual observation, using a 180x zoom lens, or by auditory means. Amphibian species were identified by direct visual observation or by auditory means, supplemented by diurnal sound recordings. Finally, the presence or absence of the Yellow-winged Agile Grasshopper was evaluated based on suitable habitat (recently burnt Schlerophyll on south-facing slopes) for this species. All observations were recorded by GPS and the species or evidence of species' presence or activity were photographed using a digital camera (Canon PowerShot SX430 IS, Canon Inc, USA). During surveying, faunal habitats were broadly identified in the field, and thereafter delineated through a desktop assessment of the study area using satellite imagery.

Habitat types

The study area landscape is comprised of five broadly identified habitat types based on habitat composition and habitat integrity. The central section of the project footprint harbours the most intact habitats, intersecting intact Fynbos habitats of South Outeniqua Sandstone Fynbos, with a small section harbouring alien and invasive trees such as Black Wattle. Small portions in the east further intersect with Forest/Woodland habitat. Conversely, the western section of the project footprint intersects with the existing footprint of the Herholds Bay Water Waste Treatment Plant (WWTP), with the eastern section largely located within the existing residential area. Collectively therefore, only a small part (<1 hectare) of the proposed footprint overlaps with intact natural habitats.

Faunal and avifaunal components

The distributions of 64 mammal and 218 avifaunal species currently overlap with the study area landscape. Among these, the majority are currently listed as "Least Concern" by the IUCN, with the remaining 21 species representing SCC. These SCC include the following:

1. The Duthie's Golden Mole (*Chlorotalpa duthieae*) classified as "Vulnerable",
2. Fynbos Golden Mole (*Amblysomus corriae*) classified as "Near-Threatened",
3. Leopard (*Panthera pardus*) classified as "Vulnerable",

4. African Clawless Otter (*Aonyx capensis*) classified as “Near-Threatened”,
5. Grey Rhebok (*Pelea capreolus*) classified as “Near-Threatened”,
6. Long-tailed Forest Shrew (*Myosorex longicaudatus*) classified as “Endangered”, and
7. White-tailed Rat (*Mystromys albicaudatus*) classified as “Vulnerable”,
8. Forest Buzzard (*Buteo trizonatus*) classified as “Near-Threatened”,
9. Black Harrier (*Circus maurus*) classified as “Endangered”,
10. African Marsh Harrier (*Circus ranivorus*) classified as “Least Concern”,
11. Martial Eagle (*Polemaetus bellicosus*) classified as “Endangered”,
12. Crowned Eagle (*Stephanoaetus coronatus*) classified as “Near-Threatened”,
13. Secretarybird (*Sagittarius serpentarius*) classified as “Endangered”,
14. Blue Crane (*Anthropoides paradiseus*) classified as “Vulnerable”,
15. Denham's Bustard (*Neotis denhami*) classified as “Near-Threatened”,
16. Knysna Warbler (*Bradypterus sylvaticus*) classified as “Vulnerable”,
17. Knysna Woodpecker (*Campethera notate*) classified as “Near-Threatened”,
18. Sooty Shearwater (*Ardenna grisea*) classified as “Near-Threatened”,
19. White-chinned Petrel (*Procellaria aequinoctialis*) classified as “Vulnerable”,
20. Cape Cormorant (*Phalacrocorax capensis*) classified as “Endangered”, and
21. Cape Gannet (*Morus capensis*) classified as “Endangered” by the IUCN.

During the field survey, six mammal, two amphibian and 34 avifaunal species were recorded within the study area. While the majority of species are currently classified as “Least Concern” by the IUCN, the study area harbours a confirmed subpopulation of the Knysna Warbler (*Bradypterus sylvaticus*), classified as “Vulnerable” by the IUCN.

Faunal and avifaunal diversity and abundances appears high over the study area landscape and is largely comprised of relatively common species of “Least Concern”, albeit one avifaunal SCC, the Knysna Warbler (*Bradypterus sylvaticus*) is present in the thick and tangled Fynbos vegetation. While mammal diversity and abundances appears relatively low, avifauna is by far the most prominent faunal component in the study area landscape, likely owing to the availability of dense Forest/Woodland and Fynbos habitats. Furthermore, the presence of aquatic and moist habitats leads to the presence of amphibians within the landscape. Although no predator-prey

dynamics were observed (as is evidenced by the lack of mammal and avifaunal predators), ecosystem dynamics do appear intact with habitats here forming a functional ecological link in the study area landscape.

Species of Conservation Concern (SCC)

Along with the four (one mammal, two avifaunal and one invertebrate) SCC listed in the DFFE Screening Tool, the potential occurrence of 19 other (seven mammal and 12 avifaunal) SCC within the study area was assessed, given their recovery in the desktop assessment. The presence of one avifaunal SCC was confirmed one the site, with three further avifaunal SCC likely also occurring within the study area landscape given suitable habitat characteristics. All remaining SCC were recovered as having a “Low” or “Medium” probability of occurrence within the study area landscape and are therefore not further considered.

Suitable habitat for one of these SCC, *Phalacrocorax capensis*, could only follow an ephemeral association to the existing man-made WWTP, and this species is not considered during the impact assessment phase of this project. Among the remaining three avifaunal SCC (*Buteo trizonatus*, *Bradypterus sylvaticus* and *Campethera notata*), no data on tis available on the Area Of Occupancy (AOO) of these species, however their on-site habitats currently form a very small part of their Extent Of Occurrence (EOO) and it is highly unlikely that their threat statuses may change if these habitats are destroyed.

Site Ecological Importance (SEI)

Evaluation of the Site Ecological Importance (SEI) for the habitats of SCC confirmed or possibly occurring in the study area was performed following the methods and criteria outlined in the Species Environmental Assessment Guideline (SANBI, 2020). Evaluation of SEI was performed only for avifauna (given the higher likelihood of SCC from this faunal group being present over the site) considering their habitat requirements in conjunction with the spatial distribution of habitats within the project footprint.

Although all the natural habitats on the site offer suitable habitat for the confirmed or possibly occurring avifaunal SCC, the project footprint itself is of a very small spatial extent, meaning that the footprint overlaps with less than one hectare of each habitat type. In addition, it is highly likely that all avifaunal species will return to area adjacent to the project footprint when the disturbances from the construction phase have ceased. Taken together, this renders habitats over the project footprint as of a "Very low" SEI, allowing for development activities of medium to high impact without restoration activities being required.

Current impacts

Current impacts within the study area include the following:

- The study area is spatially proximate to a residential area from where daily noise and vibration is evident.
- The western part of the project footprint overlaps with the existing WWTP, with the eastern section located largely within a residential area.
- A small central portion of the project footprint contains a high incidence of alien and invasive vegetation with little remaining natural vegetation.

These minor impacts do not appear to impinge on biodiversity patterns and processes within the study area landscape, adding to the intactness of ecosystem characteristics here.

Anticipated project impacts

Planned development activities for the study area will include:

- The upgrading of the existing Pump Station No.1 (PS 1).
- Construction of a new Screening and De-gritting Pump Station (PS 2).
- Construction of a new 250mm diameter rising main parallel to the existing rising main from the New Screening and De-gritting Pump Station (PS2) to the Herold's Bay Waste Water Treatment Plant (WWTP).

- Construction of a new rising main from the Herold's Bay Pump Station (PS 1) to the new screening and de-gritting pump station.

Impacts from these activities during the construction phase will include:

- Destruction of habitat,
- direct mortality of fauna, and
- vibration and noise (from machinery and people).

During the operational phase, the new rising main, screening and de-gritting pump stations will have been constructed and in operation. Because noise and vibration from the pump stations (PS1 and PS2) will be of a low degree, direct impacts during the operational phase will be of an inconsequential nature to the faunal and avifaunal biodiversity in the surrounding landscape. Should a temporary or permanent access road be constructed, however, this may bring novel indirect impacts into this landscape including:

- Vehicles and foot traffic into parts of the site which have previously been inaccessible,
- collision of fauna with vehicles,
- illegal waste dumping,
- illegal hunting, and
- the potential of a fire risk through open fires.

Impact management actions

The project footprint will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. As such, this renders the entire proposed project footprint as developable from a faunal perspective.

It is, however, recommended that the new rising main be placed below-ground and the area rehabilitated so as not to impede faunal movement within the study area landscape. In addition, every effort should be made to save and relocate any mammal, reptile, amphibian, bird, or invertebrate that cannot flee of its own accord, encountered during site preparation (i.e., to avoid and minimise the direct mortality of faunal species). These animals should be relocated to a suitable habitat area immediately outside the project footprint (in the adjoining natural habitats), but under no circumstance to an area further away.

Should a temporary or permanent access road be constructed, this road should be access controlled so as not to allow novel indirect impacts into this previously undisturbed part of the landscape. Access control should also be applied to the new rising main footprint, as this may also be used as a potential access road. Finally, irrespective of the development alternative selected, it is recommended alien and invasive vegetation should be cleared by hand and all regrowth and seed germination be monitored any new recruitment be removed.

Development alternatives

For the proposed development, two alternatives (Alternatives 1 and 2) were identified which both will be of a similar spatial layout. Even so, these alternatives differ slightly in the spatial extent and construction method of the new rising main.

Under Alternative 1, the area for the new rising main (pipeline) will be cleared by hand. This alternative will have a smaller overall disturbance footprint (<3m), and will also be rehabilitated and allowed to regenerate naturally. At the eastern section, the rising main will traverse the steep slope through the construction of plinths.

Alternative 2 represents the preferred alternative and takes into account engineering and financial restraints. To this end, Alternative 2 will include the following:

- The pipeline will be buried below ground in an excavated trench.

- A permanent access road will be constructed for maintenance purposes in the event of failures.
- A 30m corridor around the pipeline will be needed for the insertion of the pipeline (in the event of rock, outcrops, etc. being located on the route which will necessitate the pipeline to be shifted slightly).
- Within that 30m corridor a 10m-12m working area footprint is expected to be disturbed.
- Within that 10m-12m working area a 3m permanent disturbance/scar will remain (for the maintenance road).

To this end, a permanent disturbance footprint will remain as an access road, with the remainder of the 10m-12m working area footprint rehabilitated and allowed to regenerate naturally.

Impact assessment

The impact assessment for the receiving environment in the current study was performed both proposed alternatives (Alternatives 1 and 2) considering both the construction and operational phases of the development, and was contrasted against the “No-Go” alternative.

The project footprint under both alternatives will be of a limited spatial extent (albeit slightly larger in the case of Alternative 2) and impacts will be of a localised and relatively short term, ending at the construction phase. Even so, Alternative 2 will result in a wider affected area to be rehabilitated at the end of the construction phase. To this end, impacts from Alternative 2 will be of a slightly higher significance to the receiving environment compared to Alternative 1.

At the onset of the operational phase, Alternative 1 will comprise a temporary access road and / or new rising main footprint, while Alternative 2 will comprise a permanently cleared access road. Given that these open areas may result in novel indirect impacts in parts of the site which was previously inaccessible, access control

of the project footprint may be required to manage these indirect impacts. To this end, these impacts may be managed to an insignificant level.

Taken together therefore, although both alternatives will generally be of a similar spatial layout, the significance of Alternative 2 to the receiving environment will be slightly higher compared to Alternative 1. Taking into account the engineering constraints of the project along with the need to balance environmental outcomes with the need for upgrading infrastructure from a municipal perspective, development under the preferred Alternative 2 will still be acceptable from a faunal perspective, as this will not drastically affect biodiversity and ecological patterns in the broader landscape over the short term, and that indirect impacts may be managed to an insignificant level over the long term.

Conclusions

Taken together, the results of the report indicate the following:

- The central section of the project footprint harbours the most intact habitats, intersecting intact Fynbos and Forest/Woodland habitats, with the western section of the intersecting the existing WWTP and the eastern section largely located within the existing residential area. Collectively, only a small part (<1 hectare) of the proposed footprint overlaps with intact natural habitats.
- Faunal and avifaunal diversity and abundances appears high over the study area landscape and is largely comprised of relatively common species of “Least Concern” (IUCN, 2021), albeit one avifaunal SCC, the Knysna Warbler (*Bradypterus sylvaticus*) is present in the thick and tangled vegetation Fynbos vegetation which offers a dense understory.
- The presence of one avifaunal SCC, the Knysna Warbler (*Bradypterus sylvaticus*), was confirmed one the site, with three further avifaunal SCC likely also occurring within the study area landscape given suitable habitat characteristics.
- Although all the natural habitats on the site offer suitable habitat for the confirmed or possibly occurring avifaunal SCC, the project footprint itself is of

a very small spatial extent, intersecting <1 hectare of natural habitat. In addition, it is highly likely that all avifaunal species will remain in areas adjacent to the project footprint, and will return when the disturbances from construction have ceased. This renders habitats over the project footprint as of a “Very low” SEI, allowing for development activities of medium to high impact without restoration activities being required.

- Only minor current impacts are evident within the study area landscape.
- Planned development activities for the study area will be restricted to the construction phase. During the operational phase, a temporary or permanent access road will be constructed which may bring novel impacts into the landscape.
- The project footprint under both alternatives will be of a limited spatial extent and impacts will be of a localised and relatively short term, ending at the construction phase. Even so, Alternative 2 will result in a wider affected area to be rehabilitated at the end of the construction phase. To this end, impacts from Alternative 2 will be of a slightly higher significance to the receiving environment compared to Alternative 1.
- At the onset of the operational phase, Alternative 1 will comprise a temporary access road and / or new rising main footprint, while Alternative 2 will comprise a permanently cleared access road. Given that these open areas may result in novel indirect impacts in parts of the site which was previously inaccessible, access control of the project footprint may be required to manage these indirect impacts.
- Should the “No-Go” alternative be selected, the status quo will be maintained and the presence of alien and invasive vegetation over a small part of the site may continue to abstract fresh water from the environment and degrade the surrounding habitat structure over the long term (Section 11). This impact is, however, completely reversible through clearing this alien and invasive vegetation.

Taken together therefore, the project footprint under both development alternatives (Alternatives 1 and 2) will generally be of a similar spatial layout and will be of a limited spatial extent. To this end, direct impacts will be of a localised and very short

nature (less than a year), and will cease at the end of the construction phase. Although the significance of Alternative 2 (the preferred alternative) to the receiving environment will be slightly higher compared to Alternative 1 (given different construction methods, a wider temporary footprint and the establishment of a permanent access road), this alternative takes into account the engineering constraints of the project along with the need to balance environmental outcomes with the need for upgrading infrastructure from a municipal perspective. To this end, development under the preferred Alternative 2 will be acceptable from a faunal perspective as direct impacts on the receiving environment will result in only minor to insignificant loss or deterioration of faunal biodiversity in the receiving environment over the short term, and indirect impacts may be effectively managed over the long term.

1. Introduction

SMEC South Africa (Pty) Ltd has been appointed by the George Local Municipality for the upgrading of the Herold's Bay sewer pump station and associated rising main located on Remainder of Farm Brakfontein 236 and Portion 10 of Farm 236 Brakfontein as well as Erven RE/95 and 116, Herholds Bay, George Municipality, Western Cape. The project footprint and infrastructure include the following:

- The upgrading of the existing Pump Station No.1 (PS 1).
- Construction of a new screening and de-gritting pump station (PS 2).
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- Construction of a new rising main from the Herold's Bay Pump Station (PS 1) to the new screening and de-gritting pump station.

Blue Skies Research was appointed by Sharples Environmental Services cc (SES) on behalf of the applicant to perform the required terrestrial faunal and avifaunal assessment of the study area (see Sections 2 and 3). The current report represents an Impact Assessment for the site in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment (EIA) Regulations 2014 (Government Notice (GN) 984), as amended.

2. Terms of Reference

2.1. General legislature pertaining to this report

This terrestrial faunal and avifaunal assessment report is compiled in accordance with the following guidelines:

- *Department of Environmental Affairs and Development Planning (DEA&DP) Guidelines for Involving Biodiversity Specialists in the EIA Process* (Brownlie, 2005).
- *Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes, Government Notice No. 320* (Gazetted 20 March 2020).
- *Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species*, *Government Notice No. 1150* (Gazetted 30 October 2020).
- South African National Biodiversity Institute (SANBI). 2020. *Species Environmental Assessment Guideline. Guidelines for the implementation of the terrestrial fauna and terrestrial flora species protocols for environmental impact assessments in South Africa*. South African National Biodiversity Institute, Pretoria. Version 2.1 2021.

2.2 Other sources consulted

Other sources pertaining to this report are as follows:

- IUCN. 2021. The IUCN Red List of Threatened Species. Version 2021-3. https://www.iucnlist.org. Accessed on 28 August 2023.
- *National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Publication of lists of critically endangered, endangered, vulnerable and protected species, Government Notice No. 2007* (Gazetted 14 December 2007).

3. Reporting protocol

The DFFE Screening Tool Report generated for the proposed project footprint identifies the site as being of an overall “High” sensitivity under the “Relative Animal Species Sensitivity Theme”. This follows from the projected and possible occurrence of two avifaunal, one mammal and one invertebrate Species of Conservation Concern (SCC) (see Table 1). The current report therefore assesses the presence or likely presence of these mammal, avifaunal and invertebrate SCC (as well as other

possible SCC within these faunal groups, see Section 9) within the study area in accordance with the protocols outlined in the Species Environmental Assessment Guideline (SANBI, 2020).

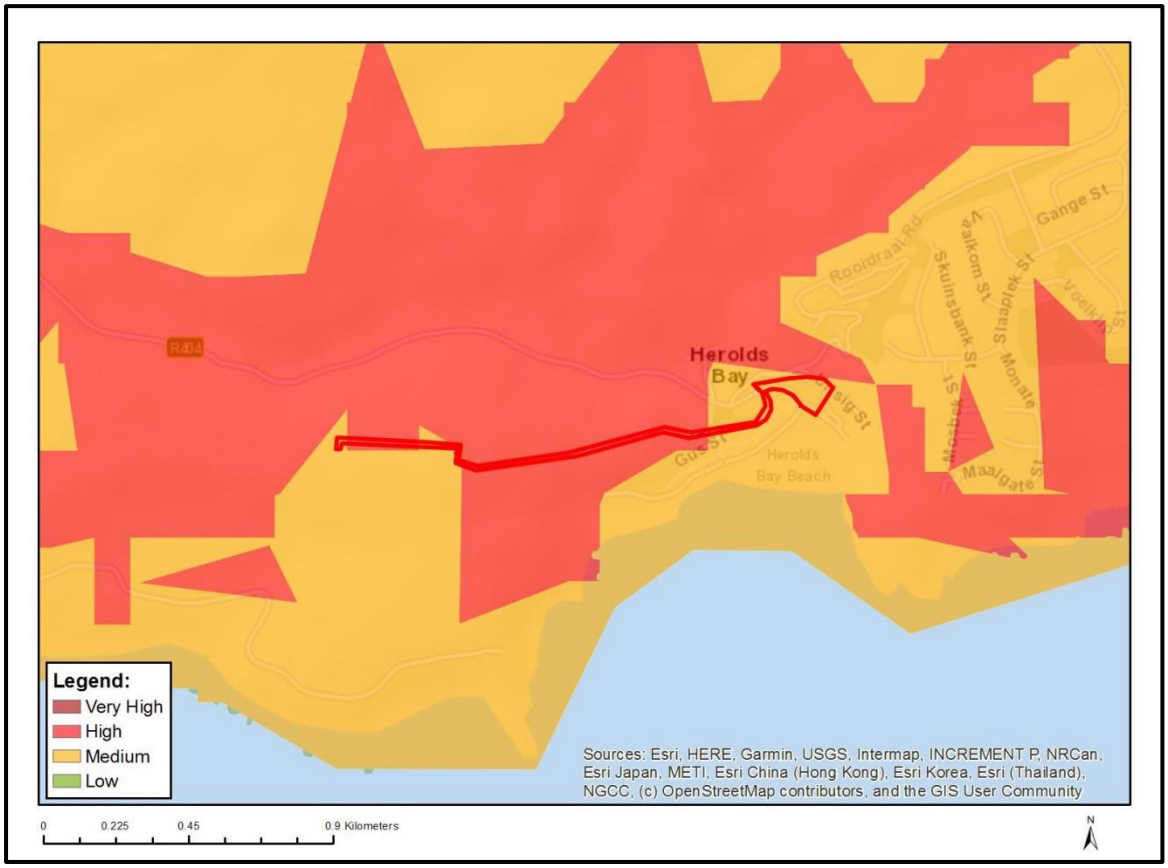

Figure 1 Relative Animal Species Sensitivity Map retrieved for the study area (Red polygon = Study area) by the DFFE Screening Tool (https://screening.environment.gov.za/screeningtool/).

Table 1 List of Species of Conservation Concern (SCC) identified in the DFFE Screening Tool Report (https://screening.environment.gov.za/screeningtool/). For each, the listed sensitivity (possibility of occurrence within the study area), scientific name and common name is shown, along with its current IUCN status. The name of "Sensitive Species 8" is purposefully omitted, given the sensitivity of this species.

Sensitivity	Species	Common name	IUCN status
High	*Circus ranivorus*	African Marsh-harrier	Least Concern
High	*Bradypterus sylvaticus*	Knysna Warbler	Vulnerable
Medium	*Sensitive species 8*	Sensitive species 8	Least Concern
Medium	*Aneuryphymus montanus*	Yellow-winged Agile Grasshopper	Vulnerable

4. Overview of the study area

4.1 Geographic location

The study area is partially located within, and to the west of Herold's Bay, with the project footprint projected to be around 2.3 hectares in extent, and 1.3 kilometres in length (Figures 2 and 3). The western part of the proposed project footprint intersects the Herhold's Bay Waste Water Treatment Plant (WWTP, Figure 3).

Figure 2 Spatial location of the study area relative to surrounding residential areas and main roads on a broad scale (Red polygon = Study area; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

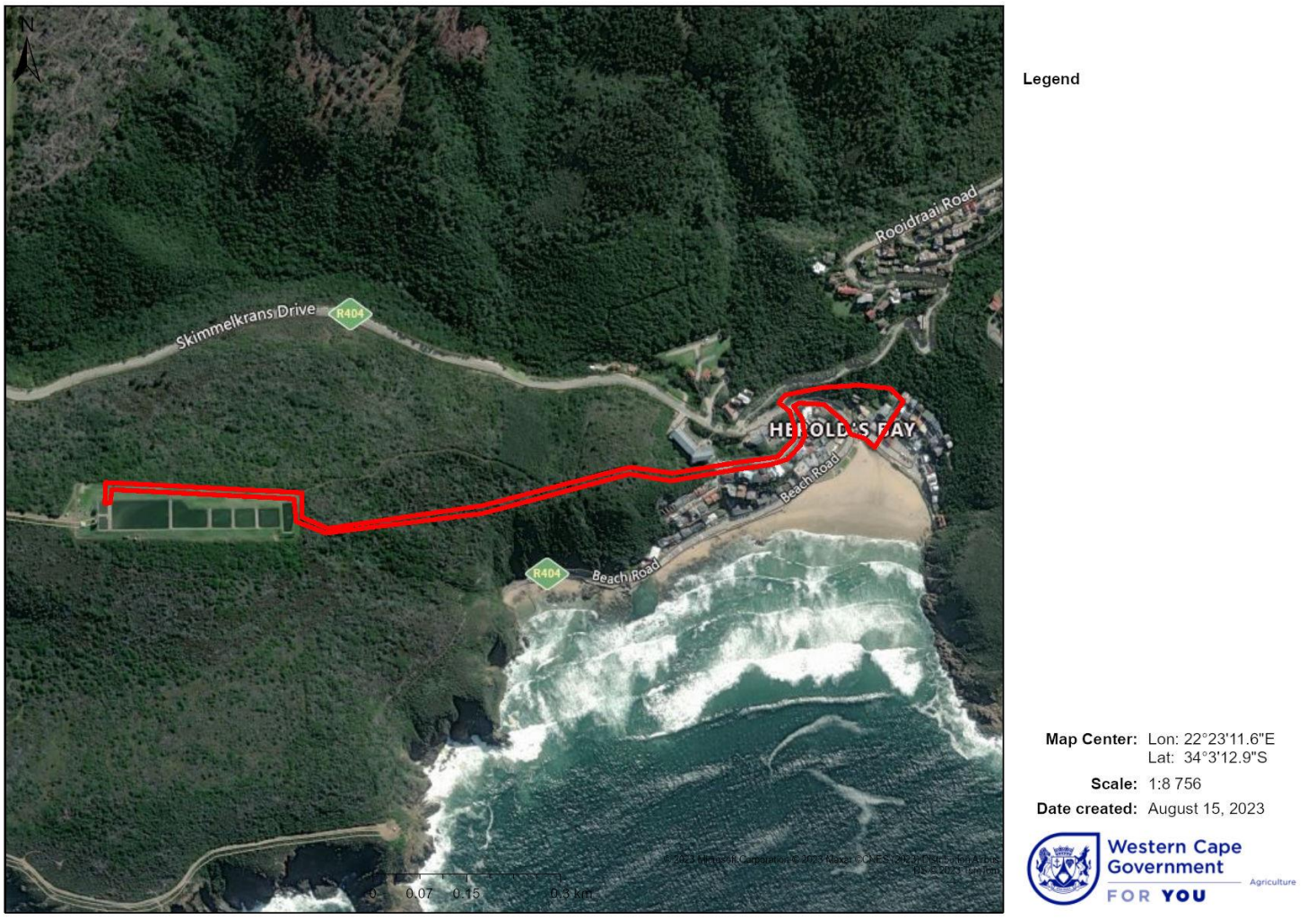

Figure 3 Spatial location of the study area relative to surrounding residential areas and main roads at a finer scale (Red polygon = Study area; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

4.2 Topology

At the eastern end, the project footprint intersects the WWTP which is located on a relatively flat area (Figure 4). From here, the project footprint slopes slightly south-eastward over the larger part, and then follows a steep eastern slope towards the residential area (Figure 4).

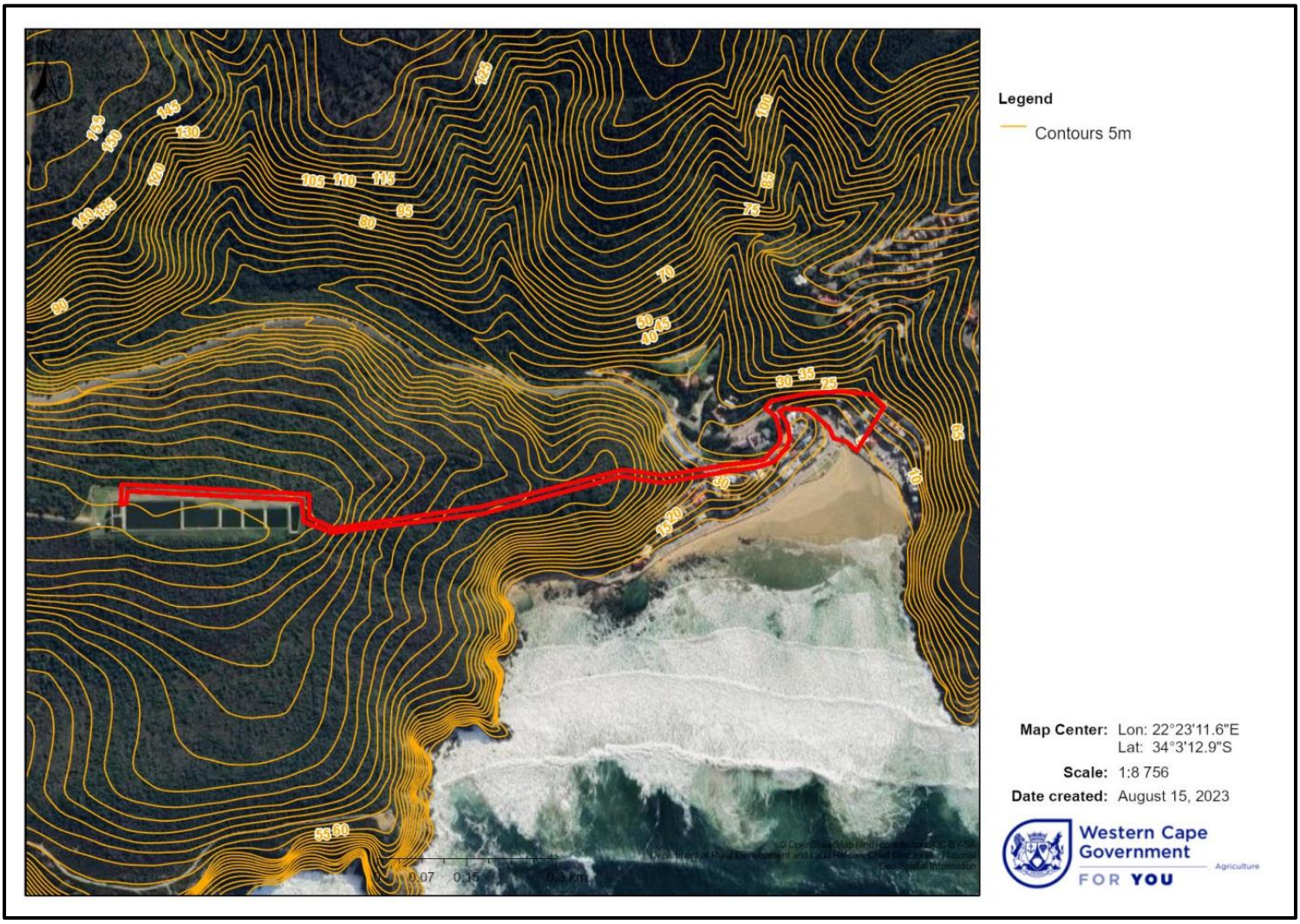

Figure 4 Topology of the study area showing 5 meter contour lines (Red polygon = Study area; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

4.3 Wetlands and rivers

The eastern part of the project footprint traverses a non-perennial stream (Figure 5), although this stream is currently channelled through man-made berms. In the central section, the project footprint borders an unchanneled valley-bottom wetland located to the north, while the western part is located adjacent to the WWTP which is classified as an artificial wetland (National Freshwater Ecosystem Priority Areas, NFEPA, CSIR et al. 2011, Figure 5).

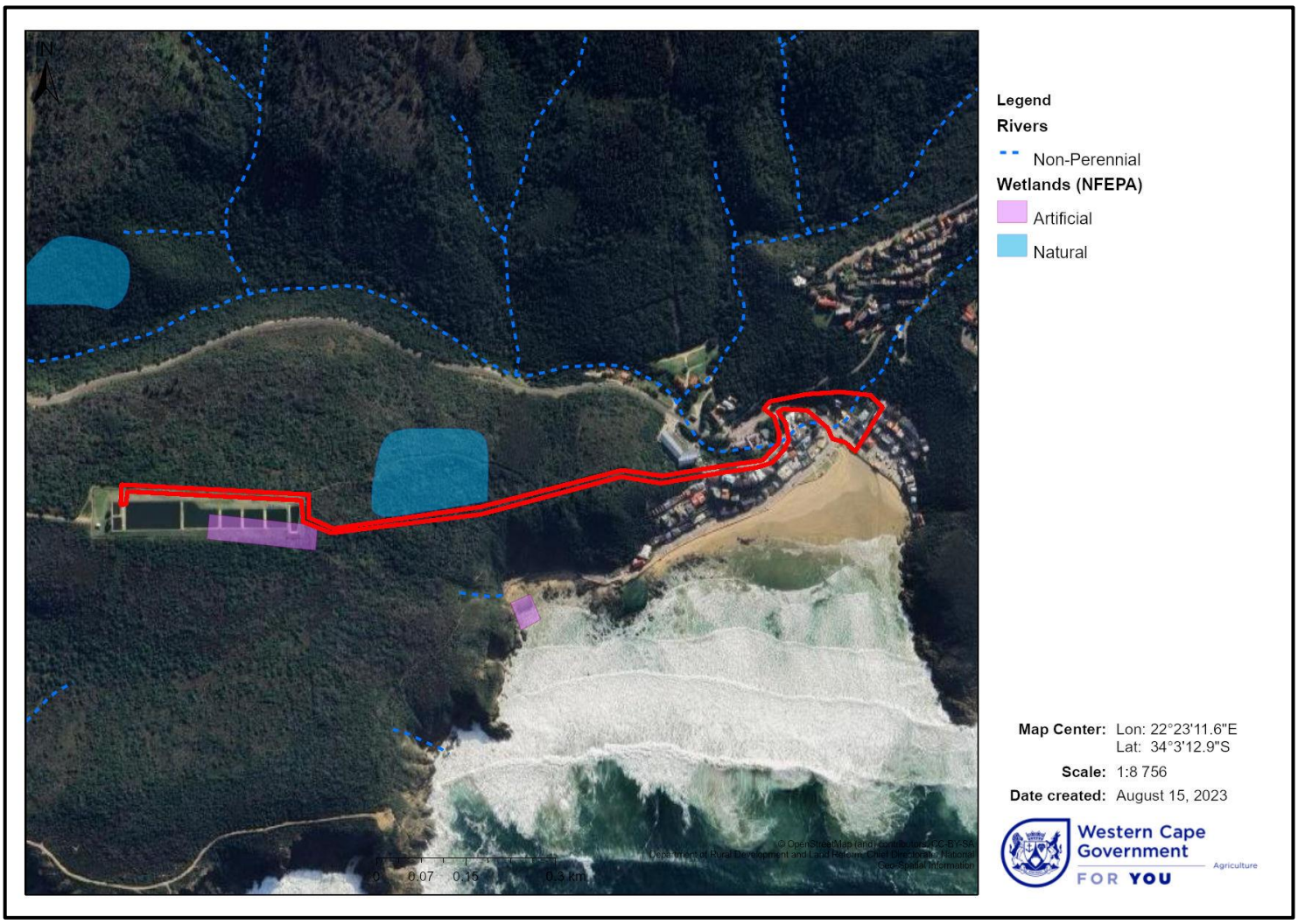

Figure 5 Distribution of wetlands (NFEPA) and rivers relative to the study area (Red polygon = Study area; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

4.4 Vegetation

Vegetation overlapping the project footprint comprises Garden Route Granite Fynbos in the western and eastern sections and Groot Brak Dune Strandveld across the central section (VegMap, 2018; Figure 6). Garden Route Granite Fynbos is currently classified as “Critically Endangered” with Groot Brak Dune Strandveld classified as “Endangered” (*National Environmental Management: Biodiversity Act, 2004, Government Notice No. 2747,* Gazetted 18 November 2022).

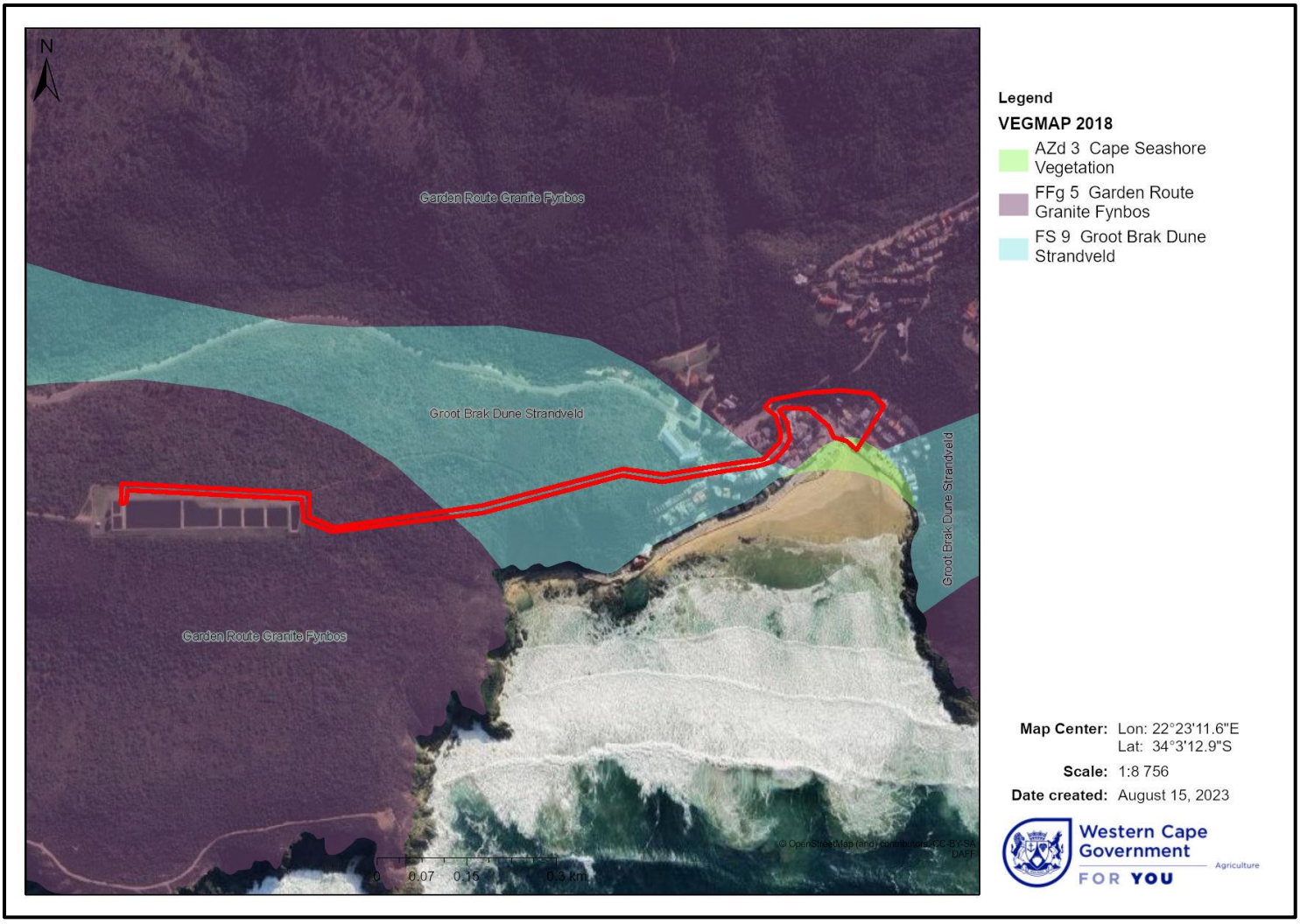

Figure 6 Vegetation types across the study area (VEGMAP, SANBI 2018; Red polygon = Study area; map generated in Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

4.5 Land cover

Land cover over the project footprint comprises a residential area in the eastern section, fallow land and old fields (trees) in the western section and contiguous low forest and thicket in the central section (Land Cover 73-class, Department of Environmental Affairs, 2020). Overall, these designations of land cover were found to accurately reflect the habitat conditions within the study area landscape (Section 7).

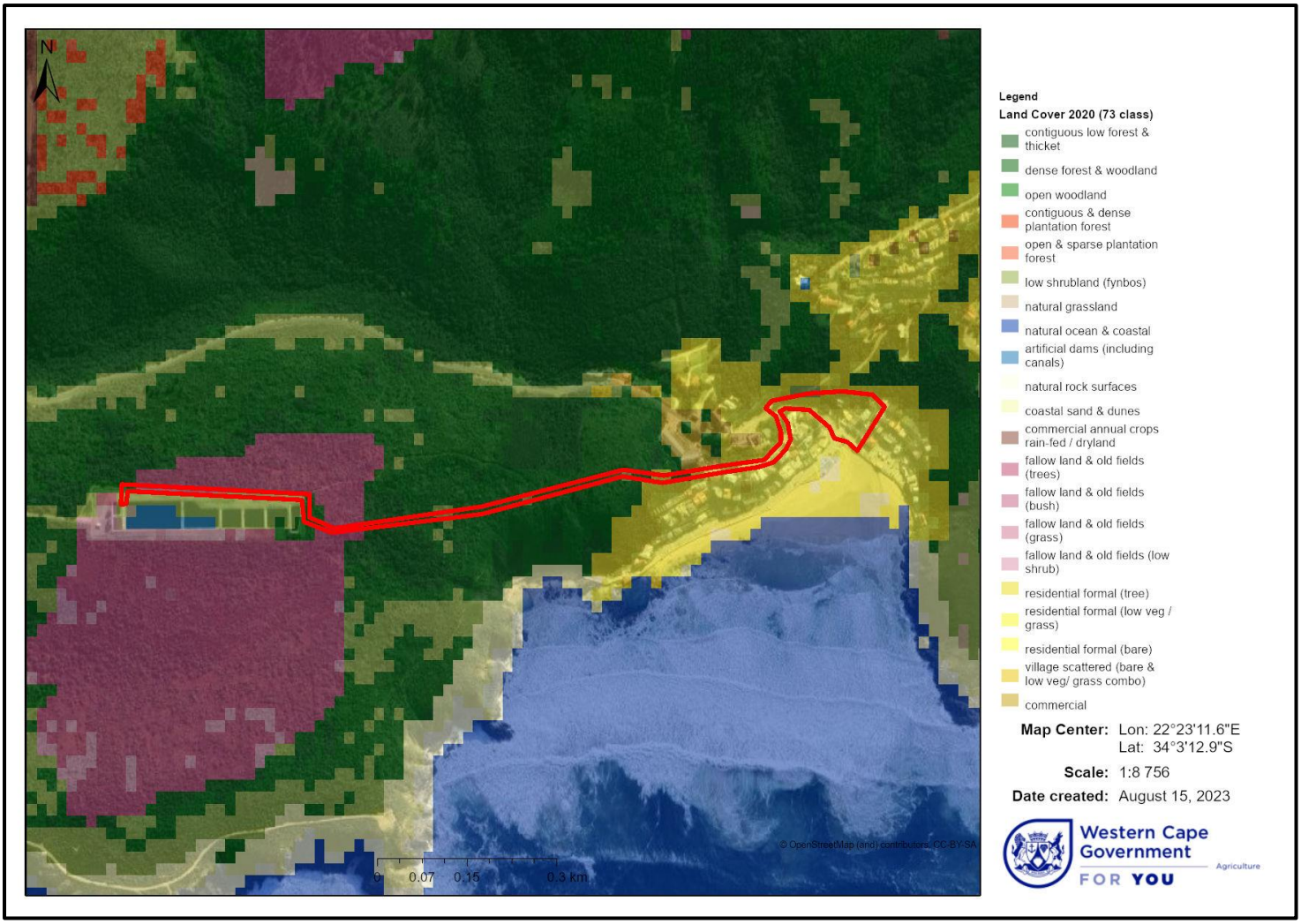

Figure 7 Land cover (Land Cover 73-class, Department of Environmental Affairs, 2020) within the study area (Red polygon = Study area; information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

4.6 Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan (Purves and Holmes, 2015). Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services.

The project footprint intersects a terrestrial CBA over the central section, and over a small part in the eastern section (Figure 8, Table 2). Furthermore, an aquatic CBA is located to the north of the central section of the footprint. The part of the footprint in the western section adjacent to the WWTP overlaps with a degraded CBA (CBA2). Finally, a large part in the eastern section of the footprint intersects a degraded ESA (ESA2, Figure 9). The presence and integrity of these CBAs and ESAs are discussed in Section 12.

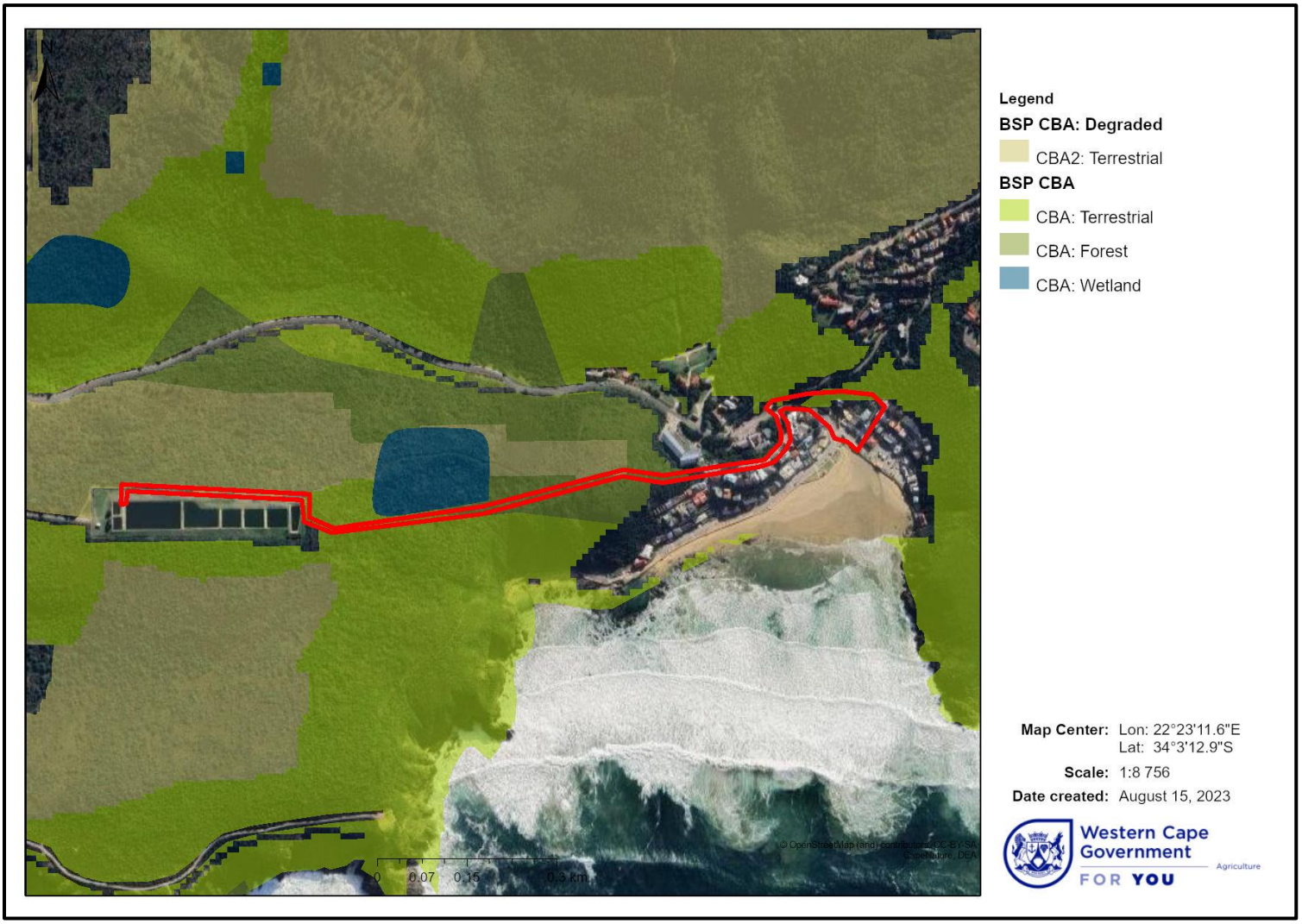

Figure 8 Spatial locations of Critical Biodiversity Areas (CBAs) overlapping with the study area (Red polygon = Study area; information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

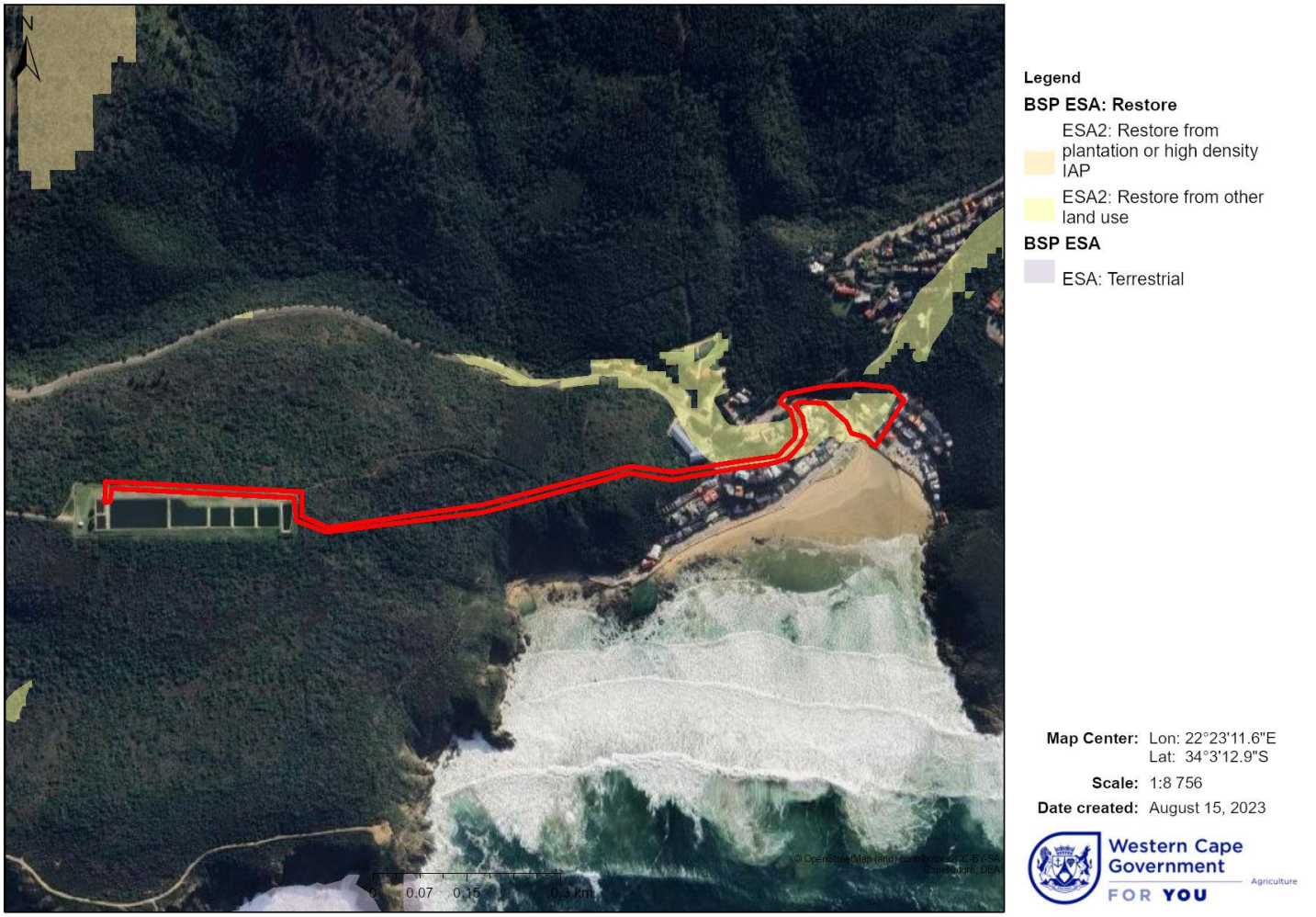

Figure 9 Spatial locations of Ecological Support Areas (ESAs) overlapping with the study area (Red polygon = Study area; information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

Table 2 A brief description of the Ecological Support Areas (ESAs) and Other Natural Areas (ONAs) categories which intersect with the study area (information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

Feature	Category 2	Definition	Objective
CBA: Terrestrial	CBA: Terrestrial	Areas in a natural condition that are 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 natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
CBA: Terrestrial	CBA: Forest	Areas in a natural condition that are 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 natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
CBA: Aquatic	CBA: Wetland	Areas in a natural condition that are 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 natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
CBA2: Terrestrial	CBA2: Forest	Areas in a degraded or secondary condition that are 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.
River	ESA2: Restore from other land use	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.	Restore and/or manage to minimize impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and to allow for faunal movement.

4.7 Ecosystem threat status

Owing tto the presence of “Critically Endangered” Garden Route Granite Fynbos in the western and eastern sections of the project footprint (Subsection 4.4), these parts of the site also overlap with a “Critically Endangered” ecosystem according to *The National List of Ecosystems that are Threatened and Need of Protection* (Government Gazette, 2011, Figure 10). Similarly, the central section of the site harbours “Endangered” Groot Brak Dune Strandveld, with this part classified as an “Endangered” ecosystem (Figure 10).

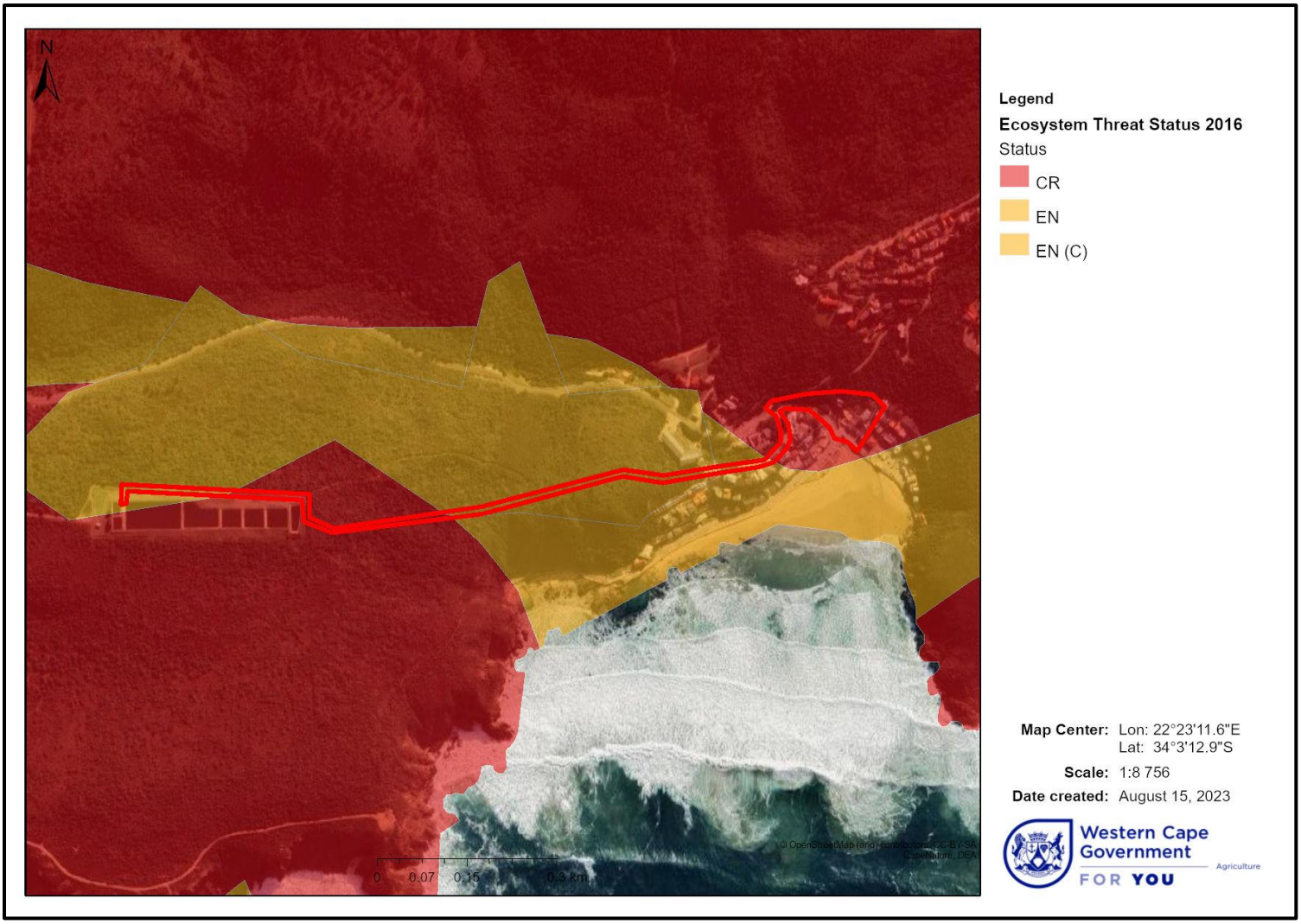

Figure 10 Spatial location of ecosystems and their threat statuses according to *The National List of Ecosystems that are Threatened and Need of Protection* (Government Gazette, 2011), overlapping with the study area (Red polygon = Study area; information sourced from Cape Farm Mapper version 2.6.10, Western Cape Department of Agriculture).

5. Study methodology

5.1 Study aims

This study represents an assessment of the terrestrial faunal and avifaunal diversity and abundances, -habitat composition, ecosystem dynamics and potential occurrence of mammal, avifaunal and invertebrate (and other) SCC within the study area. As such, the aims of this investigation were to:

1.) Assess, define and create a spatial rendering of available faunal habitats across the study area landscape based on information gathered during the field survey as well as through a desktop assessment using the latest satellite imagery,

2.) compile a complete faunal desktop species list (including mammals and avifauna) for the study area based on a thorough desktop assessment so as to assess the presence of any of the listed SCC (Table 1) as well as any additional SCC within these faunal groups,

3.) compile a faunal species list (including mammals, amphibians, avifauna and grasshoppers) within the study area through field surveying so as to assess the possibility of occurrence of the SCC retrieved in the desktop assessment (based on appropriate sampling methods, as well as the presence of suitable habitat for these species), or any additional SCC which are present on the site, and

4.) generate spatial occurrence maps for the recovered faunal species within the study area to assess the spatial extent of areas supporting higher levels of diversity, and SCC subpopulations and habitats which may be of conservation concern.

5.2 Desktop assessment

To assess the possible occurrence of the listed (Table 1) as well as any additional mammal and avifaunal SCC, a desktop assessment was performed to create a representative desktop species list for these faunal groups. Given the low number of records for grasshopper species, the presence or absence of the Yellow-winged Agile Grasshopper could only be evaluated during the field survey.

5.2.1 Mammals

The desktop species list for mammals (Appendix A) was constructed with reference to the distributional data available in Skinner and Chimimba (2005). This list was further bolstered by referring to the observational records

available on the MammalMAP (https://vmus.adu.org.za/) and iNaturalist (www.iNaturalist.org) platforms for the study area landscape (QDGS: 3422AC).

5.2.2 Avifauna

The desktop avifaunal species list for the study area was generated by referring to the species records of the South African Bird Atlas Project 2 (SABAP2, https://sabap2.birdmap.africa/) (Appendix B). The study area overlaps with one pentad (see below) which is well-represented in the atlassing cards:

Pentad: 3400_2220

Full protocol cards: 166
Ad-hoc protocol cards: 161
Total cards: 327

To create the avifaunal desktop species list for the study area, the species observed were noted, also noting the total number of observations (including both full and ad-hoc protocols) and the latest date that the species was recorded within this pentad (Appendix B).

5.3 Field survey

The study area was surveyed on foot over a single day on the 7th of August 2023, during the Winter season. Weather conditions during the surveying period were characterised by relatively warm daily temperatures, no cloud cover and low to moderate wind conditions (Figure 11).

Surveying included unconstrained point sampling through search meanders, as well active searching under rocks and debris. All tracks surveyed were recorded by GPS (Garmin eTrex® 10, Garmin International Inc, USA) and are represented in Figure 12. Terrestrial faunal species (mammals) were identified by direct visual observation, or by their tracks, burrows, remains or scat. Avifaunal species were identified by visual observation, using a 180x zoom lens, or by auditory means. Amphibian

species were identified by direct visual observation, or auditory means and sound recordings. Finally, the presence or absence of the Yellow-winged Agile Grasshopper was evaluated based on suitable habitat (recently burnt Schlerophyll on south-facing slopes) for this species. All observations were recorded by GPS and the species or evidence of species' presence or activity were photographed using a digital camera (Canon PowerShot SX430 IS, Canon Inc, USA). A species list for all fauna recorded within the study area is given in Appendix C.

Given relatively optimal weather conditions, faunal and avifaunal species' activity was observed to be high over the surveying period, thereby resulting in 58 recorded observations across the study area (Figure 13, Appendix C), relating to one observation per every 0.04 hectares of study area (the study area is 2.3 hectares in extent). During surveying, faunal habitats were broadly identified in the field, and thereafter delineated through a desktop assessment of the study area using satellite imagery (CapeFarmMapper Version 2.6.4, Western Cape Department of Agriculture).

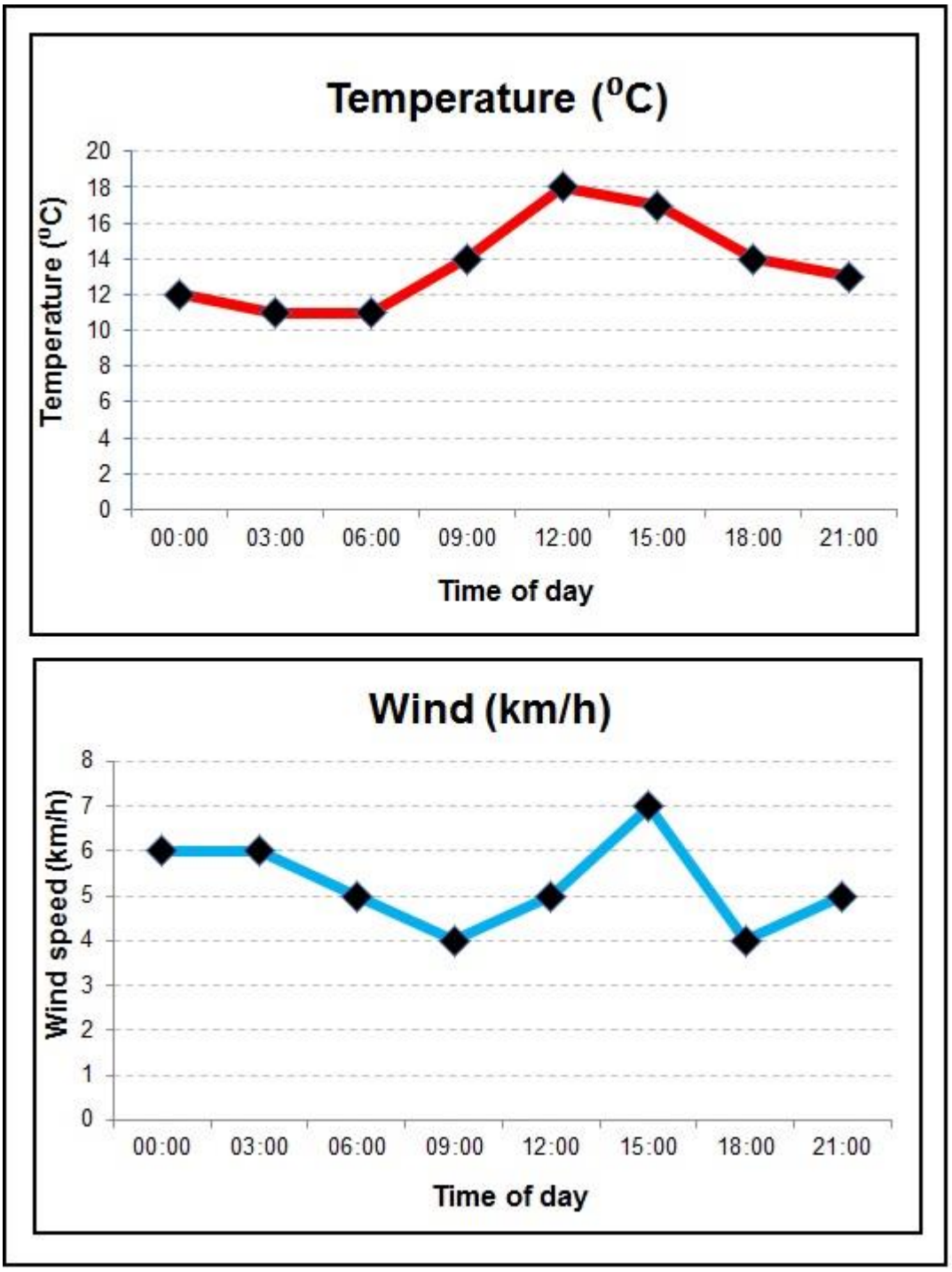

Figure 11 Weather conditions in the study area over the surveying period (07 August 2023). The time of day is indicated, along with the temperature (in °C) and wind speed (in km/h) (weather data sourced from https://www.worldweatheronline.com).

Figure 12 Spatial tracks recorded by GPS for all the search meanders across the study area over the surveying period.

Figure 13 Spatial locations of all the faunal observations across the study area over the surveying period.

6. Assumptions and limitations

Weather conditions during the surveying period were relatively optimal for detecting a representative sample of the terrestrial faunal and avifaunal species diversity across the study area. Even so, not all species could be observed (especially cryptic species), and it is further possible that the surveying period did not correspond to the activity period or activity season of some species. Coupled to this, the thick and impenetrable nature of the Forest/Woodland and Fynbos vegetation in the study area (see Section 7) hampered sampling efforts as not all areas could be accessed.

Although the observed faunal composition of the study area therefore only partly reflects the species richness of, and faunal abundances within the study area landscape (Appendix C), the inclusion and consideration of SCC was further based on a thorough desktop assessment for the included faunal groups (mammals and avifauna; Appendices A and B), meaning that all possibly occurring SCC were considered in the current assessment (Section 9).

7. Faunal habitat types within the study area

The study area landscape is comprised of five broadly identified habitat types based on habitat composition and habitat integrity (Figure 14, Table 3). The central section of the project footprint harbours the most intact habitats, intersecting intact Fynbos habitats of South Outeniqua Sandstone Fynbos, with a small section harbouring alien and invasive trees such as Black Wattle (Figure 15, Table 3). Small portions in the east further intersect with Forest/Woodland habitat (Figure 15, Table 3). Conversely, the western section of the project footprint intersects with the existing footprint of the Herholds Bay Water Waste Treatment Plant (WWTP), with the eastern section largely located within the existing residential area (Figure 15). Collectively therefore, only a small part (<1 hectare) of the proposed footprint overlaps with intact natural habitats.

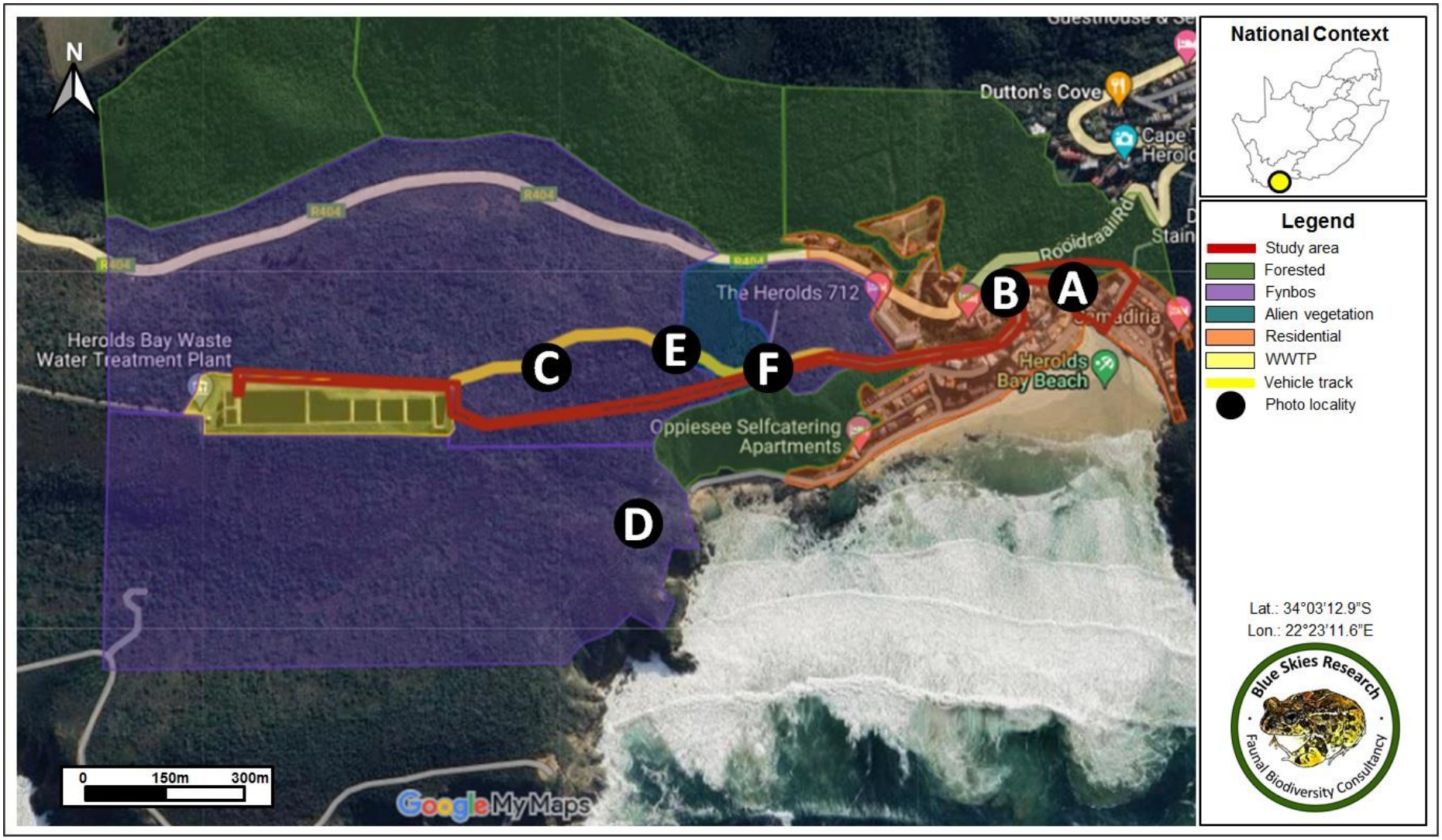

Figure 14 A broad indication of the spatial extent of habitat types overlapping the study area. Photo localities (A to F) correspond to the habitat photos in Table 3.

Figure 15 A finer scale indication of the spatial extent of habitat types overlapping the proposed project footprint.

Table 3 Habitat locations, habitat descriptions and visual representations of the different habitat types within the study area. Location designations (A to F) correspond to the photo locations in Figure 14.

Location	Habitat description	Photo 1	Photo 2
A -34.05287; 22.39249 **B** -34.05293; 22.39144	**Forest/Woodland habitat** This habitat constitutes forested areas located in close proximity to the urban edge.		

C -34.05385; 22.3844 **D** -34.05582; 22.38583	**Fynbos habitat** This habitat constitutes intact South Outeniqua Sandstone Fynbos vegetation.		
E -34.05363; 22.38641 **F** -34.05582; 22.38583	**Alien vegetation habitat** This habitat comprises thick stands of alien and invasive vegetation such as Black Wattle trees.		

8. Faunal and avifaunal composition within the study area

8.1 Mammals

8.1.1 Desktop assessment

The distributions of 64 mammal species overlap with the study area landscape (Appendix A). Among these, 57 species are currently listed as “Least Concern” by the IUCN (IUCN, 2021), with the remaining seven species representing mammal SCC. These mammal SCC include the following:

1. The Duthie's Golden Mole (*Chlorotalpa duthieae*) classified as “Vulnerable”,
2. Fynbos Golden Mole (*Amblysomus corriae*) classified as “Near-Threatened”,
3. Leopard (*Panthera pardus*) classified as “Vulnerable”,
4. African Clawless Otter (*Aonyx capensis*) classified as “Near-Threatened”,
5. Grey Rhebok (*Pelea capreolus*) classified as “Near-Threatened”,
6. Long-tailed Forest Shrew (*Myosorex longicaudatus*) classified as “Endangered”, and
7. White-tailed Rat (*Mystromys albicaudatus*) classified as “Vulnerable” by the IUCN.

From the observational records available on the MammalMAP (https://vmus.adu.org.za/) and iNaturalist (www.iNaturalist.org) platforms (QDGS: 3422AC), 11 mammal species have been confirmed in the study area landscape (Appendix A) of which 10 are currently listed as “Least Concern” and one, the African Clawless Otter (*Aonyx capensis*) classified as “Near-Threatened” by the IUCN.

8.1.2 Field survey

Evidence of six mammal species were recovered within the study area (Figures 16 and 17), all of which are currently classified as “Least concern” by the IUCN (Appendix C). Three common antelope species, the Cape Grysbok (*Raphicerus*

melanotis), Common Duiker (*Sylvicapra grimmia*) and Southern Bushbuck (*Tragelaphus scriptus*), are common within the Fynbos habitats surrounding the site given suitable vegetation cover. Other mammal species observed include the Cape Porcupine (*Hystrix africaeaustralis*), Hairy-footed Gerbil (*Gerbillurus paeba*) and Four-striped Grass Mouse (*Rhabdomys pumilio*) of which the presence of single individuals was noted.

Figure 16 Spatial locations of the different mammal species recorded within the study area.

Figure 17 Photographic evidence of the different mammal species recorded in the study area. A) Track of the Cape Gysbok (*Raphicerus melanotis*). B) Track of the Common Duiker (*Sylvicapra grimmia*). C) Track of the Southern Bushbuck (*Tragelaphus scriptus*). D) Feeding holes of the Cape Porcupine (*Hystrix africaeaustralis*). E) Burrow of the Hairy-footed Gerbil (*Gerbillurus paeba*). F) Runs (arrowed) of the Four-striped Grass Mouse (*Rhabdomys pumilio*).

8.2 Amphibians

Two amphibian species were recorded within the study area, both of which are currently classified as “Least concern” (Figure 18, Appendix C). The Clicking Stream Frog (*Strongylopus grayii*) is the most abundant amphibian species and is found along all freshwater environments on the site (Figure 17). A single individual of the Rattling Frog (*Semnodactylus wealii*) was also observed vocalising in the thicket habitat to the south of the WWTP.

Figure 18 Spatial locations of the different amphibian species recorded within the study area.

8.3 Avifauna

8.3.1 Desktop assessment

According to the SABAP2 records, 218 bird species have been recorded from the pentad overlapping the study area with 204 species classified as “Least Concern” by the IUCN, and 14 species which constitute avifaunal SCC (Appendix B). These avifaunal SCC includes the:

1. Forest Buzzard (*Buteo trizonatus*) classified as “Near-Threatened”,
2. Black Harrier (*Circus maurus*) classified as “Endangered”,
3. African Marsh Harrier (*Circus ranivorus*) classified as “Least Concern”,
4. Martial Eagle (*Polemaetus bellicosus*) classified as “Endangered”,
5. Crowned Eagle (*Stephanoaetus coronatus*) classified as “Near-Threatened”,
6. Secretarybird (*Sagittarius serpentarius*) classified as “Endangered”,
7. Blue Crane (*Anthropoides paradiseus*) classified as “Vulnerable”,
8. Denham's Bustard (*Neotis denhami*) classified as “Near-Threatened”,
9. Knysna Warbler (*Bradypterus sylvaticus*) classified as “Vulnerable”,
10. Knysna Woodpecker (*Campethera notate*) classified as “Near-Threatened”,
11. Sooty Shearwater (*Ardenna grisea*) classified as “Near-Threatened”,
12. White-chinned Petrel (*Procellaria aequinoctialis*) classified as “Vulnerable”,
13. Cape Cormorant (*Phalacrocorax capensis*) classified as “Endangered”, and
14. Cape Gannet (*Morus capensis*) classified as “Endangered” by the IUCN.

8.3.2 Field survey

In total, 34 bird species were recorded within the study area, 33 of which are currently classified as “Least concern” and one, the Knysna Warbler (*Bradypterus sylvaticus*), classified as “Vulnerable” by the IUCN (Figures 19 and 20, Appendix C). The presence of this species is linked to the thick and tangled Fynbos vegetation in the study area landscape offering a dense understorey. The remaining avifauna on the site constitutes common vegetation associated species, freshwater associated (at or near the WWTP) or marine associated species (near the coast and at or near the WWTP).

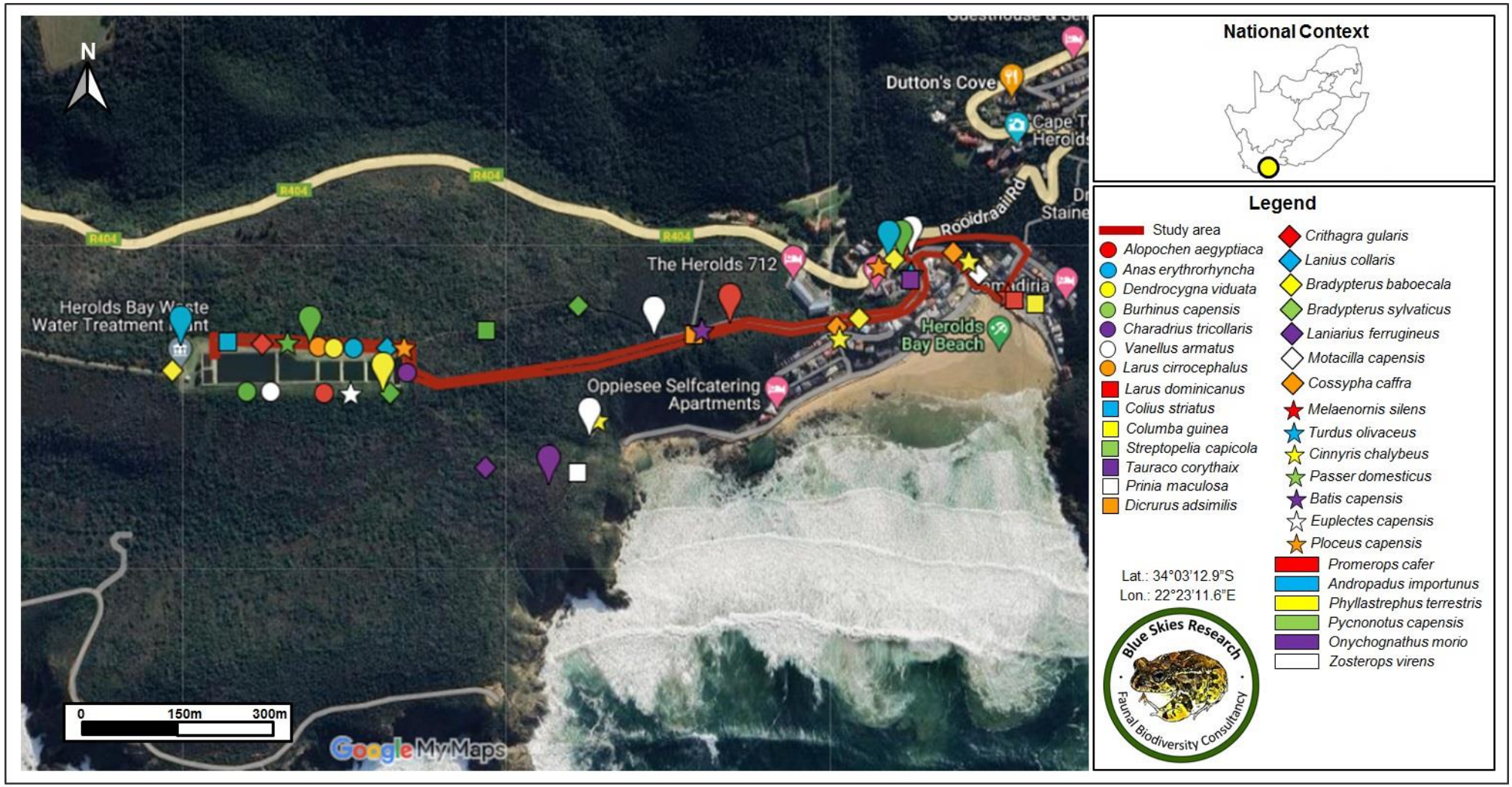

Figure 19 Spatial locations of the different avifaunal species recorded within the study area.


A
B
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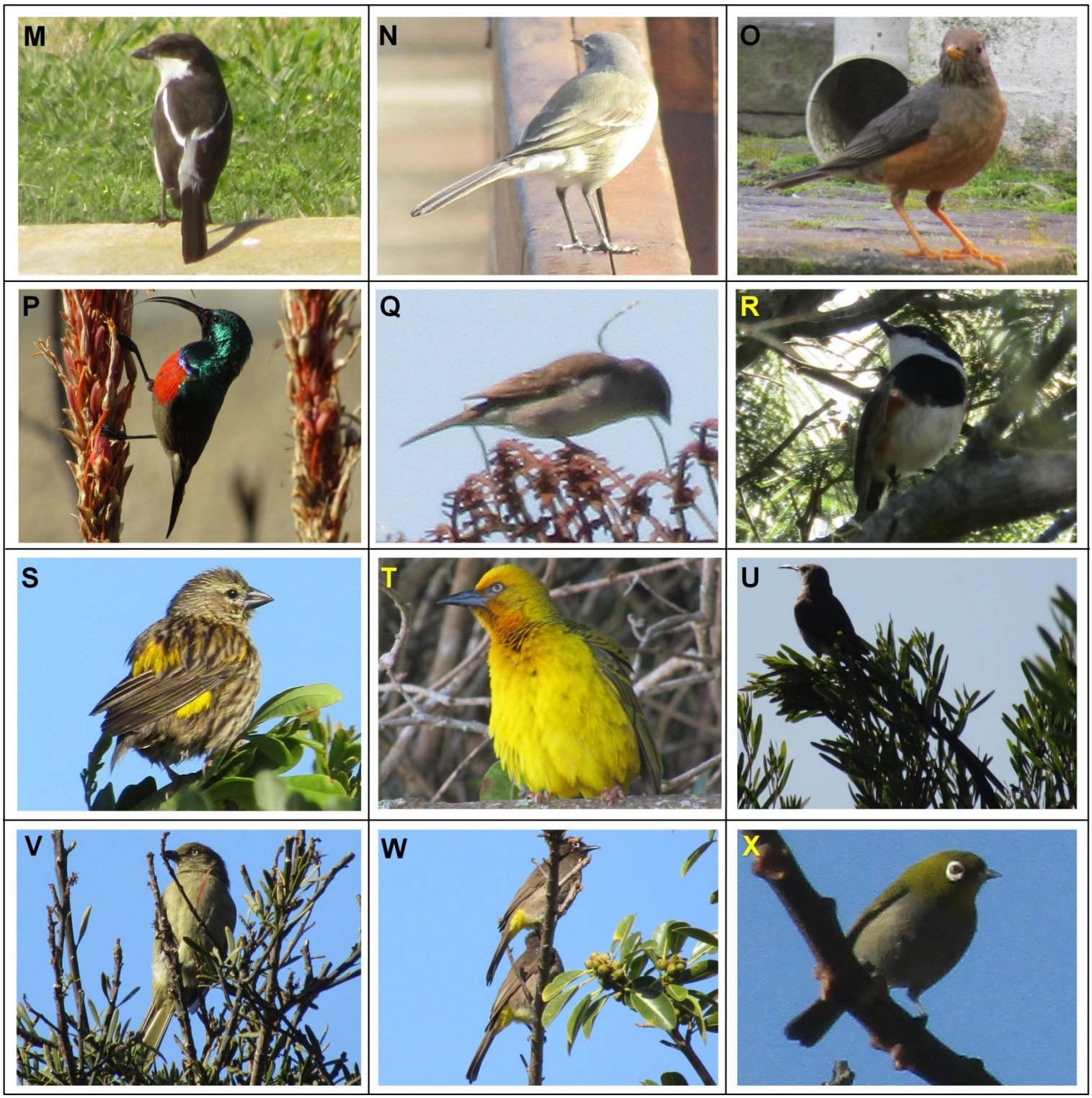
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Figure 20 Photographic evidence of different avifaunal species recorded in the study area. A) Egyptian Goose (*Alopochen aegyptiaca*). B) Red-billed Teal (*Anas erythrorhyncha*). C) White-faced Whistling Duck (*Dendrocygna viduata*). D) Spotted Thick-knee (*Burhinus capensis*). E) Three-banded Plover (*Charadrius tricollaris*). F) Blacksmith Lapwing (*Vanellus armatus*). G) Grey-headed Gull (*Larus cirrocephalus*). H) Speckled Mousebird (*Colius striatus*). I) Speckled Pigeon (*Columba guinea*). J) Cape Turtle Dove (*Streptopelia capicola*). K) Fork-tailed Drongo (*Dicrurus adsimilis*). L) Streaky-headed Seedeater (*Crithagra gularis*).

M) Southern Fiscal (*Lanius collaris*). N) Cape Wagtail (*Motacilla capensis*). O) Olive Thrush (*Turdus olivaceus*). P) Greater Double-collared Sunbird (*Cinnyris afer*). Q) House Sparrow (*Passer domesticus*). R) Cape Batis (*Batis capensis*). S) Yellow Bishop (*Euplectes capensis*). T) Cape Weaver (*Ploceus capensis*). U) Cape Sugarbird (*Promerops cafer*). V) Sombre Greenbul (*Andropadus importunus*). W) Cape Bulbul (*Pycnonotus capensis*). X) Cape White-eye (*Zosterops virens*).

Y) Karoo Prinia (*Prinia maculosa*). Z) Fiscal Flycatcher (*Melaenornis silens*).

8.4 Grasshoppers

The presence of the Yellow-winged Agile Grasshopper was evaluated based on suitable habitat (recently burnt Schlerophyll on south-facing slopes) for this species - a habitat type which is not present on the site. To this end, suitable habitat for the Yellow-winged Agile Grasshopper is not present on the site, and it is highly unlikely that this species will occur here.

8.5 Faunal and avifaunal diversity within the study area

Faunal and avifaunal diversity and abundances appears high over the study area landscape and is largely comprised of relatively common species of “Least Concern” (IUCN, 2021), albeit one avifaunal SCC, the Knysna Warbler (*Bradypterus sylvaticus*) is present in the thick and tangled Fynbos vegetation which offers a dense understorey. While mammal diversity and abundances appear relatively low, avifauna is by far the most prominent faunal component in the study area landscape, likely owing to the availability of dense Forest/Woodland and Fynbos habitats. Furthermore, the presence of aquatic and moist habitats leads to the presence of amphibians within the landscape. Although no predator-prey dynamics were observed (as is evidenced by the lack of mammal and avifaunal predators), ecosystem dynamics do appear intact with habitats here forming a functional ecological link in the study area landscape.

9. Species of Conservation Concern

Along with the four (one mammal, two avifaunal and one invertebrate) SCC listed in the DFFE Screening Tool (Table 1), the potential occurrence of 19 other (seven mammal and 12 avifaunal) SCC within the study area was assessed (Table 4), given their recovery in the desktop assessment (see Section 8). The probability of occurrence of each specific SCC within the study area landscape was assessed based on the following criteria:

Confirmed - The species was confirmed as present within the study area during the field survey.

High - The species was not confirmed as present within the study area during the field survey but has been recorded in the overlapped QDGS in the case of mammals. In the case of avifauna, the species has been recorded in the overlapped pentad recently (less than 2 years ago) and in high number (>10 times) and is therefore likely to also occur in the study area, given suitable habitat characteristics.

Medium - The species was not confirmed as present within the study area during the field survey, and has not been recorded in the overlapped QDGS in the case of mammals. In the case of avifauna, the species has been recorded a number of times (<10 times) in the overlapped pentad recently (less than 2 years ago). Suitable habitat for the species is also present in the study area.

Low - No suitable habitat for the species is present in the study area. Further, in the case of avifauna, the species has been recorded a low number of times (<2 times) or more than five years ago in the overlapped pentad.

The presence of one avifaunal SCC was confirmed one the site, with three further avifaunal SCC likely also occurring within the study area landscape given suitable habitat characteristics (Table 4). All remaining SCC were recovered as having a “Low” or “Medium” probability of occurrence within the study area landscape and are therefore not further considered in this report.

Table 4 Probability of occurrence of specific SCC in the study area. For each species, the taxonomic Family, scientific name and common name is shown, along with its current classification under the IUCN Red List of Threatened Species (IUCN, 2021). In addition, the species' preferred habitat and the probability that the species occurs within the study area is given, along with a justification for listing this probability.

Order	Family	Species	Common name	Status	Habitat	Probability of occurrence in the study area	Justification of probability
Sensitive Species 8	Sensitive Species 8	*Sensitive Species 8*	Sensitive Species 8	-	-	Low	The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Even though suitable forest and woodland habitat is available for this species in the study area landscape, the proposed project footprint only overlaps with small sections of this habitat close to the urban edge.
Afrosoricida	Chrysochloridae	*Chlorotalpa duthieae*	Duthie's Golden Mole	Vulnerable	The species occurs on alluvial sands and sandy loams in Southern Cape Afrotemperate forests (especially coastal platform and scarp forest patches) in the Fynbos and Moist Savanna biomes (Bronner, 2015). The species also thrives in cultivated areas and gardens.	Low	The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Even though suitable forest and woodland habitat is available for this species in the study area landscape, the proposed project footprint only overlaps with small sections of this habitat close to the urban edge.
Afrosoricida	Chrysochloridae	*Amblysomus corriae*	Fynbos Golden Mole	Near-Threatened	The species prefers sandy soils and soft loams in Mountain Fynbos, Grassy Fynbos and Renosterveld of South West Cape (Bronner and Mynhardt, 2015). Also in Afromontane forest and southern African moist savanna along the southern Cape coast. The species furthermore thrives in gardens, cultivated lands, golf courses and livestock paddocks, and is also present in exotic plantations, but apparently at lower densities (Bronner, 2013).	Low	The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Furthermore, the proposed project footprint is devoid of the deep and loose soils (sandy soils or soft loams) preferred by this species.

Carnivora	Felidae	*Panthera pardus*	Leopard	Vulnerable	The species occurs in the widest range of habitats among any of the Old World Cats, including the larger part of Africa and Asia (Nowell and Jackson 1996). Generally, Leopards prefer medium-sized ungulate prey (10-40kg) where available (Hayward et al. 2006). They have a highly varied diet, however, feeding on insects, reptiles, birds and small mammals up to large ungulates.	Medium	The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Even so, it is possible that single individuals of this species may ephemerally traverse the site, given the dense nature of natural habitats along with a suitable ungulate prey base.
Carnivora	Mustelidae	*Aonyx capensis*	African Clawless Otter	Near-Threatened	The species occupies aquatic freshwater areas and is seldom found far from water. It may occur in many seasonal or episodic rivers provided suitable-sized pools persist (Nel and Somers, 2007, Somers and Nel, 2013).	Medium	The species was not confirmed during the field survey, but has been recorded in the study area landscape (Appendix A). Certain portions of the proposed project footprint also overlap with freshwater environments (a small channelled non-perennial stream), however this stream is too small to support prey items for *A. capensis*, and it is highly unlikely that this species will occur within the project footprint.
Cetartiodactyla	Bovidae	*Pelea capreolus*	Grey Rhebok	Near-Threatened	The species is associated with the rocky hills of mountain fynbos. They are predominantly browsers, often feeding on ground-hugging forbs, and largely water independent, obtaining most of their water requirements from their food (Avenant 2013). Forbs constitute the majority of their diet, especially the flowers and leaves of the plants (Esser 1973, Rowe-Rowe 1983a, Beukes 1988). They require good grass cover within their home ranges for shelter and to hide from predators, but often use steep open areas with little cover when feeding. In the Western Cape, they are often observed on agricultural lands (Radloff 2008, C. Birss pers. obs. 2016).	Low	The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Furthermore, the proposed project footprint does not overlap with rocky hills or mountain habitat and it is certain that this species will not be present on the site.
Eulipotyphla	Soricidae	*Myosorex longicaudatus*	Long-tailed Forest Shrew	Endangered	The species is found in forests, forests edges, fynbos and boggy grassland, and depends on moist microhabitats (typically above the 800 mm isohyet). It is restricted to pristine primary habitat that has not been degraded (Baxter et al. 2020).	Medium	The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. Suitable near-pristine Fynbos habitat is, however, available for this species in the study area landscape. Even so, the spatial overlap with this habitat by the proposed project footprint represents a very small area, and should not impose on population dynamics within this species (if present).

Rodentia	Nesomyidae	*Mystromys albicaudatus*	White-tailed Rat	Vulnerable	The species' habitat requirements are not well known, but it appears associated with calcrete soils within grasslands. The species can occur in disturbed areas (heavily grazed, D. MacFadyen pers. obs.) and in sparse grasslands (Kuyler, 2000; Kaiser, 2006; Avenant and Cavallini, 2007; Avenant and Schulze, 2012; Morwe 2013), but does not occur in transformed habitat (croplands, fallow fields, or old fields). In the Blaauwberg Conservation Area (BCA), Western Cape Province it may occur in Dune Thicket on sloped clay soils.	Medium	The species was not confirmed during the field survey, and it has not been recorded in the study area landscape. A part of the study area landscape (towards the coast) does however contain Dune Thicket vegetation on sloped clay soils. Spatial overlap by the proposed project footprint with this habitat represents a very small area, and should not impact on population dynamics within this species (if present).
Accipitriformes	Accipitridae	*Buteo trizonatus*	Forest Buzzard	Near-Threatened	This species inhabits native temperate forests from sea level up to 1,000 m, and rarely to 1,500 m (Ferguson-Lees and Christie 2001). It can also be found in plantations, though usually near to areas of native forest (Ferguson-Lees and Christie 2001).	High	The species was not confirmed during the field survey, but has been recorded a high number of times (59 times) in the study area landscape recently (July 2023, Appendix B), likely owing to the large tracts of forest and woodland habitat. Even though suitable forest and woodland habitat is available for this species in the study area landscape, the proposed project footprint only overlaps with small sections of this habitat close to the urban edge, and it is unlikely that the proposed development will impact on population dynamics of this species.

Accipitriformes	Accipitridae	*Circus maurus*	Black Harrier	Endangered	The species occurs in coastal and montane Fynbos, highland grasslands, Karoo subdesert scrub, open plains with low shrubs and croplands (Curtis *et al*. 2004). In the Western Cape of South Africa it is most abundant in coastal and montane fynbos (Curtis *et al*. 2004), and loose colonies may aggregate around wetland areas. The Black Harrier prefers open ground with low vegetation for hunting, where it feeds mainly on small mammals, especially *Otomys* and *Rhabdomys* species, although its diet may also include birds and reptiles (Garcia-Heras *et al*. 2017). The main diet of the Black Harrier however constitutes the Four-striped Grass Mouse, *Rhabdomys pumilio* (Garcia-Heras *et al*. 2017). The species breeds close to coastal and upland marshes (damp sites, near vleis, marshes or streams are preferred for breeding), but may also nest in montane habitats, preferring south-facing slopes (Brown *et al*. 1982; Curtis *et al*. 2004). Nests are built on the ground in tall vegetation such as shrubs or reeds (Brown *et al*. 1982, Curtis *et al*. 2004). The species does not breed in transformed and cultivated lands, although it may forage in these environments (Curtis *et al*. 2004).	Low	The species was not confirmed during the field survey, and has been recorded only once in the study area landscape more than five years ago (August 2015, Appendix B). It is therefore highly unlikely that this species will be present on or near the site.
Accipitriformes	Accipitridae	*Circus ranivorus*	African Marsh Harrier	Least Concern	The species breeds in wetlands, foraging primarily over reeds and lake margins (Harrison *et al*. 1997). Its diet consists largely of small mammals, particularly striped mouse *Rhabdomys pumilio* (Kemp and Dean, 1988).	Low	The species was not confirmed during the field survey, and has been recorded only three times in the study area landscape more than five years ago (May 2017, Appendix B). It is therefore highly unlikely that this species will be present on or near the site.
Accipitriformes	Accipitridae	*Polemaetus bellicosus*	Martial Eagle	Endangered	The species inhabits open woodland, wooded savanna, bushy grassland, thornbush and, in southern Africa, more open country and even subdesert, from sea level to 3,000 m but mainly below 1,500 m (Ferguson-Lees and Christie, 2001). The main prey is sizeable mammals, birds and reptiles (Ferguson-Lees and Christie, 2001).	Medium	The species was not confirmed during the field survey, but has been recorded a number of times (five times) in the study area landscape recently (December 2022, Appendix B). Even though suitable open woodland habitat is available for this species in the study area landscape, the proposed project footprint does not overlap with large tracts of this habitat and it is unlikely that the proposed development will impact on population dynamics of this species (if present).

Accipitriformes	Accipitridae	*Stephanoaetus coronatus*	Crowned Eagle	Near-Threatened	The species inhabits forest, woodland, savanna and shrubland, as well as some modified habitats, such as plantations and secondary growth (Ferguson-Lees and Christie, 2001), and can persist in small forest fragments including urban greenspace forests (Dowsett-Lemaire and Dowsett, 2006, McPherson et al. 2016). It shows high resilience to heavy deforestation and degradation in some areas (F. Dowsett-Lemaire in litt., 2012), although such changes are assumed to cause local declines in population density. The use of exotic invasive trees (especially *Eucalyptus* and *Pinus* spp.) for nesting permits persistence in degraded and mosaic landscapes (McPherson et al. 2016).	Low	The species was not confirmed during the field survey, and it has been recorded only once in the study area landscape two years ago (January 2021, Appendix B). It is however highly unlikely that this species will be present on or near the site.
Accipitriformes	Sagittariidae	*Sagittarius serpentarius*	Secretarybird	Endangered	The species inhabits open landscapes, ranging from open plains and grasslands, to lightly wooded savanna, but is also found in agricultural areas and sub-desert (Ferguson-Lees and Christie, 2001), with up to 50% of recorded individuals in the Fynbos biome in winter being found in transformed environments (Hofmeyr *et al*. 2014). The species avoids areas of >20% wood cover (Loftie-Eaton, 2017). Although the species is nomadic, individuals which inhabit moist grassland tend to be less nomadic but may travel 20-30 km per day while foraging (Kemp and Kemp, 1977; Whitecross *et al*. 2019). The species preys on a variety of invertebrates (insects form 86% of the diet, Whitecross *et al*. 2019) and vertebrates (rodents, other mammals, lizards, snakes, eggs, young birds and amphibians, Kemp and Kemp, 1977; Ferguson-Lees and Christie, 2001). Breeding occurs throughout the year and the species typically nests in a flat-topped Acacia or other thorny tree (Ferguson-Lees and Christie, 2001).	Low	The species was not confirmed during the field survey, but has been recorded a number of times (eight times) in the study area landscape recently (July 2019, Appendix B). Even so, the site harbours dense vegetation and does not overlap with the lightly wooded or open habitats preferred by this species. To this end, it is unlikely that this species will be present on or near the site.

Galliformes	Gruidae	*Anthropoides paradiseus*	Blue Crane	Vulnerable	This species breeds in natural grass- and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short (Barnes, 2000). Occasionally it will breed in or near wetland areas (Barnes, 2000), in pans or on islands in dams (Hockey *et al*. 2005). Particularly in the Western Cape of South Africa, it also uses lowland agricultural areas, particularly pasture, fallow fields and cereal crop fields as stubble becomes available after harvest (Barnes, 2000, Hockey *et al*. 2005). During the non-breeding season the species inhabits short, dry, natural grasslands, as well as the Karoo and fynbos biomes (Barnes, 2000). In fynbos it occurs almost exclusively in cultivated habitats, largely avoiding the natural vegetation (Barnes, 2000), although this habitat may provide important cover for juveniles (Bidwell *et al*. 2006). The agricultural habitats that it uses include pastures, croplands, particularly where cereal crops are grown (Barnes, 2000), and fallow fields. It is intolerant of intensively grazed and burnt grassland (Hockey *et al*. 2005). It roosts in shallow wetlands (Barnes, 2000, Hockey *et al*. 2005).	Low	The species was not confirmed during the field survey, but has been recorded a high number of times (11 times) in the study area landscape recently (July 2023, Appendix B). Even so, the site harbours dense vegetation and does not overlap with the open habitats preferred by this species. To this end, it is unlikely that this species will be present on or near the site.
Otidiformes	Otididae	*Neotis denhami*	Denham's Bustard	Near-Threatened	The species inhabits grasslands, grassy *Acacia*-studded dunes, fairly dense shrubland, light woodland, farmland, crops, dried marsh and arid scrub plains, also grass-covered ironstone pans and burnt savanna woodland in Sierra Leone and high rainfall sour grassveld, planted pastures and cereal croplands in fynbos in South Africa (del Hoyo et al. 1996). It feeds on insects, small vertebrates and plant material (Collar, 1996).	Low	The species was not confirmed during the field survey, but has been recorded a high number of times (16 times) in the study area landscape recently (June 2023, Appendix B). Even so, the site harbours dense vegetation and does not overlap with the open habitats preferred by this species. To this end, it is unlikely that this species will be present on or near the site.
Passeriformes	Locustellidae	*Bradypterus sylvaticus*	Knysna Warbler	Vulnerable	The species occurs in thick, tangled vegetation along the banks of watercourses, or covering drainage lines in fynbos forest patches, or on the edges of afromontane forest. It breeds in dense understorey vegetation (Pryke et al. 2010).	Confirmed	The species was confirmed during the field survey, and has been recorded a high number of times (31 times) in the study area landscape recently (April 2023, Appendix B). Two individuals of this species were observed vocalising in the dense Fynbos habitats along the proposed pipeline route near the WWTP. The presence of this species is linked to the thick and tangled Fynbos vegetation on the site offering a dense understorey.

Piciformes	Picidae	*Campethera notata*	Knysna Woodpecker	Near-Threatened	The species is confined to coastal areas of forest, woodland, dense bush, *Euphorbia* scrub, or open country with large trees.	High	The species was not confirmed during the field survey, but has been recorded a high number of times (30 times) in the study area landscape recently (March 2023, Appendix B), likely owing to the large tracts of forest and woodland habitat. Even though suitable forest and woodland habitat is available for this species in the study area landscape, the proposed project footprint only overlaps with small sections of this habitat close to the urban edge and it is unlikely that the proposed development will impact on population dynamics of this species.
Procellariiformes	Procellariidae	*Ardenna grisea*	Sooty Shearwater	Near-Threatened	The species nests on islands and headlands in large colonies. Burrows are dug for breeding under tussock grass, low scrub and on the Snares Islands under Olearia forest. The species feeds on fish, crustacea and cephalopods, which are caught while diving.	Low	The species was not confirmed during the field survey, and has been recorded only twice in the study area landscape more than two years ago (December 2020, Appendix B). Furthermore, this species is strictly marine in its habitat requirements - a habitat type which is not present over the proposed project footprint. To this end, it is therefore highly unlikely that this species will be present on or near the site.
Podicipediformes	Podicipedidae	*Procellaria aequinoctialis*	White-chinned Petrel	Vulnerable	The species feeds on the Patagonian shelf and breeds on the Falkland Island (Phillips et al. 2006, Rexer-Huber et al. 2016). The non-breeding season is spent off the coasts of South Africa and Namibia (Barbraud et al. 2009). The species feeds on cephalopods, crustaceans and fish (Berrow and Croxall, 1999, Catard et al. 2000, Delord et al. 2010) and processing waste from fisheries or discarded longline baits.	Low	The species was not confirmed during the field survey, and has been recorded only twice in the study area landscape more than two years ago (October 2020, Appendix B). Furthermore, this species is strictly marine in its habitat requirements - a habitat type which is not present over the proposed project footprint. To this end, it is therefore highly unlikely that this species will be present on or near the site.
Suliformes	Phalacrocoracidae	*Phalacrocorax capensis*	Cape Cormorant	Endangered	This species is usually found in the Benguela Current less than 10 km from the coast (del Hoyo *et al*. 1992), although it does occasionally range as far as 70km offshore. During both the breeding and the non-breeding seasons it inhabits cliffs and ledges on the mainland and on offshore islands (Nelson, 2005). It is occasionally found in the brackish waters of coastal lagoons, estuaries and harbours (del Hoyo *et al*. 1992), but does not use these habitats for breeding. It occurs in highest densities in areas of suitable habitat near the recruitment grounds for pilchards (Clupeidae) and anchovies (Engraulidae.) (Crawford and Shelton, 1978).	High	The species was not confirmed during the field survey, but has been recorded a high number of times (38 times) in the study area landscape recently (July 2023, Appendix B). Even so, this species is associated with water bodies, and the only place over the proposed project footprint where it may occur is ephemerally within the WWTP. As such, it is unlikely that the proposed development will impact on population dynamics of this species.

Suliformes	Sulidae	*Morus capensis*	Cape Gannet	Endangered	This species is strictly marine. It prefers to nest on flat or gently sloping open ground on offshore islands, but will also use island cliffs as well as man-made structures such as guano platforms (Hockey et al. 2005). It most often forages within 120 km of the shore (Adams and Navarro 2005), particularly frequenting areas where purse-seine netting occurs (Nelson 2005). It occasionally wanders further offshore over the continental shelf (del Hoyo et al. 1992) where it benefits from the discards of deep-water stern trawlers (Nelson 2005).	Low	The species was not confirmed during the field survey, but has been recorded a high number of times (61 times) in the study area landscape recently (July 2023, Appendix B). Even so, this species is strictly marine in its habitat requirements - a habitat type which is not present over the proposed project footprint. To this end, it is therefore highly unlikely that this species will be present on or near the site.
Orthoptera	Acrididae	*Aneuryphymus montanus*	Yellow-winged Agile Grasshopper	Vulnerable	The species is associated with fynbos vegetation, where it has been collected "amongst partly burnt stands of evergreen Sclerophyll in rocky foothills" (Brown 1960). It prefers south-facing cool slopes (Kinvig 2005).	Low	The species was not confirmed during the field survey. Furthermore, suitable habitat (recently burnt Schlerophyll on south-facing slopes) for this species is not present on the site. To this end, it is highly unlikely that this species will occur here.

9.1 Conservation statuses of SCC in the study area

The presence of one avifaunal SCC (*Bradypterus sylvaticus*) was confirmed one the site, with three further avifaunal SCC (*Buteo trizonatus*, *Campethera notata* and *Phalacrocorax capensis*) likely also occurring within the study area landscape given suitable habitat characteristics (Table 4). As suitable habitat for *P. capensis* could only follow an ephemeral association to the existing man-made WWTP, this species is not considered during the impact assessment phase of this project.

Among the remaining three avifaunal SCC, no data on tis available on the Area Of Occupancy (AOO) of these species, however their on-site habitats currently form a very small part of their Extent Of Occurrence (EOO) and it is highly unlikely that their threat statuses may change if these habitats are destroyed. Given the confirmed or possible presence of all four SCC therefore, their on-site habitats are considered during calculation of SEI as well as during the impact assessment. In addition, the major threats to the persistence of these species (Table 5) are also taken into account during the impact assessment.

Table 5 Table showing the SCC confirmed or possibly occurring in the study area along with the full conservation status classification by the IUCN, the specific habitat for this SCC and its extent on the site, the listed Extent Of Occurrence (EOO) of the species and the proportion of the EOO which is encompassed by its on-site habitat. In addition, major threats to each species are shown, as listed by the IUCN (IUCN, 2021).

Species	Common name	IUCN status	Habitat on site	EOO (ha)	%EOO	Threats
Buteo trizonatus	Forest Buzzard	Near Threatened D1	Forest/Woodland (0.406 ha)	17 900 000	0.000002	Deforestation
Bradypterus sylvaticus	Knysna Warbler	Vulnerable B1ab(i,ii,iii,iv,v);C2a(i)	Forest/Woodland (0.406 ha); Fynbos (0.563)	251 999	0.0004	Habitat loss as a result of clearance of coastal forests. Burning of fire-breaks adjacent to forests and uncontrollable wildfires. Inbreeding depression.
Campethera notata	Knysna Woodpecker	Near Threatened C2a(ii); D1	Forest/Woodland (0.406 ha)	17 900 000	0.000002	Clearance of coastal bush and township development.
Phalacrocorax capensis	Cape Cormorant	Endangered A2bc+3bc+4bc	WWTP	106000000	N.A.	Shortage of food due to commercial overfishing. Oil pollution. Predation (of eggs, chicks and fledgelings) by Great White Pelican, Fur Seal, Sacred Ibis and Kelp Gull. Avian Cholera. Guano mining.

10. Evaluation of Site Ecological Importance (SEI)

10.1 Evaluating SEI for habitats in the study area

Evaluation of the Site Ecological Importance (SEI) for the habitats of SCC confirmed or possibly occurring in the study area was performed following the methods and criteria outlined in the Species Environmental Assessment Guideline (SANBI, 2020). Evaluation of SEI was performed only for avifauna (given the higher likelihood of SCC from this faunal group being present over the site, Table 4) considering their habitat requirements (Section 9) in conjunction with the spatial distribution of habitats within the project footprint (Section 7). In short, SEI is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/faunal community or habitat type present on the site) and its resilience to impacts (Receptor Resilience, RR) as follows: SEI = BI + RR. Biodiversity Importance (BI) is in turn a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows: BI = CI + FI.

To calculate the Conservation Importance (CI) and Functional Integrity (FI) of each habitat within the study area, the criteria outlined in Table 6 and Table 7 were respectively used.

According to the Species Environmental Assessment Guideline, Conservation Importance (CI) may defined as follows:

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.*"

Table 6 Conservation importance (CI) criteria (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

Conservation Importance (CI)	Fulfilling Criteria
Very high	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

According to the guideline, Functional Integrity (FI) is defined as:

Functional integrity (FI): "*The receptors' current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions. Simply stated, FI is: 'A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts.*"

Table 7 Functional integrity (FI) criteria (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

Functional Integrity (FI)	Fulfilling Criteria
Very high	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing).
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

Based on assessments of CI and FI for habitats within the study area, the Biodiversity Importance (BI) of each habitat was calculated using the matrix in Table 8 (based on the formula: BI = CI + FI). As Biodiversity Importance (BI) is a function of Conservation Importance (CI) and the Functional Integrity (FI) of a receptor, BI can be derived from a simple matrix of CI and FI as follows:

Table 8 Matrix for calculating Biodiversity Importance (BI) (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

Biodiversity Importance (BI)		**Conservation Importance (CI)**				
		Very high	High	Medium	Low	Very low
Functional Integrity (FI)	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

Finally, the Receptor Resilience for each habitat was evaluated following the criteria listed in Table 9. According to the Species Assessment Guidelines, Receptor resilience (RR) may defined as follows:

Receptor resilience (RR): "*The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention.*"

Table 9 Receptor Resilience (RR) criteria (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

Receptor Resilience (RR)	**Fulfilling Criteria**
Very high	Habitat that can recover rapidly (~ less than 5 years) to restore > 75%28 of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Taken together, the Site Ecological Importance (SEI) was calculated for each habitat within the study area using the formula: SEI = BI + RR, and following the matrix outlined in Table 10. The interpretation of the development actions allowed for each SEI category are outlined in Table 11.

Table 10 Matrix for calculating Site Ecological Importance (SEI) (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

Site Ecological Importance (SEI)		**Biodiversity Importance (BI)**				
		Very high	High	Medium	Low	Very low
Receptor Resilience (RR)	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

Table 11 Guidelines for interpreting SEI in the context of the proposed development activities (table adapted from the Species Environmental Assessment Guideline, SANBI, 2020).

Site Ecological Importance (SEI)	**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.

10.2 SEI for avifaunal SCC habitats in the study area

The SEI results for avifaunal SCC habitats within the study area are given in Table 12 with the spatial representation for each habitat and its concomitant SEI category portrayed in Figure 21. Although all the natural habitats on the site offer suitable habitat for the confirmed or possibly occurring avifaunal SCC, the project footprint itself is of a very small spatial extent, meaning that the footprint overlaps with less than one hectare of each habitat type. In addition, it is highly likely that all avifaunal species will return to area adjacent to the project footprint when the disturbances from the construction phase have ceased (also see Section 11). Taken together, this renders habitats over the project footprint as of a “Very low” SEI, allowing for development activities of medium to high impact without restoration activities being required (Table 10).

Table 12 Evaluation of SEI for avifaunal SCC habitats within the study area. BI = Biodiversity Importance, RR = Receptor Resilience.

Habitat type	Conservation Importance	Functional Integrity	Receptor Resilience	Site Ecological Importance
Forest/Woodland	**High** - Potential suitable habitat for *B. trizonatus* classified as "Near-Threatened" under Criterion D, *B. sylvaticus* classified as "Vulnerable" under Criteria B and C, and *C. notata* classified as "Near-Threatened" under Criteria C and D.	**Very low** - Very small area (<1 hectare)	**Very high** - Because the proportion of this habitat impacted by the proposed development is very small (<1 hectare), the avifaunal species composition of the surrounding landscape will remain unaltered, and will traverse the site again as soon as the development disturbances has ceased.	**Very low** - BI = Low; RR = Very high
Fynbos	**High** - Confirmed presence of *B. sylvaticus* classified as "Vulnerable" under Criteria B and C.	**Very low** - Very small area (<1 hectare)	**Very high** - Because the proportion of this habitat impacted by the proposed development is very small (<1 hectare), the avifaunal species composition of the surrounding landscape will remain unaltered, and will traverse the site again as soon as the development disturbances has ceased.	**Very low** - BI = Low; RR = Very high
Alien vegetation	**High** - Potential suitable habitat for *B. trizonatus* classified as "Near-Threatened" under Criterion D, and *C. notata* classified as "Near-Threatened" under Criteria C and D.	**Very low** - Very small area (<1 hectare). Furthermore, this habitat exhibits several major impacts (a high incidence of alien and invasive vegetation.	**Very high** - Because the proportion of this habitat impacted by the proposed development is very small (<1 hectare), the avifaunal species composition of the surrounding landscape will remain unaltered, and will traverse the site again as soon as the development disturbances has ceased. Furthermore, this habitat exists in an altered state (given the presence of alien and invasive vegetation) and can only recover to this state.	**Very low** - BI = Low; RR = Very high

Figure 21 Spatial representation of the SEI of avifaunal SCC habitats within the study area.

11. Current impacts, project-related impacts, mitigation measures and impact assessment

11.1 Current impacts

Current impacts within the study area include the following:

- The study area is spatially proximate to a residential area from where daily noise and vibration is evident.
- The western part of the project footprint overlaps with the existing WWTP, with the eastern section located largely within a residential area.
- A small central portion of the project footprint contains a high incidence of alien and invasive vegetation with little remaining natural vegetation.

These minor impacts do not appear to impinge on biodiversity patterns and processes within the study area landscape, adding to the intactness of ecosystem characteristics here (see Subsection 8.6).

11.2 Anticipated project impacts

Planned development activities for the study area will include:

- The upgrading of the existing Pump Station No.1 (PS 1).
- Construction of a new Screening and De-gritting Pump Station (PS 2).
- Construction of a new 250mm diameter rising main parallel to the existing rising main from the New Screening and De-gritting Pump Station (PS2) to the Herold's Bay Waste Water Treatment Plant (WWTP).
- Construction of a new rising main from the Herold's Bay Pump Station (PS 1) to the new screening and de-gritting pump station.

Impacts from these activities during the construction phase will include:

- Destruction of habitat,

- direct mortality of fauna, and
- vibration and noise (from machinery and people).

During the operational phase, the new rising main, screening and de-gritting pump stations will have been constructed and in operation. Because noise and vibration from the pump stations (PS1 and PS2) will be of a low degree, direct impacts during the operational phase will be of an inconsequential nature to the faunal and avifaunal biodiversity in the surrounding landscape. Should a temporary or permanent access road be constructed, however, this may bring novel indirect impacts into this landscape including:

- Vehicles and foot traffic into parts of the site which have previously been inaccessible,
- collision of fauna with vehicles,
- illegal waste dumping,
- illegal hunting, and
- the potential of a fire risk through open fires.

11.3 Impact management actions and mitigation measures

The project footprint will be of a limited spatial extent and impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. As such, this renders the entire proposed project footprint as developable from a faunal perspective (Figure 22).

It is, however, recommended that the new rising main be placed below-ground so as not to impede faunal movement within the study area landscape. To this end, topsoil should be removed, the rising main installed, and the topsoil levelled over the rising main so as to rehabilitate this area (i.e., rehabilitation mitigation). Furthermore, it is recommended that the project footprint be kept at the absolute minimum necessary to obtain project outcomes (i.e, minimisation mitigation).

In addition, every effort should be made to save and relocate any mammal, reptile, amphibian, bird, or invertebrate that cannot flee of its own accord, encountered during site preparation (i.e., to avoid and minimise the direct mortality of faunal species). These animals should be relocated to a suitable habitat area immediately outside the project footprint (in the adjoining natural habitats), but under no circumstance to an area further away.

Should a temporary or permanent access road be constructed, this road should be access controlled so as not to allow novel indirect impacts into this previously undisturbed part of the landscape. Access control should also be applied to the new rising main footprint, as this may also be used as a potential access road. Finally, irrespective of the development alternative selected, it is recommended alien and invasive vegetation should be cleared by hand and all regrowth and seed germination be monitored any new recruitment be removed.

Figure 22 "Constraints and Opportunities" map of the study area landscape showing areas which are suitable for potential development.

11.4 Development alternatives

For the proposed development, two alternatives (Alternatives 1 and 2) were identified which both will be of a similar spatial layout, and will include the following:

- The upgrading of the existing Pump Station No.1 (PS 1).
- Construction of a new Screening and De-gritting Pump Station (PS 2).
- Construction of a new 250mm diameter rising main parallel to the existing rising main from the New Screening and De-gritting Pump Station (PS2) to the Herold's Bay Waste Water Treatment Plant (WWTP).
- Construction of a new rising main from the Herold's Bay Pump Station (PS 1) to the new screening and de-gritting pump station.

Even so, these alternatives differ slightly in the spatial extent and construction method of the new rising main.

11.4.1 Alternative 1

Under this alternative, the area for the new rising main (pipeline) will be cleared by hand. This alternative will have a smaller overall disturbance footprint (<3m), and will also be rehabilitated and allowed to regenerate naturally. At the eastern section, the rising main will traverse the steep slope through the construction of plinths.

11.4.2 Alternative 2 (preferred alternative)

After recent meetings with the engineers and George Municipality, it has become evident that the initial plinths for the steep section will not be possible due to engineering and financial restraints. To this end, Alternative 2 will include the following:

- The pipeline will be buried below ground in an excavated trench.
- A permanent access road will be constructed for maintenance purposes in the event of failures.

- A 30m corridor around the pipeline will be needed for the insertion of the pipeline (in the event of rock, outcrops, etc. being located on the route which will necessitate the pipeline to be shifted slightly).
- Within that 30m corridor a 10m-12m working area footprint is expected to be disturbed.
- Within that 10m-12m working area a 3m permanent disturbance/scar will remain (for the maintenance road).

To this end, a permanent disturbance footprint will remain as an access road, with the remainder of the 10m-12m working area footprint rehabilitated and allowed to regenerate naturally.

11.4.3 “No-Go” alternative

Under this alternative, the *status quo* will be maintained and all current impacts (as listed in Subsection 11.1) will remain over the site.

11.5 Impact assessment

11.5.1 Methodology

The assessment criteria for this impact assessment were based on, and adapted from, the Guideline on Impact Significance, Integrated Environmental Management Information Series 5, Department of Environmental Affairs and Tourism (DEAT, 2002) and the Guideline 5: Assessment of Alternatives and Impacts in Support of the Environmental Impact Assessment Regulations (DEAT, 2006). In short, the following criteria was used for this assessment:

Determination of Extent (Scale):

Site specific	On site or within 100 m of the site boundary, but not beyond the property boundaries.
Local	The impacted area includes the whole or a measurable portion of the site and property, but could affect the area surrounding the development, including the neighbouring properties and wider municipal area.
Regional	The impact would affect the broader region (e.g., neighbouring towns) beyond the boundaries of the adjacent properties.
National	The impact would affect the whole country (if applicable).

Determination of Duration:

Temporary	The impact will be limited to the construction phase.
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than 8 months after the completion of the construction phase.
Medium term	The impact will last up to the end of the construction phase, where after it will be entirely negated in a period shorter than 3 years after the completion of construction activities.
Long term	The impact will continue for the entire operational lifetime of the development but will be mitigated by direct human action or by natural processes thereafter.
Permanent	This is the only class of impact that will be non-transitory. Such impacts are regarded to be irreversible, irrespective of what mitigation is applied.

Determination of Consequence significance:

Negligible	The impact would result in negligible to no consequences
Low	The impact would result in insignificant consequences
Medium	The impact would result in minor consequences
High	The impact would result in significant consequences

Determination of Probability:

Improbable	The possibility of the impact occurring is very low, due either to the circumstances, design or experience.
Probable	There is a possibility that the impact will occur to the extent that provisions must therefore be made.
Highly probable	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up to mitigate the activity before the activity commences.
Definite	The impact will take place regardless of any prevention plans.

Determination of Loss of Resources:

No loss of resource	The impact will not result in the loss of any resources
Marginal loss of resource	The impact will result in marginal loss of resources
Significant loss of resources	The impact will result in significant loss of resources
Complete loss of resources	The impact will result in a complete loss of all resources

Determination of Reversibility:

Completely Reversible	The impact is reversible with implementation of minor mitigation measures
Partly Reversible	The impact is partly reversible but more intense mitigation measures
Barely Reversible	The impact is unlikely to be reversed even with intense mitigation measures
Irreversible	The impact is irreversible, and no mitigation measures exist

Determination of Degree to which an Impact can be Mitigated:

Can be mitigated	The impact is reversible with implementation of minor mitigation measures
Can be partly mitigated	The impact is partly reversible but more intense mitigation measures
Can be barely mitigated	The impact is unlikely to be reversed even with intense mitigation measures
Not able to mitigate	The impact is irreversible, and no mitigation measures exist

Determination of Cumulative Impact:

Negligible	The impact would result in negligible to no cumulative effects
Low	The impact would result in insignificant cumulative effects
Medium	The impact would result in minor cumulative effects
High	The impact would result in significant cumulative effects

Determination of Significance (without mitigation):

No significance	The impact is not substantial and does not require any mitigation action.
Low	The impact is of little importance but may require limited mitigation.
Medium	The impact is of sufficient importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
Medium-High	The impact is of high importance and is therefore considered to have a negative impact. Mitigation is required to manage the negative impacts to acceptable levels.
High	The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.
Very High	The impact is critical. Mitigation measures cannot reduce the impact to acceptable levels. As such the impact renders the proposal unacceptable.

Determination of Significance (with mitigation):

No significance	The impact will be mitigated to the point where it is regarded to be insubstantial.
Low	The impact will be mitigated to the point where it is of limited importance.
Medium	Notwithstanding the successful implementation of the mitigation measures, the impact will remain of significance. However, taken within the overall context of the project, such a persistent impact does not constitute a fatal flaw.
High	Mitigation of the impact is not possible on a cost-effective basis. The impact continues to be of great importance, and taken within the overall context of the project, is considered to be a fatal flaw in the project proposal.

11.5.2 Impact assessment

The impact assessment for the receiving environment in the current study was performed both proposed alternatives (Alternatives 1 and 2) considering both the construction and operational phases of the development (Tables 13 and 14), and was contrasted against the “No-Go” alternative (Tables 15).

The project footprint under both alternatives will be of a limited spatial extent (albeit slightly larger in the case of Alternative 2) and impacts will be of a localised and relatively short term, ending at the construction phase. Even so, Alternative 2 will result in a wider affected area to be rehabilitated at the end of the construction phase (and will leave a permanent scar of the permanent access road). To this end, impacts from Alternative 2 will be of a slightly higher significance to the receiving environment compared to Alternative 1.

At the onset of the operational phase, Alternative 1 will comprise a temporary access road and / or new rising main footprint, while Alternative 2 will comprise a permanently cleared access road. Given that these open areas may result in novel indirect impacts in parts of the site which was previously inaccessible, access control of the project footprint may be required to manage these indirect impacts. To this end, these impacts may be managed to an insignificant level.

Should the “No-Go” alternative be selected, the status quo will be maintained and the presence of alien and invasive vegetation over a small part of the site may continue to abstract fresh water from the environment and degrade the surrounding habitat structure over the long term. This impact is, however, completely reversible through clearing this alien and invasive vegetation.

Taken together therefore, although both alternatives will generally be of a similar spatial layout, the significance of Alternative 2 to the receiving environment will be slightly higher compared to Alternative 1, given different construction methods, a wider temporary footprint and the establishment of a permanent access road. Taking into account the engineering constraints of the project along with the need to balance environmental outcomes with the need for upgrading infrastructure from a municipal perspective, development under the preferred Alternative 2 will still be acceptable from a faunal perspective, as this will not drastically affect biodiversity and ecological patterns in the broader landscape over the short term, and that indirect impacts may be managed to an insignificant level over the long term.

Table 13 Impact assessment of Alternative 1 (considering both the construction and operational phases of the project).

Alternative:	Alternative 1
PHASE:	Construction phase
Potential impact and risk:	Destruction of habitat; Direct mortality of fauna; Vibration and noise
Nature of impact:	Destruction of habitat; Direct mortality of fauna; Vibration and noise
Extent and duration of impact:	These impacts will be site specific and restricted to the proposed project footprint. These impacts will also be temporary, and will cease at the end of the construction phase
Consequence of impact or risk:	Low - Impacts would result in insignificant consequences given the limited spatial extent of the project footprint in a habitat of "Very low" SEI.
Probability of occurrence:	It is improbable that these impacts will occur due to circumstances and design (vegetation clearing by hand, a spatially limited project footprint and a very short duration of the impact).
Degree to which the impact may cause irreplaceable loss of resources:	Marginal loss of resource - These impacts will result in marginal loss of resources (a very small impacted area).

Degree to which the impact can be reversed:	Completely Reversible - These impacts are reversible with implementation of minor mitigation measures (rehabilitation of the natural parts impacted over the project footprint), and will cease at the end of the construction phase.
Indirect impacts:	None identified.
Cumulative impact prior to mitigation:	Low - Impacts would result in insignificant cumulative effects.
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	Low - The impacts are of little importance but may require limited mitigation.
Degree to which the impact can be avoided:	N/A
Degree to which the impact can be managed:	N/A
Degree to which the impact can be mitigated:	High - Given that the proposed footprint is already relatively small, these impacts should not influence faunal biodiversity or ecological patterns in the broader study area landscape.
Proposed mitigation:	Destruction of habitat should be limited to the smallest project footprint possible (i.e., minimisation mitigation). This footprint should be rehabilitated and allowed to regenerate naturally. In addition, every effort should be made to save and relocate any mammal, reptile, amphibian, bird, or invertebrate that cannot flee of its own accord, encountered during site preparation (i.e., to avoid and minimise the direct mortality of faunal species). These animals should be relocated to a suitable habitat area immediately outside the project footprint (in the adjoining natural habitats), but under no circumstance to an area further away. Vibration and noise through machinery, vehicles and people are unavoidable during the construction and no mitigation measures are suggested.
Residual impacts:	None identified.
Cumulative impact post mitigation:	None identified.
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	No significance - The impact will be mitigated to the point where it is regarded to be insubstantial.
Alternative:	Alternative 1
PHASE:	Operational phase
Potential impact and risk:	The temporary access road and / or new rising main footprint may lead to vehicles and foot traffic into parts of the site which have previously been inaccessible. This may cause collision of fauna with vehicles, illegal waste dumping, illegal hunting, and the potential of a fire risk through open fires.

Nature of impact:	The temporary access road and / or new rising main footprint may lead to vehicles and foot traffic into parts of the site which have previously been inaccessible. This may cause collision of fauna with vehicles, illegal waste dumping, illegal hunting, and the potential of a fire risk through open fires.
Extent and duration of impact:	These impacts will be site specific and will persist over a short term through mitigation and through natural processes.
Consequence of impact or risk:	Medium
Probability of occurrence:	Probable - There is a possibility that the impact will occur to the extent that provisions must therefore be made.
Degree to which the impact may cause irreplaceable loss of resources:	Marginal loss of resource
Degree to which the impact can be reversed:	Completely Reversible
Indirect impacts:	Vehicles and foot traffic into parts of the site which have previously been inaccessible, collision of fauna with vehicles, illegal waste dumping, illegal hunting, and the potential of a fire risk through open fires.
Cumulative impact prior to mitigation:	Negligible
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	Medium-High - The impact is of high importance and is therefore considered to have a negative impact. Management actions are required to manage the negative impacts to acceptable levels.
Degree to which the impact can be avoided:	N/A
Degree to which the impact can be managed:	N/A
Degree to which the impact can be mitigated:	High - This impact may be managed through access control of the temporary access roads and / or new rising main footprint.
Proposed mitigation:	Access control of the permanent access road and / or new rising main footprint.
Residual impacts:	None identified.
Cumulative impact post mitigation:	None identified.
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	No significance

Table 14 Impact assessment of Alternative 2 (considering both the construction and operational phases of the project).

Alternative:	Alternative 2 (preferred alternative)
PHASE:	Construction phase
Potential impact and risk:	Destruction of habitat; Direct mortality of fauna; Vibration and noise
Nature of impact:	Destruction of habitat; Direct mortality of fauna; Vibration and noise
Extent and duration of impact:	These impacts will be site specific and restricted to the proposed project footprint, albeit over a slightly larger area than Alternative 1. These impacts will also be temporary, and will cease at the end of the construction phase
Consequence of impact or risk:	Low - Impacts would result in insignificant consequences given the limited spatial extent of the project footprint in a habitat of "Very low" SEI.
Probability of occurrence:	It is probable that these impacts will occur due to a slightly larger footprint and vegetation clearing by machinery, but the project footprint will still be of a spatially limited nature and the impacts of a very short duration.
Degree to which the impact may cause irreplaceable loss of resources:	Marginal loss of resource - These impacts will result in marginal loss of resources (a loss of mostly "Least Concern" species over a very small impacted area).
Degree to which the impact can be reversed:	Partly Reversible - These impacts are partly reversible with implementation of some minor mitigation measures (relocation of less mobile fauna encountered over the project footprint and rehabilitation of the 10m-12m working area footprint), however the 3m access road scar will remain in place into the operational phase of the project.
Indirect impacts:	None identified.
Cumulative impact prior to mitigation:	Low - Impacts would result in insignificant cumulative effects.
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	Medium - The impact is of sufficient importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
Degree to which the impact can be avoided:	N/A
Degree to which the impact can be managed:	N/A
Degree to which the impact can be mitigated:	High - Given that the proposed footprint is already relatively small, should not influence faunal biodiversity or ecological patterns in the broader study area landscape.

Proposed mitigation:	Destruction of habitat should be limited to the smallest project footprint possible (i.e., minimisation mitigation). The 10m-12m working area footprint should be rehabilitated and allowed to regenerate naturally. In addition, every effort should be made to save and relocate any mammal, reptile, amphibian, bird, or invertebrate that cannot flee of its own accord, encountered during site preparation (i.e., to avoid and minimise the direct mortality of faunal species). These animals should be relocated to a suitable habitat area immediately outside the project footprint (in the adjoining natural habitats), but under no circumstance to an area further away. Vibration and noise through machinery, vehicles and people are unavoidable during the construction and no mitigation measures are suggested.
Residual impacts:	None identified.
Cumulative impact post mitigation:	None identified.
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	Low - The impact will be mitigated to the point where it is of limited importance.
Alternative:	Alternative 2 (preferred layout)
PHASE:	Operational phase
Potential impact and risk:	The permanent access road may lead to vehicles and foot traffic into parts of the site which have previously been inaccessible. This may cause collision of fauna with vehicles, illegal waste dumping, illegal hunting, and the potential of a fire risk through open fires.
Nature of impact:	The permanent access road may lead to vehicles and foot traffic into parts of the site which have previously been inaccessible. This may cause collision of fauna with vehicles, illegal waste dumping, illegal hunting, and the potential of a fire risk through open fires.
Extent and duration of impact:	These impacts will be site specific but will continue for the entire operational lifetime of the development unless managed / mitigated by direct human action.
Consequence of impact or risk:	Medium
Probability of occurrence:	Probable - There is a possibility that the impact will occur to the extent that provisions must therefore be made.
Degree to which the impact may cause irreplaceable loss of resources:	Marginal loss of resource
Degree to which the impact can be reversed:	Completely Reversible
Indirect impacts:	Vehicles and foot traffic into parts of the site which have previously been inaccessible, collision of fauna with vehicles, illegal waste dumping, illegal hunting, and the potential of a fire risk through open fires.
Cumulative impact prior to mitigation:	Negligible

Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	Medium-High - The impact is of high importance and is therefore considered to have a negative impact. Management actions are required to manage the negative impacts to acceptable levels.
Degree to which the impact can be avoided:	N/A
Degree to which the impact can be managed:	N/A
Degree to which the impact can be mitigated:	High - This impact may be managed through access control of the permanent access road.
Proposed mitigation:	Access control of the permanent access road.
Residual impacts:	None identified.
Cumulative impact post mitigation:	None identified.
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	No significance

Table 15 Impact assessment of the “No-Go” alternative.

Alternative:	"No-Go" alternative
PHASE:	N/A
Potential impact and risk:	A high incidence of alien and invasive vegetation over a small portion of the site.
Nature of impact:	A high incidence of alien and invasive vegetation over a small portion of the site.
Extent and duration of impact:	A high incidence of alien and invasive vegetation is restricted to a small portion of the project footprint, and a small part to the north of the site. This impact may be managed over a relatively short period by human actions.
Consequence of impact or risk:	This small area of alien and invasive vegetation may result in insignificant consequences over a short period (consumption of fresh water and degradation of the natural vegetation).
Probability of occurrence:	Probable - There is a possibility that the impact will occur to the extent that provisions must therefore be made (i.e., clearing of alien and invasive vegetation).
Degree to which the impact may cause irreplaceable loss of resources:	Alien and invasive vegetation may cause a consumption of fresh water and degradation of the natural vegetation.
Degree to which the impact can be reversed:	Completely Reversible - These impacts are reversible with implementation of management actions (clearing of alien and invasive vegetation).
Indirect impacts:	None identified.
Cumulative impact prior to mitigation:	Low - Impacts would result in insignificant cumulative effects.
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	Low - The impact is of little importance but may require limited mitigation.
Degree to which the impact can be avoided:	N/A
Degree to which the impact can be managed:	High
Degree to which the impact can be mitigated:	N/A
Proposed mitigation:	Alien and invasive vegetation should be cleared by hand and all regrowth and seed germination be monitored any new recruitment should be removed.
Residual impacts:	None identified.
Cumulative impact post mitigation:	None identified.
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High):	No significance - The impact will be mitigated to the point where it is regarded to be insubstantial.

12. Conclusion

12.1 Listed sensitivity in the DFFE Screening Tool Report

The results from this report confirm the “High” site sensitivity as identified in the DFFE Screening Tool Report (Figure 1, Section 3). This follows from the confirmed occurrence of the *B. sylvaticus* in the study area landscape - one of the avifaunal SCC listed in the Screening Tool Report (Table 1). Furthermore, habitats in the study area landscape may harbour potential subpopulations of three further avifaunal SCC, confirming the requirement for this Impact Assessment.

12.2 Overlap with Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

The project footprint intersects a terrestrial CBA over the central section, and over a small part in the eastern section (Subsection 4.6). Furthermore, an aquatic CBA is located to the north of the central section of the footprint. The part of the footprint in the western section adjacent to the WWTP overlaps with a degraded CBA (CBA2).

Given that the central section of the project footprint includes natural habitats in a pristine condition and which provides suitable habitat for both confirmed and possibly occurring subpopulations of avifaunal SCC, these areas may indeed be regarded as terrestrial CBA defined as: “*Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.*” Management objectives for terrestrial CBA include: *“Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate*.”

Given that the project footprint only intersects these CBA over a very small area (<1 hectare), that the area may be rehabilitated at the end of the construction phase, and that the resident faunal components are highly likely to remain in the study area landscape, and will return once any disturbance has ceased, the current provided project layout is acceptable as this will not cause irreversible loss of biodiversity and

ecosystem dynamics or impact highly on SCC subpopulations (also see Section 11). Similarly, the part of the footprint in the western section adjacent to the WWTP is also developable, as it currently intersects an already modified area.

Finally, a large part in the eastern section of the footprint intersects a degraded ESA (ESA2) which appears to follow the drainage line of the non-perennial stream in this area. Even so, the flow of this stream has been changed by man-made berms (Section 7). To this end, development in this area is also supported, given that the flow of this stream has already been changed.

12.3 Conclusion

This report provides a representative faunal and avifaunal assessment of the study area considering facets of:

- Terrestrial faunal and avifaunal habitat composition (Section 7),
- terrestrial faunal and avifaunal components (Section 8),
- the presence of any terrestrial faunal and avifaunal SCC on the site (Section 9),
- the conservation status and on-site habitats of, and threats to these SCC (Section 9),
- the SEI of habitats within the study area, with associated acceptable development activities (Section 10),
- mitigation measures and impact management actions to be implemented during the construction phase of the project along with a “Constraints and opportunities” map of the site (Section 11), and
- an impact assessment considering two development alternatives (Alternatives 1 and 2) including both the construction and operational phases of the project, and contrasted against the “No-Go” alternative (Section 11).

Taken together, the results of the report indicate the following:

- The central section of the project footprint harbours the most intact habitats, intersecting intact Fynbos and Forest/Woodland habitats, with the western section of the intersecting the existing WWTP and the eastern section largely located within the existing residential area. Collectively, only a small part (<1 hectare) of the proposed footprint overlaps with intact natural habitats (Section 7).
- Faunal and avifaunal diversity and abundances appears high over the study area landscape and is largely comprised of relatively common species of "Least Concern" (IUCN, 2021), albeit one avifaunal SCC, the Knysna Warbler (*Bradypterus sylvaticus*) is present in the thick and tangled vegetation Fynbos vegetation which offers a dense understory (Sections 8 and 9).
- The presence of one avifaunal SCC, the Knysna Warbler (*Bradypterus sylvaticus*), was confirmed one the site, with three further avifaunal SCC likely also occurring within the study area landscape given suitable habitat characteristics (Section 9).
- Although all the natural habitats on the site offer suitable habitat for the confirmed or possibly occurring avifaunal SCC, the project footprint itself is of a very small spatial extent, intersecting <1 hectare of natural habitat. In addition, it is highly likely that all avifaunal species will remain in areas adjacent to the project footprint, and will return when the disturbances from construction have ceased. This renders habitats over the project footprint as of a "Very low" SEI, allowing for development activities of medium to high impact without restoration activities being required (Section 10).
- Only minor current impacts are evident within the study area landscape (Section 11).
- Planned development activities for the study area will be restricted to the construction phase (Section 11). During the operational phase, a temporary or permanent access road will be constructed which may bring novel impacts into the landscape.
- The project footprint under both alternatives will be of a limited spatial extent and impacts will be of a localised and relatively short term, ending at the

construction phase (Section 11). Even so, Alternative 2 will result in a wider affected area to be rehabilitated at the end of the construction phase. To this end, impacts from Alternative 2 will be of a slightly higher significance to the receiving environment compared to Alternative 1.

- At the onset of the operational phase, Alternative 1 will comprise a temporary access road and / or new rising main footprint, while Alternative 2 will comprise a permanently cleared access road. Given that these open areas may result in novel indirect impacts in parts of the site which was previously inaccessible, access control of the project footprint may be required to manage these indirect impacts (Section 11).
- Should the “No-Go” alternative be selected, the status quo will be maintained and the presence of alien and invasive vegetation over a small part of the site may continue to abstract fresh water from the environment and degrade the surrounding habitat structure over the long term (Section 11). This impact is, however, completely reversible through clearing this alien and invasive vegetation.

Taken together therefore, the project footprint under both development alternatives (Alternatives 1 and 2) will generally be of a similar spatial layout and will be of a limited spatial extent. To this end, direct impacts will be of a localised and very short nature (less than a year), and will cease at the end of the construction phase. Although the significance of Alternative 2 (the preferred alternative) to the receiving environment will be slightly higher compared to Alternative 1 (given different construction methods, a wider temporary footprint and the establishment of a permanent access road), this alternative takes into account the engineering constraints of the project along with the need to balance environmental outcomes with the need for upgrading infrastructure from a municipal perspective.

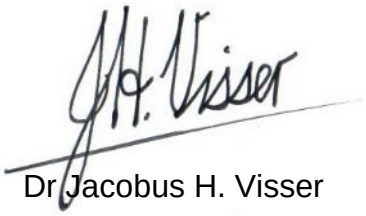
To this end, development under the preferred Alternative 2 will be acceptable from a faunal perspective as direct impacts on the receiving environment will result in only minor to insignificant loss or deterioration of faunal biodiversity in the receiving environment over the short term, and indirect impacts may be effectively managed

over the long term. To this end, the development layout under Alternative 2 is supported from a faunal biodiversity perspective.

13. Conditions to which this statement is subjected

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Since environmental impact studies deal with dynamic natural systems, additional information may come to light at a later stage which is not listed in this report. As such, the conclusions and recommendations made in this report are done in good faith based on information gathered at the time of the investigation.

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



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Appendix A

Appendix A Desktop species list of the mammal species which have a distribution overlapping with the study area (constructed with reference to Skinner and Chimimba, 2005). Species in bold have been previously recorded within the study area landscape (QDGS: 3422AC, MammalMAP, https://vmus.adu.org.za/; iNaturalist, www.iNaturalist.org). For each species, the taxonomic Order, Family, species binomial name and common name is shown, along with the current IUCN Red List classification of the species.

Mammals Desktop Species List				
Order	**Family**	**Species**	**Common name**	**Status**
Afrosoricida	Chrysochloridae	*Chlorotalpa duthieae*	Duthie's Golden Mole	Vulnerable
		Amblysomus corriae	Fynbos Golden Mole	Near-Threatened
		Amblysomus hottentotus	Hottentot Golden Mole	Least Concern
Carnivora	Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern
		Otocyon megalotis	Bat-eared Fox	Least Concern
		Vulpes chama	Cape Fox	Least Concern
	Felidae	*Caracal caracal*	Caracal	Least Concern
		Felis silvestris	African Wild Cat	Least Concern
		Leptailurus serval	Serval	Least Concern
		Panthera pardus	Leopard	Vulnerable
	Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern
	Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern
		Cynictis penicillata	Yellow Mongoose	Least Concern
		Herpestes ichneumon	Egyptian Mongoose	Least Concern
		Herpestes pulverulentus	**Cape grey Mongoose**	**Least Concern**
	Mustelidae	***Aonyx capensis***	**African Clawless Otter**	**Near-Threatened**
		Ictonyx striatus	Zorilla	Least Concern
		Mellivora capensis	Honey Badger	Least Concern

		Poecilogale albinucha	African Striped Weasel	Least Concern
	Viverridae	*Genetta genetta*	Common Genet	Least Concern
		Genetta tigrina	**Cape Genet**	**Least Concern**
Cetartiodactyla	Bovidae	*Oreotragus oreotragus*	Klipspringer	Least Concern
		Pelea capreolus	Grey Rhebok	Near-Threatened
		Philantomba monticola	Blue Duiker	Least Concern
		Raphicerus campestris	Steenbok	Least Concern
		Raphicerus melanotis	Cape Grysbok	Least Concern
		Sylvicapra grimmia	Common Duiker	Least Concern
		Tragelaphus scriptus	**Southern Bushbuck**	**Least Concern**
	Suidae	Potamochoerus larvatus	Bushpig	Least Concern
Chiroptera	Molossidae	*Tadarida aegyptiaca*	Egyptian Free-tailed Bat	Least Concern
	Nycteridae	*Nycteris thebaica*	Cape Long-eared Bat	Least Concern
	Pteropodidae	Epomophorus wahlbergi	Wahlberg's Epauletted Fruit Bat	Least Concern
		Rousettus aegyptiacus	Egyptian Fruit Bat	Least Concern
	Rhinolophidae	*Rhinolophus capensis*	Cape Horseshoe Bat	Least Concern
		Rhinolophus clivosus	Geoffroy's Horseshoe Bat	Least Concern
	Vespertilionidae	*Myotis tricolor*	Temminck's Hairy Bat	Least Concern
		Neoromicia capensis	Cape Bat	Least Concern
Eulipotyphla	Soricidae	*Crocidura cyanea*	Reddish-grey Musk Shrew	Least Concern
		Crocidura flavescens	Greater Red Musk Shrew	Least Concern
		Myosorex longicaudatus	Long-tailed Forest Shrew	Endangered
		Myosorex varius	Forest Shrew	Least Concern
		Suncus infinitesimus	Least Dwarf Shrew	Least Concern
		Suncus varilla	Lesser Dwarf Shrew	Least Concern
Hyracoidea	Procaviidae	***Procavia capensis***	**Rock Hyrax**	**Least Concern**
Lagomorpha	Leporidae	***Lepus saxatilis***	**Cape Scrub Hare**	**Least Concern**
		Pronolagus saundersiae	Hewitt's Red Rock Hare	Least Concern
Primates	Cercopithecidae	***Chlorocebus pygerythrus***	**Vervet Monkey**	**Least Concern**
		Papio ursinus	**Chacma Baboon**	**Least Concern**

Rodentia	Bathyergidae	*Cryptomys hottentotus*	African Mole-rat	Least Concern
		Georychus capensis	Cape Mole-rat	Least Concern
	Gliridae	*Graphiurus murinus*	Woodland Dormouse	Least Concern
	Hystricidae	***Hystrix africaeaustralis***	**Cape Porcupine**	**Least Concern**
	Muridae	*Acomys subspinosus*	Cape Spiny Mouse	Least Concern
		Gerbillurus paeba	Hairy-footed Gerbil	Least Concern
		Micaelamys namaquensis	Namaqua Rock Rat	Least Concern
		Mus minutoides	Pygmy Mouse	Least Concern
		Myomyscus verreauxii	Verreaux's Mouse	Least Concern
		Otomys irroratus	**Southern African Vlei Rat**	**Least Concern**
		Rhabdomys pumilio	**Four-striped Grass Mouse**	**Least Concern**
	Nesomyidae	*Dendromus melanotis*	Grey Climbing Mouse	Least Concern
		Dendromus mesomelas	Brant's Climbing Mouse	Least Concern
		Mystromys albicaudatus	White-tailed Rat	Vulnerable
		Saccostomus campestris	Pouched Mouse	Least Concern
		Steatomys krebsii	Krebs' Fat Mouse	Least Concern

Appendix B

Appendix B Desktop species list of the avifaunal species which have been recorded in the pentad (3400_2220) which overlaps the study area (the South African Bird Atlas Project 2, https://sabap2.birdmap.africa/). To create this species list, the species observed in this pentad was included, noting the total number of observations and the latest date the species was recorded (both shown). Furthermore, for each species, the taxonomic Order, Family, species binomial name and common name is shown, along with the current IUCN Red List classification of the species. Species in bold represent avifaunal species of conservation concern (SCC).

Avifauna Desktop Species List						
Order	**Family**	**Species**	**Common name**	**IUCN status**	**Number of observations**	**Latest record**
Accipitriformes	Accipitridae	*Accipiter melanoleucus*	Black Sparrowhawk	Least Concern	39	2023/06/10
		Accipiter minullus	Little Sparrowhawk	Least Concern	4	2023/01/15
		Accipiter tachiro	African Goshawk	Least Concern	42	2023/06/15
		Buteo buteo	Common Buzzard	Least Concern	34	2023/02/14
		Buteo rufofuscus	Jackal Buzzard	Least Concern	138	2023/06/20
		Buteo trizonatus	**Forest Buzzard**	**Near-Threatened**	**59**	**2023/07/22**
		Circus maurus	**Black Harrier**	**Endangered**	**1**	**2015/08/08**
		Circus ranivorus	**African Marsh Harrier**	**Least Concern**	**3**	**2017/05/21**
		Elanus caeruleus	Black-winged Kite	Least Concern	110	2023/07/22
		Haliaeetus vocifer	African Fish Eagle	Least Concern	36	2023/06/15
		Hieraaetus pennatus	Booted Eagle	Least Concern	1	2022/12/03
		Lophaetus occipitalis	Long-crested Eagle	Least Concern	74	2023/08/05
		Milvus aegyptius	Yellow-billed Kite	Least Concern	33	2023/02/24
		Polemaetus bellicosus	**Martial Eagle**	**Endangered**	**5**	**2022/12/03**
		Polyboroides typus	African Harrier-Hawk	Least Concern	8	2023/06/03
		Stephanoaetus coronatus	**Crowned Eagle**	**Near-Threatened**	**1**	**2021/01/21**

	Pandionidae	*Pandion haliaetus*	Western Osprey	Least Concern	1	2013/12/07
	Sagittariidae	***Sagittarius serpentarius***	**Secretarybird**	**Endangered**	**8**	**2019/07/13**
Anseriformes	Anatidae	*Alopochen aegyptiaca*	Egyptian Goose	Least Concern	166	2023/07/22
		Anas capensis	Cape Teal	Least Concern	12	2022/06/11
		Anas erythrorhyncha	Red-billed Teal	Least Concern	56	2023/05/18
		Anas platyrhynchos	Mallard	Least Concern	3	2020/07/26
		Anas sparsa	African Black Duck	Least Concern	27	2023/06/20
		Anas undulata	Yellow-billed Duck	Least Concern	134	2023/07/22
		Anser anser	Greylag Goose	Least Concern	1	2020/07/26
		Dendrocygna viduata	White-faced Whistling Duck	Least Concern	33	2023/03/12
		Netta erythrophthalma	Southern Pochard	Least Concern	1	2009/12/24
		Plectropterus gambensis	Spur-winged Goose	Least Concern	36	2023/06/10
		Spatula smithii	Cape Shoveler	Least Concern	20	2023/04/27
		Tadorna cana	South African Shelduck	Least Concern	4	2023/04/27
		Thalassornis leuconotus	White-backed Duck	Least Concern	6	2011/11/12
Bucerotiformes	Upupidae	*Upupa africana*	African Hoopoe	Least Concern	39	2023/06/15
Caprimulgiformes	Apodidae	*Apus affinis*	Little Swift	Least Concern	46	2023/06/20
		Apus apus	Common Swift	Least Concern	1	2021/11/27
		Apus barbatus	African Black Swift	Least Concern	42	2023/06/20
		Apus caffer	White-rumped Swift	Least Concern	75	2023/04/20
		Cypsiurus parvus	African Palm Swift	Least Concern	15	2023/02/14
		Tachymarptis melba	Alpine Swift	Least Concern	4	2023/04/13
	Caprimulgidae	*Caprimulgus pectoralis*	Fiery-necked Nightjar	Least Concern	37	2023/05/03
Charadriiformes	Burhinidae	*Burhinus capensis*	Spotted Thick-knee	Least Concern	85	2023/07/22
		Burhinus vermiculatus	Water Thick-knee	Least Concern	55	2023/06/28
		Charadrius marginatus	White-fronted Plover	Least Concern	2	2022/04/01
		Charadrius pecuarius	Kittlitz's Plover	Least Concern	8	2023/01/15
		Charadrius tricollaris	Three-banded Plover	Least Concern	29	2023/04/27
		Vanellus armatus	Blacksmith Lapwing	Least Concern	152	2023/07/22
		Vanellus coronatus	Crowned Lapwing	Least Concern	62	2023/06/15

	Charadriidae	*Vanellus melanopterus*	Black-winged Lapwing	Least Concern	48	2023/06/15
	Haematopodidae	*Haematopus moquini*	African Oystercatcher	Least Concern	84	2023/07/22
	Laridae	*Larus cirrocephalus*	Grey-headed Gull	Least Concern	37	2023/04/27
		Larus dominicanus	Kelp Gull	Least Concern	165	2023/07/22
		Larus hartlaubii	Hartlaub's Gull	Least Concern	1	2022/03/10
		Sterna hirundo	Common Tern	Least Concern	4	2019/12/24
		Thalasseus bergii	Greater Crested Tern	Least Concern	48	2023/07/22
		Thalasseus sandvicensis	Sandwich Tern	Least Concern	4	2023/03/08
	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	Least Concern	12	2022/03/10
	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	Least Concern	1	2012/02/23
		Gallinago nigripennis	African Snipe	Least Concern	6	2022/12/30
		Numenius phaeopus	Eurasian Whimbrel	Least Concern	1	2020/10/26
		Stercorarius parasiticus	Arctic Jaeger	Least Concern	2	2020/12/31
		Tringa stagnatilis	Marsh Sandpiper	Least Concern	1	2009/12/24
	Stercorariidae	*Catharacta antarctica*	Brown Skua	Least Concern	2	2021/08/28
		Ciconia ciconia	White Stork	Least Concern	7	2019/02/02
Coliiformes	Coliidae	*Colius colius*	White-backed Mousebird	Least Concern	1	2017/04/21
		Colius striatus	Speckled Mousebird	Least Concern	116	2023/07/22
		Urocolius indicus	Red-faced Mousebird	Least Concern	21	2023/06/15
Columbiformes	Columbidae	*Columba arquatrix*	African Olive Pigeon	Least Concern	22	2023/04/20
		Columba guinea	Speckled Pigeon	Least Concern	174	2023/07/22
		Columba larvata	Lemon Dove	Least Concern	11	2023/03/30
		Columba livia	Rock Dove	Least Concern	5	2021/04/24
		Oena capensis	Namaqua Dove	Least Concern	1	2023/04/20
		Spilopelia senegalensis	Laughing Dove	Least Concern	24	2023/06/15
		Streptopelia capicola	Cape Turtle Dove	Least Concern	141	2023/07/22
		Streptopelia semitorquata	Red-eyed Dove	Least Concern	150	2023/07/22
		Turtur tympanistria	Tambourine Dove	Least Concern	21	2023/04/07
Coraciiformes	Alcedinidae	*Ceryle rudis*	Pied Kingfisher	Least Concern	21	2023/07/22
		Coracias garrulus	European Roller	Least Concern	4	2023/01/27

		Corythornis cristatus	Malachite Kingfisher	Least Concern	24	2023/06/20
		Halcyon albiventris	Brown-hooded Kingfisher	Least Concern	74	2023/06/15
		Megaceryle maxima	Giant Kingfisher	Least Concern	53	2023/06/15
Cuculiformes	Cuculidae	*Centropus burchellii*	Burchell's Coucal	Least Concern	43	2023/05/28
		Chrysococcyx caprius	Diederik Cuckoo	Least Concern	21	2023/01/15
		Chrysococcyx cupreus	African Emerald Cuckoo	Least Concern	12	2022/12/14
		Chrysococcyx klaas	Klaas's Cuckoo	Least Concern	33	2023/01/07
		Cuculus clamosus	Black Cuckoo	Least Concern	13	2023/01/20
		Cuculus solitarius	Red-chested Cuckoo	Least Concern	32	2023/01/27
Falconiformes	Falconidae	*Falco biarmicus*	Lanner Falcon	Least Concern	2	2019/06/20
		Falco peregrinus	Peregrine Falcon	Least Concern	8	2023/06/20
		Falco rupicolus	Rock Kestrel	Least Concern	37	2023/07/22
Galliformes	Gruidae	***Anthropoides paradiseus***	**Blue Crane**	**Vulnerable**	**11**	**2023/07/09**
	Numididae	*Numida meleagris*	Helmeted Guineafowl	Least Concern	150	2023/07/22
		Coturnix coturnix	Common Quail	Least Concern	11	2023/02/14
	Phasianidae	*Pternistis afer*	Red-necked Spurfowl	Least Concern	21	2023/06/15
		Pternistis capensis	Cape Spurfowl	Least Concern	79	2023/06/28
	Rallidae	*Fulica cristata*	Red-knobbed Coot	Least Concern	159	2023/06/28
		Gallinula chloropus	Common Moorhen	Least Concern	105	2023/07/22
		Zapornia flavirostra	Black Crake	Least Concern	9	2022/12/03
Gruiformes	Rallidae	*Sarothrura elegans*	Buff-spotted Flufftail	Least Concern	1	2022/03/10
Musophagiformes	Musophagidae	*Tauraco corythaix*	Knysna Turaco	Least Concern	93	2023/06/20
Otidiformes	Otididae	***Neotis denhami***	**Denham's Bustard**	**Near-Threatened**	**16**	**2023/06/15**
Passeriformes	Acrocephalidae	*Acrocephalus gracilirostris*	Lesser Swamp Warbler	Least Concern	12	2023/06/28
	Alaudidae	*Calandrella cinerea*	Red-capped Lark	Least Concern	24	2023/04/27
		Mirafra apiata	Cape Clapper Lark	Least Concern	1	2010/11/27
	Campephagidae	*Campephaga flava*	Black Cuckooshrike	Least Concern	1	2023/02/14
		Ceblepyris caesius	Grey Cuckooshrike	Least Concern	5	2023/04/07
	Cisticolidae	*Apalis thoracica*	Bar-throated Apalis	Least Concern	141	2023/07/22
		Camaroptera brachyura	Bleating Camaroptera	Least Concern	44	2023/04/20

	Cisticola fulvicapilla	Neddicky	Least Concern	90	2023/06/15
	Cisticola juncidis	Zitting Cisticola	Least Concern	52	2023/06/15
	Cisticola lais	Wailing Cisticola	Least Concern	3	2012/10/31
	Cisticola subruficapilla	Grey-backed Cisticola	Least Concern	8	2022/05/22
	Cisticola tinniens	Levaillant's Cisticola	Least Concern	104	2023/06/28
	Prinia maculosa	Karoo Prinia	Least Concern	90	2023/07/22
Corvidae	*Corvus albicollis*	White-necked Raven	Least Concern	98	2023/07/22
	Corvus albus	Pied Crow	Least Concern	64	2023/07/22
	Corvus capensis	Cape Crow	Least Concern	97	2023/06/15
Dicruridae	*Dicrurus adsimilis*	Fork-tailed Drongo	Least Concern	139	2023/07/22
Emberizidae	*Emberiza capensis*	Cape Bunting	Least Concern	2	2022/03/10
	Emberiza tahapisi	Cinnamon-breasted Bunting	Least Concern	1	2021/05/09
Estrildidae	*Coccopygia melanotis*	Swee Waxbill	Least Concern	76	2023/07/22
	Estrilda astrild	Common Waxbill	Least Concern	70	2023/06/28
	Lagonosticta rubricata	African Firefinch	Least Concern	2	2022/03/25
	Ortygospiza atricollis	African Quailfinch	Least Concern	1	2022/03/25
Fringillidae	*Crithagra albogularis*	White-throated Canary	Least Concern	2	2019/07/13
	Crithagra flaviventris	Yellow Canary	Least Concern	7	2022/10/22
	Crithagra gularis	Streaky-headed Seedeater	Least Concern	102	2023/06/28
	Crithagra scotops	Forest Canary	Least Concern	66	2023/06/28
	Crithagra sulphurata	Brimstone Canary	Least Concern	69	2023/06/28
	Crithagra totta	Cape Siskin	Least Concern	12	2023/03/01
	Serinus canicollis	Cape Canary	Least Concern	66	2023/06/15
Hirundinidae	*Cecropis cucullata*	Greater Striped Swallow	Least Concern	93	2023/05/18
	Hirundo albigularis	White-throated Swallow	Least Concern	51	2023/04/13
	Hirundo dimidiata	Pearl-breasted Swallow	Least Concern	20	2023/03/30
	Hirundo rustica	Barn Swallow	Least Concern	81	2023/04/20
	Psalidoprocne pristoptera	Black Saw-wing	Least Concern	76	2023/05/18
	Ptyonoprogne fuligula	Rock Martin	Least Concern	48	2023/06/28
	Riparia cincta	Banded Martin	Least Concern	1	2012/11/14

	Riparia paludicola	Brown-throated Martin	Least Concern	32	2023/07/22
Laniidae	*Lanius collaris*	Southern Fiscal	Least Concern	191	2023/07/22
Locustellidae	*Bradypterus baboecala*	Little Rush Warbler	Least Concern	10	2023/03/01
	Bradypterus sylvaticus	**Knysna Warbler**	**Vulnerable**	**31**	**2023/04/27**
Macrosphenidae	*Sphenoeacus afer*	Cape Grassbird	Least Concern	34	2023/02/19
Malaconotidae	*Chlorophoneus olivaceus*	Olive Bushshrike	Least Concern	65	2023/06/15
	Dryoscopus cubla	Black-backed Puffback	Least Concern	61	2023/06/28
	Laniarius ferrugineus	Southern Boubou	Least Concern	120	2023/06/28
	Tchagra tchagra	Southern Tchagra	Least Concern	24	2023/05/18
	Telophorus zeylonus	Bokmakierie	Least Concern	5	2022/03/25
Monarchidae	*Terpsiphone viridis*	African Paradise Flycatcher	Least Concern	26	2023/04/13
	Trochocercus cyanomelas	Blue-mantled Crested Flycatcher	Least Concern	55	2023/06/28
Motacillidae	*Anthus cinnamomeus*	African Pipit	Least Concern	92	2023/06/28
	Anthus leucophrys	Plain-backed Pipit	Least Concern	26	2023/06/20
	Macronyx capensis	Cape Longclaw	Least Concern	96	2023/06/20
	Motacilla capensis	Cape Wagtail	Least Concern	169	2023/07/22
Muscicapidae	*Cossypha caffra*	Cape Robin-Chat	Least Concern	151	2023/06/28
	Cossypha dichroa	Chorister Robin-Chat	Least Concern	77	2023/06/28
	Melaenornis silens	Fiscal Flycatcher	Least Concern	98	2023/06/28
	Monticola rupestris	Cape Rock Thrush	Least Concern	9	2016/02/28
	Muscicapa adusta	African Dusky Flycatcher	Least Concern	69	2023/06/20
	Oenanthe familiaris	Familiar Chat	Least Concern	2	2021/07/18
	Oenanthe pileata	Capped Wheatear	Least Concern	7	2022/09/03
	Pogonocichla stellata	White-starred Robin	Least Concern	7	2023/05/03
	Saxicola torquatus	African Stonechat	Least Concern	88	2023/06/15
	Turdus olivaceus	Olive Thrush	Least Concern	49	2023/06/15
Nectariniidae	*Anthobaphes violacea*	Orange-breasted Sunbird	Least Concern	3	2015/01/11
	Chalcomitra amethystina	Amethyst Sunbird	Least Concern	113	2023/07/22
	Cinnyris afer	Greater Double-collared Sunbird	Least Concern	128	2023/07/22
	Cinnyris chalybeus	Southern Double-collared Sunbird	Least Concern	106	2023/06/15

		Cyanomitra verreauxii	Mouse-coloured Sunbird	Least Concern	72	2023/06/28
		Hedydipna collaris	Collared Sunbird	Least Concern	46	2023/06/28
		Nectarinia famosa	Malachite Sunbird	Least Concern	5	2022/06/30
	Oriolidae	*Oriolus larvatus*	Eastern Black-headed Oriole	Least Concern	87	2023/06/28
		Oriolus oriolus	Eurasian Golden Oriole	Least Concern	2	2023/01/15
	Passeridae	*Passer diffusus*	Southern Grey-headed Sparrow	Least Concern	76	2023/07/22
		Passer domesticus	House Sparrow	Least Concern	37	2023/03/01
		Passer melanurus	Cape Sparrow	Least Concern	19	2023/07/22
	Phylloscopidae	*Phylloscopus ruficapilla*	Yellow-throated Woodland Warbler	Least Concern	52	2023/06/28
	Platysteiridae	*Batis capensis*	Cape Batis	Least Concern	84	2023/06/28
	Ploceidae	*Euplectes capensis*	Yellow Bishop	Least Concern	69	2023/06/28
		Euplectes orix	Southern Red Bishop	Least Concern	106	2023/07/22
		Ploceus capensis	Cape Weaver	Least Concern	138	2023/07/22
		Ploceus velatus	Southern Masked Weaver	Least Concern	6	2022/03/10
		Quelea quelea	Red-billed Quelea	Least Concern	5	2023/04/27
	Promeropidae	*Promerops cafer*	Cape Sugarbird	Least Concern	16	2023/01/07
	Pycnonotidae	*Andropadus importunus*	Sombre Greenbul	Least Concern	169	2023/07/22
		Phyllastrephus terrestris	Terrestrial Brownbul	Least Concern	85	2023/06/20
		Pycnonotus capensis	Cape Bulbul	Least Concern	158	2023/06/28
	Sturnidae	*Creatophora cinerea*	Wattled Starling	Least Concern	1	2022/07/16
		Notopholia corusca	Black-bellied Starling	Least Concern	39	2023/06/28
		Onychognathus morio	Red-winged Starling	Least Concern	150	2023/07/22
		Sturnus vulgaris	Common Starling	Least Concern	181	2023/07/22
	Viduidae	*Vidua macroura*	Pin-tailed Whydah	Least Concern	97	2023/06/28
	Zosteropidae	*Zosterops virens*	Cape White-eye	Least Concern	133	2023/06/28
Pelecaniformes	Ardeidae	*Ardea cinerea*	Grey Heron	Least Concern	60	2023/06/28
		Ardea melanocephala	Black-headed Heron	Least Concern	144	2023/07/22
		Ardea purpurea	Purple Heron	Least Concern	25	2023/05/13
		Ardeola ralloides	Squacco Heron	Least Concern	3	2022/05/28
		Bubulcus ibis	Western Cattle Egret	Least Concern	171	2023/07/22

		Egretta garzetta	Little Egret	Least Concern	19	2022/12/24
		Nycticorax nycticorax	Black-crowned Night Heron	Least Concern	25	2023/03/12
	Scopidae	*Scopus umbretta*	Hamerkop	Least Concern	10	2023/06/03
	Threskiornithidae	*Bostrychia hagedash*	Hadada Ibis	Least Concern	175	2023/07/22
		Platalea alba	African Spoonbill	Least Concern	25	2023/06/20
		Threskiornis aethiopicus	African Sacred Ibis	Least Concern	155	2023/07/22
Piciformes	Indicatoridae	*Indicator indicator*	Greater Honeyguide	Least Concern	1	2022/08/14
		Indicator variegatus	Scaly-throated Honeyguide	Least Concern	1	2022/05/28
		Prodotiscus regulus	Brown-backed Honeybird	Least Concern	2	2022/12/19
	Picidae	***Campethera notata***	**Knysna Woodpecker**	**Near-Threatened**	**30**	**2023/03/07**
		Dendropicos fuscescens	Cardinal Woodpecker	Least Concern	1	2022/01/29
		Dendropicos griseocephalus	Olive Woodpecker	Least Concern	53	2023/06/10
Procellariiformes	Procellariidae	***Ardenna grisea***	**Sooty Shearwater**	**Near-Threatened**	**2**	**2020/12/31**
Podicipediformes	Podicipedidae	***Procellaria aequinoctialis***	**White-chinned Petrel**	**Vulnerable**	**2**	**2020/10/26**
Sphenisciformes	Spheniscidae	*Bubo africanus*	Spotted Eagle-Owl	Least Concern	53	2023/06/28
Strigiformes	Tytonidae	*Tyto alba*	Common Barn-owl	Least Concern	1	2017/01/12
Suliformes	Anhingidae	*Anhinga rufa*	African Darter	Least Concern	66	2023/06/28
	Phalacrocoracidae	*Microcarbo africanus*	Reed Cormorant	Least Concern	109	2023/06/28
		Phalacrocorax capensis	**Cape Cormorant**	**Endangered**	**38**	**2023/07/22**
		Phalacrocorax lucidus	White-breasted Cormorant	Least Concern	128	2023/06/20
	Sulidae	***Morus capensis***	**Cape Gannet**	**Endangered**	**61**	**2023/07/22**
Trogoniformes	Trogonidae	*Apaloderma narina*	Narina Trogon	Least Concern	15	2023/02/14

Appendix C

Appendix C Species list of the faunal species recovered within the study area during the field survey. For each, the taxonomic Order, Family, species binomial name and species common name are shown, along with the current IUCN Red List classification of the species, and the number of records of the species during the surveying period. Species in bold represent Species of Conservation Concern (SCC).

Mammals					
Order	**Family**	**Species**	**Common name**	**IUCN status**	**Number of observations**
Cetartiodactyla	Bovidae	*Raphicerus melanotis*	Cape Grysbok	Least Concern	1
		Sylvicapra grimmia	Common Duiker	Least Concern	2
		Tragelaphus scriptus	Southern Bushbuck	Least Concern	3
Rodentia	Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern	1
	Muridae	*Gerbillurus paeba*	Hairy-footed Gerbil	Least Concern	1
		Rhabdomys pumilio	Four-striped Grass Mouse	Least Concern	1
Amphibians					
Order	**Family**	**Species**	**Common name**	**IUCN status**	**Number of observations**
Anura	Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	Least Concern	1
	Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern	3
Avifauna					
Order	**Family**	**Species**	**Common name**	**IUCN status**	**Number of observations**
Anseriformes	Anatidae	*Alopochen aegyptiaca*	Egyptian Goose	Least Concern	1
Anseriformes	Anatidae	*Anas erythrorhyncha*	Red-billed Teal	Least Concern	1
		Dendrocygna viduata	White-faced Whistling Duck	Least Concern	1
Charadriiformes	Burhinidae	*Burhinus capensis*	Spotted Thick-knee	Least Concern	1
		Charadrius tricollaris	Three-banded Plover	Least Concern	1
		Vanellus armatus	Blacksmith Lapwing	Least Concern	1

	Laridae	*Larus cirrocephalus*	Grey-headed Gull	Least Concern	1
		Larus dominicanus	Kelp Gull	Least Concern	1
Coliiformes	Coliidae	*Colius striatus*	Speckled Mousebird	Least Concern	1
Columbiformes	Columbidae	*Columba guinea*	Speckled Pigeon	Least Concern	1
		Streptopelia capicola	Cape Turtle Dove	Least Concern	1
Musophagiformes	Musophagidae	*Tauraco corythaix*	Knysna Turaco	Least Concern	1
Passeriformes	Cisticolidae	*Prinia maculosa*	Karoo Prinia	Least Concern	1
	Dicruridae	*Dicrurus adsimilis*	Fork-tailed Drongo	Least Concern	1
	Fringillidae	*Crithagra gularis*	Streaky-headed Seedeater	Least Concern	1
	Laniidae	*Lanius collaris*	Southern Fiscal	Least Concern	1
	Locustellidae	*Bradypterus baboecala*	Little Rush Warbler	Least Concern	3
		Bradypterus sylvaticus	**Knysna Warbler**	**Vulnerable**	2
	Malaconotidae	*Laniarius ferrugineus*	Southern Boubou	Least Concern	1
	Motacillidae	*Motacilla capensis*	Cape Wagtail	Least Concern	1
	Muscicapidae	*Cossypha caffra*	Cape Robin-Chat	Least Concern	2
		Melaenornis silens	Fiscal Flycatcher	Least Concern	1
		Turdus olivaceus	Olive Thrush	Least Concern	1
	Nectariniidae	*Cinnyris afer*	Greater Double-collared Sunbird	Least Concern	3
	Passeridae	*Passer domesticus*	House Sparrow	Least Concern	1
	Platysteiridae	*Batis capensis*	Cape Batis	Least Concern	1
	Ploceidae	*Euplectes capensis*	Yellow Bishop	Least Concern	1
		Ploceus capensis	Cape Weaver	Least Concern	2
	Promeropidae	*Promerops cafer*	Cape Sugarbird	Least Concern	1
	Pycnonotidae	*Andropadus importunus*	Sombre Greenbul	Least Concern	2
		Phyllastrephus terrestris	Terrestrial Brownbul	Least Concern	1
		Pycnonotus capensis	Cape Bulbul	Least Concern	2
	Sturnidae	*Onychognathus morio*	Red-winged Starling	Least Concern	1
	Zosteropidae	*Zosterops virens*	Cape White-eye	Least Concern	3

Appendix D

Curriculum Vitae of Jacobus Hendrik Visser

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Qualifications

- PhD (Zoology), University of Johannesburg (2015 - 2017)
- MSc (Zoology), Stellenbosch University (2011 - 2013)
- BSc Honours (Zoology) cum laude, Stellenbosch University (2010)
- BSc (Biodiversity and Ecology) cum laude, Stellenbosch University (2007 - 2009)

Scientific publications

- **Visser J.H.** (2013). Gene-flow in the rock hyrax (*Procavia capensis*) at different spatial scales. MSc thesis, Stellenbosch University, Stellenbosch, South Africa. https://core.ac.uk/download/pdf/37420485.pdf
- **Visser J.H.** (2017). Evolution of the South African Bathyergidae: patterns and processes. PhD dissertation, University of Johannesburg, Johannesburg, South Africa.

- **Visser J.H.**, Bennett N.C., Jansen van Vuuren B. (2014). Local and regional scale genetic variation in the Cape dune mole-rat, *Bathyergus suillus*. PLos ONE 9(9):e107226. https://doi.org/10.1371/journal.pone.0107226
- **Visser J.H.**, Bennett N.C., Jansen van Vuuren B. (2017). Distributional range, ecology and mating system of the Cape mole-rat, *Georychus capensis* family Bathyergidae. Canadian Journal of Zoology 95 (10): 713-726. https://doi.org/10.1139/cjz-2017-0016
- **Visser J.H.**, Bennett N.C., Jansen van Vuuren B. (2018). Spatial genetic diversity in the Cape mole-rat, *Georychus capensis*: Extreme isolation of populations in a subterranean environment. PLoS ONE 13(3): e0194165. https://doi.org/10.1371/journal.pone.0194165
- **Visser J.H.**, Bennett N.C., Jansen van Vuuren B. (2019). Evolutionary and ecological patterns within the South African Bathyergidae: Implications for taxonomy. Molecular Phylogenetics and Evolution 130, 181-197. https://doi.org/10.1016/j.ympev.2018.10.017
- **Visser J.H.**, Bennett N.C., Jansen van Vuuren B. (2019). Phylogeny and biogeography of the African Bathyergidae: a review of patterns and processes. Journal of Biogeography PeerJ 7:e7730. https://doi.org/10.7717/peerj.7730
- **Visser J.H.**, Geerts S. (2020). Describing sexual dimorphism and fine scale spatial distributions in the Drab Thick-tail Scorpion, *Parabuthus planicauda*. African Zoology 55 (3): 250-256. https://doi.org/10.1080/15627020.2020.1796525
- **Visser J.H.**, Geerts S. (2021). Static allometry and sexual dimorphism in the Striped Lesser-thicktail Scorpion, *Uroplectes lineatus*. Arachnology 18 (7), 700–707. https://doi.org/10.13156/arac.2020.18.7.700
- **Visser J.H.**, Geerts S. (in review). Sexual dimorphism and static allometry in the burrowing scorpion, *Opistophthalmus pallipes*. African Zoology.
- **Visser J.H.**, Geerts S. (2021). Sexual dimorphism and static allometry in the South African scorpion *Opistophthalmus karrooensis*. Arachnology 18 (9), 1057-1063.
- **Visser J.H.**, Geerts S., Jansen van Vuuren B. (2021). Phylogeographic patterns in a semi-lithophilous burrowing scorpion from South Africa, *Opistophthalmus pallipes*. Zoological Science 38 (1): 36-44. https://doi.org/10.2108/zs200094

- **Visser J.H.**, Robinson T.J., Jansen van Vuuren B. (2020). Spatial genetic structure in the rock hyrax (*Procavia capensis*) across the Namaqualand and western Fynbos areas of South Africa - a mitochondrial and microsatellite perspective. Canadian Journal of Zoology 98 (8): 557-571. https://doi.org/10.1139/cjz-2019-0154
- Uhrová M., Mikula O., Bennett N.C., Van Daele P., Piálek L., Bryja J., **Visser J.H.**, Jansen van Vuuren B., Šumbera R. (2022). Species limits and phylogeographic structure in two genera of solitary African mole-rats *Georychus* and *Heliophobius*. Molecular Phylogenetics and Evolution 167 (2022) 107337

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- Bennett N.C., **Visser J.H.**, Maree S., Jarvis J.U.M. (2016). A conservation assessment of *Bathyergus suillus*. In: Child M.F., Roxburgh L., Do Linh San E., Raimondo D., Davies-Mostert H.T. (Eds). The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa. https://www.ewt.org.za/wp-content/uploads/2019/02/6.-Cape-Dune-Mole-rat-Bathyergus-suillus__LC.pdf
- Maree S., Jarvis J.U.M., Bennett N.C., **Visser J.H.** (2017). *Bathyergus suillus*. The IUCN Red List of Threatened Species 2017:e.T2620A110017759. http://dx.doi.org/10.2305/IUCN.Uk.2017-2.RLTS.T2620A110017759.en.
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- **Visser J.H.**, Wimberger K. (2016). A conservation assessment of *Procavia capensis*. In: Child M.F., Roxburgh L., Do Linh San E., Raimondo D., Davies-Mostert H.T. (Eds). The Red List of Mammals of South Africa, Swaziland and

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List of fauna reports

- **Visser, J.H.** Terrestrial Animal Species Compliance Statement Report For A Portion of Remainder of Farm 630, Rawsonville, Breede Valley Municipality. November 2021. Prepared for inClover Environmental Consulting.
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Compliance Statement Report for a Portion of Brazil 329, Nama Khoi Municipality, Namakwa District. April 2022. Prepared for WNel Environmental Consulting Services.
- **Visser, J.H.** Terrestrial Faunal And Avifaunal Species Scoping Report for the Proposed Waste Management Facility at Portions 1 and 6 of Farm 32 Brakkefontein, City of Cape Town. April 2022. Prepared for SLR Consulting.
- **Visser, J.H.** Terrestrial Faunal And Avifaunal Species Impact Assessment Report for a Portion of Riet Valleij (Somerset Vale, Farm Portion RE/150), Estelm Boerdery, Swellendam Municipality, Overberg District. June 2022. Prepared for PHS Consulting.
- **Visser, J.H.** Site Sensitivity Verification Report for Remainder of Farm De Draay No 563, Overstrand Municipality. August 2022. Prepared for PHS Consulting.
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Impact Assessment Report for Remainder of Farm Rooilandia No. 472, Breede Valley Municipality. October 2022. Prepared for McGregor Environmental Services.
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Impact Assessment Report for Portion 3 of Farm 781, Theewaterskloof Local Municipality. December 2022. Prepared for PHS Consulting.
- **Visser, J.H.** Terrestrial Faunal Species Compliance Statement Report for Farm Portion 49, Hansmoeskraal Farm 202, George Local Municipality. April 2023. Prepared for Sharples Environmental Services cc (SES).
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Compliance Statement Report for Farm 153 Vissershok (C1038: Upgrading of TR11/1), City of Cape

Town Municipality. May 2023. Prepared for Sharples Environmental Services cc (SES).

- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Impact Assessment Report for Farm Witteklip 69/123, Vredenburg, Saldanha Bay Municipality. June 2023. Prepared for Ecosense Environmental Consultants.
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Impact Assessment Report for the Proposed Greenvalley Mixed-use Development on Portion 28, 31 and 32 of the Farm Wittedrift No. 306, and Associated Bulk Infrastructure, Plettenberg Bay, Bitou Municipality. June 2023. Prepared for Sharples Environmental Services cc (SES).
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Compliance Statement Report for the Upgrade of the Schaapkop Sewer Rising Main on Remainder of Erf 464 and Erf 13486, George Local Municipality. July 2023. Prepared for Sharples Environmental Services cc (SES).
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Impact Assessment Report for the Proposed Mixed-use Housing Development on Portions 7 and 8 of the Farm Kranshoek No. 432, Plettenberg Bay, Bitou Municipality. July 2023. Prepared for Sharples Environmental Services cc (SES).
- **Visser, J.H.** Terrestrial Faunal and Avifaunal Species Compliance Statement Report for the Proposed Sandmine on Portion 109 of the Farm Zwarte Jongers Fontein No. 489, Hessequa Municipality. August 2023. Prepared for Pro-Earth Consulting

Other projects

- Southern African Bird Atlas Project 2 (SABAP2)
- Endemism, genetic variance and conservation priorities in the highlands of south-western Africa.
- Biodiversity and ecology of scorpions in the Cape Floristic Region.
- National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria.

Conferences

- Presenter at the 2017 conference of the South African Wildlife Management Association (Presentation title: The influence of commercial game farming on maintaining genetic diversity in the sable antelope (*Hippotragus niger*) and roan antelope (*Hippotragus equinus*)
- Presenter at the 2017 conference of the Zoological Society of Southern Africa (Presentation title: Evolution of the South African Bathyergidae: Patterns and processes)
- Presenter at the 2010 conference of the Zoological Society of Southern Africa (Presentation title: Local and regional scale genetic variation in the Cape dune mole-rat, *Bathyergus suillus*