
ERGO Mining: Solar PV Project Phase 1 (19.9 MW): Gauteng Province

Terrestrial Fauna:

Species Compliance Statement & High Level Biodiversity Impact Assessment

May 2021



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Specialist Qualification & Declaration

Barbara Kasl (CV summary attached as Appendix A):

- Holds a PhD in Animal, Plant and Environmental Sciences from the University of the Witwatersrand;
- Is a registered SACNASP Professional Ecological and Environmental Scientist (Pr.Sci.Nat. Registration No.: 400257/09), with expertise in faunal ecology; and
- Has been actively involved in the environmental consultancy field for over 13 years.

I, Barbara Kasl, confirm that:

- I act as independent consultant and specialist in the field of ecology and environmental sciences;
- I have no vested interest in the project other than remuneration for work completed in terms of the Scope of Work;
- I have presented the information in this report in line with the requirements of the Animal Species and Terrestrial Biodiversity Protocols as required under the National Environmental Management Act (107/1998) (NEMA) as far as these are relevant to the specific subject and Scope of Work;
- I have taken NEMA Principals into account as far as these are relevant to the Scope of Work; and
- Information presented is, to the best of my knowledge, accurate and correct within the restraints of stipulated limitations.



31-05-2021

Acronyms

ADU	Animal Demographic Unit
AI(S)	Alien Invasive (Species)
BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Areas
ESA	Ecological Support Area
IUCN	International Union for Conservation of Nature
NEMA	National Environment Management Act, 1998 (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NPAES	National Protected Area Expansion Strategy
PA	Protected Area
PES	Present Ecological State
QDGS	Quarter Degree Grid Square
RIVCON	River Condition
RL	Red-listed
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern (specifically listed in the SANBI's 2020 Species Guideline)
SEI	Site Ecological Importance
SWSA	Strategic Water Source Area
TOP(S)	Threatened or Protected (Species)
UNESCO	United Nations Educational, Scientific and Cultural Organization
VMUS	Virtual Museum

Executive Summary

General Intro

The project is being developed to generate electricity for the ERGO Mining's plant power requirements and includes the proposed development site for solar PV panels and proposed power line. The site / project area lies just south of the N17 and just east of the Heidelberg Road (R23), and lies within the Ekurhuleni Municipality, Gauteng Province. A separate avifauna assessment is being undertaken, and this report focusses on mammals and herpetofauna and also provides a high-level assessment of threatened or protected (TOP) invertebrates.

The site and surrounds rank as high sensitivity (EIA Toolkit) for terrestrial biodiversity, but given the history of the site (old tailings facility footprint), it is expected that the on-site biodiversity value to terrestrial fauna is low, other than the potential tributaries and associated ecological corridors on site.

The site and surrounds rank as medium and low sensitivity (EIA Toolkit) for animal species, with one butterfly (*Aloeides dentatis dentatis*) and two mammals (*Ourebia ourebi ourebi* and *Hydrichtis maculicollis*) listed as potential species of conservation concern (SCC).

Site Characterisation

The site assessment was conducted on the 9 February 2021 and the weather was warm and sunny to partly cloudy and cloudy during the course of the day. No rain was experienced, but the site visit followed an extensive 2 week rainy period in Gauteng and the site was wet, muddy and marshy. A follow-up survey was completed by the flora specialist on the 26 May 2021 to address additional areas and photos were supplied for assessment in this report.

Many areas in and around site are developed, are under infrastructure or are simply completely denuded and are designated as areas with 'No Natural Habitat'. Some generalist and tolerant fauna species will utilise such areas.

The bulk of the project area is under modified grassland, modified by historical mining and agricultural activities in the area, and at varying degrees of recovery and generally providing little in terms of habitat for TOP fauna and SCC.

Segments of undisturbed habitats (terrestrial grasslands, moist grassland and a limited area of rocky habitat) do creep into the power line route and are most likely to provide habitat to significant fauna species.

Animal Species

In terms of the mammals:

- The project area will not support significant numbers of TOP species. A handful of protected and / or near threatened species and provincially protected species could occur on site.
- SCCs (Oribi and Spotted-necked Otter) listed within the species assessment guideline (SANBI, 2020) are unlikely to occur within the project area for any length of time but may be present in the less disturbed surrounding habitats and may traverse the project area from time to time. They are mobile species likely to move away from noise and human activity and unlikely to experience direct impact.
- Although some endemic species are likely on site, none are restricted species and the area is not seen as a significant area in terms of mammal endemism.

In terms of herpetofauna:

- No significant numbers of TOP herpetofauna are expected on the property.
 - The Giant Bullfrog (*Pyxicephalus adspersus*), was the only TOP herpetofauna confirmed on site. The species is threatened by loss and degradation of its wetland and neighbouring terrestrial habitat and natural landscapes and aquatic ecological corridors identified within the project area must be maintained in their current state.
- None of the species likely to occur on site are listed as SCC in the species assessment guideline (SANBI, 2020).
- None of the endemic species are restricted and the area is not considered significant in terms of herpetofauna endemism.

In terms of invertebrates:

- The Protected Baboon Spiders cannot be excluded from site, but it is expected that they would occupy the less disturbed habitats around site.
- Despite several butterflies being confirmed on site, no *Aloeides dentatis dentatis* or similar species were noted on site, despite being a peak flight period for the butterfly.

In terms of impacts to TOP species and SCCs:

- Fauna confirmed / highly likely on site are species that are fairly tolerant of current agricultural, mining-related and general human activities including the associated anthropogenic impacts and are unlikely to be significantly impacted by the proposed development.
- This being said, a TOP species (Giant Bullfrog) has been confirmed moving through the project area and other mammal SCC may also traverse the project area. Any impact to these species, including hindering these species, could be significant in terms of long-term impacts on species status both locally and nationally and awareness of the presence of these species must be maintained on site in order to ensure they are not harmed or hindered by the development.

Terrestrial Biodiversity

The table below summarises the main terrestrial fauna biodiversity features that could be impacted in terms of the proposed development.

Aspect	Potential impacts
Ecological processes	The removal of vegetation will result in loss of the primary production and primary food base provided by plants, although loss of vegetation will be largely within the panel development area where productivity has already been impaired by homogenous grassland and faunal populations are expected to be minimal; the impact is not seen as significant in terms of terrestrial fauna. Although a greater area is affected by the preferred option, the impact is not considered

Aspect	Potential impacts
	proportionally more significant. Where vegetation is retained (most of the power line route between the pylons) these processes will continue.
Ecological drivers: AIS infestation & habitat changes.	The construction of the PV panels will result in the loss of the habitat, but the value of the habitat in terms of terrestrial fauna is not significant. There is also no significant difference in the preferred and alternative layouts in terms of loss of habitat for sensitive fauna species. Some sensitive habitats occur within the power line route that would reduce habitat diversity (and hence fauna diversity) and impair aquatic ecological corridors if activities are not modified and managed to preserve these areas. The development is not expected to significantly alter the AI species around the project area.
Ecological Corridors	The corridors are within the power line route (shared route of the two alternatives) and will be impacted should any construction occur within and across these areas. This will impair connectivity and hinder movement of fauna, specifically wetland and aquatic species. It is anticipated that, under most circumstances, the power line can be suspended across these corridors to limit direct disturbance to these corridors.
CBAs and ESAs	The development site for both alternatives is unlikely to impact on CBAs other than through potential runoff, which must be managed. CBAs occur along the proposed power line route. None of the CBAs are designated for Red-listed (RL) mammal or invertebrate species, but in many cases the CBAs overlap sensitive habitats and undisturbed habitats that are important for faunal biodiversity as well as part of ecological corridors. Impacts to CBAs would be limited to the less disturbed moist grassland and grassland units identified on site and the ecological corridors associated with these habitat units.
NFEPA features	Impacts to any surface water systems, which are centres for aquatic ecological corridors, could further impair ecological connectivity. In addition, any contaminated runoff from site or sedimentation will reach these systems very quickly due to their proximity and impact downstream areas and associated aquatic ecosystems and runoff must be managed.
Gauteng Ridges and other rocky habitats	No classified ridges occur on or near site. The power line route supports a very limited area of established rocky habitat attached to a grassland area. Destruction of rocky habitats will reduce overall habitat diversity and reduce the potential for rocky habitat species on site.

Site Sensitivity

In general, the site sensitivity is partially in agreement with the Gauteng conservation plan, with some overlap between areas. Where CBAs overlap good habitat units, these have been designated as highly sensitive areas, where CBAs have intersected disturbed habitat areas, then these have been designated as moderately sensitive areas as depicted in Figures A and B below. It must be stressed that most CBAs in the area have been designated in terms of floral characteristics and some for avifauna, but indicated limited value in terms of terrestrial fauna.



The only significant desktop features included the streams and tributaries and CBAs and ESAs, largely associated with the streams and adjacent areas. These areas are only associated with the power line route. They do not occur on the development site, but do occur downstream. These have been largely

incorporated into highly sensitive areas and designated as no go areas. Some CBA areas overlap areas that have been disturbed in the past and / or are being impacted by current activity and are not significant habitats for terrestrial fauna. These have been incorporated into moderately sensitive areas where activities must be limited and controlled in line with this report.

Only very limited TOP species are likely to traverse the areas associated with the power line routes and due to the limited extent of significant habitats overlapping the power line route, if such species do utilise these areas, they will not be confined to the power line route. Being mobile they can move away from the development once it commences, and return after activities are completed, as long as the highly sensitive areas are maintained. Significant direct impacts to fauna species are therefore not anticipated, but must be actively managed.

The assessment of potential SCCs indicates a low likelihood of such species being impacted by the activity as these species are only likely to traverse the project area and are unlikely to do so when activity commences on site. Furthermore, by maintaining the highly sensitive areas and associated ecological corridors, the habitat and means of dispersal for these species is maintained.

Impacts that have been identified to be of moderate significance can all be mitigated to low impact with vigilant activity and good house-keeping practices on site. Although a slightly larger area is targeted for development in the preferred layout, the area has little value in terms of terrestrial fauna habitat and there is no objection to the preferred or alternative layout in terms of the development site. The preferred option of the power line route is less likely to interfere with the northern ecological corridor, but with the proposed management measures strictly applied in the construction of the power line, there is also no objection to the preferred or alternative layouts of the power line routes.

In terms of terrestrial fauna biodiversity, no additional faunal assessments or studies are deemed necessary. There is no reason for not authorising the activity as long as the following recommendations are adhered to:

- Recommendations of the flora and wetland specialist must be implemented on site.
- Any areas designated as highly sensitive by the flora specialists should be considered as highly sensitive in terms of fauna (unique and unmodified fauna habitat provision) and should be considered no-go areas.
- Staff and contractors must be made aware of the potential presence of SCCs (Spotted-necked Otter, Oripi and *Aloeides dentatis dentatis*) and the confirmed TOPS (Giant Bullfrog) in the general area and report sightings of these species to the Environmental Officer and the appropriate action taken (if necessary) to prevent harm to these species.
- The mitigation measures in this report and that of the flora report must be included within the environmental management plan report and implemented on site.

Table of Contents

1. Introduction & Site Characterisation.....	1
1.1 Scope of Work.....	5
1.2 Relevant Legislation.....	6
2. Methodology.....	6
2.1 Desktop Ecological Status.....	6
2.2 TOP Species Desktop Lists.....	7
2.3 Site Assessment.....	7
2.4 Likelihood of TOP Species.....	8
2.5 Biodiversity Characterisation and Fauna Sensitivity Mapping.....	8
2.6 Fauna Impact Assessment.....	8
2.7 Limitations.....	9
3. Results.....	10
3.1 Mammals.....	15
3.2 Herpetofauna.....	20
3.3 Invertebrates.....	21
4. Terrestrial Biodiversity and Fauna Site Sensitivity.....	25
4.1 Terrestrial Biodiversity.....	25
4.2 Fauna Species.....	27
4.3 Site Sensitivity.....	28
5. Fauna Impact Assessment.....	29
6. Fauna Management & Monitoring Plan.....	36
6.1 Invasive Species.....	37
7. Conclusion and Recommendations.....	38
8. References & Bibliography.....	39
8.1 Literature.....	39
8.2 Internet Sources.....	41

List of Tables

Table 1: Ecologically significant features (distances are “as the crow flies” approximations).....	1
Table 2: Site Habitat Characterisation.....	11
Table 3: TOP and Endemic Mammals (Bold species are SCC – SANBI, 2020).....	18
Table 4: TOP and Endemic Herpetofauna (Bold species are SCC – SANBI, 2020).....	23
Table 5: Invertebrates of interest (Bold species are SCC – SANBI, 2020; Shaded species are ADU / iNaturalist species).....	24

Table 6: Terrestrial biodiversity features relevant to terrestrial fauna and impact statements.....	25
Table 7: Overall terrestrial biodiversity sensitivity (Plan 6).....	28
Table 8: Monitoring plan to be undertaken by EO.....	37

List of Plans

Plan 1: Preferred (red) and alternative (cyan) project layout (A) and panel development areas (B) overlaid onto Google Earth Image (April 2021).....	3
Plan 2: Project area in relation to Important Bird Areas and Protected Areas (SANBI, BGIS Map Viewers).....	4
Plan 3: Project area in relation to National Freshwater Priority Areas (SANBI, BGIS Map Viewers) indicating the preferred layout (red) and the alternative layout (cyan).....	4
Plan 4: Site in relation to the Gauteng biodiversity conservation plan (SANBI, BGIS Map Viewers) indicating the preferred layout (red) and the alternative layout (cyan).....	5
Plan 5: Habitat units overlaid onto Google Earth image (April 2021) with GPS tracks.....	14
Plan 6: Site sensitivity in terms of terrestrial fauna findings.....	29

List of Appendices

Appendix A: CV, Qualification, SACNASP registration

Appendix B: Desktop fauna records (from ADU and iNaturalist)

1. Introduction & Site Characterisation

The proposed project is being developed to generate electricity for the ERGO Mining plant's power requirements (Plan 1). The proposed development site (proposed for the establishment of solar PV panels) lies within the footprint of an old mine tailings dump that revegetated on its own (and possibly actively seeded) over the last 20 year. The proposed power line route is largely along existing roads, gravel roads and ERGO Mine pipeline servitudes. The development site and the proposed power line route are collectively referred to as the project area or site in this report. Plan 1 indicates the preferred and alternative layouts considered for the proposed development.

The site lies just south of the N17 and just east of the Heidelberg Road (R23), and lies within the Ekurhuleni Municipality, Gauteng Province. Table 1 provides a summary of the desktop assessment of the ecologically significant features relevant to the site.

A separate avifauna assessment is being undertaken, and the birds have been omitted from this report, which focusses on mammals and herpetofauna and also provides a high-level assessment of threatened or protected (TOP) invertebrates.

Table 1: Ecologically significant features (distances are “as the crow flies” approximations)

Ecological feature / area	Description of feature relevant to the site
International Conservation:	The Blesbokspruit RAMSAR Wetlands (incorporated in part in the Marievale Bird Sanctuary Provincial Nature Reserve) are approximately 12km east of site. No World Heritage sites occur within 50km of site.
Protected Areas (PAs) (Plan 2)	The formally protected Suikerbosrand Provincial Nature Reserve lies <10km south of site. Other nearby provincial nature reserves and bird sanctuaries are all more than 10km from site. No National Protected Area Expansion Strategy (NPAES) occur within 10km of site.
National Freshwater Priority Area (NFEPA) Features (Plan 3)	The site is not within a NFEPA Catchment. A non-perennial tributary flows north and north-west of the site (approximately 600m from site) and flows south into the Rietspruit Tributary. The proposed power line will cross this Rietspruit Tributary, which is a NFEPA river with an unacceptable ecological state (river condition has not been assessed). The tributary eventually confluences with the NFEPA Rietspruit (unacceptable ecological state and river condition) 5.3km west of the proposed power line crossing. The two small dams, upstream and north of the development site, are Rank 5 NFEPA wetlands. The remaining wetlands around site are Rank 6 wetlands which provide little in terms of habitat for TOP species (cranes, TOP water birds and frogs). In terms of the desktop information, the aquatic habitats are impaired and unlikely to have significant value for sensitive riverine and wetland fauna species.
Strategic Water Source Areas (SWSAs)	The Eastern Karst Belt SWSA occurs just over 2km north-east of the northern point of the proposed power line, but lies within a different sub-catchment.
Biome and Ecosystem	The area falls within the Grassland Biome. The following is relevant: <ul style="list-style-type: none"> The site and the bulk of the power line is within the Klipriver Highveld Grassland, listed as a Critically Endangered ecosystem (NEM:BA, GN1002,

Ecological feature / area	Description of feature relevant to the site
	<p>2011).</p> <ul style="list-style-type: none"> • The southern and northern extremities extend into Tsakane Clay Grassland, listed as an Endangered ecosystem (NEM:BA, GN1002, 2011). • The very northern extent of the power line extends into Soweto Highveld Grassland, which is listed as a Vulnerable ecosystem (NEM:BA, GN1002, 2011). <p>Given the history of the site, and the historical impacts and ongoing activities in and around the area, it is not expected that the area will support representative units of these ecosystems (to be confirmed by the flora specialist), specifically the panel development area on the old tailings facility and the power line within existing road servitudes and existing / historical mine areas.</p>
Gauteng Ridges	No classified ridges occur on or near site. Three very small Class 4 (lowest ridge classification) ridges occur within 4-11km of site.
Conservation Plan (Plan 4)	<p>The entire PV panel development site is within undesignated areas; the entire extended area is an old tailings facility. CBAs and ESAs are associated with the non-perennial tributary north and north-west of the development site.</p> <p>The power line traverses undesignated areas, ESAs and CBAs. The disconnected CBAs in the northern extent of the power line are designated for vegetation characteristics. The CBAs in the western extent of the power line are designated for vegetation characteristics and RL bird habitat. None of the CBAs are designated for RL mammal or invertebrate species.</p>
QDGS	The site lies within QDGS 2628AD. All desktop data obtained from the citizen science sites have been sourced for this QDGS.

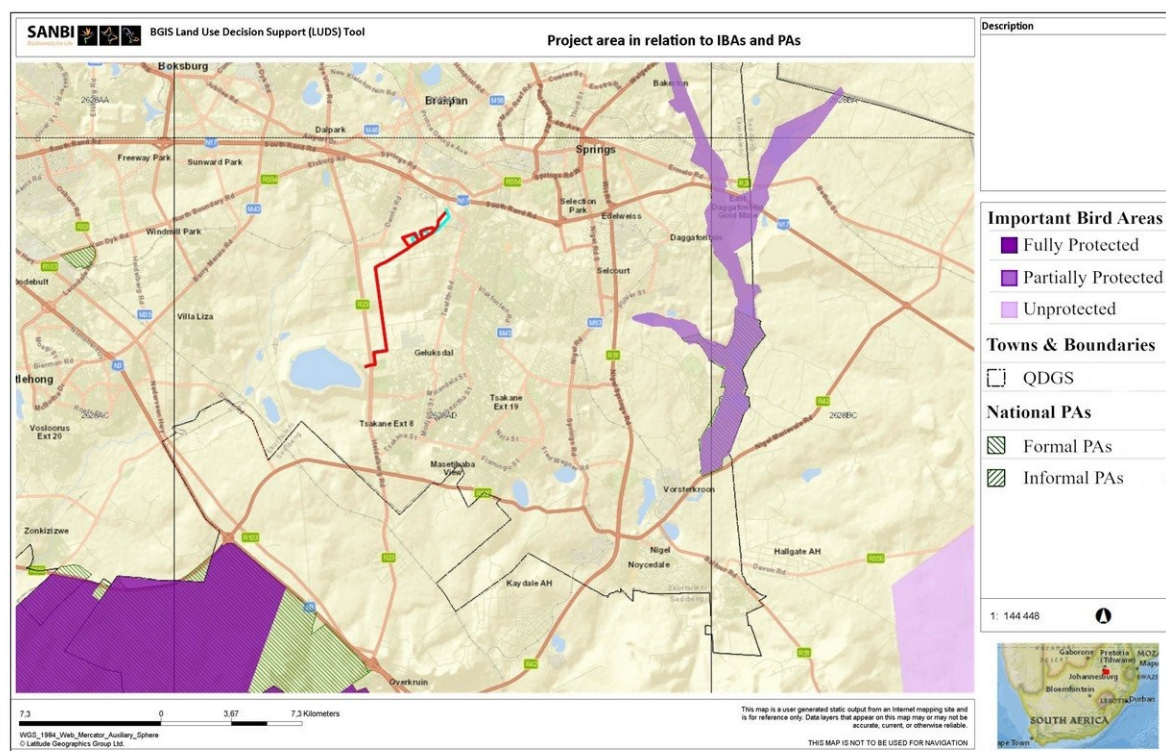


A: Full project layout alternatives

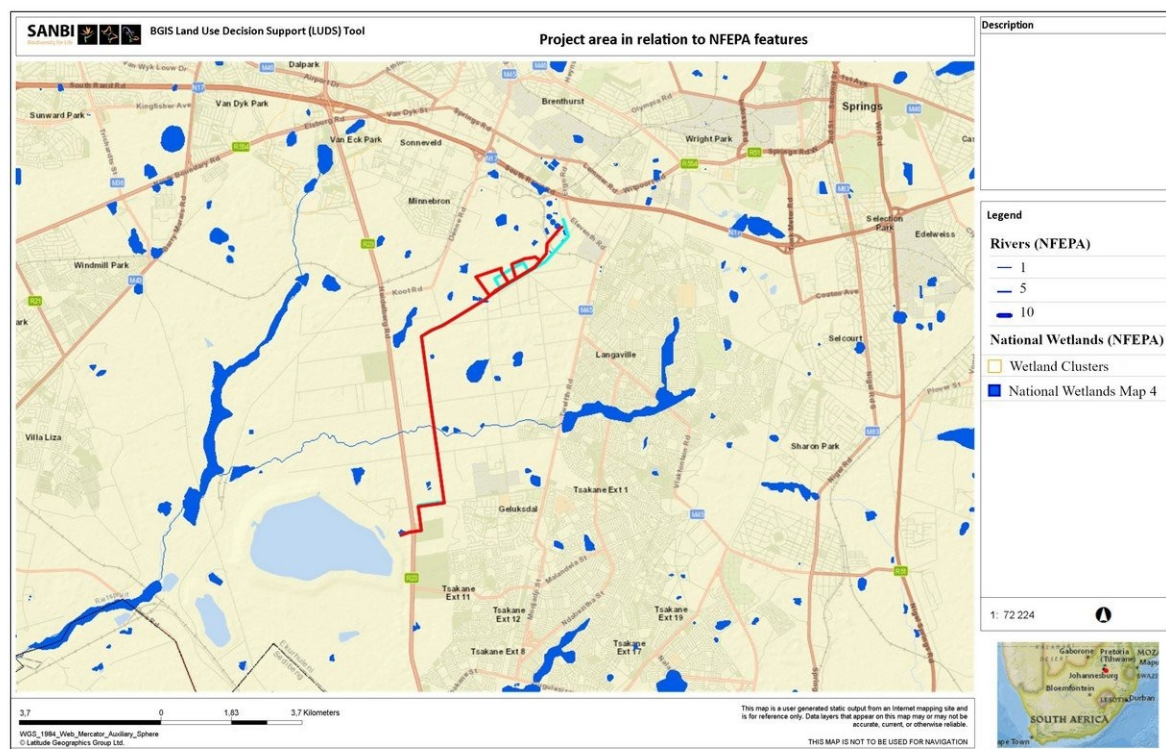


B: Panel development alternatives and supporting infrastructure

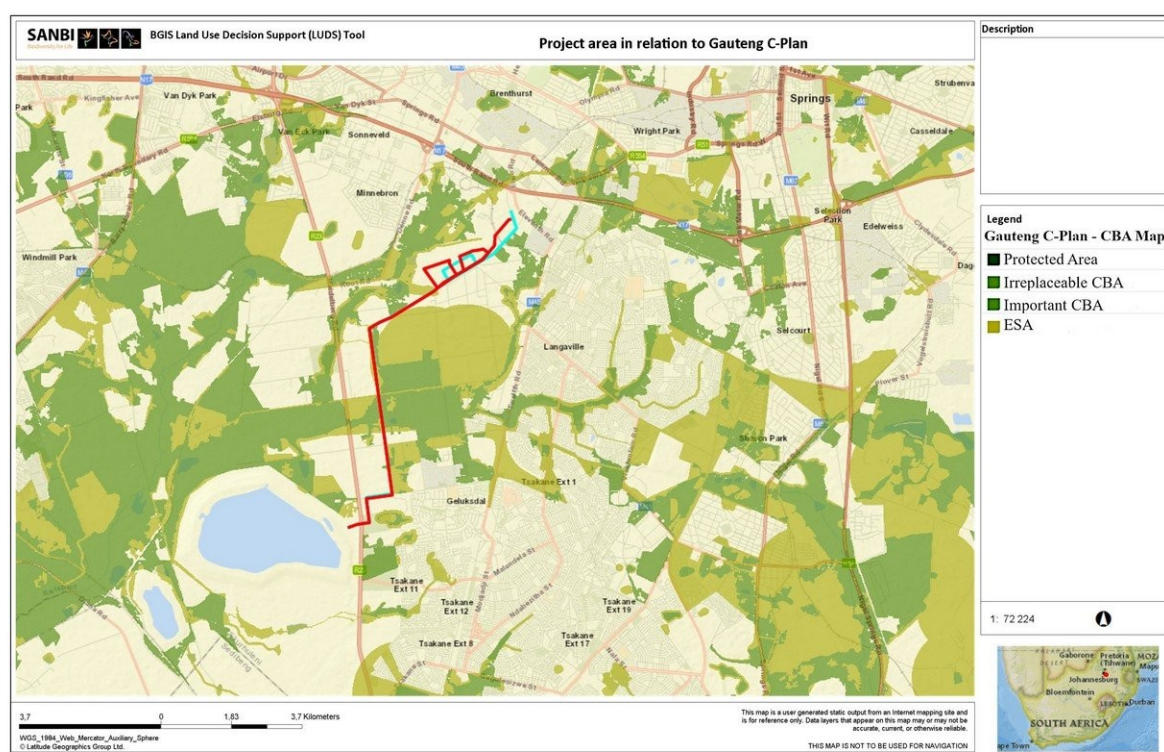
Plan 1: Preferred (red) and alternative (cyan) project layout (A) and panel development areas (B) overlaid onto Google Earth Image (April 2021)



Plan 2: Project area in relation to Important Bird Areas and Protected Areas (SANBI, BGIS Map Viewers)



Plan 3: Project area in relation to National Freshwater Priority Areas (SANBI, BGIS Map Viewers) indicating the preferred layout (red) and the alternative layout (cyan)



Plan 4: Site in relation to the Gauteng biodiversity conservation plan (SANBI, BGIS Map Viewers) indicating the preferred layout (red) and the alternative layout (cyan)

1.1 Scope of Work

The site and surrounds rank as high sensitivity (EIA Toolkit) for terrestrial biodiversity from a desktop perspective, but given the history of the site (old tailings facility footprint), it is expected that the on-site biodiversity value to terrestrial fauna is low, other than the potential tributaries and associated ecological corridors on site. A full biodiversity impact assessment has been completed with focus on the ecological corridors and natural habitat units.

The site and surrounds rank as medium and low sensitivity (EIA Toolkit) for animal species, with one butterfly (*Aloeides dentatis dentatis*) and two mammals (*Ourebia ourebi ourebi* and *Hydricitis maculicollis*) listed as potential species of conservation concern (SCC). Due to the status of the site in terms of historical land use and impacts, the animal species are assumed to rank low and a compliance statement has been completed for animal species, but with a more detailed discussion of the three SCCs.

As stated above, a separate avifauna assessment is being undertaken, and the birds have been excluded from this report.

As per NEMA EIA Regulations (GNR982, 2017) and the requirements of the EIA Screening Tool Protocols for the Assessment and Reporting of Environmental Themes (GN320 & GN1150 of 2020), the following is relevant regarding the scope of work considering the site rankings and state:

- Assess and comment on the significance of the terrestrial fauna habitat components and current general conservation status of the property in terms of SANBI BGIS data (Table 1).
- Comment on the likelihood of threatened or protected (TOP) and potential SCC fauna (*Aloeides dentatis dentatis*, *Ourebia ourebi ourebi* and *Hydrictis maculicollis*) occurring on site.
- Discuss important ecological drivers, processes and services as may be relevant.
- Address site sensitivity based on site survey findings in relation to regional ecological setting.
- Complete an impact statement for TOP fauna species and complete an impact assessment for biodiversity features of relevance to terrestrial fauna.
- Provide management recommendations to mitigate negative impacts of the activities on terrestrial fauna.

1.2 Relevant Legislation

Several Acts govern the environment and development in relation to the environment within South Africa. In terms of this study the following are relevant:

- The National Environment Management Act, 1998 (Act No. 107 of 1998); and
- The National Environmental Management Biodiversity Act, 2004. (Act 10 of 2004).

NEM:BA and its regulations are of particular importance in terms of the fauna and flora ecosystems. The principal regulations considered within this report are:

- The National Environmental Management: Biodiversity Act (10/2004): Threatened or Protected Species Regulations. General Notice 152 of the 23/02/2007;
- The National Environmental Management: Biodiversity Act (10/2004): Publication of lists of species that are threatened or protected, activities that are prohibited and exemption from restriction. General Notice 151 of the 23/02/2007;
- The National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Lists. General Notice 1003 of 18 September 2020; and
- National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Regulations. General Notice Regulation 1020 of 18 September 2020.

The Nature Conservation Ordinance 12 of 1983 as amended by Gauteng General Law Amendment Act 4 of 2005 provides for the regulation of nature conservation within the Gauteng Province. Although this report does not delve into the legislation, any relevant requirements must be complied with regarding the proposed development.

2. Methodology

2.1 Desktop Ecological Status

The desktop assessment utilised predominantly SANBI BGIS data as detailed in Table 1, accompanied by Google Earth satellite imagery.

2.2 TOP Species Desktop Lists

A TOP species assessment was undertaken, which incorporates the potential SCCs. The term TOP species (TOPS) was coined in terms of the threatened and protected species lists published under NEM:BA's General Notice 151 of 2007 (GN151, 2007). In this report TOPS also includes threatened (Vulnerable, Endangered, Critically Endangered) Red-listed and IUCN (IUCNredlist.org) species (Near Threatened species are not detailed to retain focus on threatened taxa, but status is indicated where species is listed as threatened under another listing). Distribution and general information as presented in this report were sourced for:

- Mammals [sourced from Child, *et al.* (2016) as presented in the mammal Red-list on SANBI.org.za, and the Endangered Wildlife Trust Red-listed mammal fact sheets on ewt.org.za/reddata; supplemented by Stuart and Stuart (2013), Stuart and Stuart (2015), Murray (2011), Monadjem *et al.* (2010a) and Monadjem *et al.* (2010b)].
- Reptiles [Bates, *et al.* (2014). Although an Atlas Project and not strictly a Red-listed species book, provides recent taxonomic names and more recent listings to the prior outdated Red-Data Book of 1988. Reptile information was supplemented by Tolley and Burger (2012)]
- Frogs [sourced from Minter, *et al.* (2004) as presented in the frog Red-lists on FrogMap.adu.org.za and supplemented by du Preez and Carruthers (2009)].
- Invertebrates [also supplemented by Picker *et al.* (2012), Woodhall (2005) and SANBI Biodiversity Advisor Animal Checklists for ants, millipedes, Orthoptera and scarabs]:
 - Butterflies [Mecenero *et al.* (2013) as obtained from the South African Butterfly Conservation Association lists].
 - Dragonflies (Samways & Simaika, 2016).
 - Spiders (Dippenaar-Schoeman *et al.*, 2010).
 - Scorpions (Leeming, 2019).

Endemic species for mammals, reptiles and frogs (supplemented by information on inaturalist.org) were also indicated where relevant. Variation between sources on endemic species (just South Africa or South Africa, Lesotho and Swaziland) is not seen as critical in terms of this report.

In order to determine recent fauna diversity data, various citizen science sites were consulted:

- Mammal, amphibian, reptile and available invertebrate species lists for the QDGS over the last 10 year period from the Virtual Museum of the Animal Demographic Unit (VMUS.ADU.org).
- Furthermore, iNaturalist (iNaturalist.org) was also consulted for presences of potential TOP species.

Exotic and / or Alien Invasive (AI) Species (AIS) recorded in the area as per the citizen science sites are also discussed where relevant.

2.3 Site Assessment

Much of the area was historically disturbed (mostly through mining and related activities, but also crop agriculture) as evidenced in historical Google Earth imagery and most of the grasslands can be considered historically disturbed and recovering to varying degrees. Most of the power line route

was walked and assessed with a few random meanders completed in neighbouring areas. A meander was also completed of the development site.

During meanders the areas were assessed for micro-habitats, signs (tracks, scat, etc.) of fauna and actual fauna specimens. In addition, a particular effort was made to note butterflies on site due to the presence of potential SCC.

2.4 Likelihood of TOP Species

For the desktop TOP species, a probability assessment to determine the likelihood of species occurring on site was completed. The probability assessment should be seen as a ranking system rather than an absolute and is designed to reduce subjectivity of results. Likelihood of occurrence was generally assessed as follows:

- Confirmed: either through past surveys, citizen science sites and local knowledge where provided.
- Likely: Distribution of the species occurs over the sites and the sites and immediate surrounds provide habitat, roosting and food requirements of the specific species. There is nothing to prevent the species from residing on site for a length of time (season or year).
- Possible: Distribution of the species occurs over the sites but the specific habitat, roosting and/or food requirements are absent or sparse on site, but are present in the greater area. Species are not likely to reside on site, but may forage over or traverse the site. Species population is at low density over site.
- Unlikely: Distribution is on the edge of site and habitat, roosting and/or food requirements are absent or sparse in the sites and surrounds. Species population is at low density and erratic over site or no recent records in the area.

2.5 Biodiversity Characterisation and Fauna Sensitivity Mapping

Comment and discussion is provided on the important ecological features, including ecological drivers, processes and services where these are relevant to terrestrial fauna. The site sensitivity in terms of fauna is discussed and mapped as per the biodiversity findings.

2.6 Fauna Impact Assessment

Impact assessment is a predictive tool to identify aspects of a development that need to be prevented, altered or controlled in a manner to reduce the impact to the receiving environment, or determine where remediation activities will need to be incorporated into the overall development / activity plan. This does not mean that the impact will occur at the predicted significance.

The impact assessment methodology used is based on NEMA requirements (Appendix 3 of the EIA Regulations) and is presented under the impact assessment section. The following has been included:

- Impact assessment in terms of the activities / development on terrestrial fauna biodiversity and species, including discussion on cumulative and residual impacts where relevant.

- Presentation of mitigation measures for identified impacts. The mitigation actions considered the following:
 - STOP: These are activities that cannot continue until the necessary additional authorisations / legal requirements are obtained / met or the necessary operating procedures are compiled. Also includes activities that are considered fatal flaws where stipulated as such. These **MUST** be implemented.
 - MODIFY: These are development / activity aspects that must be considered for alteration or modification in order to reduce the impact on fauna.
 - CONTROL: These are mitigation actions that must be implemented to reduce the overall impact significance on fauna.
 - REMEDY: These are mitigation measures that focus on remedying impacts that may inadvertently occur on site.
- Terrestrial fauna monitoring plan where this is relevant.
- Concluding remarks and pertinent recommendations.

2.7 Limitations

Specialist studies are conducted to certain levels of confidence, and in all instances known and accepted methodologies have been used and confidence levels are generally high. This means that in most cases the situation described in the report is accurate at high certainty levels, but there exists a low probability that some aspects have not been identified / captured during the studies. Such situations cannot be avoided simply due to the nature of field work.

It must be stressed that the survey area is a much smaller area within the larger QDGS area utilised for desktop species, and species presented in these grid-based databases may not have actually been recorded at the specific site.

Large herbivores and antelope are excluded from more detailed discussion as many of these species are actively fenced in and managed as stock within selected areas. As these species are largely restricted to reserves and farms this is not seen as a significant omission.

Some species are confirmed through signs rather than actual sightings. This is not always ideal as the age of the signs are not always known and many species have similar scat / tracks / marks on the environment and species cannot always be fully determined. The more signs the more confidence in the data. This limitation must be kept in mind where species are discussed based on signs.

The site was very wet following extensive period of rainfall in Gauteng in February 2021. This hindered access in some areas and also may have resulted in larger areas being designated as moist areas and dams. The extent of moist grasslands should be verified by wetland specialists. Also, the incessant rainfall and local flooding would have washed away and / or impaired fauna signs (tracks, mounds, burrows and scat).

A slight alteration in the layout of the two preferred panel development areas to avoid the central drainage area resulted in a few areas in the extreme east and extreme west of the preferred layout to not be fully surveyed. This is not considered a flaw or severe omission as the western area is an extension of the tailings facility and under the same grassland habitat unit as the bulk of the site. The

eastern area (description and photos provided by Dimela Eco-Consulting, 2021) is part of historic mining areas and very disturbed with excavations and earth mounds impairing drainage in the area.

There are inherent errors in mapping programmes which must be considered with all mapping information presented.

Citizen Science projects were used for animal (ADU and iNaturalist) baseline data. When utilising data from Citizen Science projects, the following must be kept in mind:

- Public interest in sites may be fickle, and may wane and increase, which could have a direct effect on the number of records available and therefore the number of species recorded.
- Populated areas or popular tourist destinations may have more participants and therefore higher biodiversity data than less populated areas.
- Misidentification of species by the public cannot be excluded, but is not seen as a major problem as this is likely to be a consistent issue from year to year, and a degree of vetting does take place.
- It must also be considered that animals observed in captivity may be recorded by citizens. Such animals should not be considered part of the natural biodiversity but as the data provided by citizen science sites do not make such distinctions, it cannot be separated from the biodiversity data presented in this report.

SANBI's Biodiversity Advisor Animal Checklist website stipulates specifically that the Checklist author and the SANBI website must be cited in order to ensure that the intellectual input of scientists is acknowledged. The Checklist authors and dates of compilation could not be found for the lists consulted and thus only the web-site and name of the list is referenced. The site can be visited for the specific authors of the species discussed in this report.

Due to the low resolution of some distribution maps and the mobility of animals, distribution data utilised to present animal lists are not 100% accurate. Proper distribution data for the TOP invertebrates is scant and it is difficult to conclusively state if every species does or does not occur in the area.

On this note, the invertebrate list provided is likely to contain many species that will not occur in the area, but due to the lack of specific distribution data, these have been retained as a cautionary approach.

3. Results




The historical activities that have taken place within the area means that there is very little likelihood of grassland representing TOP ecosystems (to be confirmed by the flora specialists) occurring in the area. Therefore, from Table 1, the only significant desktop features included the streams, CBAs and ESAs, largely associated with the streams and adjacent areas.

The site assessment was conducted on the 9 February 2021 and the weather was warm and sunny to partly cloudy and cloudy during the course of the day. No rain was experienced, but the site visit followed an extensive 2 week rainy period in Gauteng and the site was wet, muddy and marshy. A

follow-up survey was completed by the flora specialist (Dimela Eco-Consulting) on the 26 May 2021 to address additional areas (see limitations) and photos were supplied for assessment in this report.

Many areas are developed, are under infrastructure or are simply completely denuded and are designated as areas with 'No Natural Habitat' (Plan 5). Some fauna species still utilise such areas, but tend to be species that are highly tolerant of human activity and generalists species with wide habitat tolerances. Most of the AI species (rats) would also occupy such areas as most are closely linked to human settlements and areas of activity. Table 2 discusses habitat units identified on site (Plan 5).

Table 2: Site Habitat Characterisation

Grassland	
	
Photograph 1: Open grassland	Photograph 2: Grassland & active termite mound
<p>Areas where no evident historical activities could be confirmed from Google Earth imagery and site assessment have been designated as grasslands (Photograph 1) and moist grasslands (below). Four grasslands have been designated:</p> <ul style="list-style-type: none"> • Grassland near the 7th and 17th Street intersection may have been utilised as pastures but area is connected to other grasslands and forms part of terrestrial ecological corridor which contains CBAs. • Grassland near the 10th and 18th Street intersection is associated with a small rocky area and overlaps with a CBA. It appears to have been disturbed by secondary impacts (runoff from the historical tailings facility), but is well connected northwards to the non-perennial tributary. • Grassland lies around the Rietspruit Tributary (between Lukas Stein and Boland Streets) and is incorporated within a CBA. • Grassland is associated with a small drainage line and dam, south of the Rietspruit Tributary. The area to the right has been fenced off which has reduced the extent and connectivity of this small aquatic corridor and grassland area. <p>The grasslands provided substrates that varied from clay-loams to sandy loams and would be suitable for burrowing species, although no burrows were observed (possibly washed away by the recent rains). Active termite mounds were present within these areas (Photograph 2). The grasslands provided no suitable arboreal habitats and would be suitable to strictly grassland species.</p>	
Moist Grassland	
	
Photograph 3: Moist grassland around the reed-dominated tributary in the north	Photograph 4: Rietspruit and surrounding moist grassland

Three moist grasslands are designated along the power line route along 10th Street:

- Northern-most (Photograph 3) is associated with an ESA of the non-perennial tributary which has been paddocked and flow in the tributary has been heavily impeded and is overgrown with reeds with limited patches of open water. The moist grassland has also been impacted by paddocks, community waste dumping and AIS species.
- The central is associated with the CBA of the Rietspruit tributary and is probably the least impacted (Photograph 4) with the associated stream minimally impacted by the upstream farm dam and the road culvert. The tributary forms a significant aquatic ecological corridor.
- Southern-most is along a drainage line which has been dammed. A good portion of this moist grassland is contained within a larger CBA. Just east of the dam the entire area was fenced off which has reduced the connectivity of the general area to larger mammals.

Moist grasslands provide habitat to wetland species but also serve ecotone species where it neighbours terrestrial grasslands. They are often associated with streams and form part of the aquatic ecological corridors of these systems and thus are considered sensitive areas.

Rocky Habitat



Photograph 5: Minor rock habitats in the grasslands in the northern extent of the power line



Photograph 6: Rocky habitat adjacent and north of 10th street

Rocks were strewn along the proposed power line route; in most cases these were not natural. Few isolated and small patches of rocky habitats were noted within the historically developed grassland near the far north-eastern part of the power line (Photograph 5). A small rocky mound and patch of rocky habitat was noted along 10th Street (Photograph 6). It was not entirely clear if it was all natural or not, but it can be considered established and a sensitive habitat.

Rocky habitats improve habitat diversity within the terrestrial landscape and provide habitat to rocky habitat species. The rocky habitat on site is not very extensive, but may support some reptiles that are less sensitive in terms of disturbance with wider habitat tolerances.

Surface Water Features (Dams and Streams)



Photograph 7: Full dams and rain-filled depressions along the road



Photograph 8: Full and flowing Rietspruit

Streams were flowing and dams were full and overflowing after the extensive rainfall experienced in Gauteng prior to the site visit. This provided several exposed surface water habitats, largely utilised by various birds (assessed through a separate avifauna specialist report) and frogs. Patches of grassland were inundated and several pools of water and rain-filled depressions were scattered around site and along the proposed power line route.

Disturbed Grassland



Photograph 9: Grass-based vegetation established in old tailings paddocks



Photograph 10: Grass-based vegetation cultivated on the old tailings of the PV development site

Most of the grasslands in the area have been disturbed by mining and crop farming and the bulk of the project area falls within this category. The degree of recovery of the grasslands varies.

The bulk of the proposed power line route circumvented an old tailings dump; this dump has since been removed and supports grassland vegetation. The water control paddocks down-slope of the tailings dump have remained on site, but have also been vegetated with grasses (Photograph 9).

The development site also lies on an old tailings dump that has been revegetated (possibly through seeding) and forms heterogeneous grassland (Photograph 10), diversified only by bare areas and a small drainage area and off-site dam (disturbed moist grassland – see below).

The areas are disturbed but generalist fauna may still utilise the areas. It is unlikely that the areas would support TOP species for any length of time but species may traverse through these areas where they are connected to more natural habitats (predominantly along and between the riverine ecological corridors).

Disturbed Moist Grassland



Photograph 11: Artificial moist grasslands in the eastern extent of panel development area



Photograph 12: Artificial moist grassland created by impeded drainage around 17th Road

The drainage area on the PV panel development site and the eastern extent of the preferred panel development site (Photograph 11) are the main disturbed moist grasslands on site. Another smaller disturbed moist grassland occurs where 17th Road and existing infrastructure have impeded flow (just south of the eastern extent of the proposed PV panel development site) (Photograph 12). These areas have formed due to altered or impeded drainage and are not natural habitats.

AIS Stands

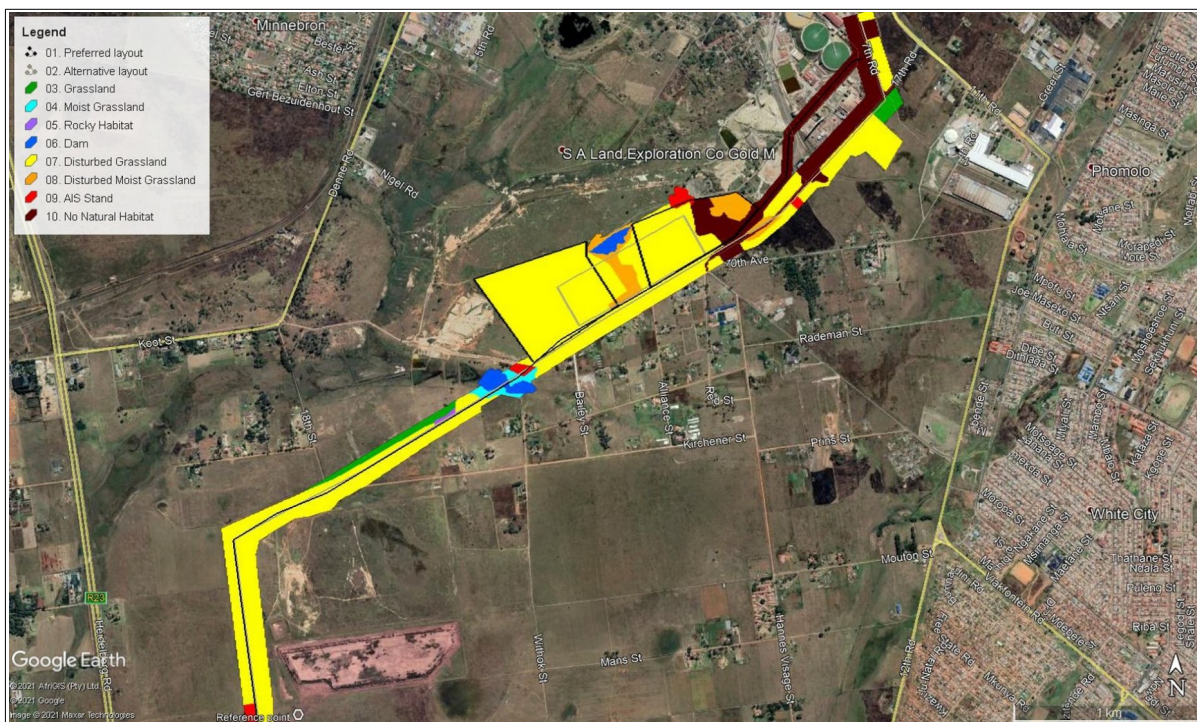


Photograph 13: Stands of alien invasive trees near the PV panel development site

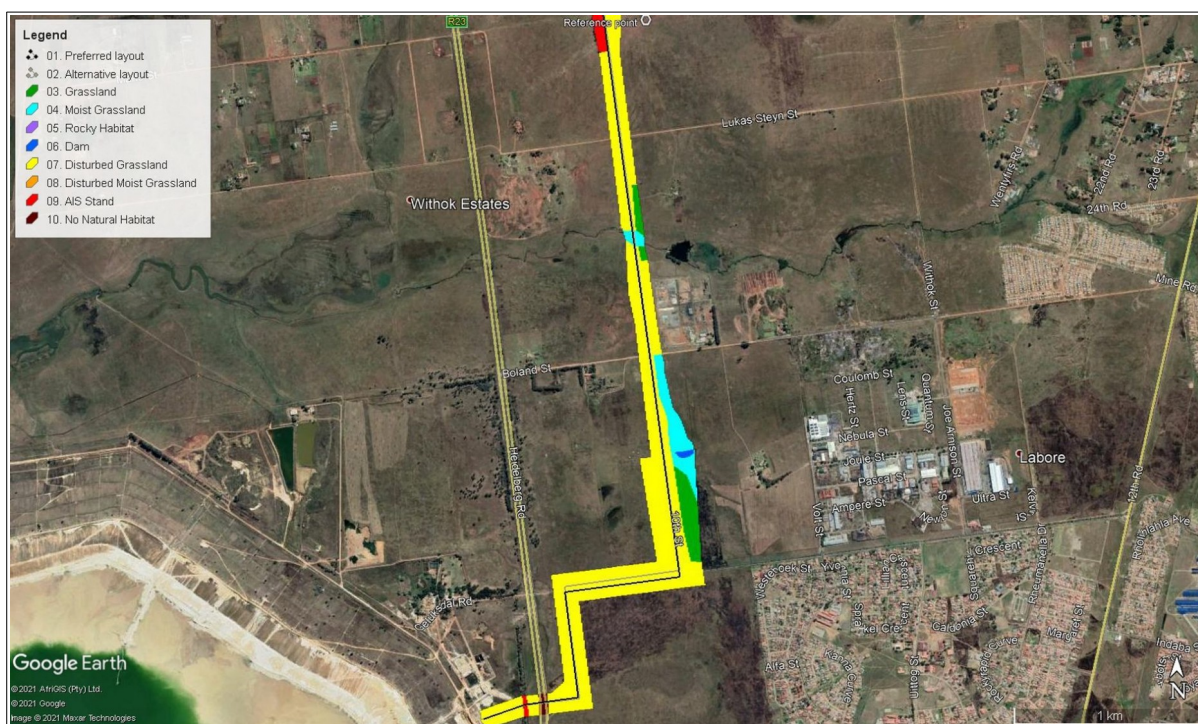


Photograph 14: Stands of alien invasive trees near 10th Street, along the tributary

Most of the site and power line route were devoid of trees, limited to very isolated and scattered trees (largely indigenous species). The limited stands of alien invasive trees provided the most significant arboreal habitats in the area.



A: Northern extent of project area incorporating the PV panel development site



B: Southern Extent of project area

Plan 5: Habitat units overlaid onto Google Earth image (April 2021) with GPS tracks

The complete desktop fauna lists as extracted from the various citizen science sites are included in Appendix B. The TOP and endemic species extracted from this list are further discussed below. Each faunal vertebrate group discussed, as relevant, the TOP species, endemic and restricted species and

the AIS, focussing on species that are highly likely to occur on site for extended periods and therefore most likely to be exposed to the development and potential impacts. Invertebrates are discussed more generally but TOP species lists are included.

3.1 Mammals

In terms of the Animal Demographic Unit (ADU) list (Appendix B), the following is relevant:

- Unidentified species on the ADU list have not been included.
- Species names are indicated as per the latest mammal Red-Lists (Child *et al.*, 2016).
- *Rhabdomys pumilio* does not have a distribution within Gauteng and *Rhabdomys dilectus* is included in Appendix B instead.
- *Mastomys natalensis* and *Mastomys coucha* represent the ADU *Mastomys* species in Appendix B.

3.1.1 Site Species

The incessant rains over the prior 2 weeks of the site visit degraded most fauna signs and few signs of fauna were noted on site. Tracks that were noted were distorted by the muddy terrain and therefore difficult to determine the species. More fauna signs were evident along the southern sections of the power line route than at the site and around the developed areas in the north, which is not entirely unexpected in the more open and less developed southern area.

Two tracks, most likely belonging to the Yellow Mongoose (*Cynictis penicillata*) (confirmed species in Table 3) and Slender Mongoose (*Herpestes sanguineus*) (not confirmed), were noted around the agricultural areas. Feeding signs and tracks of small to medium carnivores were also noted around site, but no species could be ascertained.

Antelope tracks and scat were noted and most likely belonged to the Common Duiker (*Sylvicapra grimmia*), a common buck in the rural setting.

The May 2021 survey revealed that mole-rats were utilising some of the disturbed grasslands around the panel development site. Although the species cannot be ascertained, it could be the Pretoria Mole-rat which has a tolerance for modified habitats:

- Pretoria Mole-rat (*Cryptomys pretoriae*) (Endemic). Species is considered an eco-engineer increasing the humic content of soil, aerating soil and may enhance infiltration and water holding capacity of soil. Create refuge for other species within their burrows to escape fire. Species is not threatened but is occasionally persecuted as agricultural, garden and golf-course pest (Bennett *et al.*, 2016).

3.1.2 Historical & Likely TOP, SCC & Endemic Species

The previously recorded TOP and endemic mammals for the area and those with distributions across the area are indicated in Table 3. All previously recorded TOP species are antelope which are not likely to occur on site unless deliberately stocked on site and are not further discussed.

The physical footprints of the power line route and the development site can be considered historically developed, not fully rehabilitated, and / or disturbed grasslands. Furthermore, both

power line route and development site are additionally exposed to ongoing anthropogenic impact, including vehicular and pedestrian traffic, activities associated with ERGO Mining Brakpan Plant and surrounding industries, and the slurry and water pipelines and associated activities. It is therefore unlikely that TOP species would reside within the immediate footprints of these areas.

There are some patches of less disturbed terrestrial grassland within the proximity of the power line where some TOP species may occur for more extended periods rather than just brief foraging excursions or rests. Species such as the Oribi (*Ourebia ourebia*), a potential SCC for the area, would utilise the more natural, undisturbed grasslands as part of their territory (Shrader *et al.*, 2016), which would provide better habitat for the species than the bulk of the route and development site. The species is therefore listed as possible for the project area. It is unlikely to occur for any length of time within the project area and is unlikely to be exposed to direct impacts associated with the proposed development.

The only significant natural habitats identified directly within the power line route were the moist grasslands associated with the wetland areas of the tributaries, the least impacted and well connected being the moist grassland associated with the Rietspruit Tributary. The Spotted-necked Otter (*Hydricotis maculicollis*), another potential SCC for the area, has a preference for large rivers, permanent pools, lakes, dams and well-watered swamps and is likely to be deterred by poor quality water (Ponsoby *et al.*, 2016). The development site has a dam and drainage area, but it is suspected to be a fairly limited and isolated aquatic habitat and not expected to be utilised by the otters. There are some dams around the power line route that may serve as better habitats, but are not within the route. The species may therefore move through the area, but it is unlikely to occur permanently within the project site and is listed as possible species.

The following TOP and endemic species are listed as most likely to occur in the project area and surrounds, but it must be stressed that the wetland habitats are quite limited areas and wetland species are not going to remain only within that limited footprint and are more likely to move through the area:

- Southern African Hedgehog (*Atelerix frontalis*) (GN151 Protected; Gauteng Schedule 2: Protected game species). Plays a role in invertebrate pest control as an insectivore. Main threats include habitat loss, degradation and fragmentation from urban sprawl and agriculture. Also threatened by illegal harvesting from the wild for food, or for sale as pets and for traditional medicine (Light *et al.*, 2016).
- Serval (*Leptailurus serval*) (GN151 Protected). Servals may play a functional role in agricultural landscapes in controlling the numbers of pest species, specifically rodents and invertebrates. Main threats include loss and degradation of wetlands and associated grasslands. Wetlands generally harbour high rodent densities compared with other habitat types, and form the core areas of Serval home ranges; disruption to such habitats reduces prey-base (Ramesh *et al.*, 2016).
- Southern Reedbuck (*Redunca arundinum*) (GN151 Protected; Gauteng Schedule 2: Protected game species). Impacted in the past by habitat transformation and degradation associated with agricultural activities and settlements. On agricultural land, they are subjected to possible persecution due to damage to pastures and crops. Also susceptible to hunting, snaring and poaching (du Plessis *et al.*, 2016).
- Steenbok (*Raphicerus campestris*) (Gauteng Schedule 2: Protected game species). Species may contribute to seed dispersal as the species is known to eat fruit and pods. The Steenbok

is also an important prey species for carnivores. No major threats to this species, but minor threats include subsistence hunting, range restriction through erection of fences, and loss of habitat through poor ranch management (Palmer *et al.*, 2016).

- Forest Shrew (*Myosorex varius*) (Endemic). The Forest Shrew is an important prey for the Barn Owl, Water Mongoose, African Striped Weasel and Striped Polecat. The main threat to Forest Shrew is the loss or degradation of moist, productive areas such as wetlands and rank grasslands within suitable habitat. Climate change is also seen as a threat (Taylor *et al.*, 2016).

3.1.3 Alien & Exotic Species

No exotic or AI species were recorded for the QDGS. Cats were noted in the area and dogs were heard around site.

The area is also an agricultural area and utilised for stock grazing. Cattle and chickens are confirmed and it is also suspected that sheep occur in the area based on scat and tracks.

3.1.4 Ecosystem Services

The various ecosystem services provided by the fauna previously recorded and likely in the area are fairly typical and include:

- Prey-base for predators / raptors.
- Control of potential vermin, pests and AI species, including potential vectors for disease.
- Seed dispersal.
- Ecosystem engineers:
 - Bulk grazers facilitate the presence of more selective, smaller grazers by inducing productive grasslands for these species.
 - Burrowers (for refuge, habitat or simply digging for tubers / roots). Diggings and burrows affect flow of resources, trapping materials that change soil chemical, physical nature and moisture, creating a mosaic of varied and regenerating habitat patches.

Table 3: TOP and Endemic Mammals (Bold species are SCC – SANBI, 2020)

Common name	Scientific name	Endemism	SA GN151	SA Red-list	IUCN	GP Protected Schedule
Site species						
Mongoose, Yellow	<i>Cynictis penicillata</i>					
Duiker, Common (scat & tracks)	<i>Sylvicapra grimmia</i>					
Mole-rat, Pretoria (mounds)	<i>Cryptomys pretoriae</i>	Endemic				
TOP and Endemic Species recorded in the QDGS						
Wildebeest, Black	<i>Connochaetes gnou</i>	Endemic	Protected			2: Protected Game
Blesbok	<i>Damaliscus pygargus phillipsi</i>	Endemic		NT		
Eland, Common	<i>Tragelaphus oryx</i>					2: Protected Game
Hartebeest, Red	<i>Alcelaphus buselaphus caama</i>					2: Protected Game
Likely TOP and Endemic species						
Hedgehog, Southern African	<i>Atelerix frontalis</i>		Protected	NT		2: Protected Game
Serval	<i>Leptailurus serval</i>		Protected	NT		
Reedbuck, Southern	<i>Redunca arundinum</i>		Protected			2: Protected Game
Steenbok	<i>Raphicerus campestris</i>					2: Protected Game
Shrew, Forest	<i>Myosorex varius</i>	Endemic				
Possible TOP and Endemic Species						
Oribi	<i>Ourebia ourebia</i>		Endangered	Endangered		2: Protected Game
Cat, Black-footed	<i>Felis nigripes</i>		Protected	Vulnerable	Vulnerable	
Otter, Spotted-necked	<i>Hydrictis maculicollis</i>		Protected	Vulnerable	NT	
Hyaena, Brown	<i>Parahyaena brunnea</i>		Protected	NT	NT	2: Protected Game
Reedbuck, Southern Mountain	<i>Redunca fulvorufula</i>			Endangered	Endangered	2: Protected Game
Mouse (Rat), White-tailed	<i>Mystromys albicaudatus</i>			Vulnerable	Endangered	
Rhebok, Grey	<i>Pelea capreolus</i>	Endemic		NT	NT	2: Protected Game
Unlikely TOP and Endemic Species						
Honey Badger (Ratel)	<i>Mellivora capensis</i>		Protected			
Fox, Cape	<i>Vulpes chama</i>		Protected			
Leopard	<i>Panthera pardus</i>		Vulnerable	Vulnerable	Vulnerable	4: Protected Wild Animals

Common name	Scientific name	Endemism	SA GN151	SA Red-list	IUCN	GP Protected Schedule
Aardwolf	<i>Proteles cristata</i>					2: Protected Game
Klipspringer	<i>Oreotragus oreotragus</i>					2: Protected Game
Aardvark	<i>Orycteropus afer</i>					2: Protected Game
Rat, Tete Veld	<i>Aethomys ineptus</i>	Possible endemic				
AIS / Exotic Species recorded in the area						
Cat, Domestic	<i>Felis catus</i>	Exotic				
Dog, Domestic	<i>Canis familiaris</i>	Bred				

NT: Near Threatened

3.2 Herpetofauna

In terms of the ADU list (Appendix B) the following is relevant:

- Omitted species are excluded from this report.
- The species names used in this report are as per Bates *et al.* (2014) and du Preez and Carruthers (2009).
- The ADU list includes *Leptotyphlops* sp. *Leptotyphlops scutifrons* has a corresponding distribution and is included in Appendix B.

The Gauteng Province lists several non-serpentine reptiles as Schedule 2: Protected Game and the list is too extensive to incorporate in this report. The Giant Bullfrog (*Pyxicephalus adspersus*) is the only amphibian listed (listed as Schedule 2: Protected Game). The proposed development does not intend any specific scheduled activities (hunting, catching, transporting, amongst others) involving herpetofauna, but the legislation must be consulted and complied with should any species need to be handled under any circumstances.

3.2.1 Site Species

Only one species of frog was confirmed for site and was also previously recorded in the larger QDGS:

- Giant Bullfrog (*Pyxicephalus adspersus*) (GN151 Protected; Gauteng Schedule 2: Protected game species). Species is threatened by loss and degradation of its wetland and neighbouring terrestrial habitat.

The Giant Bullfrog has been reported to be declining and is listed nationally as Near Threatened and effort must be made to conserve the species by way of maintaining the natural habitats and ecological corridors remaining in the area.

The confirmed specimen was a highly mobile, solitary juvenile (about the size of a thumb) and was noted up-slope and north of the Rietspruit Tributary crossing the gravel road. The area near the tributary supported less disturbed moist and terrestrial grasslands and it is likely that the specimen was on the move between such habitats. It is unlikely to utilise the old tailings facilities with compacted surfaces.

The frogs are known to be fairly adaptive with their breeding and will utilise pools and rain-filled depressions in grasslands during their breeding season. They are typically active between November and January, but the extended period of incessant rainfalls prior to the site visit could easily have extended their activity period. The weather experienced on site would have also provided more habitat to breeding frogs and the lack of more sightings suggests that the area may support only limited populations.

3.2.2 Historical & Likely TOP, SCC & Endemic Species

No other TOP species (other than the Giant Bullfrog) or SCC are expected in the area (Table 4). The following endemic herpetofauna have been previously recorded in the greater area and could occur in the project area:

- Eastern Ground Agama (*Agama aculeata distanti*) (Endemic).
- Common Crag Lizard (*Pseudocordylus melanotus melanotus*) (Endemic).
- Transvaal Thick-toed Gecko (*Pachydactylus affinis*) (Endemic).
- Aurora House Snake (*Lamprophis aurora*) (Endemic).
- Thin-tailed Legless Skink (*Acontias gracilicauda*) (Endemic).
- Raucous Toad (*Amietophrynus rangeri*) (Endemic).

Other endemic species that are likely to occur on site include:

- Delalande's Sandveld Lizard (*Nucras lalandii*) (Endemic).
- Spotted Harlequin Snake (*Homoroselaps lacteus*) (Endemic).
- Olive Ground Snake (*Lycodonomorphus inornatus*) (Endemic).
- Rattling Frog (*Semnodactylus wealii*) (Endemic).

In terms of the rocky habitat species listed above, it must be kept in mind that the rocky habitats were very limited within the project area (limited to a small section along the power line route) which reduced the overall likelihood of such species on site.

3.2.3 Alien & Exotic Species

No AIS or exotic species were identified from ADU lists or iNaturalist.

3.2.4 Ecosystem Services

Many of the herpetofauna species feed on arthropods and will cumulatively contribute to control of invertebrate numbers, including aquatic invertebrates that may be vectors for disease. Many reptiles and frogs are also food source to many birds and mammals, as well as other reptile species.

3.3 Invertebrates

A summary of TOP and provincially protected invertebrates with distribution ranges over and near the survey area are included in Table 5, with ADU desktop species (no iNaturalist species) indicated in bold. It must be stressed that the distribution of many species are unknown and it is very possible that species in Table 5 do not occur in the area and possibly the province (these are indicated as such). They have been included as a cautionary measure. Furthermore, in many instances, entire Family or Genera are listed and listing all these species would be too extensive.

Of the TOP ADU species confirmed for the QDGS (indicated in bold in Table 5), the Baboon Spider is a nocturnal burrowing species unlikely to be confirmed during diurnal surveys, but cannot be excluded from the more natural habitats.

One SCC butterfly has distribution near the area and has been recorded for the QDGS (October 2015) and includes:

- *Aloeides dentatis dentatis* (RL Endangered; IUCN Vulnerable; Schedule 7: Invertebrata). Host plants include *Hermannia depressa*, confirmed and scattered throughout the grasslands along the power line route, and *Lotononis eriantha* (not confirmed on site).
 - The species is mapped in the Gauteng conservation plan and is known from three localities in Gauteng Province, all within protected areas (i.e. Ruimsig Entomological Reserve, Klipriviersberg Nature Reserve, Suikerbosrand Nature Reserve). The species is therefore unlikely on site (Gauteng C-Plan technical report).
 - Butterflies were specifically noted on site during the survey, but no *Aloeides dentatis dentatis* or similar, potentially confusing, species were noted on site, despite surveys being within a peak flight period of the species.

The following butterflies are confirmed for the site:

- *Junonia orithya madagascariensis* (Lepidoptera: Nymphalidae) (Eyed Pansy).
- *Junonia hierta cebrene* (Lepidoptera: Nymphalidae) (Yellow Pansy).
- *Danaus chrysippus* (Lepidoptera: Nymphalidae) (African Monarch).
- *Pontia helice helice* (Lepidoptera: Pieridae) (Meadow White).
- *Eurema brigitta brigitta* (Lepidoptera: Pieridae) (Broad-bordered Grass Yellow).
- *Catopsilia florella* (Lepidoptera: Pieridae) (African / Common Vagrant).
- *Tarucus sybaris* (Lepidoptera: Lycaenidae) (Dotted Blue).

Table 4: TOP and Endemic Herpetofauna (Bold species are SCC – SANBI, 2020)

Common name	Scientific name	Endemism	SA GN151	SA Red-list	IUCN
Site species					
Bullfrog, Giant	<i>Pyxicephalus adspersus</i>		Protected	NT	
TOP and Endemic Species recorded in the greater area					
Agama, Eastern Ground	<i>Agama aculeata distanti</i>	Endemic			
Lizard, Common Crag	<i>Pseudocordylus melanotus melanotus</i>	Endemic (PR)			
Gecko, Transvaal Thick-toed	<i>Pachydactylus affinis</i>	Endemic (PR)			
Snake, Aurora House	<i>Lamprophis aurora</i>	Endemic			
Skink, Thin-tailed Legless	<i>Acontias gracilicauda</i>	Endemic			
Bullfrog, Giant	<i>Pyxicephalus adspersus</i>		Protected	NT	
Toad, Raucous	<i>Amietophrynus rangeri</i>	Endemic			
Likely TOP and Endemic species					
Lizard, Delalande's Sandveld	<i>Nucras lalandii</i>	Endemic			
Snake, Spotted Harlequin	<i>Homoroselaps lacteus</i>	Endemic			
Snake, Olive Ground	<i>Lycodonomorphus inornatus</i>	Endemic			
Frog, Rattling	<i>Semnodactylus wealii</i>	Endemic			
Possible TOP and Endemic Species					
Lizard, Coppery Grass	<i>Chamaesaura aenea</i>	Endemic		NT	
Slug-eater, Common	<i>Duberria lutrix lutrix</i>	Endemic			
Snake, Striped Harlequin	<i>Homoroselaps dorsalis</i>	Endemic		NT	
Unlikely TOP and Endemic Species					
Lizard, Cape Grass	<i>Chamaesaura anguina anguina</i>	Endemic			
AIS / Exotic Species recorded in the area					
No AIS or exotic species recorded on ADU or iNaturalist					

NT: Near Threatened**PR: Partially Restricted**

Table 5: Invertebrates of interest (Bold species are SCC – SANBI, 2020; Shaded species are ADU / iNaturalist species)

Order	Family	Scientific name	SA GN151	SA Red-list	IUCN	GP Protected Schedule
Araneae	Theraphosidae	<i>Harpactira hamiltoni</i>	Protected			7: Invertebrata
Araneae	Theraphosidae	<i>Pterinochilus lugardi</i>	Protected			7: Invertebrata
Scorpiones	Scorpionidae	<i>Opisthophthalmus pugnax</i>	Protected			
Coleoptera	Carabidae	<i>Dromica sp.</i>	Protected			
Coleoptera	Carabidae	<i>Graphipterus assimilis*</i>	Protected			
Coleoptera	Carabidae	<i>Manticora sp.</i>	Protected			
Coleoptera	Carabidae	<i>Megacephala asperata*</i>	Protected			
Coleoptera	Carabidae	<i>Megacephala regalis*</i>	Protected			
Coleoptera	Carabidae	<i>Prothyma guttipennis*</i>	Protected			
Coleoptera	Lucanidae	<i>Nigidius auriculatus*</i>	Protected			
Coleoptera	Lucanidae	<i>Prosopocoilus petitclerci*</i>	Protected			
Coleoptera	Scarabaeidae	<i>Ichnestoma sp.</i>	Protected			
Lepidoptera	Lycaenidae	<i>Aloeides dentatis dentatis</i>		Endangered	Vulnerable	7: Invertebrata
Lepidoptera	Nymphalidae	<i>Charaxes jahlnusa rex</i>				7: Invertebrata
Lepidoptera	Nymphalidae	<i>Charaxes jaisius saturnus</i>				7: Invertebrata
Orthoptera	Tettigoniidae	<i>Clonia uvarovi*</i>			Vulnerable	

* Provincial and / or specific distribution unknown

4. Terrestrial Biodiversity and Fauna Site Sensitivity

This section must be read together with the floral sensitivity plan to ensure a comprehensive terrestrial biodiversity sensitivity plan.

4.1 Terrestrial Biodiversity

Table 6 summarises the terrestrial fauna biodiversity findings as required under the terrestrial biodiversity protocol.

Table 6: Terrestrial biodiversity features relevant to terrestrial fauna and impact statements

Aspect	Fauna findings
Ecological processes	<p>The main ecological process is the plant-based primary production of 'food' through photosynthesis and forms the principal base of the food-chain in a terrestrial environment. Secondly, the associated contribution to the water cycle through evapotranspiration is also a significant ecological process provided by the plant life. Another important process is that of natural fires. As the natural fire cycles in South Africa's grassland and savanna have already been impacted by humans, this is not evaluated further.</p> <p><u>Impact:</u></p> <p>The removal of vegetation will result in loss of the primary production and primary food base provided by plants, although loss of vegetation will be largely within the panel development area where productivity has already been impaired by homogenous grassland and sensitive faunal populations are negligible; the impact is not seen as significant in terms of terrestrial fauna. Although a greater area is affected by the preferred option, the impact is not considered proportionally more significant. Where vegetation is retained (most of the power line route between the pylons) these processes will continue.</p>
Ecological drivers: climate change, AIS infestation & habitat changes.	<p>The development site can be considered a homogeneous habitat with only the drainage line and dam providing some diversity in the area. The area was not observed to, and is not expected to, support any significant terrestrial fauna populations.</p> <p>The power line route is largely proposed within existing road and mine pipeline servitudes and the route supports disturbed grasslands for the most part. A few moist grasslands occur within the power line route as well as a small rocky area; both contribute to habitat diversification and are considered sensitive habitats that must be preserved. Smaller patches of undisturbed grasslands were noted in neighbouring areas not targeted for development and which should remain intact.</p> <p><u>Impact:</u></p> <p>The construction of the PV panels will result in the loss of the habitat, but the value of the habitat in terms of terrestrial fauna is not significant. There is also no significant difference in the preferred and alternative layouts in terms of loss of habitat for sensitive fauna species. Some sensitive habitats occur within the power line route that would reduce habitat diversity (and hence fauna diversity) and impair aquatic ecological corridors if activities are not modified and managed to preserve these areas.</p> <p>The development is not expected to significantly alter the AI species around the project area.</p>
Ecological services	<p>No special or critical ecological services provided by fauna were identified for the area and were largely related to the usual services provided by fauna (prey-base in food chain, pest control, pollination and seed dispersal).</p> <p><u>Impact:</u></p> <p>It is expected that the limited faunal populations on site will move off to neighbouring areas</p>

Aspect	Fauna findings
	where they will persist and provide their ecological services. Minimal services will cease in the immediate panel development area but will continue in the surrounds and impact and is not considered highly significant.
Ecological Corridors	<p>The aquatic ecological corridors are limited to the non-perennial tributary and the Rietspruit Tributary, the latter being the least impacted corridor with moist and terrestrial grassland units interconnected with the corridor. This corridor extends to the east and also west, where the tributary confluences with the Rietspruit.</p> <p>The non-perennial tributary was heavily modified within the power line route with successive paddocks along the stream and historical paddocks across the width of the corridor. Furthermore, the adjacent patch of AI trees served as a community dumping site. A terrestrial corridor has been identified in the northern extent of the proposed alternative power line route. The area is connected southwards to eventually connect to a tributary and tract of land connected to the Rietspruit Tributary (assessed from Google Earth imagery).</p> <p><u>Impact:</u></p> <p>The corridors are within the power line routes and will be impacted should any construction occur within and across these areas. This will impair connectivity and hinder movement of fauna, specifically wetland and aquatic species. It is anticipated that, under most circumstances, the power line can be suspended across these corridors to limit direct disturbance to these corridors.</p>
CBAs and ESAs	<p>The panel development area has no CBAs or ESAs but some areas occur downstream of the development site.</p> <p>CBAs occur along the proposed power line, largely associated with tributaries, moist grasslands and grasslands. None of the CBAs are designated for RL mammal or invertebrate species, but in many cases the CBAs overlap sensitive habitats and undisturbed habitats that are important for faunal biodiversity and also as part of ecological corridors.</p> <p>ESAs are largely associated with the tributaries and as buffer areas to the CBAs.</p> <p>In terms of site findings, some correlation was noted with the less disturbed habitat units and sensitive habitat units and designated CBAs, but extent of the correlation varied.</p> <p><u>Impact:</u></p> <p>The development site for both alternatives is unlikely to impact on CBAs other than through potential runoff, which must be managed.</p> <p>Impacts to CBAs would be limited to the less disturbed moist grassland and grassland units identified on site and the ecological corridors associated with these habitat units as discussed above.</p>
International Conservation:	<p>The Blesbokspruit RAMSAR Wetlands occur approximately 12km east of site.</p> <p><u>Impact:</u></p> <p>No impacts will occur to these wetlands which are in a different sub-catchment.</p>
PAs	<p>The formally Protected Suikerbosrand Provincial Nature Reserve is the only Protected area within 10km of site (<10km south of site).</p> <p><u>Impact:</u></p> <p>No impacts are expected to this or other PAs.</p>
NPAES	<p>No NPAES occur within 10km of site.</p> <p><u>Impact:</u></p> <p>No impacts are expected on NPAESs.</p>
SWSA	<p>The Eastern Karst Belt SWSA occurs just over 2km north-east of the power line, but lies within a different sub-catchment.</p> <p><u>Impact:</u></p> <p>Groundwater falls outside the scope of the fauna assessment, but any contamination to water resources must be curbed as fauna and the faunal habitats are reliant on water.</p>
NFEPA features	<p>The site is not within a designated NFEPA Catchment.</p> <p>The aquatic habitats (NFEPA Rivers and Wetlands) on and near site are mostly impaired or modified with limited habitat for sensitive riverine and wetland TOP fauna species. The Rietspruit Tributary is the most significant aquatic ecological corridor connected to moist</p>

Aspect	Fauna findings
	<p>grassland and terrestrial grassland units and is likely to support more faunal diversity in the greater area. The Giant Bullfrog was observed around this tributary and is likely to make use of the moist grasslands and grasslands associated with this tributary.</p> <p><u>Impact:</u> Further impacts to any of these surface water systems could further impair ecological connectivity. In addition, any contaminated runoff from site or sedimentation will reach these systems very quickly due to their proximity and impact downstream areas and associated aquatic ecosystems and runoff must be managed.</p>
Gauteng Ridges	<p>No classified ridges occur on or near site. Three very small Class 4 (lowest ridge classification) ridges occur within 4-11km of site.</p> <p>No rocky habitats were identified within the development site. The power line route supports a very limited area of established rocky habitat attached to a grassland area. The habitat is limited, but does add to the habitat diversity of the terrestrial setting. The rocky habitat has been designated as a sensitive habitat.</p> <p><u>Impact:</u> Classified Gauteng Ridges will not be impacted. Destruction of rocky habitats will reduce overall habitat diversity and reduce the potential for rocky habitat species on site.</p>

4.2 Fauna Species

The following is relevant in terms of animal species as relates to the animal species protocol:

- In terms of the mammals:
 - The project area will not support significant numbers of TOP species. A handful of protected and / or near threatened species and provincially protected species could occur on site.
 - SCCs (Oribi and Spotted-necked Otter) listed within the species assessment guideline (SANBI, 2020) are unlikely to occur within the project area for any length of time but may be present in the less disturbed surrounding habitats and may traverse the project area from time to time. They are mobile species likely to move away from noise and human activity and unlikely to experience direct impact.
 - Although some endemic species are likely on site, none are restricted species and the area is not a significant area in terms of mammal endemism.
- In terms of herpetofauna:
 - No significant numbers of TOP herpetofauna are expected on the property.
 - The Giant Bullfrog (*Pyxicephalus adspersus*), was the only TOP herpetofauna confirmed on site. The species is threatened by loss and degradation of its wetland and neighbouring terrestrial habitat and natural landscapes and aquatic ecological corridors identified within the project area must be maintained in their current state.
 - None of the species likely to occur on site are listed as SCC in the species assessment guideline (SANBI, 2020).
 - None of the endemic species are restricted and the area is not considered significant in terms of herpetofauna endemism.
- In terms of invertebrates
 - The Protected Baboon Spiders cannot be excluded from site, but it is expected that they would occupy the less disturbed habitats around site.

- Despite several butterflies being confirmed on site, no *Aloeides dentatis dentatis* or similar species were noted on site.

In terms of impacts to animal species:

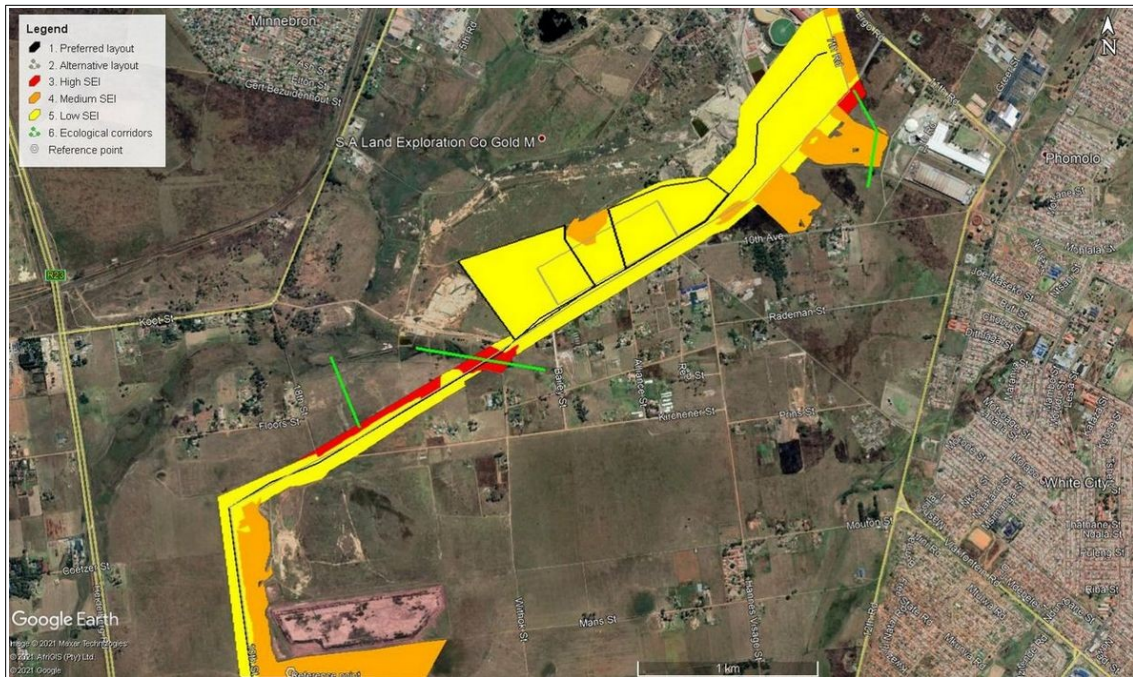
- Fauna confirmed / highly likely on site are species that are fairly tolerant of current agricultural, mining-related and general human activities including the associated anthropogenic impacts and are unlikely to be significantly impacted by the proposed development.
- This being said, a TOP species (Giant Bullfrog) has been confirmed moving through the project area and other mammal SCC may also traverse the project area. Any impact to these species, including hindering these species, could be significant in terms of long-term impacts on species status both locally and nationally and awareness of the presence of these species must be maintained on site in order to ensure they are not harmed or hindered by the development.

4.3 Site Sensitivity

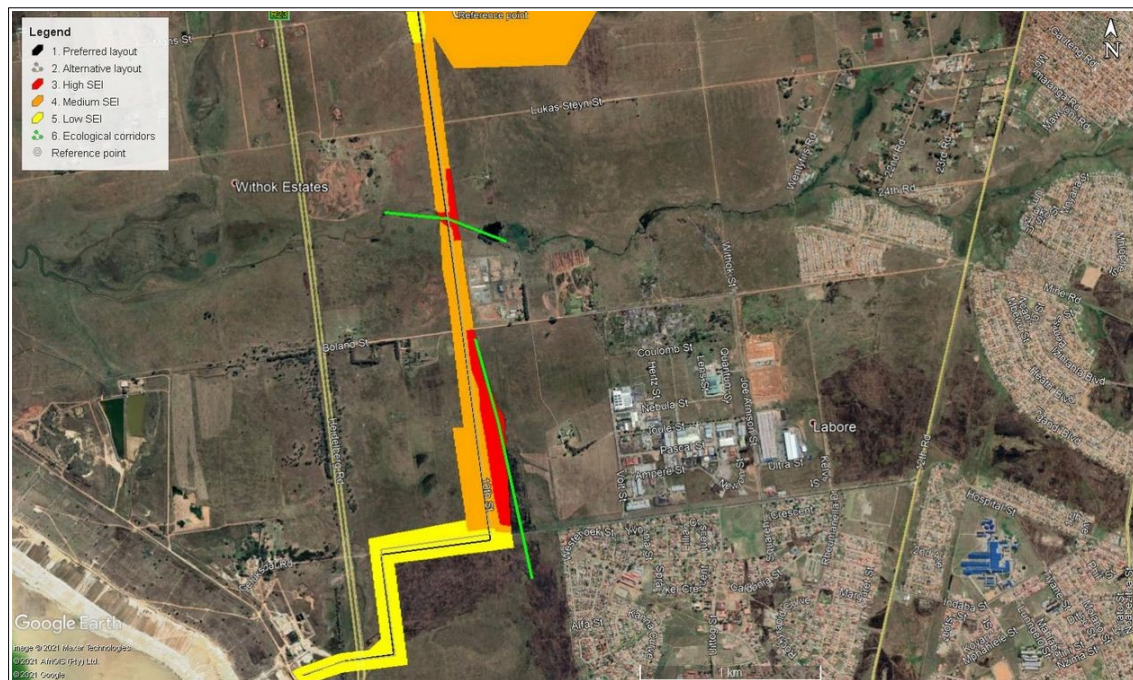
In general, the site sensitivity is partially in agreement with the Gauteng conservation plan, with some overlap between areas. Where CBAs overlap good habitat units, these have been designated as highly sensitive areas, where CBAs have intersected disturbed habitat areas then these have been designated as moderately sensitive areas where ecological function is still provided to terrestrial fauna. The site sensitivity has been detailed in Table 7 and indicated in Plan 6.

Table 7: Overall terrestrial biodiversity sensitivity (Plan 6)

Sensitivity	Incorporates	Discussion
High (no activity)	CBAs	Where CBAs overlap undisturbed habitats that have a high likelihood of providing habitat for protected species.
	Drainage lines, tributaries and dams	Surface water features are legally protected and require additional authorisation. Surface water features provide unique habitats within the terrestrial setting and often support TOP species. Support good faunal assemblages during the rainy season.
	Rocky habitat	Rocky habitats improve habitat diversity within the terrestrial setting and often support TOP species.
Medium (controlled activity)	CBAs	CBAs that have been disturbed and are not considered significant areas in terms of terrestrial fauna.
	Disturbed moist grasslands	Although part of the surface water features and subject to additional authorisation, these are specifically wetlands and drainage lines that have formed as a result of man-modified terrain. They have some value to fauna in terms of habitat diversification and water provision.
	Disturbed grasslands	Disturbed grasslands that have connectivity to more natural / less disturbed habitats, overlap CBAs or could serve as significant buffer areas.
Low (prioritised activity)	Developed & AIS areas	Man-made habitats and stands of alien invasive trees in this particular area are unlikely to serve as habitats for significant faunal assemblages.
	Disturbed grasslands	Very disturbed, denuded, highly homogeneous and man-modified grasslands.
	Disturbed moist grasslands	Although part of the surface water features and subject to additional authorisation, the drainage line in the PV development area and the eastern extent of the preferred panel development area are highly disturbed and is also of little value in terms of terrestrial fauna.



A: Northern extent of project area incorporating the PV panel development site



B: Southern extent of project area

Plan 6: Site sensitivity in terms of terrestrial fauna findings

5. Fauna Impact Assessment

In terms of the fauna biodiversity and animal species findings above, the following impacts could be significant during construction phase and have been assessed further:

- Destruction of significant fauna habitat, specifically potential TOPS habitat (power line route shared by both alternatives).
- Destruction of ecological corridors and reducing ecological connectivity (power line route shared by both alternatives and alternative route in the northern extent).
- Hindering or interfering with TOP fauna species that may traverse through the project area.
- Contaminated or silt-loaded runoff to on-site and nearby aquatic ecosystems within the project area.

Impact assessment criteria considered include:

The duration of the impact		
Score	Duration	Description
1	Temporary	0 – 1 years
2	Short to medium term	2 – 5 years
3	Medium term	5 – 15 years
4	Medium to long term	15+ years
5	Permanent	Permanent
The extent of the impact		
Score	Extent	Description
1	Site specific	Within the site boundary
2	Local	Affects immediate surrounding areas
3	Regional	Extends substantially beyond the site boundary
4	National	Extends to almost entire province or larger region
5	International	Affects country or possibly world
The magnitude (severe or beneficial) of the impact		
Score	Severe/beneficial effect	Description
0	None	No effect – No disturbance/benefit
2	Slight	Little effect – negligible disturbance/benefit
4	Slight to moderate	Effects observable – environmental impacts reversible with time
6	Moderate	Effects observable – impacts reversible with rehabilitation
8	Moderate to high	Extensive effects – irreversible alteration to the environment
10	High	Extensive permanent effects with irreversible alteration
The probability of the impact		
Score	Rating	Description
1	Very Improbable	Probably won't occur
2	Improbable	Low likelihood of occurring
3	Probable	Distinct possibility of occurring
4	Highly Probable	Very likely to occur
5	Definite	Will occur, regardless of any intervention
The Significance = (Magnitude + Spatial Scale + Duration) x Probability		
Low (score of 1 to 29)		Impact will not significantly change fauna biodiversity and requires no significant mitigation measures.
Moderate (score of 30 to 60)		Impact will change fauna biodiversity and requires some mitigation measures.
High (Score of 61 to 100)		Impact will significantly change fauna biodiversity and significant mitigation measures and management is required. Potential fatal flaw.

Activity:	Power line Construction – power line route shared by both alternatives.				
Impact:	1) Nature: Destruction of significant and / or sensitive fauna habitat For areas designated as low sensitivity the impact is not significant in terms of fauna. The highly and moderately sensitive areas provide less disturbed habitats, improve habitat diversity and contribute to ecological corridors for fauna dispersal and activities in these areas must be reduced and / or managed.				
Significance rating:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium (3)	Site specific (1)	Moderate-high (8)	Highly Probable (4)	Moderate (48)
Post-Mitigation	Short (1)	Site specific (1)	Slight (2)	Improbable (2)	Low (8)
Is the Impact Reversible?	Moderately Reversible: Requires mitigation and rehabilitation to ensure reversibility				
Mitigation Measures:	STOP: No activities are to commence within the streams, wetlands and buffers until the necessary authorisations are obtained under the National Water Act (NWA) and NEMA. No activities are to take place in areas designated as highly sensitive as per Plan 6. Only the discrete footprints of pylons are allowed to occur within moderately sensitive areas. MODIFY: Low sensitivity areas must be targeted for all supporting infrastructure / facilities. Reduce the number of pylons required in moderately sensitive areas as far as possible. The gravel road crossing the Rietspruit Tributary should not be utilised by any construction vehicles during the rainy season if the bullfrogs are observed to be active near the area. Conduct all excavations for pylons near the Rietspruit Tributary during the dry season. Should this not be possible, no activity is to take place within this area during the rainy season if the bullfrogs are observed to be active in the construction areas. Plan and implement a proper storm-water management plan from the onset to prevent excessive runoff and associated erosion and sedimentation in downstream habitats. CONTROL: Peg out and demarcate areas for development and no-go areas before commencing with any activities. No activity whatsoever should occur in no-go areas. Pylons in moderately sensitive areas must be constructed in very discrete areas with minimal footprints. REMEDY: Where areas not targeted for development are inadvertently impacted and / or damaged, clear any material dumped and rehabilitate the site as soon as possible.				
Cumulative impacts:	Generally, the cumulative loss of habitat will reduce species richness and biodiversity. In this highly disturbed area the impact is not seen as significant as long as undisturbed areas remain in their current state.				
Residual impacts:	Although only a single TOP species was confirmed, it is possible that the natural habitat units support some TOP species. Therefore, the loss of remaining undisturbed habitats within the area may mean a decrease and potential loss of TOP species in the area.				
Climate Change:	Climate change status for Gauteng is not expected to change significantly due to the proposed development, although carbon emissions may be reduced due to the proposed development. No additional regional or national climate change impacts expected on terrestrial fauna.				

Activity:	Power line Construction – power line route shared by both alternatives and alternative route in the northern extent				
Impact:	2) Nature: Destruction of ecological corridors and ecological connectivity All highly sensitive areas and moderately sensitive areas attached to corridors (Plan 6) must have their connectivity preserved to prevent habitat fragmentation and isolation of faunal communities.				
Significance rating:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Permanent (5)	Local (2)	Moderate-high (8)	Highly Probable (4)	Moderate (60)
Post-Mitigation	Short (1)	Site specific (1)	Slight (2)	Improbable (2)	Low (8)
Is the Impact Reversible?	Moderately Reversible: Requires mitigation and rehabilitation to ensure reversibility				
Mitigation Measures:	STOP: No activities are to take place in areas designated as highly sensitive. This will preserve the core areas of the ecological corridors. No contractors camps, storage yards, parking areas or other activities are allowed to occur within the ecological corridors. No fencing should be established in moderately and highly sensitive areas. Where fencing around structures might be required, these must enclose very discrete footprints and not sever connectivity within and between sensitive areas. Fencing must be palisade or similar fencing and not wire mesh or barbed wire (materials which could ensnare animals). CONTROL: Ensure that unhindered access for fauna is maintained along the ecological corridors (see Plan 6). REMEDY: Where areas not targeted for development are inadvertently impacted and / or damaged, clear any material dumped and rehabilitate the site as soon as possible.				
Cumulative impacts:	Development anywhere within the existing corridors will cumulatively deteriorate the ecological corridors, connectivity and dispersal routes for fauna and could result in isolation of faunal populations.				
Residual impacts:	Many species are threatened due to isolation of populations which results in in-breeding, genetic deterioration and associated illness and possible local extinctions and the residual impact is seen as significant.				
Climate Change:	Climate change status for Gauteng is not expected to change significantly due to the proposed development, although carbon emissions may be reduced due to the proposed development. No additional regional or national climate change impacts expected on terrestrial fauna. It must be stressed that ecological corridors are critical for terrestrial fauna to mobilise in response to climate change and therefore preservation of ecological corridors will allow fauna to persist in face of climate change.				

Activity:	Power Line and Solar Panel Construction and to a lesser extent Operational Phase				
Impact:	3) Nature: Hindrance, trapping, killing of fauna, focussing on potential TOP species in the project area TOP species may wonder into the project area periodically.				
Significance rating Construction:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Short-medium (2)	Local (2)	Moderate (6)	Highly Probable (4)	Moderate (40)
Post-Mitigation	Short-medium (2)	Local (2)	Slight-moderate (4)	Improbable (2)	Low (16)
Significance rating Operation:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium-long (4)	Local (2)	Slight to moderate (4)	Improbable (2)	Low (20)
Post-Mitigation	Medium-long (4)	Local (2)	Slight (2)	Improbable (2)	Low (16)
Is the Impact Reversible?	Moderately Reversible: Requires mitigation and rehabilitation to ensure reversibility				
Mitigation Measures:	<p>STOP: No poisons against fauna are to be brought on site; where this is not possible any substance that could be toxic to fauna will be stored and handled in a manner that will prevent exposure of the substance to the environment. No deliberate killing or trapping of indigenous fauna is allowed on site.</p> <p>CONTROL: Environmental awareness training must include the prohibition of any harm or hindrance to any indigenous fauna species and the consequences of such actions. Ensure safe speed limits and safe working conditions in the project area.</p> <p>REMEDY: Contracts with contractors must specify actions that will be taken against contractors who do not conduct activities in line with the EMP.r. Should any fauna be trapped within the development area, activities will cease and specialists brought in to safely remove the animals from site in line with the Gauteng Nature conservation Ordinance. Monitor TOPS observed to enter the site, specifically the Rietspruit Tributary area during rainfalls for Giant Bullfrog activity. Should monitoring indicate that aspects of the development are posing a risk to these species, then activity ceased or management must be adapted to protect these species. Any requirements of the Gauteng Nature Conservation Ordinance complied with regarding handling of such species.</p>				
Cumulative impacts:	Local extinctions that could be caused by cumulative destruction of TOPS will alter the faunal community structure (for example the prey-base may bloom, or competitive predator numbers could decline). Predicting the extent and significance of such changes is not possible, although is not expected to be severe in terms of this area.				
Residual impacts:	Destruction of any TOPS (or prey-base of TOPS) could cause a cascade affect on populations and, in extreme circumstances, local extinctions.				
Climate Change:	No climate-change related impacts.				

Activity:	Power Line and Solar Panel Construction and to a lesser extent Operational Phase				
Impact:	4) Nature: Contamination of fauna environment The proximity of the project area to various water bodies and tributaries means that any contamination in the project area will find its way into the streams and aquatic environments during a rainfall event.				
Significance rating Construction:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium (3)	Local (2)	Moderate (6)	Definite (5)	Moderate (55)
Post-Mitigation	Short-medium (2)	Site specific (1)	Slight-moderate (4)	Improbable (2)	Low (14)
Significance rating Operation:	Duration	Extent	Magnitude	Probability	Significance
Pre-Mitigation	Medium-long (4)	Local (2)	Slight to moderate (4)	Improbable (2)	Low (20)
Post-Mitigation	Medium-long (4)	Site specific (1)	Slight to moderate (4)	Improbable (2)	Low (18)
Is the Impact Reversible?	Moderately Reversible: Requires mitigation and rehabilitation to ensure reversibility				
Mitigation Measures:	<p>STOP: Discontinue use of all faulty machinery / equipment on site until properly repaired.</p> <p>No activities are to commence within the streams, wetlands and buffers until the necessary authorisations are obtained under the National Water Act (NWA).</p> <p>Ensure a waste management plan has been compiled in line with the National Environmental Management: Waste Act (NEM:WA) before any activities commence on site.</p> <p>MODIFY: Due to proximity of petrol stations, hydrocarbon storage on site should be limited to daily needs only.</p> <p>Plan and implement a proper storm-water management plan from the onset.</p> <p>Facilities will be provided for storage of all hazardous substances and waste to prevent the exposure of these substances to the environment. The aim is to PREVENT exposure of fauna to any potential toxin.</p> <p>CONTROL: All equipment / machinery will be serviced and maintained within operating specifications to prevent the risks of leaks. Repairs to vehicles will be conducted off-site.</p> <p>All substances including waste must be properly stored and handled according to prescribed manner / standards and must not be exposed to the environment and sheltered from environmental elements.</p> <p>Any cars, machinery or equipment parked on site will either be parked on a concrete slab or have pans placed under them to collect all drips and potential leaks.</p> <p>Manage all waste in line with the waste management plan.</p> <p>Cement bags will be stored under a tarpaulin and on an impervious sheet. Cement mixing will take place within a designated area only.</p> <p>REMEDY: All hydrocarbons spills on bare ground will be cleared immediately.</p> <p>Inspect and clear all litter and waste from the site and surrounds.</p> <p>All dry and wet cement spills on bare ground will be cleared immediately.</p>				
Cumulative impacts:	Any additional development will add to the potential of contamination to the area and down-slope areas. Large spills or continuous cumulative leaks and waste dumping that are not cleaned up will enter the environment through run-off or leachate and contaminate the				

Activity:	Power Line and Solar Panel Construction and to a lesser extent Operational Phase
	environment.
Residual impacts:	If toxic substances and waste are not properly managed or spills not cleared immediately, the environment will suffer extended residual impacts, particularly if toxins seep into the soils or are washed to downstream environments. No impacts with proper on-site management.
Climate Change:	Although there will be an initial increase in diesel-powered vehicles and machinery contributing to elevated carbon emissions, this will be temporary, and overall long-term carbon emissions may be reduced in the area due to the proposed development.

6. Fauna Management & Monitoring Plan

The objectives of the management plan are as follows:

- To prevent the unnecessary destruction of natural habitat and animal life within the development area and to maintain ecological connectivity to neighbouring sites and, where possible, to regional ecological corridors.
- Not to unnecessarily or deliberately alienate or hinder the movement of fauna in the area or to harm any animal life found on the property.
- To maintain existing fauna biodiversity and prevent the skewing of fauna communities as far as possible.

A monitoring plan and an adaptive management approach must be implemented in order to ensure effective mitigation measures are applied at all times. The specific mitigation measures are highlighted in the impact assessment tables above and the monitoring plan is indicated in Table 8.

In addition to the mitigation measures in the various impact tables above, the following general measures must also be applied during the construction and operation of the development:

- All species status is not likely to be impaired or altered, but activities on site must be managed to prevent attracting such species to site or cause population explosions of existing species on site.
 - Maintaining and improving local indigenous populations could assist in reducing alien species numbers on site through competition. Therefore maintain indigenous landscapes in and around the project area where any landscaping is conducted (possibly in and around the panel development area).
 - Compile and implement an alien invasive management plan in line with the municipal management plan, which must include measures to prevent attracting additional alien animals to site. This should include not feeding wild life and ensuring that all food and food waste, including domestic waste, is placed in sealed containers and not exposed on site. Ensure that the outside areas are kept clean and tidy and provide adequate waste removal services to prevent the attraction of rats and other alien scavenging species to the site.
- General activities that generate noise, dust and vibration will be nuisance impacts to fauna. The status of the site means these impacts are already taking place, but these should not be exacerbated as far as possible.
 - Utilise quieter equipment where feasible.
 - Ensure dust suppression, through water sprinkling, is applied at time of high dust generation.
 - Noisy point-sources should be enclosed and equipment / machinery fitted with silencers and serviced and maintained within operating specifications to prevent excessive noise.
- Ensure all operational and maintenance activities proceed in an environmentally responsible manner as per the recommendations in this report and the environmental management plan.

An Environmental Officer (EO) must be appointed to ensure construction activities are in line with environmental management programme and authorisation requirements, including the mitigation

and management measures stipulated within this report. Inspection, records of issues, corrective measures and sign-off will form part of the EO's responsibilities.

Table 8: Monitoring plan to be undertaken by EO

Monitoring Action	Frequency
Ensure all proposed mitigation measures detailing proposed activity modifications have been fully considered and incorporated into the final design plan and operational procedures and sign off on final plans and procedures.	Once-off
Inspect and sign-off on placement of demarcation pegs marking out no-go areas and specific activity areas (discrete footprints of pylons in moderately sensitive areas).	Once-off
Inspect highly sensitive areas (no activity) and moderately sensitive areas (only pylon construction) in and around the project areas and ensure no unauthorised activity, dumping, excavations, obstructions to fauna mobility within these areas.	Weekly
Monitor TOPS observed to enter the site, specifically the Rietspruit Tributary area during rainfalls for Giant Bullfrog activity. Cease any activity that could be harmful or adapt activity to prevent harm. Requirements of the Gauteng Nature Conservation Ordinance must be complied with regarding handling of such species.	Rietspruit Tributary area will be monitored during every rainfall event in the morning and at close of business day.
Apply monitoring and auditing requirements stipulated in NWA & NEMA authorisations as relevant.	Every 6 months

6.1 Invasive Species

The Alien and Invasive Species Regulations published under GNR1020 (2020) list aliens under various categories, including:

- Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of NEM:BA as species which must be eradicated.
- Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of NEM:BA as species which must be controlled.
- Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of NEM:BA as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. If no permit for these species, then they are to be treated as Category 1 species.
- Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of NEM:BA, as species which are subject to exemptions (regarding possession of such species) in terms of section 71(3) and prohibitions (importing, transporting, handling, breeding, releasing) in terms of section 71A of Act, as specified in the Notice.

In terms of the findings, no AIS species have been confirmed at site.

7. Conclusion and Recommendations

The only significant desktop features included the streams and tributaries and CBAs and ESAs, largely associated with the streams and adjacent areas. These areas are only associated with the power line route. They do not occur on the development site, but do occur downstream. These have been largely incorporated into highly sensitive areas and designated as no go areas. Some CBA areas overlap areas that have been disturbed in the past and / or are being impacted by current activity and are not significant habitats for terrestrial fauna. These have been incorporated into moderately sensitive areas where activities must be limited and controlled in line with this report.

Only very limited TOP species are likely to traverse the areas associated with the power line routes and due to the limited extent of significant habitats overlapping the power line route, if such species do utilise these areas, they will not be confined to the power line route. Being mobile they can move away from the development once it commences, and return after activities are completed, as long as the highly sensitive areas are maintained. Significant direct impacts to fauna species are therefore not anticipated, but must be actively managed.

The assessment of potential SCCs indicates a low likelihood of such species being impacted by the activity as these species are only likely to traverse the project area and are unlikely to do so when activity commences on site. Furthermore, by maintaining the highly sensitive areas and associated ecological corridors, the habitat and means of dispersal for these species is maintained.

Impacts that have been identified to be of moderate significance can all be mitigated to low impact with vigilant activity and good house-keeping practices on site. Although a slightly larger area is targeted for development in the preferred layout, the area has little value in terms of terrestrial fauna habitat and there is no objection to the preferred or alternative layout in terms of the development site. The preferred option of the power line route is less likely to interfere with the northern ecological corridor, but with the proposed management measures strictly applied in the construction of the power line, there is also no objection to the preferred or alternative layouts of the power line routes.

In terms of terrestrial fauna biodiversity, no additional faunal assessments or studies are deemed necessary. There is no reason for not authorising the activity as long as the following recommendations are adhered to:

- Recommendations of the flora and wetland specialist must be implemented on site.
- Any areas designated as highly sensitive by the flora specialists should be considered as highly sensitive in terms of fauna (unique and unmodified fauna habitat provision) and should be considered no-go areas.
- Staff and contractors must be made aware of the potential presence of SCCs (Spotted-necked Otter, Oribi and *Aloeides dentatis dentatis*) and the confirmed TOPS (Giant Bullfrog) in the general area and report sightings of these species to the Environmental Officer and the appropriate action taken (if necessary) to prevent harm to these species.
- The mitigation measures in this report and that of the flora report must be included within the environmental management plan report and implemented on site.

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Appendix A: CV, Qualification, SACNASP registration

Curriculum Vitae

BARBARA KASL

Personal Information

- Full Name: Barbara Kasl
- Qualifications: PhD (Animal, Plant and Environmental Sciences)
- E-mail: bk.zoology@gmail.com

Education – ±10 years

Tertiary Institute: University of the Witwatersrand

- 2002-2004: PhD (Animal, Plant and Environmental Sciences)
- 1999-2001: MSc (upgraded to PhD)
- 1998: B.Sc. Hon. (Zoology and Botany)
- 1995-1998: BSc (Zoology and Botany)

MSc AND PhD - South African Sugar Experiment Station (SAHRA) – On site research for MSc and PhD degree to determine habitat management strategies to control sugarcane borer (*Eldana saccharina*) in South African sugarcane (Mnt. Edgcombe, R. S. A.).

- Systematic and orderly work habits, which extended into the field, greenhouse and laboratory experiments, and associated data capturing.
- Gained competency on statistical programmes (Statistica, Origin and Excel).
- Data assessment, presentation and discussion of findings through written reports, presentations and posters.
- Good computer literacy and fully competent in MS Office.

Professional Experience – ±12 years

02/2017 - Current: Self-employed as fauna specialist & environmental consultant

- Fauna impact assessments and management and monitoring plans for various developments requiring NEMA authorisation.
- Terrestrial alien invasive fauna management plans.
- Working closely with ecologists on a variety of projects requiring specialists terrestrial fauna input.
- Gauteng & North West Provincial Biodiversity Outlook Reports – Terrestrial Fauna input.
- Generic environmental management plans for the Working for Ecosystems and Landcare projects (ongoing).
- Consulting on projects requiring Environmental Authorisation, including Mineral Authorisations.

- Review of various environmental documentation.

01/2008 – 02/2017: CABANGA CONCEPTS: Environmental Scientist / Principal Consultant

Requested to join the company as an environmental consultant specialising in all environmental authorisation processes and related documents. I am one of three principal members/shareholders of Cabanga Concepts.

- One of two **principal report reviewers** of external reports supplied by subcontractors [soil assessments, ecological (terrestrial and aquatic) assessments groundwater and surface water assessments, heritage and cultural resource assessments to name a few] and internal reports compiled by staff.
- Overall **project manager** regarding mineral rights application processes as well as environmental authorisation processes in South Africa, including **management of a team** of external (sub-consultants) and internal specialists. Including **overview of budget** and spending of the budget during the life of the project.
- **Compilation of proposals and associated budgets** for various environmental requirements made by new and existing clients.
- Principal EMP report compiler and reviewer for a **World Bank mining project** in Rwanda, including review of external specialist reports. Familiar with **IFC, Equator Principals**.
- Compilation of **environmental applications and documents** required under the various environmental acts (environmental act, waste act, air quality act and water act) in South Africa. This includes scoping reports, impact assessment reports, environmental management plans, environmental monitoring reports, environmental pre-feasibility reports and bankable feasibility studies, integrated water and waste management plans, audit reports, due diligence assessments, reports on monitoring findings (water quality, dust levels, ambient noise).
- Compilation of various **audit reports** including EMP Audits, Legal Compliance Audits, Due Diligences, Integrated Water and Waste Management Plan Audits, Licence and Permitting Audits.
- Compilation of draft sensitivity plans for internal GIS specialists to refine.
- Compiled a detailed and comprehensive **alien invasive management plan** for principal invasive plant species in the Highveld region of South Africa.
- Keep up-to-date with **environmental legislation** and relevant application processes.
- Keep up-to-date on various **standards, norms** and management requirements released through official organisations and institutes.

09/2004 – 11/2007: DIGBY WELLS & ASSOCIATES (Now DIGBY WELLS ENVIRONMENTAL): Unit Manager / Acting Department Head: Biophysical Department

- Initially hired as entomologist and fauna specialist.
- Responsible in **completion of full fauna assessments** and eventually **compilation of overall ecological reports**.
- Received training in full **environmental authorisation processes** including compilation of EIA and EMP reports.
- Various **sub-Saharan environmental projects** included Etoile Mine in DRC, Randgold Mine in Mali, Valencia uranium green-field mine in Namibia, Mmamabula coal mine and power plant in Botswana.
- **Unit Manager** for the Ecology Unit including management of a flora and wetland specialist.
- **Acting Department Head** and management of the Biophysical Department which included the Ecology Unit and Atmospheric Environment Unit.

2001-2003: Various University and Temp Research Jobs in Entomology

2001: Private Tutor - Private tutoring for first year student.

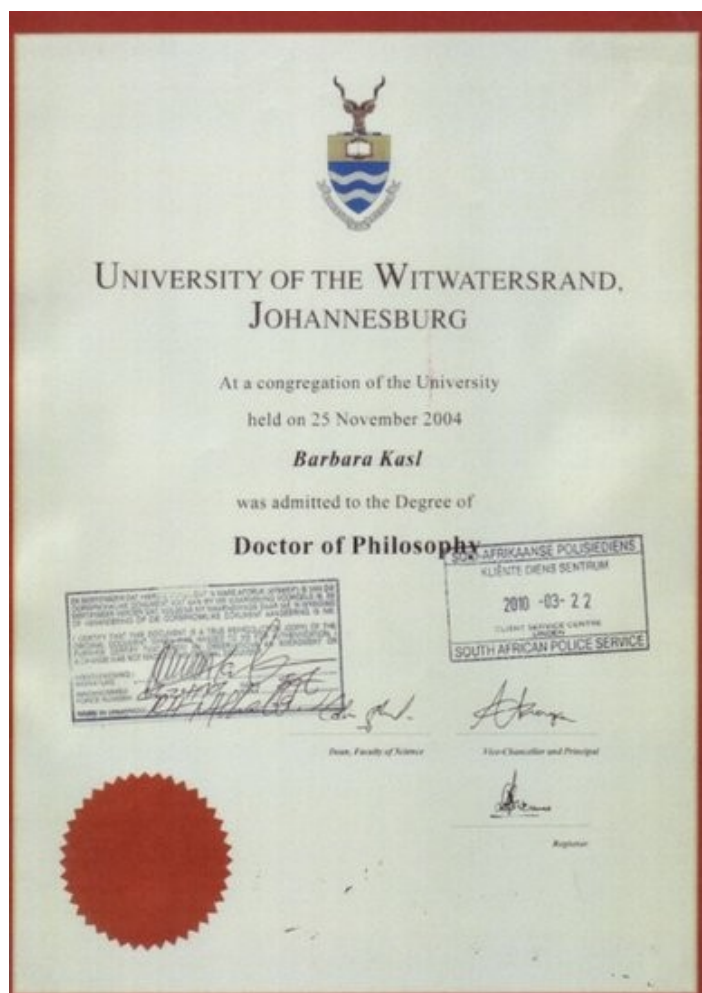
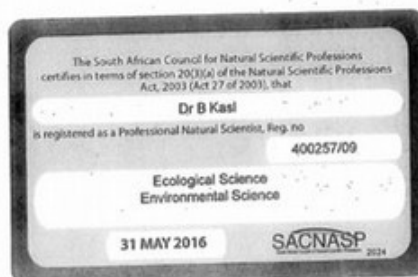
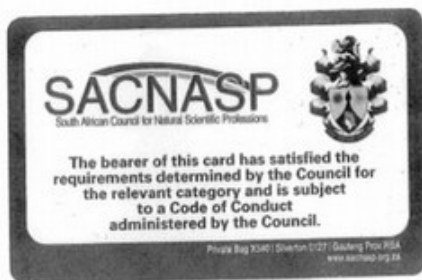
1993-1998: Part-Time Jobs

Professional Memberships and Affiliations

- **2011 – current:** Registered Professional Environmental And Ecological Scientist
- **2015 – 2017:** EAPSA Certified Environmental Assessment Practitioner
- **1999, 2001 & 2008 – current:** Entomological Society of South Africa
- **2008-2011:** International Association for Impact Assessment
- **1998:** Zoological Society of Southern Africa

Courses Attended

April 2017:	Alien invasive species identification and management course in KZN organised through Kay Montgomery.
October 2010:	NEM: Air Quality Act course through IMBEWU Sustainability Legal Specialists (Pty) Ltd
August 2009:	NEMA and NEMWA course through ECOLAW
November 2007:	Environmental Impact Assessment Training
February/March 2007:	Project Management for Non-Project Managers Course through Astro Tech
September 2006:	Unilever Introduction to Managing Environmental Water Quality - Practical, Theoretical and Policy; through Institute for Water Research – RHODES University.
September 2005:	Non-credited course in River health and SASS5 rapid methodology of water quality assessment through NEPID Consultants
May 2005:	Snake Identification and Snakebite Treatment Course



Appendix B: Desktop fauna records (mainly from ADU and iNaturalist)

Family	Common name	Taxon name
MAMMALS		
Carnivora	Otter, Cape Clawless	<i>Aonyx capensis</i>
Cetartiodactyla	Blesbok	<i>Damaliscus pygargus phillipsi</i>
Cetartiodactyla	Duiker, Common	<i>Sylvicapra grimmia</i>
Cetartiodactyla	Eland, Common	<i>Tragelaphus oryx</i>
Cetartiodactyla	Hartebeest, Red	<i>Alcelaphus buselaphus caama</i>
Cetartiodactyla	Springbok	<i>Antidorcas marsupialis</i>
Cetartiodactyla	Wildebeest, Black	<i>Connochaetes gnou</i>
Chiroptera	Bat, Mauritian Tomb	<i>Taphozous mauritanus</i>
Eulipotyphla	Shrew, Swamp Musk	<i>Crocidura mariquensis</i>
Perissodactyla	Zebra, Plains	<i>Equus quagga</i>
Rodentia	Gerbil, Bushveld	<i>Gerbilliscus leucogaster</i>
Rodentia	Mouse, Mesic Four-striped Grass	<i>Rhabdomys dilectus</i>
Rodentia	Mouse, Namaqua Rock	<i>Micaelamys namaquensis</i>
Rodentia	Mouse, Natal Multimammate	<i>Mastomys natalensis</i>
Rodentia	Mouse, Southern Multimammate	<i>Mastomys coucha</i>
Rodentia	Rat, Vlei	<i>Otomys auratus</i>
REPTILES		
Agamidae	Agama, Eastern Ground	<i>Agama aculeata distantii</i>
Agamidae	Agama, Southern Rock	<i>Agama atra</i>
Colubridae	Egg-eater, Common	<i>Dasypeltis scabra</i>
Cordylidae	Lizard, Common Girdled	<i>Cordylus vittifer</i>
Cordylidae	Lizard, Common Crag	<i>Pseudocordylus melanotus melanotus</i>
Gekkonidae	Gecko, Cape	<i>Pachydactylus capensis</i>
Gekkonidae	Gecko, Transvaal Thick-toed	<i>Pachydactylus affinis</i>
Lamprophiidae	Centipede-eater, Black-headed	<i>Aparallactus capensis</i>
Lamprophiidae	Snake, Aurora House	<i>Lamprophis aurora</i>
Lamprophiidae	Snake, Brown House	<i>Boaedon capensis</i>
Lamprophiidae	Snake, Common (Brown) Water	<i>Lycodonomorphus rufulus</i>
Leptotyphlopidae	Snake, Peters' Thread	<i>Leptotyphlops scutifrons</i>
Scincidae	Skink, Speckled Rock	<i>Trachylepis punctatissima</i>
Scincidae	Skink, Thin-tailed Legless	<i>Acontias gracilicauda</i>
Testudinidae	Tortoise, Leopard / Mountain	<i>Stigmochelys pardalis</i>
FROGS		
Pyxicephalidae	Bullfrog, Giant	<i>Pyxicephalus adspersus</i>
Pyxicephalidae	Caco, Boettger's	<i>Cacosternum boettgeri</i>
Hyperoliidae	Kassina, Bubbling	<i>Kassina senegalensis</i>
Pipidae	Platanna, Common	<i>Xenopus laevis</i>
Bufo	Toad, Raucous	<i>Amietophrynus rangeri</i>
Bufo	Toad, Red	<i>Schismaderma carens</i>