JUNE 2017

EXPANSION OF THABAZIMBI, FERROGATE & NORTHAM RAILWAY LOOPS

SPECIALIST AVIFAUNAL IMPACT ASSESSMENT

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PROFESSIONAL EXPERIENCE

Megan completed a Bachelor of Science degree in Environmental Management from the University of South Africa and has been involved in conservation for 18 years. She has ten years' experience in the field of bird interactions with electrical infrastructure (both linear and footprint) and during this time has completed specialist avifaunal impact assessments for over 80 projects. In various roles (including Programme Manager) with the Endangered Wildlife Trust's Wildlife & Energy Programme and the Programme's primary project (Eskom-EWT Partnership) from 2006 to 2013, Megan was responsible for assisting the energy industry and the national utility in minimising the negative impacts (associated with electrical infrastructure) on wildlife through the provision of strategic guidance, risk and impact assessments, training and research. Megan currently owns and manages *Feathers Environmental Services* and is tasked with providing strategic guidance to industry through the development of best practice procedures and guidelines, reviewing and commenting on methodologies, specialist studies and EIA reports for Renewable Energy projects as well as providing specialist avifaunal input into various developments including renewable energy facilities, power line, power station and substation infrastructure in addition to railway infrastructure and residential properties within South Africa and elsewhere within Africa. In addition, Megan has attended and presented at several conferences and facilitated workshops, as a subject expert, since 2007. Megan is a co-author of the *BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa* and the *Avian Wind Farm Sensitivity Map for South Africa* (2015) and played an instrumental role in facilitating the endorsement of these two products by the South African Wind Energy Association (SAWEA), IAIAsa (International Association for Impact Assessment South Africa) and Eskom. In 2011/2012, she chaired the Birds and Wind Energy Specialist Group in South Africa. From 2013 to 2015, Megan chaired the IUCN/SSC Crane Specialist Group's Crane and Powerline Network, a working group comprised of subject matter experts from across the world, working in partnership to share lessons, develop capacity, pool resources, and accelerate collective learning towards finding innovative solutions to mitigate this impact on threatened crane populations.

DECLARATION OF INDEPENDENCE

I, **Megan Diamond**, in my capacity as a specialist consultant, hereby declare that I:

- Act as an independent specialist to Nsovo Environmental Consulting for this project.
- Do not have any personal or financial interest in the project except for financial compensation for specialist investigations completed in a professional capacity as specified by the Amendment to Environmental Impact Assessment Regulations of 2017.
- Will not be affected by the outcome of the environmental process, of which this report forms part of.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed developments, but aim to present facts and our best scientific and professional opinion with regard to the impacts of the development.

- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Amendment to Environmental Impact Assessment Regulations of 2017.

INDEMNITY

- This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- This report is based on a desktop investigation using the available information and data related to the site to be affected; and a one day site visit to the study area on 18 May 2017. No long-term investigation or monitoring has been conducted.
- The Precautionary Principle has been applied throughout this investigation.
- The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of study.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist investigator reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist investigator as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgment of these terms and liabilities.

27 June 2017

EXECUTIVE SUMMARY

Expansion of the country's rail capacity has received much attention from Government and has been identified as a strategic initiative and a key driver for the South African economy. In line with these priorities, Transnet SOC Ltd has developed a programme for the expansion of railway infrastructure between Lephalale in the Limpopo province and Pyramid South in Gauteng. The proposed construction activity associated with this project focusses on the extensions of the existing crossing loops at Thabazimbi, Ferrogate and Northam located in the Limpopo province.

A fairly wide diversity of species (240 species) could be found in the broader area within which the proposed study areas are located based on existing data sources. Although seven Red List species have been recorded in the broader area, these species have not been recorded in significant numbers with between one and six individuals recorded in the area during the ten-year survey period to date. The low report rates of these species could possibly be attributed to the fact that the four pentad grid cells have not been surveyed extensively or perhaps more likely a result of the fairly high levels of disturbance caused by the surrounding land use practices. The significant disturbance and habitat loss experienced in the study area is undoubtedly displacing various birds that would, under optimum conditions, inhabit these areas. The likelihood of Red List avifaunal species frequenting the three study areas is considered to be low. As a result, the impacts of the proposed project could be more important for the more common bird species, which are generally more tolerant of human disturbance and hence more likely to regularly make use of this site.

The study areas are located within the Savanna Biome and any remaining natural woodland occurring within these areas, is likely to be comprised of the either Dwaalboom Thornveld or Waterberg Mountain Bushveld. Although natural woodland prevails within the three study areas (particularly the area earmarked for the Thabazimbi railway loop), there is evidence of bush clearing and the removal of trees along the proposed Ferrogate and Northam railway loops, where both past and present agricultural and pastoral practices, road infrastructure, as well as low to medium urbanisation dominate the landscape. This has resulted in very little undisturbed woodland remaining in these two areas. Investigation of the study areas revealed the presence of woodland, rivers, dams, wetlands, rocky outcrops and urban areas. The most sensitive of the micro habitats within the study areas are the waterbodies and woodland vegetation which may provide foraging, roosting and breeding habitat for the waterbird, raptors and passerine species recorded in the area. However sufficient similar habitat is available within the broader study area, so it is highly unlikely that the impacts will be of regional or national significance.

The construction and operation of the proposed Thabazimbi, Ferrogate and Northam railway loops may result in various threats, particularly displacement, to the birds occurring in the vicinity of the new infrastructure. These impacts range from low to medium significance.

Taking the above information into account, it is anticipated that the proposed Thabazimbi, Ferrogate and Northam railway loops can be constructed within the study area with acceptable levels of impact on the resident avifauna subject to the following recommendations:

- Construction activity should be restricted to the immediate footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.
- In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

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1. INTRODUCTION

Expansion of the country's rail capacity has received much attention from Government and has been identified as a strategic initiative and a key driver for the South African economy. In addition, with the expansion of coal mine projects and new mine developments within the Waterberg region, unlocking this area and ensuring the delivery of the coal resources it contains is fast-becoming a priority. In line with these priorities, Transnet SOC Ltd has developed a programme for the expansion of railway infrastructure between Lephalale in the Limpopo province and Pyramid South in Gauteng. The expansions will ultimately feed the heavy haul Coal Line for increased coal exports through the Port of Richards Bay and also deliver coal to several power stations along the existing railway network.

The proposed construction activity associated with this project focusses on the extensions of the existing crossing loops (i.e. a section of rail where another railway line is constructed for the purposes of the train to enter and allow another train to travel in the opposite direction) at Thabazimbi, Ferrogate and Northam located in the Limpopo province. Each railway loop will be between 3km and 4km in length (FIGURE 1).

The National Environmental Management Act (NEMA) (Act 107 of 1998) requires that an impact assessment be conducted for any development which could have a significant effect on the environment, with the objective to identify, predict and evaluate the actual and potential impacts of these activities on ecological systems; identify alternatives; and provide recommendations for mitigation to minimize the negative impacts. In order to meet the Basic Assessment requirements as outlined in Regulations 19 – 20 of the Amendment to Environmental Impact Assessment Regulations of 2017, Transnet SOC Ltd require detailed specialist studies that will document any potential fatal flaws and the impacts of the project and recommend measures to manage (maximise positive and minimise negative) and monitor those impacts. Transnet SOC Ltd has appointed Nsovo Environmental Consulting as independent environmental assessment practitioners to manage the Basic Assessment process for the proposed development. Feathers Environmental Services was subsequently appointed to compile a specialist avifaunal assessment report (based on a desktop review and a one-day site visit) which uses a set methodology and various data sets (discussed elsewhere) to determine which avian species regularly occur within the study area, the availability of bird micro habitats (i.e. avifaunal sensitive areas) and the possible impacts of the proposed development. In general terms, the impacts that could be associated with a project of this nature include: displacement of birds as a result of habitat loss and disturbance; electrocution on the overhead traction equipment and collisions with the moving train.

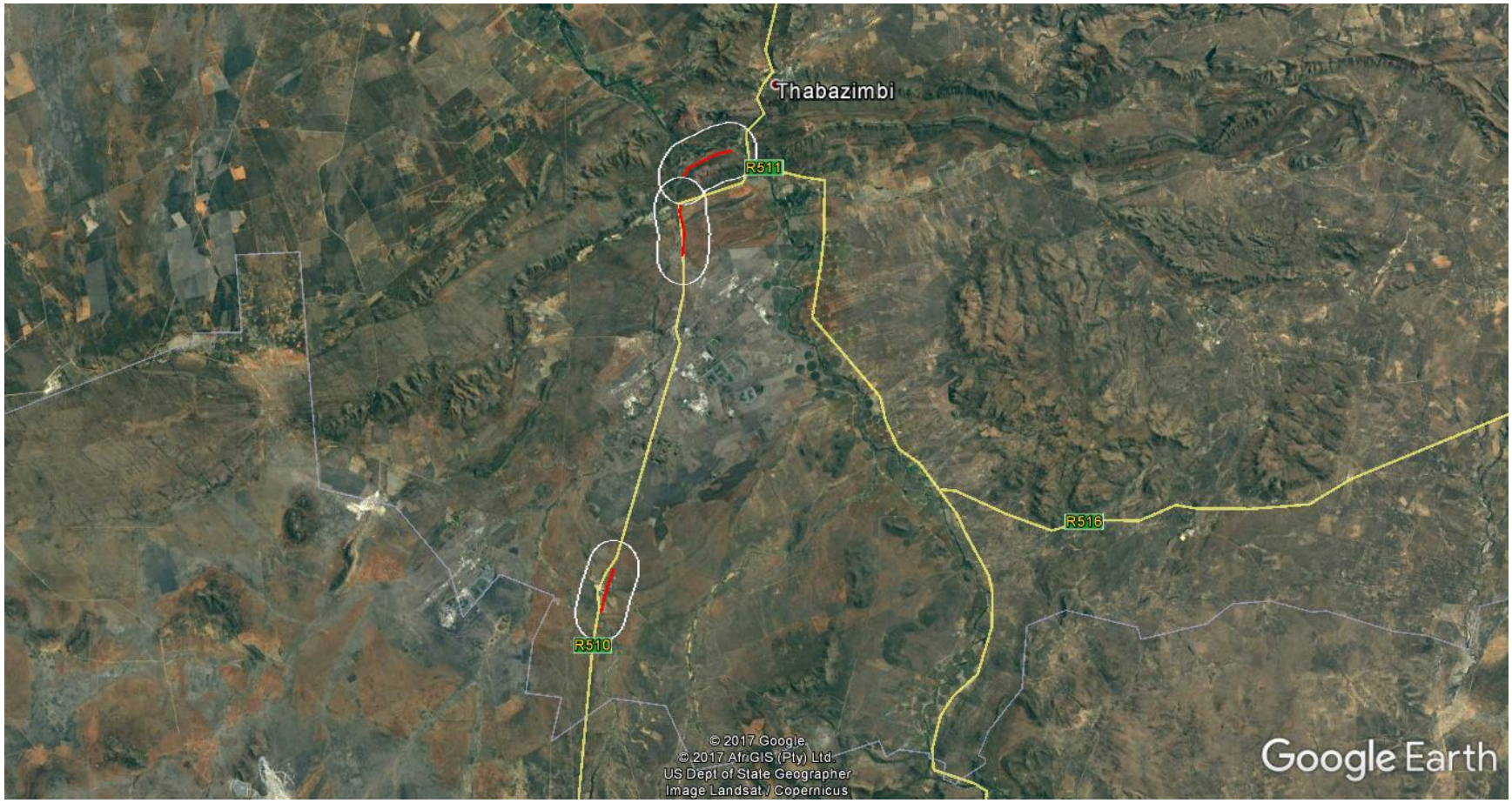

FIGURE 1: Geographical location of the three study areas and the proposed railway loop expansions.

Proposed Thabazimbi, Ferrogate and Northam railway loop expansions = *red lines*
2km Buffers = white polygons

2 RELEVANT LEGISLATION AND GUIDELINES

The following pieces of legislation are applicable to the proposed development:

2.1 THE CONVENTION ON BIOLOGICAL DIVERSITY

The Convention on Biological Diversity is an international convention (to which South Africa is a signatory) and represents a commitment to sustainable development. The Convention has three main objectives: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources (http://www.cbd.int/convention/guide/). Although the convention has not developed specific recommendations or guidelines pertaining to birds and railway infrastructure interactions and impacts, it does make provision (in a general policy guideline) for keeping and restoring biodiversity. In addition to this the CBD is an ardent supporter of thorough assessment procedures (Strategic Environmental Assessments (SEA) and Environmental Impact Assessments (EIA)) and requires that Parties apply these processes when planning activities that will have a biodiversity impact. An important principle encompassed by the CBD is the precautionary principle which essentially states that where serious threats to the environment exist, lack of full scientific certainty should not be used a reason for delaying management of these risks. The burden of proof that the impact will *not* occur lies with the proponent of the activity posing the threat. In addition, the Aichi Biodiversity Targets (CBD 2011) address several priority issues i.e. the loss of biodiversity and its causes; reducing direct pressure on biodiversity; safeguarding ecosystems, species and genetic diversity and participatory planning to enhance implementation of biodiversity conservation. Each of these is relevant in the case of railway infrastructure and bird conservation through all project phases from planning to the implementation of mitigation measures for existing developments.

2.2 THE CONVENTION ON THE CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) is an intergovernmental treaty and is the most appropriate instrument to deal with the conservation of terrestrial, aquatic and avian migratory species. The convention includes policy and guidelines with regards to the impacts associated with man-made infrastructure. CMS requires that Parties (South Africa is a signatory) take measures to avoid migratory species from becoming endangered (Art II, par. 1 and 2) and to make every effort to prevent the adverse effects of activities and obstacles that seriously impede or prevent the migration of migratory species (Art III, par. 4b and 4c). At CMS/CoP7 (2002) Res. 7.2 on Impact Assessment and Migratory Species was accepted, requesting Parties to apply appropriate SEA and EIA procedures for all proposed developments. An agreement developed in the framework of CMS, in force since November 1999, brings the 119 Range States of the Africa Eurasian Waterbird Agreement (AEWA) region together in a common policy to protect migratory waterbirds that use the flyway from the Arctic to southern Africa.

2.3 THE AGREEMENT ON THE CONSERVATION OF AFRICAN-EURASIAN MIGRATORY WATER BIRDS

The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA) is an 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. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle, including many species of divers, grebes, pelicans, cormorants, herons, storks, rails, ibises, spoonbills, flamingos, ducks, swans, geese, cranes, waders, gulls, terns, tropic birds, auks, frigate birds and even the South African penguin. The core activities carried out under AEWA are described in its Action Plan, which is legally binding for all countries that have joined the Agreement. The AEWA Action Plan details the various measures to be undertaken by Contracting Parties (South Africa included) to guarantee the conservation of migratory waterbirds within their national boundaries. These include species and habitat protection and the management of human activities as well as legal and emergency measures.

2.4 THE NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT

The National Environmental Management: Biodiversity Act (No. 10 of 2004), (NEMBA) regulations on Threatened and Protected Species (TOPS) provides for the consolidation of biodiversity legislation through establishing national norms and standards for the management of biodiversity across all sectors and by different management authorities. The national Act and several sets of provincial conservation legislation provide for among other things, the management and conservation of South Africa's biodiversity; protection of species and ecosystems that necessitate national protection and the sustainable use of indigenous biological resources.

3 STUDY METHODOLOGY

3.1 TERMS OF REFERENCE

The avifaunal specialist has conducted this assessment according to the following generic terms of reference:

- Describe the current state of avifauna in the study area, outlining important characteristics which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction and operation.
- Identify Red List species potentially affected by the proposed expansion of the railway loops.
- Identify potential impacts (positive and negative (if relevant)) of the proposed development on avifauna during construction and operation.
- Provide a statement regarding the potential significance of the identified issues based on the evaluation of the impacts associated with the proposed development.
- Identify mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks.
- Identify information gaps, limitations and additional information required.
- Identify and address any other aspects related to avifauna in the study area that should be incorporated into the reports.

3.2 METHODS

The following methodology was employed to compile this avifaunal assessment report:

- Various avifaunal data sets (listed below) were collected and examined to determine the location and abundance of sensitive Red List (as well as non-Red List) species that may be vulnerable to the impacts associated with the proposed activities.
- Avifaunal sensitive areas within the study area, where the above impacts are likely to occur, were identified using various GIS (Geographic Information System) layers, Google Earth imagery and personal observations made during the site visit on 18 May 2017 (autumn).
- The potential impacts of the proposed railway loops and the associated infrastructure on the avifaunal community were predicted on the basis of experience in gathering and analysing data on avian impacts with various forms of linear infrastructure and developments in southern Africa since 2006 and supplemented with first hand data.
- Practical recommendations are made for the management and mitigation of potentially significant impacts.

3.3 DATA SOURCES USED

The following data sources and reports were used in varying levels of detail for this study:

- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the Animal Demography Unit of the University of Cape Town, as a means to ascertain which species occur within the study area consisting of four pentad grid cells within which the study areas are situated. A pentad grid cell covers five minutes of latitude by five minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. Between 2007 and 2017, a total of 77 full protocol cards (i.e. 77 bird surveys lasting a minimum of two hours each) have been completed for those pentads in which the proposed railway crossing loop extensions are located. The relevant pentads within the study area include: 2435_2720; 2435_2715; 2440_2715 and 2455_2715.
- The Important Bird Areas report (Marnewick *et al*. 2015) was consulted to determine the location of the nearest IBA's and their importance for this study. The Northern Turf Thornveld Important Bird Area is relevant to this project (FIGURE 2).
- The Co-ordinated Avifaunal Roadcount project (CAR) data was consulted to obtain relevant data on large terrestrial bird report rates in the area. There are no CAR routes in the vicinity of the proposed development.
- The Co-ordinated Waterbird Count (CWAC) data was consulted determine if large concentrations of water birds, associated with South African wetlands, may occur within the study area. There are no CWAC sites in the vicinity of the proposed development.
- The conservation status and endemism information of all bird species occurring in the aforementioned pentads was then determined with the use of the Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al*. 2015) and the IUCN Red List of Threatened Species (http://www.iucnredlist.org/,

2017) and the most recent and comprehensive summary of southern African bird biology (Hockey *et al.* 2005).

- The latest vegetation classification described in the Vegetation Map of South Africa (South African National Biodiversity Institute, 2012 and Mucina & Rutherford, 2006) was consulted in order to determine which vegetation types occur on site.
- High resolution Google Earth ©2017 imagery was used to further examine the micro habitats within the study area.
- KMZ. shapefiles detailing the location of the proposed study area were created using information provided by Nsovo Environmental Consulting.
- A field visit to the study area was conducted on 18 May 2017 (autumn) to form a first-hand impression of the micro-habitat on site (FIGURE 3).
- Personal observations made during the aforementioned site visit to the study coupled with the author's experience gained from assessing various infrastructure development projects in the Limpopo region have been used to formulate a professional opinion of the species likely to occur in the study area and the likely impacts that the proposed development may have on the resident avifaunal community.

3.4 LIMITATIONS & ASSUMPTIONS

The author made the assumption that the sources of information used are reliable. However, it must be noted that there are limiting factors and these may potentially detract from the accuracy of the predicted results.

- The report is the result of a short-term study and is based on a one-day site visit to the proposed development area. No long-term monitoring was conducted by the avifaunal specialist; therefore, this assessment relies upon secondary data sources with regards to bird abundances such as the SABAP1, SABAP2, IBA, CAR and CWAC projects. Although in some cases the data are more than two decades old, these comprehensive datasets provide a valuable baseline against which any changes in species presence, abundance, and distribution can be monitored. However, primary information on bird habitat was collected during the site visit and is used directly in determining which species of conservation importance are likely to occur on site. Based on these findings, the specialist was able to assess the anticipated impacts and provide recommendations for mitigation.
- The site visits to the study area and the resultant observations were made in a single season (autumn), during which time various species may not have been present in the study area.
- The core study area for the proposed expansion of the railway loops was defined as a 2km zone around the proposed infrastructure.
- Predictions in this study are based on experience of these and similar species in different parts of South Africa, through the authors' experience working in the avifaunal specialist field since 2006. However, bird behaviour can't be reduced to formulas that will hold true under all circumstances. It must also be noted that, it is often not possible to entirely eliminate the risk of the disturbance and displacement impacts associated with the activities proposed. Our best possible efforts can probably not ensure zero impact

on birds. Studies such as this attempt to minimise the risk as far as possible, and although the impacts will be unavoidable, they are likely to be temporary.

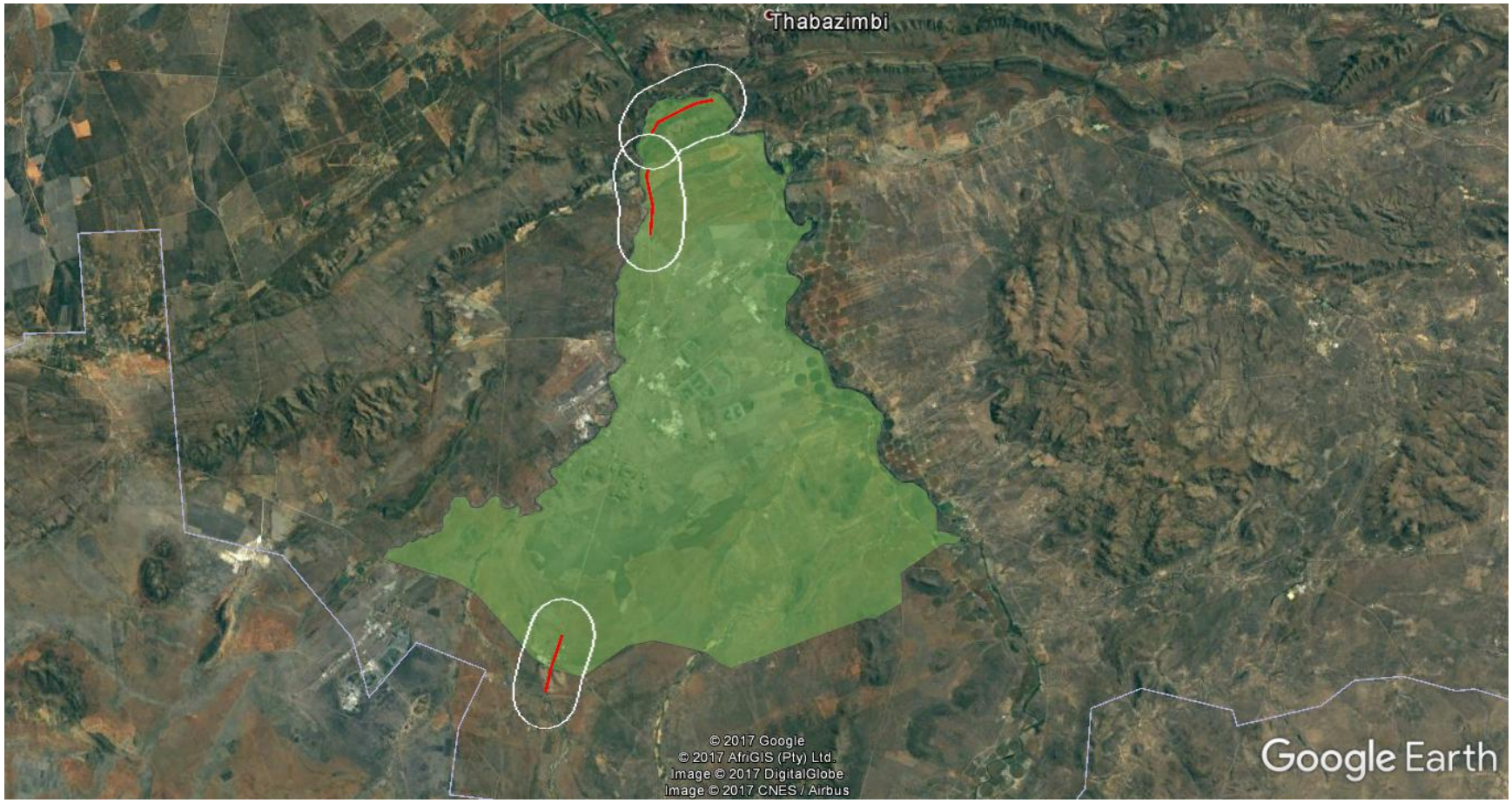

FIGURE 2. Regional map showing the study area in relation to the Northern Turf Thornveld Important Bird Area (SA009).

Proposed Thabazimbi, Ferrogate and Northam railway loops expansions *= red lines*
2km Buffers = white polygons
Northern Turf Thornveld Important Bird Area = green polygon

Figure 3: Regional map detailing the track log and habitat points surveyed during the site visit to the study area.

Proposed Thabazimbi, Ferrogate and Northam railway loop expansions = red lines
2km Buffers = white polygons
Site Visit Track Log = yellow line
Survey Points = white markers

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 RELEVANT BIRD POPULATIONS

4.1.1. Important Bird Areas (IBA's)

Some sites are exceptionally important for maintaining the taxa dependent upon the habitats and ecosystems in which they occur. Vigorous protection of the most critical sites is one important approach to conservation. Many species may be effectively conserved by this means. Patterns of bird distribution are such that, in most cases, it is possible to select sites that support many species. These sites, carefully identified on the basis of the bird numbers and species complements they hold, are termed Important Bird Areas (IBAs). IBAs are selected such that, taken together, they form a network throughout the species' biogeographic distributions. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a protected-area network. They are responsible for one (or more) of three factors:

- Hold significant numbers of one or more globally threatened species;
- Are one of a set of sites that together hold a suite of restricted-range species or biome-restricted species;
- Have exceptionally large numbers of migratory or congregatory species.

All three study areas fall within the SA009 - Northern Turf Thornveld IBA (Marnewick *et al*, 2015). The IBA consists of a group of privately owned farms that form a triangle delineated roughly by the Crocodile River in the east and the Bierspruit River in the west. The road running along the railway line from the Bierspruit siding to Northam and on to Koedoeskop forms the southern boundary of the IBA. The area is characterised by flat plains and is widely used for wheat, maize, sunflower and livestock farming. Natural pockets of bushveld remain and are scattered throughout the farmland. The IBA supports the core of the remaining resident South African population of Yellow-throated Sandgrouse *Pterocles gutturalis* which typically inhabit short, open grasslands, fallow fields and recently burnt veld, especially near water. Other bird species of conservation concern that have been recorded within the IBA include the globally threatened Black-winged Pratincole *Glareola nordmanni* Secretarybird *Sagittarius serpentarius* and Kori Bustard *Ardeotis kori*, in addition to the regionally threatened Lanner Falcon *Falco biarmicus*. Common biome-restricted species include Kurrichane Thrush *Turdus libonyanus*, White-throated Robin-Chat *Cossypha humeralis*, Burchell's Starling *Lamprotornis australis*, White-bellied Sunbird *Cinnyris talatala* and the fairly common Kalahari Scrub Robin *Erythropygia paena* (Marnewick *et al*, 2015).

Although all three of the proposed railway loops are located within this IBA, the presence and frequent utilization of the habitats, within the immediate vicinity of these areas, by the aforementioned species is unlikely due to the significant existing disturbance and habitat transformation impacts.

4.1.2. Southern African Bird Atlas Project 2 Data (SABAP2)

A total of 240 bird species have been recorded within the relevant pentads during the SABAP2 atlassing period to date (APPENDIX 2). The presence of these species in the broader area provides an indication of the diversity of species that could potentially occur within the areas earmarked for the proposed developments. Of the 240 species, seven are considered to be of conservation concern (Red List), according to the 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al*, 2015) and the IUCN Red List (2016). The White Stork, which is not listed, but is protected internationally through the Bonn Convention on Migratory species, was also recorded.

It must be noted that the Red List species have not been recorded in significant numbers with between one and six individuals recorded in the broader study area during the ten-year survey period to date. The low report rates of these species could possibly be attributed to the fact that the four pentad grid cells have not been surveyed extensively or perhaps more likely a result of the fairly high levels of disturbance caused by the surrounding land use practices. The significant disturbance and habitat loss experienced in the study area is undoubtedly displacing various birds that would, under optimum conditions, inhabit these areas. The potential for occurring in a specific habitat class is indicated in TABLE 4.1, in addition to the type of impact that could potentially affect each species. In addition, birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis in TABLE 4.1 represents each species' most preferred habitats. These locations are where most of the birds of that species will spend most of their time – so logically that is where potential impacts on those species will be most significant.

The likelihood of the threatened Red List species in TABLE 4.1 frequenting the three study areas is considered to be low. This was confirmed during the site visit with only Marabou Stork *Leptoptilos crumeniferus* being observed thermalling in the skies within five kilometres of the proposed Thabazimbi expansion loop. As a result, the impacts of the proposed project could be more important for the more common bird species, which are generally more tolerant of human disturbance and hence more likely to regularly make use of this site. Development in these areas will undoubtedly displace these species either temporarily of perhaps more permanently through habitat transformation and disturbance associated with construction activities. However sufficient similar habitat is available within the broader study area, so it is highly unlikely that the displacement impact will be of regional or national significance. Although this impact assessment focuses on Red List species, the impact on non-Red List species is also assessed, albeit in less detail. Furthermore, much of the mitigation recommended for Red List species will also protect non-Red List species in the study area. The non-Red List species that have been considered for this assessment include large eagles, buzzards, kestrels, herons, korhaans, geese, ibis and various water bird species. All species that were observed during the site visit are indicated in APPENDIX 2.

TABLE 4.1: Red List species that could potentially occur in the study area

Name	Regional Conservation Status (Taylor, 2015)	Global Conservation Status (IUCN 2016)	Av. reporting rate across the relevant SABAP 2 pentads	Preferred Habitat (Harrison *et al* 1997, Barnes 2000, Hockey *et al* 2005, personal observations)	Displacement through habitat destruction	Displacement through disturbance	Electrocutions on the OHTE	Collisions with the moving train	Likelihood of occurrence
Falcon, Lanner *Falco biarmicus*	VU	LC	2.50	Generally, prefers open habitat, but exploits a wide range of habitats. Will nest in wooded areas if suitable cliffs are present.	x	x	x	-	Medium
Painted-snipe, Greater *Rostratula benghalensis*	VU	LC	1.39	Vegetated waterside habitats with exposed mud.	-	-	-	-	Low
Stork, Abdim's *Ciconia abdimii*	NT	LC	1.39	Grassland, open woodland, pans, pastures and cultivated lands.	x	x	-	-	Medium
Stork, Black *Ciconia nigra*	VU	LC	1.75	Rivers, dams, cliffs. Could be a visitor to the Crocodile River. Sometimes roost on power lines.	-	-	-	-	Low
Stork, Marabou *Leptoptilos crumeniferus*	NT	LC	9.02	Open woodland, rivers, dams, livestock carcasses. Could be a visitor to the Crocodile River.	x	x	-	Possible If there is a carcass on the track	Observed
Stork, Yellow-billed *Mycteria ibis*	EN	LC	2.50	Rivers, dams. Could be a visitor to the Crocodile River.	-	-	-	-	Low
Vulture, Cape *Gyps coprotheres*	EN	EN	8.81	Large cliffs for breeding and roosting, open woodland and grassland. Roosts on transmission power lines.	-	-	x	Possible If there is a carcass on the track	Medium
Stork, White *Ciconia ciconia*	BONN		4.17	Grassland, open woodland, wetlands, pastures and cultivated lands	x	x	-	-	Medium
EN = Endangered; VU = Vulnerable; NT = Near-threatened; LC = Least Concern; BONN = The Convention on the Conservation of Migratory Species of Wild Animals									

4.2 BIRD HABITAT CLASSES

Vegetation is one of the primary factors determining bird species distribution and abundance in an area. The following description of the vegetation on the site focuses on the vegetation structure and not species composition since it is widely accepted within ornithological circles that vegetation structure is more important in determining which bird species will occur there. The classification of vegetation types is from South African National Biodiversity Institute (2012) and Mucina & Rutherford (2006), while from an avifaunal perspective, the Atlas of southern African Birds (SABAP1) recognises six primary vegetation divisions or biomes within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison *et al.* 1997). In addition to the description of vegetation, it is important to understand the habitats available to birds at a smaller spatial scale, i.e. micro habitats. Micro habitats are shaped by factors other than vegetation, such as topography, land use (CSIR, 2009), food sources and anthropogenic factors are critically important in mapping the site in terms of avifaunal sensitivity and ultimately informing the mitigation requirements.

Investigation of this study area revealed the following bird micro habitats, with APPENDIX 1 providing a photographic record of the bird habitats that occur within the study area:

4.2.1. Savanna (Woodland)

The three study areas are located within a single primary vegetation division namely the Savanna Biome which is defined by SABAP1 as having a grassy under-storey and a distinct woody upper-storey of trees and tall shrubs (Harrison *et al* 1997). Any remaining natural woodland occurring within the three study areas, is likely to be comprised of the either Dwaalboom Thornveld or Waterberg Mountain Bushveld (APPENDIX 1). Dwaalboom Thornveld is restricted to the flats north of the Dwarsberge and ridges associated with the Crocodile River. However, it is centred near the Dwaalboom area but also extends eastward and north of Pilanesberg to Northam. The floristic and structural attributes of Dwaalboom Thornveld is fairly homogenous and consists of low to medium high microphyllous bushveld that is dominated by taxa of the genus *Acacia*. The herbaceous layer is dominated by graminoid taxa as opposed to forb species (Mucina and Rutherford, 2006). Waterberg Mountain Bushveld is located in the Waterberg Mountains, including the foothills, escarpment and tablelands south of the line between Lephalale and Marken. The landscape consists of rugged mountains with vegetation grading from *Faurea saligna-Protea caffra* bushveld on higher slopes to *Burkea africana-Terminalia sericea* savanna in the lower-lying valleys. The grass layer is moderately developed (Mucina and Rutherford, 2006). Relevant to this assessment, this vegetation type has been largely transformed by mining activities, urbanisation, cultivation and bush encroachment due to over grazing.

Although natural woodland (APPENDIX 1 - FIGURE 1) prevails within the three study areas (particularly the area earmarked for the Thabazimbi railway loop), there is evidence of bush clearing and the removal of trees along the proposed Ferrogate and Northam railway crossing loops, where both past and present agricultural and pastoral practices, road infrastructure, as well as low to medium urbanisation dominate the landscape. This has resulted in very little undisturbed woodland remaining in these two areas.

The savanna biome contains a large variety of bird species (it is the most species-rich community in southern Africa) but very few bird species are restricted to this biome. It is also relatively well conserved compared to the grassland biome. Savanna is particularly rich in raptors, and forms the stronghold for Red List species (recorded in the study area by SABAP2) such as Lanner Falcon, Abdim's Stork *Ciconia abdimii*, Marabou Stork and Cape Vulture *Gyps coprotheres*. Apart from Red List species, it also supports several non-Red List raptor species, such as the Brown Snake-Eagle *Circaetus cinereus*, Black-chested Snake-Eagle *Circaetus pectoralis*, and a multitude of medium-sized raptors, for example the migratory Steppe Buzzard *Buteo vulpinus*, African Harrier Hawk (Gymnogene) *Polyboroides typus*, Wahlberg's Eagle *Aquila wahlbergi and* African Hawk Eagle *Aquila spilogaster*. The SABAP2 reporting rates for the Red List birds potentially occurring in woodland habitat in the study area are low, indicating that human activity has impacted on the avifaunal community and that levels of disturbance are high.

4.2.2. Rivers

Most rivers in southern Africa are in the east and extreme south, in the higher rainfall areas. Thirteen species of water bird are mostly restricted to riverine habitat in southern Africa. Rivers and drainage lines are important corridors of microhabitat for waterbirds particularly as a source water that will be regularly utilised not only as a source of drinking water and food, but also for bathing. In addition, the riparian vegetation provides cover for skulking species, e.g. Black-crowned Night Heron *Nycticorax nycticorax*, and the thick riverine woodland with large shady riparian trees, offers important breeding substrate for a variety of birds, including raptors.

The study area contains the Crocodile River which has its source in the Witwatersrand mountain range in the Gauteng province. In the Limpopo province, the Crocodile River passes the town of Thabazimbi and meanders for many kilometers through a sparsely inhabited area before joining the Marico River just west of *Rooibokkraal* at the limit of North West province to form the start of the Limpopo River. The Bierspruit, a tributary of the Crocodile River, also features prominently within the Thabazimbi and Ferrogate study areas. The non-perennial Phufane River is located just to the south of the proposed Northam railway loop.

The Crocodile River is one of the most pressured river systems in South Africa with the detrimental effects of pollution from two of South Africa's largest cities, Johannesburg and Tshwane, clearly evident. Untreated industrial, mining, agricultural and household waste has deteriorated the water quality throughout most of its course, with invasive plant species negatively affecting the integrity of the system. Despite these impacts, common water dependent species e.g. Red-knobbed Coot *Fulica cristata*, Black-headed Heron *Ardea melanocephala*, African Darter *Anhinga rufa*, White-faced Duck *Dendrocygna viduata*, Yellow-billed Duck *Anas undulata*, Blacksmith Lapwing *Vanellus armatus,* African Sacred Ibis *Threskiornis aethiopicus* and Egyptian Goose *Alopochen aegyptiaca* may utilise the river systems within the study areas quite extensively.

Relevant to this study, the aforementioned river systems are located some distance from the areas that have been earmarked for the proposed developments. Therefore, potential displacement impacts as a result of habitat loss and disturbance associated with the construction and operation of the railway loops are likely to be negligible.

4.2.3. Wetlands

Wetlands are characterized by slow flowing seasonal water (or permanently wet) and tall emergent vegetation (rooted or floating) and provide habitat for many water birds. The conservation status of many of the bird species that are dependent on wetlands reflects the critical status of wetlands worldwide, with many having already been destroyed. There are examples of small localized wetlands (APPENDIX 1 - FIGURE 2) occurring in the study area which may represent attractive foraging areas for common species i.e. ibis, herons and geese. Given their locations within the study areas, construction and operational activities associated with the proposed developments are unlikely to have a permanent negative impact on the wetlands and the bird communities that these may support.

4.2.4. Dams

Many thousands of earthen and other dams exist in the southern African landscape. Whilst dams have altered flow patterns of streams and rivers, and affected many bird species detrimentally, a number of species have benefited from their construction. The construction of these dams has probably resulted in a range expansion for many water bird species that were formerly restricted to areas of higher rainfall. Man-made impoundments, although artificial in nature, can be very important for variety of birds, particularly water birds. Apart from the water quality, the structure of the dam, and specifically the margins and the associated shoreline and vegetation, plays a big role in determining the species that will be attracted to the dam. Common species in the study area that could use dams and dam edges include Red-knobbed Coot, Black-headed Heron, African Darter, White-faced Duck, Yellow-billed Duck, Blacksmith Lapwing, African Sacred Ibis and Egyptian Goose. Red List species recorded in the study area by SABAP2 that are likely to be attracted to dams include Black Stork, Yellow-billed Stork and Abdim's Stork. Although a couple of medium-large sized dams occur within the Thabazimbi and Ferrogate study areas (APPENDIX 1 - FIGURE 3), similarly construction and operational activities associated with the proposed developments are unlikely to have a permanent negative impact on the dams and the bird communities that these may support.

4.2.5. Ridges and Rocky outcrops

Examples of ridges and rocky outcrops were observed within the study area (APPENDIX 1 - FIGURE 4) and are potentially suitable roosting habitat for Lanner Falcon.

4.2.6. Built-up Residential Areas

The entire Northam study area is densely populated (APPENDIX 1 - FIGURE 5), with significant habitat degradation and high volumes of disturbance associated with pedestrian and vehicle traffic. These densely populated urban areas are of very little value to sensitive Red List species, with the possible exception of Lanner Falcon which hunt feral pigeons and (possibly) free-ranging poultry. The impact of the dense human population also spills over in the

adjacent habitat classes through the constant movement of pedestrians, cattle and dogs into those areas. This has implications for the avifauna, particularly the larger species, in that it acts as sources of potential disturbance.

5 GENERAL DESCRIPTION OF BIRD INTERACTIONS WITH ELECTRICAL INFRASTRUCURE

Poorly sited or designed facilities and infrastructure can negatively impact not only vulnerable species and habitats, but also entire ecological processes. These impacts are extremely variable and are dependent on a number of contributing factors which include the design and specifications of the development, topography, habitats capable of supporting various bird species, as well as the number and diversity of birds present at the development site. The principal areas of concern for Red List species related to the proposed Thabazimbi, Ferrogate and Northam railway loops and the associated infrastructure are:

- Displacement due to habitat loss in the physical infrastructure footprint;
- Displacement due to disturbance associated with construction and maintenance;
- Mortality due to electrocution on the overhead electrical infrastructure; and
- Collisions with the moving train.

5.1 DISPLACEMENT AS A RESULT OF HABITAT LOSS

Although this impact is dependent on the location and the scale of the development, this is potentially the most significant impact associated with the construction and operation of the proposed railway loops and the associated infrastructure. Extensive areas of vegetation (habitat) may need to be cleared to accommodate the considerable amount of infrastructure, thereby reducing the amount of habitat available to birds for foraging, roosting, and breeding (Smallie, 2013). The effect of the vegetation clearing is always more marked in woodland areas, where construction necessitates the removal of woody plants, and especially large trees. This development will undoubtedly destroy and modify a certain amount of habitat and is likely to impact the smaller passerine bird species with small home ranges as entire territories could be removed during construction activities. However, the natural vegetation present within the three study areas, particularly at Ferrogate and Northam, is degraded to a fairly large extent and subject to significant existing disturbance. It is therefore unlikely to support the more sensitive woodland Red List species and at a landscape level, any habitat transformation impacts that may occur are likely to be **LOW** in significance and likely to affect local, non-threatened bird populations.

5.2 DISPLACEMENT AS A RESULT OF DISTURBANCE

Excavation and construction activities are a source of significant disturbance, particularly as a result of the amount of machinery and labour present on site for a period of time. For most bird species, construction activities are likely to be a cause of temporary disturbance and will impact on foraging, breeding and roosting behaviours or in more extreme cases, result in displacement from the site entirely. In addition, species commuting around the area

may become disorientated, avoid the site and fly longer distances than usual as a result, and for some species this may have critical energy implications (Smallie, 2013). Similarly, but to a lesser extent, ongoing maintenance activities at the operational facility, are likely to cause some degree of disturbance to birds in the general vicinity.

The study area is already subjected to a fairly significant degree of disturbance associated with various mining activities, urbanisation and high volumes pedestrian and vehicle traffic in the immediate vicinity of the proposed sites. It is therefore difficult to predict at this stage how detrimental the disturbance impacts will be on local bird populations in the short or long-term. However, based on the footprint of the proposed railway loops and the bird species likely to occupy the study area, **MEDIUM to LOW** impacts are probable. It is also important to note that similar habitats are available within the broader study area, so it is highly unlikely that the displacement impact will be of regional or national significance.

5.3 ELECTROCUTIONS

Similarly, to power lines, electrocution on the overhead traction equipment refers to the scenario where a bird is perched or attempts to perch on the electrical structure of the railway line and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). The clearances on these structures are small and can be bridged by a medium-sized bird that perches on the steel cross-arm (van Rooyen, 2009). Birds such as owls, buzzards and kites may be tempted to perch on these structures to prey on rodents and other prey items in the servitude, and Pied Crows might also use these structures as lookouts to scavenge for train kills (van Rooyen, 2009). All of these species may be exposed to phase-earth electrocution, however this impact is likely to be of **LOW** significance.

5.4 COLLISIONS

Mortality through collisions with fast moving vehicles is a common source of mortality among birds. Although most avian fatalities caused by vehicles occur on roadways, avian collisions with the moving train could be a potential source of mortality too (Spencer 1965). Similarly, to the potential electrocution impact, species at risk here are likely to be mostly owls (if the train operates at night, or at dawn or dusk), crows and kites. Owls are particularly vulnerable to nocturnal traffic. In a study conducted by Ansara (2004) a total of 554 owl mortalities were recorded on a 30km stretch of the N17 road on the eastern Gauteng highveld near Springs. The study's results showed an average casualty rate of 9.2 owls per year. One mitigating factor that will help to reduce the potential for collisions with the train, is the speed that the train will be traveling at. Ansara found that highway mortalities are directly proportional to the speed of the traffic. It is assumed that the train will be operating at a speed considerably less than the average speed that motorists are driving on the neighbouring regional road, and should afford the birds more chance to take evasive action. This impact is not site specific and could potentially occur in any of the proposed develeopment areas, if food resources become available on or alongside the tracks. Again, given bird species likely to occupy the study area, this impact is rated to be of **LOW** significance.

6 ASSESSMENT OF EXPECTED IMPACTS

The assessment of each avifaunal impact is discussed. The aforementioned avifaunal impacts have been formally assessed, rated and presented in tabular format below for both pre- and post-mitigation according to set criteria (APPENDIX 3).

TABLE 6.1: Assessment of displacement impact as a result of habitat loss caused by the construction of the proposed railway loops.

Nature: Displacement of sensitive and threatened species as a result of the loss or transformation of natural bird habitat along the proposed railway loop expansions.		
	Without mitigation	**With mitigation**
Physical Extent	1	1
Duration	3	3
Magnitude	4	2
Probability	3	2
Significance	**24 - Low**	**12 - Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Partially - a certain amount of land surface will be impacted on.	
Mitigation: Construction activity should be restricted to the existing servitude and immediate footprint of the infrastructure. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.		
Cumulative impacts: High – the surrounding area is already heavily transformed as a result of urbanisation. Any addition infrastructure development will contribute to the absence of Red List species within the study area.		

TABLE 6.2: Assessment of the displacement impact as a result of disturbance of birds caused by the construction and operation of the proposed railway loops.

Nature: Displacement of Red List species due to disturbance associated with the construction of the proposed railway loop expansions.		
	Without mitigation	**With mitigation**
Physical Extent	2	2
Duration	2	2
Magnitude	6	4
Probability	4	3
Significance	**40 - Medium**	**24 - Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Partially	

Mitigation:

Construction activity should be restricted to the immediate footprint of the infrastructure. Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of Red List species. Measures to control noise should be applied according to current best practice in the industry.

It is unlikely that any species of conservation concern will be breeding within the study area and given the level of existing disturbance in the area, no additional mitigation measures are recommended.

Cumulative impacts:

High - In addition to the proposed crossing loop extensions, residential and industrial activities feature prominently both within the impact zone and the broader study area and are a significant source of existing disturbance. These activities, coupled with the habitat degradation within the proposed study area, are a likely cause of the absence of Red List species within the study area. Those species that have persisted have undoubtedly developed a tolerance for the current levels of disturbance and are likely to persist within the broader area despite the development of the proposed crossing loop extensions.

TABLE 6.3: Assessment of electrocution of birds on the proposed overhead traction equipment.

Nature: Electrocution of Red List species on the proposed overhead traction equipment.		
	Without mitigation	**With mitigation**
Physical Extent	2	1
Duration	4	4
Magnitude	4	2
Probability	2	1
Significance	**20 - Low**	**7- Low**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	

Mitigation:

The hardware is often too complex to warrant any mitigation for electrocution at this stage. It is rather recommended that if on-going impacts are recorded once operational, site specific mitigation be applied reactively. This is an acceptable approach because Red List bird species are unlikely to frequent the substation and be electrocuted.

Cumulative impacts:

Low - Although existing electrical infrastructure occurs with the study areas in the form of power lines, it is unlikely that any Red List species that are vulnerable to the electrocution impact will frequently utilise the areas earmarked for the proposed railway loop developments.

TABLE 6.4: Assessment of collision of birds with moving trains.

Nature: Red List species mortality due to collisions with moving trains.		
	Without mitigation	**With mitigation**
Physical Extent	2	1
Duration	4	4
Magnitude	4	2
Probability	2	1
Significance	**20 - Low**	**7 - Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: A mitigating measure to reduce the risk of collisions with the moving train would be to reduce the speed at which the train would be traveling.		
Cumulative impacts: Low		

7 CONCLUSION & IMPACT STATEMENT

In conclusion, the habitat within which the proposed study areas are located is low to moderately sensitive from a potential bird impact perspective. In recent years, anthropogenic impacts, mostly in the form of mining, urbanisation, agricultural and pastoral activities have largely transformed the landscape resulting in a negative impact on avifaunal diversity and abundance with the study areas. This is reflected in the low reporting rates for Red List species, which may also indicate that levels of disturbance are high. The construction of the proposed railway loops will result in various impacts of low to medium significance to the birds occurring in the vicinity of the new infrastructure, which can be reduced through the application of mitigation measures. Given the presence of existing habitat degradation and disturbance, it is anticipated that the proposed Thabazimbi, Ferrogate and Northam railway loops can be constructed within the study area with acceptable levels of impact on the resident avifauna subject to the following recommendations:

- Construction activity should be restricted to the immediate footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
- Maximum use of existing access roads and the construction of new roads should be kept to a minimum.
- The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint and rehabilitation of disturbed areas is concerned.
- In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

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APPENDIX 1
AVIFAUNAL HABITAT OBSERVED WITHIN THE STUDY AREA

FIGURE 1: Woodland (Savanna) habitat in the vicinity of the proposed Thabazimbi railway loop.

FIGURE 3: A localized wetland area within the proposed Ferrogate railway loop study area.

FIGURE 3: An example of a large dam within the Thabazimbi railway loop study area.

FIGURE 4: Rocky outcrops/ ridges above at proposed Thabazimbi railway loop study area.

FIGURE 5: A residential area located adjacent to the proposed Northam railway loop.

FIGURE 6: Typical transformed habitat within the road and railway servitudes in the Ferrogate and Northam study areas.

APPENDIX 2

SOUTH AFRICAN BIRD ATLAS PROJECT DATA (SABAP 1 & 2) FOR THE PROPOSED PROJECT

(SPECIES OBSERVED DURING THE SITE VISIT ARE HIGHLIGHTED IN GREY)

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Apalis, Bar-throated	Apalis thoracica		x	x
Avocet, Pied	Recurvirostra avosetta		x	-
Babbler, Arrow-marked	Turdoides jardineii		x	x
Babbler, Southern Pied	Turdoides bicolor		x	x
Barbet, Acacia Pied	Tricholaema leucomelas		x	x
Barbet, Black-collared	Lybius torquatus		x	x
Barbet, Crested	Trachyphonus vaillantii		x	x
Batis, Chinspot	Batis molitor		x	x
Bee-eater, Blue-cheeked	Merops persicus		x	-
Bee-eater, European	Merops apiaster		x	x
Bee-eater, Little	Merops pusillus		x	x
Bee-eater, Southern Carmine	Merops nubicoides		x	-
Bee-eater, Swallow-tailed	Merops hirundineus		x	-
Bee-eater, White-fronted	Merops bullockoides		x	x
Bishop, Southern Red	Euplectes orix		x	x
Bishop, Yellow-crowned	Euplectes afer		x	x
Bittern, Dwarf	Ixobrychus sturmii		x	-
Bittern, Little	Ixobrychus minutus		x	-
Boubou, Southern	Laniarius ferrugineus		x	x
Brubru, Brubru	Nilaus afer		x	x
Buffalo-weaver, Red-billed	Bubalornis niger		x	x
Bulbul, African Red-eyed	Pycnonotus nigricans		x	x
Bulbul, Dark-capped	Pycnonotus tricolor		x	x
Bunting, Cape	Emberiza capensis		x	-
Bunting, Cinnamon-breasted	Emberiza tahapisi		x	x
Bunting, Golden-breasted	Emberiza flaviventris		x	x
Bush-shrike, Grey-headed	Malaconotus blanchoti		x	x
Bush-shrike, Orange-breasted	Telophorus sulfureopectus		x	x
Bustard, Kori	Ardeotis kori		x	-
Buttonquail, Kurrichane	Turnix sylvaticus		x	-
Buzzard, Jackal	Buteo rufofuscus		x	-
Buzzard, Lizard	Kaupifalco monogrammicus		x	-
Buzzard, Steppe	Buteo vulpinus		x	x
Camaroptera, Green-backed	Camaroptera brachyura		x	x
Camaroptera, Grey-backed	Camaroptera brevicaudata		x	x

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Canary, Black-throated	Crithagra atrogularis		x	x
Canary, Yellow-fronted	Crithagra mozambicus		x	x
Chat, Anteating	Myrmecocichla formicivora		x	-
Chat, Familiar	Cercomela familiaris		x	x
Cisticola, Desert	Cisticola aridulus		x	x
Cisticola, Lazy	Cisticola aberrans		x	-
Cisticola, Levaillant's	Cisticola tinniens		x	x
Cisticola, Rattling	Cisticola chiniana		x	x
Cisticola, Wing-snapping	Cisticola ayresii		x	x
Cisticola, Zitting	Cisticola juncidis		x	x
Cliff-chat, Mocking	Thamnolaea cinnamomeiventris		x	-
Coot, Red-knobbed	Fulica cristata		x	x
Cormorant, Reed	Phalacrocorax africanus		x	x
Cormorant, White-breasted	Phalacrocorax carbo		x	x
Coucal, Burchell's	Centropus burchellii		x	x
Coucal, White-browed	Centropus superciliosus		x	-
Courser, Bronze-winged	Rhinoptilus chalcopterus		x	-
Courser, Temminck's	Cursorius temminckii		x	-
Crake, Black	Amaurornis flavirostris		x	x
Crombec, Long-billed	Sylvietta rufescens		x	x
Crow, Pied	Corvus albus		x	x
Cuckoo, African	Cuculus gularis		x	-
Cuckoo, Black	Cuculus clamosus		x	x
Cuckoo, Diderick	Chrysococcyx caprius		x	x
Cuckoo, Great Spotted	Clamator glandarius		x	-
Cuckoo, Jacobin	Clamator jacobinus		x	x
Cuckoo, Klaas's	Chrysococcyx klaas		x	x
Cuckoo, Levaillant's	Clamator levaillantii		x	x
Cuckoo, Red-chested	Cuculus solitarius		x	x
Cuckoo-shrike, Black	Campephaga flava		x	-
Darter, African	Anhinga rufa		x	x
Dove, Laughing	Streptopelia senegalensis		x	x
Dove, Namaqua	Oena capensis		x	x
Dove, Red-eyed	Streptopelia semitorquata		x	x
Dove, Rock	Columba livia		x	x
Drongo, Fork-tailed	Dicrurus adsimilis		x	x
Duck, African Black	Anas sparsa		x	-
Duck, Comb	Sarkidiornis melanotos		x	x

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Duck, White-backed	Thalassornis leuconotus		x	-
Duck, White-faced	Dendrocygna viduata		x	x
Duck, Yellow-billed	Anas undulata		x	x
Eagle, Lesser Spotted	Aquila pomarina		x	-
Eagle, Martial	Polemaetus bellicosus		x	-
Eagle, Steppe	Aquila nipalensis		x	-
Eagle, Tawny	Aquila rapax		x	-
Eagle, Verreaux's	Aquila verreauxii		x	-
Eagle, Wahlberg's	Aquila wahlbergi		x	x
Eagle-owl, Spotted	Bubo africanus		x	-
Eagle-owl, Verreaux's	Bubo lacteus		x	-
Egret, Cattle	Bubulcus ibis		x	x
Egret, Great	Egretta alba		x	x
Egret, Little	Egretta garzetta		x	x
Egret, Yellow-billed	Egretta intermedia		x	x
Eremomela, Burnt-necked	Eremomela usticollis		x	x
Eremomela, Yellow-bellied	Eremomela icteropygialis		x	x
Falcon, Amur	Falco amurensis		x	x
Falcon, Lanner	Falco biarmicus	VU	x	x
Falcon, Red-footed	Falco vespertinus		x	-
Finch, Cuckoo	Anomalospiza imberbis		x	-
Finch, Cut-throat	Amadina fasciata		x	x
Finch, Red-headed	Amadina erythrocephala		x	x
Finch, Scaly-feathered	Sporopipes squamifrons		x	x
Firefinch, African	Lagonosticta rubricata		-	x
Firefinch, Jameson's	Lagonosticta rhodopareia		x	x
Firefinch, Red-billed	Lagonosticta senegala		x	x
Fiscal, Common (Southern)	Lanius collaris		x	x
Fish-eagle, African	Haliaeetus vocifer		x	x
Flamingo, Greater	Phoenicopterus ruber		x	-
Flufftail, Red-chested	Sarothrura rufa		x	-
Flycatcher, Fairy	Stenostira scita		x	x
Flycatcher, Fiscal	Sigelus silens		x	x
Flycatcher, Marico	Bradornis mariquensis		x	x
Flycatcher, Pale	Bradornis pallidus		x	-
Flycatcher, Southern Black	Melaenornis pammelaina		x	x
Flycatcher, Spotted	Muscicapa striata		x	x
Francolin, Coqui	Peliperdix coqui		x	-

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Francolin, Crested	Dendroperdix sephaena		x	x
Go-away-bird, Grey	Corythaixoides concolor		x	x
Goose, Egyptian	Alopochen aegyptiacus		x	x
Goose, Spur-winged	Plectropterus gambensis		x	x
Goshawk, Gabar	Melierax gabar		x	x
Goshawk, Southern Pale Chanting	Melierax canorus		x	-
Grebe, Great Crested	Podiceps cristatus		x	-
Grebe, Little	Tachybaptus ruficollis		x	x
Greenbul, Yellow-bellied	Chlorocichla flaviventris		-	x
Green-pigeon, African	Treron calvus		x	x
Greenshank, Common	Tringa nebularia		x	x
Guineafowl, Helmeted	Numida meleagris		x	x
Gull, Grey-headed	Larus cirrocephalus		x	-
Hamerkop, Hamerkop	Scopus umbretta		x	x
Harrier, Montagu's	Circus pygargus		x	-
Harrier-Hawk, African	Polyboroides typus		x	x
Hawk-eagle, African	Aquila spilogaster		x	x
Helmet-shrike, White-crested	Prionops plumatus		x	x
Heron, Black	Egretta ardesiaca		x	-
Heron, Black-headed	Ardea melanocephala		x	x
Heron, Goliath	Ardea goliath		x	-
Heron, Green-backed	Butorides striata		x	x
Heron, Grey	Ardea cinerea		x	x
Heron, Purple	Ardea purpurea		x	-
Heron, Squacco	Ardeola ralloides		x	-
Honeyguide, Greater	Indicator indicator		x	x
Honeyguide, Lesser	Indicator minor		x	x
Hoopoe, African	Upupa africana		x	x
Hornbill, African Grey	Tockus nasutus		x	x
Hornbill, Damara	Tockus damarensis		x	-
Hornbill, Hybrid Damara/Red-billed	Tockus damarensis/erythrorhynchus		x	-
Hornbill, Red-billed	Tockus erythrorhynchus		x	x
Hornbill, Southern Yellow-billed	Tockus leucomelas		x	x
House-martin, Common	Delichon urbicum		x	-
Ibis, African Sacred	Threskiornis aethiopicus		x	x
Ibis, Glossy	Plegadis falcinellus		x	x
Ibis, Hadeda	Bostrychia hagedash		x	x
Indigobird, Dusky	Vidua funerea		x	x

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Indigobird, Purple	Vidua purpurascens		x	x
Indigobird, Village	Vidua chalybeata		x	x
Jacana, African	Actophilornis africanus		x	-
Kestrel, Greater	Falco rupicoloides		x	-
Kestrel, Lesser	Falco naumanni		x	-
Kestrel, Rock	Falco rupicolus		x	-
Kingfisher, Brown-hooded	Halcyon albiventris		x	x
Kingfisher, Giant	Megaceryle maximus		x	x
Kingfisher, Grey-headed	Halcyon leucocephala		x	-
Kingfisher, Malachite	Alcedo cristata		x	x
Kingfisher, Pied	Ceryle rudis		x	x
Kingfisher, Striped	Halcyon chelicuti		x	-
Kingfisher, Woodland	Halcyon senegalensis		x	x
Kite, Black	Milvus migrans		x	-
Kite, Black-shouldered	Elanus caeruleus		x	x
Kite, Yellow-billed	Milvus aegyptius		x	x
Korhaan, Northern Black	Afrotis afraoides		x	x
Korhaan, Red-crested	Lophotis ruficrista		x	x
Lapwing, African Wattled	Vanellus senegallus		x	x
Lapwing, Blacksmith	Vanellus armatus		x	x
Lapwing, Crowned	Vanellus coronatus		x	x
Lark, Pink-billed	Spizocorys conirostris		x	-
Lark, Red-capped	Calandrella cinerea		x	-
Lark, Rufous-naped	Mirafra africana		x	x
Lark, Sabota	Calendulauda sabota		x	x
Mannikin, Bronze	Spermestes cucullatus		x	x
Marsh-harrier, African	Circus ranivorus		x	-
Martin, Banded	Riparia cincta		x	-
Martin, Brown-throated	Riparia paludicola		x	-
Martin, Rock	Hirundo fuligula		x	-
Martin, Sand	Riparia riparia		x	-
Masked-weaver, Lesser	Ploceus intermedius		x	x
Masked-weaver, Southern	Ploceus velatus		x	x
Moorhen, Common	Gallinula chloropus		x	x
Moorhen, Lesser	Gallinula angulata		-	x
Mousebird, Red-faced	Urocolius indicus		x	x
Mousebird, Speckled	Colius striatus		x	x
Mousebird, White-backed	Colius colius		x	-

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Myna, Common	Acridotheres tristis		-	x
Neddicky, Neddicky	Cisticola fulvicapilla		x	x
Night-Heron, Black-crowned	Nycticorax nycticorax		x	-
Nightjar, Fiery-necked	Caprimulgus pectoralis		x	-
Nightjar, Rufous-cheeked	Caprimulgus rufigena		x	-
Olive-pigeon, African	Columba arquatrix		x	-
Oriole, Black-headed	Oriolus larvatus		x	x
Oriole, Eurasian Golden	Oriolus oriolus		x	x
Ostrich, Common	Struthio camelus		x	x
Owl, Barn	Tyto alba		x	-
Owl, Marsh	Asio capensis		x	x
Owlet, Pearl-spotted	Glaucidium perlatum		x	x
Oxpecker, Red-billed	Buphagus erythrorhynchus		x	x
Painted-snipe, Greater	Rostratula benghalensis	NT	x	x
Palm-swift, African	Cypsiurus parvus		x	x
Paradise-flycatcher, African	Terpsiphone viridis		x	x
Paradise-whydah, Long-tailed	Vidua paradisaea		x	x
Parrot, Meyer's	Poicephalus meyeri		x	x
Pelican, Pink-backed	Pelecanus rufescens		x	-
Penduline-tit, Cape	Anthoscopus minutus		x	-
Penduline-tit, Grey	Anthoscopus caroli		x	-
Petronia, Yellow-throated	Petronia superciliaris		x	x
Pigeon, Speckled	Columba guinea		x	x
Pipit, African	Anthus cinnamomeus		x	x
Pipit, Buffy	Anthus vaalensis		-	x
Pipit, Bushveld	Anthus caffer		x	-
Pipit, Long-billed	Anthus similis		x	-
Pipit, Plain-backed	Anthus leucophrys		x	-
Pipit, Striped	Anthus lineiventris		x	-
Plover, Three-banded	Charadrius tricollaris		x	x
Pochard, Southern	Netta erythrophthalma		x	-
Pratincole, Black-winged	Glareola nordmanni		x	-
Prinia, Black-chested	Prinia flavicans		x	x
Prinia, Tawny-flanked	Prinia subflava		x	x
Puffback, Black-backed	Dryoscopus cubla		x	x
Pytilia, Green-winged	Pytilia melba		x	x
Quail, Common	Coturnix coturnix		x	-
Quail, Harlequin	Coturnix delegorguei		x	-

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Quailfinch, African	Ortygospiza atricollis		x	-
Quelea, Red-billed	Quelea quelea		x	x
Reed-warbler, Great	Acrocephalus arundinaceus		x	-
Robin-chat, Cape	Cossypha caffra		x	-
Robin-chat, White-throated	Cossypha humeralis		x	x
Rock-thrush, Short-toed	Monticola brevipes		x	-
Roller, European	Coracias garrulus		x	-
Roller, Lilac-breasted	Coracias caudatus		x	x
Roller, Purple	Coracias naevius		x	x
Ruff, Ruff	Philomachus pugnax		x	x
Rush-warbler, Little	Bradypterus baboecala		x	-
Sandgrouse, Double-banded	Pterocles bicinctus		x	x
Sandgrouse, Yellow-throated	Pterocles gutturalis		x	-
Sandpiper, Common	Actitis hypoleucos		x	-
Sandpiper, Curlew	Calidris ferruginea		x	-
Sandpiper, Marsh	Tringa stagnatilis		x	x
Sandpiper, Wood	Tringa glareola		x	x
Scimitarbill, Common	Rhinopomastus cyanomelas		x	x
Scops-owl, African	Otus senegalensis		x	x
Scops-owl, Southern White-faced	Ptilopsus granti		x	-
Scrub-robin, Kalahari	Cercotrichas paena		x	x
Scrub-robin, White-browed	Cercotrichas leucophrys		x	x
Secretarybird, Secretarybird	Sagittarius serpentarius		x	-
Seedeater, Streaky-headed	Crithagra gularis		x	-
Shelduck, South African	Tadorna cana		x	-
Shikra, Shikra	Accipiter badius		x	x
Shoveler, Cape	Anas smithii		x	x
Shrike, Crimson-breasted	Laniarius atrococcineus		x	x
Shrike, Lesser Grey	Lanius minor		x	x
Shrike, Magpie	Corvinella melanoleuca		x	x
Shrike, Red-backed	Lanius collurio		x	x
Shrike, Southern White-crowned	Eurocephalus anguitimens		x	x
Snake-eagle, Black-chested	Circaetus pectoralis		x	x
Snake-eagle, Brown	Circaetus cinereus		x	x
Sparrow, Cape	Passer melanurus		x	x
Sparrow, Great	Passer motitensis		x	x
Sparrow, House	Passer domesticus		x	x
Sparrow, Northern Grey-headed	Passer griseus		x	-

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Sparrow, Southern Grey-headed	Passer diffusus		x	x
Sparrowhawk, Little	Accipiter minullus		x	-
Sparrowhawk, Ovambo	Accipiter ovampensis		x	-
Sparrowlark, Chestnut-backed	Eremopterix leucotis		x	-
Sparrowlark, Grey-backed	Eremopterix verticalis		x	-
Sparrow-weaver, White-browed	Plocepasser mahali		x	x
Spoonbill, African	Platalea alba		x	x
Spurfowl, Natal	Pternistis natalensis		x	x
Spurfowl, Swainson's	Pternistis swainsonii		x	x
Starling, Burchell's	Lamprotornis australis		x	x
Starling, Cape Glossy	Lamprotornis nitens		x	x
Starling, Red-winged	Onychognathus morio		x	x
Starling, Violet-backed	Cinnyricinclus leucogaster		x	x
Starling, Wattled	Creatophora cinerea		x	x
Stilt, Black-winged	Himantopus himantopus		x	x
Stint, Little	Calidris minuta		x	x
Stonechat, African	Saxicola torquatus		x	x
Stork, Abdim's	Ciconia abdimii	NT	x	x
Stork, Black	Ciconia nigra	VU	x	x
Stork, Marabou	Leptoptilos crumeniferus	NT	x	x
Stork, White	Ciconia ciconia	BONN	x	x
Stork, Yellow-billed	Mycteria ibis	EN	x	x
Sunbird, Amethyst	Chalcomitra amethystina		x	x
Sunbird, Malachite	Nectarinia famosa		x	-
Sunbird, Marico	Cinnyris mariquensis		x	x
Sunbird, White-bellied	Cinnyris talatala		x	x
Swallow, Barn	Hirundo rustica		x	x
Swallow, Greater Striped	Hirundo cucullata		x	x
Swallow, Lesser Striped	Hirundo abyssinica		x	x
Swallow, Pearl-breasted	Hirundo dimidiata		x	x
Swallow, Red-breasted	Hirundo semirufa		x	x
Swallow, White-throated	Hirundo albigularis		x	-
Swamphen, African Purple	Porphyrio madagascariensis		x	-
Swamp-warbler, Lesser	Acrocephalus gracilirostris		x	-
Swift, African Black	Apus barbatus		x	x
Swift, Alpine	Tachymarptis melba		x	x
Swift, Common	Apus apus		x	-
Swift, Horus	Apus horus		x	-

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Swift, Little	Apus affinis		x	x
Swift, White-rumped	Apus caffer		x	x
Tchagra, Black-crowned	Tchagra senegalus		x	x
Tchagra, Brown-crowned	Tchagra australis		x	x
Teal, Cape	Anas capensis		-	x
Teal, Hottentot	Anas hottentota		x	-
Teal, Red-billed	Anas erythrorhyncha		x	x
Tern, Whiskered	Chlidonias hybrida		x	-
Tern, White-winged	Chlidonias leucopterus		x	-
Thick-knee, Spotted	Burhinus capensis		x	x
Thrush, Groundscraper	Psophocichla litsipsirupa		x	x
Thrush, Karoo	Turdus smithi		x	x
Thrush, Kurrichane	Turdus libonyanus		x	x
Thrush, Olive	Turdus olivaceus		x	-
Tinkerbird, Yellow-fronted	Pogoniulus chrysoconus		x	x
Tit, Ashy	Parus cinerascens		x	x
Tit, Southern Black	Parus niger		x	x
Tit-babbler, Chestnut-vented	Parisoma subcaeruleum		x	x
Tit-flycatcher, Grey	Myioparus plumbeus		x	x
Turtle-dove, Cape	Streptopelia capicola		x	x
Vulture, Cape	Gyps coprotheres	EN	x	x
Vulture, Lappet-faced	Torgos tracheliotus		x	-
Vulture, White-backed	Gyps africanus		x	-
Wagtail, African Pied	Motacilla aguimp		-	x
Wagtail, Cape	Motacilla capensis		x	x
Warbler, Icterine	Hippolais icterina		x	x
Warbler, Olive-tree	Hippolais olivetorum		x	-
Warbler, Sedge	Acrocephalus schoenobaenus		x	-
Warbler, Willow	Phylloscopus trochilus		x	x
Waxbill, Black-faced	Estrilda erythronotos		x	x
Waxbill, Blue	Uraeginthus angolensis		x	x
Waxbill, Common	Estrilda astrild		x	x
Waxbill, Orange-breasted	Amandava subflava		x	x
Waxbill, Violet-eared	Granatina granatina		x	x
Weaver, Cape	Ploceus capensis		x	-
Weaver, Red-headed	Anaplectes rubriceps		x	x
Weaver, Thick-billed	Amblyospiza albifrons		-	x
Weaver, Village	Ploceus cucullatus		x	x

SPECIES	TAXONOMIC NAME	CONS. STATUS	SABAP 1	SABAP 2
Wheatear, Capped	Oenanthe pileata		x	-
White-eye, Cape	Zosterops virens		x	x
White-eye, Orange River	Zosterops pallidus		x	-
Whitethroat, Common	Sylvia communis		x	-
Whydah, Pin-tailed	Vidua macroura		x	x
Whydah, Shaft-tailed	Vidua regia		x	x
Widowbird, Long-tailed	Euplectes progne		x	-
Widowbird, White-winged	Euplectes albonotatus		x	x
Wood-dove, Emerald-spotted	Turtur chalcospilos		x	x
Wood-hoopoe, Green	Phoeniculus purpureus		x	x
Woodpecker, Bearded	Dendropicos namaquus		x	x
Woodpecker, Bennett's	Campethera bennettii		x	-
Woodpecker, Cardinal	Dendropicos fuscescens		x	x
Woodpecker, Golden-tailed	Campethera abingoni		x	x
Wren-warbler, Barred	Calamonastes fasciolatus		x	x

APPENDIX 3
METHOD OF ASSESSING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise as a result of the development of the proposed railway crossing loop extensions. The process of assessing the impacts of the project encompasses the following four activities:

- Identification and assessment of potential impacts
- Prediction of the nature, magnitude, extent and duration of potentially significant impacts
- Identification of mitigation measures that could be implemented to reduce the severity or significance of the impacts of the activity
- Evaluation of the significance of the impact after the mitigation measures have been implemented i.e. the significance of the residual impact.

In accordance with GNR 543, promulgated in terms of section 24 of the National Environmental Management Act, 1998 (Act 107 of 1998), specialists will be required to assess the significance of potential impacts in terms of the following criteria:

- Cumulative impacts
- Nature of the impact
- Extent of the impact
- Intensity of the impact
- Duration of the impact
- Probability of the impact occurring
- Impact non-reversibility
- Impact on irreplaceable resources
- Confidence level

Issues are assessed in terms of the following criteria:

- The nature, a description of what causes the effect, what will be affected and how it will be affected
- The physical extent, wherein it is indicated whether:

  1 - the impact will be limited to the site

  2 - the impact will be limited to the local area

  3 - the impact will be limited to the region

  4 - the impact will be national

  5 - the impact will be international

» The duration, wherein it is indicated whether the lifetime of the impact will be:

1 - of a very short duration (0–1 years)

2 - of a short duration (2-5 years)

3 - medium-term (5–15 years)

4 - long term (> 15 years)

5 – permanent

» The magnitude of impact on ecological processes, quantified on a scale from 0-10, where a score is assigned:

0 - small and will have no effect on the environment

2 - minor and will not result in an impact on processes

4 - low and will cause a slight impact on processes

6 - moderate and will result in processes continuing but in a modified way

8 - high (processes are altered to the extent that they temporarily cease)

10 - very high and results in complete destruction of patterns and permanent cessation of processes

» The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

1 - very improbable (probably will not happen

2 - improbable (some possibility, but low likelihood)

3 - probable (distinct possibility)

4 - highly probable (most likely)

5 - definite (impact will occur regardless of any prevention measures)

» The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.

» The status, which is described as either positive, negative or neutral.

» The degree to which the impact can be reversed.

» The degree to which the impact may cause irreplaceable loss of resources.

» The degree to which the impact can be mitigated.

The significance is determined by combining the criteria in the following formula:

S = (E + D + M) * P

The significance weightings for each potential impact are as follows:

< 30 points: LOW (i.e. where this impact would not have a direct influence on the decision to develop in the area);

30-60 points: MEDIUM (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated);

> 60 points: HIGH (i.e. where the impact must have an influence on the decision process to develop in the area).