

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR
GAS PIPELINE DEVELOPMENT IN SOUTH AFRICA

Biodiversity and Ecological Impacts - Avifauna

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR GAS PIPELINE DEVELOPMENT

Draft v3 Specialist Assessment Report for Stakeholder Review

AVIFAUNA

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ABBREVIATIONS AND ACRONYMS

SEA	Strategic Environmental Assessment
IBA	Important Bird Area
SABAP1	Southern African Bird Atlas Project 1
SABAP2	Southern African Bird Atlas Project 2
EWT	Endangered Wildlife Trust
NT	Near threatened
VU	Vulnerable
EN	Endangered
CR	Critically Endangered
SANBI	South African National Biodiversity Institute
QDGC	Quarter Degree Grid Cell
BLSA	Birdlife South Africa
IFC	International Finance Corporation

1 SUMMARY

The table below provides a summary of the most important findings of the study, as well as an overall suitability rating for each Gas Pipeline Corridor Phase.

Corridor Phase	Overall Suitability	Comment
Phase Inland	High	<p><u>Mortality</u>: Very low risk for Red Data species is anticipated.</p> <p><u>Displacement due to disturbance</u>: Low to very low risk for Red Data species is anticipated. Depending on where the alignment is located, the impact could be moderate on tree and powerline nesting Martial Eagles.</p> <p><u>Displacement due to habitat destruction</u>: Very low risk for Red Data species is anticipated.</p>
Phase 1	Medium - high	<p><u>Mortality</u>: Moderate to very low risk for Red Data species is anticipated. Depending on where the alignment is located, the impact on Martial Eagle could be moderate, and substantial in the case of Damara Terns breeding at De Mond in the De Hoop Nature Reserve.</p> <p><u>Displacement due to disturbance</u>: Moderate to very low risk for Red Data species is anticipated. Depending on where the alignment is situated, impact on the Cape Vulture colony at Potberg and the Damara Terns breeding at De Mond in the De Hoop Nature Reserve could be substantial.</p> <p><u>Displacement due to habitat destruction</u>: Very low risk for Red Data species is anticipated.</p>
Phase 2	Medium - high	<p><u>Mortality</u>: Low to very low risk for Red Data species is anticipated. Depending on where the alignment is located, the impact on Martial Eagle could be moderate.</p> <p><u>Displacement due to disturbance</u>: Low to very low risk for Red Data species is anticipated. Depending on where the alignment is situated, the impact on Martial Eagles could be moderate.</p> <p><u>Displacement due to habitat destruction</u>: Very low risk for Red Data species is anticipated.</p>
Phase 3	Medium	<p><u>Mortality</u>: Moderate to very low risk for Red Data species anticipated. Depending on where the alignment is located, impact on Wattled Crane, forest specialists e.g. Eastern Bronze-naped Pigeon, and tree nesting vultures could be substantial. Rudd's Lark and Botha's lark could also be substantially impacted in grassland habitat.</p> <p><u>Displacement due to disturbance</u>: Moderate to low risk for Red Data species is anticipated. Depending on where the alignment is located, impact on forest specialists e.g. Eastern Bronze-naped Pigeon, and vultures, both tree nesting and cliff-nesting (Cape Vultures in the Magaliesberg) could be substantial. Disturbance of breeding Wattled Cranes in wetlands could also be substantial. Rudd's Lark and Botha's lark could also be substantially impacted in grassland habitat.</p> <p><u>Displacement due to habitat destruction</u>: Low to very low risk for Red Data species is anticipated. Depending on where the alignment is located, impact on forest specialists e.g. Eastern Bronze-naped Pigeon, and tree nesting vultures could be moderate. Rudd's Lark and Botha's lark could also be moderately impacted in grassland habitat.</p>
Phase 4	Medium	<p><u>Mortality</u>: Moderate to very low risk for Red Data species anticipated. Depending on where the alignment is located, impact on tree nesting raptors and vultures could be substantial.</p> <p><u>Displacement due to disturbance</u>: Moderate to very low risk for Red Data species anticipated. Depending on where the alignment is located, the impact on large eagles, vultures and Pink-backed Pelicans could be substantial.</p> <p><u>Displacement due to habitat destruction</u>: Low to very low risk for Red Data species is anticipated. Depending on where the alignment is located, impact on forest specialists e.g. Eastern Bronze-naped Pigeon, and tree nesting vultures could be moderate.</p>

Corridor Phase	Overall Suitability	Comment
Phase 5	High	<p><u>Mortality</u>: Very low risk for Red Data species is anticipated.</p> <p><u>Displacement due to disturbance</u>: Low to very low impact risk for Red data species is envisaged. Depending on where the alignment is located, the impact on powerline nesting raptors, especially Martial Eagle, could be moderate.</p> <p><u>Displacement due to habitat destruction</u>: Very low risk for Red Data species is anticipated</p>
Phase 6	High	<p><u>Mortality</u>: Very low risk for Red Data species is anticipated.</p> <p><u>Displacement due to disturbance</u>: Low to very low impact risk for Red data species is envisaged. Depending on where the alignment is located, the impact on powerline nesting raptors, especially Martial Eagle, could be moderate.</p> <p><u>Displacement due to habitat destruction</u>: Very low risk for Red Data species is anticipated.</p>
Phase 7	Medium	<p><u>Mortality</u>: Moderate to very low risk for Red Data species anticipated. Depending where the alignment is situated, impact could be substantial on Damara Tern, Southern Ground Hornbill, forest species, tree nesting large eagles and vultures and Wattled Crane.</p> <p><u>Displacement due to disturbance</u>: Moderate to very low risk for Red Data species. Depending where the alignment is situated, impact could be substantial on Damara Tern, Southern Ground Hornbill, forest species, tree nesting large eagles and vultures, Blue Swallows and Wattled Crane.</p> <p><u>Displacement due to habitat destruction</u>: Moderate to very low risk for Red Data species. Depending on where the alignment is situated, impact could be moderate on forest species and tree nesting large eagles and vultures, but substantial for Blue Swallow.</p>
Phase 8	Medium	<p><u>Mortality</u>: High to very low risk for Red Data species anticipated. Depending on where the alignment is located, impacts could be substantial for large raptors and vultures and Southern Ground Hornbill. Severe impacts are possible in the case of White-winged Flufftail.</p> <p><u>Displacement due to disturbance</u>: High to very low risk for Red Data species anticipated. Depending on where the alignment is located, impacts could be substantial for large raptors and vultures and Southern Ground Hornbill. Severe in the case of White-winged Flufftail and Wattled Crane.</p> <p><u>Displacement due to habitat destruction</u>: Depending where the alignment is situated, impact could be moderate on tree nesting large eagles and vultures</p>

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2 INTRODUCTION

The focus of this report is on activities associated with construction and operation of gas pipelines and related facilities that have the potential to affect avifauna, particularly Red Data species. Examples of related facilities are pigging stations and block valves, and other infrastructure required for the operation of the gas transmission line. The actual sourcing of gas and the activities associated with the distribution of the gas or use of the gas by third parties is not included in the scope of this SEA. Distribution (branch lines to industrial areas and reticulation offtake points) and reticulation (lines to homes and small industry) pipelines, with pressures less than 15 bar, are also not considered in this SEA Process.

Generally, gas infrastructure is divided into small- and large-diameter pipelines. Large pipelines (>508 mm; 20 in), require larger equipment and more space for construction, emphasizing the need for detailed considerations during the planning stages (Stantec, 2013). For purposes of this report a construction servitude of 50m (25m either side of the centre line) was assumed (Refer to Part 2 of the SEA Report for a Project Description).

Operational activities on gas pipeline servitudes are generally limited to maintenance and monitoring programs and as such have fewer operational interactions with avifauna. Operational activities are mostly related to integrity management, vegetation management and daily operational activities at compressor or pump stations¹. These activities pose some risk to avifauna depending on the timing, extent and duration of work activities. Generally operational activities are localized, and the risk of direct mortality and displacement due to disturbance and habitat destruction is much less than what exists for construction-related activities.

While the envisaged impacts on avifauna are linked to and overlap with some of the other disciplines e.g. terrestrial ecology, estuaries and freshwater, there are also important differences, in that the mobility of birds means they can sometimes (although not in the case of nestlings or eggs) avoid an impact by moving out of an impacted area. Also, in the case of avifauna, transformed habitats can be very important, e.g. the mosaic of pastures and cultivation in the Overberg Wheatbelt (Phase 1) is crucial habitat for the threatened Blue Crane.

3 PROJECT SCOPE

3.1 Terms of reference

The terms of reference for this report are as follows:

- Review of existing literature to compile a baseline description applicable to each corridor phase;
- Compilation of a shortlist of bird species that are sensitive to gas pipeline infrastructure that are likely to occur in each corridor phase;
- Identification of avifaunal sensitivity features (e.g. habitat classes, roosts and colonies etc.) within each corridor phase;
- Development of an approach for classing each sensitivity feature in each corridor phase according to a four-tiered sensitivity rating system i.e. Very High, High, Medium or Low;
- Assessment of the proposed corridor phases in terms of the potential impacts associated with the construction and operation of gas pipelines on priority species and their habitats;
- Description of proposed management actions to enhance benefits and avoid/reduce/offset negative impacts in each corridor phase;
- Based on the findings of the assessment, the compilation of a four-tiered sensitivity map related to potential impact on avifauna in each corridor phase;

¹ Compressor stations are not included in the scope of work as the initial pipeline phases will, most likely, be built without compressor stations. Compressor stations form part of future expansions of the pipelines and will be located near the pigging stations.

- Provision of input into the pre-construction site specific environmental assessment protocol (Decision-Support Tools) for each corridor phase i.e. the additional information and level of assessment which is required in each sensitivity category before an authorisation with respect to avifauna should be considered.

3.2 Data Sources

Below is a detailed list and description of all data sources on which the assessment is based, and from which sensitive features/criteria are extracted (Table 1).

Table 1: Data sources on which the avifauna assessment is based.

Data title	Source and date of publication	Data Description
The Southern African Bird Atlas 1 (SABAP1)	Animal Demography Unit, University of Cape Town, 1997.	<p>The Southern African Bird Atlas Project (SABAP) was conducted between 1987 and 1991. Because a new bird atlas was started in southern Africa in 2007, the earlier project is now referred to as SABAP1. SABAP1 covered six countries: Botswana, Lesotho, Namibia, South Africa, Swaziland and Zimbabwe. At the time, Mozambique was engulfed in a civil war, and had to be excluded. The resolution for SABAP1 was the quarter degree grid cell (QDGC), 15 minutes of latitude by 15 minutes of longitude, 27.4 km north-south and about 25 km east-west, an area of about 700 km². Fieldwork was conducted mainly in the five-year period 1987–1991, but the project coordinators included all suitable data collected from 1980–1987. In some areas, particularly those that were remote and inaccessible, data collection continued until 1993.</p> <p>Fieldwork was undertaken mainly by birders, and most of it was done on a volunteer basis. Fieldwork consisted of compiling bird lists for the QDGCs. All the checklists were fully captured into a database. The final dataset consisted of 147 605 checklists, containing a total of 7.3 million records of bird distribution. Of the total 3973 QDGCs, only 88 had no checklists (2.2% of the total).</p>
The Southern African Bird Atlas 2 (SABAP2)	Animal Demography Unit, University of Cape Town, 1 July 2007 to present, ongoing. Accessed in March 2018.	<p>SABAP2 is the follow-up project to the Southern African Bird Atlas Project (for which the acronym was SABAP, and which is now referred to as SABAP1). This first bird atlas project took place from 1987-1991. The second bird atlas project started on 1 July 2007 and plans to run indefinitely. The current project is a joint venture between the Animal Demography Unit at the University of Cape Town, BirdLife South Africa and the South African National Biodiversity Institute (SANBI). The project aims to map the distribution and relative abundance of birds in southern Africa and the atlas area includes South Africa, Lesotho and Swaziland. SABAP2 was launched in Namibia in May 2012. The field work for this project is done by more than one thousand five hundred volunteer birders. The unit of data collection is the pentad, five minutes of latitude by five minutes of longitude, squares with sides of roughly 9km. At the end of June 2017, the SABAP2 database contained more than 189,000 checklists. The milestone of 10 million records of bird distribution in the SABAP2 database was less than</p>

Data title	Source and date of publication	Data Description
		300,000 records away. Nine million records were reached on 29 December 2016, eight months after reaching 8 million on 14 April 2016, which in turn was eight months after reaching seven million on 22 August 2015, and 10 months after the six million record milestone. More than 78% of the original SABAP2 atlas area (i.e. South Africa, Lesotho and Swaziland) has at least one checklist at this stage in the project's development. More than 36% of pentads have four or more lists.
2013 - 2014 South African National Land-Cover Dataset	DEA February 2015 (https://egis.environment.gov.za/)	The 2013-14 South African National Land-cover dataset produced by GEOTERRAIMAGE as a commercial data product has been generated from digital, multi-seasonal Landsat 8 multispectral imagery, acquired between April 2013 and March 2014. The data set was procured by the Department of Environmental Affairs for public use. In excess of 600 Landsat images were used to generate the land-cover information, based on an average of 8 different seasonal image acquisition dates, within each of the 76 x image frames required to cover South Africa. The land-cover dataset, which covers the whole of South Africa, is presented in a map-corrected, raster format, based on 30x30m cells equivalent to the image resolution of the source Landsat 8 multi-spectral imagery. The dataset contains 72 x land cover / use information classes, covering a wide range of natural and man-made landscape characteristics. Each data cell contains a single code representing the dominant land-cover class (by area) within that 30x30m unit, as determined from analysis of the multi-date imagery acquired over that image frame. The original land-cover dataset was processed in UTM (north) / WGS84 map projection format based on the Landsat 8 standard map projection format as provided by the USGS3. The final product is available in UTM35 (north) and (south), WGS84 map projections and Geographic Coordinates, WGS84.
The biomes of South Africa as contained in the National Vegetation Map of South Africa (2012)	The Vegetation Map of South Africa, Lesotho and Swaziland by Mucina and Rutherford (eds.), 2006, with the spatial product updated in 2012.	The descriptions of vegetation types are given for each biome and include a general introduction to each biome, details about how each vegetation type relates to previously published vegetation maps, distribution, vegetation and landscape features, geology and soils, climate, important taxa, biogeographically important taxa, endemic taxa, conservation, and remarks.
The crane, raptor and vulture nest databases of the Endangered Wildlife Trust (EWT)	Endangered Wildlife Trust, accessed February 2018	Data on crane, vulture and raptor nests collected by the various programmes of the EWT. Absence of records does not imply absence of the species within an area, but simply that this area may not have been surveyed. All recorded nesting sites were included, no verification of current status of nests were conducted.
National vulture restaurant database	VulPro, March 2017 http://www.vulpro.com/	The register contains a georeferenced list of vulture restaurants throughout South Africa as compiled by VulPro. All recorded vulture restaurants were included; no verification of current status of vulture restaurants was conducted.

Data title	Source and date of publication	Data Description
List of eagle nests on Eskom transmission lines in the Karoo	Endangered Wildlife Trust, 2006	The dataset contains a georeferenced list of Tawny Eagle, Martial Eagle and Verreaux's Eagle nests on transmission lines in the Karoo as at 2006. All recorded nesting sites were included, no verification of current status of nests were conducted.
Information on the locality of Red Data nests	Unpublished data from pre-construction monitoring at renewable energy projects from 2010 - 2018, obtained from various avifaunal specialists.	Nests of various raptors, including Verreaux's Eagle, Martial Eagle, Tawny Eagle, African Crowned Eagle, Wattled Crane, White-backed Vulture collected in the course of pre-construction monitoring at proposed renewable energy projects in the Western, Northern, and Eastern Cape, and KZN.
The national register of Cape Vulture colonies	VulPro and Endangered Wildlife Trust, 2018	The dataset contains a georeferenced list of Cape Vulture colonies, as well as the results of the 2013 aerial survey of Cape Vulture colonies conducted by Eskom, EWT and Birdlife South Africa (BLSA) in the former Transkei, Eastern Cape.
A map of Blue Swallow breeding areas	Ezemvelo KZN Wildlife, March 2018	The KZN Mistbelt Grassland Important Bird Area (IBA) which incorporates all the known patches of grassland where Blue Swallows are known to nest and forage, plus additional nests sites outside the IBA. No verification of current status of nests was conducted.
Information on potential nesting areas of Southern Ground Hornbills.	Mabula Ground Hornbill Project, March 2018.	The data consists of a list of pentads where the species was sighted in Kwa-Zulu-Natal, Mpumalanga and the Eastern Cape. Data was provided in pentad format. The assumption was made that the species would be breeding within the pentad.
Information on various Red Data species nests obtained from the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa.	Wind and Solar SEA, Phase 1, CSIR, 2015	The data comprise nest localities of Black Harrier, Martial Eagle, Verreaux's Eagle, Blue Crane, Lanner Falcon, in the 8 solar and wind focus areas where they overlap with the gas phases.
Information on the localities of Southern Bald Ibis breeding colonies.	BirdLife South Africa 2015	The data comprises nest localities of Southern Bald Ibis collected by Dr. Kate Henderson as part of her PhD studies.
KNP Buffer Aug2017v2	Kruger National Park Management Plan 2018 – 2028	Buffer zone proposed in the latest management plan for the Kruger National Park.
Areas earmarked for formal conservation as part of the National Protected Areas Expansion Strategy (NPAES)	Priority areas for protected area expansion, 2017 (including updated Northern Cape priorities) Department of Environmental Affairs (DEA)	The goal of the NPAES is to achieve cost-effective protected area expansion for ecological sustainability and increased resilience to climate change. It sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion.
Database of national estuaries	SANBI, Biodiversity GIS, 2012 http://bgis.sanbi.org/	Estuarine systems along the South African coastline
Conservation Areas	SA conservation area database-Q2 2017 (DEA); Provincial game farm data https://egis.environment.gov.za/	Biosphere reserves Botanical gardens Ramsar Sites (not already protected) Game farms, private reserves and hunting areas
Protected Areas	South African Protected Areas Database (SAPAD) - Q3, 2017, South African National Parks (SANParks) and Provincial https://egis.environment.gov.za	Marine Protected Areas National Parks Nature Reserves Protected Environments Forest Nature Reserve Forest Wilderness Area

Data title	Source and date of publication	Data Description
		Special Nature Reserve
Important Bird and Biodiversity Areas of South Africa	BirdLife South Africa, 2015	National inventory of the Important Bird or Biodiversity Areas of South Africa, compiled by BirdLife South Africa.
A list of potential Bush Blackcap, Spotted Ground-Thrush and Orange Ground-Thrush breeding habitat.	BirdLife South Africa, 2018	The results of a modelling exercise undertaken by BirdLife South Africa to identify critical breeding habitat for three key forest – dwelling Red Data species.
Bearded Vulture nest sites in KwaZulu – Natal	Maloti-Drakensberg Vulture Project, Dr. Sonja Krüger, Ezemvelo KZN Wildlife, 2013.	The results of nest surveys conducted from 2000 - 2012
Yellow-breasted Pipit core distribution mapping	BirdLife South Africa, 2018	Map of core distribution/breeding areas based on the modelling of key aspects of the species' biology.
Rudd's Lark core distribution mapping	BirdLife South Africa, 2018	Map of core distribution/breeding areas based on the modelling of key aspects of the species' biology.
Botha's Lark core distribution mapping	BirdLife South Africa, 2018	Map of core distribution/breeding areas based on the modelling of key aspects of the species' biology.
White-winged Flufftail confirmed sightings 2000 – 2014	BirdLife South Africa, 2018	A list of wetlands where this critically endangered species has been recorded in South Africa which includes the locality where the first breeding for the region has recently been confirmed.
Red Data nest localities in the Western Cape	CapeNature, 2018	A list of nest localities of Black Harrier, Blue Crane, Verreaux's Eagle.

3.3 Assumptions and limitations

3.3.1 Assumptions

- It is assumed that the data layers used are reasonably accurate. Field verification will have to take place on a site by site basis linked to development proposals.
- Important Bird Areas were automatically classified as High Sensitivity, on the basis that those areas have already gone through an extensive rating process by BirdLife South Africa before being designated Important Bird Area status.
- Sections of Protected Areas overlapping with an Important Bird Area were automatically elevated to a Very High sensitive level, on the assumption that those areas are likely to be of crucial importance to avifauna.
- Note that although compressor/pump stations are not part of the Scope of Work of this SEA, they have been included in this assessment for completeness.

3.3.2 Limitations

- Due to the relatively coarse resolution of a QDGC (25 x 27.4km) sometimes species were recorded within a QDGC which contains more than one biome, e.g. in the Corridor Phase 1, Southern Black Korhaan was recorded in some of the QDGCs which contains both Forest (where it is unlikely to occur) and Fynbos (where it will most likely occur). In such an instance professional judgment was used to assess the potential for a species to occur in a given habitat class and it was taken into account in the risk rating process.
- Only existing published and unpublished datasets used with limited desktop verification.
- Some avifaunal specialists did not respond to data requests.
- The recommendations put forward here should be seen as generic and not replacing the project-specific recommendations which will be generated for an individual project that requires an Environmental Impact Assessment level of assessment.

- Due to the wide scope of the assessment, it is not possible to determine limits of acceptable change with a great deal of accuracy for each species in each corridor phase. For that, accurate data on population figures is required, as well as comprehensive data on the biology of each species, in order to model the effect of the envisaged impacts on the population. Information on that level is lacking for the majority of the species. Modelling impact at population level is a complicated process which falls outside the scope of this project.

3.4 Relevant Regulations and Legislation

Below is a detailed list and description of relevant regulatory instruments associated with the field of expertise at international, national scale, as well as provincial scale (Table 2).

Table 2: International, national and provincial regulatory instruments relevant to avifauna.

Instrument	Key objective
International Instruments	
Ramsar Convention (The Convention of Wetlands of International Importance, 1971 and amendments)	Protection and conservation of wetlands, particularly those of importance to waterfowl and waterfowl habitat.
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)	Aims to conserve terrestrial, marine and avian migratory species throughout their range.
The Agreement on the Conservation of African- Eurasian Migratory Waterbirds, or African- Eurasian Waterbird Agreement (AEWA)	Intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago.
International Finance Corporation (IFC) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	To protect and conserve biodiversity. To maintain the benefits from ecosystem services. To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.
Convention on Biological Diversity (1993) including the CBD's Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets	The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.
National Instruments	
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)	The National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. Activity 12 in Listing Notice 3 (Government Notice R324 of 7 April 2017) relates to clearance of 300 m ² or more of vegetation within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004
National Environmental Management: Protected Areas Act, 2003. (Act 57 of 2003)	To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.
National Environmental Management Act, 1998 (Act 107 of 1998), as amended	Promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Instrument	Key objective
Environment Conservation Act, 1989 (Act 73 of 1989)	To provide for the effective protection and controlled utilization of the environment and for matters incidental thereto.
National Water Act, 1998 (Act 36 of 1998)	Part 3, The Reserve: The ecological reserve relates to the water required to protect the aquatic ecosystems of the water resource.
Provincial Instruments	
KwaZulu Nature Conservation Act, 1992 (Act 29 of 1992) still in force	Provides for the protection of fauna and flora in those areas that formed part of the former KwaZulu.
Natal Nature Conservation Ordinance 15 of 1974 (still in force)	Provides for the protection of fauna and flora in those areas that form part of the former Natal province.
Western Cape Nature Conservation Board Act, 1998 (Act 15 of 1998)	To provide for the establishment, powers, functions and funding of the Western Cape Nature Conservation Board and the establishment, funding a control of a Western Cape Nature Conservation Fund, and to provide for matters incidental thereto. The object of the board shall be, (a) promote and ensure nature conservation and related matter in the Province.
Western Cape Nature Conservation Laws Amendment Act, 2000. (Act 3 of 2000)	To provide for the amendment of various laws on nature conservation in order to transfer the administration of the provisions of those laws to the Western Cape Nature Conservation Board; to amend the Western Cape Nature Conservation Board Act, 1998 to provide for a new definition of Department and the deletion of a definition; to provide for an increase in the number of members of the Board; to provide for additional powers of the Board; to amend the provisions regarding the appointment and secondment of persons to the Board; and to provide for matters incidental thereto.
Northern Cape Nature Conservation Act, 2009 (Act 10 of 2009).	To provide for the sustainable utilization of wild animals, aquatic biota and plants: to provide for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; to provide for offences and penalties for contravention of the Act: to provide for the issuing of permits and other authorisations: and provide for the matter connected therewith.
Bophuthatswana Nature Conservation Act, 1973 (Act 3 of 1973; still in force)	To provide for the protection of game and fish, the conservation of flora and fauna and the destruction of vermin in the former Bophuthatswana.
Free State Nature Conservation Ordinance, 1969 (Act 8 of 1969)	To provide for the conservation of fauna and flora and the hunting of animals causing damage and for matters incidental thereto.
Ciskei Nature Conservation, 1987 (Act 10 of 1987, still in force)	To consolidate and amend the laws relating to the conservation, management and protection of fauna, flora, fish and the habitats generally, to provide for the establishment and management of nature reserves, hiking trails, water catchment areas and a coastal conservation area, to provide for matter relating to the sea and the seashore and the provide for the incidental matters.
Transvaal Nature Conservation Ordinance No 12 of 1983 as amended (still in force)	Provides for the protection of fauna and flora in the North-West and Gauteng Provinces (former Transvaal Province).
Mpumalanga Nature Conservation Act Of 1998	Provides for the protection of fauna and flora in the Mpumalanga Province.
Cape Nature Conservation Ordinance, No. 19 of 1974 (still in force)	Provides for the protection of fauna and flora in parts of the North-West Province and the Eastern Cape (former Cape Province).

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4 KEY ENVIRONMENTAL ATTRIBUTES AND SENSITIVITIES OF THE CORRIDOR PHASES

4.1 Description of corridor phases

The point of departure was the delineation of a corridor phase according to the biomes that are contained in the phase and then extracting the Red Data species recorded by SABAP 2 within that biome². It is generally accepted that vegetation structure, rather than the actual plant species, influences bird species distribution and abundance (Harrison et al., 1997). The description of the biomes largely follows the classification system used in the Atlas of Southern African Birds (SABAP1) (Harrison et al. 1997) supplemented with material from Mucina and Rutherford (2006). The criteria used by the SABAP1 authors to amalgamate botanically defined vegetation units, or to keep them separate were: (1) the existence of clear differences in vegetation structure, likely to be relevant to birds; and (2) the results of published community studies on bird/vegetation associations.

The biome descriptions used in this report are as follows:

- Fynbos: Fynbos is dominated by low shrubs and has two major vegetation divisions: fynbos proper characterised by restioid, ericoid and proteoid components; and renosterveld, dominated by *Asteraceae*, specifically *Renosterbos* *Elytropappus rhinocerotis*, with geophytes and some grasses.
- Succulent Karoo: The Succulent Karoo falls within the winter rain-fall region in the far west, and is characterised by succulent shrubs, particularly *Mesembryanthemaceae* and a particular paucity of grass cover and trees, except in the Little Karoo of the Western Cape Province, where tree cover is relatively well developed.
- Nama Karoo: The Nama Karoo vegetation largely comprises low shrubs and grasses; peak rainfall occurs in summer. Trees, e.g. *Vachellia karoo* and aline species such as Mesquite *Prosopis glandulosa* are mainly restricted to water courses where fairly luxuriant stands can develop especially in the Eastern Cape Province. In comparison to the Succulent Karoo, the Nama Karoo has a higher proportion of grass and tree cover.
- Savanna: Savanna is defined here as having a grassy understorey and a distinct woody upper storey of trees and tall shrubs. Tree cover can range from sparse to almost closed-canopy cover. The relatively arid fine-leaved, typically *Vachellia*-dominated woodland types typically occur in the drier western regions, while the mesic, pre-dominantly broadleaved woodlands typically occur in the more mesic eastern regions.
- Grassland: The dominant vegetation comprises grasses, with geophytes and herbs also well-represented. These grasslands are maintained largely by a combination of relatively high summer rainfall, frequent fires, frost and grazing, which preclude the presence of shrubs and trees. Sweet grasslands are found in lower rainfall areas, are taller and less dense, have a lower fibre content and retain nutrients in the leaves during winter. Sour grasslands occur in higher rainfall regions and are characterized by being shorter and denser in structure, having a high fibre content and a tendency to withdraw nutrients to the roots during winter.
- Desert: The dominant vegetation comprises grassland dominated by “white grasses”, some spinescent (*Stipograstis* species) on flats with additional shrubs and herbs in the drainage lines or on more gravelly or loamy soil next to mountains. Hills and mountains are dominated by bare outcrops with very sparse shrubby vegetation in crevices, sometimes with localised grassland areas.
- Albany Thicket: The vegetation of this biome comprises dense, woody, semi-succulent and thorny vegetation of an average height of 2-3m, relatively impenetrable with a poorly developed grass cover. There is a wide range of growth forms and a high diversity of plant species which is a

² It should be noted that due to the relatively coarse resolution of a QDGC (25 x 27.4km) sometimes species were recorded within a QDGC which contains more than one biome, e.g. in the Corridor Phase 1, Southern Black Korhaan was recorded in some of the QDGCs which contains both Forest (where it is unlikely to occur) and Fynbos (where it will most likely occur). In such an instance professional judgment was used to assess the potential for a species to occur in a given habitat class, and it was taken into account in the risk rating process.

reflection of the transitional nature of thicket vegetation, being an interface between the various types of forest, shrublands, karoo and grasslands.

- **Indian Ocean Coastal Belt/East Coast Littoral:** This is a mosaic of coastal forest, sand forest, coastal thicket, coastal grasslands and mangroves. It is typically moist and tropical to sub-tropical.
- **Azonal vegetation:** This refers to distinctive vegetation types not restricted to a specific biome but occurring across several biomes. In azonal vegetation special substrate (special soil types or bedrocks) and/or hydrogeological conditions (waterlogging, flooding, tidal influence) exert an overriding influence on floristic composition, structure and dynamics over macroclimate. Azonal vegetation are mostly found in freshwater wetlands, alluvial zones, salt pans, estuaries, seashores, and dunes.

Figure 1 provides an overview of the various biomes within South Africa, as well as the proposed gas pipeline corridors.

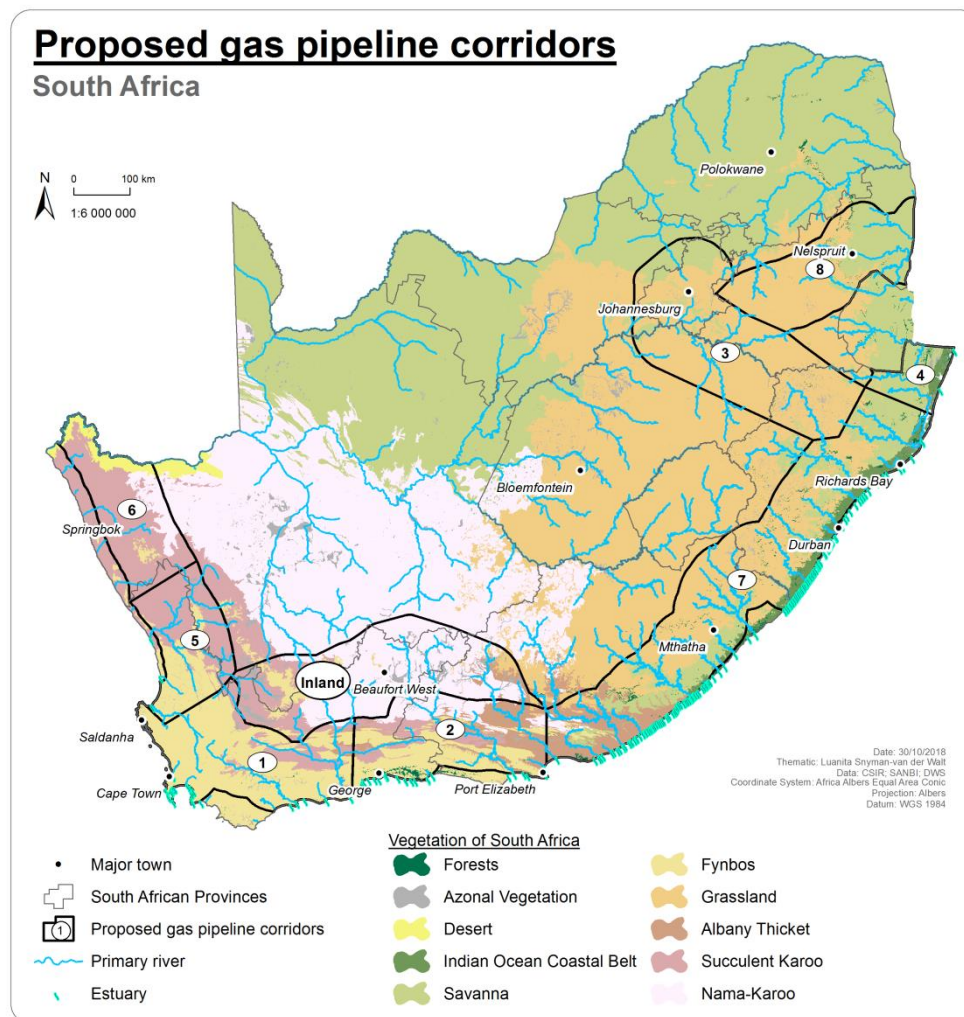
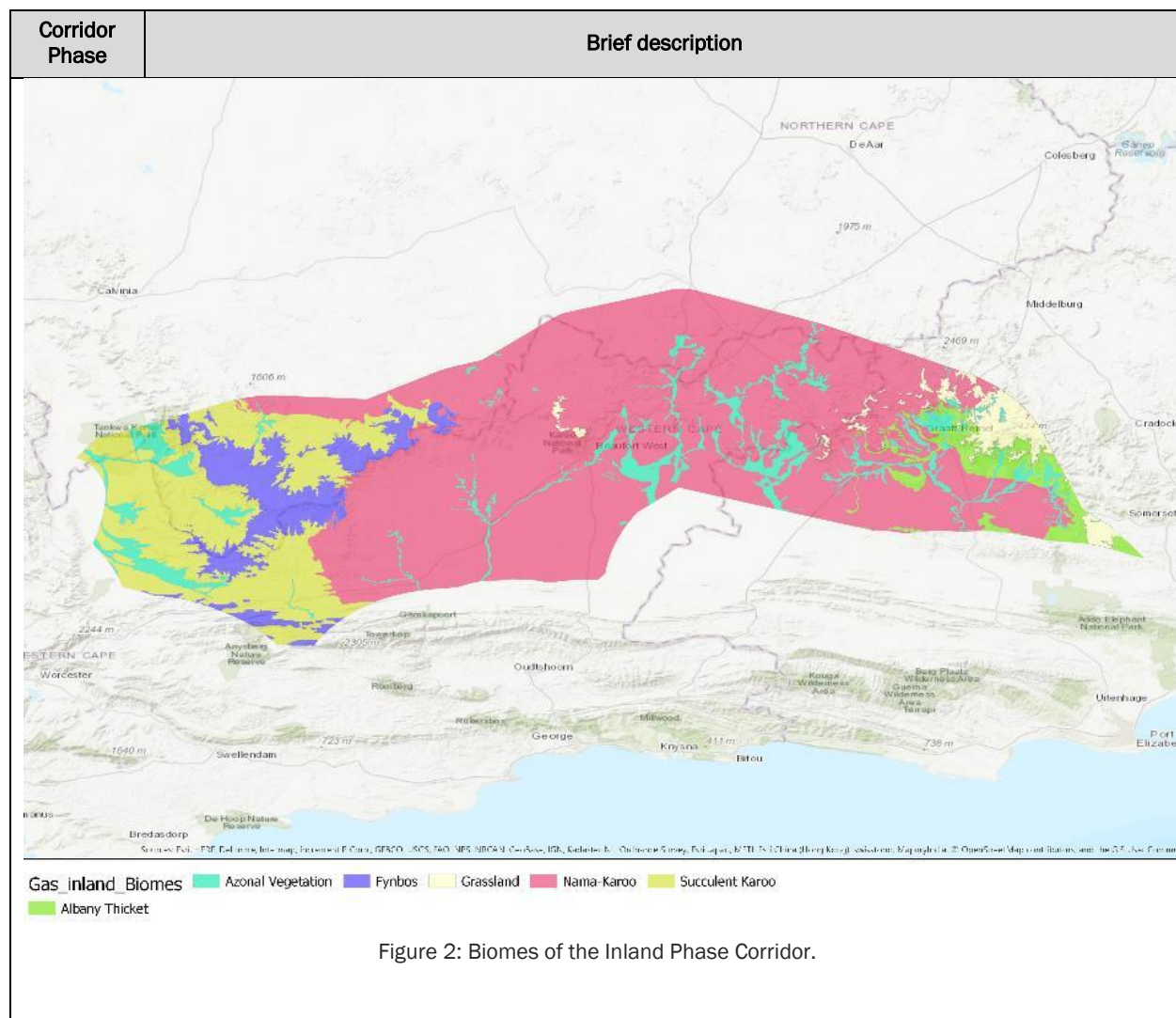


Figure 1: Overview of the Biomes within South Africa and the Proposed Gas Pipeline Corridors

Table 3: Environmental description of the proposed gas pipeline corridors.

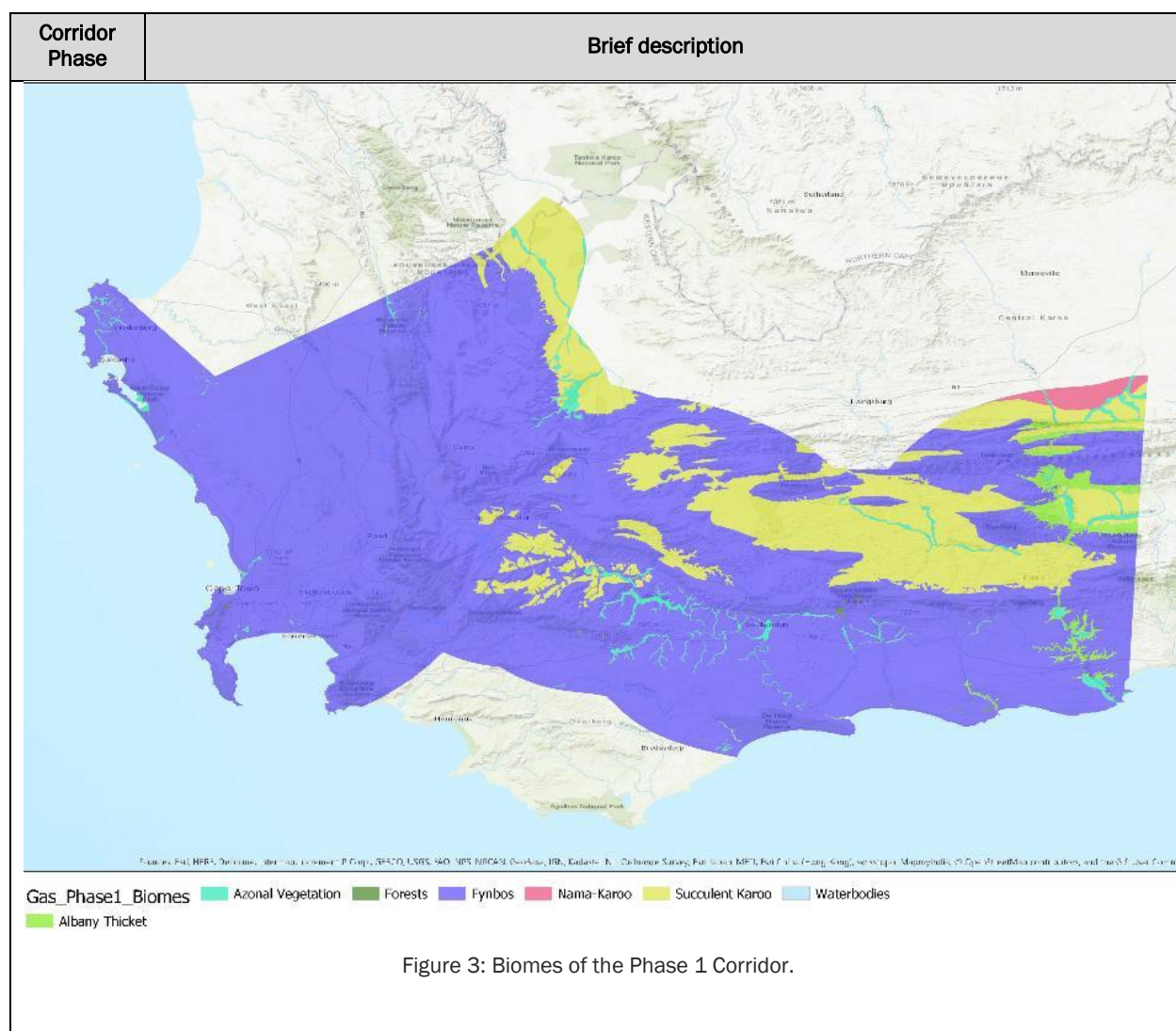
Corridor Phase	Brief description																																																																																																																																																																																																																																																																						
Inland	<p>The Inland corridor phase contains five biomes, as well as Azonal vegetation. These are:</p> <ul style="list-style-type: none"> • Fynbos • Succulent Karoo • Nama Karoo • Albany Thicket • Grassland <p>The following Red Data species were identified and rated for potential impacts in each biome, extracted from a total of 133 QDGCs. Biomes where the species is most likely to be encountered is listed below.</p> <p>NT = Near threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered</p> <table> <tr> <th>Species</th><th>Status</th><th>Fynbos</th><th>Succulent Karoo</th><th>Nama Karoo</th><th>Albany Thicket</th><th>Grassland</th><th>Azonal</th></tr> <tr><td>African Finfoot</td><td>VU</td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr> <tr><td>African Marsh-Harrier</td><td>EN</td><td>x</td><td></td><td></td><td></td><td>x</td><td>x</td></tr> <tr><td>African Rock Pipit</td><td>NT</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td></td></tr> <tr><td>Black Harrier</td><td>EN</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td></td></tr> <tr><td>Black Stork</td><td>VU</td><td></td><td>x</td><td>x</td><td></td><td></td><td>x</td></tr> <tr><td>Blue Crane</td><td>NT</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td></tr> <tr><td>Caspian Tern</td><td>VU</td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr> <tr><td>European Roller</td><td>NT</td><td></td><td></td><td></td><td>x</td><td>x</td><td></td></tr> <tr><td>Greater Flamingo</td><td>NT</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td></tr> <tr><td>Karoo Korhaan</td><td>NT</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td></td></tr> <tr><td>Knysna Woodpecker</td><td>NT</td><td></td><td></td><td></td><td>x</td><td></td><td></td></tr> <tr><td>Kori Bustard</td><td>NT</td><td></td><td>x</td><td>x</td><td></td><td>x</td><td></td></tr> <tr><td>Lanner Falcon</td><td>VU</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr> <tr><td>Lesser Flamingo</td><td>NT</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td></tr> <tr><td>Ludwig's Bustard</td><td>EN</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td></td></tr> <tr><td>Maccoa Duck</td><td>NT</td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr> <tr><td>Martial Eagle</td><td>EN</td><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr> <tr><td>Red-footed Falcon</td><td>NT</td><td></td><td></td><td>x</td><td></td><td>x</td><td></td></tr> <tr><td>Secretary bird</td><td>NT</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td></td></tr> <tr><td>Southern Black Korhaan</td><td>VU</td><td>x</td><td>x</td><td></td><td></td><td></td><td></td></tr> <tr><td>Tawny Eagle</td><td>EN</td><td></td><td></td><td>x</td><td></td><td>x</td><td></td></tr> <tr><td>Verreaux's Eagle</td><td>VU</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td></td></tr> <tr><td>Burchell's Courser</td><td>VU</td><td></td><td>x</td><td>x</td><td></td><td>x</td><td>x</td></tr> <tr><td>Cape Rock-jumper</td><td>NT</td><td>x</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Denham's Bustard</td><td>VU</td><td></td><td></td><td></td><td></td><td>x</td><td></td></tr> <tr><td>Marabou Stork</td><td>NT</td><td colspan="6">Vagrant</td></tr> <tr><td>Protea Seedeater</td><td>NT</td><td>x</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>Sclater's Lark</td><td>NT</td><td></td><td>x</td><td>x</td><td></td><td></td><td></td></tr> <tr><td>Yellow-billed Stork</td><td>EN</td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr> <tr><td>Abdim's Stork</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td><td></td></tr> <tr><td>Half-collared Kingfisher</td><td>NT</td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr> </table>							Species	Status	Fynbos	Succulent Karoo	Nama Karoo	Albany Thicket	Grassland	Azonal	African Finfoot	VU						x	African Marsh-Harrier	EN	x				x	x	African Rock Pipit	NT	x	x	x		x		Black Harrier	EN	x	x	x		x		Black Stork	VU		x	x			x	Blue Crane	NT	x	x	x		x	x	Caspian Tern	VU						x	European Roller	NT				x	x		Greater Flamingo	NT	x	x	x			x	Karoo Korhaan	NT	x	x	x				Knysna Woodpecker	NT				x			Kori Bustard	NT		x	x		x		Lanner Falcon	VU	x	x	x	x	x	x	Lesser Flamingo	NT	x	x	x			x	Ludwig's Bustard	EN	x	x	x		x		Maccoa Duck	NT						x	Martial Eagle	EN		x	x	x	x		Red-footed Falcon	NT			x		x		Secretary bird	NT	x	x	x		x		Southern Black Korhaan	VU	x	x					Tawny Eagle	EN			x		x		Verreaux's Eagle	VU	x	x	x				Burchell's Courser	VU		x	x		x	x	Cape Rock-jumper	NT	x						Denham's Bustard	VU					x		Marabou Stork	NT	Vagrant						Protea Seedeater	NT	x						Sclater's Lark	NT		x	x				Yellow-billed Stork	EN						x	Abdim's Stork	NT					x		Half-collared Kingfisher	NT						x
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Corridor Phase	Brief description																																								
Phase 1	<p>Corridor Phase 1 contains five biomes, as well as Azonal vegetation. These are:</p> <ul style="list-style-type: none">Albany ThicketForestsFynbosNama-KarooSucculent Karoo. <p>The following Red Data species were identified and rated for potential impacts in each biome, extracted from a total of 105 QDGCs. Biomes where the species is most likely to be encountered is listed below.</p> <p>NT = Near threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered</p> <table><tr><th>Species</th><th>Status</th><th>Fynbos</th><th>Succulent Karoo</th><th>Nama Karoo</th><th>Albany Thicket</th><th>Forest</th><th>Azonal</th></tr><tr><td>African Marsh-Harrier</td><td>EN</td><td>x</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Agulhas Long-billed Lark</td><td>NT</td><td>x</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Black Harrier</td><td>EN</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Black Stork</td><td>VU</td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td></tr></table>	Species	Status	Fynbos	Succulent Karoo	Nama Karoo	Albany Thicket	Forest	Azonal	African Marsh-Harrier	EN	x					x	Agulhas Long-billed Lark	NT	x						Black Harrier	EN	x	x	x				Black Stork	VU	x	x	x			x
Species	Status	Fynbos	Succulent Karoo	Nama Karoo	Albany Thicket	Forest	Azonal																																		
African Marsh-Harrier	EN	x					x																																		
Agulhas Long-billed Lark	NT	x																																							
Black Harrier	EN	x	x	x																																					
Black Stork	VU	x	x	x			x																																		

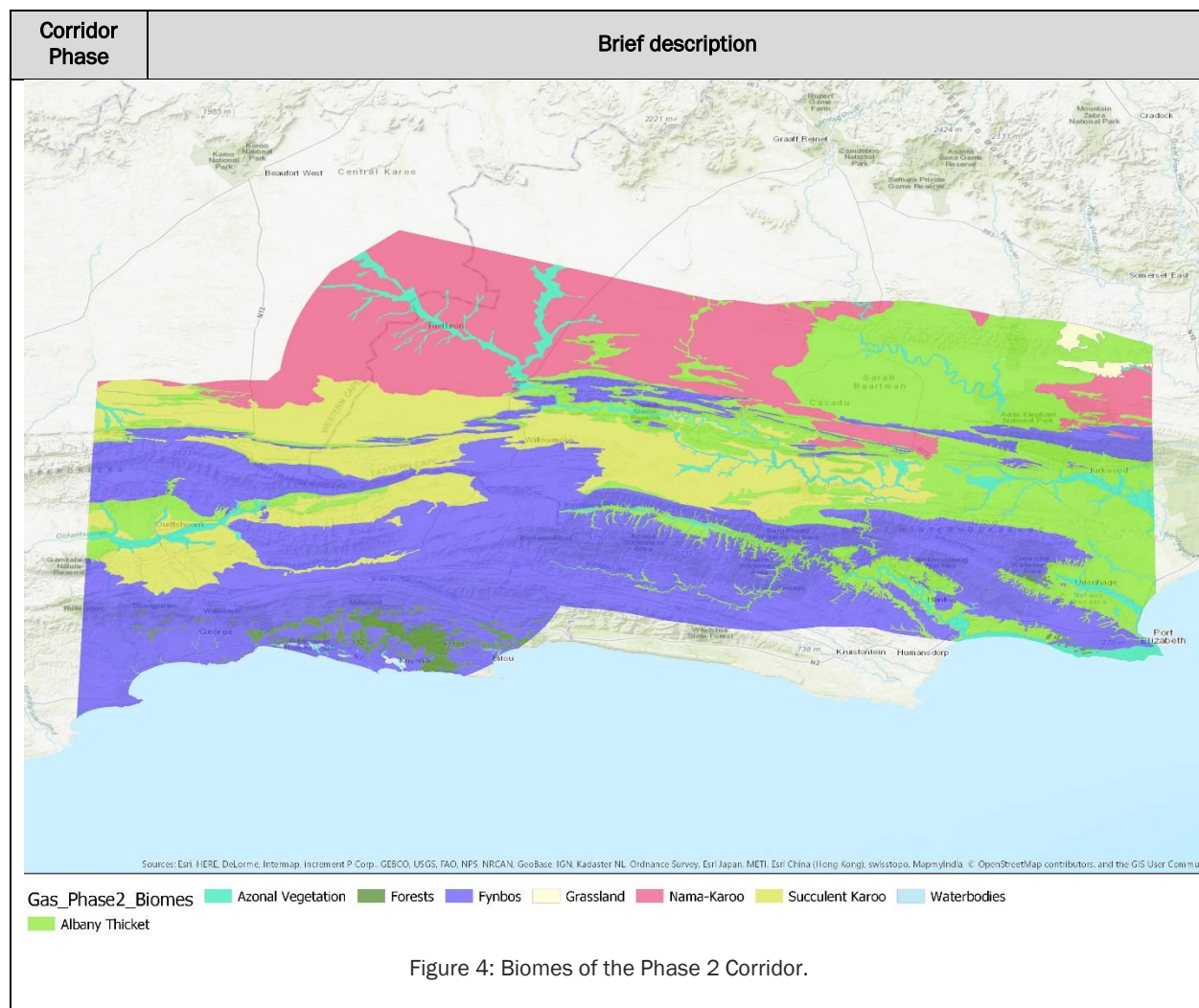
Corridor Phase	Brief description							
	Blue Crane	NT	x	x				x
	Caspian Tern	VU						x
	European Roller	NT	x			x		
	Greater Flamingo	NT	x	x	x			x
	Karoo Korhaan	NT	x	x	x			
	Knysna Woodpecker	NT				x	x	
	Kori Bustard	NT		x	x			
	Lanner Falcon	VU	x	x	x	x	x	x
	Lesser Flamingo	NT	x	x	x			x
	Ludwig's Bustard	EN	x	x	x			
	Maccoa Duck	NT						x
	Martial Eagle	EN	x	x	x	x		
	Red-footed Falcon	NT						
	Secretarybird	NT	x	x	x			
	Southern Black Korhaan	VU	x	x				
	Tawny Eagle	EN						
	Verreaux's Eagle	VU	x	x	x			
	Burchell's Courser	VU						
	Cape Rock-jumper	NT	x					
	Denham's Bustard	VU	x					
	Marabou Stork	NT	Vagrant					
	Protea Seed-eater	NT	x					
	Sclater's Lark	NT						
	Yellow-billed Stork	EN						
	Abdim's Stork	NT						
	Half-collared Kingfisher	NT						x
	African Rock Pipit	NT	x	x	x			
	Eurasian Curlew	NT						x
	Greater Painted-snipe	NT						x
	Hottentot Buttonquail	EN	x					
	Knysna Warbler	VU				x	x	
	Striped Flufftail	VU	x					
	African Crowned Eagle	VU					x	
	Burchell's Courser	VU		x	x			x
	Cape Vulture	EN	x					
	Chestnut-banded Plover	NT						x
	Damara Tern	CR						x
	Great White Pelican	VU						x
	Black-winged Pratincole	NT	Vagrant					



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Corridor Phase	Brief description
Phase 2	<p>Corridor Phase 2 contains six biomes, as well as Azonal vegetation. These are:</p> <ul style="list-style-type: none"> • Albany Thicket • Forests • Fynbos • Grassland • Nama-Karoo • Succulent Karoo <p>The following Red Data species were identified and rated for potential impacts in each biome, extracted from a total of 88 QDGCs.</p> <p>NT = Near threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered</p>

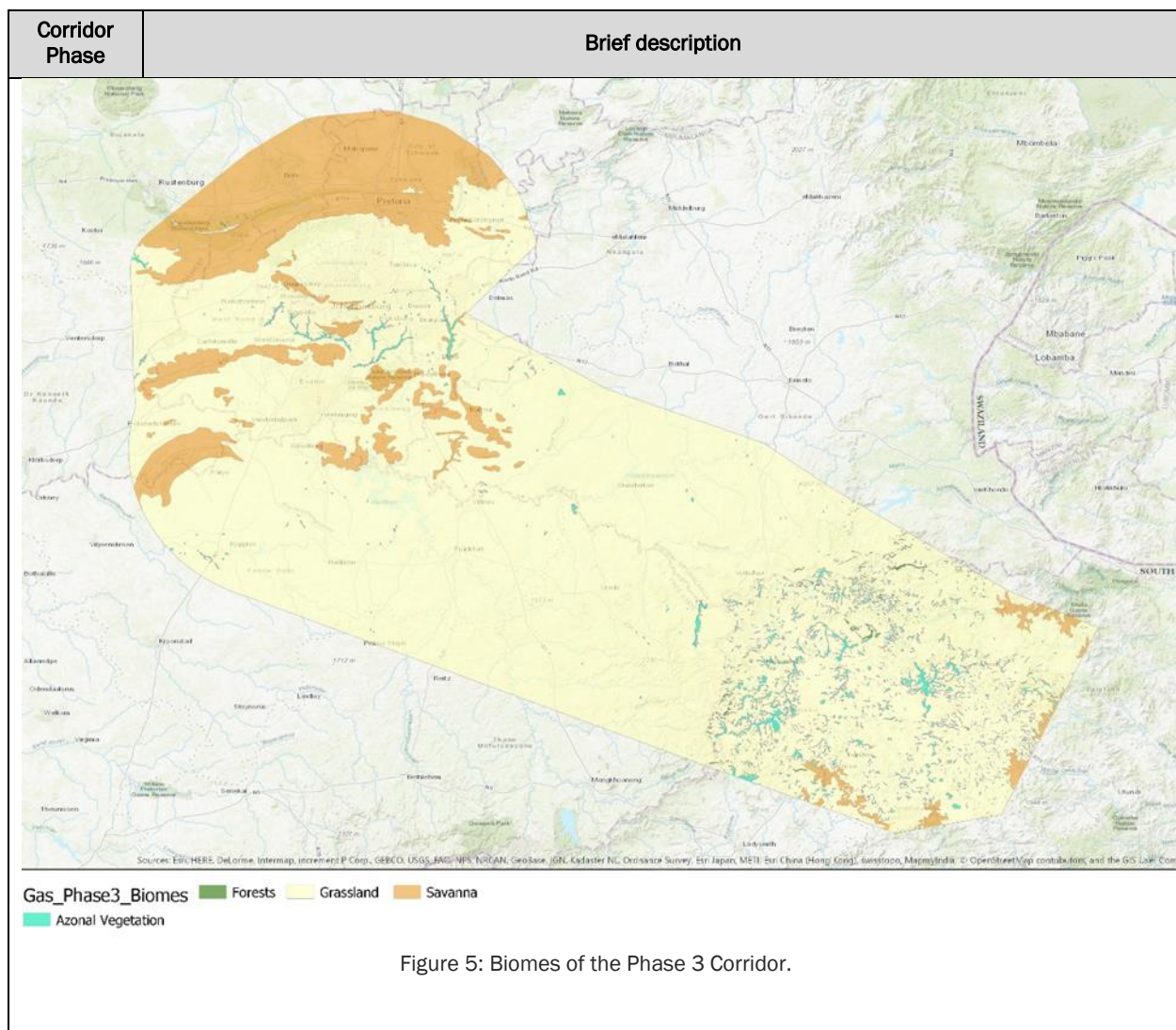
Corridor Phase	Brief description								
	Species	Status	Fynbos	Succulent Karoo	Nama Karoo	Albany Thicket	Grassland	Forest	Azonal
	African Marsh-Harrier	EN	x				x		x
	Agulhas Long-billed Lark	NT	x						
	Black Harrier	EN	x	x	x		x		
	Black Stork	VU	x	x	x	x			x
	Blue Crane	NT	x	x	x		x		x
	Caspian Tern	VU							x
	European Roller	NT	x			x			
	Greater Flamingo	NT	x	x	x				x
	Karoo Korhaan	NT	x	x	x				
	Knysna Woodpecker	NT				x		x	
	Kori Bustard	NT		x	x		x		
	Lanner Falcon	VU	x	x	x	x	x	x	x
	Lesser Flamingo	NT	x	x	x				x
	Ludwig's Bustard	EN		x	x				
	Maccoa Duck	NT							x
	Martial Eagle	EN	x	x	x	x	x		
	Red-footed Falcon	NT			x		x		
	Secretary bird	NT	x	x	x		x		
	Southern Black Korhaan	VU	x	x					
	Verreaux's Eagle	VU	x	x	x				
	Cape Rock-jumper	NT	x						
	Denham's Bustard	VU	x				x		
	Protea Seedeater	NT	x						
	Sclater's Lark	NT		x	x				
	Half-collared Kingfisher	NT							x
	African Rock Pipit	NT	x	x	x	x			
	Eurasian Curlew	NT							x
	Greater Painted-snipe	NT							x
	Hottentot Buttonquail	EN	x						
	Knysna Warbler	VU				x		x	
	Striped Flufftail	VU	x						
	African Crowned Eagle	VU						x	
	Burchell's Courser	VU		x	x				x
	Cape Vulture	EN	x						
	Chestnut-banded Plover	NT							x
	Damara Tern	CR							x
	Great White Pelican	VU							x
	African Finfoot	VU							x
	African Grass-Owl	VU	x				x		
	Grey Crowned Crane	EN					x		x
	Pallid Harrier	NT					x		
	White-bellied Korhaan	VU	x				x		
	Black-winged Pratincole	NT	Vagrant						



1

Corridor Phase	Brief description																																										
Phase 3	<p>Corridor Phase 3 contains three biomes, as well as Azonal vegetation. These are:</p> <ul style="list-style-type: none">• Forests• Grassland• Savanna <p>The following Red Data species were identified and rated for potential impacts in each biome, extracted from a total of 136 QDGCs.</p> <p>NT = Near threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered</p> <table><tr><th>Species</th><th>Status</th><th>Savanna</th><th>Grassland</th><th>Forest</th><th>Azonal</th></tr><tr><td>African Marsh-Harrier</td><td>EN</td><td>x</td><td>x</td><td></td><td>x</td></tr><tr><td>Abdim's Stork</td><td>NT</td><td>x</td><td>x</td><td></td><td>x</td></tr><tr><td>Black Harrier</td><td>EN</td><td></td><td>x</td><td></td><td></td></tr><tr><td>Black Stork</td><td>VU</td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>Blue Crane</td><td>NT</td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>Caspian Tern</td><td>VU</td><td></td><td></td><td></td><td>x</td></tr></table>	Species	Status	Savanna	Grassland	Forest	Azonal	African Marsh-Harrier	EN	x	x		x	Abdim's Stork	NT	x	x		x	Black Harrier	EN		x			Black Stork	VU		x		x	Blue Crane	NT		x		x	Caspian Tern	VU				x
Species	Status	Savanna	Grassland	Forest	Azonal																																						
African Marsh-Harrier	EN	x	x		x																																						
Abdim's Stork	NT	x	x		x																																						
Black Harrier	EN		x																																								
Black Stork	VU		x		x																																						
Blue Crane	NT		x		x																																						
Caspian Tern	VU				x																																						

Corridor Phase	Brief description					
	European Roller	NT	x			
	Greater Flamingo	NT	x	x		x
	Black-rumped Buttonquail	VU		x		
	Black-winged Pratincole	NT	x	x		x
	Botha's Lark	EN		x		
	Lanner Falcon	VU	x	x	x	x
	Lesser Flamingo	NT	x	x		x
	Bush Blackcap	VU			x	
	Maccoa Duck	NT				x
	Martial Eagle	EN	x	x	x	x
	Red-footed Falcon	NT		x		
	Secretary bird	NT	x	x		
	Lappet-faced Vulture	EN	x			
	Verreaux's Eagle	VU	x	x		
	Marabou Stork	NT	x			x
	Denham's Bustard	VU		x		
	Orange Ground-Thrush	NT			x	
	Pink-backed Pelican	VU				x
	Half-collared Kingfisher	NT				x
	African Rock Pipit	NT	x	x		
	Eurasian Curlew	NT				x
	Greater Painted-snipe	NT				x
	Rudd's Lark	EN		x		
	Saddle-billed Stork	EN				x
	Short-tailed Pipit	VU		x		
	Southern Bald Ibis	VU		x		
	Burchell's Courser	VU		x		
	Cape Vulture	EN	x	x		
	Chestnut-banded Plover	NT				x
	Southern Ground-Hornbill	EN	x			
	Tawny Eagle	EN	x			
	Wattled Crane	CR		x		x
	African Grass-Owl	VU		x		x
	Grey Crowned Crane	EN		x		x
	Pallid Harrier	NT		x		
	White-bellied Korhaan	VU	x	x		
	White-backed Vulture	CR	x			
	Yellow-billed Stork	EN				x
	Yellow-breasted Pipit	VU		x		
	Eastern Bronze-naped Pigeon	EN			x	
	Yellow-throated Sandgrouse	NT	x	x		



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Corridor Phase	Brief description																																																																																																																																																																																																																																																																																								
Phase 4	<p>Corridor Phase 4 contains four biomes, as well as Azonal vegetation. These are</p> <ul style="list-style-type: none">• Forests• Grassland• Indian Ocean Coastal Belt• Savanna <p>The following Red Data species were identified and rated for potential impacts in each biome, extracted from a total of 26 QDGCs.</p> <p>NT = Near threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered</p> <table><tr><th>Species</th><th>Status</th><th>Savanna</th><th>Grassland</th><th>Forest</th><th>Indian Ocean Coastal Belt</th><th>Azonal</th></tr><tr><td>African Marsh-Harrier</td><td>EN</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td></tr><tr><td>Abdim's Stork</td><td>NT</td><td></td><td>x</td><td></td><td></td><td>x</td></tr><tr><td>Black Harrier</td><td>EN</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Black Stork</td><td>VU</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td></tr><tr><td>Blue Crane</td><td>NT</td><td></td><td>x</td><td></td><td>x</td><td>x</td></tr><tr><td>Caspian Tern</td><td>VU</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>European Roller</td><td>NT</td><td>x</td><td></td><td></td><td>x</td><td></td></tr><tr><td>Greater Flamingo</td><td>NT</td><td></td><td></td><td></td><td>x</td><td>x</td></tr><tr><td>Black-rumped Buttonquail</td><td>VU</td><td>x</td><td></td><td></td><td>x</td><td></td></tr><tr><td>Black-winged Pratincole</td><td>NT</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Botha's Lark</td><td>EN</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Lanner Falcon</td><td>VU</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>Lesser Flamingo</td><td>NT</td><td></td><td></td><td></td><td>x</td><td>x</td></tr><tr><td>Bush Blackcap</td><td>VU</td><td></td><td></td><td>x</td><td></td><td></td></tr><tr><td>Maccoa Duck</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Martial Eagle</td><td>EN</td><td>x</td><td>x</td><td></td><td>x</td><td></td></tr><tr><td>Red-footed Falcon</td><td>NT</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Secretary bird</td><td>NT</td><td>x</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Lappet-faced Vulture</td><td>EN</td><td>x</td><td></td><td></td><td></td><td></td></tr><tr><td>Verreaux's Eagle</td><td>VU</td><td>x</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Marabou Stork</td><td>NT</td><td>x</td><td></td><td></td><td>x</td><td>x</td></tr><tr><td>Denham's Bustard</td><td>VU</td><td></td><td>x</td><td></td><td>x</td><td></td></tr><tr><td>Orange Ground-Thrush</td><td>NT</td><td></td><td></td><td>x</td><td></td><td></td></tr><tr><td>Pink-backed Pelican</td><td>VU</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Half-collared Kingfisher</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>African Rock Pipit</td><td>NT</td><td>x</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Eurasian Curlew</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Greater Painted-snipe</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Rudd's Lark</td><td>EN</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Saddle-billed Stork</td><td>EN</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Short-tailed Pipit</td><td>VU</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Southern Bald Ibis</td><td>VU</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Burchell's Courser</td><td>VU</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Cape Vulture</td><td>EN</td><td>x</td><td></td><td></td><td></td><td></td></tr><tr><td>Chestnut-banded Plover</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Southern Ground-Hornbill</td><td>EN</td><td>x</td><td></td><td></td><td>x</td><td></td></tr><tr><td>Tawny Eagle</td><td>EN</td><td>x</td><td></td><td></td><td></td><td></td></tr><tr><td>Wattled Crane</td><td>CR</td><td></td><td>x</td><td></td><td></td><td>x</td></tr><tr><td>African Grass-Owl</td><td>VU</td><td></td><td>x</td><td></td><td></td><td>x</td></tr></table>	Species	Status	Savanna	Grassland	Forest	Indian Ocean Coastal Belt	Azonal	African Marsh-Harrier	EN	x	x		x	x	Abdim's Stork	NT		x			x	Black Harrier	EN		x				Black Stork	VU	x	x		x	x	Blue Crane	NT		x		x	x	Caspian Tern	VU					x	European Roller	NT	x			x		Greater Flamingo	NT				x	x	Black-rumped Buttonquail	VU	x			x		Black-winged Pratincole	NT		x				Botha's Lark	EN		x				Lanner Falcon	VU	x	x	x	x	x	Lesser Flamingo	NT				x	x	Bush Blackcap	VU			x			Maccoa Duck	NT					x	Martial Eagle	EN	x	x		x		Red-footed Falcon	NT		x				Secretary bird	NT	x	x				Lappet-faced Vulture	EN	x					Verreaux's Eagle	VU	x	x				Marabou Stork	NT	x			x	x	Denham's Bustard	VU		x		x		Orange Ground-Thrush	NT			x			Pink-backed Pelican	VU					x	Half-collared Kingfisher	NT					x	African Rock Pipit	NT	x	x				Eurasian Curlew	NT					x	Greater Painted-snipe	NT					x	Rudd's Lark	EN		x				Saddle-billed Stork	EN					x	Short-tailed Pipit	VU		x				Southern Bald Ibis	VU		x				Burchell's Courser	VU		x				Cape Vulture	EN	x					Chestnut-banded Plover	NT					x	Southern Ground-Hornbill	EN	x			x		Tawny Eagle	EN	x					Wattled Crane	CR		x			x	African Grass-Owl	VU		x			x
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African Grass-Owl	VU		x			x																																																																																																																																																																																																																																																																																			

Corridor Phase	Brief description						
	Grey Crowned Crane	EN		x		x	x
	Pallid Harrier	NT		x		x	
	White-bellied Korhaan	VU	x	x		x	
	White-backed Vulture	CR	x				
	Yellow-billed Stork	EN					x
	Yellow-breasted Pipit	VU		x			
	Eastern Bronze-naped Pigeon	EN			x		
	African Broadbill	VU			x		
	African Crowned Eagle	VU			x		
	African Finfoot	VU					x
	African Pygmy-Goose	VU					x
	Bateleur	EN	x				
	Great White Pelican	VU					x
	Hooded Vulture	CR	x				
	Lemon-breasted Canary	NT				x	
	Lesser Jacana	VU					x
	Mangrove Kingfisher	EN				x	
	Neergaard's Sunbird	VU				x	
	Pel's Fishing-Owl	EN					x
	Rosy-throated Longclaw	NT				x	
	Southern Banded Snake-Eagle	CR				x	
	Swamp Nightjar	VU				x	
	White-headed Vulture	CR	x				

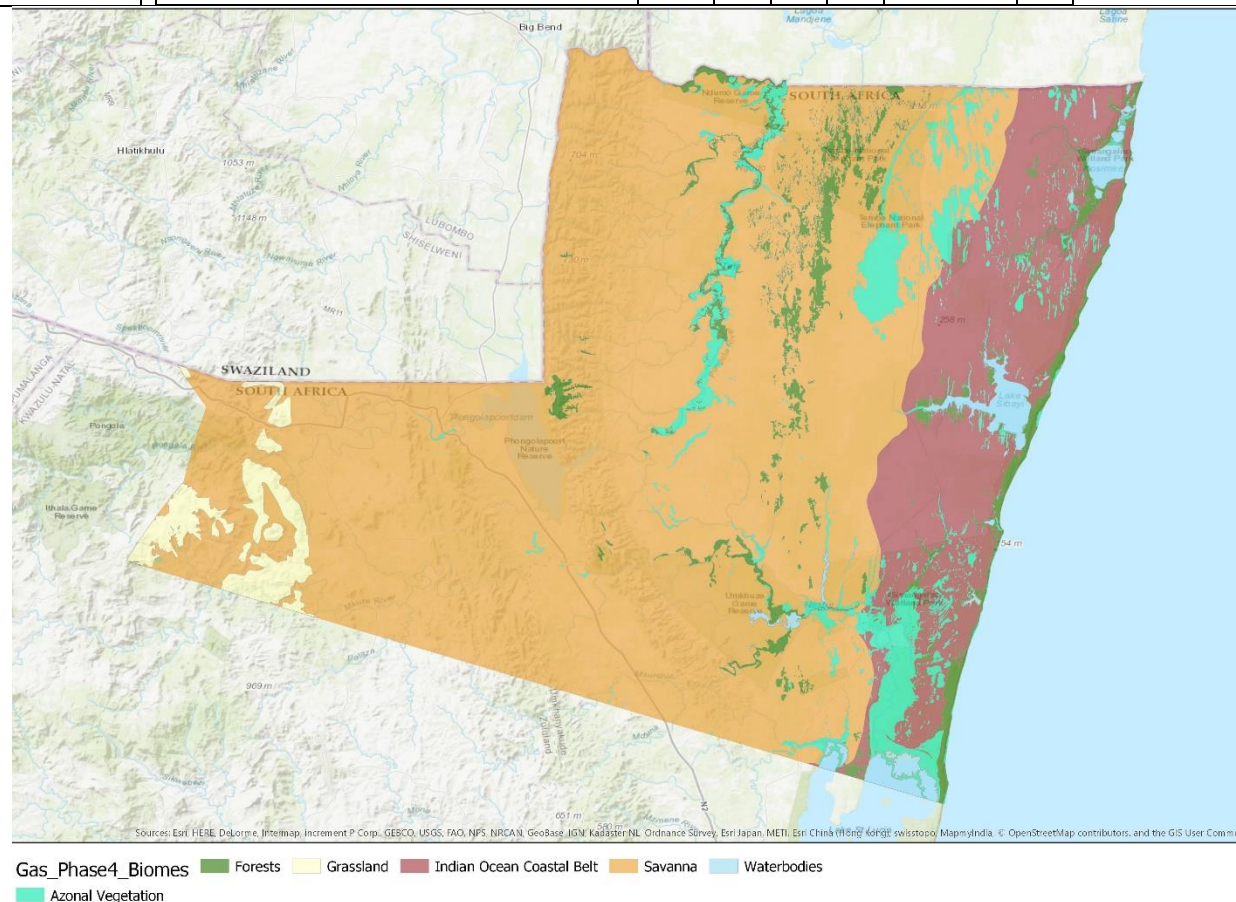
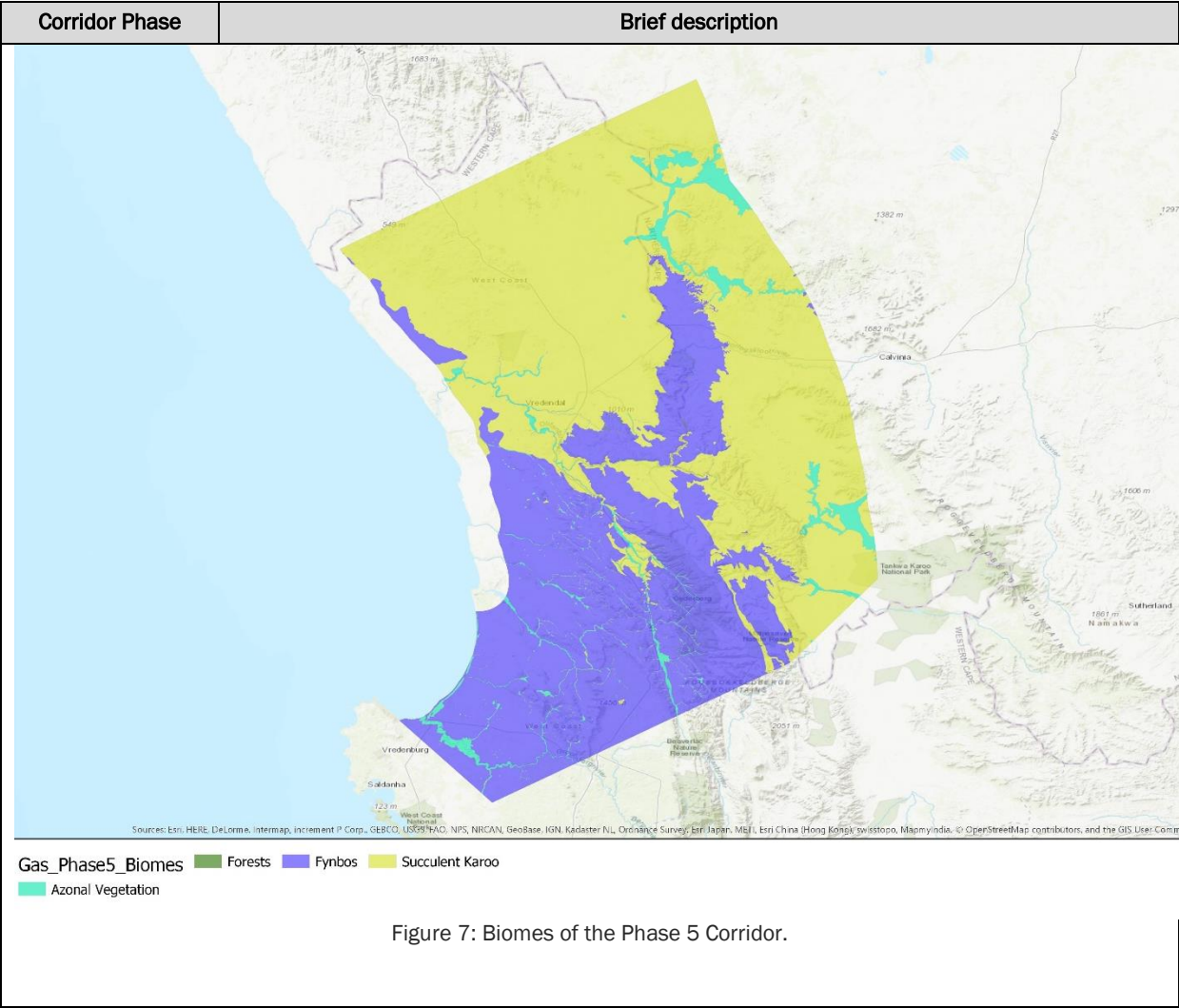


Figure 6: Biomes of the Phase 4 Corridor.

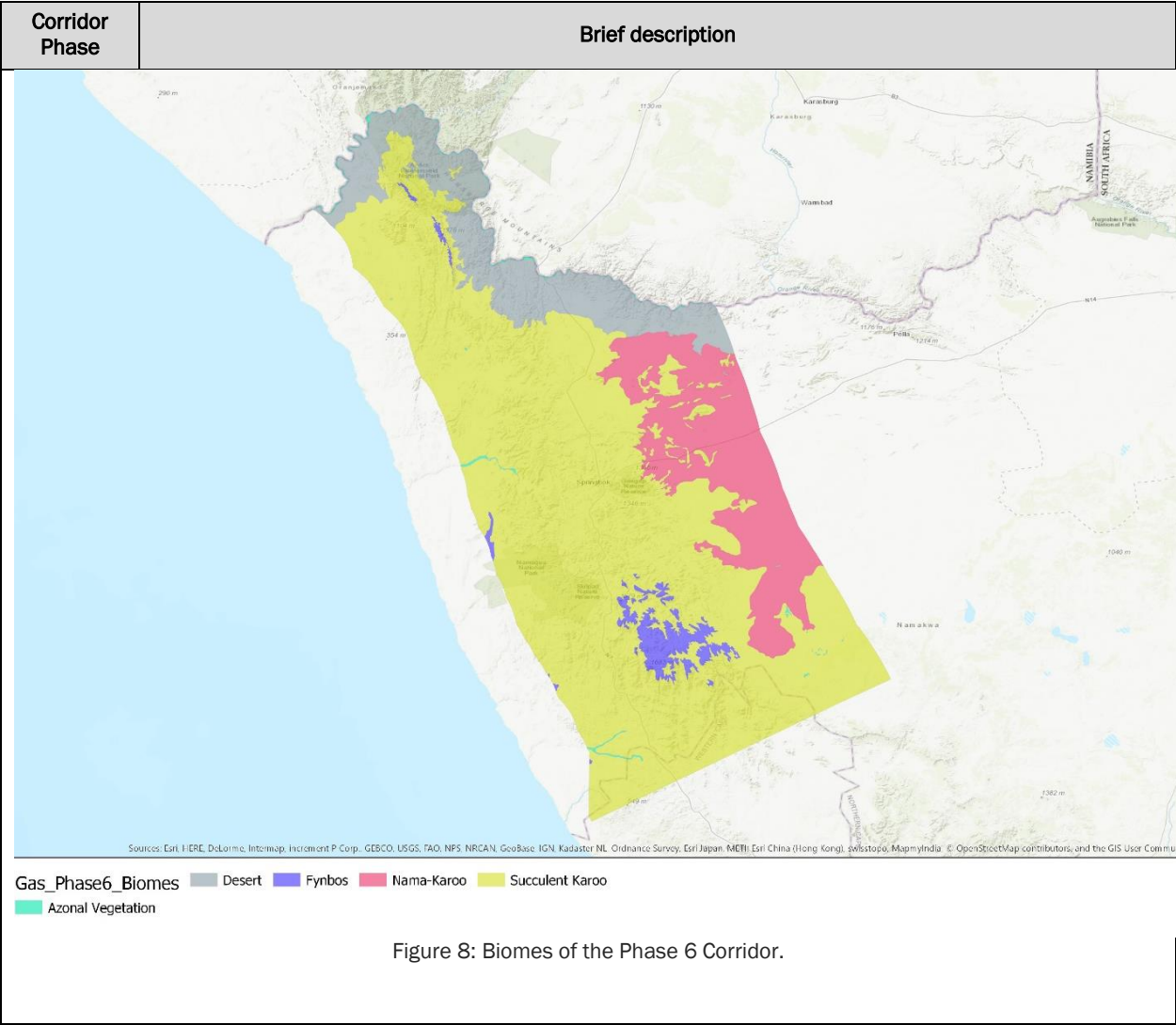
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Corridor Phase	Brief description																																																																																																																																					
Phase 5	<p>Corridor Phase 5 contains 2 biomes, as well as Azonal vegetation. These are</p> <ul style="list-style-type: none"> Fynbos Succulent Karoo <p>The following Red Data species were identified and rated for potential impacts in each biome, extracted from a total of 66 QDGCs.</p> <p>NT = Near threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered</p> <table> <tr> <th>Species</th><th>Status</th><th>Fynbos</th><th>Succulent Karoo</th><th>Azonal</th></tr> <tr><td>African Marsh-Harrier</td><td>EN</td><td>x</td><td></td><td>x</td></tr> <tr><td>Black Harrier</td><td>EN</td><td>x</td><td>x</td><td></td></tr> <tr><td>Black Stork</td><td>VU</td><td>x</td><td>x</td><td>x</td></tr> <tr><td>Blue Crane</td><td>NT</td><td>x</td><td>x</td><td>x</td></tr> <tr><td>Caspian Tern</td><td>VU</td><td></td><td></td><td>x</td></tr> <tr><td>European Roller</td><td>NT</td><td>x</td><td></td><td></td></tr> <tr><td>Greater Flamingo</td><td>NT</td><td>x</td><td>x</td><td>x</td></tr> <tr><td>Karoo Korhaan</td><td>NT</td><td>x</td><td>x</td><td></td></tr> <tr><td>Lanner Falcon</td><td>VU</td><td>x</td><td>x</td><td>x</td></tr> <tr><td>Lesser Flamingo</td><td>NT</td><td>x</td><td>x</td><td>x</td></tr> <tr><td>Ludwig's Bustard</td><td>EN</td><td>x</td><td>x</td><td></td></tr> <tr><td>Maccoa Duck</td><td>NT</td><td></td><td></td><td>x</td></tr> <tr><td>Martial Eagle</td><td>EN</td><td>x</td><td>x</td><td></td></tr> <tr><td>Secretary bird</td><td>NT</td><td>x</td><td>x</td><td></td></tr> <tr><td>Southern Black Korhaan</td><td>VU</td><td>x</td><td>x</td><td></td></tr> <tr><td>Verreaux's Eagle</td><td>VU</td><td>x</td><td>x</td><td></td></tr> <tr><td>Burchell's Courser</td><td>VU</td><td></td><td>x</td><td>x</td></tr> <tr><td>Cape Rock-jumper</td><td>NT</td><td>x</td><td></td><td></td></tr> <tr><td>Protea Seedeater</td><td>NT</td><td>x</td><td></td><td></td></tr> <tr><td>Yellow-billed Stork</td><td>EN</td><td></td><td></td><td>x</td></tr> <tr><td>Eurasian Curlew</td><td>NT</td><td></td><td></td><td>x</td></tr> <tr><td>Burchell's Courser</td><td>VU</td><td></td><td>x</td><td>x</td></tr> <tr><td>Chestnut-banded Plover</td><td>NT</td><td></td><td></td><td>x</td></tr> <tr><td>Great White Pelican</td><td>VU</td><td></td><td></td><td>x</td></tr> <tr><td>Red Lark</td><td>VU</td><td></td><td>x</td><td></td></tr> </table>				Species	Status	Fynbos	Succulent Karoo	Azonal	African Marsh-Harrier	EN	x		x	Black Harrier	EN	x	x		Black Stork	VU	x	x	x	Blue Crane	NT	x	x	x	Caspian Tern	VU			x	European Roller	NT	x			Greater Flamingo	NT	x	x	x	Karoo Korhaan	NT	x	x		Lanner Falcon	VU	x	x	x	Lesser Flamingo	NT	x	x	x	Ludwig's Bustard	EN	x	x		Maccoa Duck	NT			x	Martial Eagle	EN	x	x		Secretary bird	NT	x	x		Southern Black Korhaan	VU	x	x		Verreaux's Eagle	VU	x	x		Burchell's Courser	VU		x	x	Cape Rock-jumper	NT	x			Protea Seedeater	NT	x			Yellow-billed Stork	EN			x	Eurasian Curlew	NT			x	Burchell's Courser	VU		x	x	Chestnut-banded Plover	NT			x	Great White Pelican	VU			x	Red Lark	VU		x	
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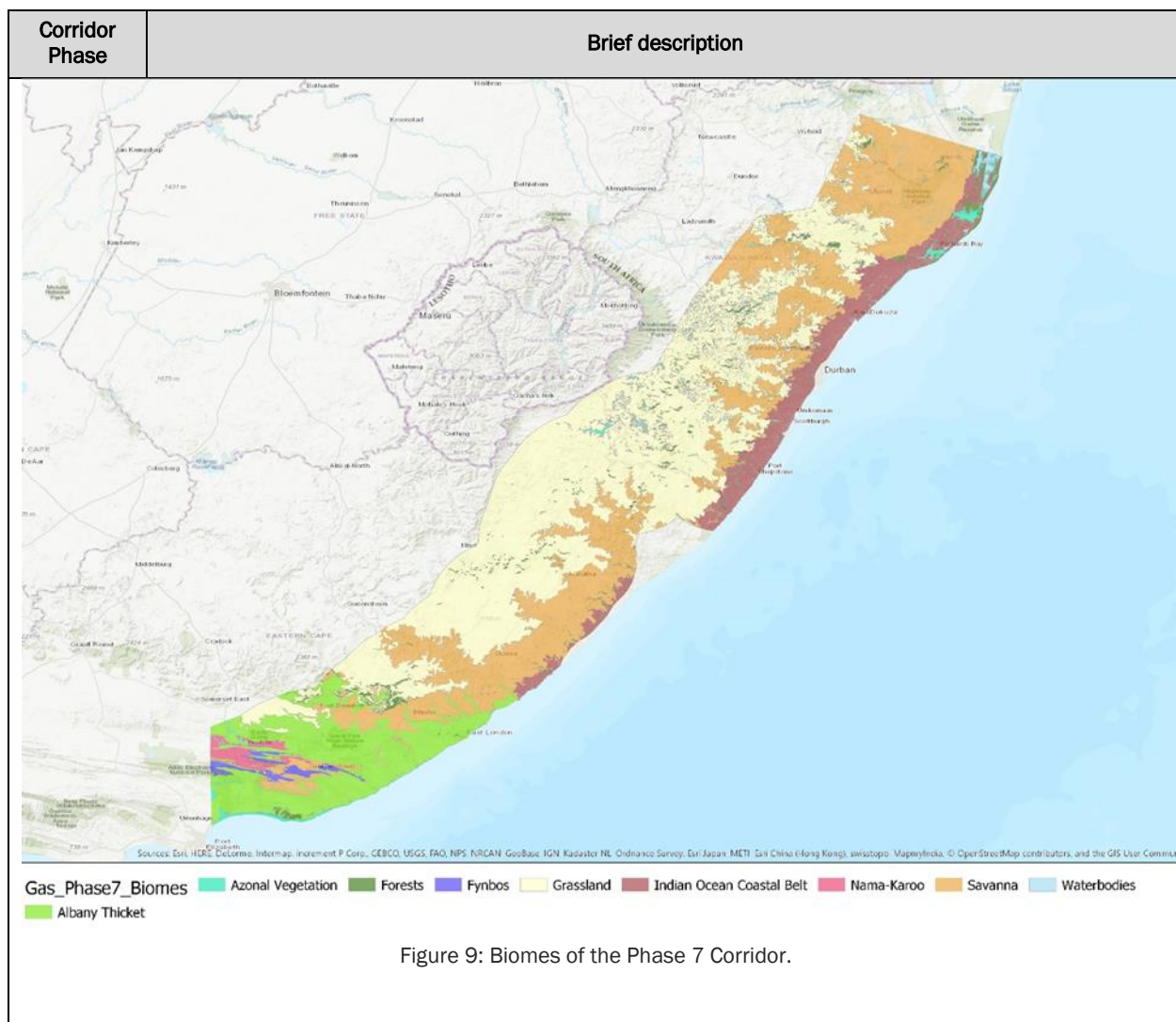
Corridor Phase	Brief description																																																																																																																																																																	
Phase 6	<p>Corridor Phase 6 contains 4 biomes, as well as Azonal vegetation. These are</p> <ul style="list-style-type: none">DesertFynbosNama-KarooSucculent Karoo <p>The following Red Data species were identified and rated for potential impacts in each biome, extracted from a total of 71 QDGCs.</p> <p>NT = Near threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered</p> <table><tr><th>Species</th><th>Status</th><th>Fynbos</th><th>Succulent Karoo</th><th>Nama Karoo</th><th>Desert</th><th>Azonal</th></tr><tr><td>African Marsh-Harrier</td><td>EN</td><td>x</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Black Harrier</td><td>EN</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr><tr><td>Black Stork</td><td>VU</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>Blue Crane</td><td>NT</td><td>x</td><td>x</td><td></td><td></td><td>x</td></tr><tr><td>Caspian Tern</td><td>VU</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Greater Flamingo</td><td>NT</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>Karoo Korhaan</td><td>NT</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr><tr><td>Lanner Falcon</td><td>VU</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>Lesser Flamingo</td><td>NT</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>Ludwig's Bustard</td><td>EN</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr><tr><td>Maccoa Duck</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Martial Eagle</td><td>EN</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr><tr><td>Secretarybird</td><td>NT</td><td>x</td><td>x</td><td>x</td><td></td><td></td></tr><tr><td>Southern Black Korhaan</td><td>VU</td><td>x</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Verreaux's Eagle</td><td>VU</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr><tr><td>Burchell's Courser</td><td>VU</td><td></td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>Chestnut-banded Plover</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Great White Pelican</td><td>VU</td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Red Lark</td><td>VU</td><td></td><td>x</td><td>x</td><td></td><td></td></tr><tr><td>Barlow's Lark</td><td>VU</td><td></td><td>x</td><td></td><td>x</td><td></td></tr><tr><td>Kori Bustard</td><td>NT</td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Sclater's Lark</td><td>NT</td><td></td><td>x</td><td></td><td></td><td></td></tr></table>	Species	Status	Fynbos	Succulent Karoo	Nama Karoo	Desert	Azonal	African Marsh-Harrier	EN	x				x	Black Harrier	EN	x	x	x	x		Black Stork	VU	x	x	x	x	x	Blue Crane	NT	x	x			x	Caspian Tern	VU					x	Greater Flamingo	NT	x	x	x	x	x	Karoo Korhaan	NT	x	x	x	x		Lanner Falcon	VU	x	x	x	x	x	Lesser Flamingo	NT	x	x	x	x	x	Ludwig's Bustard	EN	x	x	x	x		Maccoa Duck	NT					x	Martial Eagle	EN	x	x	x	x		Secretarybird	NT	x	x	x			Southern Black Korhaan	VU	x	x				Verreaux's Eagle	VU	x	x	x	x		Burchell's Courser	VU		x	x	x	x	Chestnut-banded Plover	NT					x	Great White Pelican	VU					x	Red Lark	VU		x	x			Barlow's Lark	VU		x		x		Kori Bustard	NT		x				Sclater's Lark	NT		x			
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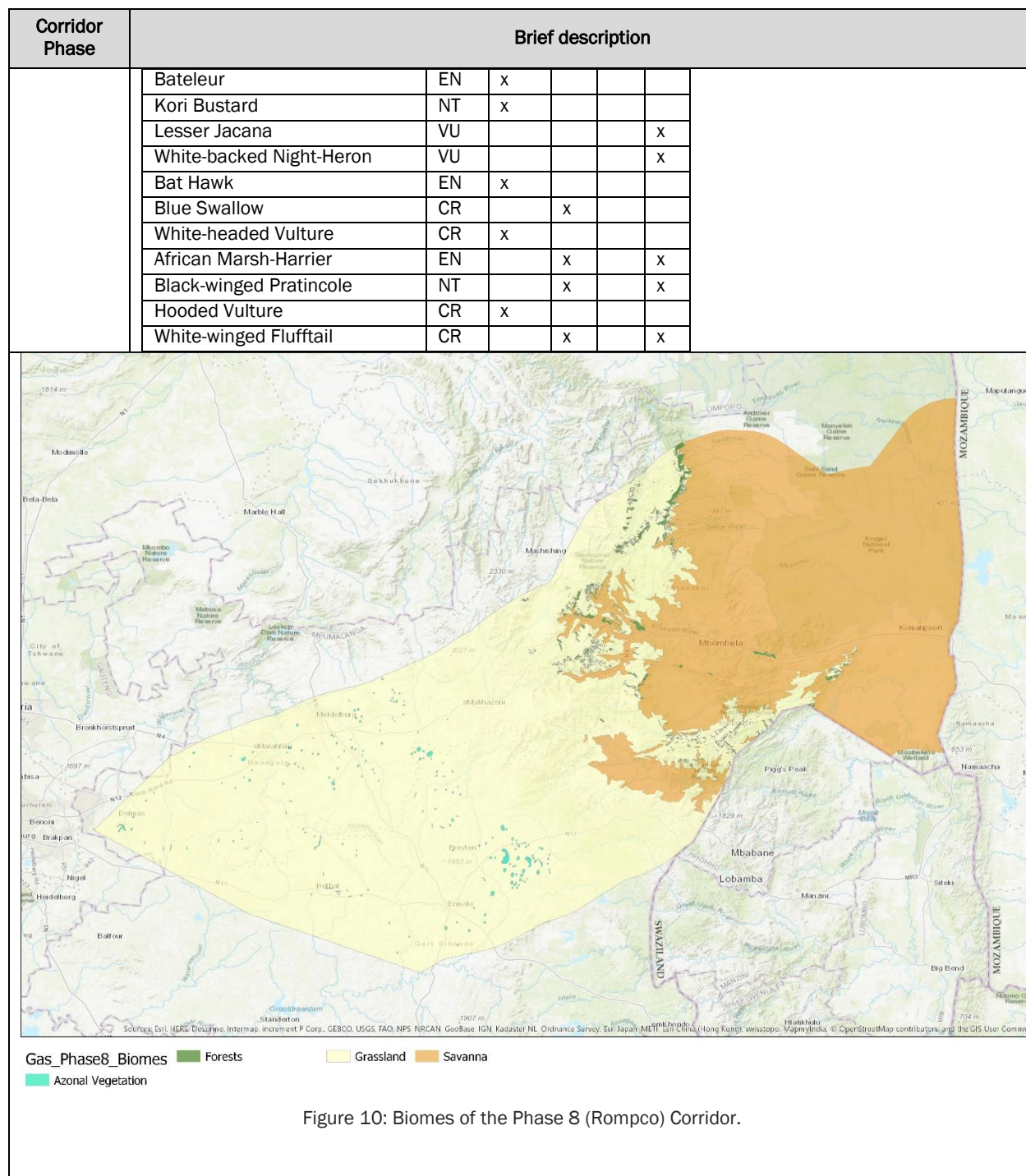
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Phase 7	<p>Corridor Phase 7 contains 7 biomes, as well as Azonal vegetation. 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Falcon</td><td>VU</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td><td>x</td></tr><tr><td>Lesser Flamingo</td><td>NT</td><td></td><td></td><td></td><td>x</td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>Bush Blackcap</td><td>VU</td><td></td><td></td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Maccoa Duck</td><td>NT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Martial Eagle</td><td>EN</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td><td></td></tr><tr><td>Red-footed Falcon</td><td>NT</td><td></td><td></td><td>x</td><td>x</td><td></td><td></td><td></td><td></td></tr><tr><td>Secretary bird</td><td>NT</td><td></td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td>x</td><td></td></tr><tr><td>Lappet-faced Vulture</td><td>EN</td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Verreaux's Eagle</td><td>VU</td><td></td><td>x</td><td>x</td><td>x</td><td></td><td></td><td>x</td><td></td></tr><tr><td>Marabou Stork</td><td>NT</td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Denham's Bustard</td><td>VU</td><td></td><td>x</td><td>x</td><td></td><td></td><td>x</td><td></td><td></td></tr><tr><td>Orange Ground-Thrush</td><td>NT</td><td></td><td></td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Pink-backed Pelican</td><td>VU</td><td></td><td></td><td></td><td></td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>Half-collared Kingfisher</td><td>NT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>African Rock Pipit</td><td>NT</td><td></td><td></td><td></td><td>x</td><td></td><td></td><td></td><td></td></tr><tr><td>Eurasian Curlew</td><td>NT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Greater Painted-snipe</td><td>NT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Knysna Warbler</td><td>VU</td><td>x</td><td></td><td></td><td></td><td>x</td><td></td><td></td><td></td></tr><tr><td>Saddle-billed Stork</td><td>EN</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Short-tailed Pipit</td><td>VU</td><td></td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Southern Bald Ibis</td><td>VU</td><td></td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Burchell's Courser</td><td>VU</td><td></td><td></td><td></td><td>x</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Cape Vulture</td><td>EN</td><td></td><td>x</td><td>x</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Chestnut-banded Plover</td><td>NT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr><tr><td>Southern Ground-Hornbill</td><td>EN</td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Species	Status	Albany Thicket	Savanna	Grassland	Nama Karoo	Forest	Indian Ocean Coastal Belt	Fynbos	Azonal	Cape Parrot	EN					x				Abdim's Stork	NT		x	x					x	Black Harrier	EN			x	x			x		Black Stork	VU		x	x	x		x	x	x	Blue Crane	NT			x	x		x	x	x	Caspian Tern	VU								x	European Roller	NT		x				x			Greater Flamingo	NT				x		x		x	Black-rumped Buttonquail	VU		x	x			x			Damara Tern	CR								x	Karoo Korhaan	NT				x			x		Lanner Falcon	VU	x	x	x	x		x	x	x	Lesser Flamingo	NT				x		x		x	Bush Blackcap	VU					x				Maccoa Duck	NT								x	Martial Eagle	EN	x	x	x	x		x	x		Red-footed Falcon	NT			x	x					Secretary bird	NT		x	x	x		x	x		Lappet-faced Vulture	EN		x							Verreaux's Eagle	VU		x	x	x			x		Marabou Stork	NT		x						x	Denham's Bustard	VU		x	x			x			Orange Ground-Thrush	NT					x				Pink-backed Pelican	VU						x		x	Half-collared Kingfisher	NT								x	African Rock Pipit	NT				x					Eurasian Curlew	NT								x	Greater Painted-snipe	NT								x	Knysna Warbler	VU	x				x				Saddle-billed Stork	EN								x	Short-tailed Pipit	VU			x						Southern Bald Ibis	VU			x						Burchell's Courser	VU				x				x	Cape Vulture	EN		x	x						Chestnut-banded Plover	NT								x	Southern Ground-Hornbill	EN		x						
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Corridor Phase	Brief description									
	Tawny Eagle	EN		x						
	Wattled Crane	CR			x					x
	African Grass-Owl	VU			x			x		
	Grey Crowned Crane	EN			x			x		x
	Pallid Harrier	NT			x					
	White-bellied Korhaan	VU		x	x				x	
	White-backed Vulture	CR		x						
	Yellow-billed Stork	EN								x
	Yellow-breasted Pipit	VU			x					
	Eastern Bronze-naped Pigeon	EN					x			
	Knysna Woodpecker	NT	x				x			
	African Crowned Eagle	VU					x			
	African Finfoot	VU								x
	African Pygmy-Goose	VU								x
	Bateleur	EN		x						
	Great White Pelican	VU								x
	Kori Bustard	NT		x		x				
	Lemon-breasted Canary	NT						x		
	Lesser Jacana	VU								x
	Mangrove Kingfisher	EN						x		x
	Neergaard's Sunbird	VU						x		
	Ludwig's Bustard	EN				x				
	Rosy-throated Longclaw	NT						x		
	Southern Banded Snake-Eagle	CR						x		
	Swamp Nightjar	VU						x		
	White-headed Vulture	CR		x						
	Southern Black Korhaan	VU							x	
	Striped Flufftail	VU			x					
	White-backed Night-Heron	VU								x
	African Broadbill	VU					x			
	Bat Hawk	EN		x						
	Bearded Vulture	CR			x					
	Blue Swallow	CR			x					
	Green Barbet	EN					x			
	Mountain Pipit	NT			x					
	Spotted Ground-Thrush	EN					x			
	White-headed Vulture	CR		x						



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Corridor Phase	Brief description																																																																																																																																																																																																																																																												
Phase 8	<p>Corridor Phase 8 contains 3 biomes, as well as Azonal vegetation. These are:</p> <ul style="list-style-type: none">• Forests• Grassland• Savanna <p>The following Red Data species were identified and rated for potential impacts in each biome, extracted from a total of 80 QDGCs.</p> <p>NT = Near threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered</p> <table><tr><th>Species</th><th>Status</th><th>Savanna</th><th>Grassland</th><th>Forest</th><th>Azonal</th></tr><tr><td>Abdim's Stork</td><td>NT</td><td>x</td><td>x</td><td></td><td>x</td></tr><tr><td>Black Harrier</td><td>EN</td><td></td><td>x</td><td></td><td></td></tr><tr><td>Black Stork</td><td>VU</td><td>x</td><td>x</td><td></td><td>x</td></tr><tr><td>Blue Crane</td><td>NT</td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>Caspian Tern</td><td>VU</td><td></td><td></td><td></td><td>x</td></tr><tr><td>European Roller</td><td>NT</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Greater Flamingo</td><td>NT</td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>Black-rumped Buttonquail</td><td>VU</td><td>x</td><td>x</td><td></td><td></td></tr><tr><td>Lanner Falcon</td><td>VU</td><td>x</td><td>x</td><td></td><td>x</td></tr><tr><td>Lesser Flamingo</td><td>NT</td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>Bush Blackcap</td><td>VU</td><td></td><td></td><td>x</td><td></td></tr><tr><td>Maccoa Duck</td><td>NT</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Martial Eagle</td><td>EN</td><td>x</td><td>x</td><td></td><td></td></tr><tr><td>Red-footed Falcon</td><td>NT</td><td></td><td>x</td><td></td><td></td></tr><tr><td>Secretary bird</td><td>NT</td><td>x</td><td>x</td><td></td><td></td></tr><tr><td>Lappet-faced Vulture</td><td>EN</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Verreaux's Eagle</td><td>VU</td><td>x</td><td>x</td><td></td><td></td></tr><tr><td>Marabou Stork</td><td>NT</td><td>x</td><td></td><td></td><td>x</td></tr><tr><td>Denham's Bustard</td><td>VU</td><td></td><td>x</td><td></td><td></td></tr><tr><td>Orange Ground-Thrush</td><td>NT</td><td></td><td></td><td>x</td><td></td></tr><tr><td>Pink-backed Pelican</td><td>VU</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Half-collared Kingfisher</td><td>NT</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Greater Painted-snipe</td><td>NT</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Saddle-billed Stork</td><td>EN</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Short-tailed Pipit</td><td>VU</td><td></td><td>x</td><td></td><td></td></tr><tr><td>Southern Bald Ibis</td><td>VU</td><td></td><td>x</td><td></td><td></td></tr><tr><td>Cape Vulture</td><td>EN</td><td>x</td><td>x</td><td></td><td></td></tr><tr><td>Chestnut-banded Plover</td><td>NT</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Southern Ground-Hornbill</td><td>EN</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Tawny Eagle</td><td>EN</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Wattled Crane</td><td>CR</td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>African Grass-Owl</td><td>VU</td><td></td><td>x</td><td></td><td></td></tr><tr><td>Grey Crowned Crane</td><td>EN</td><td></td><td>x</td><td></td><td>x</td></tr><tr><td>Pallid Harrier</td><td>NT</td><td></td><td>x</td><td></td><td></td></tr><tr><td>White-bellied Korhaan</td><td>VU</td><td>x</td><td>x</td><td></td><td></td></tr><tr><td>White-backed Vulture</td><td>CR</td><td>x</td><td></td><td></td><td></td></tr><tr><td>Yellow-billed Stork</td><td>EN</td><td></td><td></td><td></td><td>x</td></tr><tr><td>Yellow-breasted Pipit</td><td>VU</td><td></td><td>x</td><td></td><td></td></tr><tr><td>African Crowned Eagle</td><td>VU</td><td></td><td></td><td>x</td><td></td></tr><tr><td>African Finfoot</td><td>VU</td><td></td><td></td><td></td><td>x</td></tr><tr><td>African Pygmy-Goose</td><td>VU</td><td></td><td></td><td></td><td>x</td></tr></table>	Species	Status	Savanna	Grassland	Forest	Azonal	Abdim's Stork	NT	x	x		x	Black Harrier	EN		x			Black Stork	VU	x	x		x	Blue Crane	NT		x		x	Caspian Tern	VU				x	European Roller	NT	x				Greater Flamingo	NT		x		x	Black-rumped Buttonquail	VU	x	x			Lanner Falcon	VU	x	x		x	Lesser Flamingo	NT		x		x	Bush Blackcap	VU			x		Maccoa Duck	NT				x	Martial Eagle	EN	x	x			Red-footed Falcon	NT		x			Secretary bird	NT	x	x			Lappet-faced Vulture	EN	x				Verreaux's Eagle	VU	x	x			Marabou Stork	NT	x			x	Denham's Bustard	VU		x			Orange Ground-Thrush	NT			x		Pink-backed Pelican	VU				x	Half-collared Kingfisher	NT				x	Greater Painted-snipe	NT				x	Saddle-billed Stork	EN				x	Short-tailed Pipit	VU		x			Southern Bald Ibis	VU		x			Cape Vulture	EN	x	x			Chestnut-banded Plover	NT				x	Southern Ground-Hornbill	EN	x				Tawny Eagle	EN	x				Wattled Crane	CR		x		x	African Grass-Owl	VU		x			Grey Crowned Crane	EN		x		x	Pallid Harrier	NT		x			White-bellied Korhaan	VU	x	x			White-backed Vulture	CR	x				Yellow-billed Stork	EN				x	Yellow-breasted Pipit	VU		x			African Crowned Eagle	VU			x		African Finfoot	VU				x	African Pygmy-Goose	VU				x
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4.2 Feature Sensitivity Mapping

4.2.1 Identification of feature sensitivity criteria

The basic point of departure for the definition of avifaunal feature sensitivity classes (habitat classes) was the 2013 - 2014 South African National Land-Cover Dataset. This was supplemented with information on specific features (sensitivity features) where available, e.g. Important Bird Areas (IBAs), South African Protected Areas, known nests sites of Red Data species, and vulture colonies (refer to Section 3.3) (Table 4). The potential negative impacts on avifauna by the proposed gas pipeline were summarised as³:

- Direct mortality due to the destruction of nests in the construction servitude;
- Displacement due to disturbance during the construction of the pipeline and associated infrastructure; and
- Displacement of breeding individuals through habitat transformation⁴.

The probability of the impacts occurring in a specific habitat class for a specific species was rated for all Red Data species with a SABAP2 reporting rate of >5%, to arrive at a species-specific probability score, within each habitat class, within each biome, within each corridor phase. Probabilities for the respective impacts occurring were rated according to the below scale:

- 0 = probability of the impact occurring is < 20%
- 1 = probability of the impact occurring is 20 – 50%
- 2 = probability of the impact occurring is 51 - 80%
- 3 = probability of the impact occurring is >80%

The species-specific probability score was multiplied by a weighted Red Data status score for each priority species to arrive at a species-specific habitat sensitivity score for each species, for each habitat class. The Red Data status was assigned weighted scores according to the below scale:

- Near threatened = 2
- Vulnerable = 4
- Endangered = 8
- Critically endangered = 16

An aggregated habitat sensitivity score for each habitat class within each biome, within each corridor phase was calculated as the sum of all the species-specific probability scores for that particular habitat class:

- Low = 0; Medium = 1-11; High = 12 – 22; Very High = 23 – 33

³ See Section 5 for a more detailed exposition of potential impacts on avifauna.

⁴ Although the 50 m wide construction servitude will be revegetated through a process of vegetation rehabilitation and natural colonisation, a 10 m wide servitude will remain to provide access for maintenance. In the case of access roads, the transformation will be permanent. However, where possible, shallow rooted plants/crops can be allowed to re-grow in the 10 m wide servitude. No service road is planned to be built along the pipeline.

Table 4: Description and sources of data used for the avifauna sensitivity analysis.

Sensitivity Feature Class (Habitat class)	Data Source + Date of Publications	Data Description, Preparation and Processing	Relevant Corridors Phases
Wetlands and waterbodies: Water permanent	South African National Land-Cover Dataset, 2013/14	Areas of open, surface water, that are detectable on all image dates used in the Landsat 8 based water modelling processes. Permanent water extent typically refers to the minimum water extent, which occurs throughout the 2013-14 assessment period. Includes both natural and man-made water features.	All
Wetlands and waterbodies: Water seasonal	South African National Land-Cover Dataset, 2013/14	Areas of open, surface water, that are detectable on one or more, but not all image dates used in the Landsat 8 based water modelling processes. Seasonal water extent typically refers to the maximum water extent, which may only occur for a limited time within the 2013-14 assessment period. Includes both natural and man-made water features.	All
Wetlands and waterbodies: Wetlands	South African National Land-Cover Dataset, 2013/14	<p>Wetland areas that are primarily vegetated on a seasonal or permanent basis. Defined on the basis of seasonal image identifiable surface vegetation patterns (not subsurface soil characteristics). The vegetation can be either rooted or floating. Wetlands may be either daily (i.e. coastal), temporarily, seasonal or permanently wet and/or saturated. Vegetation is predominately herbaceous. Includes but not limited to wetlands associated with seeps/springs, marshes, floodplains, lakes/pans, swamps, estuaries, and some riparian areas. Wetlands associated with riparian zones represent image identified vegetation along the edges of watercourses that show similar spectral characteristics to nearby wetland vegetation.</p> <p>Excludes Mangrove swamps. Permanent or seasonal open water areas within the wetlands are classified separately. Seasonal wetland occurrences within commercially cultivated field boundaries are not shown, although they have been retained within subsistence level cultivation fields.</p>	All
Indigenous Forest	South African National Land-Cover Dataset, 2013/14	Natural / semi-natural indigenous forest, dominated by tall trees, where tree canopy heights are typically $> \pm 5\text{m}$ and tree canopy densities are typically $> \pm 75\%$, often with multiple understory vegetation canopies.	All
Thicket/dense bush	South African National Land-Cover Dataset, 2013/14	Natural / semi-natural tree and / or bush dominated areas, where typically canopy heights are between 2 - 5 m, and canopy density is typically $> \pm 75\%$, but may include localised sparser areas down to $\pm 60\%$. Includes dense bush, thicket, closed woodland, tall, dense shrubs, scrub forest and mangrove swamps. Can include self-seeded bush encroachment areas if sufficient canopy density exists.	All

Sensitivity Feature Class (Habitat class)	Data Source + Date of Publications	Data Description, Preparation and Processing	Relevant Corridors Phases
Woodland/open bush	South African National Land-Cover Dataset, 2013/14	Natural / semi-natural tree and / or bush dominated areas, where typically canopy heights are between $\pm 2 - 5$ m, and canopy densities typically between 40 - 75%, but may include localised sparser areas down to $\pm 15 - 20$ %. Includes sparse – open bushland and woodland, including transitional wooded grassland areas. Can include self-seeded bush encroachment areas if canopy density is within indicated range. In the arid western regions (i.e. Northern Cape), this cover class may be associated with a transitional bush / shrub cover that is lower than typical Open Bush / Woodland cover but higher and/or more dense than typical Low Shrub cover.	All
Grassland	South African National Land-Cover Dataset, 2013/14	Natural / semi-natural grass dominated areas, where typically the tree and / or bush canopy densities are typically $< \pm 20$ %, but may include localised denser areas up to ± 40 %, (regardless of canopy heights). Includes open grassland, and sparse bushland and woodland areas, including transitional wooded grasslands. May include planted pasture (i.e. grazing) if not irrigated. Irrigated pastures will typically be classified as cultivated, and urban parks and golf courses etc. under urban.	All
Shrubland fynbos	South African National Land-Cover Dataset, 2013/14	Natural / semi-natural low shrub dominated areas, typically with $< \pm 2$ m canopy height, specifically associated with the Fynbos Biome. Includes a range of canopy densities encompassing sparse to dense canopy covers. Very sparse covers may be associated with the bare ground class. Note that taller tree / bush / shrub communities within this vegetation type are typically classified separately as one of the other tree or bush dominated cover classes.	All
Low shrubland	South African National Land-Cover Dataset, 2013/14	Natural / semi-natural low shrub dominated areas, typically with ≤ 2 m canopy height. Includes a range of canopy densities encompassing sparse to dense canopy covers. Very sparse covers may be associated with the bare ground class. Typically associated with low, woody shrub, karoo-type vegetation communities, although can also represent locally degraded vegetation areas where there is a significantly reduced vegetation cover in comparison to surrounding, less impacted vegetation cover, including long-term wildfire scars in some mountainous areas in the western Cape. Note that taller tree / bush / shrub communities within this vegetation type are typically classified separately as one of the other tree or bush dominated cover classes.	All
Cultivated commercial fields rainfed	South African National Land-Cover Dataset, 2013/14	Cultivated lands used primarily for the production of rain-fed, annual crops for commercial markets. Typically represented by large field units, often in dense local or regional clusters. In most cases the defined cultivated extent represents the actual cultivated or potentially extent.	All

Sensitivity Feature Class (Habitat class)	Data Source + Date of Publications	Data Description, Preparation and Processing	Relevant Corridors Phases
Cultivated commercial pivots	South African National Land-Cover Dataset, 2013/14	Cultivated lands used primarily for the production of centre pivot irrigated, annual crops for commercial markets. In most cases the defined cultivated extent represents the actual cultivated or potentially extent.	All
Cultivate orchards and vines	South African National Land-Cover Dataset, 2013/14	Cultivated lands used primarily for the production of both rain-fed and irrigated permanent crops for commercial markets. Includes both tree, shrub and non-woody crops, such as citrus, tea, coffee, grapes, lavender and pineapples etc. In most cases the defined cultivated extent represents the actual cultivated or potentially extent.	All
Cultivated subsistence	South African National Land-Cover Dataset, 2013/14	Cultivated lands used primarily for the production of rain-fed, annual crops for local markets and / or home use. Typically represented by small field units, often in dense local or regional clusters. The defined area may include intra-field areas of non-cultivated land, which may be degraded or use-impacted, if the individual field units are too small to be defined as separate features.	All
Cultivated sugar cane	South African National Land-Cover Dataset, 2013/14	Commercial, pivot irrigated fields that appear to be used continuously for growing sugarcane on the majority of multi-date Landsat images used in the 2013-14 analysis period. Also includes commercial and semi-commercial / emerging farmer status, non-pivot fields, that appear to be used continuously for growing sugarcane on the majority of multi-date Landsat images used in the 2013-14 analysis period.	3,4,7
Plantations	South African National Land-Cover Dataset, 2013/14	Planted forestry plantations used for growing commercial timber tree species. The class represents mature tree stands which have approximately 70% or greater tree canopy closure (regardless of canopy height), on all the multi-date Landsat images in the 2013-14 analysis period. The class includes spatially smaller woodlots and windbreaks with the same cover characteristics. It also includes young tree stands that have approximately 40 - 70% tree canopy closure (regardless of canopy height), clear-felled stands and spatially smaller woodlots and windbreaks with the same cover characteristics.	All
Industrial	South African National Land-Cover Dataset, 2013/14	Mining activity footprint, based on pure, non-vegetated, bare ground surfaces. Includes extraction pits, tailings, waste dumps and associated surface infrastructure such as roads and buildings (unless otherwise indicated), for both active and abandoned mining activities. Class may include open cast pits, sand mines, quarries and borrow pits etc. also includes mining activity footprint, based on semi-bare ground surfaces, which may be sparsely vegetated. Includes extraction pits, tailings, waste dumps and associated surface infrastructure such as roads and buildings (unless otherwise indicated) and surrounding dust-impacted areas, for both active and abandoned mining activities. Water bodies inside mining areas which	All

Sensitivity Feature Class (Habitat class)	Data Source + Date of Publications	Data Description, Preparation and Processing	Relevant Corridors Phases
		represent permanent and non-permanent water extents are also included. Areas containing buildings and large surface infrastructure associated with the extraction, processing or administration of the associated mining area are also included.	
Bare	South African National Land-Cover Dataset, 2013/14	Non-vegetated donga and gully features, typically associated with significant natural or man-induced erosion activities along or in association with stream and flow lines. The mapped extent of the dongas and gullies is represented by bare ground conditions in all or the majority of the multi-date Landsat images used in the land-cover modelling. Note that these erosion features are significantly better represented both spatially and numerically in the wetter, more lush regions of the country where the non-vegetated erosion surface is significantly different from the surrounding vegetation cover (i.e. bushveld and grassland regions). In general, sparsely vegetated sheet eroded areas and degraded areas with significantly reduced local vegetation cover are not included in this class but will be represented by local areas of low shrub or bare ground. Also included are bare, non-vegetated ground, with little or very sparse vegetation cover (i.e. typically < $\pm 5 - 10$ % vegetation cover), occurring as a result of either natural or man-induced processes. Includes but not limited to natural rock exposures, dry river beds, dry pans, coastal dunes and beaches, sand and rocky desert areas, very sparse low shrublands and grasslands, surface (sheet) erosion areas, severely degraded areas, and major road networks etc. May also include long-term wildfire scars in some mountainous areas in the western Cape.	All
Urban	South African National Land-Cover Dataset, 2013/14	<p>Areas containing the following:</p> <ul style="list-style-type: none"> • high density buildings and other built-up structures associated with mainly non-residential, commercial, administrative, health, religious or transport (i.e. train station) activities; • buildings and other built-up structures associated with mainly non-residential, industrial and manufacturing activities, including power stations; • high density buildings and other built-up structures typically associated with informal, often non-regulated, residential housing; • variable density buildings and other built-up structures typically associated with formal, regulated, residential housing; • buildings, other built-up structures and open sports areas typically areas associated with schools and school sports grounds. • Areas containing a low density mix of buildings, other built-up structures 	All

Sensitivity Feature Class (Habitat class)	Data Source + Date of Publications	Data Description, Preparation and Processing	Relevant Corridors Phases
		<p>within open areas, which may or may not be cultivated, that are representative of both formally declared agricultural holdings, and similar small holdings / small farms, typically located on the periphery of urban areas.</p> <ul style="list-style-type: none"> • Areas containing a low density mix of buildings, other built-up structures associated with golf courses. The class includes both residential golf estates and non-residential golf courses, and typically represents the border extent of the entire estate or course. • Areas containing high density buildings and other built-up structures typically associated with formal, regulated, residential housing associated with townships and "RDP" type housing developments. • Areas containing variable density structures typically associated with rural villages, including both traditional and modern building formats. • Areas containing variable densities of buildings other built-up structures, or no structures at all, that are not clearly identifiable as one of the other Built-Up classes. May include runways, major infrastructure development sites, holiday chalets, roads, car parks, cemeteries etc. 	
Drainage lines	National Freshwater Ecosystem Priority Areas Project (NFEPA), 2011	<ul style="list-style-type: none"> • The National Freshwater Ecosystem Priority Areas (NFEPA) project identifies a national network of freshwater conservation areas and explores institutional mechanisms for their implementation. 	All
Areas earmarked for formal conservation as part of the National Protected Areas Expansion Strategy (NPAES)	Priority areas for protected area expansion, 2017 (including updated Northern Cape priorities) Department of Environmental Affairs (DEA)	<ul style="list-style-type: none"> • Maps of the most important areas for protected area expansion in South Africa. 	All
Conservation Areas	SA conservation area database-Q2 2017 (DEA); Provincial game farm data	<ul style="list-style-type: none"> • Biosphere reserves, Botanical gardens, Ramsar Sites (not already protected), Game farms, private reserves and hunting areas. 	All
Protected Areas	South African Protected Areas Database (SAPAD) - Q3, 2017, South African National Parks (SANParks) and Provincial	<ul style="list-style-type: none"> • Marine Protected Areas, National Parks, Nature Reserves, Protected Environments, Forest Nature Reserve, Forest Wilderness Area, Special Nature Reserve 	All
Wetlands and waterbodies: Estuaries	Database of national estuaries, SANBI, Biodiversity GIS, 2012	<ul style="list-style-type: none"> • Estuarine systems along the South African coastline 	1,2,4,5,7
Important Bird and Biodiversity Areas of South Africa	BirdLife South Africa, 2015	<ul style="list-style-type: none"> • National inventory of the Important Bird on Biodiversity Areas of South Africa, compiled by BirdLife South Africa. 	All
Nest sites, roosts and colonies of Red Data species	<ul style="list-style-type: none"> • The crane and raptor nest databases of the Endangered Wildlife Trust (EWT); 2018 • The Endangered Wildlife Trust's database of 	<ul style="list-style-type: none"> • Nest sites of Martial Eagle, Verreaux's Eagle, Tawny Eagle, Bateleur, White-backed Vulture, Lappet-faced Vulture, Black Harrier, Lanner Falcon, Blue Crane, Wattled Crane, Grey Crowned Crane. • Martial Eagle, Verreaux's Eagle and Tawny Eagle nests on transmission 	4,7,8

Sensitivity Feature Class (Habitat class)	Data Source + Date of Publications	Data Description, Preparation and Processing	Relevant Corridors Phases
	<p>eagles nesting on transmission lines in the Karoo; 2006</p> <ul style="list-style-type: none"> • A map of Blue Swallow breeding areas obtained from Ezemvelo KZN Wildlife; 2018 • Information on the locality of various Red Data raptor nests and Cape Vulture roosts in the Northern, Eastern Cape, and Western Cape. Received from various avifaunal specialists working on renewable energy projects, 2010 – 2018. • Information on potential nesting areas of Southern Ground Hornbills, Mabula Ground Hornbill Project, 2018. • Information on various Red Data species nests and vulture colonies obtained from the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa, 2015. • Information on the locality of Southern Bald Ibis breeding colonies, Birdlife South Africa, 2015. • National vulture restaurant database obtained from VulPro in March 2017 • The results of the 2013 aerial survey of Cape Vulture colonies conducted by Eskom, EWT and Birdlife South Africa (BLSA) in the former Transkei, Eastern Cape. • The national register of vulture Cape Vulture colonies obtained from VulPro in May 2015. • A list of potential Bush Blackcap, Spotted Ground-Thrush and Orange Ground-Thrush breeding sites. BirdLife South Africa, 2018. • Bearded Vulture nest sites in KwaZulu – Natal, obtained from Dr. Sonja Krüger at Ezemvelo KZN Wildlife. • White-winged Flufftail confirmed sightings 2000 – 2014 	<p>lines in the Karoo.</p> <ul style="list-style-type: none"> • Blue Swallow breeding areas in KwaZulu-Natal • Nest localities of Martial Eagle, Verreaux's Eagle, Tawny Eagle and Black Harrier (roosts included) at renewable energy development sites. Also includes a number of Cape Vulture roosts. • Potential nest areas of Southern Ground Hornbill. • The data comprise nest localities of Black Harrier, Martial Eagle, Verreaux's Eagle, Blue Crane, Lanner Falcon, in the 8 solar and wind focus areas that overlap with the gas phases. • Information from Dr. Kate Henderson's PhD on the locality of Southern Bald Ibis roost and colonies. • A register of all known vulture restaurants. • List of Cape Vulture colonies in the former Transkei, Eastern Cape, collected via an aerial survey in 2013. • List of all known Cape Vulture colonies compiled by VulPro. • The results of a modelling exercise undertaken by BirdLife South Africa to identify critical habitat for three key forest – dwelling Red Data species. • The results of nest surveys conducted from 2000 – 2012. • A list of wetlands where this critically endangered species has been recorded in South Africa which includes the locality where the first breeding for the region has recently been confirmed. 	<p>Inland, 5</p> <p>7</p> <p>Inland, 1,2,3,4,5,6,7</p> <p>3,4,7,8</p> <p>Inland,1,6,7</p> <p>3,4,7,8</p> <p>1,3,4,7,8</p> <p>7</p> <p>1,3,4,7,8</p> <p>3,4,7,8</p> <p>7</p> <p>3,7,8</p>

Sensitivity Feature Class (Habitat class)	Data Source + Date of Publications	Data Description, Preparation and Processing	Relevant Corridors Phases
	<ul style="list-style-type: none"> Information on various Red Data species nests obtained from Ezemvelo KZN Wildlife 	<ul style="list-style-type: none"> Nests localities of Bateleur, Black Stork, African Crowned Eagle, Lappet-faced Vulture, Marabou Stork, Martial Eagle, Secretary bird, Tawny Eagle, White-backed Vulture and White-headed Vulture. 	4, 7

Below are all feature types considered in the sensitivity analysis and the rating given to each feature and buffered area, where applicable (Table 5). Details on each individual feature ratings are available on request in spreadsheet format.

Table 5: Avifauna sensitivity features and ratings.

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
Inland	Albany Thicket	Bare	Medium	
		Cultivated commercial fields rainfed	High	
		Cultivated commercial pivots	High	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Inland	Azonal Vegetation	Bare	Medium	
		Cultivated commercial fields rainfed	High	
		Cultivated commercial pivots	High	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Medium	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Inland	Fynbos	Bare	Medium	
		Cultivated commercial fields rainfed	High	
		Cultivated commercial pivots	High	
		Cultivated orchards	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	High	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Inland	Grassland	Bare	Medium	
		Cultivated commercial fields rainfed	High	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Inland	Nama-Karoo	Bare	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Cultivated commercial fields rainfed	High	
		Cultivated commercial pivots	High	
		Cultivated orchards	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Inland	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	High	
		Cultivated commercial pivots	High	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	
		Woodland/Open bush	Medium	
Phase 1	Albany Thicket	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Medium	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 1	Azonal Vegetation	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	
		Grassland	High	
		Industrial	Medium	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
Phase 1	Forests	Woodland/Open bush	Medium	
		Bare	Low	
		Cultivated commercial fields rainfed	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	Medium	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Medium	200m
		Woodland/Open bush	Medium	
Phase 1	Fynbos	Bare	Medium	
		Cultivated commercial fields rainfed	High	
		Cultivated commercial pivots	High	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Medium	
		Low shrubland	High	
		Plantations	Medium	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 1	Nama-Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	High	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Medium	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Wetlands and waterbodies (200m buffer)	Medium	200m
		Woodland/Open bush	Medium	
Phase 1	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Medium	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 2	Albany Thicket	Bare	Medium	
		Cultivated commercial fields rainfed	High	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 2	Azonal Vegetation	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Medium	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 2	Forests	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Medium	200m
		Woodland/Open bush	Medium	
Phase 2	Fynbos	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Indigenous Forest	High	
		Industrial	Low	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 2	Grassland	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Low shrubland	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 2	Nama-Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	High	
		Cultivated commercial pivots	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 2	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 3	Azonal Vegetation	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Very high	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
Phase 3	Forests	Bare	Low	
		Cultivated commercial fields rainfed	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	Medium	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Medium	200m
		Woodland/Open bush	Medium	
Phase 3	Grassland	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	Medium	
Phase 3	Indian Ocean Coastal Belt	Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Medium	200m
Phase 3	Savanna	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
Phase 4	Azonal Vegetation	Woodland/Open bush	High	
		Bare	Medium	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Medium	
		Grassland	High	
		Indigenous Forest	Medium	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	High	
Phase 4	Forests	Bare	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	Medium	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 4	Grassland	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Medium	
		Drainage lines 60m buff	High	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 4	Indian Ocean Coastal Belt	Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	High	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	High	
Phase 4	Savanna	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Medium	
		Drainage lines 60m buff	High	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	Very high	
Phase 5	Azonal Vegetation	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Cultivated subsistence	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 5	Forests	Bare	Low	
		Cultivated commercial fields rainfed	Low	
		Cultivated orchards	Low	
		Grassland	Low	
		Low shrubland	Low	
		Shrubland fynbos	Low	
		Thicket /Dense bush	Low	
		Wetlands and waterbodies (200m buffer)	Low	200m
		Woodland/Open bush	Low	
Phase 5	Fynbos	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Medium	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 5	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 6	Azonal Vegetation	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated orchards	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Medium	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 6	Desert	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated orchards	Medium	
		Cultivated vines	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 6	Fynbos	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Medium	200m
		Woodland/Open bush	Medium	
Phase 6	Nama-Karoo	Bare	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Wetlands and waterbodies (200m buffer)	Medium	200m
		Woodland/Open bush	Medium	
Phase 6	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 7	Albany Thicket	Bare	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 7	Azonal Vegetation	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	Medium	
Phase 7	Forests	Bare	Low	
		Cultivated commercial fields rainfed	Low	
		Cultivated orchards	Medium	
		Cultivated subsistence	Low	
		Cultivated sugar cane	Low	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	High	
		Industrial	Low	
		Low shrubland	Low	
		Plantations	Medium	
		Shrubland fynbos	Low	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Medium	200m
		Woodland/Open bush	Medium	
Phase 7	Fynbos	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 7	Grassland	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Very high	
		Indigenous Forest	High	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	Medium	
Phase 7	Indian Ocean Coastal Belt	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Medium	
		Drainage lines 60m buff	High	60m
		Grassland	High	
		Indigenous Forest	High	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	Medium	
Phase 7	Nama-Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Industrial	Medium	
		Low shrubland	High	
		Shrubland fynbos	High	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	High	200m
		Woodland/Open bush	Medium	
Phase 7	Savanna	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Medium	
		Shrubland fynbos	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
		Woodland/Open bush	Very high	
Phase 8	Azonal Vegetation	Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Very high	200m
Phase 8	Forests	Bare	Low	
		Cultivated commercial fields rainfed	Low	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Cultivated sugar cane	Low	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	High	
		Low shrubland	Low	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Low	200m
		Wetlands and waterbodies (200m buffer)	Low	200m
		Woodland/Open bush	Medium	
Phase 8	Grassland	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	Medium	
		Indigenous Forest	High	
		Industrial	Medium	
		Low shrubland	Low	
		Plantations	Medium	
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Medium	200m
		Wetlands and waterbodies (200m buffer)	Low	200m
		Woodland/Open bush	Very high	
Phase 8	Savanna	Bare	High	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Medium	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Medium	
		Drainage lines 60m buff	Medium	60m
		Grassland	High	
		Indigenous Forest	High	
		Industrial	Medium	
		Low shrubland	Low	
		Plantations	Medium	

Corridor Phase	Biome	Feature Class	Feature Class Sensitivity	Buffer Distance Sensitivity
		Thicket /Dense bush	Medium	
		Urban (200m buffer)	Medium	200m
		Wetlands and waterbodies (200m buffer)	Low	200m
		Woodland/Open bush	Very high	
All phases	All biomes	Areas earmarked for formal conservation as part of the National Protected Areas Expansion Strategy (NPAES)	High	
		Conservation Areas	High (Elevated to Very high if overlapping with IBA)	
		Protected Areas	High (Elevated to Very high if overlapping with IBA)	
		Estuaries	High (Elevated to Very high if overlapping with IBA)	
		Nest sites, roosts and colonies of Red Data species	Very high	2km (3km for Black Harrier)
		Important Bird and Biodiversity Areas of South Africa	High	

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2

4.3 Feature maps

4.3.1 Phase Inland

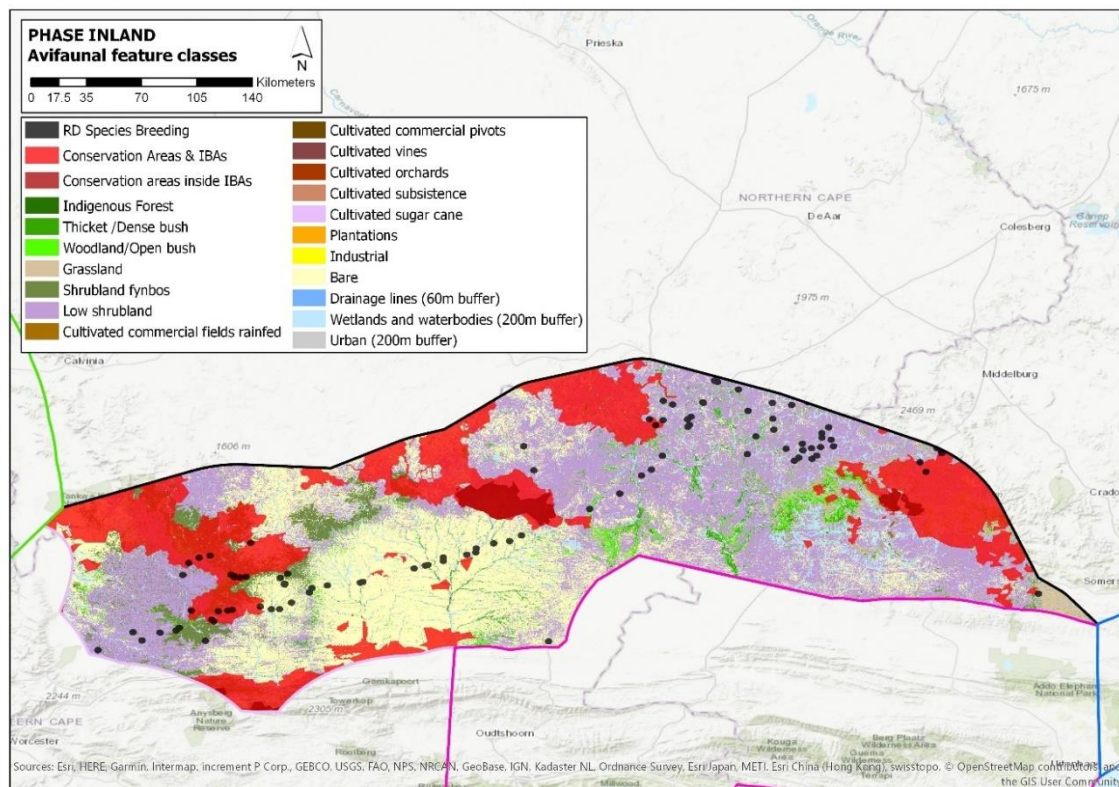


Figure 11: Sensitive environmental features of importance to avifauna in the Inland Phase Corridor.

4.3.2 Phase 1

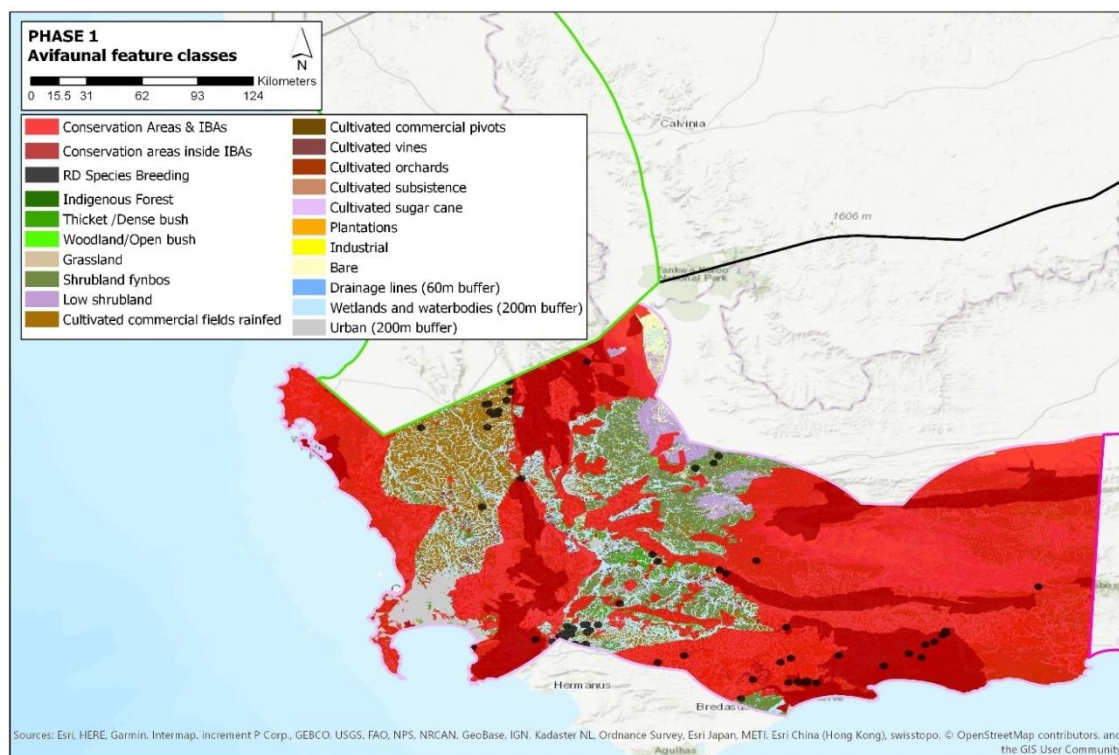


Figure 12: Sensitive environmental features of importance to avifauna in the Phase 1 Corridor.

4.3.3 Phase 2

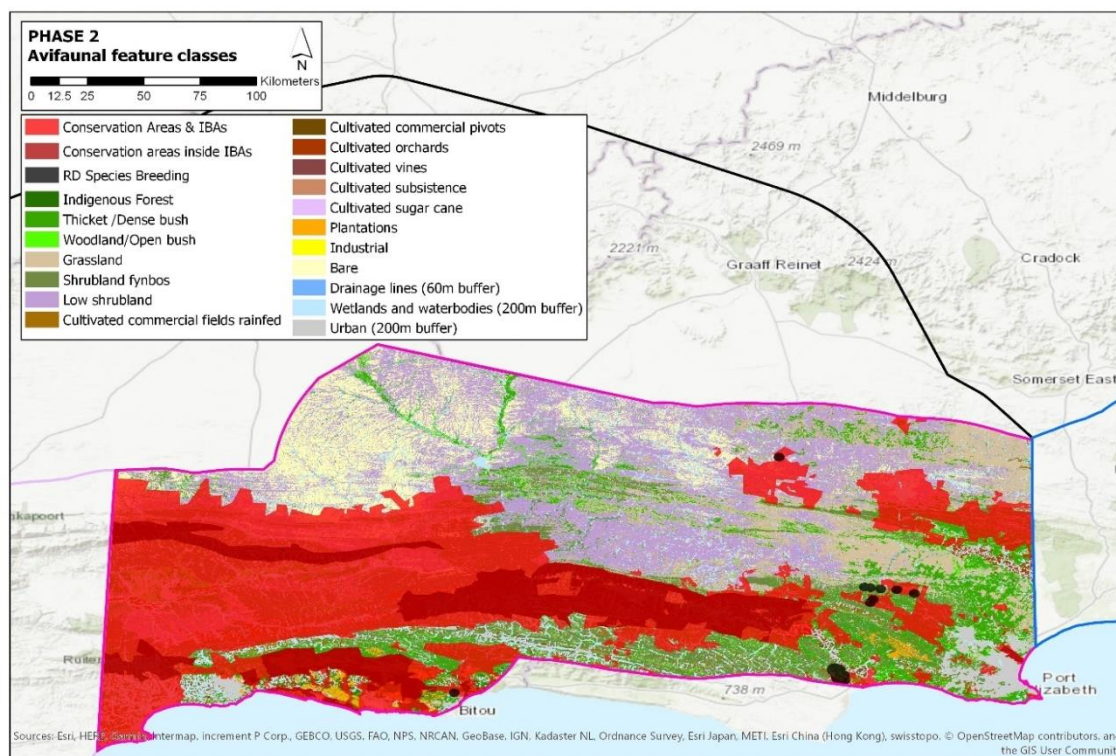


Figure 13: Sensitive environmental features of importance to avifauna in the Phase 2 Corridor.

4.3.4 Phase 3

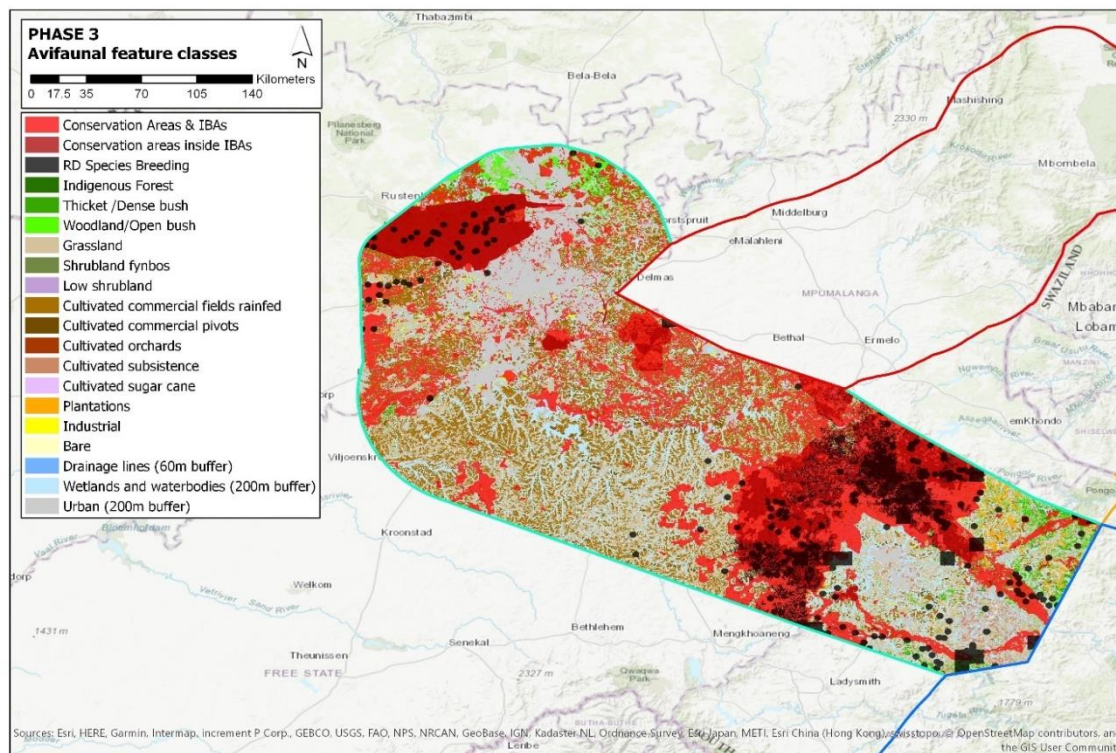


Figure 14: Sensitive environmental features of importance to avifauna in the Phase 3 Corridor

4.3.5 Phase 4

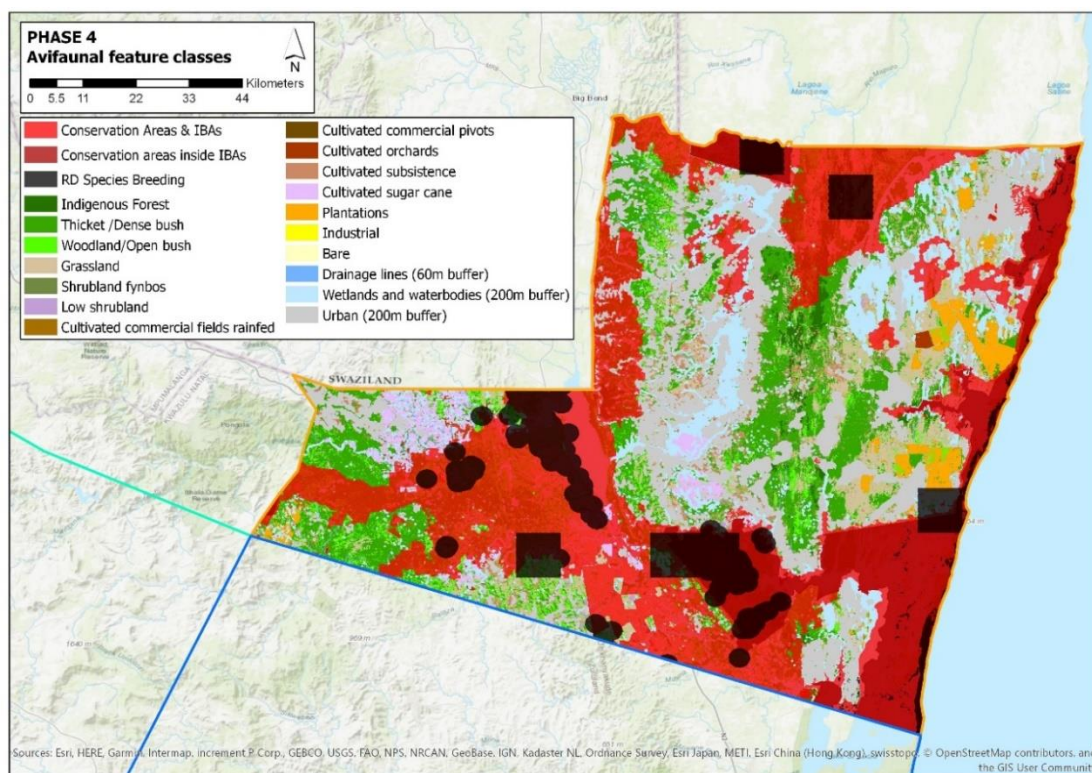


Figure 15: Sensitive environmental features of importance to avifauna in the Phase 4 Corridor

4.3.6 Phase 5

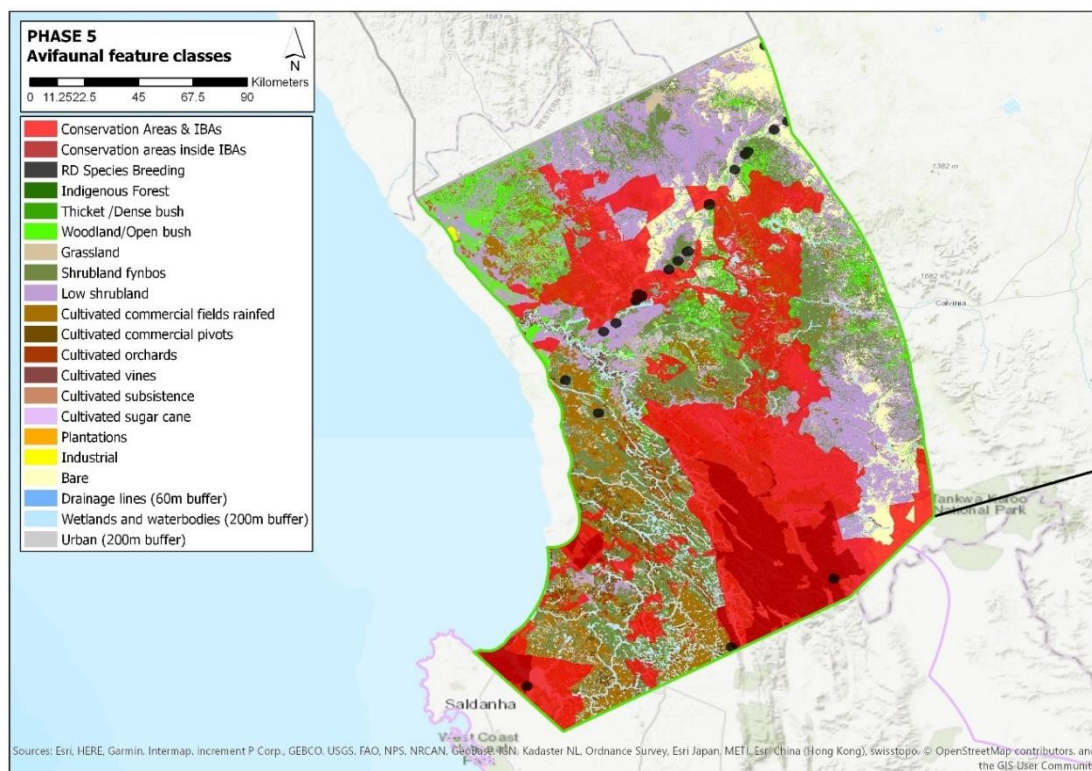


Figure 16: Sensitive environmental features of importance to avifauna in the Phase 5 Corridor

4.3.7 Phase 6

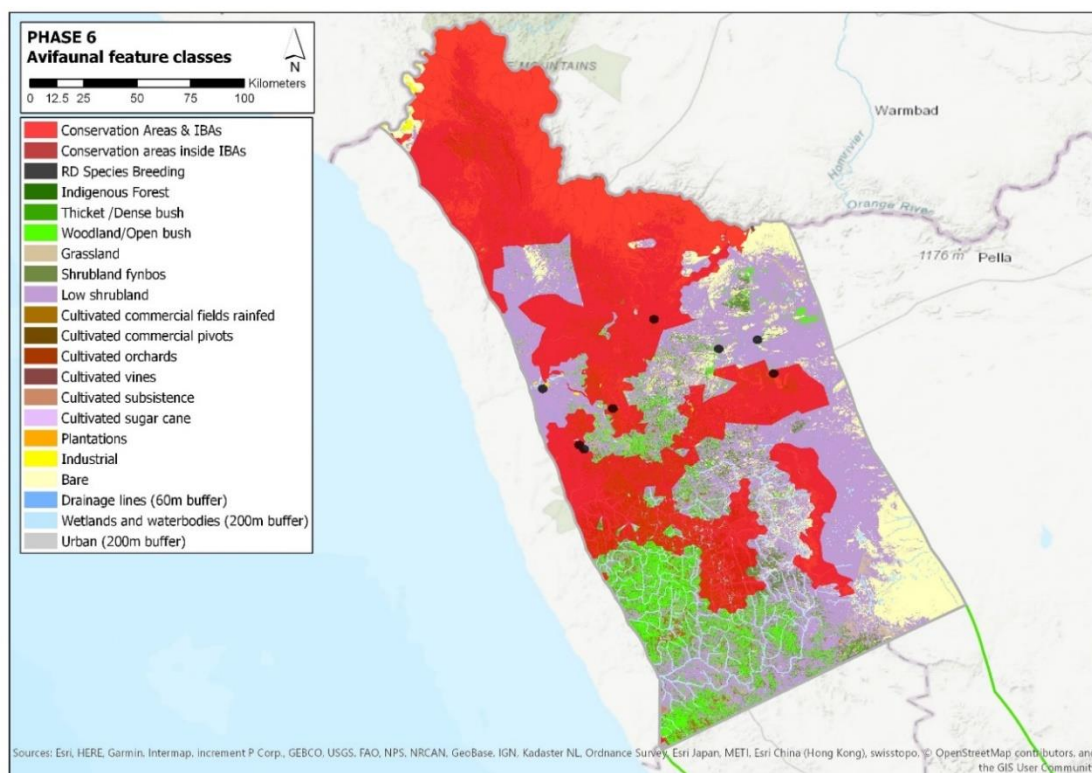


Figure 17: Sensitive environmental features of importance to avifauna in the Phase 6 Corridor.

4.3.8 Phase 7

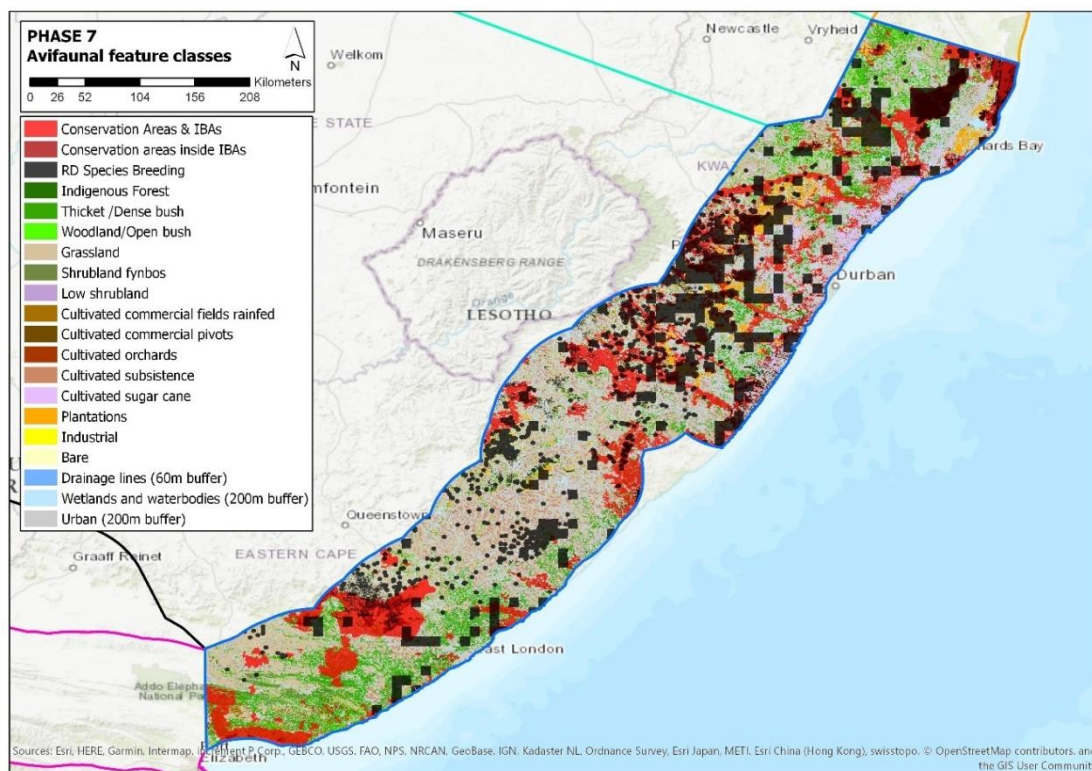


Figure 18: Sensitive environmental features of importance to avifauna in the Phase 7 Corridor.

4.3.9 Phase 8

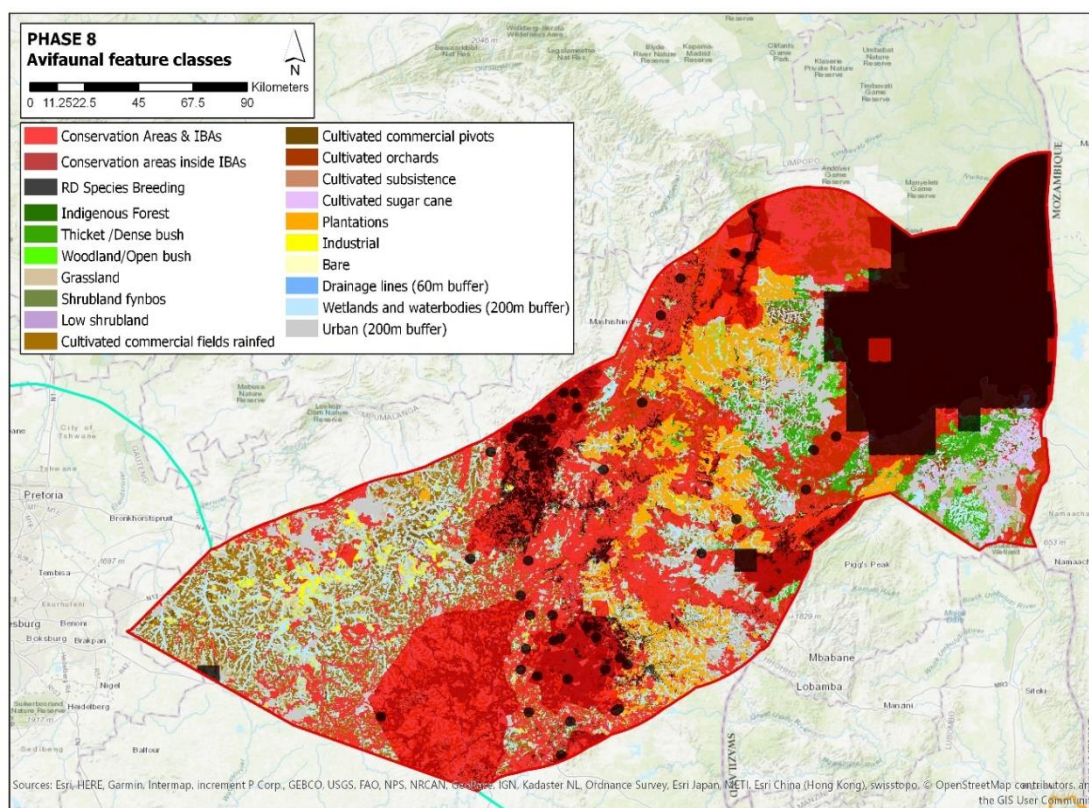


Figure 19: Sensitive environmental features of importance to avifauna in the Phase 8 Corridor.

4.4 Four-Tier Sensitivity Mapping

4.4.1 Phase Inland

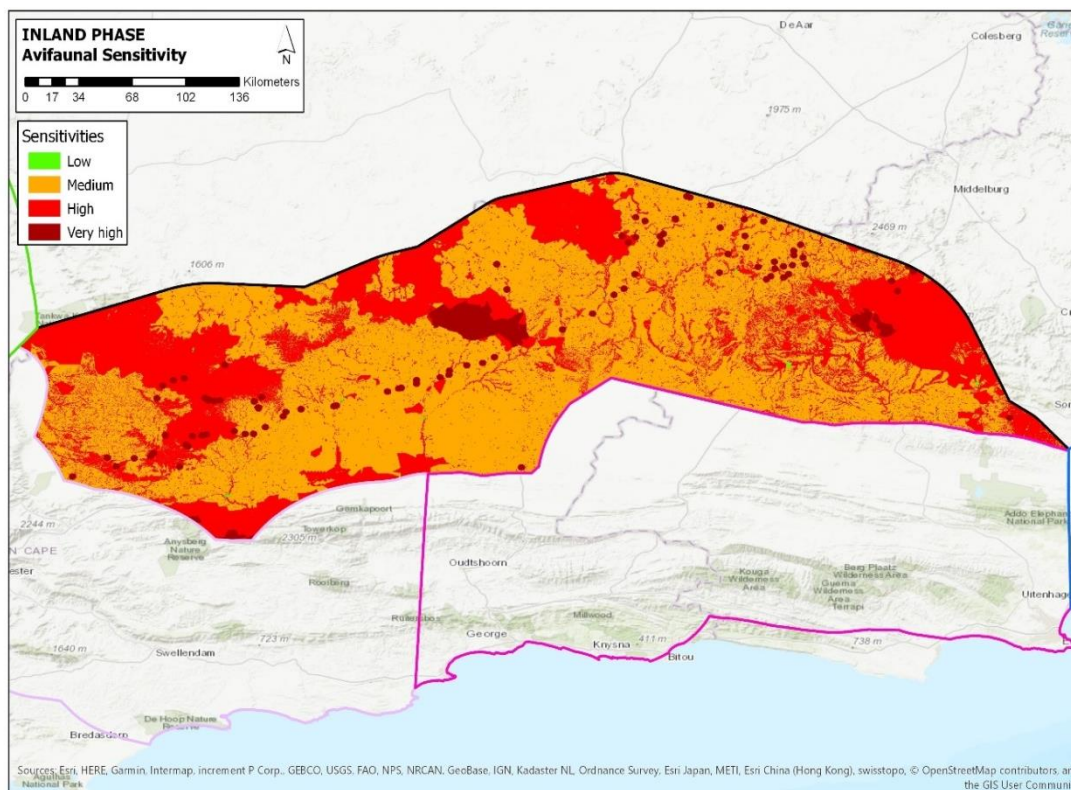


Figure 20: Avifauna sensitivity map for the Inland Phase Corridor.

4.4.2 Phase 1

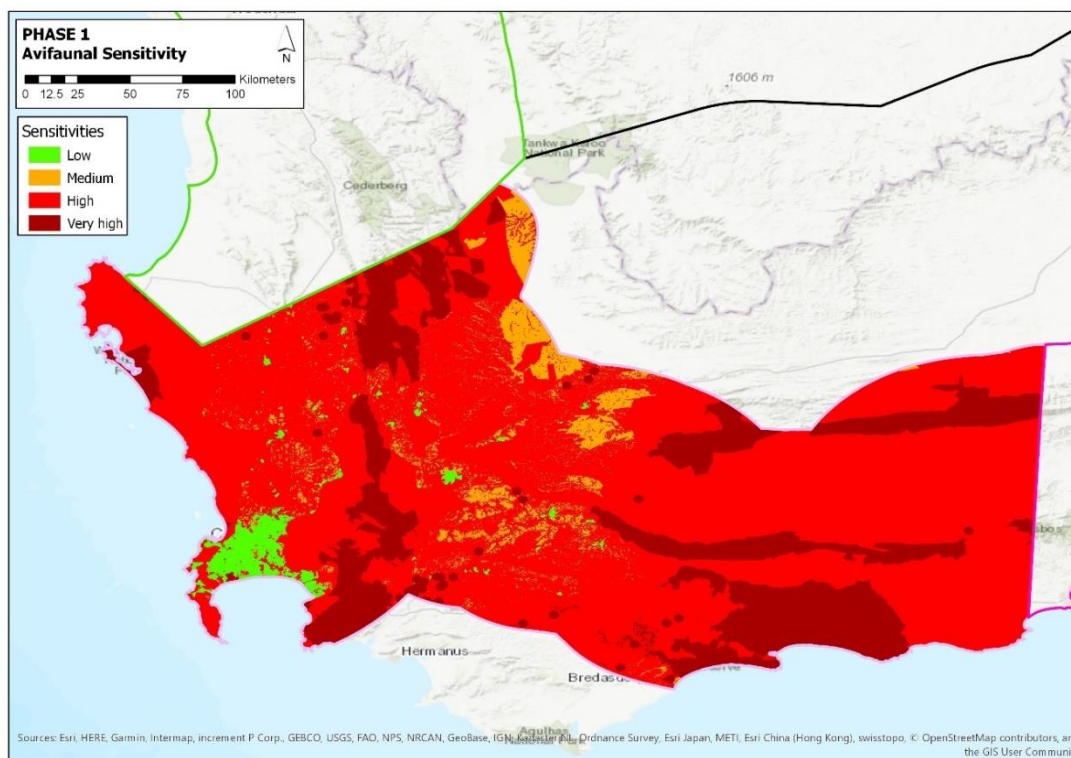


Figure 21: Avifauna sensitivity map for the Phase 1 Corridor.

4.4.3 Phase 2

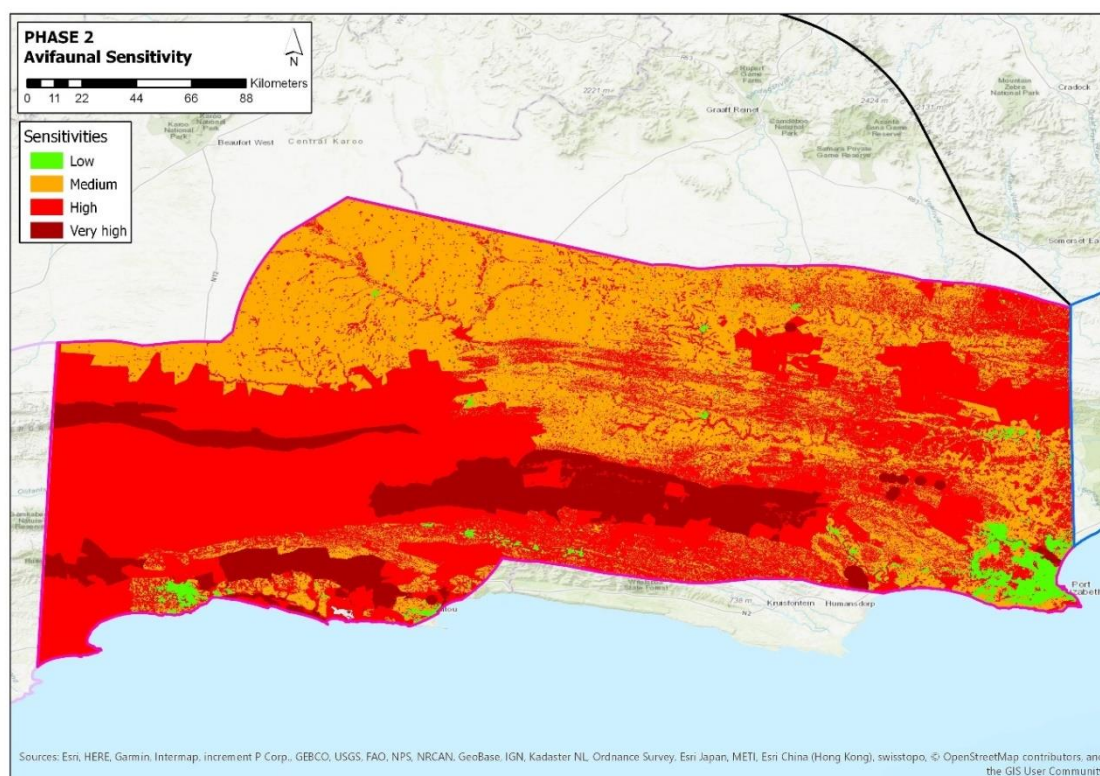


Figure 22: Avifauna sensitivity map for the Phase 2 Corridor.

4.4.4 Phase 3

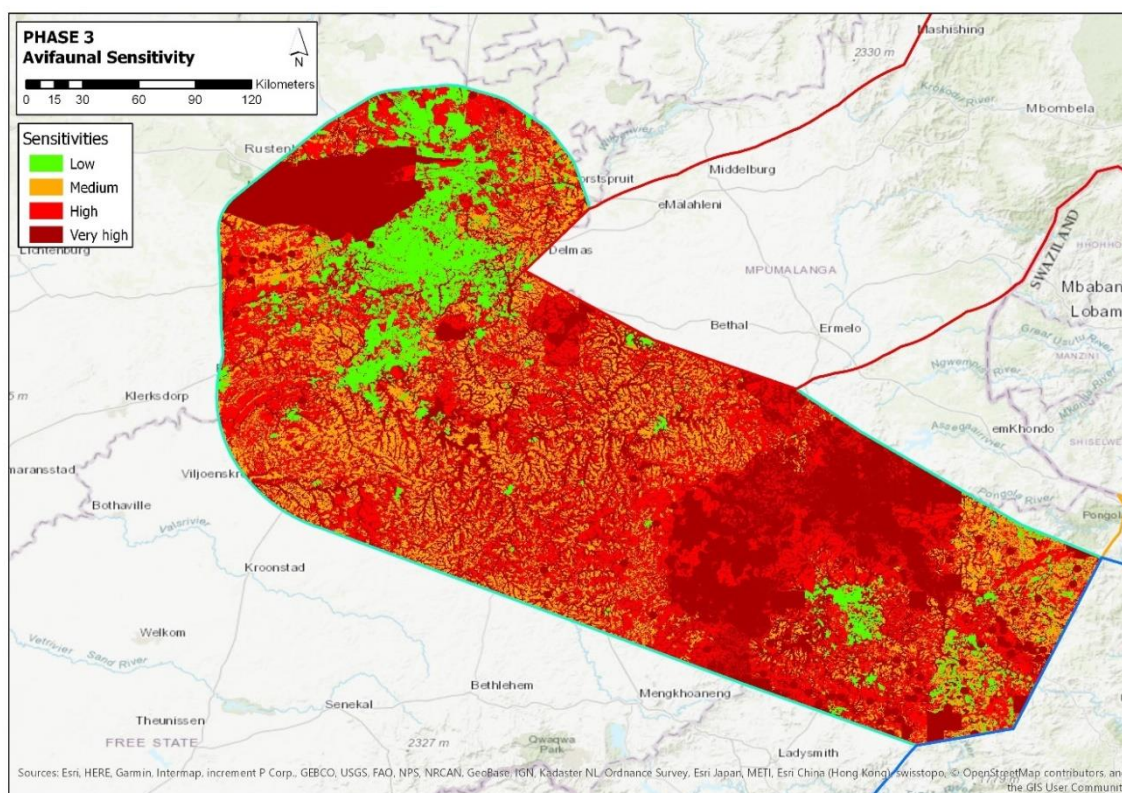


Figure 23: Avifauna sensitivity map for the Phase 3 Corridor.

4.4.5 Phase 4

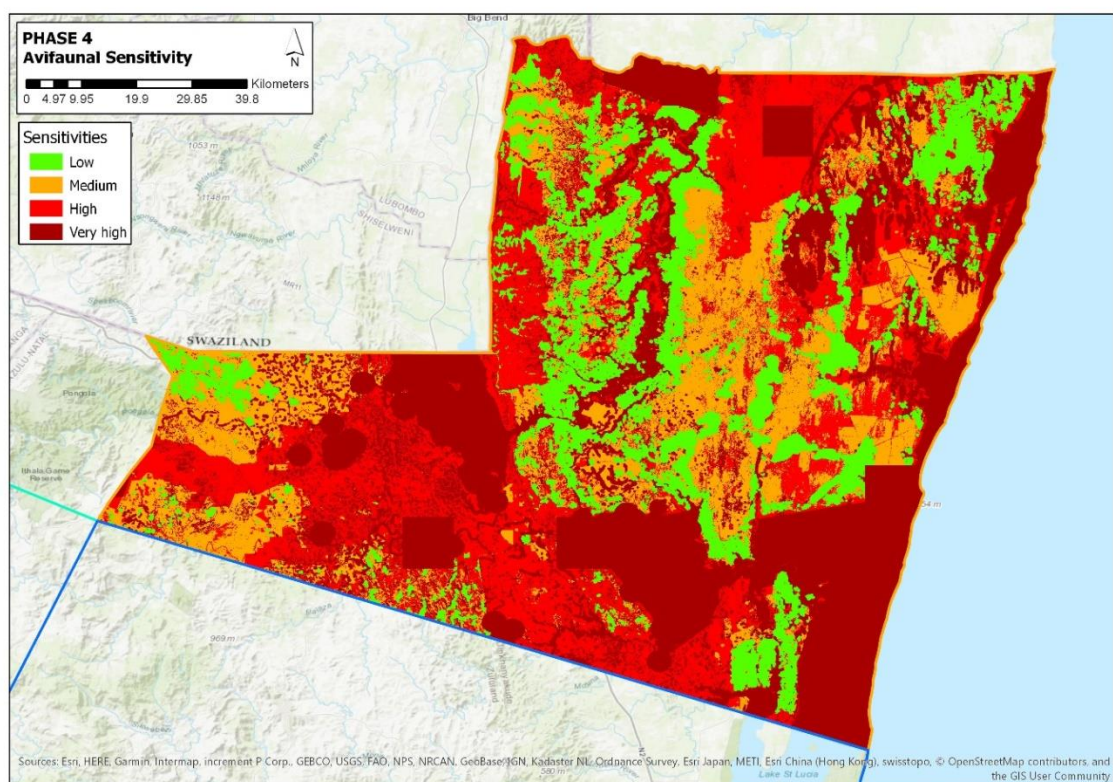


Figure 24: Avifauna sensitivity map for the Phase 4 Corridor.

4.4.6 Phase 5

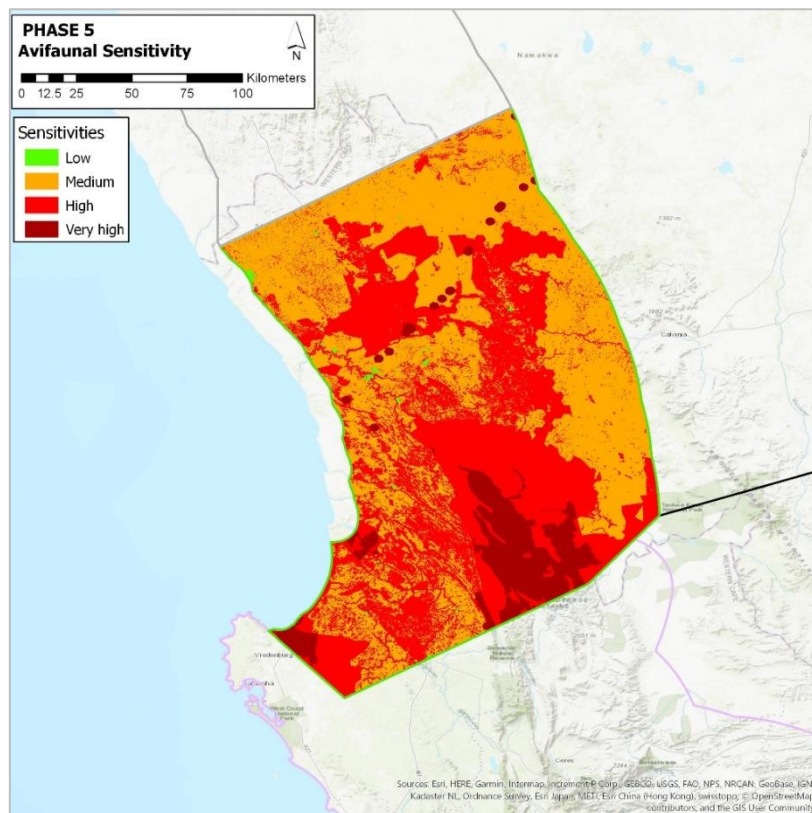


Figure 25: Avifauna sensitivity map for the Phase 5 Corridor.

4.4.7 Phase 6

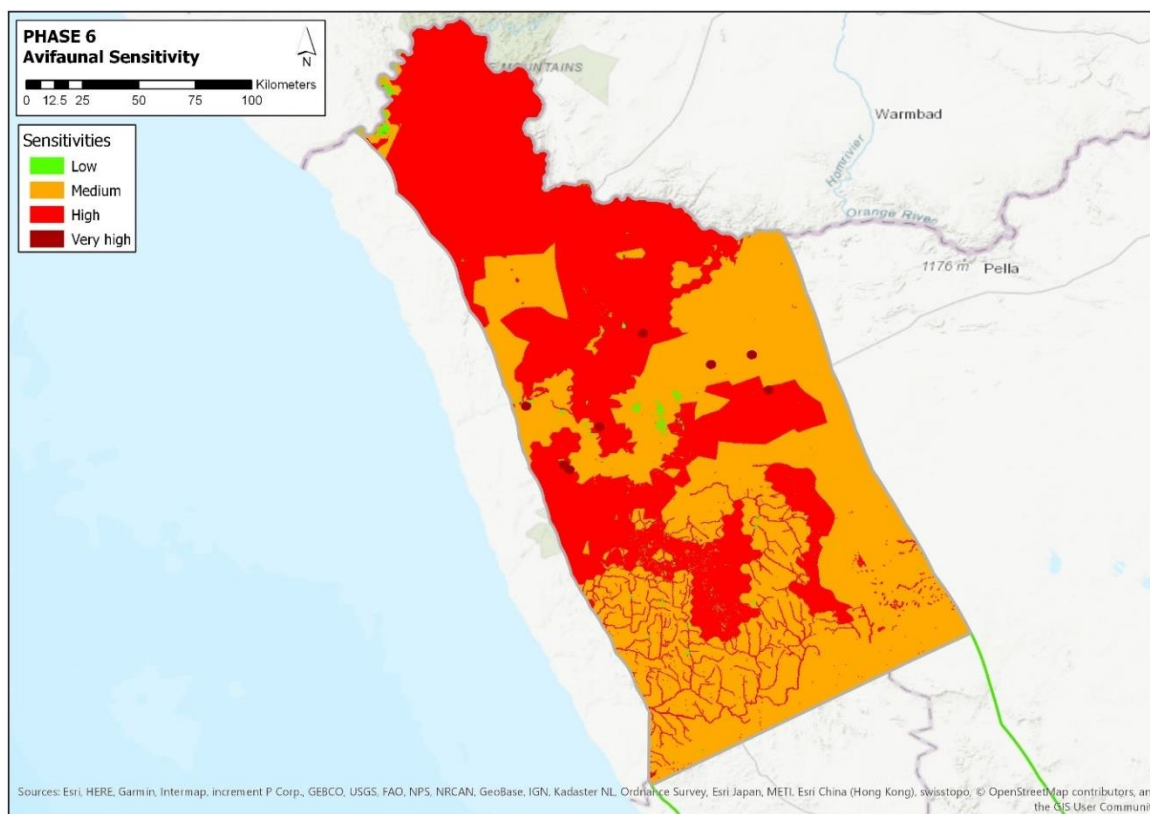


Figure 26: Avifauna sensitivity map for the Phase 6 Corridor.

4.4.8 Phase 7

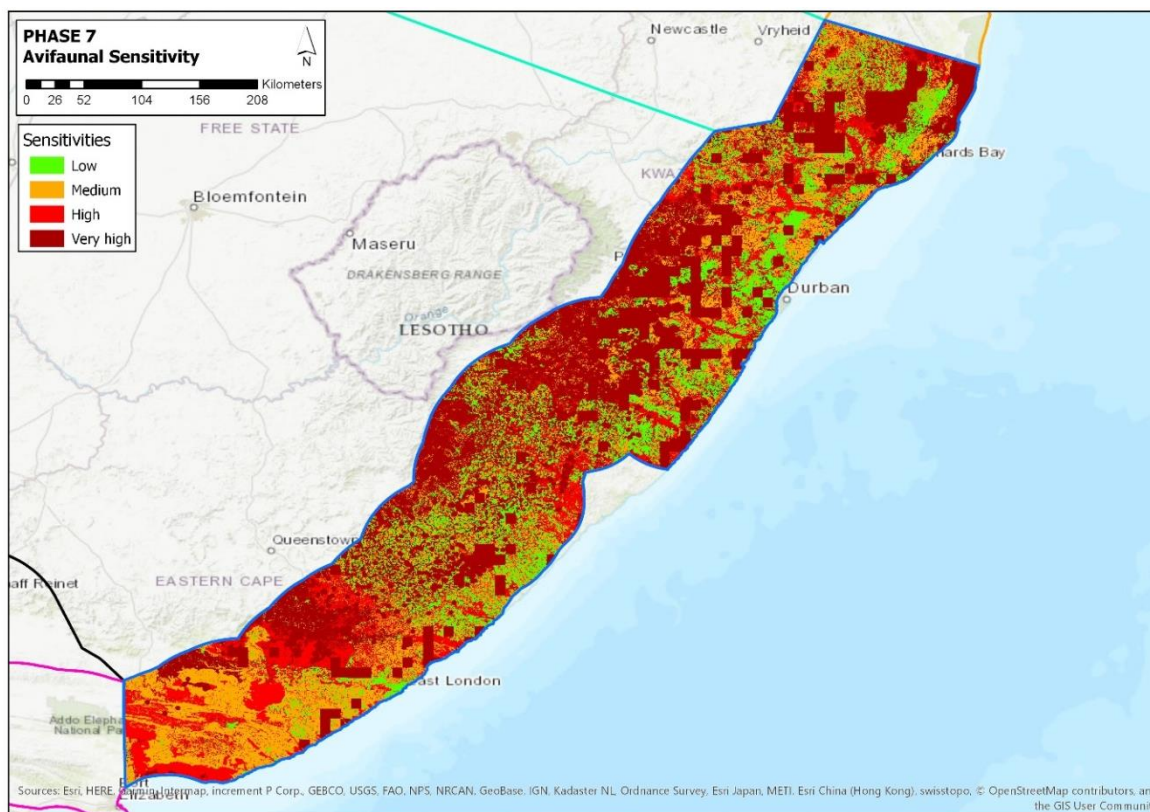


Figure 27: Avifauna sensitivity map for the Phase 7 Corridor.



5 KEY POTENTIAL IMPACTS AND THEIR MITIGATION

Table 6 list the most important potential impacts on Red Data avifauna associated with the construction of gas pipelines and associated infrastructure, with proposed generic mitigation measures (adapted from Stantec (2013)):

Table 6: Potential impacts on Red Data avifauna associated with the construction of gas pipelines and associated infrastructure and suggested mitigation measures⁵.

Planning and Construction Phase: Pipeline						
Stage	Activity Summary description	Activity	Potential impact on avifauna			Mitigation
			Direct mortality through the destruction of active nests in the construction servitude	Displacement due to sensory disturbance during construction activities	Displacement due to habitat destruction	
Planning	Identification of potential pipeline assessment corridors	<ul style="list-style-type: none"> Identify technically feasible assessment corridor alternatives for assessment. 	N/A	N/A	N/A	<ul style="list-style-type: none"> Avoidance of Very High and High sensitivity areas as much as possible. If these areas cannot be avoided, the Mitigation Hierarchy must be followed (as prescribed by IFC Performance Standards) and there is a high likelihood of a biodiversity offset being required.
Servitude Preparation	Preparation of the pipeline servitude for installation of pipe, topsoil conservation and grading.	<ul style="list-style-type: none"> Removal of vegetation Use of temporary workspace for soil and spoil salvage 	x	x	x	<ul style="list-style-type: none"> Nest surveys by a suitably qualified avifaunal specialist to identify all active nests in the servitude and immediately adjacent areas prior to the commencement of the servitude clearing. On discovery of a nest, the avifaunal specialist must be provided with a work schedule which will enable him/her to ascertain, if, when and where the breeding birds could be impacted by the clearing activities. Appropriate management measures would need to be implemented, the nature of which will depend on the

⁵ Each project should have a set of project specific recommendations emanating from the bird impact assessment study which was conducted during the Project Specific Assessment Phase of the project, the level of which should have been determined by the sensitivity rating of the area where the proposed pipeline is situated. The recommendations put forward here should be seen as generic and not replacing the project specific recommendations.

Planning and Construction Phase: Pipeline						
Stage	Activity Summary description	Activity	Potential impact on avifauna			Mitigation
			Direct mortality through the destruction of active nests in the construction servitude	Displacement due to sensory disturbance during construction activities	Displacement due to habitat destruction	
						<p>conservation status of the species and the location of the nest. Each case will have to be dealt with on an ad hoc basis but could include the following:</p> <ul style="list-style-type: none"> ○ Removal of the eggs and/or chicks to rehabilitation facility if the nest will be destroyed. ○ If the nest falls outside the actual pipeline servitude, the timing of construction activities to avoid the disturbance of the breeding birds.
						<ul style="list-style-type: none"> ● Restrict activity to the servitude width. ● Ensure that no access is allowed to property/habitat beyond the servitude. ● Make maximum use of existing access roads to prevent the unnecessary construction of new roads.
	Stringing pipe, welding, trenching, lowering-in, and backfill	<ul style="list-style-type: none"> ● Sequential staging of pipeline activities cumulating with installation of the pipe ● Involves heavy equipment such as tracked backhoes; side booms, pipe trucks, welders (mechanized and non-mechanized) ● Progresses quickly over the length of the pipeline right-of-way (on average 3-4 km/day) 		x		<ul style="list-style-type: none"> ● Restrict activity to the servitude width. ● Ensure that no access is allowed to property/habitat beyond the servitude. ● Implement noise and dust reduction measures according to industry best practices.

Planning and Construction Phase: Pipeline						
Stage	Activity Summary description	Activity	Potential impact on avifauna			Mitigation
			Direct mortality through the destruction of active nests in the construction servitude	Displacement due to sensory disturbance during construction activities	Displacement due to habitat destruction	
Pipeline Installation	Rehabilitation	<ul style="list-style-type: none"> Low vehicle and people intensity work Seeding of the pipeline right-of-way Ground application using all-terrain vehicles, agricultural equipment, seed drills etc. Aerial application using helicopter and/or fixed wing aircraft Specialized reclamation in some areas (water crossings) Minimal people and equipment on site 		x		<ul style="list-style-type: none"> Restrict activity to the servitude width Ensure that no access is allowed to property/habitat beyond the servitude Keep people and equipment to a minimum to execute the on-site work. Ensure that a rehabilitation expert is consulted to manage the process in order to recreate the natural environment as best as possible.

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2

Construction Phase: Compressor/Pump Stations, Pigging Stations and Block Valves						
Stage	Activity Summary description	Activity	Potential impact on avifauna			Mitigation
			Direct mortality through the destruction of active nests	Displacement due to sensory disturbance	Displacement due to habitat destruction	
Site Preparation	Involves removing of vegetation cover, topsoil conservation and grading	<ul style="list-style-type: none"> Clearing of vegetation, topsoil conservation and grading 	x	x	x	<ul style="list-style-type: none"> Nest surveys conducted by a suitably qualified avifaunal specialist to identify all active nests in the construction footprint and immediately adjacent areas prior to the commencement of the servitude clearing.

Construction Phase: Compressor/Pump Stations, Pigging Stations and Block Valves						
Stage	Activity Summary description	Activity	Potential impact on avifauna			Mitigation
			Direct mortality through the destruction of active nests	Displacement due to sensory disturbance	Displacement due to habitat destruction	
						<ul style="list-style-type: none"> On discovery of a nest, the avifaunal specialist should be provided with a work schedule which will enable him/her to ascertain, if, when and where the breeding birds could be impacted by the clearing activities. Appropriate management measures would need to be implemented, the nature of which will depend on the conservation status of the species and the location of the nest. Each case will have to be dealt with on an ad hoc basis but could include the following: <ul style="list-style-type: none"> Removal of the eggs and/or chicks to rehabilitation facility if the nest will be destroyed. If the nest falls outside the actual pipeline servitude, the timing of construction activities should be structured so as to avoid the disturbance of the breeding birds.
Associated Infrastructure construction	Construction of compressor station / pump station/meter stations, Pigging Stations and Block Valves	<ul style="list-style-type: none"> Involves construction of foundations and buildings, installation of pumps and or compressor units and pigging stations and block valves. Installation of yard piping. Fencing of facility. 		x		<ul style="list-style-type: none"> Restrict activity to the servitude width. Ensure that no access is allowed to property/habitat beyond the servitude. Make maximum use of existing access roads to prevent the unnecessary construction of new roads.
Construction of permanent access roads to facility sites	-	<ul style="list-style-type: none"> Vegetation removal and topsoil conservation, and grading to create road bed, and gravelling of 	x	x	x	<ul style="list-style-type: none"> Nest surveys to be conducted by a suitably qualified avifaunal specialist to identify all active nests in the servitude and immediately adjacent areas prior to the commencement of the servitude clearing.

Construction Phase: Compressor/Pump Stations, Pigging Stations and Block Valves						
Stage	Activity Summary description	Activity	Potential impact on avifauna			Mitigation
			Direct mortality through the destruction of active nests	Displacement due to sensory disturbance	Displacement due to habitat destruction	
		access road.				<ul style="list-style-type: none"> On discovery of a nest, the avifaunal specialist should be provided with a work schedule which will enable him/her to ascertain, if, when and where the breeding birds could be impacted by the clearing activities. Appropriate management measures would need to be implemented, the nature of which will depend on the conservation status of the specie and the location of the nest. Each case will have to be dealt with on an ad hoc basis but could include the following: <ul style="list-style-type: none"> Removal of the eggs and/or chicks to rehabilitation facility if the nest will be destroyed. If the nest falls outside the actual pipeline servitude, the timing of construction activities to avoid the disturbance of the breeding birds. Restrict activity to the servitude width. Ensure that no access is allowed to property beyond the servitude. Make maximum use of existing access roads to prevent the unnecessary construction of new roads.

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Operation Phase: Pipeline						
Stage	Activity Summary description	Activity	Potential impact on avifauna			Mitigation
			Direct mortality through the destruction of active nests	Displacement due to sensory disturbance	Displacement due to habitat destruction	
Aerial and Ground Surveillance - Line Patrol	<p>Aerial and ground surveillance activities to:</p> <ul style="list-style-type: none"> identify any potential 3rd party incursions onto their servitudes identify areas of servitude instability that could potentially affect the integrity of the pipeline to identify areas where there is potential surface erosion to comply the requirements of permits and approvals 	<ul style="list-style-type: none"> Aerial line patrol – varies in frequency depending on location Walking/driving the pipeline servitude. Occurs typically at least once every 3 years. 		x		<ul style="list-style-type: none"> Avoid flying below 500m above ground to limit sensory disturbance to nesting birds. Consider the use of drones for aerial inspections to limit the disturbance factor. Schedule ground-based programs to occur outside of breeding window. When conducting ground-based programs (walking or driving) stay near ditchline to limit disturbance to breeding birds Plan once-off pass through vs “in and out” to limit potential disturbance to birds.
Pipeline repairs	Similar to pipeline construction but on a very site-specific basis. Involves vegetation removal (topsoil stripping), trenching, replacing/repairing pipe, backfill, and reclamation	<ul style="list-style-type: none"> Removing vegetation through topsoil stripping Trenching Pipe removal and replacement Backfilling Reclamation 	x	x	x	<ul style="list-style-type: none"> If feasible, schedule repairs outside breeding window Restrict activity to the servitude width Ensure that no access is allowed to property/habitat outside the servitude Implement noise and dust reduction measures according to best practices If activity occurs within breeding window, conduct nesting surveys Temporary removal of a nestlings and/or eggs by a qualified avifaunal rehabilitation expert for the duration of the repair activities could be an option to explore.

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6 RISK ASSESSMENT OF EACH IMPACT WITHIN EACH PROPOSED CORRIDOR PHASE, AND DIFFERENT SENSITIVITY CLASSES IN EACH STUDY AREA

6.1 Consequence levels

The table below provides a description of the consequence levels used in the rating process.

Table 7: Consequence levels used in the risk assessment.

Consequence level					
Impact ↓	Slight	Moderate	Substantial	Severe	Extreme
Mortality of Red Data species due to destruction of nests in the 50m construction servitude, or within the compressor/pump station, block valves and pigging stations footprint, or during pipeline repairs in the operational phase.	Negligible impact on current reproductive output within Corridor Phase, i.e. it is hardly affected. Impact is temporary.	Notable impact on current reproductive output within the Corridor Phase, reproductive output is notably reduced for some species. Impact is temporary.	Substantial impact on current reproductive output within the Corridor Phase, i.e. reproductive output is significantly reduced for some species. Impact may be permanent in the case of some species.	Severe impact on current reproductive output within the Corridor Phase, i.e. reproductive output is severely reduced for some species. Impact may be permanent in the case of some species.	Extreme impact on current reproductive output within the Corridor Phase, i.e. reproductive output is almost completely terminated for some species. Impact is permanent.
Displacement of Red Data species due to sensory disturbance during the construction phase of the pipeline and the compressor/pump stations, block valves and pigging stations or during pipeline repairs in the operational phase.	Negligible impact on life cycles within Corridor Phase, i.e. they are hardly affected. Displacement is temporary. Breeding is slightly affected.	Notable impact on life cycles within the Corridor Phase. Breeding activity is notably reduced for some species. Displacement is temporary.	Substantial impact on life cycles within the Corridor Phase. Breeding activity is significantly reduced for some species. Displacement may be permanent in the case of some species.	Severe impact on life cycles within the Corridor Phase. Breeding activity is severely reduced for some species. Displacement may be permanent in the case of some species.	Extreme impact on life cycles within the Corridor Phase. Breeding activity ceases almost completely. Displacement is permanent.
Displacement of Red Data species due to habitat destruction within the 50m construction servitude, or within the compressor/pump station footprint, block valves and pigging stations or during pipeline repairs in the operational phase.	Negligible impact on abundance within Corridor Phase, i.e. populations are hardly affected. Impact is temporary.	Notable impact on abundance within the Corridor Phase. Impact is temporary.	Substantial impact on abundance within the Corridor Phase. Displacement is temporary but may be permanent for some species.	Severe impact on abundance within the Corridor Phase. Displacement is temporary but may be permanent for some species.	Extreme impact on abundance within the Corridor Phase. Displacement is permanent.

6.2 Risk assessment results

Table 8: Assessment of the risk of gas pipeline construction and operation to avifauna in the proposed gas pipeline corridors.

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
Mortality of Red Data species due to destruction of nests in the 50m construction servitude, or within the compressor/pump station, block valves and pigging stations footprint, or during pipeline repairs in the operational phase.	Phase Inland	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo, Nama Karoo. Key ground nesting species i.e. Black Harrier, Blue Crane, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, Burchell's Courser, Sclater's Lark.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 1	Very high sensitivity area	Moderate to substantial (especially in the case of Martial Eagle and Damara Tern)	Likely	Moderate negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo. Key ground nesting species i.e. Agulhas Long-billed Lark, Black Harrier, Blue Crane, Denham's Bustard, Hottentot Buttonquail, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, Burchell's Courser, Damara Tern. Key tree nesting species: Martial Eagle Depending on where the alignment is located, the impact on Martial Eagle could be moderate, and substantial in the case of Damara Terns breeding at De Mond in the De Hoop Nature Reserve.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 2	Very high sensitivity area	Moderate (especially in the case of Martial Eagle)	Likely	Low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo, Nama Karoo and Albany Thicket. Key ground nesting species i.e. African Grass-Owl, African Marsh-Harrier, Black Harrier,
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	Blue Crane, Denham's Bustard, Hottentot Buttonquail, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, White-bellied Korhaan, Agulhas Long-billed Lark, Burchell's Courser, Sclater's Lark. <ul style="list-style-type: none"> Key tree nesting species: Martial Eagle Depending on where the alignment is located, the impact on Martial Eagle could be moderate.
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 3	Very high sensitivity area	Substantial	Likely	Moderate negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Grassland, Forest and Savanna. Keys tree nesting species i.e. African Crowned Eagle, Bush Blackcap, Orange Ground-Thrush Eastern Bronze-naped Pigeon, Lappet-faced Vulture, Martial Eagle, Secretary bird, Southern Ground-Hornbill, Tawny Eagle, White-backed Vulture. Key ground nesting species i.e. African Grass-Owl, African Marsh-Harrier, Black-rumped Buttonquail, Blue Crane, Botha's Lark, Burchell's Courser, Denham's Bustard, Grey Crowned Crane, Rudd's Lark, Short-tailed Pipit, Wattled Crane (wetlands), White-bellied Korhaan, Yellow-breasted Pipit, Yellow-throated Sandgrouse. Depending on where the alignment is located, impact on forest specialists e.g.
		High sensitivity area	Moderate	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight (moderate for some species in some habitat classes e.g. Eastern Bronze-naped Pigeon)	Likely	Low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Not likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
									Eastern Bronze-naped Pigeon, and tree nesting vultures could be substantial. Rudd's Lark and Botha's Lark could also be substantially impacted in grasslands.
	Phase 4	Very high sensitivity area	Substantial (especially for nesting vultures and large raptors)	Likely	Moderate negative	Slight	Not likely	Very low	<ul style="list-style-type: none"> Primary biomes: Savanna, Forest, Indian Ocean Coastal Belt, Azonal Key tree nesting species i.e. African Broadbill, African Crowned Eagle, African Pygmy-Goose, Bateleur, Hooded Vulture, Lappet-faced Vulture, Lemon-breasted Canary, Martial Eagle, Pel's Fishing-Owl, Saddle-billed Stork, Secretary bird, Southern Ground-Hornbill, Tawny Eagle, White-backed Vulture, White-headed Vulture, African Broadbill, African Crowned Eagle, Neergaard's Sunbird, Southern Banded Snake-Eagle, Pink-backed Pelican. Key nesting ground nesting species i.e. African Marsh-Harrier, Rosy-throated Longclaw, Swamp Nightjar. Depending on where the alignment is located, the impact on large eagles and vultures could be substantial
		High sensitivity area	Moderate	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight (substantial for some species and habitat classes e.g. Southern Banded Snake – Eagle)	Not likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Not likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 5	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo. Key ground nesting species i.e. African Marsh-Harrier, Black Harrier, Blue Crane, Karoo
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium	Slight	Likely	Very low	Slight	Not likely	Very low	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
		sensitivity area			negative			negative	Korhaan, Ludwig's Bustard, Southern Black Korhaan, Red Lark, Burchell's Courser. <ul style="list-style-type: none"> Key tree nesting species i.e. Martial Eagle, Secretary bird. Slight impact on Red Data species anticipated.
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 6	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Succulent Karoo, Nama Karoo, Desert. Key ground nesting species i.e. Barlow's Lark, Black Harrier, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Red Lark, Southern Black Korhaan, Burchell's Courser, Sclater's Lark. Key tree nesting species i.e. Martial Eagle, Secretary bird. Slight impact on Red Data species anticipated.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 7	Very high sensitivity area	Substantial (especially for Damara Tern, Southern Ground Hornbill, forest species, tree nesting large eagles and vultures.	Likely	Moderate	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Savanna, Grassland, Indian Ocean Coastal Belt. Key tree nesting species i.e. African Crowned Eagle, African Finfoot, African Pygmy-Goose, Bush Blackcap, Cape Parrot, Half-collared Kingfisher, Mangrove Kingfisher, Martial Eagle, Orange Ground-Thrush, Secretary bird, Southern Ground-Hornbill, White-backed Night-Heron, Yellow-billed Stork, African Broadbill, Bat Hawk, Bateleur, Eastern Bronze-naped Pigeon, Green Barbet, Lappet-faced Vulture, Lemon-breasted Canary,
		High sensitivity area	Moderate (especially for forest species e.g. Cape Parrot)	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<p>Neergaard's Sunbird, Saddle-billed Stork, Southern Banded Snake-Eagle, Spotted Ground-Thrush, Tawny Eagle, White-backed Vulture, White-headed Vulture.</p> <ul style="list-style-type: none"> • Key ground nesting species i.e. African Marsh-Harrier, Blue Crane, Damara Tern, Denham's Bustard, Grey Crowned Crane, Kori Bustard, Striped Flufftail, White-bellied Korhaan, Yellow-breasted Pipit, African Grass-Owl, Black-rumped Buttonquail, Blue Swallow, Rosy-throated Longclaw, Short-tailed Pipit, Swamp Nightjar, Wattled Crane (wetlands). • Depending where the alignment is situated, impact could be substantial on Damara Tern, Southern Ground Hornbill, forest species, tree nesting large eagles and vultures.
	Phase 8	Very high sensitivity area	Substantial to severe (substantial for large raptors and vultures and Southern Ground Hornbill. Severe in the case of White-winged	Likely	High negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> • Primary biomes: Savanna, Forest, Grassland. • Key tree nesting species i.e. African Crowned Eagle, African Finfoot, Bush Blackcap, Half-collared Kingfisher, Secretary bird, Yellow-billed Stork, Bateleur, Hooded Vulture, Lappet-faced Vulture, Martial Eagle, Saddle-billed Stork, Southern Ground-Hornbill, Tawny Eagle, White-backed

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
			Flufftail).						Night-Heron, White-backed Vulture, White-headed Vulture, African Pygmy-Goose, Bat Hawk. <ul style="list-style-type: none"> Key ground nesting species i.e. African Grass-Owl, African Marsh-Harrier, Black-rumped Buttonquail, Blue Crane, Denham's Bustard, Grey Crowned Crane, Wattled Crane, White-bellied Korhaan, Blue Swallow, Short-tailed Pipit, Yellow-breasted Pipit, White-winged Flufftail, Kori Bustard. Depending on where the alignment is located, impacts could be substantial for large raptors and vultures and Southern Ground Hornbill. Severe in the case of White-winged Flufftail.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
Displacement of Red Data species due to sensory disturbance during the construction phase of the pipeline and the compressor/pump stations, block valves and pigging stations , or during pipeline repairs in the operational phase.	Inland Phase	Very high sensitivity area	Moderate (especially in the case of Martial Eagle)	Likely	Low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo, Nama Karoo. Key ground nesting species i.e. Black Harrier, Blue Crane, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, Burchell's Courser, Sclater's Lark. Key tree and/or powerline nesting species: Martial Eagle, Secretary bird. Depending on where the line is situated, the impact could be moderate tree and powerline nesting Martial Eagles.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 1	Very high sensitivity area	Substantial (especially for	Likely	Moderate negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo, Nama Karoo

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
			Cape Vulture and Damara Tern)						and Albany Thicket. <ul style="list-style-type: none"> Key ground nesting species i.e. African Grass-Owl, African Marsh-Harrier, Black Harrier, Blue Crane, Denham's Bustard, Hottentot Buttonquail, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, White-bellied Korhaan, Agulhas Long-billed Lark, Burchell's Courser, Sclater's Lark and Damara Tern. Key cliff-nesting species i.e. Cape Vulture Key wetland and waterbody species: Greater Flamingo, Lesser Flamingo, Great White Pelican. Depending on where the alignment is situated, impact on the Cape Vulture colony at Potberg and the Damara Terns breeding at De Mond in the De Hoop Nature Reserve could be substantial.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 2	Very high sensitivity area	Moderate (especially in the case of Martial Eagles)	Likely	Low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo, Nama Karoo and Albany Thicket. Key ground nesting species i.e. African Grass-Owl, African Marsh-Harrier, Black Harrier, Blue Crane, Denham's Bustard, Hottentot Buttonquail, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, White-bellied Korhaan, Agulhas Long-billed Lark, Burchell's Courser,
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
									Sclater's Lark. <ul style="list-style-type: none"> Key tree nesting species: Martial Eagle Key wetland and waterbody species: Greater Flamingo, Lesser Flamingo. Depending on where the alignment is situated, the impact on Martial Eagles could be moderate.
	Phase 3	Very high sensitivity area	Substantial	Likely	Moderate negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Grassland, Forest and Savanna. Key tree nesting species i.e. African Crowned Eagle, Bush Blackcap, Orange Ground-Thrush Eastern Bronze-naped Pigeon, Lappet-faced Vulture, Martial Eagle, Secretary bird, Southern Ground-Hornbill, Tawny Eagle, White-backed Vulture. Key ground nesting species i.e. African Grass-Owl, African Marsh-Harrier, Black-rumped Buttonquail, Blue Crane, Botha's Lark, Burchell's Courser, Denham's Bustard, Grey Crowned Crane, Rudd's Lark, Short-tailed Pipit, White-bellied Korhaan, Yellow-breasted Pipit, Yellow-throated Sandgrouse, Wattled Crane (wetlands). Key cliff-nesting species: Cape Vulture Key wetlands and waterbody species: Greater Flamingo, Lesser Flamingo, Wattled
		High sensitivity area	Moderate	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight (moderate for some species in some habitat classes e.g. Eastern Bronze-naped Pigeon)	Likely	Low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Not likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
									Crane. <ul style="list-style-type: none"> Depending on where the alignment is located, impact on forest specialists e.g. Eastern Bronze-naped Pigeon, and vultures, both tree nesting and cliff-nesting (Cape Vultures in the Magaliesberg) could be substantial. Disturbance of breeding Wattled Cranes in wetlands, and Rudd's Lark and Botha's Lark in grasslands could also be substantial.
	Phase 4	Very high sensitivity area	Substantial (especially for nesting vultures and large raptors, and Pink-backed Pelicans)	Likely	Moderate negative	Slight	Not likely	Very low	<ul style="list-style-type: none"> Primary biomes: Savanna, Forest, Indian Ocean Coastal Belt, Azonal Key tree nesting species i.e. African Broadbill, African Crowned Eagle, African Pygmy-Goose, Bateleur, Hooded Vulture, Lappet-faced Vulture, Lemon-breasted Canary, Martial Eagle, Pel's Fishing-Owl, Saddle-billed Stork, Secretary bird, Southern Ground-Hornbill, Tawny Eagle, White-backed Vulture, White-headed Vulture, African Broadbill, African Crowned Eagle, Neergaard's Sunbird, Southern Banded Snake-Eagle, Pink-backed Pelican. Key ground nesting species i.e. African Marsh-Harrier, Rosy-throated Longclaw, Swamp Nightjar. Key wetland species: Great White Pelican, Greater Flamingo, Lesser Flamingo,
		High sensitivity area	Moderate	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight (substantial for some species and habitat classes e.g. Southern Banded Snake – Eagle)	Not likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Not likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
									Pink-backed Pelican. <ul style="list-style-type: none"> Depending on where the alignment is located, the impact on large eagles, vultures and Pink-backed Pelicans could be substantial.
	Phase 5	Very high sensitivity area	Moderate	Likely	Low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo. Key ground nesting species i.e. African Marsh-Harrier, Black Harrier, Blue Crane, Karoo Korhaan, Ludwig's Bustard, Southern Black Korhaan, Red Lark, Burchell's Courser. Key tree and/or powerline nesting species i.e. Martial Eagle, Secretary bird, Lanner Falcon, Verreaux's Eagle. Key wetland species: Lesser Flamingo, Greater Flamingo. Depending on where the alignment is located, the impact on powerline nesting raptors, especially Martial Eagle could be moderate.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 6	Very high sensitivity area	Moderate	Likely	Low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Succulent Karoo, Nama Karoo, Desert. Key ground nesting species i.e. Barlow's Lark, Black Harrier, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Red Lark, Southern Black Korhaan, Burchell's Courser, Sclater's Lark. Key tree and/or powerline nesting species i.e. Martial Eagle, Verreaux's Eagle, Secretary bird.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
									<ul style="list-style-type: none"> Key wetland species: Lesser Flamingo, Greater Flamingo. Depending on where the alignment is located, the impact on powerline nesting raptors, especially Martial Eagle, could be moderate
	Phase 7	Very high sensitivity area	Substantial (especially for Damara Tern, Southern Ground Hornbill, forest species, tree nesting large eagles and vultures, and Wattled Crane.	Likely	Moderate	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Savanna, Grassland, Indian Ocean Coastal Belt. Key tree nesting species i.e. African Crowned Eagle, African Finfoot, African Pygmy-Goose, Bush Blackcap, Cape Parrot, Half-collared Kingfisher, Mangrove Kingfisher, Martial Eagle, Orange Ground-Thrush, Secretary bird, Southern Ground-Hornbill, White-backed Night-Heron, Yellow-billed Stork, African Broadbill, Bat Hawk, Bateleur, Eastern Bronze-naped Pigeon, Green Barbet, Lappet-faced Vulture, Lemon-breasted Canary, Neergaard's Sunbird, Saddle-billed Stork, Southern Banded Snake-Eagle, Spotted Ground-Thrush, Tawny Eagle, White-backed Vulture, White-headed Vulture. Key ground nesting species i.e. African Marsh-Harrier, Blue Crane, Damara Tern, Denham's Bustard, Grey Crowned Crane, Kori Bustard, Striped Flufftail, White-bellied Korhaan, Yellow-breasted Pipit, African Grass-Owl, Black-
		High sensitivity area	Moderate (especially for forest species e.g. Cape Parrot)	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
									<p>rumped Buttonquail, Blue Swallow, Rosy-throated Longclaw, Short-tailed Pipit, Swamp Nightjar, Wattled Crane.</p> <ul style="list-style-type: none"> • Key wetland and waterbody species: Greater Flamingo, Lesser Flamingo, Pink-backed Pelican, Wattled Crane. • Depending where the alignment is situated, impact could be substantial on Damara Tern, Southern Ground Hornbill, forest species, tree nesting large eagles and vultures, Blue Swallows and Wattled Crane.
	Phase 8	Very high sensitivity area	Substantial to severe (substantial for large raptors and vultures and Southern Ground Hornbill. Severe in the case of White-winged Flufftail and Wattled Crane).	Likely	High negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> • Primary biomes: Savanna, Forest, Grassland. • Key tree nesting species i.e. African Crowned Eagle, African Finfoot, Bush Blackcap, Half-collared Kingfisher, Secretary bird, Yellow-billed Stork, Bateleur, Hooded Vulture, Lappet-faced Vulture, Martial Eagle, Saddle-billed Stork, Southern Ground-Hornbill, Tawny Eagle, White-backed Night-Heron, White-backed Vulture, White-headed Vulture, African Pygmy-Goose, Bat Hawk.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> • Key ground nesting species i.e. African Grass-Owl, African Marsh-Harrier, Black-rumped Buttonquail, Blue Crane, Denham's Bustard, Grey Crowned Craned, Wattled
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity	Slight	Likely	Very low	Slight	Not likely	Very low	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
		area			negative			negative	Crane, White-bellied Korhaan, Blue Swallow, Short-tailed Pipit, Yellow-breasted Pipit, White-winged Flufftail, Kori Bustard. <ul style="list-style-type: none"> Depending on where the alignment is located, impacts could be substantial for large raptors and vultures and Southern Ground Hornbill. Severe in the case of White-winged Flufftail and Wattled Crane.
Displacement of Red Data species due to habitat destruction within the 50m construction servitude, or within the compressor/pump station, block valves and pigging stations footprint, or during pipeline repairs in the operational phase.	Phase Inland	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo, Nama Karoo. Key ground nesting species i.e. Black Harrier, Blue Crane, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, Burchell's Courser, Sclater's Lark.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 1	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo. Key ground nesting species i.e. Agulhas Long-billed Lark, Black Harrier, Blue Crane, Denham's Bustard, Hottentot Buttonquail, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, Burchell's Courser, Damara Tern. Key tree nesting species: Martial Eagle
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 2	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo, Nama Karoo and Albany Thicket. Key ground nesting species i.e.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	African Grass-Owl, African Marsh-Harrier, Black Harrier, Blue Crane, Denham's Bustard, Hottentot Buttonquail, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Southern Black Korhaan, White-bellied Korhaan, Agulhas Long-billed Lark, Burchell's Courser, Sclater's Lark. • Key tree nesting species: Martial Eagle
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 3	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	• Primary biomes: Grassland, Forest and Savanna. • Keys tree nesting species i.e. African Crowned Eagle, Bush Blackcap, Orange Ground-Thrush Eastern Bronze-naped Pigeon, Lappet-faced Vulture, Martial Eagle, Secretary bird, Southern Ground-Hornbill, Tawny Eagle, White-backed Vulture. • Key ground nesting species i.e. African Grass-Owl, African Marsh-Harrier, Black-rumped Buttonquail, Blue Crane, Botha's Lark, Burchell's Courser, Denham's Bustard, Grey Crowned Crane, Rudd's Lark, Short-tailed Pipit, Wattled Crane (wetlands), White-bellied Korhaan, Yellow-breasted Pipit, Yellow-throated Sandgrouse. • Depending on where the alignment is located, impact on forest specialists e.g. Eastern Bronze-naped Pigeon, and tree nesting vultures could
		High sensitivity area	Moderate for tree nesting vultures and raptors	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Moderate for some species in forest habitat classes e.g. Eastern Bronze-naped Pigeon	Likely	Low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Not likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
									be moderate. Rudd's Lark and Botha's Lark could also be moderately impacted in grasslands.
	Phase 4	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Savanna, Forest, Indian Ocean Coastal Belt, Azonal Key tree nesting species i.e. African Broadbill, African Crowned Eagle, African Pygmy-Goose, Bateleur, Hooded Vulture, Lappet-faced Vulture, Lemon-breasted Canary, Martial Eagle, Pel's Fishing-Owl, Saddle-billed Stork, Secretary bird, Southern Ground-Hornbill, Tawny Eagle, White-backed Vulture, White-headed Vulture, African Broadbill, African Crowned Eagle, Neergaard's Sunbird, Southern Banded Snake-Eagle, Pink-backed Pelican. Key nesting ground nesting species i.e. African Marsh-Harrier, Rosy-throated Longclaw, Swamp Nightjar. Depending on where the alignment is located, the impact on large eagles and vultures could be moderate.
		High sensitivity area	Moderate for tree nesting vultures and raptors	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Moderate for some species in forest habitat classes e.g. Eastern Bronze-naped Pigeon	Likely	Low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Not likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 5	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Fynbos, Succulent Karoo. Key ground nesting species i.e. African Marsh-Harrier, Black Harrier, Blue Crane, Karoo Korhaan, Ludwig's Bustard, Southern Black Korhaan, Red Lark, Burchell's Courser.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity	Slight	Likely	Very low	Slight	Not likely	Very low	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
		area			negative			negative	<ul style="list-style-type: none"> Key tree nesting species i.e. Martial Eagle, Secretary bird.
	Phase 6	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Succulent Karoo, Nama Karoo, Desert. Key ground nesting species i.e. Barlow's Lark, Black Harrier, Karoo Korhaan, Kori Bustard, Ludwig's Bustard, Red Lark, Southern Black Korhaan, Burchell's Courser, Sclater's Lark. Key tree nesting species i.e. Martial Eagle, Secretary bird.
		High sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
	Phase 7	Very high sensitivity area	Substantial for Blue Swallow.	Likely	Moderate negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Primary biomes: Savanna, Grassland, Indian Ocean Coastal Belt. Key tree nesting species i.e. African Crowned Eagle, African Finfoot, African Pygmy-Goose, Bush Blackcap, Cape Parrot, Half-collared Kingfisher, Mangrove Kingfisher, Martial Eagle, Orange Ground-Thrush, Secretary bird, Southern Ground-Hornbill, White-backed Night-Heron, Yellow-billed Stork, African Broadbill, Bat Hawk, Bateleur, Eastern Bronze-naped Pigeon, Green Barbet, Lappet-faced Vulture, Lemon-breasted Canary, Neergaard's Sunbird, Saddle-billed Stork, Southern Banded Snake-Eagle, Spotted Ground-Thrush, Tawny Eagle, White-backed Vulture, White-headed Vulture. Key ground nesting species i.e. African Marsh-Harrier, Blue
		High sensitivity area	Moderate for tree nesting vultures and raptors	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Substantial for Blue Swallow. Moderate for some species in forest habitat classes e.g. Eastern Bronze-naped Pigeon	Likely	Moderate negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Not likely	Very low negative	Slight	Not likely	Very low negative	

Impact	Study area	Sensitivity	Without mitigation			With mitigation			Comments
			Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
									Crane, Damara Tern, Denham's Bustard, Grey Crowned Crane, Kori Bustard, Striped Flufftail, White-bellied Korhaan, Yellow-breasted Pipit, African Grass-Owl, Black-rumped Buttonquail, Blue Swallow, Rosy-throated Longclaw, Short-tailed Pipit, Swamp Nightjar, Wattled Crane (wetlands). <ul style="list-style-type: none"> Depending where the alignment is situated, impact could be moderate on forest species and tree nesting large eagles and vultures, but substantial for Blue Swallow.
	Phase 8	Very high sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	<ul style="list-style-type: none"> Depending where the alignment is situated, impact could be moderate on tree nesting large eagles and vultures.
		High sensitivity area	Moderate on tree nesting vultures and eagles	Likely	Low negative	Slight	Not likely	Very low negative	
		Medium sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	
		Low sensitivity area	Slight	Likely	Very low negative	Slight	Not likely	Very low negative	

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2 6.3 Limits of Acceptable Change: Avifauna

3 Due to the wide scope of the assessment, it is not possible to determine limits of acceptable change with a great deal of accuracy for each species in each corridor
4 phase. For that, accurate data on population figures is required, as well as comprehensive data on the biology of each species, in order to model the effect of the
5 envisaged impacts on the population. Information on that level is lacking for the majority of the species. Modelling impact at population level is a complicated process
6 which falls outside the scope of this project. However, the impact of pipeline developments on avifauna is likely to be less severe than for example renewable energy,
7 powerline developments or urban developments, due to its limited footprint, compared to other types of developments.

8

7 BEST PRACTICE GUIDELINES AND MONITORING REQUIREMENTS: AVIFAUNA

Table 9 provides a framework for the investigation, assessment and mitigation of pipeline developments on avifauna.

7.1 Planning phase

Table 9: Planning phase framework for the investigation, assessment and mitigation of pipeline developments on avifauna.

Stage	Activity Summary description	Activity	Suggested best practices for the assessment and mitigation of impacts on avifauna
Planning	The identification of potential pipeline assessment corridors as part of the Project Specific Assessment.	<ul style="list-style-type: none"> Identify technically feasible assessment corridor alternatives for assessment. 	<ul style="list-style-type: none"> A suitably qualified avifaunal specialist should be appointed to conduct an avifaunal impact assessment study. The specialist should proceed as follows: <ul style="list-style-type: none"> The centre line of each assessment corridor must be determined. A 2km buffer zone must be drawn around the centre line of each assessment corridor. The sum total area of each habitat sensitivity class in the assessment corridor must be calculated, based on the four-tier avifaunal sensitivity map. The procedure to follow for the avifaunal assessment of each assessment corridor alternative must be determined, based on the majority sensitivity class in the corridor. Depending on the representation of sensitivity classes in the corridor, this may be a combination of procedures. Nest surveys to be conducted in Very High sensitivity and High sensitivity areas. The specialist must make a recommendation on whether the project/gas pipeline section may proceed or not, based on the anticipated impacts on Red Data avifauna, and must identify a preferred corridor which will have the least impact on Red Data avifauna, i.e. one which avoids Very High and High sensitive areas as much as possible.

7.2 Construction phase

Table 10: Construction phase framework for the investigation, assessment and mitigation of pipeline developments on avifauna.

Stage	Activity Summary description	Activity	Suggested best practices for the assessment and mitigation of impacts on avifauna
Pipeline Servitude Preparation	Preparation of the pipeline servitude for installation of pipe, topsoil conservation and grading.	<ul style="list-style-type: none"> Removal of vegetation Use of temporary workspace for soil and spoil salvage 	<p>If a feasible corridor alternative is identified and authorisation or similar is obtained to proceed with the project, the procedure is as follows:</p> <ul style="list-style-type: none"> If need be, nest surveys should be conducted by a suitably qualified avifaunal specialist to identify all active Red Data nests in the servitude and immediately adjacent areas prior to the commencement of the servitude clearing. Due to the length of time between the authorisation (or similar) of the project and the commencement of construction activities, the nest surveys (if any) conducted during the planning phase will have to be repeated. This is usually only applicable in Very High and High sensitivity areas but depending on the circumstances of each project and the professional opinion of the specialist, this may have to be extended to Medium and Low sensitivity areas as well. The width of the corridor to be surveyed will be determined by the species which are likely to breed there. Should a nest be discovered, the avifaunal specialist should be provided with a work schedule which will enable him/her to ascertain, if, when and where the breeding birds could be impacted by the clearing activities. Appropriate management measures would need to be implemented, the nature of which will depend on the Red Data conservation status of the species and the location of the nest. Each case will have to be dealt with on an ad hoc basis but could include the following: <ul style="list-style-type: none"> The eggs and/or chicks must be removed to a rehabilitation facility if the nest will be destroyed. If the nest falls outside the actual pipeline servitude, the construction activities must be timed to avoid the disturbance of the breeding birds. Activities must be restricted to the servitude width. No access must be allowed to property/habitat beyond the servitude. Maximum use must be made of existing access roads to prevent the unnecessary construction of new roads.
Pipeline Installation	Stringing pipe, welding, trenching, lowering-in, and backfill	<ul style="list-style-type: none"> Sequential staging of pipeline activities cumulating with installation of the pipe Involves heavy equipment such as tracked backhoes; side booms, pipe trucks, welders (mechanized and non-mechanized) Progresses quickly over the length of the pipeline right-of-way (on average 3- 	<ul style="list-style-type: none"> Activities must be restricted to the servitude width. No access must be allowed to property/habitat beyond the servitude. Maximum use must be made of existing access roads to prevent the unnecessary construction of new roads.

Stage	Activity Summary description	Activity	Suggested best practices for the assessment and mitigation of impacts on avifauna
		4 km/day)	
	Rehabilitation	<ul style="list-style-type: none"> • Low vehicle and people intensity work • Seeding of the pipeline right-of-way • Ground application using all-terrain vehicles, agricultural equipment, seed drills etc. • Aerial application using helicopter and/or fixed wing aircraft • Specialized reclamation in some areas (water crossings) • Minimal people and equipment on site 	<ul style="list-style-type: none"> • Activities must be restricted to the servitude width as far as is practical possible. • No access must be allowed to property/habitat beyond the servitude. • Maximum use must be made of existing access roads to prevent the unnecessary construction of new roads. • People and equipment must be restricted to a minimum to execute the on-site work. • A suitably qualified rehabilitation expert must be appointed to manage the process in order to recreate the natural environment as best as possible.
Pump/compressor station, block valves and pigging stations site Preparation	Involves removing of vegetation cover, topsoil conservation and grading	<ul style="list-style-type: none"> • Clearing of vegetation, topsoil conservation and grading 	<ul style="list-style-type: none"> • Nest surveys should be conducted by a suitably qualified avifaunal specialist to identify all active nests in the construction footprint and immediately adjacent areas prior to the commencement of the site clearing. • Should a nest be discovered, the avifaunal specialist should be provided with a work schedule which will enable him/her to ascertain, if, when and where the breeding birds could be impacted by the clearing activities. Appropriate management measures would need to be implemented, the nature of which will depend on the conservation status of the species and the location of the nest. Each case will have to be dealt with on an ad hoc basis but could include the following: <ul style="list-style-type: none"> ○ Removal of the eggs and/or chicks to rehabilitation facility if the nest will be destroyed. • If the nest falls outside the actual site footprint, the timing of construction activities should be scheduled in order to avoid the disturbance of the breeding birds.
Facility construction	Construction of compressor station / pump station/meter stations, Pigging Stations and Block Valves	<ul style="list-style-type: none"> • Involves construction of foundations and buildings, installation of pumps and/or compressor units, and block valves and pigging stations. Installation of yard piping. Fencing of facility 	<ul style="list-style-type: none"> • Activities must be restricted to the footprint. • No access must be allowed to property beyond the footprint. • Maximum use must be made of existing access roads to prevent the unnecessary construction of new roads.
Construction of permanent access roads to facility sites	-	<ul style="list-style-type: none"> • Vegetation removal and topsoil conservation, and grading to create road bed, and gravelling of access road 	<ul style="list-style-type: none"> • Nest surveys should be conducted by a suitably qualified avifaunal specialist to identify all active nests in the servitude and immediately adjacent areas prior to the commencement of the servitude clearing. • Should a nest be discovered, the avifaunal specialist should be provided with a work schedule which will enable him/her to ascertain, if, when and where the breeding birds could be impacted by the clearing activities. Appropriate management measures would need to be implemented, the nature of which will depend on the conservation status of the species and the location of the nest. Each case will have to be dealt with

Stage	Activity Summary description	Activity	Suggested best practices for the assessment and mitigation of impacts on avifauna
			<p>on an ad hoc basis but could include the following:</p> <ul style="list-style-type: none"> ○ Removal of the eggs and/or chicks to rehabilitation facility if the nest will be destroyed. ○ If the nest falls outside the actual pipeline servitude, the timing of construction activities must be scheduled in order to avoid the disturbance of the breeding birds. ● Activities must be restricted to the servitude width. ● No access must be allowed to property beyond the servitude. ● Maximum use must be made of existing access roads to prevent the unnecessary construction of new roads.

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7.3 Operations phase

Table 11: Operations phase framework for the investigation, assessment and mitigation of pipeline developments on avifauna.

Stage	Activity Summary description	Activity	Suggested best practices for the assessment and mitigation of impacts on avifauna
Aerial and Ground Surveillance - Line Patrol	<p>Aerial and ground surveillance activities to:</p> <ul style="list-style-type: none"> identify any potential 3rd party incursions onto their servitudes identify areas of servitude instability that could potential affect the integrity of the pipeline to identify areas where there is potential surface erosion to comply the requirements of permits and approvals 	<ul style="list-style-type: none"> Aerial line patrol – varies in frequency depending on location Walking/driving the pipeline servitude. Occurs typically at least once every 3 years. 	<ul style="list-style-type: none"> Flying below 500m above ground should be avoided to limit sensory disturbance to nesting birds Consider the use of drones for aerial inspections to limit the disturbance factor. Ground-based programs should be scheduled to occur outside of breeding window. When conducting ground-based programs (walking or driving) stay near ditchline to limit disturbance to breeding birds Once-off pass through should be planned vs “in and out” to limit potential disturbance to birds.
Pipeline repairs	<p>Similar to pipeline construction but on a very site-specific basis. Involves vegetation removal (topsoil stripping), trenching, replacing/repairing pipe, backfill, and reclamation</p>	<ul style="list-style-type: none"> Removing vegetation through topsoil stripping Trenching Pipe removal and replacement Backfilling Reclamation 	<ul style="list-style-type: none"> If feasible, repairs should be scheduled outside the breeding window Activity should be restricted to the servitude width No access should be allowed to property/habitat outside the servitude Noise and dust reduction measures must be implemented according to best practices If activity occurs within breeding window, nesting surveys should be conducted. Temporary removal of a nestlings and/or eggs for the duration of the repair activities could be an option to explore.

7.4 Rehabilitation and post closure

Table 12: Rehabilitation and post closure framework for the investigation, assessment and mitigation of pipeline developments on avifauna.

Stage	Activity Summary description	Activity	Suggested best practices for the assessment and mitigation of impacts on avifauna
Rehabilitation and post closure	Rehabilitation	<ul style="list-style-type: none"> • Low vehicle and people intensity work • Appropriate seeding of the pipeline right-of-way • Ground application using all-terrain vehicles, agricultural equipment, seed drills etc. • Aerial application using helicopter and/or fixed wing aircraft • Specialized reclamation in some areas (water crossings) • Minimal people and equipment on site 	<ul style="list-style-type: none"> • A suitably qualified rehabilitation expert must be appointed to manage the process in order to recreate the natural environment as best as possible.

7.5 Monitoring requirements

Table 13: Avifauna monitoring requirements for pipeline developments.

Stage	Activity Summary description	Activity	Suggested best practices for the assessment and mitigation of impacts on avifauna
Post closure	Monitoring	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Depending on the sensitivity of the site, post-construction monitoring may be required for a specific period to compare pre- and post-construction populations of avifauna, to assess the longer-term impact of the pipeline.

8 GAPS IN KNOWLEDGE

The potential impact of pipeline developments on avifauna in South Africa is not as well studied as for example the impacts of powerline networks or wind energy. The reasons for that could be that the impacts on avifauna may on average not be as significant as those associated with powerlines and wind energy.

Areas where the lack of knowledge is a constraint are the following:

- It is unclear how some Red Data species will react to the disturbance associated with the construction of pipelines and associated infrastructure - more scientifically verifiable knowledge of the disturbance thresholds of these species would improve predictive capabilities.
- The population sizes of many Red Data species are not well known. The impact of nestling mortality on the population is therefore difficult to assess.

9 REFERENCES

- BirdLife South Africa. 2015. Nest localities of Southern Bald Ibis. <https://www.birdlife.org.za/>
- BirdLife South Africa. 2015. Important Bird and Biodiversity Areas of South Africa. <https://www.birdlife.org.za/>.
- BirdLife South Africa, 2018. A list of potential Bush Blackcap, Spotted Ground-Thrush and Orange Ground-Thrush breeding habitat.
- BirdLife South Africa, 2018. Botha's Lark core distribution mapping.
- BirdLife South Africa, 2018. Rudd's Lark core distribution mapping.
- BirdLife South Africa, 2018. White-winged Flufftail confirmed sightings 2000 – 2014
- BirdLife South Africa, 2018. Yellow-breasted Pipit core distribution mapping.
- CapeNature. 2018. Red Data nest localities in the Western Cape.
- CSIR, 2015. Information on various Red Data species nests obtained from the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa.
- Department of Environmental Affairs (DEA). National Protected Areas Expansion Strategy (NPAES). Priority areas for protected area expansion, 2017 (including updated Northern Cape priorities)
- Department of Environmental Affairs. 2017. SA conservation area database - Q2 2017.
- Department of Environmental Affairs. 2017. South African Protected Areas Database (SAPAD) - Q3, 2017.
- Endangered Wildlife Trust. 2006. List of eagle nests on Eskom transmission lines in the Karoo.
- Endangered Wildlife Trust. 2018. The crane, raptor and vulture nest databases, accessed February 2018.
- Ezemvelo KZN Wildlife, 2013. Bearded Vulture nest sites in KwaZulu – Natal Maloti-Drakensberg Vulture Project, Dr Sonja Krüger.
- Ezemvelo KZN Wildlife, March 2018. A map of Blue Swallow breeding areas.
- Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V & Brown, C.J. (eds). 1997. The atlas of southern African birds. Vol 1 & 2. BirdLife South Africa, Johannesburg.
- KNP Buffer Aug2017v2. Kruger National Park Management Plan 2018 – 2028.
- Mabula Ground Hornbill Project, March 2018. Information on potential nesting areas of Southern Ground Hornbills.
- Marnewick, M.D., Retief E.F., Theron N.T., Wright D.R., Anderson T.A. 2015. Important Bird and Biodiversity Areas of South Africa. Johannesburg: Birdlife South Africa.
- Mucina, L. & Rutherford, M.C. (Eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- SANBI. 2015. 2013 - 2014 South African National Land-Cover Dataset. SANBI February 2015
- SANBI. 2012. Database of national estuaries SANBI, Biodiversity GIS.

- 1 Stantec Consulting. 2013. Migratory Birds Convention Act: A Best Management Practice for Pipelines. Stantec
- 2 Consulting Ltd. Project Number 123510637.
- 3 The Southern African Bird Atlas 1 (SABAP1). 1997. Animal Demography Unit, University of Cape Town.
- 4 The Southern African Bird Atlas 2 (SABAP2) Animal Demography Unit, University of Cape Town, 1 July 2007 to present,
- 5 ongoing. Accessed in March 2018.
- 6 VulPro 2017. National vulture restaurant database.
- 7 VulPro and Endangered Wildlife Trust. 2018. The national register of Cape Vulture colonies.
- 8