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AVIFAUNAL IMPACT ASSESSMENT

PROPOSED SALDANHA BAY NETWORK STRENGTHENING PROJECT, SALDANHA BAY LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE.

JANUARY 2016

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DECLARATION

I, **Craig Widdows,** declare that -

- I act as the independent specialist in this application;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998)(NEMA), regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the NEMA Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; all the particulars furnished by me in this form are true and correct.

Signature of the specialist:

Date:

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EXECUTIVE SUMMARY

Afzelia Environmental Consultants (Pty) Ltd were appointed by Savannah Environmental (Pty) Ltd to undertake an avifaunal scoping assessment for the proposed construction of the Saldanha Bay Network Strengthening Project, Saldanha Local Municipality, Western Cape. The study site is located ~5km north east of Saldanha Bay. The network strengthening project will comprise:

- Construction of a new 400/132kV Transmission Substation in the Saldanha Bay area with a planned capacity of 3 x 500 MVA transformers;
- Construction of a new 132/66kV Distribution Substation near the current Blouwater Substation in the Saldanha Bay area;
- The construction of 2 x 400kV power lines (approximately 35 - 40 km) from the Aurora Substation to the new proposed distribution and transmission substations;
- Replace two of the four existing 250 MVA 400/132kV transformers with 2 x 500 MVA transformers at Aurora Substation; and
- Establishing 2 x 132 kV feeder bays around Aurora Substation.

A total of 245 bird species are recorded within the 3218CC and 3318AA quarter degree grid square (South African Bird Atlas Project 2), seven of which are considered "Endangered", five are considered "Vulnerable" and six are considered "Near Threatened" (Barnes 2014). Avian species likely to be impacted by the proposed substation and power line development include local populations of waterbirds, locally resident or transient raptors (Martial Eagle) and large terrestrial birds (Secretarybird, Blue Crane, Lesser Flamingo and Greater Flamingo).

The impacts associated with the proposed substations and power lines developments include:

- Destruction and alteration of avian habitats;
- Disturbance of birds;
- Collision and electrocution on associated overhead powerlines; and
- Electrocution on substation infrastructure.

The construction of the proposed Transmission Substation at site alternative A is the most favourable site from an avifaunal perspective as the alternative sites B and C are located within close proximity to a sensitive avifaunal habitat. The construction of the dual 400kV power line route alternatives 2 and 3 are the most favourable sites from an

avifaunal perspective. These alternatives will pose a limited threat to the birds occurring in the vicinity of the new infrastructure. This is largely due to the limited avian micro-habitats coupled with the shorter length (16km) of the proposed power line. The power line poses a moderate collision risk and a low electrocution risk. Due to the homogenous nature of the site, displacement of avifaunal communities is expected to be negligible.

Given the relative homogeneity of the habitat within the study area as well as existing levels of disturbance (existing power line and substation infrastructure, roads, urban development, agricultural and stock farming), the proposed strengthening project is unlikely to have a significant, long-term impact on the local avifauna. However, due to the sensitive avifaunal areas that support high populations of endemic and Red Listed species, in close proximity to the proposed development, a detailed site visit and species identification is required during the EIA phase in order to assess potential impacts in detail and recommend appropriate mitigation.

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1. INTRODUCTION

1.1 Background and locality of the assessment

Afzelia Environmental Consultants (Pty) Ltd were appointed by Savannah Environmental (Pty) Ltd to undertake a avifaunal scoping assessment for the proposed Saldanha Bay Network Strengthening Project, Saldanha Bay Local Municipality, Western Cape.

Eskom Holdings SOC Ltd is proposing the construction of new dual 400kV power lines of approximately 35km as well as a new transmission substation (Tx) and a new distribution (Dx) substation in the Saldanha Bay area of the Western Cape. The construction development footprint for the Transmission Substation is 600m x 600m and the Distribution Substation is 120m x 120m. The infrastructures associated with the proposed development include:

- Construction of a new 400/132kV Transmission Substation in the Saldanha Bay area with a planned capacity of 3 x 500 MVA transformers;
- Construction of a new 132/66kV Distribution Substation near the current Blouwater Substation in the Saldanha Bay area;
- The construction of 2 x 400kV power lines from the Aurora Substation to the new proposed distribution and transmission substations;
- Replace two of the four existing 250 MVA 400/132kV transformers with 2 x 500 MVA transformers at Aurora Substation; and
- Establishing 2 x 132 kV feeder bays around Aurora Substation.

The proposed development will form part of the Saldanha Bay Network Strengthening Project in order to increase the power supply to the area. The establishment of the Transmission and Distribution Substations will assist in resolving the transmission capacity constraints at Aurora Substation and will play an important role in addressing the forecasted load requirements from industrial customers, the Industrial Development Zone (IDZ), local distributors and facilitate the integration of renewable generation in the area.

The proposed development is located in the Saldanha Bay area, within the Saldanha Bay Local Municipality, Western Cape Province (**Figure 1**). The site is located approximately 5 km from Saldanha Bay, between the R27 and R45. The study area borders the West Coast National Park to the south of the development. There are five proposed power line corridors and three transmission substation site alternatives all of which are situated within the quarter-degree squares 3218CC and 3318AA (**Figure 2**).

Overhead power line infrastructure is known to negatively impact various avian species through direct mortality of birds and indirectly through the removal of natural habitats. Interactions between birds and substations are predicted to be less significant and are likely to be indirect as a result of habitat loss and disturbance.

1.2 SCOPE OF WORK

The most important objectives of this avifaunal scoping assessment report were to describe and evaluate the study area from an avifaunal sensitivity perspective:

- Provide a desktop description and assessment of avian habitats associated with the proposed development as well as avian micro-habitats and species that will potentially use these niches;
- A description of the current avifauna within the study area and the identification of Red Data species potentially affected by the proposed substations and associated power line infrastructure;
- Integration of the site data collected with avian atlases and counts within the area to develop a comprehensive avifaunal database likely to be present within the development footprint;
- Recommendations on which sites are preferable for the construction of the substations and associated power lines in order to pose the least impact risk to avifauna;
- Identify potential negative impacts on the avifaunal diversity and species composition at the site of the proposed development and assess the significance of these impacts; and
- To make recommendations regarding further study to be undertaken within the EIA Phase of the process.

1.3 SOURCES OF INFORMATION

The study made use of the following data sources:

- Bird distribution data of the Southern African Bird Atlas Project obtained from the Animal Demography Unit of the University of Cape Town, in order to ascertain species occurrence within the study area (Harrison et al. 1997);
- The Birds in Reserves Project database was used to augment bird count data (Animal Demographic Unit 2015)
- The conservation status of all bird species occurring within the quarter degree square determined with the use of The Eskom Red Data book of birds of South Africa, Lesotho and Swaziland (Taylor 2014);
- The Important Bird Areas (IBA) programme according to BirdLife South Africa was consulted;
- Coordinated Waterbird Count (CWAC) data was consulted and analysed;
- A review of avian monitoring and mitigation information at existing utility scale solar facilities compiled by Watson et al. (2015) was used to determine the impacts of solar facilities on avian species; and
- A classification of the vegetation types in the study area was obtained from Mucina & Rutherford (2006).

1.4 ASSUMPTIONS AND LIMITATIONS

It is difficult to apply pure scientific methods within a natural environment without limitations; consequentially, assumptions need to be made. The following constraints may have affected this assessment:

- In this instance the 3218CC and 3318AA pentads were reasonably well covered by South African Bird Atlas Project (SABAP2), with data recorded on 25-87 data cards. This means that the species diversity and densities recorded by SABAP2 provides an accurate interpretation of the avifauna potentially occurring in the study area.

- No site visit was conducted for the scoping phase and the assessment was based on secondary data sources. During the EIA phase a site visit and subsequent primary avifaunal data will be collected.

- Conclusions of this report were based on experience of these and similar species in different parts of South Africa. Bird behaviour cannot be entirely reduced to formulas that will hold true under all circumstances. By virtue of their mobility they can rapidly adapt and relocate. However, power line and substation impacts can be predicted with a fair amount of certainty due to a vast amount of data available in this regard.

- It is important to note that, although the predicted impacts are mostly concerned with Red Data species, the non-Red Data species will also benefit from the proposed mitigation measures as they share the same habitat and face the same potential impacts.

2. METHODOLOGY

The methodology used to predict impacts of the proposed project in this study was as follows:

- The various data sets discussed above under "sources of information" were collected and examined with the aim of determining the focal species for this study.
- The data was examined to determine the location and abundance of species which may be susceptible to impacts from the proposed project including both Red Data and non-Red Data species.
- A desk top examination of the site, using Google Earth imagery was done to compare the power line route options and substation site alternatives. These will be confirmed during the site visit to be undertaken in the EIA Phase of the process.
- Avian micro-habitats and sensitive habitats for avifaunal communities were identified and mapped.

- The impacts of the proposed project on the avifaunal populations were described and evaluated by analysing data on wildlife impacts with power lines and associated substation infrastructure throughout Southern Africa.

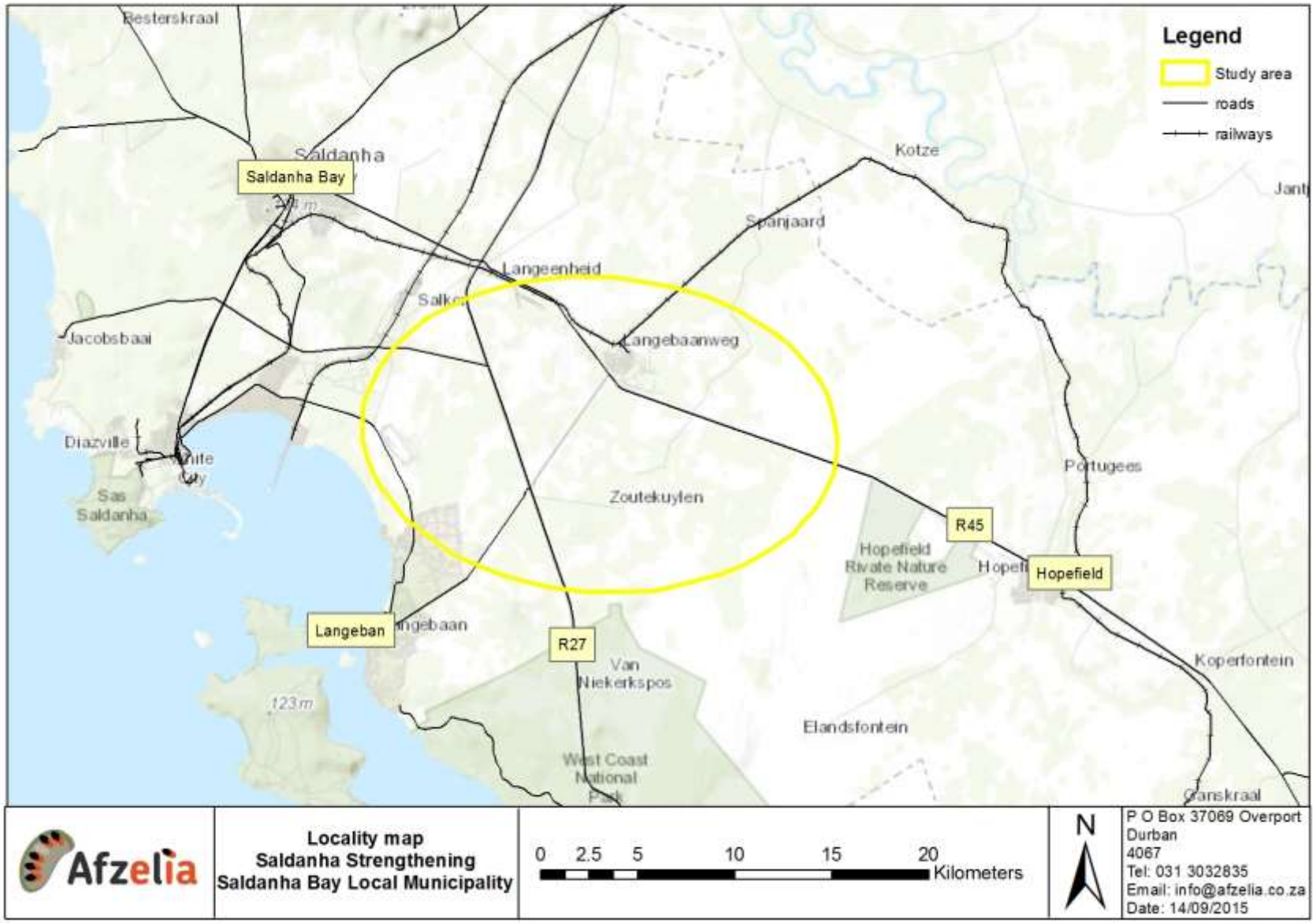

Figure 1: Locality of study area for the proposed substations and associated power line infrastructure.

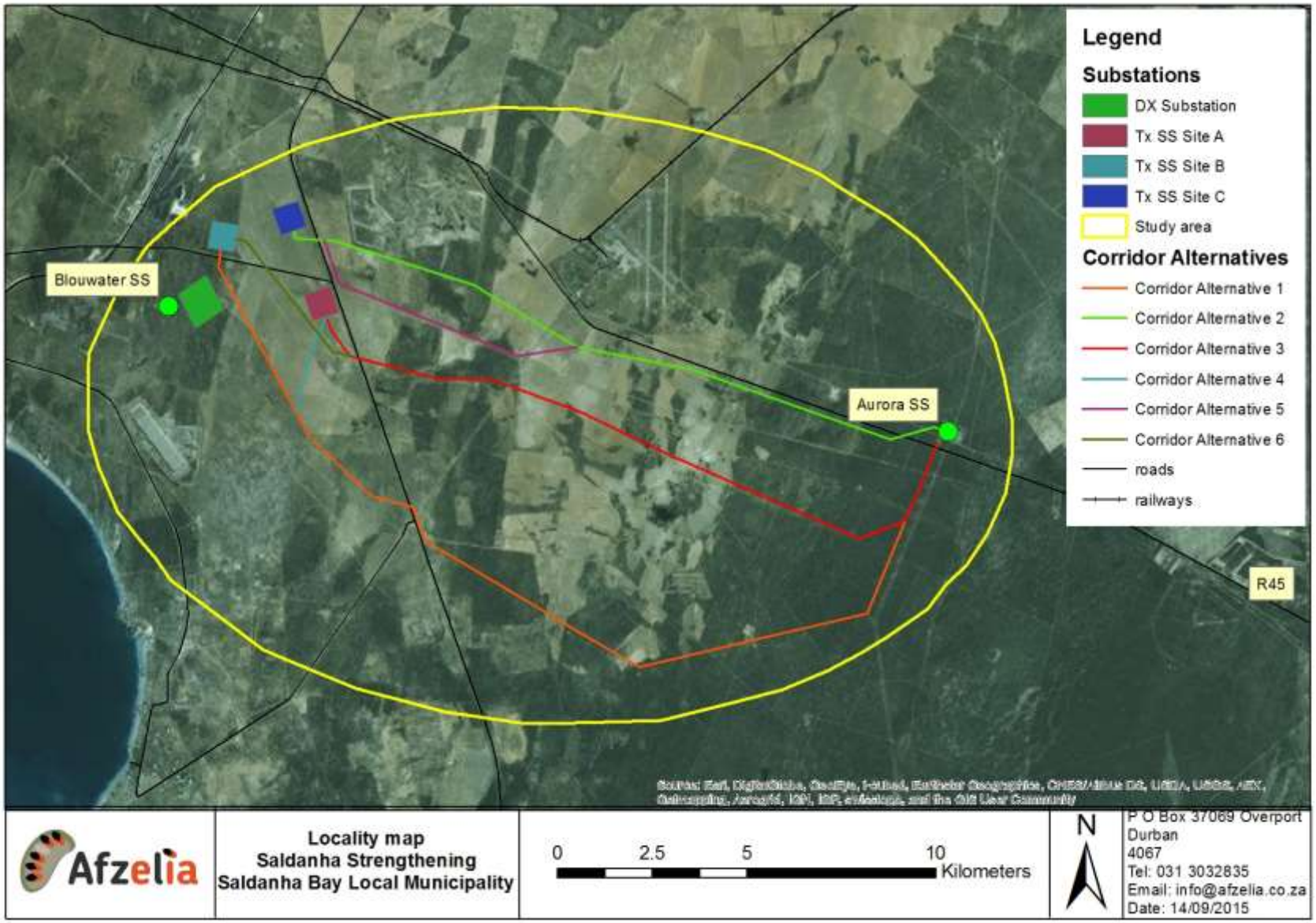

Figure 2. Site description map of the proposed substation site alternatives and power line route alternatives.

3. DESCRIPTION OF AFFECTED ENVIRONMENT

3.1 Climate and vegetation

The Saldanha Bay area is characterised by a winter rainfall pattern with some rain occurring in summer. The mean annual precipitation is approximately 250mm per year. The area receives the lowest rainfall in February (1mm) and the highest in June (49mm). The average daily maximum temperatures range from 16.4 °C in July to 25.1 °C in February. The region is the coldest in June with minimum temperatures of 8.0 °C (Mucina and Rutherford 2006).

According to the national vegetation map (Mucina & Rutherford 2006) four vegetation types occur within the study area (Figure 2). Saldanha Flats Strandveld is the dominant vegetation type located within the study area while the Saldanha Limestone Strandveld occupies the western edge of the study area. This vegetation type consists of low Sclerrophyllous shrublands with an open succulent layer forming in the undergrowth. Both vegetation types are considered endangered with at least 50% transformed mostly by cultivation, development of coastal settlements and road development (Mucina and Rutherford, 2006).

A small outcrop of Saldanha Granite Strandveld is located along the southern section of the site and Hopefield Sand Fynbos Vegetation traverses the northern boundary. Both vegetation types are considered Endangered with approximately 70% and 40% transformed by cultivation, urban development and grazing land respectively (Mucina and Rutherford, 2006).

Within the site, these different vegetation types are structurally very similar and all consist of low shrub land and fynbos with varying amounts of grass, succulents, forbs and geophytes depending on the aspect and landscape position. Although the fynbos biome has a high floral species diversity, this vegetation type does not support a large diversity of avifaunal species.

The main topographical unit within the proposed study area consists of flat plains with limited undulations and ridgelines which are characteristic of the west coast coastal plains. The Berg River is the main water course located in the study area (15km) which drains northwards to the east of the proposed site alternatives.

In examining the region as a whole in terms of avifauna, it is important to relate the avifauna to the biomes and vegetation types present in the area. Harrison et al (1997) in "The Atlas of Southern African Birds" provide a description of the various vegetation types represented in the region and the associated bird species. It is generally accepted in the ornithological field that vegetation structure is more important in determining avian species abundance and distribution than vegetation species composition (Harrison et al. 1997). Therefore, the vegetation description within this report does not focus on lists of plant species, but rather on vegetation structural units such as woodlands, riverine habitats or pans and wetlands. The classification used in this report makes extensive use of the work of Harrison et al. (1997).

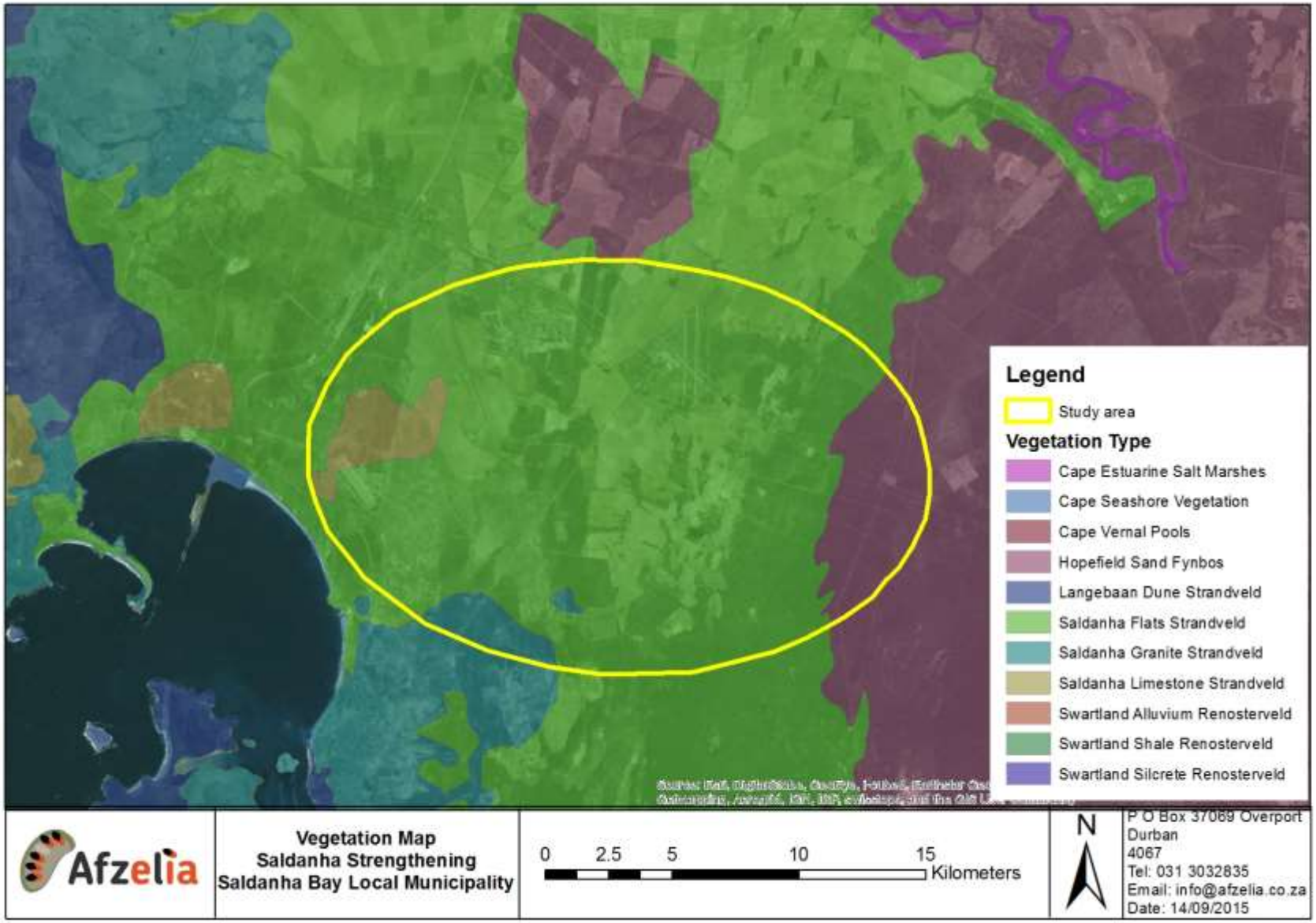

Figure 3. Vegetation types located within the proposed study area and surrounds.

3.2 AVIAN MICRO-HABITATS

In determining how suitable the study area is for avian species, it is necessary to look at the habitats available to determine where the relevant species will most likely occur within the study area. These "micro habitats" do not always correspond to vegetation types and are determined by a combination of vegetation type, topography, land use, food sources and other various intrinsic factors.

Investigation of the study area revealed the following important avian micro habitats. In each case, some of the species likely to make use of the various micro habitats have been described. It must be emphasised that birds will, by virtue of their mobility, utilise almost any area in a landscape from time to time.

Arable or cultivated landscape

Agricultural lands are found within the study area and is a common micro-habitat (**Figure 4**). Avian species that will be attracted to these areas include Blue Cranes, Harrier species and various Heron species. In particular the White Stork has a high affinity for arable land, with 80% of sightings in South Africa recorded within this habitat (Dean & Ryan 2005).

Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons:

- Through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources readily accessible to birds and other predators;
- The agricultural or pasture plants cultivated are often eaten by birds, or attract insects which are in turn eaten by birds; and
- During the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape.

However, these benefits do not apply to all species and active agricultural lands are not a favourable environment for certain avian species due to the lack of natural vegetation cover and the regular disturbance experienced during the harvesting period.

Figure 4. Agricultural land located within the study area.

Pans

The western section of the study area contains seasonal pans (**Figure 5**). Pans are defined as a near-level shallow depression or basin, usually containing an intermittent supply of water. At certain times of the year, they are characterised by slow flowing water and tall emergent vegetation. These factors provide habitats for various waterbirds and the pans in this study area could be used by White Storks, and Greater and Lesser Flamingos. Furthermore, these water sources are often used by large flocks of granivorous bird species such as Cape Sparrow, Canary Species and Southern Red Bishop.

Figure 5. One of several pans located within the western portion of the study area.

Strandveld Shrublands

Strandveld low shrublands occupy the central and southern boundaries of the study area (**Figure 6**). These shrublands are important for Secretarybirds as they provide foraging opportunities in the form of invertebrates and small vertebrates. Furthermore, the shrubland habitat also provides habitat for various species such as the endemic Cape Spurfowl, Black Harrier, Thrushes and Lark species. Although the shrublands within the area are negatively impacted due to the disturbance and encroachment from the croplands and power line infrastructure, they provide important areas of natural vegetation, cover and nesting opportunities for many avian species within the largely agricultural and industrial landscape.

Figure 6. The Strandveld shrubland habitat which occupies the central and southern sections of the proposed study area.

Artificial habitats are provided by the existing overhead power lines that traverse through the study area (**Figure 7**). The pylons are used by various species including raptors from which to hunt and to nest.

Figure 7. A series of overhead power lines exiting the Aurora Substation located on the eastern portion of the study area.

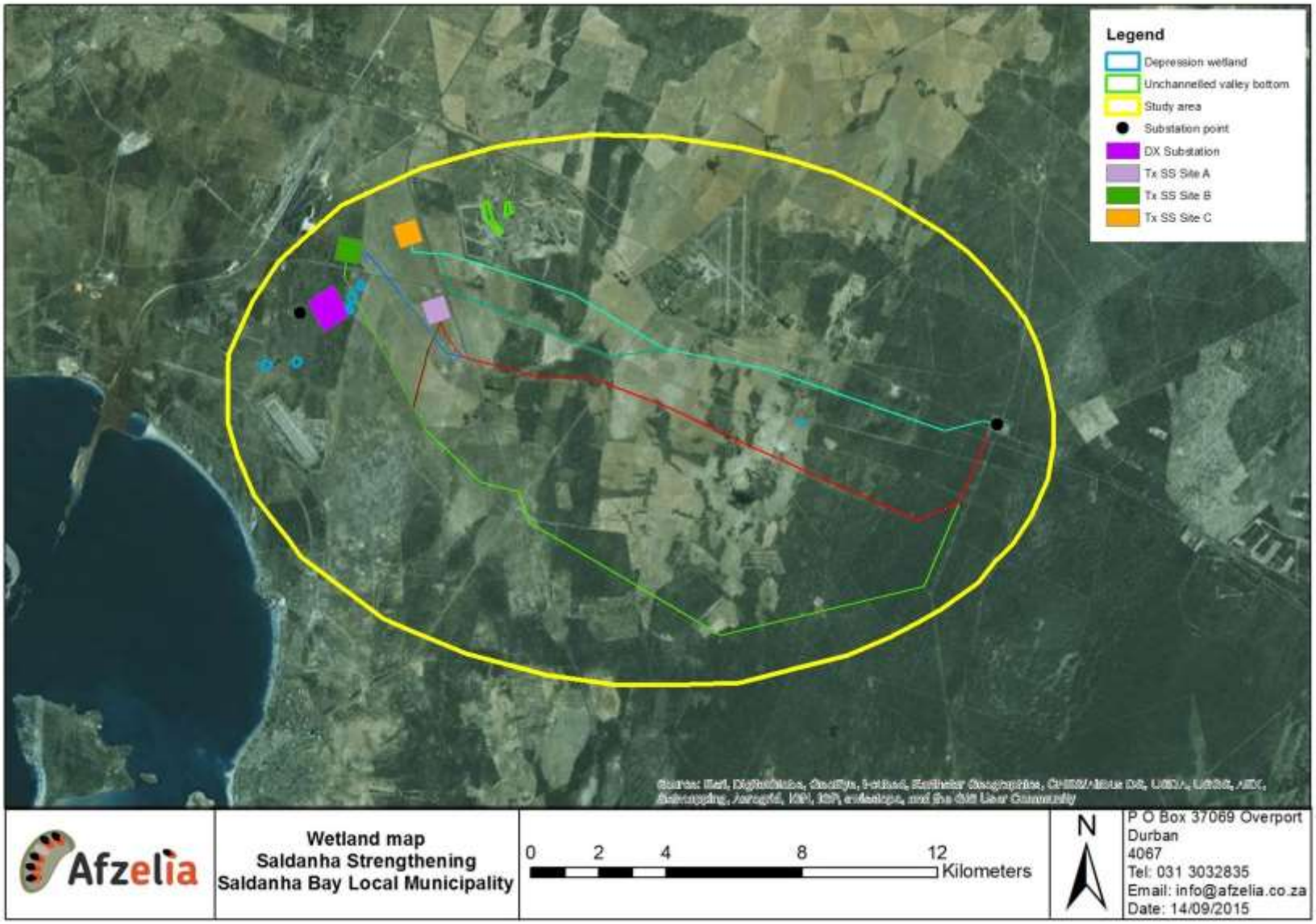

Figure 8. Wetland areas located within the study area.

3.3 IMPORTANT BIRD AREAS (IBA)

The proposed substation sites and associated power line corridors are located approximately 8km north of the West Coast National Park and Saldanha Bay Islands (SA099) Important Bird Area. The extent of the IBA is 30 140 ha and forms part of the Fynbos Biome.

This IBA supports 250 bird species and hosts many biome-restricted species. The area includes the Langebaan Lagoon which is a vital wetland for South African wader species and accounts for 10% of South Africa's coastal wader population. It supports 20 000 waterbirds in summer of which 16 500 are waders and 93% are Palearctic migrants.

IBA trigger species for this area include African Penguin (*Spheniscus demersus*) Cape Gannet (*Morus capensis*), Crowned (*Microcarbo coronatus*) and Bank Cormorant (*Phalacrocorax neglectus*) Southern Black Korhaan (*Afrotis afra*) Lesser Flamingo (*Phoenicopterus minor*), Secretarybird (*Sagittarius serpentarius*) and African Marsh Harrier (*Circus ranivorus*). Regionally threatened species include Caspian Tern (*Hydroprogne caspia*), Great White Pelican (*Pelecanus onocrotalus*), Verreauxs' Eagle (*Aquila verreauxii*) and Lanner Falcon (*Falco biarmicus*).

The Berg River Estuary (SA104) is another IBA located 10km north of the proposed development site. It is 24 200 ha in extent and encompasses eight major wetland types in addition to the Berg River channel. Important avian micro-habitats include estuarine mudflats and ephemeral floodplains. This IBA supports 250 bird species of which 50% (127) are waterbirds and supports a population of 20 000 waterbirds during the summer periods.

Avifaunal moments between the two IBAs will be assessed during the EIA phase.

According to BirdLife South Africa, one-third of the 112 IBAs located within South Africa are under threat by alien invasive vegetation, habitat modification and agricultural expansion (Marnewick et al. 2015). It is therefore important to include mitigation measures to ensure the development does not have a significant negative effect on protected avian species and source populations occurring within the IBA. This will be particularly important as the development site is located between two important bird areas supporting a high population of avifaunal species.

3.4 Coordinated Waterbird Count (CWAC)

A coordinated waterbird site is comprised of any body of water (apart from oceans) which supports a high abundance of avifaunal species that utilise the site for feeding, breeding and roosting (Harrison et al. 2004). The abundance is set at approximately 500 waterbirds, irrespective of the number of species present. These bodies of water include lakes, rivers, pans, marshes and various anthropogenic infrastructures such as waste

water treatment works (WWTW). Although there are no CWAC sites within the study area, there are several located within the Berg River to the north of the study area.

4. AVIFAUNA SPECIES COMPOSITION

A total of 243 species were recorded in 3218CC and 3318AA by SABAP2, with twenty species (8.2%) classified as Red Data species (Barnes 2014). Furthermore, 19 species are Southern African endemics (7.8%).

Reporting rates are an indication of the relative density of a species on the ground in that it reflects the number of times that a species was recorded relative to the total amount of cards that were completed for the pentad[1].

4.1 AVIFAUNAL SPECIES OF CONCERN

Table 1 provides a guideline of the Red Data species that could potentially be encountered anywhere within the pentad where suitable habitat is available. This was based on avifaunal micro-habitats in combination with documented records within the study area. Report rates are the likelihood of a particular species occurring within the study area and along any of the alignments/substation sites represented as a percentage.

[1] A 5 minute X 5 minute coordinate grid super-imposed over the continent for spatial reference. One QDGC comprises of 9 pentads.

Table 1. Red Listed bird species recorded in the 2821CA and 3318AA quarter degree square within which the proposed substations and power line infrastructure are located.

Name	Conservation Status (2014)	Habitat	Likelihood of Occurrence	Habitat Destruction	Disturbance	Collisions with power line	Electrocution	Endemic
SECRETARY BIRD *Sagittarius serpentarius*	VU	Grassland	Low	X	X	X		
MARTIAL EAGLE *Polemaetus bellicosus*	EN	Woodland/Savannah	Low	X	X	X		
LUDWIG'S BUSTARD *Neotis ludwigii*	EN	Savannah	Low			X		Near-Endemic
LANNER FALCON *Falco biarmicus*	VU	Woodland/Savannah	Medium		X			
GREAT WHITE PELICAN *Pelecanus onocrotalus*	VU	Wetlands, Estuaries and Coastal bays	Medium	X		X		Endemic
CAPE GANET *Morus capensis*	VU	Ocean islands and coastlines	Low					
CAPE CORMORANT *Phalacrocorax capensis*	EN	Coastal waters and wetlands	Low	X	X			
BANK CORMORANT *Phalacrocorax neglectus*	EN	Coastal waters	Low					
CROWNED CORMORANT *Phalacrocorax coronatus*	NT	Coastal waters and wetlands	Low					
GREATER FLAMINGO *Phoenicopterus ruber*	NT	Wetlands, lagoons and estuaries	Medium			X		

Name	Conservation Status (2014)	Habitat	Likelihood of Occurrence	Habitat Destruction	Disturbance	Collisions with power line	Electrocution	Endemic
LESSER FLAMINGO *Phoenicopterus minor*	NT	Wetlands, lagoons and estuaries	Low			X		
AFRICAN-MARSH HARRIER *Circus ranivorus*	EN	Wetlands and farmlands	Medium	X	X			Near-Endemic
BLACK HARRIER *Circus maurus*	EN	Fynbos shrubland and agricultural land	High	X	X			
BLUE CRANE *Anthropoides paradiseus*	NT	Croplands and pastures	Medium		X			
CHESTNUT-BANDED PLOVER *Charadrius pallidus*	NT	Estuaries and coastal wetlands	Low					
EURASIAN CURLEW *Numenius arquata*	NT	Estuaries and lagoons	Low					
CASPIAN TERN *Sterna caspia*	VU	Coastal waters	Low					
ANTARCTIC TERN *Sterna vittata*	EN	Coastal waters	Low					
SOUTHERN BLACK KORHAAN *Afrotis afra*	VU	Coastal Fynbos/Karoo scrub	High	X	X	X		Endemic

*NT= Near Threatened; VU=Vulnerable; EN= Endangered

Although this assessment focuses on Red Data bird species, other less threatened species will also potentially be affected by the proposed development. Mitigation measures proposed for Red Data species will therefore also serve to protect the more common species.

5. COMPARISON OF SITE ALTERNATIVES

Substation Site A:

This is the central substation site and is largely transformed and located within close proximity to the R27 and 4.5km west of Langebaanweg. The desktop analysis identified no sensitive micro-habitats within close proximity of the proposed site and the site is likely to have low sensitivity for avifauna. Furthermore, the power line which enters the substation is also preferred from an avifaunal perspective (route alternative 3).

Substation Site B:

This is the westernmost substation site alternative and is situated in a degraded patch of Fynbos. A series of wetland depressions and pan micro-habitats are located within close proximity of the proposed site. Due to the presence of these sensitive avian micro-habitats and the increased length of the associated power line (and associated increased mortality potential due to collision by larger species) this alternative is not preferred from an avifaunal perspective.

Substation Site C:

This is northernmost substation alternative and located 1km to the west of the West Coast Fossil Park. The vegetation surrounding the site is degraded and in close proximity to a road. Based on available aerial photography there does not appear to be any water bodies within the substation development footprint.

Power line route alternative 1 and 4 are the longest line alternatives, 23km and 21.6km respectively. Route alternative 1 is the southernmost alternative and is the closest alternative to the Saldanha Bay. Route alternative 1 crosses a series of pan micro habitats that are considered sensitive to avifauna. The longer power line coupled with the presence of sensitive micro habitats, poses an increased risk of collision by larger avifauna (Blue Crane, Lesser Flamingo, Greater Flamingo and Secretarybird) within the area.

Power line route alternative 2 and 5 traverse within close proximity to the R45 and are the shortest line alternatives (16km) and both lines are proposed to enter into substation site alternative C. The reduction in the length of the power line will minimise the risk of electrocution and collision of avifaunal species as well as reduce the potential for habitat impacts. The alternatives are located to the south of urban development (Langebaanweg). The sum of impacts on avian species from the urban development and existing power lines, within close proximity of one another, may be significantly lower than if these structures were separate in the landscape. The presence of an existing road

structure within close proximity of the route alternatives will ensure that the development of new access roads will be reduced. A negative aspect associated with these route alternatives are that they traverse near an unchannelled valley bottom wetland system that may support a variety of avifaunal species.

Power line route alternative 3

This route is 17km long and traverses through degraded fynbos habitat and agricultural land. The last portion of the line will cross the R27 and enter the substation site alternative A (preferred site alternative). This route alternative is predicted to have a low impact on avifauna.

Power line route alternative 6 is 19km long and enters the proposed substation site alternative A. This route follows a similar path to alternative 1 but deviates during the final stages.

Overall, substation site A and C is the preferred substation site alternative and route alternatives 2 or 3 are the preferred power line routes.

5.1. Preliminary sensitivity assessment

The preliminary sensitivity assessment identifies those parts of the study area that have high conservation value or that may be sensitive to disturbance (Figure 7). The information provided in the preceding sections was used to compile a map of remnant natural habitats and areas important for conserving ecological processes in the study area. Broad scale mapping was used to provide information on the location of sensitive features. There are a number of features that need to be taken into account in order to evaluate sensitivity in the study area. These include the following:

- Avifaunal microhabitats of conservation importance: This is based primarily on the situation of the site within the ;
- Wetland and pan micro habitats such as those located in the western portion of the study area; and
- potential occurrence of Red List species that have been evaluated as having a high chance of occurrence within the study area.

These factors have all been taken into account in evaluating sensitivity within the study area. It must be emphasized that this is a preliminary sensitivity map (Figure 7), based on broad information compiled during a desktop assessment. It is therefore vitally important to establish, during the EIA phase, which areas constitute sensitive faunal habitats within the study area.

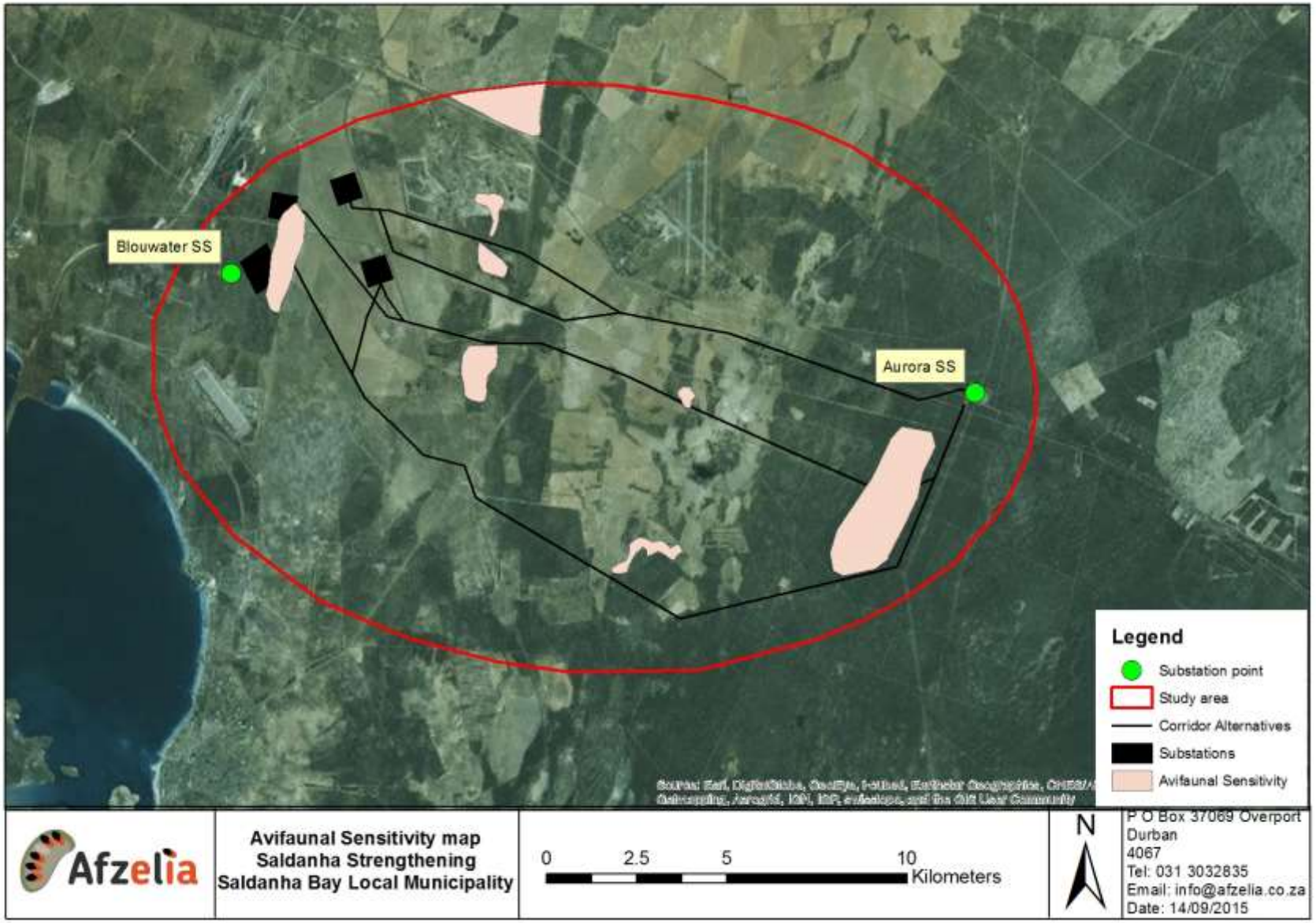

Figure 9. Preliminary sensitivity assessment.

6. IMPACT ASSESSMENT

The implications of the proposed transmission and distribution substation development and associated power lines to avifauna are as follows:

- An area of approximately 600m x 600m and 120m x 120m of land will be altered and considered artificial, and largely unsuitable to avian species.
- During the construction phase, disturbance levels will be significantly higher in the immediate vicinity than previously. This disturbance will consist of machinery and vehicle disturbance as well as other construction activities.
- During the operational phase, there will be some vehicle activity resulting in disturbance, particularly within the road access corridor.
- Due to the length of the overhead power lines (35km), this will pose a collision and electrocution risk to avifauna, particularly heavier birds with low manoeuvrability.
- The substation infrastructure provides perching and nesting substrate for various avifauna, particularly crows and smaller species such as sparrows and starlings.
- There is a possibility that species such as crows/owls could be electrocuted on the substation infrastructure.
- Identified potential impacts and potential magnitude of these impacts are discussed further in Table 4.

6.1 Significance of identified impacts

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

- The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high).

The **duration**, wherein it will be indicated whether:

- the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
- the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
- medium-term (5–15 years) – assigned a score of 3;
- long term (> 15 years) - assigned a score of 4; or

- permanent - assigned a score of 5;

The consequences (**magnitude**), quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

The **probability** of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be 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 calculated by combining the criteria in the following formula:

S=(E+D+M)P	
S = Significance weighting	M = Magnitude
E = Extent	P = Probability
D = Duration	

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).

Table 2: Potential impacts associated with the proposed substation and overhead power lines

ISSUE	NATURE OF IMPACT	EXTENT OF IMPACT	'NO GO' AREAS
CONSTRUCTION PHASE			
Habitat destruction	During the construction of the substations and power lines, some habitat destruction and alteration will occur due to the clearing at tower positions, along access roads and vegetation at the substation site. These activities will have an impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat. It is not envisaged that any Red Data species will be displaced by the habitat transformation that will take place as a result of the construction of the proposed development. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local in extent, in that it will not have a significant effect on regional or national populations. Various sections of the habitat is already largely transformed and fragmented by agricultural land. Furthermore, this is not a unique habitat within the landscape. The construction of the proposed new power lines and substations should therefore have a low displacement impact from an avifaunal perspective.	Local	None identified during the scoping phase
Disturbance and displacement	The disturbance of avifauna during the construction phase will occur. Species sensitive to disturbance and ground-nesting species resident	Local	Confirmation of active

	within the development footprint. These species include African Marsh Harrier (*Circus ranivorus*), Black Harrier (*Circus maurus*) and Blue Cranes (*Anthropoides paradiseus*). Both Harrier species often breed in damp vegetation in close proximity to wetlands or pans and Blue Cranes often breed on open ground near a water source (Hockey *et al.* 2006). These species will be sensitive to disturbance and habitat loss due to the construction of the proposed substation and overhead power lines. The study area is already subject to varying degrees of disturbance due to agriculture, industrial infrastructure as well as existing power line and substation infrastructure. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed substation and power lines is anticipated to be of low significance as birds will move away from the area temporarily. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna.		nests and breeding species will be conducted during the EIA phase in order to determine 'no go' areas.
OPERATIONAL PHASE			
Electrocution on substation infrastructure	Since there is live hardware in the substation yard, the potential exists for birds to bridge the gap between two phases or a phase and earth resulting in electrocution. However, very few electrocutions have been recorded on transmission substations. Species likely to be affected are crows and other species that are tolerant of disturbance and are attracted to the suitable nesting opportunity provided by the electrical infrastructure within the yard. Small raptors such as Lanner Falcons are sometimes attracted into substation yards in pursuit of species nesting	Site	None identified during the scoping phase

	there such as sparrows and canaries**.** With the majority of threatened species (Secretarybird, Lesser Flamingo and Blue Cranes) avoiding the substation yard as they are sensitive to disturbances, it is predicted to have a low impact.		
Electrocution of birds caused by the overhead power line	Electrocution 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 (Van Rooyen & Ledger 1999). Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004; Lehman et al. 2007). Electrocution risk is influenced by the voltage of the powerline coupled with the pole structure. The risk of avian electrocution due to 400kV power lines are low. The impact of electrocution to be of medium significance.	Local	None identified during the scoping phase
Collisions with the power line	Collisions are the biggest single threat posed by transmission power lines to birds in Southern Africa (van Rooyen 2004). Species particularly susceptible to collisions include bustards, cranes and various species of waterbirds. These species are heavy-bodied birds with limited manoeuvrability (Van Rooyen 2004, Anderson 2001). Many of the collision sensitive species are considered threatened in Southern Africa. In order to reduce the impacts of power line on avian species, where possible lines must be placed next to existing lines. Sensitive areas identified will be fitted marked with anti-collision marking devices (diurnal and nocturnal diverters) to increase the visibility of the power line and reduce likelihood of collisions. These line marking devices include spiral vibration dampers, strips, Firefly Bird Flight Diverters, bird	Local	None identified during the scoping phase

	flappers, aerial marker spheres, ribbons, tapes, flags and aviation balls (Prinsen et al. 2012).		
Disturbance	Ongoing maintenance activities will have an impact on species within the vicinity of the substations and power lines.	Local	N/A

DESCRIPTION OF EXPECTED SIGNIFICANCE OF IMPACT
CONSTRUCTION PHASE

Impacts associated with habitat destruction

Impact	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
Construction Phase										
Habitat destruction	5	4	2	2	2	1	8	6	60 (High)	36 (Moderate)

Impacts associated with Disturbance										
Impact	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
Construction Phase										
Disturbance	5	4	2	2	2	1	8	6	60 (High)	36 (Medium)

OPERATIONAL PHASE

Impacts associated with Electrocution on substation infrastructure										
Impact	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
Operational Phase										
Electrocution on substation infrastructure	2	1	4	4	2	1	4	4	20 (Low)	9 (Low)

Impacts associated with electrocution with power lines										
Impact	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
Operational Phase										
Electrocution with power lines	3	2	4	4	2	1	6	4	36 (Medium)	18 (Low)

Impacts associated with disturbance										
Impact	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
Operational Phase										
Disturbance	4	3	4	4	2	1	6	4	48 (Medium)	27 (Low)

Impacts associated with collisions with power lines										
Impact	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
Collisions with power lines	4	3	4	4	3	2	6	4	52 (Medium)	30 (Medium)

The findings of this report and identification of potential impacts are based on preliminary desktop work. The specification of the duration, probability and reversibility of the impacts will be subject to change prior to a detailed site inspection. The significance of impacts stated below were calculated using prior knowledge of similar developments coupled with the desktop work detailed in this report. Furthermore, the precautionary principle will be applied with respect to impacts where there is uncertainty.

GAPS IN KNOWLEDGE AND RECOMMENDATIONS FOR FURTHER STUDY

The scoping avifaunal assessment has identified a series of sensitive avifaunal micro habitats within the vicinity of corridor alternative 1 as well as adjacent to the DX substation. It is recommended that route alternative 2 or 3 and substation site A are taken forward as the preferred options from an avifaunal perspective. These alternatives will minimise the impacts to avifauna. This will be investigated further during the EIA phase.

Proposed scope of work for the EIA phase includes:

- Revision of the conducted literature review.
- Identification and delineation of key avifaunal species residing within the study area as well as roost and nest sites.

- Further inspection of avifaunal microhabitats and their ability to support Red Data listed or endemic species.
- Further investigation of identified impacts associated with the proposed development and revised scoring.
- Sensitive avifaunal habitats within the study area will be identified and mapped.
- Assess and evaluate identified potential impacts. The impacts will be assessed as both pre and post implementation of mitigation measures.
- Propose and explain mitigation measures for unavoidable impacts. This will need to be incorporated into the Environmental Management Programme (EMPr).

7. Conclusion

The desktop assessment indicated that there do not appear to be any obvious risks associated with the construction of the proposed substation and power line infrastructure from an avifaunal perspective. Various sections of the habitat within the study area is degraded and there is numerous power line infrastructure already present within the area. Substation site alternative A and power line route alternative 2 or 3 are recommended as the preferred alternatives at this stage in the process, as these are close to existing infrastructure and will minimise the risk to avifaunal species and loss of habitats.

Potential impacts identified during the scoping phase included habitat loss and disturbance, collision of large avifaunal species with the power lines, electrocution of birds on power lines and the substation infrastructure. Habitat destruction is a consequence of constructing access roads, operation buildings and the clearing of sections of power line servitudes. Movement of waterbirds through the site that are not residents within the site is possible and these species would also be vulnerable to the abovementioned impacts.

The sensitivity map indicated in figure 9 must not be used to govern the final decision regarding sensitive fauna habitats but rather to identify areas that require in-depth attention during the EIA phase.

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