

Terrestrial ecological assessment with specific focus on Plant and Animal Species and terrestrial biodiversity: Proposed Bypass Pipelines and Associated Infrastructure, PetroSA, Mossel Bay October 2022.

**Terrestrial ecological assessment with
specific focus on Plant and Animal Species
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Bypass Pipelines and Associated
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October 2022.**



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1 Introduction

1.1 Development Description

The current proposed development aims to build a temporary elevated launch way of approximately 8.5m x 70-100m long. The launch way outline is shown in Figure 1 and represents the Project Area of interest (PAOI) as described by SANBI, 2020. The launch way will be constructed across a narrow strip across the dunes between the logistic Base of PetroSA and the sea in Mosselbay (Fig. 1; GPS 34° 8'46.54"S 22° 6'37.70"E). This elevated launch way is to enable two bypass steel pipelines (each approximately 1.4km long) to be towed by a tug boat from the manufacturing base to the sea where it will be installed. The specific footprint of the launch way is located in a previously disturbed area that has become naturally revegetated. According to Plesnik et al. (2011) such an environment can be considered degraded, although there is still great scope for protecting the remaining biodiversity. During the construction of this launch way, most of the terrestrial flora will be removed, cut or disturbed requiring a terrestrial biodiversity compliance statement to comply with the minimum report content requirements for activities requiring environmental authorization as required by NEMA Act 107 of 1998. This project aims to do a terrestrial biodiversity compliance statement of an area proposed for this development.

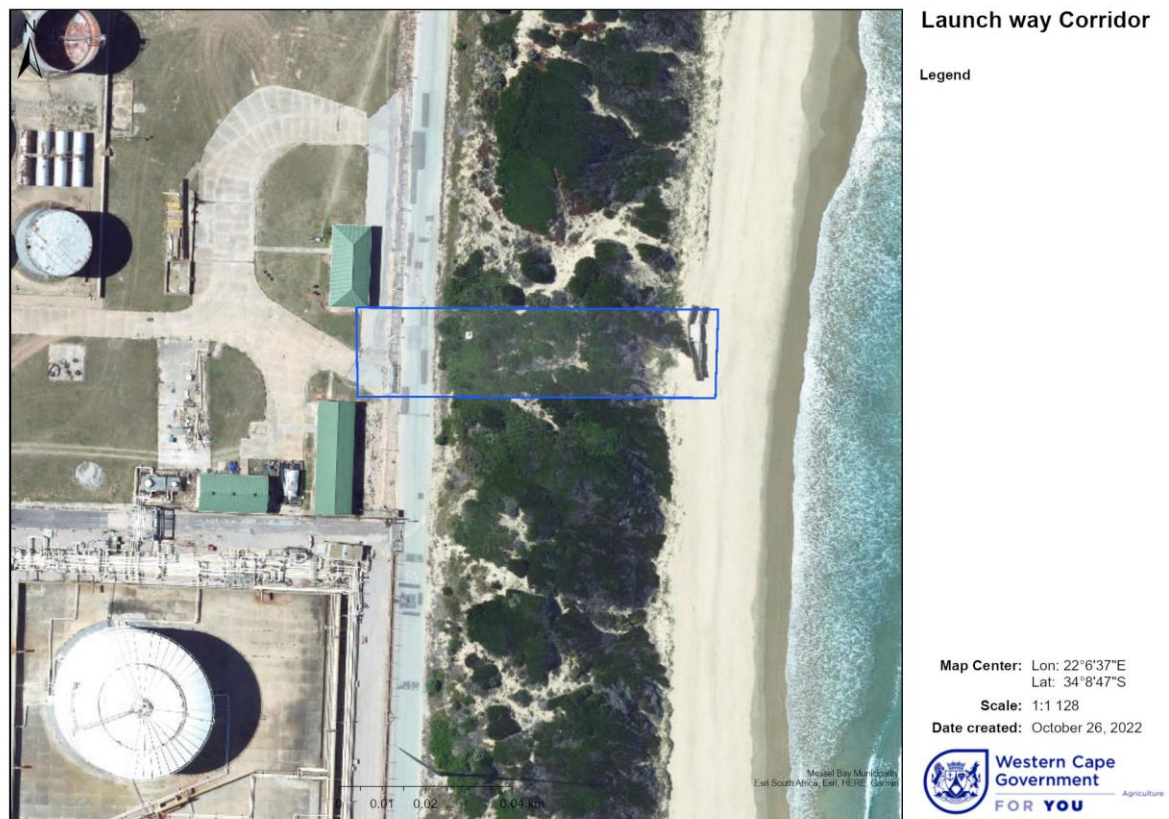


Figure 1: Outline of the development footprint for the construction of the pipeline launch way.

1.2 Terms of Reference

The aims of this project were to carry out a combined terrestrial animal - and Terrestrial Plant Species Compliance Statement and Terrestrial biodiversity impact statement for the proposed development area. Specifically, it complies with the most recent requirements of the Protocol for the specialist assessment and minimum report requirements for the environmental impacts on Terrestrial plants, - animals and terrestrial biodiversity (Government Gazette 43110 and 1150, 2020). The main terms of reference are to provide ground truthing of the proposed footprint and to search for any species of conservation concern and map/GPS mark the presence of plant or animal species of high conservation concern. The comprehensive list of specific requirements for the themes of either Terrestrial plant species, Terrestrial animal species and Terrestrial biodiversity is outlined in NEMA Act 107 of 1998 (see specific notices below).

2 Methodology

2.1 Screening tool, Biodiversity themes, and species assessment protocols.

Prior to the application for environmental authorization, a pre-screening of environmental sensitivities was carried out by SRK on behalf of the application by PetroSA. This was done through the web based environmental screening tool (SRK, 2022; <https://screening.environment.gov.za/screeningtool>). The screening tool provides a pre-application assessment of the sensitivities of different aspects of the environment (e.g. terrestrial biodiversity, animals, plants, agriculture) and lists these different aspects under themes (SANBI, 2020). Ten different environmental themes have been published and include Agriculture, Animal species, Terrestrial biodiversity, Aquatic biodiversity and others listed in Table 1 below. Environmental sensitivities are listed in different sensitivity levels. The environmental sensitivities for the relevant themes of this report are as follows: Very high sensitivity, High Sensitivity, Medium sensitivity and Low sensitivity. This report is confined entirely to only three of these themes

- 1) **Animal species theme,**
- 2) **Plant species theme,** and
- 3) **Terrestrial biodiversity theme.**

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Table 1: Summary of the site sensitivity according to DFFE Screening Tool (Source: SRK, 2022)

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme				X
Animal Species Theme			X	

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Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme			X	
Plant Species Theme				X
Terrestrial Biodiversity Theme	X			

An important part of the pre-screening screening tool is that it provides the relevant assessment protocols for the different themes listed. Each of the protocols provides a guideline to the minimum requirements needed to accurately assess the site sensitivity with respect to its theme. As an example, to assess the site sensitivity according to the Plant species theme, the protocol for the sensitivity analysis is outlined in the NEMA act 107 of 1998 Government notice 1150, 2022. (see Table 2 below).

Table 2: Environmental themes and the relevant assessment protocols assess in this report.

Theme	Legislation	Title
Animal species	NEMA Act 107 of 1998, Notice 1150 of 2022	TERRESTRIAL ANIMAL SPECIES PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL ANIMAL SPECIES
Plant species	NEMA Act 107 of 1998, Notice 1150 of 2022	TERRESTRIAL PLANT SPECIES PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR

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		ENVIRONMENTAL IMPACTS ON TERRESTRIAL PLANT SPECIES
Terrestrial biodiversity	NEMA Act 107 of 1998, Notice 43110 of 2022	Protocol for the specialist assessment and minimum report content requirements for environmental impacts on biodiversity.

2.2 Baseline terrestrial plants-, animals- and biodiversity themes and site sensitivity verification

The above-mentioned themes provide the protocols for the assessment of different environmental themes. In addition to a screening report, a further site sensitivity verification step has to be carried out which involves a desktop survey combined with a physical site visit. In order to assess the sensitivity of the site with respect the three themes mentioned above, I visited the site on Monday 31 October 2022 and followed the techniques and procedures outlined below to monitor the site sensitivity with respect to different themes. The specific methods to determine site sensitivity are listed below:

2.2.1 Terrestrial Plant species theme:

The basic ecosystems, general vegetation and threatened status description is taken from the vegetation description provided by Rebelo *et al.* (2006). In order to provide site specific vegetation and biodiversity description, a ground truthing site visit was made on Monday, 31 October 2022. This corresponds to early summer season for this area when a sufficiently large proportion of the flora will be flowering to be enable an adequate botanical assessment. During the site visit, I carried out a thorough walk-through survey of the proposed development footprint. The site visit lasted from 06:30am to 12p.m. This was sufficient time to carry out a full plant species assessment and it is unlikely any plants were missed. The survey tracks are provided as KML tracks (see Figure 2). The site location is directly in front of two access gates on the Mossgrass/PetroSA property constructed inland of the dunes.

The requirements of the terrestrial plants and animals theme protocols are listed by SANBI (2020, Protocols 1.7- 3.1.12, p.12 -19) and is primarily determined by the numbers and population sizes of species of conservation concern that are present on the site and how the nature of the development will affect these (SANBI, 2020). Species of conservation concern are defined by SANBI, 2020 as species falling classified by the IUCN redlist criteria as either being Critically Endangered, Endangered,

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Vulnerable, Near Threatened, or Data deficient. Following the requirement by SANBI, 2020, the IUCN status of plant species was obtained from the following sources:

- National Redlist of South African plants online (<http://redlist.sanbi.org/>)

The exact GPS location of plants that must be taken into consideration for permitting applications was recorded with a GPS coordinate.

2.2.2 Terrestrial Animals theme:

In addition to plants, I also monitored the presence of different animal species on the development footprint as this is a key consideration to the determining the biodiversity sensitivity. Specifically, I recorded different species of birds, reptiles and mammals present on the site. Monitoring terrestrial animal species was carried out both directly (visually identifying any animals present) and indirectly by observing for scat and footprints and any other signs of their presence. Footprints and scat were identified using personal experience and resources such as Stuart and Stuart (2013) that provide a good guide to animals tracks and signs. The same protocol was followed to determine for species sensitivity by construction a list of animal species present and determining their conservation status from the following sources:

- Red list of South African species published online by SANBI, 2022.

2.2.3 Terrestrial biodiversity theme

The terrestrial biodiversity was done by combining the data obtained from the terrestrial plants and terrestrial animal themes with the ecosystem of the area. This protocol follows that outlined by NEMA Act 107 of 1998, Notice 43110 of 2022 and provides an overview of the biodiversity of the site along with the important ecological features and the overall impact of the development on the site. To determine this I included the numbers of plant and animal species observed, the density of different plant species, and the presence of invasive species. I described the main ecological drivers of the area, as well the presence of any Critical Biodiversity areas. I also give a description of any assumptions and uncertainties as well as mitigation measures.

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2.3 Previous site disturbance and alien invasive species.

As the site is considered previously disturbed and invaded, invasive species present were also identified and the status of invasive species checked against the Conservation of Agricultural resources Act 43 of 1983 (CARA, 2001) and the National List of Invasive species, Government notice 3, National Environmental Management and Biodiversity Act 10 of 2004 (NEMBA, 2004) and NEMBA National list of invasive species (NEMBA Notice 3, 2016.)

2.4 Conservation Status

A major consideration in determining site sensitivity is the presence of endangered vegetation types and Critical Biodiversity Areas (CBA's). Thus, I determined the most recent vegetation of the area and the conservation status of the vegetation type using both Rebelo *et al.* 2006 and the most recent 2017 Western Cape Spatial Biodiversity Plan (WCBSBP) available online from SANBI.



Figure 2: GPS trail of the route walked during the site visit on 31 October 2022.

The conservation status for land-based fauna was determined by the following legislation:

- Red list of South African species published online by SANBI, 2022.

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3 Relevant Legislation

In order to conform with the legal requirements for environmental authorization for listed activities the requirements stipulated by the legislation listed below was followed:

- Conservation of Agricultural Resources Act 43 of 1983. Government publication, Republic of South Africa.
- National Environmental Management Act No. 107 of 1998. 2022. PROCEDURES FOR THE ASSESSMENT AND MINIMUM CRITERIA FOR REPORTING ON IDENTIFIED ENVIRONMENTAL THEMES IN TERMS OF SECTIONS 24(5)(a) AND (h) AND 44 OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998, WHEN APPLYING FOR ENVIRONMENTAL AUTHORISATION
- Nature conservation ordinance 19 of 1974. 1975. Provincial council of the province of the Cape of Good
- NFA act 84 of 1998. 2014. National Forestry Act 84 of 1998. Notice of the lists of protected tree species under the national forests act, 1998 (Act no. 84 of 1998). Government Notices, State Newspaper, 21 November 2014, Vol. 593, No. 38215. Pretoria, South Africa.
- NEMBA, 2016. Notice 3. NATIONAL LIST OF INVASIVE SPECIES IN TERMS SECTIONS 70(1), 71(3) and 71. Government Gazette, 29 July 2016.
- SANBI, 2010. Redlist of South African plants online. <http://redlist.sanbi.org/>. Accessed 15 – 22 April 2018.
- Red list of south African species (published online [SANBI](#))

4 Terrestrial plant species theme:

5 Description of Flora

5.1 Vegetation type of the area

The vegetation of the area is described by Mucina *et al.* (2006), although more recent updates to the vegetation of South Africa have been published, no updates have occurred for this vegetation type (SANBI 2006 - 2018) and this remains listed as part of the fynbos biome, more specifically Cape Seashore vegetation (AZd3, Mucina *et al.* (2006) and Hartenbos Dune thicket which are considered least threatened vegetation types and widely distributed (Mucina *et al.* 2006).

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Plant species present consist of low growing succulent shrubs that have a sprawling growth form. These include species such as *Drosanthemum candens*, *Carpobrotus edulis*, *C. acinaciformis*, *Pelargonium capitatum*, *Tetragonia decumbens*, *Didelta carnosus var. tomentosa*, *Exomis microphylla var. axyrioides*, *Lycium tetrandrum*, *Scaevola plumieri* and lower growing shrubs including *Hebenstretia cordata*, *Frankenia repens*, *Oncosiphon sabulosum*. Common herbaceous creepers are also found and include common and widespread species such as *Cynanchum ellipticum* and *C. obtusifolium*. Smaller herbs include species such as *Gazania rigens*, *Senecio littoreus*, *Amellus asteroides*, *Dasispermum suffruticosum*, *Manulea tomentosa*, *Polygonum maritimum*, *Senecio elegans*. Other species present include succulent herbs such as *Arctotheca populifolia* and grasses such as *Cladoraphis cyperoides*, *Ehrharta villosa var. maxima*, *Sporobolus virginicus*, *Stipagrostis zeyheri subsp. Barbata* (Mucina et al. 2006).

5.2 The Flora of the Site

The terrestrial plant theme sensitivity is considered to be low. Only 15 plant species were recorded and none were species of conservation concern (Table 7). Plant species present on the footprint consisted of a range of small trees, lower growing shrub and succulent shrubs. The site has is invaded with *Acacia cyclops*, a category 1b invader (NEMBA, 2016), which was originally introduced as a dune stabilizer. The foredune areas are covered with common foredune species and dune pioneer plant species including *Sporobolus virginicus*, *Zygophyllum morgsana*, *Arctotheca populifolia*, *Acacia cyclops* and *Oenothera drummondii*. *Oenothera drummondii* is a naturalized exotic species and is not indigenous.

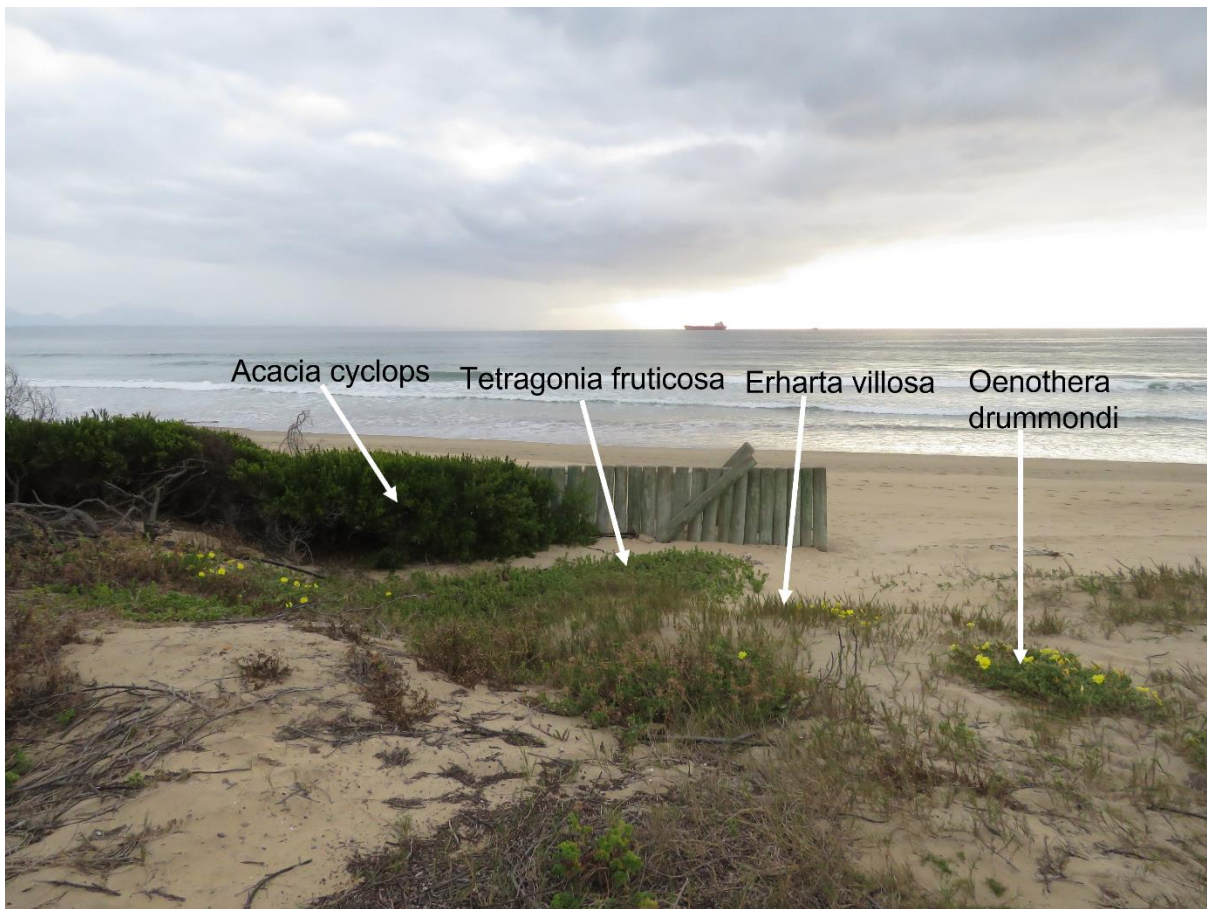


Figure 3: Plant species present in the foredune area. No species of conservation concern present.

The vegetation of the stabilized back dunes areas consisted mostly of higher growing trees (max height ca. 2.5-3m) and various lower growing shrubs, particularly *Acacia cyclops*, *Sideroxylon inerme* (Milk Wood), and *Searsia crenata*. The most abundant indigenous species present were *Searsia crenata*, *Sideroxylon inerme*, *Carpobrotus edulis*, *Passerina rigida* and *Lampranthus amoenus*. Other species present were *Helichrysum teretifolium*, *Crassula expansa* and *Pelargonium capitatum* and *Tarconanthus camphoratus*. An estimate of the density of subset of common species on site is given in Table 4. This is a protected species according the NFA 84 of 1998, it is however abundant and listed as Least Concern (Foden and Potter, 2005). *Sideroxylon inerme* is not currently considered a species of conservation concern according to the definitions provided by SANBI, 2020. The GPS coordinates are given below for permitting applications (Table 3), as a permit should be obtain to cut, disturb or destroy 15 individuals of *S. inerme*. A clearer satellite image of the site, along with the location is shown in Figure 5.

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Table 3: GPS coordinates of *Sideroxylon inerme* (Milk Wood) present on site.

	Date		Lat	Long	Species	
1	2022-10-31T04:49:10Z		-34,146288	22,110678	<i>Sideroxylon inerme</i>	
2	2022-10-31T04:49:10Z		-34,146266	22,110617	<i>Sideroxylon inerme</i>	
3	2022-10-31T04:49:10Z		-34,146295	22,110347	<i>Sideroxylon inerme</i>	
4	2022-10-31T04:49:10Z		-34,1463	22,110362	<i>Sideroxylon inerme</i>	
5	2022-10-31T04:49:10Z		-34,146331	22,110432	<i>Sideroxylon inerme</i>	
6	2022-10-31T04:49:10Z		-34,146216	22,110382	<i>Sideroxylon inerme</i>	
7	2022-10-31T04:49:10Z		-34,146214	22,110382	<i>Sideroxylon inerme</i>	
8	2022-10-31T04:49:10Z		-34,146592	22,107693	<i>Sideroxylon inerme</i>	
9	2022-10-31T04:49:10Z		-34,146416	22,110378	<i>Sideroxylon inerme</i>	
10	2022-10-31T04:49:10Z		-34,146413	22,110348	<i>Sideroxylon inerme</i>	
11	2022-10-31T04:49:10Z		-34,146229	22,110312	<i>Sideroxylon inerme</i>	
12	2022-10-31T04:49:10Z		-34,146218	22,110354	<i>Sideroxylon inerme</i>	
13	2022-10-31T04:49:10Z		-34,146244	22,110311	<i>Sideroxylon inerme</i>	
14	2022-10-31T04:49:10Z		-34,146274	22,110345	<i>Sideroxylon inerme</i>	
15	2022-10-31T04:49:10Z		-34,146268	22,110344	<i>Sideroxylon inerme</i>	

Table 4: Density of common plant species present on site.

Species	Density estimate (plants/m ²)
<i>Sideroxylon inerme</i>	0-5
<i>Acacia cyclops</i>	0-1
<i>Searsia crenata</i>	0-3
<i>Carpobrotus edulis</i>	0-1
<i>Helichrysum teretifolium</i>	0-1
<i>Lampranthus amoenus</i>	0-2

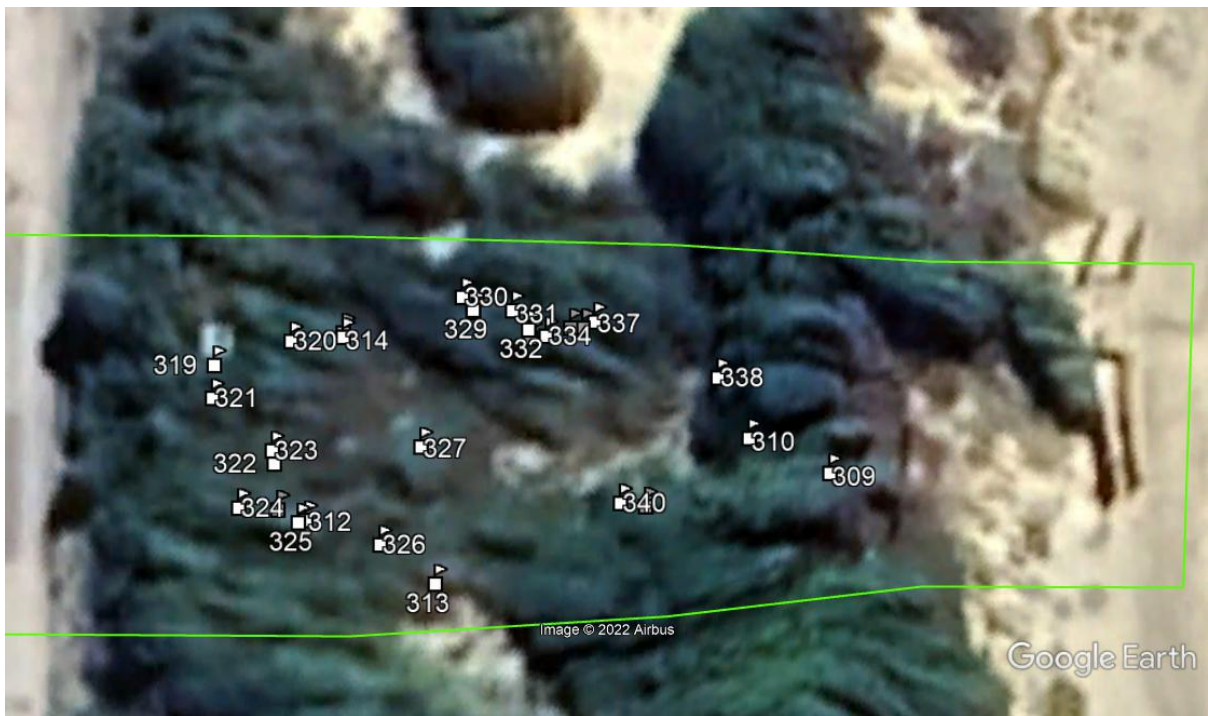


Figure 4: Map indicating the location of *Sideroxylon inerme*, a protected tree species in the footprint.



Figure 5: Satellite image of the proposed site, showing the location of milkwood trees (highlighted in blue)

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Figure 6: South facing image of the site showing foredune vegetation present. No species of conservation concern present.

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*Figure 7: Image of the site taken from nearer to the Mossgas/PetroSA fenceline showing the stabilized foredune vegetation consisting mostly of shrubs such as *S. crenata*, trees (*S.inerme*) and common creeping succulents (*C. edulis*). No species of conservation concern present.*



*Figure 8: *Sideroxylon inerme* is the only Protected tree species present on site. At least 15 individuals were found and marked.*



Figure 9: Searsia crenata is one of the most abundant woody shrub on the site.

5.3 Terrestrial plant site sensitivity

Although Milkwoods are a Protected tree species that requires a permit prior to removal, it is not a listed SCC in the IUCN Red List as it is a Least Concern (LC) species. No plant species of conservation concern were present on the development footprint (Table 7; Appendix 1), thus the site sensitivity for the terrestrial plant theme is low and agrees with the original screening tool.

5.4 Conservation Plans

The 2017 Western Cape Spatial Biodiversity Plan (WCBSP) distinguishes between the various conservation planning categories. Critical Biodiversity Areas (CBA's) are habitats with high biodiversity and ecological value. Such areas include those that are likely to be in a natural condition (CBA 1) and those that are potentially degraded or represent secondary vegetation (CBA 2). The site is currently classified as an ESA 2 (Table 5) and the presence of the wooden baffles in the foredune area combined with the pipeline manhole, indicates that this area was likely cleared before for the construction of underground pipelines and subsequently became naturally revegetated. Due to the low numbers of plant and animal species present and no species of conservation concern being present I consider the total impact on biodiversity to be low (Table 6). An important mitigating

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factor is to re-establish some milkwood trees on the actual site once construction has been completed and to erect windbreaks to prevent any unnecessary wind erosion.

Table 5: Ecological support area 2 definition provided by WCSBP, 2017

<p>Ecological Support Area Area 2 (Degraded)</p>	<p>Maintain in a functional, natural or near-natural state, with no further loss of natural habitat. These areas should be rehabilitated.</p>	<p>Acceptable land uses are those that are least harmful to biodiversity, such as conservation management, or extensive livestock or game farming (see below). Large-scale cultivation, mining and urban or industrial development are not appropriate</p> <ul style="list-style-type: none"> • Extensive (widespread, low-intensity) livestock and game ranching, if well-managed (see above), is compatible with the desired management objectives for these areas • Implementation of habitat restoration measures to restore the habitat to a better condition 	<p>If small-scale land use change is unavoidable, it must be located and designed to be as biodiversity-sensitive as possible.</p> <ul style="list-style-type: none"> • A specialist study must be part of the Scoping and EIA process for all land use applications in these areas, using the services of an experienced and locally knowledgeable biodiversity expert registered with SACNASP. • Provision for biodiversity offsets in exchange for biodiversity loss should only be considered as a last resort and at a ratio consistent with national policy. • Should be targeted as high priority areas for rehabilitation and restoration including natural resource management (NRM) projects e.g. Working for Water as well as landowner driven initiatives.
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Figure 10: CBA's and ESA's present in the proposed development footprint.

6 Terrestrial animal species theme

6.1 The Fauna of the Region

6.1.1 Birds

Bird species present within this area was taken from the nearest pentad provided by the South African Bird Atlas project (SABAP 2, 2022; Appendix 2, Table 8) pentad for this area. The pentad reference is 34102200. Birds that have been recorded here include common widespread small and medium sized passerine species. These include a diverse range of birds with different life histories such as Black capped bulbul (*Pycnonotus barbatus*), Cape white eye (*Zosterops capensis*), Bokmakierie (*Telephorus zeylonus*), southern boubou (*Laniarius ferrugineus*) Neddicky (*Cisticola fulvicapilla*), Barthroated Apalis (*Apalis thoracica*), Forest canary (*Crithagra scotops*), Red eyed dove (*Streptopelia semitorquata*), Olive thrush (*Turdus olivaceus*), Fork tailed drongo (*Dicrurus adsimilis*). As the site is within the dunefields there are likely to be marine shore species such as Kelp Gull (*Larus dominicanus*), African oystercatcher (*Haematopus moquini*) and other species listed in

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Appendix 2. Due to the small footprint of the development it is doubtful whether it would make an impact large enough to decrease bird diversity in the area.

6.1.2 Reptiles

Data for the reptile records for this specific area were taken from the ReptileMap, 2022 (Reptile Atlas of Africa; Appendix 3, Table 9) for the GPS quarter degree grid of 3422AA and showed a total of 37 species that have been recorded here. This consists of tortoise species such as Leopard tortoise (*Stigmochelys pardalis*), Angulate tortoise (*Chersine angulata*) and parrot beaked tortoise (*Homopus areolatus*). Snake species recorded include Red lipped herald (*Crotaphopeltis hotamboeia*), Boomslang (*Dispholidus typus*), Western Natal Green snake (*Philothamnus occidentalis*), Cape cobra (*Naja nivea*), house snakes (*Lycodonmorups inornatus*, *Boaedon capensis*, *Lamprophis aurora*) and Grass and sand snakes such as the Cross marked grass snake (*Pssamophis crucifer*) and Karoo sand snake (*Pssamamophis notostictus*). Other snake species recorded here include Cape wolf snake (*Lycophidion capense capense*), Puff adder (*Bitis arietans*), Spotted grass snake (*Pssamophylax rhombeatus*) and Delalandes beaked blind snake (*Rhinotyphlops lalandei*). See appendix 3 for complete list of recorded species for this QDSG.

6.1.3 Mammals

Data for the mammals from this area was taken from the database MammalMap, 2022 (Virtual Museum of African Mammals; Appendix 4, Table 10). When considering this data, it must be considered that the development footprint is not within a reserve or area protected by fencing meaning that large antelope species such as Bontebok (*Damaliscus pygargus pygargus*), Eland (*Taurotragus oryx*), and African Elephant (*Loxodonta africana*) are not present. This assessment is also terrestrial which excludes marine mammal species. Mammal species in such open access areas are smaller species that can adapt to peri urban and public environments and include antelopes such as Blue duiker (*Philantomba monticola*), Cape grysbok (*Raphicerus melanotis*), mongoose species such as Cape grey mongoose (*Herpestes pulverulentus*), Marsh mongoose (*Atilax paludinosus*), Slender mongoose (*Herpestes sanguineus*), Striped polecat (*Ictonyx striatus*), smaller mammals such as diversity of rats including South African Vlei Rat (*Ottomy irroratus*), Cape gerbil (*Gerbilisscus afra*), Xeric four striped grass rat (*Rhabdomys pumilio*), Grey african climbing mouse (*Dendromis melanotis*), and South African pouched mouse (*Saccostomus campestris*). Other mammals that could be present include Cape porcupine (*Hystrix africaeustralis*), Honey badger (*Mellivora capensis*), Chacma baboon (*Papio ursinus*) and Cape genet (*Genetta tigrina*).

6.2 The Fauna of the Site

6.2.1 Birds

A total of 18 birds species were observed during 5 hours of observation (Table 8; Appendix 2) . No species of conservation concern were observed, although a pair of African Oystercatchers (*Haematopus moquini*) did feed in the intertidal zone. These birds are highly mobile and will easily move away from any construction works. Other species that were observed were Karoo prinia (*Prinia maculosa*), Bar throated apalis (*Apalis thoracica*), Fork tailed drongo (*Dricrurus adsimilis*), Kelp gull (*Larus dominicanus*), Speckled mousebird (*Colius striatus*), Cape white eye (*Zosterops capensis*) and other highlighted in Appendix 2.



Figure 11: African oystercatcher feeding in the intertidal zone within the site footprint.

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6.2.2 Reptiles

No reptiles were observed during the site visit. This assessment is however limited in that I did not set any traps to monitor for the present of lizards, skinks, geckos, and snakes that may have been found in this way.

6.2.3 Mammals

No mammals were observed, however scat fitting the dimensions of a Cape clawless otter was found (Figure 13). This is potentially an area used by these animals as a latrine, however the development does not threaten these animals.



Figure 12: Scat of Cape clawless otter present on site.

Although the initial screening sensitivity listed the terrestrial animal theme as Medium sensitivity the absence of any species of conservation concern found in the field visit to this site indicates that the terrestrial animal theme sensitivity is low.

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6.3 Terrestrial animal theme sensitivity

No terrestrial animal species of conservation concern were present on the site and the terrestrial animal theme sensitivity is considered low. Within the original screening report, the terrestrial animal theme was considered to be medium sensitivity due to the likelihood of the presence of the locust *Aneuryphymus montanus*, an insect species currently classified as Vulnerable and therefore a SCC. Although the author is not a specialist with regard to this taxon, an informed opinion can be provided as to likelihood of the presence of this species on site owing to its habitat requirements. According to the habitat description given by Brown (1960), this species is mainly found in fynbos environments described as “burnt stands of evergreen Sclerophyll” (Brown, 1960, p. 139). The vegetation type and habitat of the proposed development site is very different (see section 5.2 “Flora of the site”). Therefore, since the habitat is unlikely to support the locust identified by the DFFE Screening Tool as a SCC and since no locusts were observed during the physical site inspection, it is highly unlikely the species is present on site.

7 Terrestrial biodiversity theme

The sensitivity of the terrestrial biodiversity is a combination of plant and animals present on site combined with the ecology of the area. Given that no terrestrial plant or animals SCC’s were present and that the terrestrial development area is small it unlikely to have long term cumulative impacts on the ecology of the area. According to Tinley (1985) the current dune system is classified as a low relief dune embankment with a well developed scrub/thicket zone on the seaward facing foredunes (Tinley, 1985). Industrial developments by Mossgass begins directly behind this zone. Some of the main drivers of vegetation communities in dunes is the movement of sand and plants are continuously buried in the foredune areas and have to adapt to survive or outgrow sand burial. As the windspeed is reduced in the vegetated areas of the foredunes, there is increased accumulation of dead organic matter which promotes the establishment of larger, woody plant species. Faunal changes are associated with the changes in vegetation, with species adapted to foredunes environment (e.g. marine wading birds) not utilizing the scrub/thicket zone.

As the vegetation is cleared on the proposed site, this may have a localized impact that more sand will be removed from the sand by prevailing winds, however much the windspeed is likely to be slowed significantly by the presence of undisturbed vegetation around the development footprint. The dunes surrounding the site, have also been stabilized by the present of indigenous trees (e.g. *S. inerme*) and exotic invasive plants (E.g. *A. cyclops*). Sand can also be stabilized during the project by erecting wind break fences. Given the ecosystem will not be irreversibly modified by the current

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development I consider the impact on the terrestrial biodiversity to be low. A summary of the site sensitivity for all three themes is given in Table 6 below.

Table 6: Summary of the site sensitivity with respect to different themes in this report, as verified in this Ecology Assessment

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS	Terrestrial biodiversity	Animal species	Plant species
Very high			
High			
Medium			
Low	X	X	X

8 Mitigation measures

Depending on the degree of disturbance, plants are likely to re-establish naturally once construction works have been completed. Due to the clearing of protected tree species being required, milkwood trees can be replanted again on the site once construction has been completed. Note that trees cannot be excavated and replanted, as large trees are unlikely to survive, thus nursery stock should be used. The following other mitigation measures can be implemented:

1. Restrict all activities to the designated launch way footprint and demarcate all other areas on the vegetative dune as no-go areas;
2. Use areas that have already been developed such as the PetroSA yard for laydown purposes;
3. Under no circumstances must any contaminated runoff from the project be allowed to run into the sea; and
4. The launch way area must be rehabilitated after construction has been completed. To achieve this, seedlings or sapling would need to be acquired from local nurseries in the area (e.g. George).

9 No Go areas

No terrestrial areas within the development footprint areas are of sufficiently high sensitivity to designate as No-Go areas. All areas outside of the approved construction footprint, should however

be designated as No-Go areas. All clearing and construction should follow the following good practices:

- Pre-construction educational talks (e.g. Toolbox talks) should be carried out to inform staff or environmental legislation and good practice issues.
- All building materials should be stockpiled and stored in areas cleared specifically for that purpose.
- Clearing of any indigenous vegetation should be restricted to the development footprint only;
- Clearing of areas for storage should preferably be done on areas that were previously disturbed or cleared.
- Soil should only be excavated at designated areas.
- Under no circumstances may any contaminated run-off from the site activities enter the sea!
- Dust from building activities should be controlled as far as is reasonably possible.
- Topsoil should only be stripped when necessary and only the quantities required.
- Vehicles, machinery and other equipment should only be stored in designated areas.
- Site offices and parking lots should be located in areas that requires minimum clearing of indigenous vegetation.
- Do not park heavy machinery underneath large trees to avoid damage to the roots of these plants.
- All cleared areas should be re-vegetated and rehabilitated.
- Stored topsoil should be used to re-vegetation cleared areas and be re-distributed over the site as necessary.
- An application for a water use license must be made if water is to be obtained from the sea.

10 Conclusion

The biodiversity within the proposed development footprint is relatively low, with only one species of protected tree being present. No SCC concern, as listed in the IUCN Redlist are present in the launch way footprint. The majority of the site is covered in a mixture of indigenous shrubs and trees and is also invaded by *A. cyclops*, a common invasive wattle in dune systems. Although the presence of invasive species suggests that the site is degraded, there is still a need to limit the damage to

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indigenous protected flora to as large extent as possible. It is important to note that the development footprint is small, and consequently the amount of vegetation removed and disturbance is unlikely to have wide spread and negative, long-term impacts on terrestrial biodiversity. The construction site should be clearly demarcated and all areas outside of the construction site boundary designated as No-GO areas to avoid damage to vegetation outside the site boundaries. In addition, the area cleared of vegetation should be rehabilitated following soon after construction with indigenous plant species.

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11.1 Appendix 1: Plant species

Table 7: Plant species identified on site.

Species	Family	Conservation status
<i>Dasispermum suffuticosum</i>	Apiaceae	LC
<i>Acacia cyclops</i>	Fabaceae	LC, category 1b invader NEMBA 2016, Cat.2 (Cara, 2001)
<i>Crassula expansa subsp. expansa</i>	Crassulaceae	LC
<i>Osteospermum monoliferum</i>	Asteraceae	LC
<i>Tetragonia decumbens</i>	Aizoaceae	LC
<i>Sporobolus virginicus</i>	Poaceae	LC
<i>Arctotheca populifolia</i>	Asteraceae	LC
<i>Tarconanthus littoralis</i>	Asteraceae	LC
<i>Searsia crenata</i>	Anacardiaceae	LC
<i>Sideroxylon inerme</i>	Sapotaceae	LC
<i>Carpobrotus edulis</i>	Aizoaceae	LC
<i>Gazania rigens</i>	Asteraceae	LC
<i>Oenothera drummondii</i>	Asteraceae	Naturalized invasive
<i>Zygophyllum morgsana</i>	Zygophyllaceae	LC
<i>Lampranthus amoenum</i>	Aizoaceae	LC

11.2 Appendix 2: Birds

Table 8: Bird species that have been reported within the pentad 34102200. Birds observed during the sight visit are highlighted in yellow.

Common species	Genus	Species	FP (RR%)
	Bokmakierie	Telophorus	Zeylonus
	Budgerigar	Melopsittacus	Undulatus
	Neddicky	Cisticola	Fulvicapilla
	Quailfinch	Ortygospiza	Atricollis
	Sanderling	Calidris	Alba
Apalis	Bar-throated	Apalis	Thoracica
Barbet	Acacia Pied	Tricholaema	Leucomelas
Batis	Cape	Batis	Capensis
Bishop	Southern Red	Euplectes	Orix
Bishop	Yellow	Euplectes	Capensis
Boubou	Southern	Laniarius	Ferrugineus
Brownbul	Terrestrial	Phyllastrephus	Terrestris
Bulbul	Cape	Pycnonotus	Capensis
Bunting	Cape	Emberiza	Capensis
Bunting	Cinnamon-breasted	Emberiza	Tahapisi
Bushshrike	Olive	Chlorophoneus	Olivaceus
Bustard	Denham's	Neotis	Denhami

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Buzzard	Common	Buteo	buteo
Buzzard	Jackal	Buteo	rufofuscus
Canary	Brimstone	Crithagra	sulphurata
Canary	Cape	Serinus	canicollis
Canary	Forest	Crithagra	scotops
Canary	White-throated	Crithagra	albogularis
Canary	Yellow	Crithagra	flaviventris
Chat	Familiar	Oenanthe	familiaris
Cisticola	Cloud	Cisticola	textrix
Cisticola	Grey-backed	Cisticola	subruficapilla
Cisticola	Levaillant's	Cisticola	tinniens
Cisticola	Zitting	Cisticola	juncidis
Coot	Red-knobbed	Fulica	cristata
Cormorant	Cape	Phalacrocorax	capensis
Cormorant	Reed	Microcarbo	africanus
Cormorant	White-breasted	Phalacrocorax	lucidus
Coucal	Burchell's	Centropus	burchellii
Crane	Blue	Grus	paradisea
Crombec	Long-billed	Sylvietta	rufescens
Crow	Cape	Corvus	capensis
Crow	Pied	Corvus	albus
Cuckoo	Diederik	Chrysococcyx	caprius
Cuckoo	Jacobin	Clamator	jacobinus
Cuckoo	Klaas's	Chrysococcyx	klaas
Cuckooshrike	Black	Campephaga	flava
Darter	African	Anhinga	rufa
Dove	Cape Turtle	Streptopelia	capicola
Dove	Laughing	Spilopelia	senegalensis
Dove	Namaqua	Oena	capensis
Dove	Red-eyed	Streptopelia	semitorquata

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Dove	Rock	Columba	livia
Drongo	Fork-tailed	Dicrurus	adsimilis
Duck	African Black	Anas	sparsa
Duck	White-backed	Thalassornis	leuconotus
Duck	White-faced Whistling	Dendrocygna	viduata
Duck	Yellow-billed	Anas	undulata
Eagle	Booted	Hieraaetus	pennatus
Eagle	Martial	Polemaetus	bellicosus
Eagle-Owl	Cape	Bubo	capensis
Eagle-Owl	Spotted	Bubo	africanus
Egret	Little	Egretta	garzetta
Egret	Western Cattle	Bubulcus	ibis
Falcon	Lanner	Falco	biarmicus
Falcon	Peregrine	Falco	peregrinus
Fiscal	Southern	Lanius	collaris
Flamingo	Greater	Phoenicopterus	roseus
Flycatcher	African Dusky	Muscicapa	adusta
Flycatcher	African Paradise	Terpsiphone	viridis
Flycatcher	Fiscal	Melaenornis	silens
Francolin	Grey-winged	Scleroptila	afra
Gannet	Cape	Morus	capensis
Goose	Egyptian	Alopochen	aegyptiaca
Goose	Spur-winged	Plectropterus	gambensis
Grassbird	Cape	Sphenoeacus	afer
Grebe	Little	Tachybaptus	ruficollis
Greenbul	Sombre	Andropadus	importunus

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Guineafowl	Helmeted	Numida	meleagris
Gull	Grey-headed	Chroicocephalus	cirrocephalus
Gull	Hartlaub's	Chroicocephalus	hartlaubii
Gull	Kelp	Larus	dominicanus
Harrier	Black	Circus	maurus
Harrier-Hawk	African	Polyboroides	typus
Heron	Black-headed	Ardea	melanocephala
Heron	Grey	Ardea	cinerea
Honeyguide	Lesser	Indicator	minor
Hoopoe	African	Upupa	africana
Ibis	African Sacred	Threskiornis	aethiopicus
Ibis	Hadada	Bostrychia	hagedash
Kestrel	Rock	Falco	rupicolus
Kingfisher	Brown-hooded	Halcyon	albiventris
Kingfisher	Giant	Megaceryle	maxima
Kingfisher	Pied	Ceryle	rudis
Kite	Black-winged	Elanus	caeruleus
Kite	Yellow-billed	Milvus	aegyptius
Lapwing	Black-winged	Vanellus	melanopterus
Lapwing	Blacksmith	Vanellus	armatus
Lapwing	Crowned	Vanellus	coronatus
Lark	Agulhas Long-billed	Certhilauda	brevirostris
Lark	Cape Clapper	Mirafra	apiata
Lark	Large-billed	Galerida	magnirostris
Lark	Red-capped	Calandrella	cinerea
Longclaw	Cape	Macronyx	capensis
Martin	Brown-throated	Riparia	paludicola

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Martin	Common House	Delichon	urbicum
Martin	Rock	Ptyonoprogne	fuligula
Moorhen	Common	Gallinula	chloropus
Mousebird	Red-faced	Urocolius	indicus
Mousebird	Speckled	Colius	striatus
Mousebird	White-backed	Colius	colius
Nightjar	Fiery-necked	Caprimulgus	pectoralis
Ostrich	Common	Struthio	camelus
Oystercatcher	African	Haematopus	moquini
Penguin	African	Spheniscus	demersus
Pigeon	African Olive	Columba	arquatrix
Pigeon	Speckled	Columba	guinea
Pipit	African	Anthus	cinnamomeus
Pipit	Nicholson's	Anthus	nicholsoni
Pipit	Plain-backed	Anthus	leucophrys
Plover	Common Ringed	Charadrius	hiaticula
Plover	Three-banded	Charadrius	tricoloris
Plover	White-fronted	Charadrius	marginatus
Prinia	Karoo	Prinia	maculosa
Quail	Common	Coturnix	coturnix
Quelea	Red-billed	Quelea	quelea
Raven	White-necked	Corvus	albicollis
Robin-Chat	Cape	Cossypha	caffra
Saw-wing	Black (Southern Africa)	Psalidoprocne	pristoptera holomelas
Scrub Robin	Karoo	Cercotrichas	coryphoeus
Seed-eater	Streaky-headed	Crithagra	gularis

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Shelduck	South African	Tadorna	cana
Shoveler	Cape	Spatula	smithii
Snipe	African	Gallinago	nigripennis
Sparrow	Cape	Passer	melanurus
Sparrow	House	Passer	domesticus
Sparrow	Southern Grey-headed	Passer	diffusus
Sparrowhawk	Black	Accipiter	melanoleucus
Sparrowhawk	Rufous-breasted	Accipiter	rufiventris
Spoonbill	African	Platalea	alba
Spurfowl	Cape	Pternistis	capensis
Spurfowl	Red-necked	Pternistis	afer
Starling	Common	Sturnus	vulgaris
Starling	Pied	Lamprotornis	bicolor
Starling	Red-winged	Onychognathus	morio
Stilt	Black-winged	Himantopus	himantopus
Stonechat	African	Saxicola	torquatus
Stork	White	Ciconia	ciconia
Sugarbird	Cape	Promerops	cafer
Sunbird	Amethyst	Chalcomitra	amethystina
Sunbird	Greater Double-collared	Cinnyris	afer
Sunbird	Grey	Cyanomitra	veroxii
Sunbird	Malachite	Nectarinia	famosa
Sunbird	Orange-breasted	Anthobaphes	violacea
Sunbird	Southern Double-collared	Cinnyris	chalybeus
Swallow	Barn	Hirundo	rustica
Swallow	Greater Striped	Cecropis	cucullata

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Swallow	Pearl-breasted	Hirundo	dimidiata
Swallow	White-throated	Hirundo	albigularis
Swift	African Black	Apus	barbatus
Swift	African Palm	Cypsiurus	parvus
Swift	Alpine	Tachymarptis	melba
Swift	Common	Apus	apus
Swift	Little	Apus	affinis
Swift	White-rumped	Apus	caffer
Tchagra	Southern	Tchagra	tchagra
Teal	Cape	Anas	capensis
Teal	Red-billed	Anas	erythrorhyncha
Tern	Common	Sterna	hirundo
Tern	Greater Crested	Thalasseus	bergii
Tern	Sandwich	Thalasseus	sandvicensis
Thick-knee	Spotted	Burhinus	capensis
Thick-knee	Water	Burhinus	vermiculatus
Thrush	Cape Rock	Monticola	rupestris
Thrush	Olive	Turdus	olivaceus
Tit	Cape Penduline	Anthoscopus	minutus
Turnstone	Ruddy	Arenaria	interpres
Wagtail	Cape	Motacilla	capensis
Warbler	Knysna	Bradypterus	sylvaticus
Warbler	Little Rush	Bradypterus	baboecala
Warbler	Marsh	Acrocephalus	palustris
Waxbill	Common	Estrilda	astrild
Waxbill	Sweet	Coccyzygia	melanotis
Weaver	Cape	Ploceus	capensis
Weaver	Southern Masked	Ploceus	velatus
Wheatear	Capped	Oenanthe	pileata

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White-eye	Cape	Zosterops	virens
Whydah	Pin-tailed	Vidua	macroura
Woodpecker	Cardinal	Dendropicos	fuscescens
Woodpecker	Knysna	Campethera	notata
Woodpecker	Olive	Dendropicos	griseocephalus

11.3 Appendix 3: Reptiles

Table 9: Reptile species recorded within the QDS 3422AA

Family	Species name	Red list category	Number of QDSs
Agamidae	Agama atra	Southern Rock Agama	Least Concern (SARCA 2014)
Chamaeleonidae	Bradypodion damaranum	Knysna Dwarf Chameleon	Least Concern (SARCA 2014)
Chamaeleonidae	Bradypodion gutturale	Little Karoo Dwarf Chameleon	Least Concern (SARCA 2014)
Cheloniidae	Chelonia mydas	Green Turtle	Near Threatened (SARCA 2014)
Colubridae	Crotaphopeltis hotamboeia	Red-lipped Snake	Least Concern (SARCA 2014)
Colubridae	Dispholidus typus typus	Boomslang	Least Concern (SARCA 2014)

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Colubridae	Philothamnus occidentalis	Western Natal Green Snake	Least Concern (SARCA 2014)
Cordylidae	Chamaesaura anguina anguina	Cape Grass Lizard	Least Concern (SARCA 2014)
Cordylidae	Cordylus cordylus	Cape Girdled Lizard	Least Concern (SARCA 2014)
Elapidae	Naja nivea	Cape Cobra	Least Concern (SARCA 2014)
Gekkonidae	FAMILY Gekkonidae	Unidentified Gekkonidae	
Gekkonidae	Afrogecko porphyreus	Marbled Leaf-toed Gecko	Least Concern (SARCA 2014)
Gekkonidae	Hemidactylus mabouia	Common Tropical House Gecko	Least Concern (SARCA 2014)
Gekkonidae	Lygodactylus capensis	Common Dwarf Gecko	Least Concern (SARCA 2014)
Gekkonidae	Pachydactylus geitje	Ocellated Gecko	Least Concern (SARCA 2014)
Gerrhosauridae	Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)

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Lacertidae	Pedioplanis lineocellata pulchella	Common Sand Lizard	Least Concern (SARCA 2014)
Lamprophiidae	Boaedon capensis	Brown House Snake	Least Concern (SARCA 2014)
Lamprophiidae	Duberria lutrix lutrix	South African Slug-eater	Least Concern (SARCA 2014)
Lamprophiidae	Homoroselaps lacteus	Spotted Harlequin Snake	Least Concern (SARCA 2014)
Lamprophiidae	Lamprophis aurora	Aurora House Snake	Least Concern (SARCA 2014)
Lamprophiidae	Lycodonomorphus inornatus	Olive House Snake	Least Concern (SARCA 2014)
Lamprophiidae	Lycodonomorphus rufulus	Brown Water Snake	Least Concern (SARCA 2014)
Lamprophiidae	Lycophidion capense capense	Cape Wolf Snake	Least Concern (SARCA 2014)
Lamprophiidae	Prosymna sundevallii	Sundevall's Shovel-snout	Least Concern (SARCA 2014)
Lamprophiidae	Psammophis crucifer	Cross-marked Grass Snake	Least Concern (SARCA 2014)

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Lamprophiidae	<i>Psammophis notostictus</i>	Karoo Sand Snake	Least Concern (SARCA 2014)
Lamprophiidae	<i>Psammophylax rhombeatus</i>	Spotted Grass Snake	Least Concern (SARCA 2014)
Scincidae	<i>Acontias meleagris</i>	Cape Legless Skink	Least Concern (SARCA 2014)
Scincidae	<i>Scelotes bipes</i>	Silvery Dwarf Burrowing Skink	Least Concern (SARCA 2014)
Scincidae	<i>Trachylepis capensis</i>	Cape Skink	Least Concern (SARCA 2014)
Scincidae	<i>Trachylepis homalocephala</i>	Red-sided Skink	Least Concern (SARCA 2014)
Testudinidae	<i>Chersina angulata</i>	Angulate Tortoise	Least Concern (SARCA 2014)
Testudinidae	<i>Homopus areolatus</i>	Parrot-beaked Tortoise	Least Concern (SARCA 2014)
Testudinidae	<i>Stigmochelys pardalis</i>	Leopard Tortoise	Least Concern (SARCA 2014)
Typhlopidae	<i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	Least Concern (SARCA 2014)

Viperidae	Bitis arietans arietans	Puff Adder	Least Concern (SARCA 2014)
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11.4 Appendix 4: Mammals

Table 10: Mammal species that have been recorded within the QDS 3422AA.

Family	Species name	Common name	Conservation status
Bathyergidae	Bathyergus suillus	Cape Dune Mole-rat	Least Concern (2016)
Bovidae	Damaliscus pygargus pygargus	Bontebok	Vulnerable (2016)
Bovidae	Philantomba monticola	Blue Duiker	Vulnerable (2016)
Bovidae	Raphicerus melanotis	Cape Grysbok	Least Concern (2016)
Bovidae	Taurotragus oryx	Common Eland	Least Concern (2016)
Bovidae	Tragelaphus scriptus	Bushbuck	Least Concern
Canidae	Canis mesomelas	Black-backed Jackal	Least Concern (2016)

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Canidae	Otocyon megalotis	Bat-eared Fox	Least Concern (2016)
Scientific name	Common name	Red list category	Number of QDSs
Bathyergidae	Bathyergus suillus	Cape Dune Mole-rat	Least Concern (2016)
Bovidae	Damaliscus pygargus pygargus	Bontebok	Vulnerable (2016)
Bovidae	Philantomba monticola	Blue Duiker	Vulnerable (2016)
Bovidae	Raphicerus melanotis	Cape Grysbok	Least Concern (2016)
Bovidae	Taurotragus oryx	Common Eland	Least Concern (2016)
Bovidae	Tragelaphus scriptus	Bushbuck	Least Concern
Canidae	Canis mesomelas	Black-backed Jackal	Least Concern (2016)
Canidae	Otocyon megalotis	Bat-eared Fox	Least Concern (2016)
Scientific name	Common name	Red list category	Number of QDSs
Bathyergidae	Bathyergus suillus	Cape Dune Mole-rat	Least Concern (2016)
Bovidae	Damaliscus pygargus pygargus	Bontebok	Vulnerable (2016)
Bovidae	Philantomba monticola	Blue Duiker	Vulnerable (2016)

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Bovidae	Raphicerus melanotis	Cape Grysbok	Least Concern (2016)
Bovidae	Taurotragus oryx	Common Eland	Least Concern (2016)
Bovidae	Tragelaphus scriptus	Bushbuck	Least Concern
Canidae	Canis mesomelas	Black-backed Jackal	Least Concern (2016)
Canidae	Otocyon megalotis	Bat-eared Fox	Least Concern (2016)
Scientific name	Common name	Red list category	Number of QDSs
Bathyergidae	Bathyergus suillus	Cape Dune Mole-rat	Least Concern (2016)
Bovidae	Damaliscus pygargus pygargus	Bontebok	Vulnerable (2016)
Bovidae	Philantomba monticola	Blue Duiker	Vulnerable (2016)
Bovidae	Raphicerus melanotis	Cape Grysbok	Least Concern (2016)
Bovidae	Taurotragus oryx	Common Eland	Least Concern (2016)
Bovidae	Tragelaphus scriptus	Bushbuck	Least Concern
Canidae	Canis mesomelas	Black-backed Jackal	Least Concern (2016)
Canidae	Otocyon megalotis	Bat-eared Fox	Least Concern (2016)