

**AVIAN IMPACT ASSESSMENT
FOR
GOURIKWA - BLANKO
400 KV TRANSMISSION POWER LINE
AND
SUBSTATION UPGRADES**



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INDEX

SECTION	TITLE	PAGE
1	OVER VIEW	3
2	BIOMES AND VELD TYPES	4 - 6
3	ALTERNATIVES	7 - 11
4	TRANSMISSION POWER LINE AVIAN IMPACTS	12 - 14
5	IMPACTS & ASSESMENT TABLES	15
6	AVIAN SPECIES LIST	16 - 22
7	MIGRANT SPECIES	23
8	GAME BIRDS AND RED DATA SPECIES	24 - 26
9	LOCALITY MAPS	27
10	ACKNOWLEDGEMENTS	28
	PHOTOGRAPHS TAKEN BY AUTHOR DURING FIELD TRIPS TO SCOPING AREA 2015	

OVERVIEW

Eskom Transmission and grid planning has identified the need to ensure that Gourikwa Substation is grid code compliant. Gourikwa—Proteus 1 and 2, 400Kv transmission power lines. This results in the islanding of the Gourikwa Power Station. Proteus--Bacchus and Droërivier—Blanco 400Kv transmission power lines. This results in the islanding of the Gourikwa Power Station together with Blanco and Proteus transmission Substations.

Gourikwa Power Station generates 740 Mw. Different options were studied and considered to ensure compliance over Gourikwa Power Station. The third line thus needs to be built out of the facility.

The project entails the construction of a 50Km.long 400Kv.Transmission Power Line from Gourikwa Substation at Mossel Bay to the Blanco Substation at George, and the construction of a 200Km. long 400Kv. Transmission Power Line from Blanco Substation to the Droërivier Substation at Beaufort West in the Western Cape. The alternative routes that are investigated for the latter section are located in the Eastern Cape Province.

Gourikwa to Blanco

The gap between Gourikwa and Blanco Substations is sandwiched between the Ocean and a Mountainous terrain. Two corridors have been identified, option 1 and 2 with a third option which is a slight deviation from the option 2. All the options have been aligned mostly to be parallel to the existing Transmission Power Lines.

Option 3 is an alternative to option 2. The corridor is aligned Easterly towards Hartenbos. Hartenbos is a developed suburb.

Option 3 deviation joins the option 2 corridor on the Northern side of Brandwag River.

Option 2 exits Gourikwa Substation in the same direction as option 1 Option 2 turns Easterly to cross over the R327 Road and run parallel to the existing distribution power lines.

Option 2 route is heavily characterized by passing several dams and water features, it also traverses over difficult terrain.

Two dams will be directly crossed over if the proposed route is aligned 55m parallel to the existing Dx Power lines.

The remaining dams will be in close proximity of the proposed alignmen but could possibly be avoided.

Option 1 runs parallel to the existing Proteus--Droerivier 400Kv. Power line for approximately 45Km.until it reaches the site of the proposed Blanco Substation. On the Blanco EIA project, the existing Proteus--Droerivier will loop in and out of the proposed Blanco Substation and the option 1 route aims to follow the existing power line all the way until Blanco proposed substation.

Biomes and Veld types for scoping area

There are four Biome types in the study area that the transmission powerlines traverse through namely :-

Forest Fynbos
Savanna Succulent Karoo

There are four Veld types in the study area that the transmission power

lines traverse through namely :-

Forest with grass Veld
Fynbos
Savanna valley bushveld
Succulent and desert Karoo

Forest type :- Montane
Veld types :- Mixedveld
 Sourveld
 Sweetveld

Precipitation for the scoping area :- < 200mm to > 800mm per Annum

KLEIN KAROO

The Klein Karoo is sharply defined by mountain ranges to the West, North and South, known as Swartberg (North) Langeberg – Outeniqua (South) . Nama Karoo vegetation of the semi-arid Karoo region largely comprises low shrubs and grasses.

Peak rainfall occurs in summer, trees and alien species are mainly restricted to water courses especially in the South Eastern Karoo. The Nama Karoo has higher proportions of grass and tree cover in comparison to the Succulent Karoo.

Many avian species show clear differences in relative abundance between the Succulent Karoo and the Nama Karoo vegetation types, for example the Karoo Lark and Thickbilled Lark show clear preference for the Succulent Karoo and the Red Lark, Slaters Lark are restricted to the Nama Karoo, this also applies to the Ludwig's Bustard and the Larklike Bunting.

Rainfall in Nama Karoo is mainly in summer while Succulent Karoo receives rain in winter, this provides opportunities for the migration of avian species between the Nama Karoo and Succulent Karoo to take advantage of the enhanced conditions associated with rainfall.

FYNBOS

Fynbos is dominated by low shrubs and has two major vegetation divisions Fynbos proper and Renosterbos.

Renosterveld has now been largely replaced by Agricultural crop fields and planted pastures.

This biome is characterized by a high level of diversity and endemism in its botanical composition.

The endemic avifauna consists of, Cape Rockjumper, Cape Sugarbird and Cape Siskin. The Black Harrier, endemic to Southern Africa is likely to have most of its breeding grounds in the Fynbos but is associated with Forest-edge habitats. The Fynbos also shares some Avian species with the Karoo such as the Greybacked Cisticola and the Karoo Prinia.

The introduction of alien trees and the establishment of crop fields, and planted pastures in the Fynbos has resulted in numerous Avian species colonizing or increasing in abundance in these areas.

SAVANNA

Savanna is open grasslands with scattered bushes or trees.

Savanna is the largest Biome in South Africa covering 34 % of the country about (435000 sq.km.)

It is a mixture of grasses and trees or shrubs. Shrubland, Bushveld and Woodland are types of Savanna

Savanna stretches from the Kalahari in the North West across to the Lowveld in the North East and South wards to the low lands of Kwa-Zulu Natal and the Eastern Cape, it is found from sea level to about 2000m above sea level.

Fires are frequent, most plants can re-sprout after fire. More than 5700 plant species grow in the Savanna Biome.

Many grassland birds, several of which are endemic to South Africa show a clear preference for Sour over Sweet and Mixed grasslands

Some of these are essentially absent from the latter two grassland types



FOREST

Forest is the smallest Biome in South Africa covering about 0.1% of the country (1062km)

Forests are found at sea level to above 2000m. They grow in areas with high rainfall and no frost.

Forests consist of trees that form a closed canopy with layers of plants beneath the canopy.

The largest and most famous forests in South Africa are Knysna and Tsitsikama forest of the Southern Cape.

Birds include Knysna Lourie, Pigeons, and Eagles.

Today many indigenous forests have been replaced by plantations of alien trees (e.g. Pine trees) the harvesting of indigenous forest trees is strictly controlled.

Southern Afro temperate Forest (the Southern Cape Forest) is a kind of tall, shady, multilayered indigenous South African Forest.

This is the main Forest type in the South Western part of South Africa extending from the Cape Peninsula in the West to Port Elizabeth in the East. It usually occurs in small Forest pockets and is home to avian species such as the Knysna Lourie and Forest Buzzard. The Forest is mostly surrounded by Fynbos vegetation.



ALTERNATIVES

Alternative 1 Gourikwa --- Blanco

Geography:

Biome Fynbos, Rivers, Plantations, Mountainous terrain and Southern coastal plain.

This route is the most Northerly of the three routes that exits from Gourikwa Substation from the North-Eastern side and is aligned Northerly towards Proteus Substation parallel to the Dx Duinzicht-Proteus 66Kv power line. The alignment then turns North-Easterly to join the existing Proteus- Droerivier power line before it

reaches Proteus Substation. The proposed alignment runs parallel to the Droerivier 400Kv power line, for approximately 45Km until it reaches the site of the proposed Blanco Substation. On the Blanco EIA project, the existing Proteus-Droerivier will loop in and out of the proposed Blanco Substation and the option 1 aims to follow the existing power line all the way until proposed Blanco Substation.

The route runs farther away from Urban settlements than the other two options and is predominantly agricultural, Dairy, Arable, Game farming and Plantations.

During the field trip interviews with the land owners revealed that species such as Fish Eagle, Black Eagle and Giant Eagle Owl are among the species that were recorded in the area of the proposed line.

There are several dams and water courses that provide a permanent habitat for a wide variety of species breeding and non-breeding, it also provides habitat for a wide variety of migrant birds. The power lines over or in close proximity to these water courses could have an adverse affect on the species flight paths, possible collisions by the larger and / or fast-flying species such as teal, duck, geese, heron and stork. Cranes bustards and korhaans which are large heavy bodied, flocking and low flying are highly susceptible to line collisions, predatory birds can also be at risk along with birds that tend to fly during dusk and dawn.

The Red Data species that have been reported on this route.

Greater Flamingo: Conservation Status: Indeterminate.
 Lesser Flamingo: Conservation Status: Indeterminate.
 Kori Bustard: Conservation Status: Vulnerable.
 Stanley's Bustard: Conservation Status: Vulnerable.
 Ludwig's Bustard: Conservation Status: Vulnerable.

Co-ordinates for Bird Flight Diverters recommended along this route.

		from	34°01' 20.33" S	22°02' 40.00" E
River crossing.	to		34°01' 15.10" S	22°02' 54.04" E
		from	33°59' 46.01" S	22°02' 00.76" E
River crossing.	to		33°59' 40.68" S	22°08' 21.91" E
		from	33°59' 16.59" S	22°10' 41.75" E
Dam	to		33°59' 16.47" S	22°11' 01.91" E

Abundance of dams and water-ways require bird flight diverters for a considerable length at this point.

	from	33°59' 21.88" S	22°11' 55.07" E
	to	33°56' 29.85" S	22°19' 59.62" E
	from	33°56' 25.22" S	22°20' 55.48" E

Dam to 33°55' 57.73" S 22°21' 20.40" E

From an avian impact perspective this route would pose the least threat as it is farther away from the coastal belt where there are more likely to be larger flocks of birds near and around the river estuary's.



Alternative 2 Gourikwa --- Blanco

Geography:

Biome Fynbos, Lakes, Man made Dams, Rivers, Pans Wetlands, Southern coastal plain and Mountainous terrain.

This route exits Gourikwa Substation in the same direction as the alternative route 1.

The route turns Easterly to cross over the R327 road and run parallel to the existing distribution transmission power lines.

The route will possibly cross over approximately four dams dependant on the exact route that is decided on. Two dams will be directly crossed over if the alignment of the proposed route is aligned 55m parallel to the existing Dx transmission power lines.

- The route is heavily characterized by water features and a bad terrain.
- There is no flat topographic area between Gourikwa and Blanco.
- To encourage better access it is proposed to run the transmission power line parallel to the existing power lines.

The route is predominantly agricultural, Dairy, Arable, Game farming and Plantations. The habitat is well suited to Wetland species and ground nesting species such as Korhaan and Bustard, it is also host to a wide diversity of Migrant species.

During the field trip interviews with various land owners showed that they had concerns over the impact that the proposed power line would have on the avian species that inhabit the area as there have been several fatalities due to collisions with existing power lines among species such as Blue Crane, Bustard and Korhaan.

There are several dams, rivers and water courses that are permanent habitat for a wide variety of species, breeding and non-breeding. Power lines erected over or in close proximity to these water courses could also have an adverse affect on the species flight paths, they could also be seen as ideal nesting sites that could lead to excrement build up and the possibility of flash over's causing power outages. Due to the amount of dams situated on the proposed route it would entail a considerable amount of route deviation to avoid the avian impact and a considerable amount of bird flight diverters would have to be installed.

The Red Data species that have been reported on this route.

Greater Flamingo: Conservation status; Indeterminate.
 Lesser Flamingo: Conservation status; Indeterminate.
 Kori Bustard: Conservation status; Vulnerable.
 Stanley's Bustard: Conservation status; Vulnerable.
 Ludwig's Bustard: Conservation status; Vulnerable.
 White Stork: Conservation status; Rare.

Co-ordinates for Bird Flight Diverters recommended along this route.

	from	34°08' 05.72" S	21°56' 31.75" E
Dam	to	34°07' 42.14" S	21°56' 14.46" E

	from	34°05' 21.75" S	21°58' 46.79" E
Dam	to	34°05' 14.17" S	22°00' 24.45" E

Abundance of dams and water-ways require bird flight diverters for a considerable length at this point.

	from	34°05' 16.39" S	22°02' 43.64" E
	to	34°02' 37.60" S	22°08' 51.82" E

	from	34°00' 50.73" S	22°12' 36.43" E
Dam	to	34°00' 29.55" S	22°14' 37.21" E

	from	33°59' 31.83" S	22°15' 55.22" E
Dam	to	33°57' 38.70" S	22°20' 33.53" E

	from	33°56' 43.39" S	22°20' 54.02" E
Dam	to	33°56' 02.45" S	22°20' 53.55" E

From an Avian Impact perspective this route would not be recommended due to the amount of water features on the route and the possible affect it would have on the flight paths that are used by the local and migratory species that make use of the habitat on this route.

3 Gourikwa ---Blanco

Geography:

Biome Fynbos, Estuaries, Lagoons, Lakes, Rivers, Pans and Wetlands. This route deviation is an alternative of the route 2.

The route is aligned easterly towards Hartenbos. Hartenbos is a developed Suburb. It would be best to align the proposed route along the existing distribution transmission power lines and thus avoiding the need to create a completely new route.

This route deviation joins the route 2 on the northern side of the Brandwag River.

This route is sandwiched between the coast line and a mountainous terrain, it is predominately dairy farms, there are also game farms, eco estates and a considerable amount of urban areas.

The habitat is well suited to wetland species, Heron's, Ducks, Cormorant and Migrant Waders as examples.

Flocks of Pelican and Flamingo along with an abundance of Migrating species have been reported in this area by the local land owners evidence of Blue Crane mortalities due to collisions with existing power lines was found during the field trip, photographic evidence has been recorded.

The bird flappers that were installed on the existing lines were found to have little or no affect from the outset and have now either broken or dropped of the power line.

The type used were of the flapper design and according to the land owners never very affective, Perhaps the use of amore stable design would have been more affective.

The Red Data species that have been reported on this route.

Greater Flamingo:	Conservation status; Indeterminate.
Lesser Flamingo:	Conservation status; Indeterminate.
White Pelican:	Conservation status; Rare.
Little Bittern:	Conservation status; Rare.

Co-ordinates for Bird Flight Diverters recommended along this route.

	from	34°08' 59.75" S	22°00' 28.45" E
Dam	to	34°08' 55.38" S	22°00' 28.45" E

From an avian impact perspective this route would not be recommended due to the sensitivity of the wetland habitat and the flight paths of both the resident species and the numerous migratory species that make use of the habitats of this proposed route.

Transmission power line avian impacts

1) Collisions with associated power line infrastructure.

- 2) Electrocutation on associated power line infrastructure.
- 3) Nesting on associated power line infrastructure.
- 4) Disturbance through construction and maintenance activities of new power line.
- 5) Direct interaction in which the bird comes into physical contact with the power line infrastructure.
- 6) Indirect interaction include, disturbance or habitat destruction as a direct result of construction and maintenance which could have a negative impact.
- 7) The design of the transmission line and associated pylons also has a bearing on the risks to certain avian species.
The earthing conductors is one of the biggest risks as it is thinner than the transmission conductors and therefore not as visible to birds in flight. Bird excreta on the infrastructure can also have a negative impact on the transmission lines causing possible power interruptions.
- 8) Electrocutation of birds on pylons will depend on the particular design of the pylon to be utilized for the project, the risks to the birds is determined by the phase to phase and phase to earth clearances.
- 9) Nesting and roosting of birds on pylon structures can have a positive impact on avifauna, but it could also have a negative affect by causing electrical faults due to added weight, shorts due to excreta and possible fire risks from nesting material.

Avian species that are most consistently affected by over head transmission lines are water birds that congregate at wetlands and commute between them in flocks, examples being large and / or fast flying species examples such as ducks, geese, flamingos, storks, herons and waders, that have a high collision rate. Game birds and rails have less exposure but are still highly susceptible. Canes, storks, bustards korhaans which are large heavy bodied, flocking and low flying are also highly susceptible to collisions with over head transmission power lines.



CASUALTIES OF POWER LINE COLLISIONS FOUND DURING FIELD TRIPS.

Predatory birds can also be at risk along with species that tend to fly at dawn and dusk such as eagles and owls.

Routing transmission power lines over or close to water bodies is problematic as is valley heads and ridge tops.

Over head transmission lines should be kept as low as possible, spans as short as possible, transmission lines of a similar height and structure with common sources and destinations should be run in close parallel in affectively a common servitude. Transmission lines with different heights and configurations should be kept well apart.

Visible markers that are sufficiently large placed at regular intervals of 5--10 meters on the earthing conductors are likely to reduce collisions by approximately 50 to 80 % . (A.R.Jenkins et al). Routing transmission power lines over or close to water bodies can be problematic as are valley heads and ridge tops.

Points to be considered with the erection of over head transmission lines are line placement, to take into consideration migratory patterns and high density areas of the avian species.

Line placement taking into account environmental factors such as flight paths, topography, line configuration that reduces vertical spread of lines, use of the same right of way to increase the visibility of lines and the use of line marking with Bird Flight Diverters.

10% Blue Crane are electrocuted on Transmission Power Lines per year 1/2 the world population found in the Western Cape. (EWT).

Marking transmission lines to make them more visible to birds in flight can be achieved by using (BFD's) Bird flight diverters although there are a wide variety of types and size of bird flight diverters only a fraction have been properly field tested, but nearly all of the devices tested have yielded at least moderate reduction in collision frequency.

Evidence available suggests that any bird flight diverter that appears to thicken the line at that point by at least 20cm over a length of 10-20cm placed every 5 to 10 meters on the earth wires is likely to reduce the general collision rates.

Unfortunately there is no legitimate way to compare the results because of the wide variety of species and conditions involved.

IMPACTS

Impacts associated with the collision of avian species on new transmission power lines is likely to be of moderate significance.

This should be mitigated by marking the transmission power lines in the areas that are recommended, by installing bird flight diverters at co-ordinates given in this report.

Habitat destruction and disturbance of the avian species should be of moderate significance, this can be mitigated by ensuring that construction of the transmission power line is monitored during construction to ensure that the impact is kept to a minimum.

Disturbance of the avian species is unavoidable, but with the correct approach to the construction and maintenance of the transmission power line it can be kept to a minimum. Once construction is completed the avian populations should return to normal activities.

The disturbance of the avian habitat and biomes should only be during the construction phase, and make a full recovery once it has been completed and the sites rehabilitated back to normal.

Construction will inevitably disturb the breeding and non-breeding avian species on the proposed transmission power line routes.

These avian species will move off during construction to find new nesting sites and similar habitat elsewhere and should return after the construction phase is completed.

Dams and wetlands attract large numbers of water fowl, waders along with flamingo and stork, population numbers are subject to seasonal changes in population and the abundance of the nutrients which are providing food for the local and migrating species.

During the construction phase the disturbance should be kept to minimum by routing the transmission power lines away from these sensitive areas as far as it is practical to do so.

Game reserves and game lodges attract a large amount of visitors and foreign currency to the area. Taking this in to consideration it would be advisable to consult the owners in regard to the installation of bird flight diverters being attached to the transmission power lines that cross their property to ascertain if the avian impact risks are greater than the aesthetic impact, this would be dependant on the route that is taken and the requirements of the owners. Where there are the need for bird flight diverters being attached to the transmission power lines that cross their property consultation with the owners in regard to their positioning should be agreed on by both parties.

ASSESSMENT TABLES

Avifaunal Impact Assessment: Habitat Destruction
Nature: During the construction phase and maintenance of substations and power lines, some habitat destruction and alteration will occur due to the clearing of servitudes and vegetation at the substation site. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation intrusion and to minimise the risk of fire under the

lines. These activities have an impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat.

Avian species that are most consistently affected by over head transmission lines are water birds that congregate at wetlands and commute between them in flocks, examples being large and / or fast flying species examples such as ducks, geese, flamingos, storks, herons and waders that have a high collision rate. Game birds and rails have less exposure but are still highly susceptible. Canes, storks, bustards which are large heavy bodied, flocking and low flying are also highly susceptible to collisions with over head transmission power lines.

From an avian impact perspective Alternative 1 would pose the least threat as it is farther away from the coastal belt were there are more likely to be larger flocks of birds near and around the river estuaries. Alternative 2 would not be recommended due to the number of water features on the route and the possible affect it would have on the flight paths that are used by the local and migratory species that make use of the habitat on this route. Alternative 3 would not be recommended due to sensitivity of the wetland habitat and the flight paths of both the resident species and the numerous migratory species that make use of the habitats of this proposed route. (Avifauna Report, Rodney Chrisford, 2015)

CONSTRUCTION PHASE		
Rating of Impacts	Without mitigation	With mitigation
Probability	Definite (5)	Highly Probable (4)
Duration	Permanent (5)	Permanent (5)
Extent	Limited to Site (1)	Limited to Site (1)
Magnitude	Moderate (6)	Low (4)
Significance	60 (high)	40 (medium)
<i>Alternative 1</i>	50 (high)	30 (medium)
<i>Alternative 2</i>	55 (high)	36 (medium)
<i>Alternative 3</i>	60 (high)	45 (medium)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Permanent (5)	Permanent (5)
Extent	Limited to Site (1)	Limited to Site (1)
Magnitude	Moderate (6)	Low (4)
Significance	36 (medium)	20 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	
No Go Alternative	The no-go option would prevent loss of faunal habitat that is important to Avifauna	

<p>Mitigation:</p> <ul style="list-style-type: none"> • Owners of Nature and Game Reserves to be consulted to estimate if and where there is a need for bird flight diverters being attached to the transmission power lines that cross their properties (Avifauna Report, Rodney Chrisford, 2015). • All construction and maintenance activities must be carried out according to the generally accepted environmental best practice and the temporal and spatial footprint of the development should be kept to a minimum. In particular, care must be taken in the vicinity of the drainage lines and existing roads must be used as much as possible for access during construction. • The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area. • Wetland areas where water birds frequent to be treated as sensitive areas, best to be avoided. • Bird markers to be placed every 50m on the line where it occurs in the vicinity of water bodies (Avifauna Report, Rodney Chrisford, 2015). • Provide adequate briefing for site personnel. • Any bird nests that are found during the construction period must be reported to the Environmental Control Officer (ECO). • The above measures must be covered in a site specific EMPr and controlled by an ECO.
<p>Cumulative impacts: Expected to be moderate. Portions of the habitat are relatively unique within the landscape. Some Red Data species could be displaced temporarily by the habitat transformation that will take place as a result of the construction and operation of the proposed development.</p>
<p>Residual Risks: None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.</p>

Avifaunal Impact Assessment: Disturbance of birds

Nature: In terms of disturbance of birds, Alternative 1 would pose the least threat as it is farther away from the coastal belt where there are more likely to be larger flocks of birds near and around the river estuaries. Disturbance at Alternative 2 and 3 would be more significant due to the number of water features and the flight paths of resident species and migratory species. (Avifauna Report, Rodney Chrisford, 2015)

Species residing within this landscape often experience varying degrees of disturbance. As a result, disturbance of birds by the proposed substation and power line is anticipated to be of low significance as birds will move away from the area temporarily. Species sensitive to disturbance and ground-nesting species resident within the development footprint will be particularly susceptible. Game reserves and game lodges attract a large amount of visitors and foreign currency to the area. Taking this into consideration it would be advisable to consult the owners in regard to the installation of bird flight diverters being attached to the transmission power lines that cross their property to ascertain if the avian impact risks are greater than the aesthetic impact, this would be dependent on the route that is taken and the requirements of the owners.

CONSTRUCTION PHASE		
Rating of Impacts	Without mitigation	With mitigation
Probability	Definite (5)	Highly Probable (4)
Duration	Short Duration (2)	Short Duration (2)
Extent	Limited to Local Area (2)	Limited to Site (1)

Magnitude	Moderate (6)	Low (4)
Significance	50 (medium)	28 (low)
<i>Alternative 1</i>	50 (medium)	30 (medium)
<i>Alternative 2</i>	55 (high)	36 (medium)
<i>Alternative 3</i>	60 (high)	45 (medium)
Status (positive or negative)	Negative	Negative
OPERATIONAL PHASE		
Probability	Probable (3)	Improbable (2)
Duration	Permanent (5)	Permanent (5)
Extent	Limited to Site (1)	Limited to Site (1)
Magnitude	Moderate (6)	Low (4)
Significance	36 (medium)	20 (low)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	
No Go Alternative	The no-go option would prevent disturbance of birds	
Mitigation: <ul style="list-style-type: none"> • Owners of Game Reserves and eco-estates to be consulted to estimate if and where there is a need for bird flight diverters being attached to the transmission power lines that cross their properties (Avifauna Report, Rodney Chrisford, 2015). • All construction and maintenance activities must be carried out according to the generally accepted environmental best practice and the temporal and spatial footprint of the development should be kept to a minimum. In particular, care must be taken in the vicinity of the drainage lines and existing roads must be used as much as possible for access during construction. • The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area. • Wetland areas where water birds frequent to be treated as sensitive areas, best to be avoided. • Bird markers to be placed every 50m on the line where it occurs in the vicinity of water bodies (Avifauna Report, Rodney Chrisford, 2015). • Strict control must be maintained over all activities during construction, in line with an approved Construction EMP. • During Construction, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified. • Contractors and working staff should stay within the development footprint and movement outside these areas including avian micro-habitats must be restricted. Water bodies are of particular importance and best avoided by personnel. • Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads running through the study area during all phases. 		
Cumulative impacts: Impact on birds is expected to be of moderate significance. Species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.		
Residual Risks: None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.		

Avifaunal Impact Assessment: Electrocutation of birds on power line

Nature: Electrocutation of birds on associated overhead power lines is an important cause of mortality for a variety of bird species particularly storks, cranes and raptors in South Africa. The design of the transmission line and associated pylons also has a bearing on the risks to certain avian species. The earthing conductors create one of the biggest risks as it is thinner than the transmission conductors and therefore not as visible to birds in flight. Bird excreta on the infrastructure can also have a negative impact on the transmission lines causing possible power interruptions. Electrocutation of birds on pylons will depend on the particular design of the pylon to be utilized for the project, the risks to the birds is determined by the phase to phase and phase to earth clearances (Avifauna Report, Rodney Chrisford, 2015).

Nesting and roosting of birds on pylon structures can have a positive impact on avifauna, but it could also have a negative affect by causing electrical faults due to added weight, shorts due to excreta and possible fire risks from nesting material. Avian species that are most consistently affected by over head transmission lines are water birds that congregate at wetlands and commute between them in flocks, examples being large and / or fast flying species examples such as ducks, geese, flamingos, storks, herons and waders that have a high collision rate. Game birds and rails have less exposure but are still highly susceptible. Canes, storks, bustards korhaans which are large heavy bodied, flocking and low flying are also highly susceptible to collisions with over head transmission power lines (Avifauna Report, Rodney Chrisford, 2015). The potential for this impact is similar for all three the alternatives, but due to the presence of more water bodies along Alternative 2 and 3, the impact may be more for these routes than for Alternative 1.

CONSTRUCTION PHASE

During construction the lines will not carry voltage and thus no electrocutation is possible.

OPERATIONAL PHASE

Rating of Impacts	Without mitigation	With mitigation
Probability	Probable (3)	Improbable (2)
Duration	Long term (4)	Long term (4)
Extent	Limited to Local Area (2)	Limited to Local Area (2)
Magnitude	Moderate (6)	Low (4)
Significance	36 (medium)	20 (low)
<i>Alternative 1</i>	39 (medium)	20 (low)
<i>Alternative 2</i>	52 (medium)	30 (medium)
<i>Alternative 3</i>	52 (medium)	30 (medium)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	
No Go Alternative	The no-go option would not add to the situation regarding electrocutation of birds	

Mitigation:

- All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents.
- Installation of artificial bird space perches and nesting platforms, at a safe distance from energised.

<ul style="list-style-type: none"> Bird markers to be installed in areas of water bodies and where property owners have indicated the occurrence of breeding pairs or bird colonies (Avifauna Report, Rodney Chrisford, 2015).
<p>Cumulative impacts: The impact assessment found the impact of electrocution to be of moderate significance after the mitigation in the form of bird friendly structures.</p>
<p>Residual Risks: None anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.</p>

Avifaunal Impact Assessment : Summary of collisions of birds with the power line Alternative 1,2, and 3		
<p>Nature: Collisions are the biggest single threat posed by transmission power lines to birds in Southern Africa. The Red Data species that are vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. The potential of collisions of birds exists equally for both alternatives, but due to the additional length of Alternative 2, the impact may be more than for Alternative 1.</p>		
CONSTRUCTION PHASE		
<p>During construction, lines will not be erected at operational height and will thus not have a risk of collisions.</p>		
OPERATIONAL PHASE		
Significance	Without mitigation	With mitigation
Collisions with Route 1	39 (medium)	20 (low)
Collisions with Route 2	52 (medium)	30 (medium)
Collisions with Route 3	52 (medium)	30 (medium)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes	
No Go Alternative	The no-go option would prevent an increase in bird collisions	
<p>Mitigation:</p> <ul style="list-style-type: none"> Mark sections of line in high sensitivity areas with anti-collision marking devices (diurnal and nocturnal diverters) to increase the visibility of the power line and reduce likelihood of collisions. Marking devices should be spaced 10 m apart in areas where the line is located in close proximity of water bodies, and where large winged birds are known to breed. Marking devices include spiral vibration dampers, strips, Firefly Bird Flight Diverters, bird flappers, aerial marker spheres, ribbons, tapes, flags and aviation balls. Construction of the power line in close proximity to other existing lines will reduce the cumulative impacts and collision risk. 		
<p>Cumulative impacts: Various species require specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. These species have not evolved to cope with high adult mortality. Therefore, consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the medium to long term.</p>		
<p>Residual Risks: Low risk anticipated provided that the mitigation measures are implemented correctly and rehabilitation of the site is undertaken.</p>		

COMPLETE LIST OF THE AVIAN SPECIES THAT HAVE BEEN RECORDED IN THE SCOPING AREA FOR THE GOURIKWA - BLANCO - DROERIVIER 400KV TRANSMISSION POWER LINES AND SUBSTATION UPGRADES

The following species list is shown in family groups for easy identification the left hand number is the Roberts number (Maclean 1993b)

NON--PASSERINES

Family; Podicipediformes:

GREBES

- 006 Great Crested Grebe
- 007 Black necked Grebe
- 008 Dabchick

Family; Anhingidae:

DARTERS

- 060 Darter

Family; Ardeidae:

HERONS, EGRETS, BITTERNES

- 062 Grey Heron
- 063 Blackheaded Heron
- 065 Purple Heron
- 066 Great White Heron
- 067 Little Egret

Family:Phalacrocoracidae:

CORMORANTS

- 055 Whitebreasted Cormorant
- 058 Reed Cormorant

- 068 Yellowbilled Egret
- 071 Cattle Egret
- 076 Blackcrowned Night heron
- 078 Little Bittern
- 080 Bittern

Family; Scopidae:

HAMERKOP

- 081 Hamerkop

Family; Plataleidae:

IBISES, SPOONBILLS

- 091 Sacred Ibis
- 093 Glossy Ibis
- 094 Hadeda Ibis
- 095 African Spoonbill

Family; Ciconiidae:

STORKS

- 083 White Stork
- 084 Black Stork

Family; Phoenicopteridae:

FLAMINGOS

- 096 Greater Flamingo
- 097 Lesser Flamingo

Family; Anatidae:

DUCKS, GEESE, SWANS

- 100 Fulvous Duck
- 101 Whitebacked Duck
- 102 Egyptian Goose
- 103 South African Shelduck
- 104 Yellowbilled Duck
- 105 African Black Duck
- 106 Cape Teal

- 107 Hottentot Teal
- 108 Redbilled Teal
- 112 Cape Shoveller
- 113 Southern Pochard
- 116 Spurwinged Goose
- 117 Maccos Duck

**Family; Sagittariidae:
SECRETARYBIRD**

118 Secretarybird

Family; Accipitridae:

VULTURES, KITES, HAWKS, EAGLES, BUZZARDS, HARRIERS

122 Cape Vulture	155 Redbreasted Sparrowhawk
127 Blackshouldered Kite	157 Littlesparrow Hawk
131 Black Eagle	158 Blacksparrow Hawk
136 Booted Eagle	160 African Goshawk
140 Martial Eagle	162 Pale Chanting Goshawk
148 African Fish Eagle	165 African Marsh Harrier
149 Steppe Buzzard	168 Black Harrier
150 Forest Buzzard	169 Gymnogone
152 Jackal Buzzard	

**Family; Pandionidae:
OSPREY**

170 Osprey

**Family; Falconidae:
FALCONS, KESTRELS**

171 Peregrine Falcon
172 Lanner Falcon
173 Hobby Falcon
181 Rock Kestrel
182 Greater Kestrel
183 Lesser Kestrel

**Family; Phasianidae:
FRANCOLINS, QUAIL**

190 Greywing Francolin
192 Redwing Francolin
195 Cape Francolin
198 Rednecked Francolin
200 Common Quail

**Family; Numididae:
GUINEAFOWL**

203 Helmeted Guineafowl

**Family; Turnicidae:
BUTTONQUAILS**

206 Blackrumped Buttonquail

**Family; Gruidae:
CRANES**

208 Blue Crane

Family; Rallidae:

RAILS, CRAKES, FLUFFTAILS, GALLINULES, MOORHENS, COOTS

213 Black Crake	221 Striped Flufftail
215 Billions Crake	223 Purple Gallinule
217 Redchested Flufftail	226 Moorhen
218 Buffspotted Flufftail	228 Redknobed Coot

**Family; Otididae:
BUSTARDS, KORHAANS**

230 Kori Bustard	235 Karoo Korhaan
231 Stanley's Bustard	239 Black Korhaan
232 Ludwig's Bustard	

**Family; Charadriidae:
PLOVERS**

248 Kittlitz's Plover
249 Threebanded Plover

255 Crowned Plover
258 Blacksmith Plover

**Family; Scolopacidae:
TURNSTONES, SANPIPERS, STINTS, SNIPE, CURLEWS**

264 Common Sandpiper
265 Green Sandpiper
266 Wood Sandpiper
269 Marsh Sandpiper
270 Greenshank

272 Curlew Sandpiper
274 Little Stint
284 Ruff
286 Ethiopian Snipe

**Family; Recurvirostridae:
AVOCETS, STILTS**

294 Avocet
295 Blackwinged Stilt

**Family; Burhinidae:
DIKKOPS**

297 Spotted Dikkop
298 Water Dikkop

**Family; Glareolidae:
COURSERS, PRATINCOLES**

299 Burchell's Courser

**Family; Laridae:
SKUAS, GULLS, TERNS**

315; Greyheaded Gull
338; Whiskered Tern
339; Whitewinged Tern

**Family; Pteroclididae:
SANDGROUSE**

344 Namaqua Sandgrouse

**Family; Columbidae:
PIGEONS, DOVES**

349 Rock Pigeon
350 Rameron Pigeon
352 Redeyed Dove
354 Cape Turtle Dove

355 Laughing Dove
356 Namaqua Dove
360 Cinnamon Dove

**Family; Cuculidae:
CUCKOOS, COUCALS**

374 European Cuckoo
377 Redched Cuckoo
378 Black Cuckoo
382 Jacobin Cuckoo

385 Klaas's Cuckoo
386 Diederik Cuckoo
391 Whitebrowed Coucal

**Family; Tytonidae:
BARN, GRASS, OWLS**

392 Barn Owl
393 Grass

Family; Strigidae:
TYPICAL OWLS

394 Wood Owl
395 Marsh Owl

400 Cape Eagle Owl
401 Spotted Eagle Owl

Family; Caprimulgidae:
NIGHTJARS

404 European Nightjar
405 Fierynecked Nightjar

Family; Apodidae:
SWIFTS

411 European Swift
412 Black Swift
415 Whiterumped Swift

416 Horus Swift
417 Little Swift
418 Alpine Swift

Family; Coliidae:
MOUSEBIRDS

424 Speckled Mousebird
425 Whitebacked Mousebird
426 Redfaced Mousebird

Family; Trogonidae:
TROGONS

427 Narina Trogon

Family; Halcyonidae:
KINGFISHERS

428 Pied Kingfisher
429 Giant Kingfisher
430 Halfcollared Kingfisher
431 Malachite Kingfisher
435 Brownhooded Kingfisher

Family; Meropidae:
BEE-EATERS

438 European Bee-eater

Family; Upupidae:
HOOPOE

451 Hoopoe

Family; Phoeniculidae:
WOODHOOPES

452 Redbilled Woodhoopoe

Family; Capitonidae:
BARBETS, TINKER BARBETS

464 Blackcollared Barbet
465 Pied Barbet

Family; Indicatoridae:
HONEYGUIDES

474 Greater Honeyguide

Family; Picidae:
WOODPECKERS

480 Ground Woodpecker
486 Cardinal Woodpecker
488 Olive Woodpecker

PASSERINES

Family; Alaudidae:

LARKS

495 Clapper Lark
500 Longbilled Lark
506 Spikeheeled Lark

507 Redcapped Lark
512 Thickbilled Lark
516 Greybacked Finchlark

Family; Hirundinidae:

SWALLOWS, MARTINS

518 European Swallow
520 Whitethroated Swallow
523 Pearlbreasted Swallow
526 Greater Striped Swallow

529 Rock Martin
530 House Martin
533 Brownthroated Martin
534 Banded Martin

Family; Campephagidae:

CUCKOOSHRIKES

538 Black Cuckooshrike
540 Grey Cuckooshrike

Family; Dicruridae:

DRONGOS

541 Forktailed Drongo

Family; Oriolidae:

ORIOLES

545 Blackheaded Oriole

Family; Corvidae:

CROWS, RAVENS

547 Black Crow
548 Pied Crow
550 Whitenecked Raven

Family; Paridae:

TITS

551 Southern Grey Tit
554 Southern Black Tit

Family; Remizidae:

PENDULINE TITS

557 Cape Penduline Tit

Family; Pycnonotidae:

BULBULS

566 Cape Bulbul
569 Terrestrial Bulbul

572 Sombre Bulbul

Family; Turdidae:

THRUSHES, CHATS, ROBINS, ROCKJUMPERS

577 Olive Thrush
581 Cape Rock Thrush
582 Sentinel Rock Thrush
586 Mountain Chat
587 Capped Wheatear
589 Familiar Chat
592 Karoo Chat
593 Mocking Chat

595 Anteating Chat
596 Stone Chat
598 Chorister Robin
601 Cape Robin
611 Cape Rockjumper
613 Whitebrowed Robin
614 Karoo Robin

Family; Sylviidae:

WARBLERS, APALISES, CROMBECS, EREMOMELAS, CISTICOLAS, PRINIAS

621 Titbabbler	651 Longbilled Crombec
631 African Marsh Warbler	664 Fantailed Cisticola
633 European Marsh Warbler	666 Cloud Cisticola
635 Cape Reed Warbler	669 Greybacked Cisticola
638 African Sedge Warbler	677 Levaillant's Cisticola
643 Willow Warbler	681 Neddicky
644 Yellowthroated Warbler	686 Karoo Prinia
645 Barthroated Apalis	688 Roufouseared Warbler

Family; Muscicapidae:

FLYCATHERS, BATISES

689 Spotted Flycatcher	700 Cape Batis
690 Dusky Flycatcher	710 Paradise Flycatcher
698 Fiscal Flycatcher	

Family; Motacillidae:

WAGTAILS, PIPITS, LONGCLAWS

713 Cape Wagtail	718 Plainbacked Pipit
716 Grassveld Pipit	727 Orangethroated Longclaw
717 Longbilled Pipit	

Family; Laniidae:

SHRIKES

732 Fiscal Shrike

Family; Malaconotidae:

BOUBOUS, TCHAGRAS, BUSH SHRIKES

740 Puffback	746 Bokmakierie
742 Southern Tchagra	750 Olive Bush Shrike

Family; Sturnidae:

STARLINGS, MYNAS

757 European Starling	764 Glossy Starling
759 Pied Starling	768 Blackbellied Starling
760 Wattled Starling	769 Redwinged Starling

Family; Promeropidae:

SUGARBIRDS

773 Cape Sugarbird

Family; Nectariniidae:

SUNBIRDS

775 Malachite Sunbird	792 Black Sunbird
783 Lesser Doublecollared Sunbird	793 Collard Sunbird
785 Greater Doublecollared Sunbird	

Family; Zosteropidae:

WHITE-EYES

796 Cape White-eye

Family; Polceidae:

SPARROWS, WEAVERS, BISHOPS, WIDOWS, QUELEAS

801 House Sparrow

813 Cape Weaver

803 Cape Sparrow

814 Masked Weaver

804 Southern Greyheaded Sparrow

824 Red Bishop

805 Yellowthroated Sparrow

827 Yellowrumped Widow

810 Spectacled Weaver

832 Longtailed Widow

811 Spottedbacked Weaver

Family; Estrildidae:

TWINSPTS, FIREFINCHES, WAXBILLS, MANNIKINS

846 Common Waxbill

856 Redheaded Finch

850 Swee Waxbill

857 Bronze Mannikin

852 Quail Finch

Family; Viduidae:

WHYDAHs, WIDOWFINCHES

860 Pintailed Whydah

Family; Fringillidae:

CANARIES, BUNTINGS

872 Cape Canary

881 Streakyheaded Canary

874 Cape Siskin

884 Goldenbreasted Bunting

877 Bully Canary

885 Cape Bunting

878 Yellow Canary

887 Larklike Bunting

879 Whitethroated Canary

THE TOTAL NUMBER OF SPECIES (264).

MIGRANT SPECIES RECORDED IN SCOPING AREA

078	Little Bittern	non breeding	un common
083	White Stork	non breeding	
149	Steppe Buzzard	non breeding	
173	Hobby Falcon	non breeding	un common
183	Lesser Kestrel	non breeding	
264	Common Sandpiper	non breeding	
265	Green Sandpiper	non breeding	un common
266	Wood Sandpiper	non breeding	un common
269	Marsh Sandpiper	non breeding	
270	Greenshank	non breeding	
272	Curlew Sandpiper	non breeding	
274	Little Stint	non breeding	
284	Ruff	non breeding	
339	Whitewinged Tern	non breeding	un common
374	European Tern	non breeding	un common
377	Redchested Cuckoo	breeding	un common
378	Black Cuckoo	breeding	un common
382	Jacobin Cuckoo	breeding	un common
385	Klaas's Cuckoo	breeding	
386	Diederik Cuckoo	breeding	
404	European Nightjar	non breeding	un common
411	European Swift	non breeding	un common
412	Black Swift	breeding	
415	Whiterumped Swift	breeding	
416	Horus Swift	breeding	un common
417	Little Swift	breeding	
418	Alpine Swift	breeding	
438	European Bee-eater	breeding	
518	European Swallow	non breeding	
520	Whitethroated Swallow	breeding	
523	Pearlbreasted Swallow	breeding	
526	Greater Striped Swallow	breeding	
530	House Martin	non breeding	
534	Banded Martin	breeding	un common
587	Capped Wheatear	breeding	
631	African Marsh Warbler	breeding	un common
633	European Marsh Warbler	non breeding	un common
643	Willow Warbler	non breeding	
689	Spotted Flycatcher	non breeding	
710	Paradise Flycatcher	breeding	

40 Species

GAME BIRDS

Spurwinged goose
Egyptian goose
Duck
Guinea fowl

Francolin
Partridge
Pigeon
Quail

08 Species

RED DATA SPECIES

078 Little Bittern	reporting rate < 2.0 %
083 White Stork	reporting rate < 2.0 to >15.3 %
084 Black Stork	reporting rate < 2.0 to >5.5 - 11.7%
096 Greater Flamingo	reporting rate < 2.0 %
097 Lesser Flamingo	reporting rate < 2.0 %
171 Peregrine Falcon	reporting rate < 2.0 to 3.9 -3.8 %
206 Blackrumped Buttonquail	reporting rate < 1.0 %
215 Ballian's Crake	reporting rate < 1.0 %
230 Kori Bustard	reporting rate < 2.0 to 2.0 - 14.2 %
231 Stanley's Bustard	reporting rate < 2.0 to 6.0 -13.2 %
232 Ludwig's Bustard	reporting rate < 2.0 to 2.0 - 12.4 %
530 House Martin	reporting rate < 2.0 to 2.0 - 4.7 %

12 Species

RED DATA SPECIES STATUS

206 Black Rumped Button Quail endangered

The nominate race occurs in the Southern and South Western Cape as far East as Port Elizabeth.

It is one of the most threatened species in South Africa.

230 Kori Bustard vulnerable

The threats faced by the Kori Bustard are the following :-

Habitat destruction due to crop farming, human encroachment, encroachment due to over stocking, hunting, poisoning, stray dogs and most relative to this impact assessment is their flight, not being very agile in flight they are very susceptible to colliding with the transmission lines.

231 Stanley's Bustard vulnerable

The threats faced by the Stanleys Bustard are the following :-

This species seems to be on the decline due to lose of habitat caused by afforestation, crop farming and high human encroachment, snaring, poisoning, and relative to this assessment colliding with over head lines.

232 Ludwig's Bustard vulnerable

The threats faced by the Ludwig's Bustard are the following :-

Habitat destruction, crop farming, human encroachment and relative to this assessment collisions with over head lines.

078 Little Bittern rare

The threats faced by the Little Bittern are the following :-

Habitat destruction in particular reedbeds and suitable wetlands, also the pollution of suitable habitats, relative to this assesment is it's flight pattern, legs dangling and tends to suddenly bank before alighting which could be detrimental if close to over head lines.

083 White Stork rare

The threats faced by the White Stork are the following :-

Habitat destruction, pesticide contamination, human encroachment and relative to this assessment, prone to collisions with over head transmission power lines.

171 Peregrine Falcon rare

The threats faced by the Peregrine Falcoln are the following :-

Destruction of woodlands, expansion of agriculture.

RED DATA SPECIES STATUS

084 Black Stork indeterminate

The threats faced by the Black Stork are the following :-
Habitat destruction, wetland degradation, flow of rivers, afforestation, threat's from fish farms and relative to this assessment prone to collisions with over head lines.

096 Greater Flamingo I indeterminate

The threats faced by the Greater Flamingo are the following :-Pollutants, obstructions across waterbodies, developments at and around wetlands, low flying aircraft, and relative to this assessment collisions with over head transmission power lines.

097 Lesser Flamingo indeterminate

The threats faced by the Lesser Flamingo are the following :-
Pollutants, degregation of wetlands and water ways, changes in the management of the pans and sewage works, and relative to this assessment collisions with over head lines.

215 Ballions Crake indeterminate

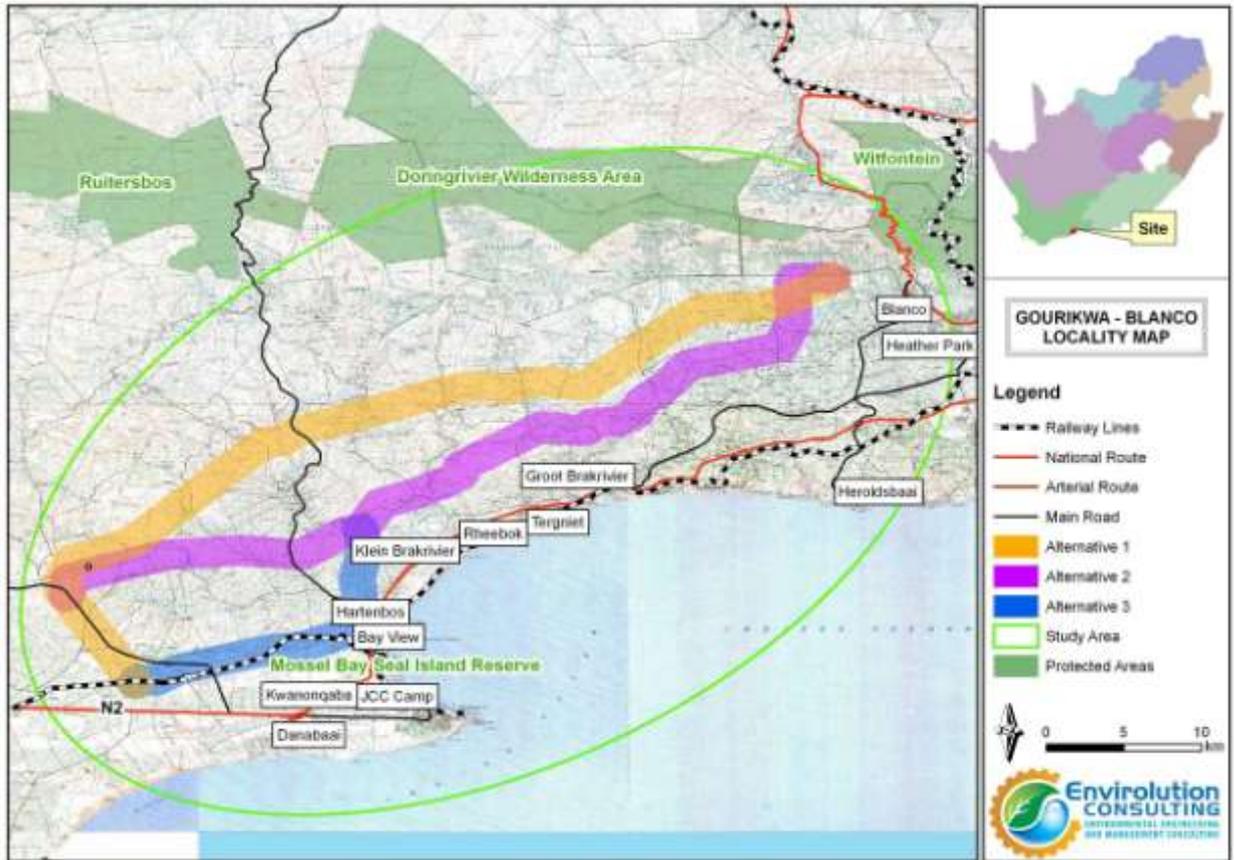
The threats faced by the Ballions Crake are the following :-
Destruction of suitable wetland habitats, disturbance around breeding areas, poisoning of aquatic insects, molluscs and its habitat.

530 House Martin indeterminate

The threats faced by the House Martin are the following :-

No specific threats to the House Martin in South Africa, breeding is sporadic.





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N M Tainton Unsiversity of Natal Press	Veld Management in S.A.
SADC South African Development Community	
IUCN The world Conservation Union SARDC South African Research & Documentation Centre	
Duard Barnard Impact Books CC	Environmental law for all
R F Fuggle-M A Rabie	Environmental Management In South Africa
CWAC Co ordinated Waterbird Counts	
Sanford D Schemnitz	Wildlife Management Techniques
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Gordon Lindsay Maclean	Roberts Birds Of South Africa
CTP Book Printers	
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W.W.W.	Wikipedia encyclopaedia