Appendix K

BIODIVERSITY OFFSET STRATEGY

Seriti Green Developments South Africa (Pty) Ltd

PHEFUMULA EMOYENI ONE GRID-BIODIVERSITY OFFSET REPORT

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Seriti Green Developments South Africa (Pty) Ltd

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PHEFUMULA EMOYENI ONE GRID-BIODIVERSITY OFFSET REPORT

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1 INTRODUCTION

Seriti Green is proposing the establishment of the Phefumula Emoyeni One WEF, Grid and associated infrastructure northwest of Ermelo, Mpumalanga. WSP has been appointed to conduct the necessary ecological baseline surveys and impact assessment reports, as part of the Environmental Impact Assessment (EIA) in support of the environmental regulatory process required to authorise development related activities.

South Africa's National Biodiversity Offset Guideline was gazetted in 2023. It sets out the requirements for the development of a Biodiversity Offset Report (BOR) in support of an application for environmental authorisation (EA). The proposed Phefumula Emoyeni One Grid is considered highly likely to require a Biodiversity Offset, effectively as a result of its location in an area that supports extensive areas of natural wetland and grassland habitat, some of which has been defined as Critical Biodiversity Areas (CBAs) in the Mpumalanga Biodiversity Sector Plan (MBSP), as well as populations of bird species of conservation concern (SCC), many of which are at risk of collision with project infrastructure such as powerlines. The anticipated Project interaction with these features (habitat loss, collision mortality of bird species of concern) factors are expected to result in significant residual impacts, which would then require offset. WSP's proposed approach to the development of the BOR to accompany the EA application is set out in this document.

1.1 TERMS OF REFERENCE

South Africa's draft National Biodiversity Offset Guideline was published for public consultation on 25 March 2022, which sets out the requirements for the development of a Biodiversity Offset Report (BOR) in support of an application for environmental authorisation (EA). This report was compiled based on the guidance set out in the draft guideline, and follows the requirements for preparation of the BOR set out in the guideline as follows:

'*Where the biodiversity offset site cannot be identified before the decision-making phase, Biodiversity Offset Reports must, as a minimum, specify the following':*

- That the mitigation hierarchy, including due consideration of project alternatives to avoid or minimise impacts, has been appropriately applied before considering biodiversity offsetting.
- The degree of risk that negative residual impacts cannot be offset (i.e. negative residual impacts on irreplaceable biodiversity and/or major constraints on finding suitable biodiversity offset sites to meet the offset requirements) and how the risk is to be addressed or mitigated.
- A measure of significant residual negative biodiversity impacts which must be offset. The applicable biodiversity offset ratios for impacted ecosystems.
- Any other considerations which are relevant to determining the size and characteristics of the biodiversity offset (for example, impacts on species of conservation concern with specific habitat requirements, impacts on ecological corridors and connectivity in the landscape, and impacts on important ecological infrastructure), and how the size of offset is to be adjusted to take these considerations into account.
- An explicit statement on the required size of the biodiversity offset to remedy the residual negative biodiversity impacts, applying the basic offset ratio and adjustments as appropriate
- The portfolio of candidate biodiversity offset sites, including the likelihood of each site's availability and feasibility. (this level of detail is not yet available for inclusion into this report)
- The required biodiversity outcomes on each of the candidate biodiversity offset sites identified in the Biodiversity Offset Report. (this level of detail is not yet available for inclusion into this report)

- The management measures that would need to be employed as part of the biodiversity offset for a defined period, for which the applicant would be responsible. Typically, this period is not less than 30 years, and is longer if the impacting activity, or activities, will last beyond 30 years.

1.2 PROJECT LOCATION AND EXTENT

The proposed Phefumula Emoyeni One Grid site is located approximately 16 km north of Ermelo in the Msukaligwa Local Municipality and Gert Sibande District Municipality, in Mpumalanga Province, South Africa (Figure 1-1). The entire Grid site was regarded as the 'study area' for this specialist assessment.

1.3 STUDY AREA

The study area for the Project was defined as follows:

- Local Study Area (LSA): The proposed development footprint plus all areas encompassed by the project site boundary, within which direct and indirect impacts on terrestrial and aquatic biodiversity receptors (i.e. direct habitat loss, fauna mortality) could occur;
- Regional Study Area (RSA): The quaternary catchments within which the proposed development is situated which is considered to be an ecologically appropriate area of analysis, within which indirect and/or induced impacts on biodiversity receptors (e.g. dust deposition, sensory disturbance, hydrological changes) could occur.

The LSA and RSA are shown on Figure 1-1, this includes the WEF and Grid areas.

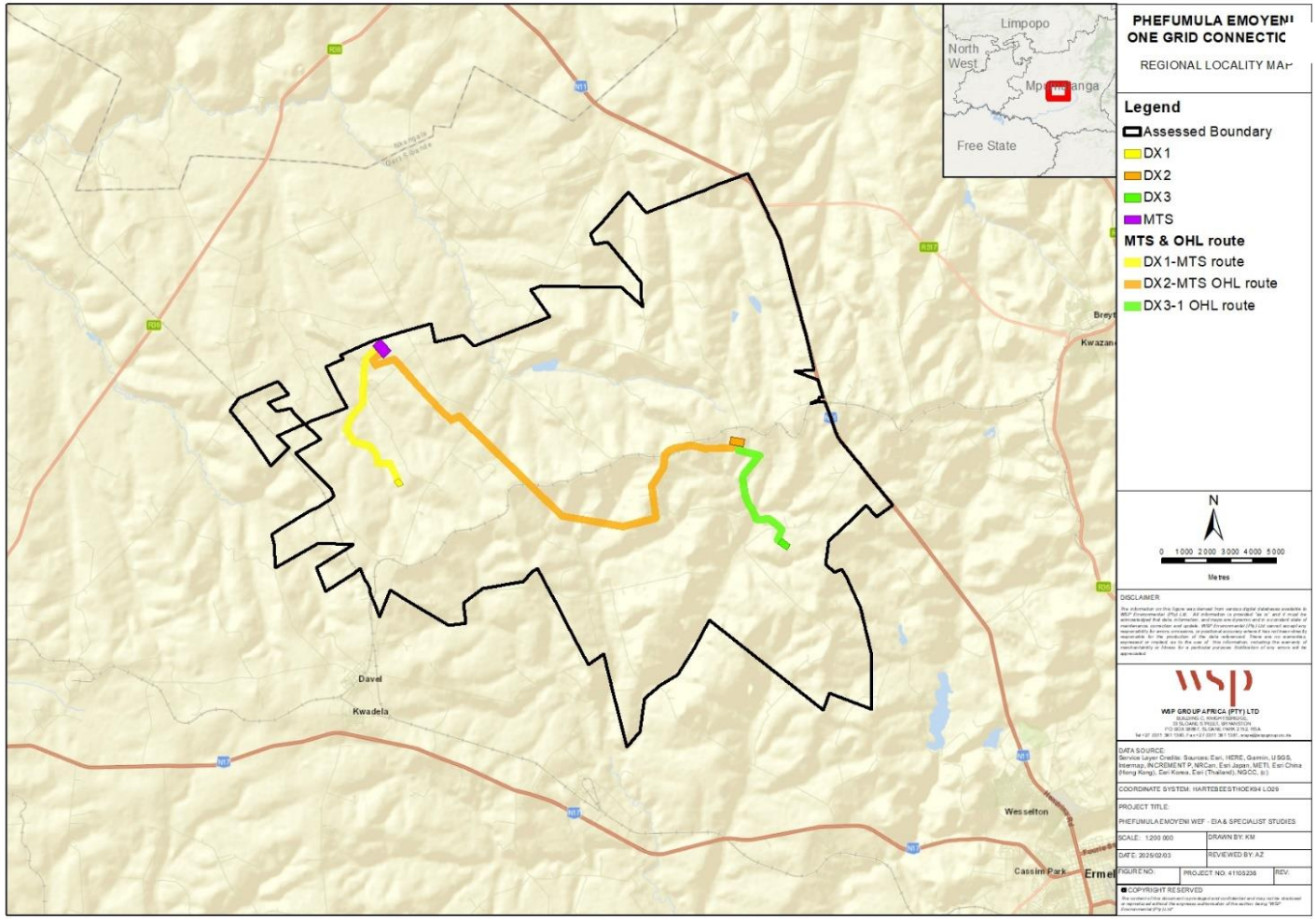

Figure 1-1 – Locality map of the proposed Phefumula Emoyeni One Grid (and WEF area of influence)

2 APPLICABLE LEGISLATION, POLICY AND STANDARDS

Applicable national and provincial legislation, associated regulations and policies that are pertinent to biodiversity, which were used to guide the EIA, include:

- National Environmental Management Act (NEMA) (Act No. 107 of 1998) including Section 24, concerning Procedures for the assessment and minimum criteria for reporting on identified themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA, when applying for environmental authorisation;
  - Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity; and
  - Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity;
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA), specifically:
  - Threatened or Protected Species (ToPS) – National lists of critically endangered, endangered, vulnerable and protected species (2007);
  - National list of threatened terrestrial ecosystems for South Africa (2011) (NEMBA Threatened Ecosystems, 2011);
  - National list of alien and invasive species (2016);
- Environment Conservation Act (Act No. 73 of 1989), specifically the Lists of declared weeds and invader plants (CARA, 1983);
- National Water Act (Act No. 36 of 1998);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998);
- Mpumalanga Biodiversity Sector Plan (Lötter, 2015).
- National Protected Area Expansion Strategy (2016).

Recent, relevant South African national policies and guidance were also taken into consideration, in the development of the baseline description and impact assessment process, including:

- Draft National Biodiversity Offset Policy (2017);
- Draft National Biodiversity Offset Guideline (2022);
- Species Environmental Assessment Guideline (SANBI, 2020); and
- Wetland offsets: a best-practice guideline for South Africa (Macfarlane et al., 2014).

3 TERRESTRIAL BIODIVERSITY OVERVIEW

The local study area is situated in a landscape that is characterised by rolling high-altitude grassland interspersed by rocky outcrops, with extensive hillslope seep and valley bottom wetlands, and farmlands that are cultivated to varying degrees, but largely consist of secondary grasslands.

3.1 CONSERVATION CONTEXT

TERRESTRIAL CRITICAL BIODIVERSITY AREAS (CBAS) AND ECOLOGICAL SUPPORT AREAS (ESAS)

The LSA was compared to relevant available spatial biodiversity planning datasets, i.e. the Mpumalanga Biodiversity Sector Plan (2019) (Figure 3-1), in order to assess the local and regional biodiversity context of the site.

The Mpumalanga Biodiversity Sector Plan (MBSP) technical report (Lotter, 2015) defines five categories of conservation focus; protected areas, critical biodiversity areas (CBA), ecological support areas (ESA), other natural areas, and modified habitats. Definitions for each are listed below. These areas present risks to the Project in terms of impact, as well as opportunities for contribution to achieving provincially-set targets for biodiversity conservation, through focused biodiversity management planning and adherence to the mitigation hierarchy at EIA stage:

- **Protected Areas**: protected areas recognised in terms of the National Environmental Management Protected Areas Act, No. 57 of 2003, that are currently considered to meet biodiversity targets in the MBSP.
- **Critical Biodiversity Area**: areas (outside of Protected Areas) that are required to meet biodiversity targets for biodiversity pattern (species and ecosystems) and ecological processes. They should remain in a natural state that is maintained in good ecological condition.
- **Ecological Support Area**: play an important role in supporting the ecological functioning of critical biodiversity areas or for generating or delivering important ecosystem services. They support landscape connectivity and resilience to climate change adaptation. They need to be maintained in at least an ecologically functional state.
- **Other Natural Areas**: often retain much of their natural character and may contribute significantly to maintenance of viable species populations and natural ecosystem functioning and may provide important ecological infrastructure and ecosystem services. They are not, however, prioritized for immediate conservation action in the MBSP.
- **Modified**: often referred to as transformed, these areas have lost a significant proportion (or all) of their natural biodiversity and in which ecological processes have broken down (in some cases irretrievably), as a result of biodiversity-incompatible land-use practices such as ploughing, hardening of surfaces, mining, cultivation and the construction of houses or other built infrastructure.

Much of the LSA is mapped as CBAs and ESAs, which are largely aligned with grassland and wetland layers presented in the national landcover dataset (GTI, 2020) (Figure 3-2). These datasets are based on satellite imagery interpretation and as such the data may be aged or require in-field verification.

The main outcome of the vegetation and flora baseline study which was conducted during the flowering season (late October 2022) is the vegetation map of the LSA (Figure 3-6), which defines the location and extent of natural and modified vegetation communities.

PRIORITY AREAS FOR PROTECTED AREA EXPANSION

The LSA coincides with areas that have been identified as Priority Focus Areas as part of the National Protected Area Expansion Strategy (PAES) (2016) (Figure 3-3), which are aligned with the MBSP CBAs and ESAs (Figure 3-1). In Figure 3-4 the project is in relation to the Mpumalanga PAES 20 year priorities is displayed.

PROTECTED AREAS

The study area is not located in, or in close proximity to, a protected area. The closest protected areas are:

- Rietvlei Private Nature Reserve, which is located to the south of the N17 national road, approximately 12 km south of the study area; and
- Private Nature Reserve, which is located approximately 14 km south-east of the study area.

Chrissiesmeer Protected Environment is another important conservation area that was noted in the surrounding landscape. This protected environment was established in 2014 and covers a large, albeit fragmented area, approximately 23 km east of the study area. It forms part of a crucial habitat for several threatened bird species and encompasses the Chrissie Pans Important Bird Area.

INDIGENOUS FORESTS

No indigenous forests occur in the study area. The study area is dominated by cultivated fields and tracts of natural grassland and wetland habitat. Indigenous forests are therefore not included as receptor for the impact assessment, or considered further in this report (Hawkhead, 2025a).

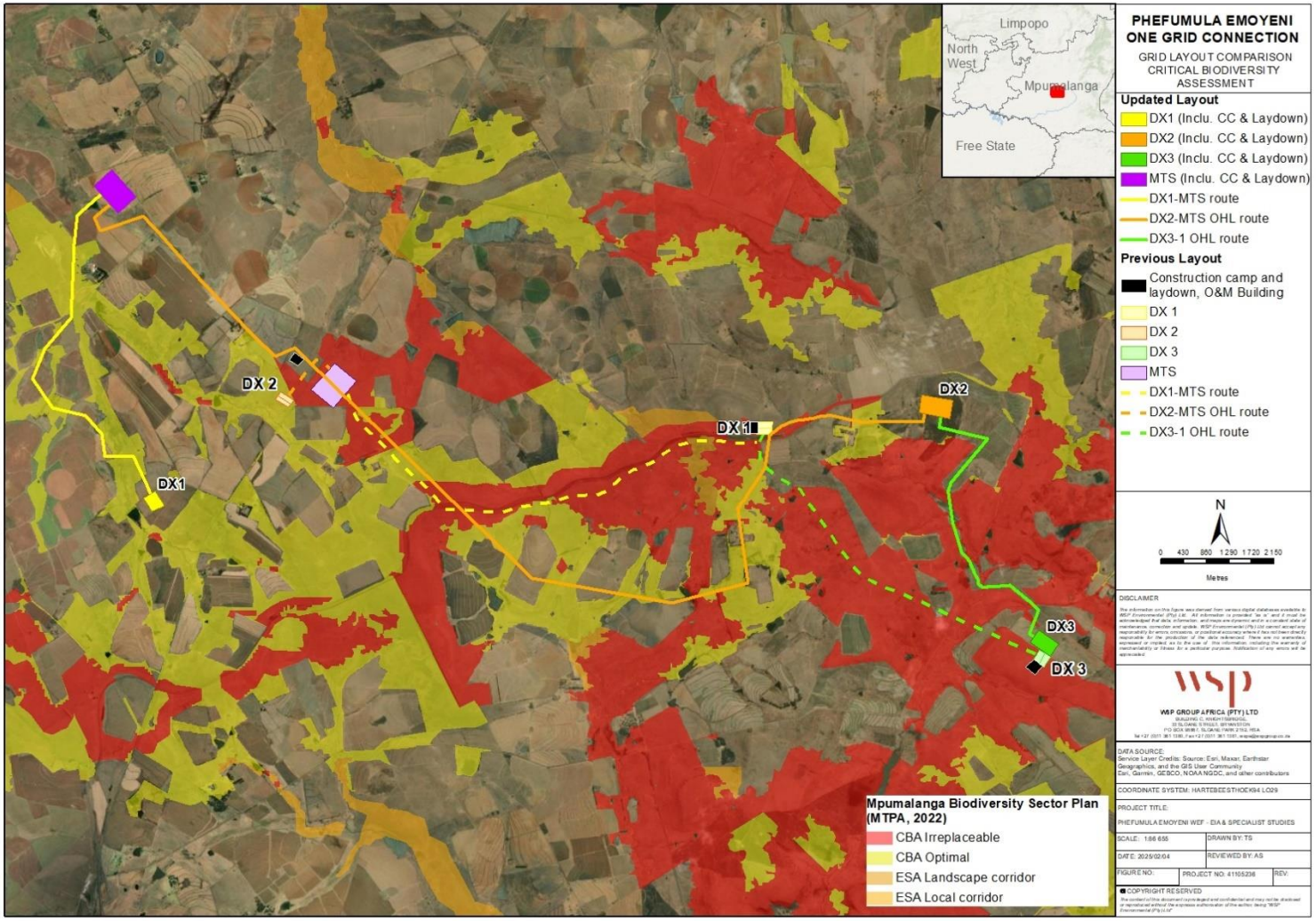

Figure 3-1 - Mpumalanga Biodiversity Sector Plan

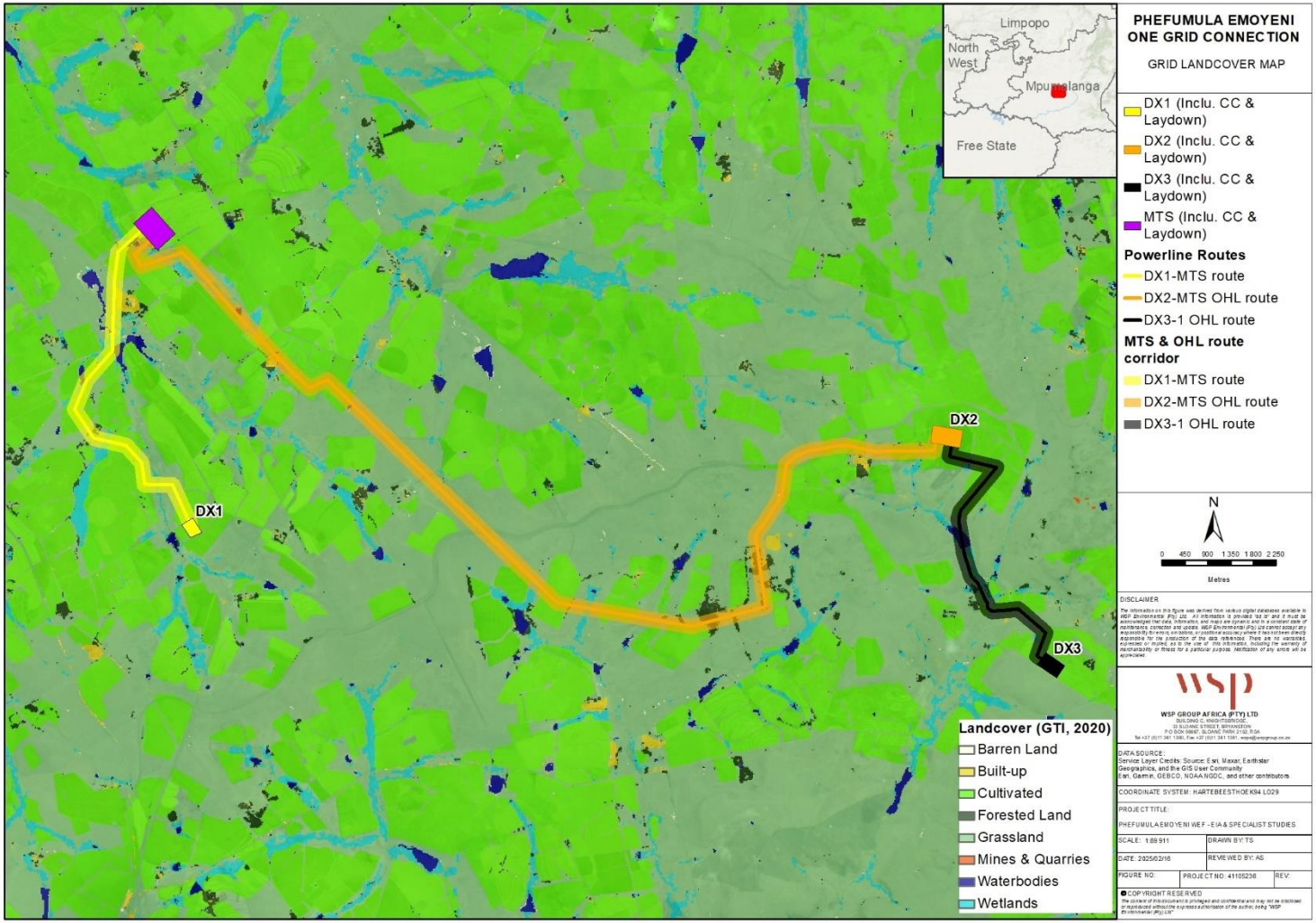

Figure 3-2 - Land Cover dataset for LSA (GTI, 2020)

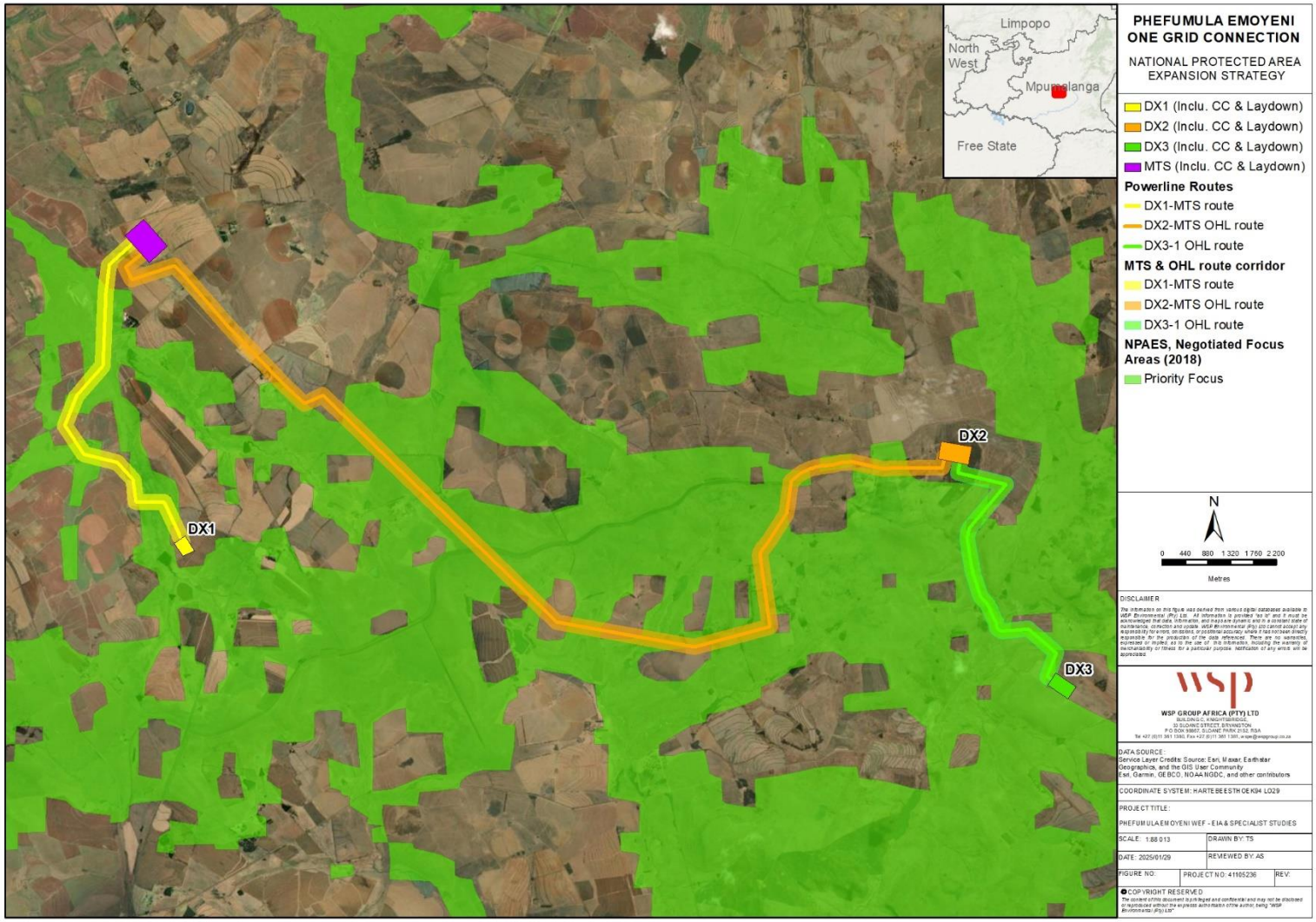

Figure 3-3 - LSA in relation to National Protected Area Expansion Strategy

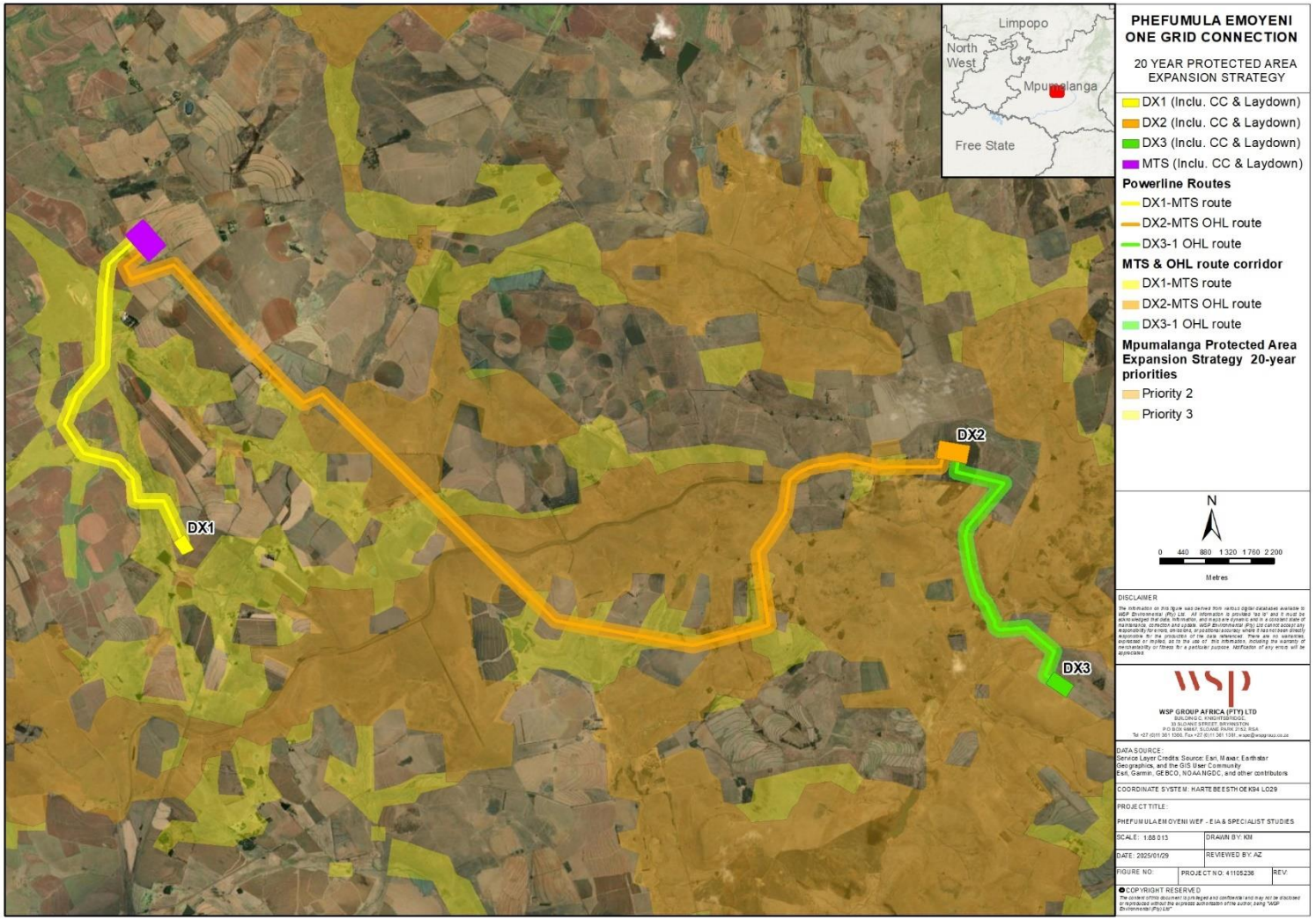

Figure 3-4 - Mpumalanga PAES 20 year priorities

3.2 VEGETATION AND FLORA

Two major vegetation types occur across the LSA; these include Eastern Highveld Grassland and Soweto Highveld Grassland (Figure 3-5). Eastern Highveld Grassland and Soweto Highveld Grasslands are listed as threatened, as per NEMBA Threatened Ecosystems (2021).

Eastern Highveld Grassland is listed as Endangered and is subject to high rates of habitat loss as a result of cultivation, forestry, mines, urbanisation and the building of dams (Mucina & Rutherford, 2011). Estimates suggest that up to approximately 70% of the original extent of Eastern Highveld Grassland has been transformed. Only a very small fraction is conserved in statutory reserves (e.g., Nooitgedacht Dam and Jericho Dam Nature Reserves) (Mucina & Rutherford, 2011). The mapped remaining extent of Eastern Highveld Grassland, as per SANBI (2021).

Cultivation, urbanisation, road infrastructure and mining have similarly resulted in the transformation of more than half of the original extent of Soweto Highveld Grasslands (Vulnerable) (Mucina & Rutherford, 2011). Only a few patches are conserved in formal protected areas, such as Waldrift Nature Reserve, Krugersdorp Nature Reserve, Leeuwkuil Nature Reserve and Suikerbosrand Nature Reserve. This vegetation type is therefore listed as Vulnerable, according to the NEMBA Threatened Ecosystems (2021).

ECOLOGICAL IMPORTANCE OF VEGETATION COMMUNITIES IN THE LSA

The ecological importance of identified vegetation communities mapped in the LSA during baseline studies is summarised in Table 3-1. Natural vegetation communities mapped within the LSA are considered sensitive to development, and where these coincide with CBAs, and project infrastructure, offsets will typically be required according to the draft biodiversity offset guideline.

Table 3-1 – Ecological importance of mapped vegetation communities in LSA

Vegetation Community	Analysis
Cultivated Fields	A modified vegetation community, that has been heavily impacted by anthropogenic activity. Typically characterised by high-levels of ongoing disturbance and either denuded of vegetation (recently ploughed) and/or dominated by non-indigenous flora species. The ecological importance of this vegetation community is rated very low.
Alien Tree Plantations	A modified vegetation community, that is characterised by an almost complete dominance of alien invasive tree species. Little indigenous flora is present. It is noted that plantations do however, provide refuge habitat for sensitive fauna species. Notwithstanding this functional attribute, the ecological importance of the Alien Tree Plantations vegetation community is rated very low.
Mixed Dry Grassland	This habitat unit characterises large portions of the study area. In conjunction with adjacent Moist Grassland habitat, areas of Mixed Dry Grassland are crucial resource and refuge habitat for flora and fauna. They also act as important ecological corridors, increasing local habitat connectivity and facilitating various ecological processes such as, inter alia, flora and fauna movement and dispersal. The conservation importance and functional integrity of this vegetation community are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated high-medium, resulting in an ecological importance rating of medium.

Vegetation Community	Analysis
Old Lands	As the name suggests, this habitat unit characterises old cultivated fields that have been left fallow for several years, and as a result have subsequently regenerated to a secondary grassland community. As such, this is considered a modified habitat unit. Vegetation structure is low closed grassland (sensu. Edwards, 1983). Compositionally, compared to natural grasslands, Old Lands are depleted of nutrients and thus floristically depauperate. Dominant grass species recorded in this unit during the field survey include the tall, robust thatching grasses. This community is rated as having a medium/low functional integrity, but low conservation importance. The biodiversity importance of old lands community is thus low. Receptor resilience is rated high, resulting in an ecological importance rating of very low.
Rocky Grassland	Rocky grassland is a natural vegetation community, that is confined to ridge areas and localised sites embedded within the broader study area habitat matrix. The prominence of large rock outcrops and the presence of indigenous woody flora species, increases local-scale habitat heterogeneity and flora and fauna diversity. Several flora and fauna SCC have been recorded in this community, or have a high probability of occurrence. The functional integrity and conservation importance of the Rocky grassland are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated medium, and accordingly ecological importance is rated high.
Moist Grassland	The Moist grassland community maintains several important ecological functions / traits, including its role in local hydrological patterns, providing linear and largely intact movement and dispersal corridors for fauna and flora, and promoting local-scale habitat heterogeneity. Moreover, several flora and fauna SCC have been recorded in this community or have a high probability of occurrence. The functional integrity and conservation importance of the Moist grassland and wetland are both rated high, resulting in a high biodiversity importance score. Receptor resilience is rated medium, and accordingly ecological importance is rated high.

Figure 3-5 - Vegetation types

Figure 3-6 - Mapped vegetation communities

FLORA SPECIES OF CONSERVATION CONCERN

The National Web Based Screening Tool indicated that the majority of the LSA is considered to be of 'Medium sensitivity' in terms of the Plant Species Theme on account of the potential presence of at least 9 flora species of conservation concern (e.g. *Khadia carolinensis, Aspidoglossum xanthosphaerum*).

Based on reviewed literature and data sources, 11 flora species that occur, or potentially occur in the study area are listed as threatened or Near Threatened on the national and/or provincial Red Lists.

No flora species listed as threatened or Near Threatened on the national Red List were recorded in the study area during the field survey.

Several flora species that are listed as protected at a provincial level according to Mpumalanga Nature Conservation Act (Act No. 10 of 1998) were recorded in the study area during the field survey, including *Aloe ecklonis, Boophone disticha, Crinum bulbispermum, Gladiolus crassifolius, Gladiolus longicollis subsp. platypetalus, Gladiolus sericeovillosus subsp. calvatus* and *Haemanthus humilis*.

No flora species listed on the NEMBA ToPS (2007) List were recorded or potentially occur in the study area.

3.3 FAUNA

Fauna species confirmed in the LSA during field surveys conducted during 2024, as well as fauna SCC confirmed/expected to occur, are summarised in the sections that follow. Full details of the methods used, and survey results, are available in the terrestrial fauna specialist assessments (Hawkhead, 2025) that accompany this EA application.

HERPETOFAUNA

Reptiles

Up to 65 reptile species have been documented the region in which the study area is located; of these, four were confirmed in the LSA during field studies - Water Monitor (*Varanus niloticus*) and Rinkhals (*Hemachatus haemachatus*). Anecdotal evidence from a local farmer indicate that other common encountered species include the Mole Snake (*Pseudaspis cana*) and Red-lipped Snake (*Crotaphopeltis hotamboeia*). These are all common and widespread species.

Seven reptile SCC potentially occur in the study area. None of these taxa are listed as threatened on the regional Red Lists. They are however listed as Vulnerable or Near Threatened or the Mpumalanga Red List.

Amphibians

Based on historic distribution ranges, up to 24 amphibian species are known from the region and potentially occur in the study area; four of which were confirmed during field surveys (Table 3-2), and all of which are common with widespread distributions (i.e. not of conservation concern).

Table 3-2 – Amphibian species recorded in LSA

Family	Scientific Name	Common Name
Bufonidae	*Bufo gutturalis*	Guttural Toad
Pipidae	*Xenopus laevis*	Common Platanna
Pyxicephalidae	*Stongylopus fasciatus*	Striped Stream Frog
Pyxicephalidae	*Amietia angolensis*	Common River Frog

Giant Bullfrog (*Pyxicephalus adspersus*) is the only amphibian of conservation concern potentially occurring in the study area. It inhabits seasonally shallow pans, wetland and rained-filled depressions in savanna and grassland ecosystems. These habitats are present in the LSA, and it is therefore probable that Giant Bullfrog are present.

INVERTEBRATES

Limited data are available on the invertebrate diversity of the study area and surrounding landscape. The invertebrate profiles on the Virtual Museum database lists 18 butterfly, one dragonfly, one scorpion and one spider for the 2629BD and 2629BC QDS (Fitzpatrick Institute of African Ornithology, 2023). Of these, two are of conservation concern, namely the Marsh Sylph (*Metisella meninx*) and the Golden Star-dust Baboon Spider (*Harpactira hamiltoni*).

The national environmental screening tool highlighted the Potchefstroom Blue, Marsh Sylph and Golden Stardust Baboon Spider as a potentially sensitive feature for the study area. These three SCC are discussed in more detail in the subsections below:

Potchefstroom Blue

The Potchefstroom Blue is a butterfly species that is listed as Rare in South Africa and is endemic to the country. It is a habitat specialist that is known from only a few locations across an EOO of 93 799 km² (Dobson & Dobson, 2018). This species favours rocky areas in grassland, where it is dependent on the presence of the larval host plant *Ocimum obovatum*, and potentially also a host ant, viz., Camponotus species (Dobson & Dobson, 2018). The Potchefstroom Blue thrives in grasslands subject to annual winter fires (Dobson & Dobson, 2018). The larval host plant *Ocimum obovatum* was recorded in the study area during the field survey, and it is therefore possible that the Potchefstroom Blue is present.

Marsh Sylph

The Marsh Sylph is listed as Near Threatened. This butterfly species favours pristine wetland habitats, where it feeds on the host grass *Leersia hexandra* (Henning, 2018). It has an EOO of 80 348 km² but only occurs in small areas of suitable habitat across its range (Henning, 2018). The total population size is approximately 12 000 mature individuals, but each subpopulation only numbers about 250 individuals (Henning, 2018). Considering the availability of suitable moist grassland habitat, it is probable that this species is present in the study area.

Golden Star-dust Baboon Spider

The Golden Star-dust Baboon Spider is listed as protected at both a provincial level according to Mpumalanga Nature Conservation Act (Act No. 10 of 1998), and at a national level according to the NEMBA ToPS (2007) List. According to the distribution maps in Dippenaar-Schoeman (2014) is known from grassland habitats, and suitable habitat is present in the study area. It is therefore probable that this species is present in the study area

BIRDS

A total of 224 species could potentially occur within the Broader Area where the Project Site is located. Of these, 40 are classified as priority species for wind energy developments. Of these 40 priority species, 36 have a medium to high likelihood of occurring regularly in the Project Area of Influence (Project Site). Of the 40 priority species, 34 (85%) have been recorded during the on-site field surveys thus far (three of four surveys completed).

Eighteen (18) priority species recorded in the Broader Area are also Species of Conservation Concern (SCC). Twelve (12) SCC have been recorded during the on-site field surveys thus far (Table 3-3).

Table 3-3 – Avifauna species of conservation concern recorded in LSA

Common Name	Scientific Name	Global Conservation Status	Regional Conservation Status
African Marsh Harrier	*Circus ranivorus*	-	EN
Black Harrier	*Circus maurus*	EN	EN
Black Stork	*Ciconia nigra*	-	VU
Black-winged Pratincole	*Glareola nordmanni*	NT	NT
Blue Crane	*Grus paradisea*	VU	NT
Blue Korhaan	*Eupodotis caerulescens*	NT	LC
Cape Vulture	*Gyps coprotheres*	VU	EN
Denham's Bustard	*Neotis denhami*	NT	VU
Lanner Falcon	*Falco biarmicus*	-	VU
Martial Eagle	*Polemaetus bellicosus*	EN	EN
Pallid Harrier	*Circus macrourus*	NT	NT
Secretarybird	*Sagittarius serpentarius*	EN	VU
Southern Bald Ibis	*Geronticus calvus*	VU	VU

BATS

Twenty-three bat species are expected to occur in the RSA, of which two are considered threatened at the national/global level; of these, a total of six bat species from five families were detected during the pre-construction monitoring period, all of which are listed as Least Concern, with no endemic or range-restricted species encountered. Of the six afore-mentioned bat species that were recorded onsite, all were recorded near ground level and at 65 m a.g.l., and five (excluding the Yellow-bellied House Bat) were recorded at 116 m a.g.l.

MAMMALS

Nineteen mammal species were recorded in the study area during the field survey. Four mammal species that were recorded in the study area during the field survey are listed as threatened or Near Threatened on the national mammal Red List (Child et al., 2016), namely the Mountain Reedbuck (*Redunca fulvorufula fulvorufula*), Serval (*Leptailurus serval*), Cape Clawless Otter (*Aonyx capensis*) and Swamp Musk Shrew (*Crocidura mariquensis*).

Three mammal species were highlighted by the web-based screening tool as potentially sensitive features for the study area, namely the Maquassie Musk Shrew (*Crocidura maquassiensis*), Spotted-necked Otter (*Hydrictis maculicollis*) and Oribi (*Ourebia ourebi ourebi*).

It is noted that reviewed literature and datasets also indicate that an additional 24 mammal SCC potentially occur in the study area.

4 AQUATIC BIODIVERSITY OVERVIEW

This section summarises the baseline aquatic biodiversity environment of the local and regional study areas. It draws upon existing studies, published information, local knowledge and data gathered during the wetland and aquatic baseline studies conducted during 2022.

The LSA falls within the upper reaches of the Olifants North and Upper Vaal Water Management Areas, and the quaternary catchments X11A (Komati River), C11 F and H (Vaal) and B11A and B12A (Olifants North).

The study area and investigation areas fall within the Mesic Highveld Grassland Group 3 and Group 4. These vegetation groups are considered to be Critically Endangered (CR) according to Mbona et al. (2015).

4.1 CONSERVATION CONTEXT

The relative Aquatic Biodiversity theme sensitivity of the LSA is Very High, due to the presence of aquatic CBAs, wetlands, and freshwater ecosystem priority area quinary catchments (DFFE, 2022).

AQUATIC CRITICAL BIODIVERSITY AREAS (CBAS) AND ECOLOGICAL SUPPORT AREAS (ESAS)

The areas along and adjacent to the unnamed tributary of the Xspruit River are indicated as Aquatic CBA River areas. Several sections of the channelled valley bottom wetlands (per the NBA: 2018 and MPHW: 2014 Databases) in the western sections are also indicated as CBA: Wetlands. CBA Areas that are required to meet biodiversity targets for species, ecosystems, or ecological processes. These include all areas required to meet biodiversity pattern targets and to ensure the continued existence and functioning of species and ecosystems, special habitats, and species of conservation concern; Critically Endangered ecosystems and critical linkages (corridor 'pinch-points') to maintain connectivity. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species.

STRATEGIC WATER SOURCE AREAS (SWSAS)

The study area, the crossings, and the investigation areas are not indicated to be within a groundwater SWSA or within any surface water SWSA.

FRESHWATER ECOSYSTEM PRIORITY AREA (FEPA) SUB-CATCHMENTS

The study area and grid investigation area in the south and east is indicated within a CODE 1 FEPA catchment, while the remainder and the crossings are not indicated to be within a FEPA catchment. FEPAs achieve biodiversity targets for river ecosystems and threatened fish species and were identified in rivers that are currently in a good condition. Although the FEPA status applies to the actual river reach within the sub-quaternary catchment the surrounding land and smaller stream network needs to be managed in a way that maintain the good condition of the river reach.

NATIONAL FRESHWATER ECOSYSTEMS PRIORITY AREAS DATATBASE

The NBA (2018) database like the NFEPA database, also indicates the presence of numerous channelled valley bottom (CVB), seep wetlands, and one depression wetland. The CVB wetlands are mostly indicated to be in a Largely to Critically Modified (Class D/E/F) ecological condition, Critically Endangered (ETS) and Not Protected (EPL). The seep wetlands are indicated to largely be in a

Moderately Modified (Class C) ecological condition and in a Largely to Critically Modified (Class D/E/F) ecological condition. The seep wetlands are indicated by the database to be Critically Endangered (ETS) and Poorly Protected (EPL). The one depression wetland is indicated to be of Least Concern (ETS), Natural/Near-Natural (PES Class AB), and Poorly Protected (EPL). The NBA Rivers database further indicates the unnamed tributary of Xspruit River traversing the study area and is indicated to be in a Near Natural to Natural (class A/B) ecological condition, in a Critically Endangered (ETS), and Poorly Protected (EPL). The NBA Artificial Wetlands Database furthermore indicates numerous dams within the study and associated investigation area overlaying the seeps and CVB wetlands. (Figure 4-2).

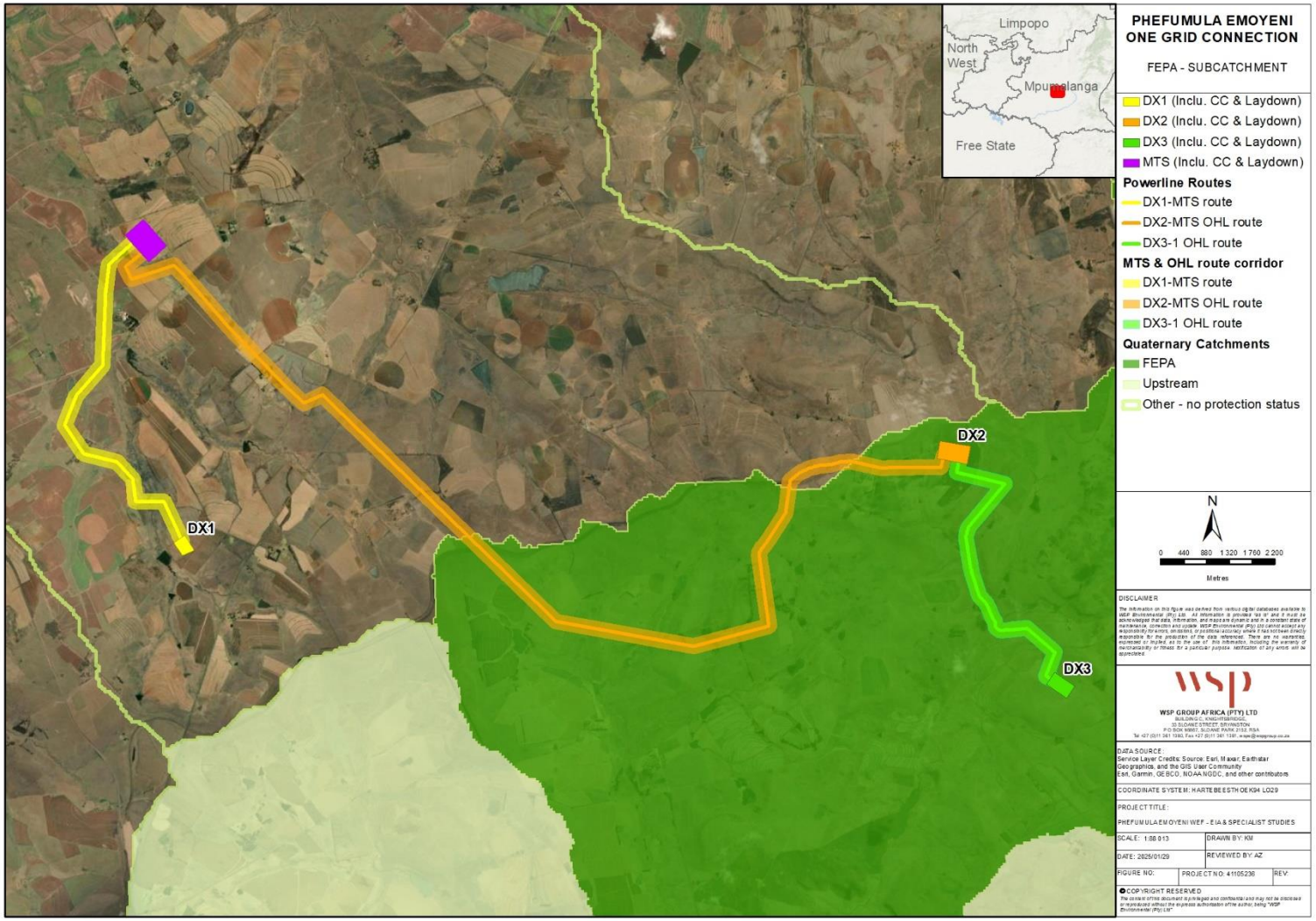

Figure 4-1 - FEPA Sub catchment

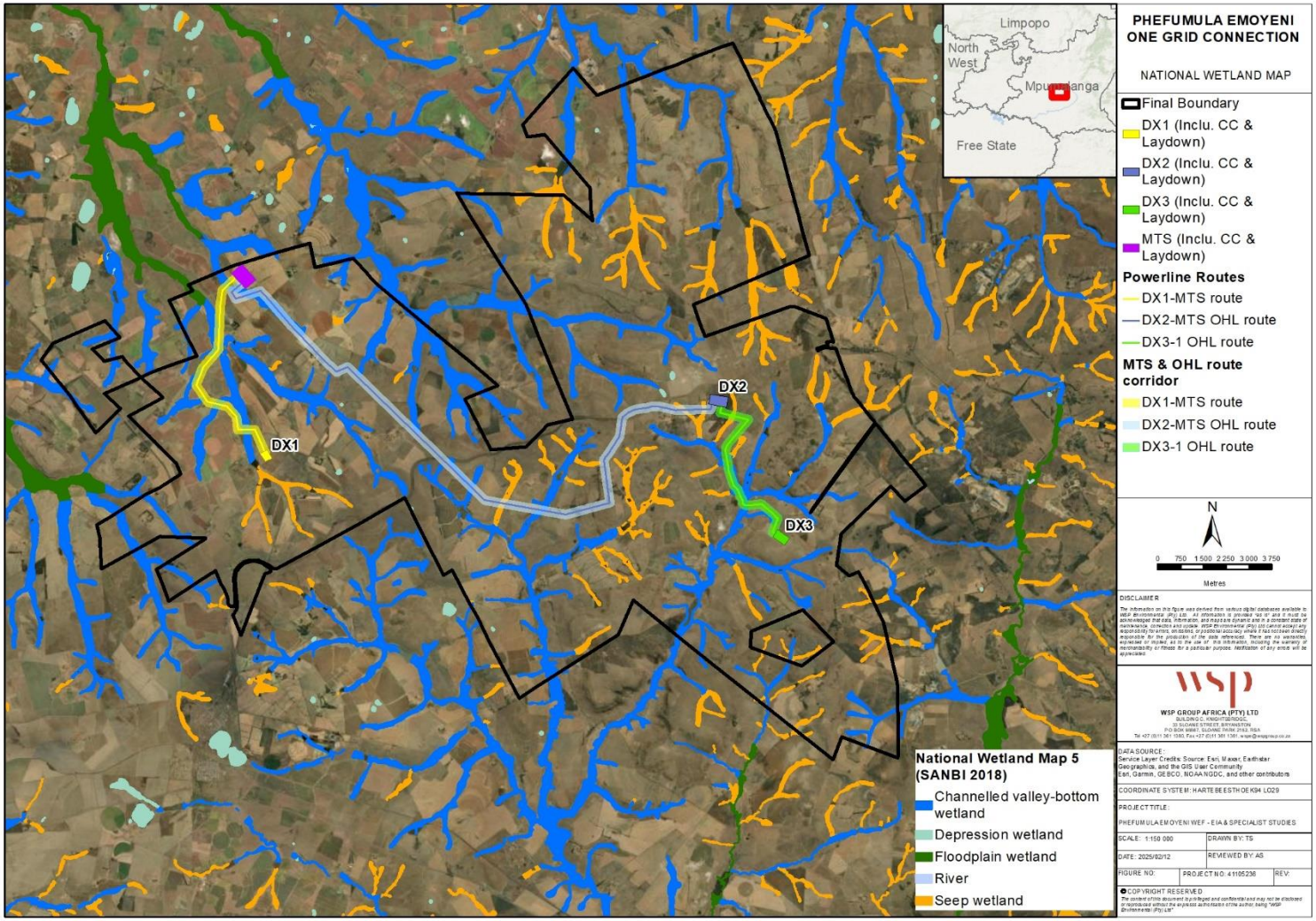

Figure 4-2 – NFEPA Wetlands

4.2 WETLAND ECOSYSTEMS

The LSA is dominated by mixed grassland and agricultural cultivation, with hillslope seeps and valley bottom wetlands occurring throughout.

Approximately 5130.7 ha of wetland habitat has been mapped in the LSA. The wetlands within the LSA exist in a landscape that is characterised by agricultural activities – predominantly livestock grazing, with some intensive crop production. The wetlands within the Project Area are in a Moderately Modified (PES C), and PES B wetlands considered to be in Good also present.

The EIS of the wetlands in the Project area varies, largely as a function of their size and ecological integrity, which affects their capacity to deliver biodiversity and water-related ecosystem services. The majority of wetlands in the LSA are considered to be of Moderately to High EIS.

5 APPLICATION OF THE MITIGATION HIERARCHY

Biodiversity offsets are the final option in the mitigation hierarchy (Figure 5-1), once all other foregoing steps have been considered to their full extent. Environmental measures that have been incorporated in the Project design so that potential impacts can be avoided, are described in Section 5.1; and additional mitigation measures that have been prescribed in each of the biodiversity specialist reports are summarised in Section 5.2.

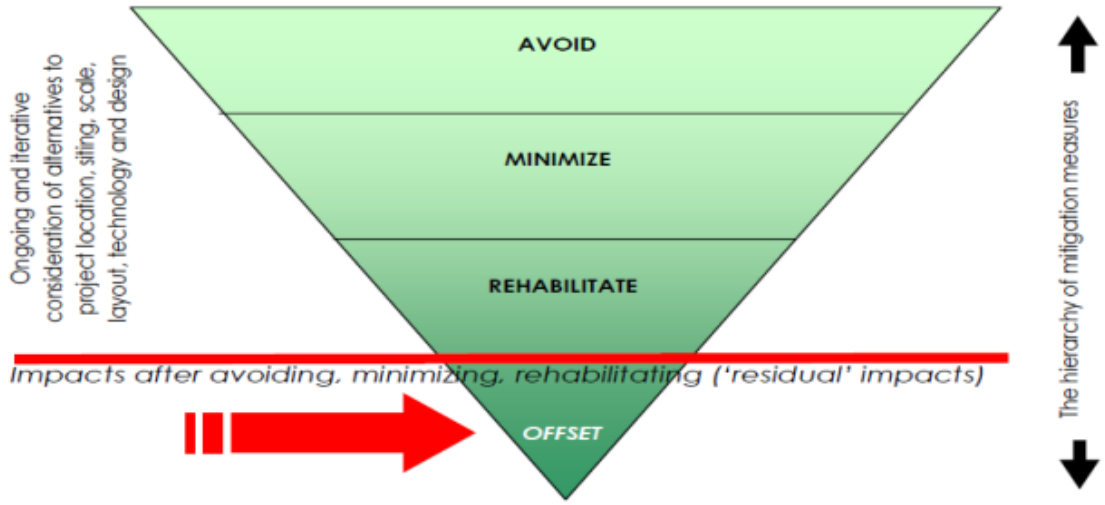

Figure 5-1 - The mitigation hierarchy (DFFE, 2022)

5.1 INCORPORATED ENVIRONMENTAL MEASURES

Given the sensitive nature of much of the LSA, a number of environmental mitigation measures were incorporated into the Project design to avoid and minimise potential effects to biodiversity. These include:

- A 100 m buffer was applied to all watercourses (wetlands and riparian systems) and all turbines, laydown and construction camps, and structures (wind power factory and yard, on-site IPP substation and BESS) have been sited outside of this buffer area.
- Use will be made of existing access roads/tracks to the extent possible, to minimise the requirement for construction of new access roads.
- Low speed limits (20-40 kph) for all construction and operation vehicles will be clearly signposted and enforced.
- Internal roads will be designed and maintained so that natural drainage patterns and catchments are changed as little as possible.
- Appropriate sanitary facilities will be provided for the duration of the construction and operation and all wastes will be removed to an appropriate waste facility.

- Fuel/chemical storage and usage areas will be sited above any 1:100 year floodline/outside watercourse buffer zones, and limited to demarcated areas in laydown and construction camps, sealed and bunded, with storm water directed around these areas;
- All fuel/chemical/concrete storage areas will be on bunded hard stands to prevent any spills from infiltrating to the underlying soil;
- Grease and oil traps will be installed at refuelling facilities, workshops and fuel storage depots. Drip trays will be used in the plant and workshops.
- An alien and invasive species management procedure will be developed to:
  - Prevent the spread of invasive species and pathogens that may already be present in the surrounding environment;
  - Implement prompt and effective rehabilitation and revegetation (with desirable plant species) where applicable;
  - Implement of ongoing monitoring in Project-occupied land throughout the life of the Project to ensure early detection of new areas of weed and pathogen spread, identify previously unrecorded invasive species, pest and pathogens, and assess the efficacy of prescribed control measures; and
  - Provision of all construction contractors and other subcontractors with a copy of the invasive species management procedure, and specific invasive species, pest and pathogen management plans and secure their commitment to adhere to the measures outlined therein.

5.2 BIODIVERSITY MITIGATION MEASURES

The mitigation measures to minimise Project impacts on species and ecosystem receptors and rehabilitate impacted areas that have been prescribed in the various biodiversity specialist assessments are summarised as follows.

AVOIDANCE AND MINIMISATION MEASURES

All receptors

- The sensitive (No-Go) areas identified in the terrestrial and aquatic biodiversity specialist assessments should be adhered to;
- All temporary construction footprints, including, but not limited to, laydown areas, portable toilets, cement batching plants, wind tower factory etc., should only be located in areas of modified habitat (e.g., cultivated fields and alien tree plantations), and outside and above the 1:100 year floodline;
- Where feasible, permanent proposed Project infrastructure should be located on land that is already modified;
- All human activities associated with construction, operation and decommissioning should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.
- Project access roads should be aligned with existing district and farm roads and tracks to the extent possible.

- All staff, vehicle and machinery activities should be strictly controlled at all times so as to ensure that the absolute minimum of surface area is impacted.
- Care should be taken not to introduce or propagate alien plant species/weeds during construction.

Avifauna

- A pre-construction avifaunal walk down should be conducted to confirm final layout and identify any sensitivities that may arise between the conclusion of the EIA process and the construction phase.
- No internal medium voltage power lines should be overhead. All such cables should be buried, and follow road verges at all times. Only the 132kV grid connection power line should be above ground (this is assessed in a separate application).
- Any overhead conductors or earth wires should be fitted with an Eskom approved anti-bird collision line-marking device to make cables more visible to birds in flight and reduce the likelihood of collisions.
- The pole design of any overhead power line should be approved by an ornithologist in terms of the electrocution risk it may pose to large birds such as eagles and vultures.
- A post-construction site inspection must be conducted by an avifaunal specialist to confirm that all aspects have been appropriately handled and in particular that road and hard stand verges do not provide additional substrate for raptor prey species. It is essential that the new wind farm does not create favourable conditions for such mammals in high risk areas. We therefore recommend that within the first year of operations a full assessment of this aspect be made by the ornithologist contracted for post-construction monitoring. If such conditions have been created, case-specific solutions will need to be developed and implemented by the wind farm.
- It is strongly recommended that rodenticides not be used at the newly established Operation and Maintenance (O&M) buildings or around auxiliary infrastructure on the project site. While pest control of this nature may be effective, even so-called “environmentally friendly” rodenticides are toxic and pose significant secondary poisoning risk to predatory avifauna, especially owls.
- A ‘Cape Vulture Food Management Programme’ must be implemented on site to ensure all dead livestock/wildlife on site are removed as soon as possible and made unavailable to vultures for feeding. This programme will reduce the amount of available vulture food on site and reduce vulture-turbine collision risk. This programme will require the deployment of a dedicated (i.e. no other tasks) and adequately resourced (transport, binoculars, GPS, cameras, training) team of staff to patrol the full site and immediate surrounds during all daylight hours. The co-operation of landowners will also be essential to ensure that reported carcasses are disposed of effectively. This programme must be operational by the time the first turbine blades are turning on site and should not wait for Commercial Operations Date (COD). A full detailed method statement for this programme must be designed by an ornithologist prior to COD, and included in the EMPr.
- The landowner agreements should ensure specifically that any vulture feeding sites be stopped from the start of wind farm construction and not used for the full lifespan of the wind farm. Landowners should also be sensitised to the need to cooperate with the above Cape Vulture Food Management Programme.

- Cape Vultures will have to be effectively deterred from roosting on overhead power lines on site. This will need to be achieved well before turbines are operational and maintained through the project lifespan. Eskom Bird Guards (perch deterrents), with full coverage of steel cross members (not just above live phases as per Eskom standard). In addition, the team of staff employed to implement the Cape Vulture Food Management Programme described above should also be tasked with patrolling the relevant sections of power line early morning and late evenings to scare any perching vultures away. This should first be trialled by in collaboration with an avifaunal specialist to ensure that such actions don't increase turbine collision risk in the short term by flushing vultures into turbines.
- An Observer-Led Turbine Shutdown on Demand (OLSDOD) programme must be implemented on site from COD. This is required in order to mitigate the risk of turbine collision for priority bird species. This programme must consist of a suitably qualified, trained, dedicated and resourced team of observers present on site for all daylight hours 365 days of the year. This team must be stationed at vantage points with full visible coverage of all turbine locations. The observers must detect incoming priority bird species, track their flights, judge when they enter a turbine proximity threshold, and alert the control room to shut down the relevant turbine/s until the risk has reduced. A full detailed method statement must be designed by an ornithologist prior to COD, and included in the EMPr. The effectiveness of this programme is highly dependent on hiring the correct staff and managing them appropriately. The project must pay careful attention to this aspect if it is to succeed.
- All turbines must have one of their blades painted according to a protocol currently under development by the South African Wind Energy Association (SAWEA) from the outset (i.e. prior to installation). Provision must be made by the developer for the resolution of any technical, warranty or supplier challenges that this may present.
- A bird fatality threshold and adaptive management plan must be designed by an ornithologist for the site prior to the Commercial Operation Date (COD) and included in the EMPr. This plan should identify most importantly the number of bird fatalities of priority species which will trigger a management response, appropriate responses, and time lines for such responses. Fatalities of priority bird species are usually rare events (but with very high consequence) and it is difficult to analyse trends or statistics related to these fatalities as they occur. It is therefore important to have a threshold policy in place proactively to assist adaptive management.
- Any residual impacts after all possible mitigation measures have been implemented will need to be mitigated off site. The facility will need to address other sources of mortality of priority species in a measurable way so as to compensate for residual effects on the facility itself. This will need to be detailed in a Biodiversity Action Plan.
- The "during construction" and "post-construction" monitoring programme outlined in the avifauna impact assessment (WildSkies, 2023) should be implemented according to the latest available version of the Best Practice Guidelines at the time. The findings from Operational Phase monitoring should inform the adaptive management programme to mitigate any impacts on avifauna to acceptable levels.
- The project must keep abreast of new developments in avifauna mitigation (e.g. blade illumination; radar technology; and acoustic deterrents) and implement if deemed necessary and reasonable as per the projects' adaptive management plan.

Bats

- A 200 m buffer to be implemented around sites that are considered to be of Medium Sensitivity to bats (i.e. water sources and potential foraging areas) as recommended by MacEwan (2022);
- A 500 m buffer to be implemented around confirmed bat roosts, within which no turbines should be located
- Adaptive mitigation during operational phase (i.e. application of additional/changed mitigation, further to the findings of operation phase monitoring of bat carcasses, and passive acoustic monitoring), which could include curtailment (as necessary).
- Use of minimal compulsory civil aviation lighting on turbines at night time
- Use of low-intensity, directional (downward) lights, that are non-UV emitting
- Higher cut-in speeds during times of peak activity (October to January), particularly during times of higher levels of bat activity (18:00 – 21:00).

Terrestrial plant species

Avoidance

- As far as possible, permanent Project infrastructure footprints should be located in areas of modified habitat (i.e., Cultivated Fields & Old Lands) to avoid/minimise impacts on natural habitats;
- Temporary Project infrastructure footprints (e.g., laydown areas) should only be located in areas of modified habitat;
- In areas of natural habitat, micro-site Project infrastructure to localised disturbed sites; and
- A pre-construction walkdown of the transmission line corridor and the other development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform micro-siting options, and any other relevant management measures.

Minimisation

- All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these areas;
- The footprints to be cleared of vegetation should be clearly demarcated prior to construction to prevent unnecessary clearing outside of these areas;
- No heavy vehicles should travel beyond the marked works zone;
- Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas.

Rehabilitation

A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction. The protocol should include:

- Stockpiling of topsoil that was cleared from development footprints during site preparation;

- Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment;
- Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation;
- Grass species used during rehabilitation should be indigenous, locally-occurring perennial species;
- An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS occurring at sites disturbed by project activities in the Project site. The plan must include:
  - Identification of AIS management units
  - Prioritisation of sites and species requiring control;
  - Targets and indicators of success;
  - Scheduling of AIS control;
  - Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and
  - Provision for follow-up treatments, as informed by regular AIS monitoring.
- Project infrastructure should be regularly inspected and maintained to ensure operational efficiency and prevent electrical failures and accidental fires;
- The Project proponent should approach all relevant farmers and the local fire protection association (FPA) to investigate developing a co-ordinated Grassland Burning Management Programme for the farms encompassing the Project site;
- As required, firebreaks should be maintained around infrastructure that are susceptible to faults/shorts that may cause accidental wildfires; and
- Construction- and maintenance workers should be trained on the dangers of wildfire and the need to actively prevent unplanned/accidental fires.

Terrestrial animal species

- A Mountain Reedbuck surveying programme should be conducted to determine the population size and spatial use (i.e., territorial configuration) of the study area. These data should then be used to identify the need for any additional and adaptive conservation and management interventions for Mountain Reedbuck to be incorporated in the BMP/BAP;
- Limit the construction of fences or other linear artificial movement barriers to the minimum required to meet facility safety/security requirements.
- A suitably experienced Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions;
- As appropriate, barriers should be erected around construction trenches and excavations to prevent fauna being trapped in these features;
- Any fauna species trapped in construction areas should be safely and correctly relocated to an adjacent area of natural habitat;
- The handling, poisoning and killing of on-site fauna by contractors must be strictly prohibited;

- General noise abatement equipment should be fitted to construction machinery and vehicles;
- Dust suppression using water bowsers should be undertaken on all roads and other sites where dust entrainment occurs;
- The rules and regulations concerning fauna should be communicated to contractors through on-site signage and awareness training.
- An incidence register should be maintained throughout all phases of the Project detailing any fauna mortalities/injuries caused by on-site activities. The register should be used to identify additional biodiversity management requirements
- Project proponent must keep actively informed about new research in the field of vibration impacts on fauna and potential mitigation options;
- Based on the findings of new research in the field of vibration impacts on fauna and potential mitigation options, the biodiversity management plan for the proposed Project should be updated to include additional mitigation measures (as required) for on-site implementation.

Aquatic ecosystems (rivers and wetlands)

- A buffer zone of at least 100 m around wetlands must be clearly demarcated with semi-permanent fencing and maintained throughout the duration of the construction phase to enable construction workers to avoid the wetland areas outside the construction footprint, and minimise the risk of disturbance.
- A functional buffer of at least 63 m from the edge of the macro-channel of rivers and streams must be preserved for protection of the riverine ecosystem and maintenance of a functional riverine buffer zone.
    - No activities, roads or infrastructure (other than the absolute minimum necessary and approved road-crossings) are to be located within the final designated buffer zone area;
    - Indigenous vegetation cover within the designated buffer zone is to be maintained at a minimum of 80% to ensure that the buffer remains functional, and must be assessed annually;
    - Alien vegetation establishment within these buffer zone areas is to be strictly controlled through the development and implementation of a detailed alien management plan developed in accordance with legislative requirements.
- Some unavoidable wetland/river crossings will be utilised and will require upgrade, mitigation measures that will be applied at these crossings include:
    - A construction method statement for wetland road crossings must be developed by a wetland ecologist and environmental engineer, and implemented on site during construction;
    - Construction should be done in the dry season and completed by the wet season, so that appropriate water management systems are in place for stormwater management;
    - Design of infrastructure should be environmentally and structurally sound and should take into consideration any required restoration of the affected watercourses as well as the reach-scale movement needs of the expected fish assemblages and other migratory fauna;
    - Culvert designs should be such that no fragmentation of the affected systems occurs;

- Where the gradient allows, culvert design must ensure that the base of the culverts are countersunk in line with the baseflows of the watercourse;
- Should any sloped culverts be necessary, these should include the use of baffles or a roughened channel to ensure complex flow throughout culvert length (as opposed to laminar flow). Various options for inclusion of baffles are available, and final design selection would require engineering input and consideration of hydraulic roughness through the culvert;
- The number of culverts installed should be suitable for the gradient, width and flow profiles of the watercourses being crossed so as to avoid upstream inundation, erosion and incision, and alterations to the natural channel;
- Pipe culverts are to be avoided at all watercourse crossings to limit opportunities of flow confinement and channel incision of the wetland units, drainage lines and rivers. Piped culverts have the additional impact of limiting fish movement between reaches;
- Designs should account for high flow velocities, which may result in further scouring of the watercourse downgradient of the structure and as such, bed and bank protection downgradient of structures should be considered.

- Site clearing activities should take place at the end of the wet season to minimise the risk of erosion, incision and sedimentation of the associated watercourses, and as far as possible, all remaining construction activities should take place during the dry winter months to minimise impacts as a result of high flows and runoff from exposed soils and materials;
- Ensure a soil management programme is implemented and maintained to minimise the potential for erosion and sedimentation;
- All/any topsoil or building material stockpiles must be protected from erosion, stored on flat areas where runoff will be minimised, and be surrounded by bunds. Stockpiles must also only be stored for the minimum amount of time necessary;
- Erosion berms or suitable water attenuation measures should be installed on roadways and downstream of construction and infrastructure areas to prevent gully formation and siltation of the associated watercourses.
- All erosion noted within the construction/operation footprint should be remedied immediately and included as part of an ongoing rehabilitation plan;
- Only authorised personnel should be allowed within the construction area;
- No material may be dumped or stockpiled within or adjacent to the watercourses;
- No mixing of construction materials such as cement should be permitted within or adjacent to watercourses and no such mixing may occur on bare soils in the surrounding area

REHABILITATION MEASURES

- A rehabilitation/landscaping protocol should be developed and implemented on-site. The protocol should include the following provisions:
  - Stockpiling of topsoil from development footprints during site preparation;

- Post-construction, the land form should be correctly contoured to limit potential erosion and compacted soils should be ripped and loosened to facilitate vegetation establishment;
- Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and
- The location of sites requiring erosion prevention and rehabilitation should be identified through regular field inspections;
- Locally-occurring indigenous plant species should be used to revegetate all areas disturbed during construction;
- The re-vegetation programme shall take cognisance of the climatic and seasonal conditions but should generally be undertaken annually starting in spring and early summer.

- Active rehabilitation, re-sloping, and re-vegetation of disturbed riparian areas must take place immediately after construction;
- Active alien invasive species control should continue throughout the operational and decommissioning phase, as per the Project's AIS Control and Eradication Plan. Follow up control should be carried out for a five- year period following decommissioning.
- Develop a wetland rehabilitation and management plan for the remaining wetlands in the Study Area, to offset unavoidable losses of wetland habitat;
- Rehabilitation of wetlands disturbed during construction of wetland crossing upgrades should be implemented as soon as construction is completed.

6 RESIDUAL IMPACTS REQUIRING OFFSET

The LSA and Project infrastructure are situated in a high biodiversity value landscape, interacting with extensive areas of natural habitats, areas mapped as terrestrial and aquatic CBAs according to the MBSP, and an IBA, and supports numerous flora and fauna SCC. As a result, a number of residual impacts of moderate-high significance on species and ecosystem receptors have been identified in the various terrestrial and aquatic biodiversity specialist assessment reports. The significant residual impacts are summarised in Table 6-1.

Table 6-1 – Significant residual impact summary

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
Aquatic Biodiversity	Development of OHPL: • Transformation of freshwater vegetation, associated habitat and ecosystem services within freshwater ecosystems not proposed to be directly impacted from indirect impacts; • Transportation of construction materials can result in disturbances to soils, and increased risk of sedimentation/erosion; • Risk of AIP proliferation in disturbed areas that could colonise the adjacent wetland areas; and • Soil and stormwater contamination from oils and hydrocarbons originating from construction vehicles	C	(-)	Low	Low
	Development of MTS, DX1 Substation: • Earthworks and exposure of soil could result in sedimentation of downgradient wetlands, which may be transported as runoff into the downgradient wetlands and may smother wetland vegetation; • Altered water quality in downgradient wetlands (if surface water is present) as a result of pollution as a result of oils (e.g. from spills) and concrete mixing; and. • Risk of AIP proliferation in disturbed areas that could colonise the adjacent wetland areas; and	C	(-)	Low	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	• Soil and stormwater contamination from oils and hydrocarbons originating from construction vehicles..				
	Development of the OHPLs (Stringing of the lines across wetlands): • Potential damage to wetland habitat and vegetation as a result of stringing activities	C	(-)	Low	Low
	Development of the OHPLs: • Disturbance to soil and vegetation relating to movement of vehicles / equipment through freshwater ecosystems as a result of periodic maintenance activities; and • •Altered water quality (if surface water is present) as a result of increased availability of pollutant	O	(-)	Moderate	Low
	Development of the Substations: • Disturbance to soil and ongoing erosion as a result of periodic maintenance activities; and • Altered water quality (if surface water is present) as a result of increased availability of pollutants, especially in the event of spills / failure of transformers in the substation	O	(-)	Moderate	Low
	Removal of all surface infrastructure from the project area: • Disturbance of soil and vegetation that established within the decommissioning area	D	(-)	Low	Low
Avifauna	Noise pollution and environmental disruption : Displacement of priority species from breeding/feeding/roosting areas	C	(-)	Moderate	Moderate
	Habitat transformation: Displacement of priority species from breeding/feeding/roosting areas	O	(-)	Moderate	Moderate

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Electrocution of priority species on the on-site sub-stations and internal 33kV network	O	(-)	High	Low
	Collisions of EGI sensitive species with the 132kV power line	O	(-)	High	Moderate
	Noise pollution and environmental disruption: Total/partial displacement of priority species from breeding/feeding/roosting areas	D	(-)	Moderate	Low
Animal Species	Direct loss and disturbance of natural habitat.	C	(-)	Moderate	Low
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	Moderate	Low
	Impact on fauna SCC: Injury, mortality and disturbance of fauna	C	(-)	Moderate	Low
	Impact on fauna SCC: Injury and mortality of fauna, including SCC	C	(-)	Moderate	Low
	Impact on fauna SCC: Increase in wildfires from faulty/shorting powerline infrastructure	O	(-)	Moderate	Low
	Impact on fauna SCC: Injury and mortality of fauna, including SCC	D	(-)	Moderate	Low
Terrestrial Biodiversity	Direct loss and disturbance of natural habitat	C	(-)	Moderate	Low
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	C	(-)	Moderate	Low
	Increased soil erosion and sedimentation	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	O	(-)	Moderate	Low
	Increase in wildfires from Project workers or faulty infrastructure	O	(-)	Moderate	Low
	Establishment and spread of alien invasive species	D	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Increased soil erosion and sedimentation	D	(-)	Moderate	Low
Plant Species	Direct loss and disturbance of natural habitat	C	(-)	Moderate	Low
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	Moderate	Low
	Loss of flora of conservation concern	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	O	(-)	Moderate	Low
	Establishment and spread of alien invasive species	D	(-)	Moderate	Low

7 TARGETS FOR OFFSET

Since direct loss of wetland and terrestrial habitats cannot be mitigated, these losses must be offset. The results of the application of wetland functional and ecosystem hectare equivalent calculations for wetland losses as a result of the proposed Project components using the revised SANBI and DWS offset guidelines (Macfarlane *et al.,* 2014) and guidance provided in the draft Biodiversity Offset Guidelines (DFFE, 2022) are presented in the following sections.

7.1 TERRESTRIAL HABITAT

Residual impacts on terrestrial habitat were defined as the extent of natural habitats supporting plant/fauna SCC that would be lost as a result of the proposed development options.

The basic and adjusted offset ratios for natural terrestrial habitats are set out in Table 7-1, based on the biodiversity offset ratios look-up table provided in the draft Biodiversity Offset Guideline. When the relevant habitats fall within a CBA1, the ratio is automatically set to 30:1, while the basic ratio for areas within CBA2 is adjusted by increasing it by a factor of 1.5. For other mapped categories, excluding 'heavily modified' and 'modified' areas (i.e. Ecological Support Areas - ESAs and Other Natural Areas - ONA) the basic ratio applies.

Table 7-1 – Basic and adjusted biodiversity offset ratios for terrestrial habitats

Criteria	Basic Ratio (DFFE, 2022)	CBA1	CBA2
Endangered ecosystems	10:1	30:1	15:1
Vulnerable ecosystems	5:1	30:1	7.5:1
Eastern Highveld Grassland (EN)	13:1	30:1	19.5:1
Soweto Highveld Grassland (VU)	12:1	30:1	18:1

Mapped vegetation communities within the LSA that will be lost as a result of the proposed Grid were ranked according to their occurrence in CBA1, CBA2, ESA and ONA areas mapped by the MBSP. Targets were then set for areas of natural habitat loss (i.e. loss of Disturbed Grassland, Wet and Dry Mixed Grassland, and Rocky Grassland) only. Loss of areas of Alien Tree Plantations, Cultivated Fields, Infrastructure and Transformed areas was not included in target setting, even if they occurred within areas mapped as CBA, since their loss is not considered a significant impact. Loss of areas mapped as 'Moist Grassland in the terrestrial vegetation dataset are included, since detailed wetland targets have not been set. The transmission line corridor width was given as 300m.

The calculated targets for each vegetation group within the LSA, for each Project component, are summarised on Table 7-2, with a total of 16.95 ha.

The calculations in Table 7-2 is based on the assumption that each pylon for the length of the Grid connection will be 200m apart, at each pylon location we created a square block 10x10m around each point (square is orientated N/S, not angled according to the line direction).

WSP reserves the right to recalculate all data in the event that official pylon layout is received from the client, this exercise is completely theoretical, having a pylon placed differently from the automation will potentially change these results significantly.

Table 7-2 – Terrestrial habitat offset targets

MBSP category and Vegetation Communities verified infield	Estimated extent of loss based on current design (ha)	Offset Target
Phefumula Grid		
CBA Irreplaceable	**0.25**	**7.5**
Eastern Highveld Grassland (EN)	0.05	
Soweto Highveld Grassland (VU)	0.2	
CBA Optimal		**5.29**
Eastern Highveld Grassland	0.13	1.69
Soweto Highveld Grassland	0.3	3.6
Moderately/Heavily Modified	**0.23**	**2.86**
Eastern Highveld Grassland	0.1	1.3
Soweto Highveld Grassland	0.13	1.56
Other Natural Areas		**1.3**
Eastern Highveld Grassland	0.1	1.3
Soweto Highveld Grassland	0	0
Total		**16.95**

8 CANDIDATE OFFSET SITES

Wherever possible, a 'like-for-like' biodiversity offset is preferred so that residual negative impacts on affected biodiversity features are appropriately compensated – ensuring no net loss of that feature on a local or regional scale. In addition, the realities of securing offsets in the long-term depends heavily on securing appropriate areas from a land tenure and/or management perspective. For this reason, the selection of candidate offset sites should focus on nearby habitats within the LSA, where the Project Developer has established relationships with landowners and can capitalise on this for offset planning purposes.

The draft National Biodiversity Offset guideline (DFFE, 2022) requires that the below-listed principles – which are widely recognised in standard offset guidance (e.g. BBOP, 2009) – guide the selection of suitable candidate offset sites; these principles were also applied when identifying potentially suitable areas and required actions for offset:

- *Biodiversity offset sites should be selected for ecological equivalence (the "like-for-like" principle) or, where appropriate, there could be "trading-up" to select an area of relatively high or more urgent conservation priority.*
- *Selection should be guided as far as possible by existing biodiversity priority areas in the landscape (for example, the CBA and ESA network, Freshwater Ecosystem Priority Areas, and focus areas for protected area expansion) and/or areas identified as strategic from an ecological infrastructure perspective (such as Strategic Water Source Areas).*
- *Biodiversity offsets should strive to secure the best examples of the features which have been impacted and to improve connectivity in the landscape between protected and priority areas for biodiversity.*
- *The final selection can be influenced by the reasonable consideration of factors other than the biodiversity value of the different candidate sites, such as: ease of the management of the site by a relevant management authority; and threats to conservation due to conflicting land use rights, claims or land use classification*.

For biodiversity offsets in terrestrial ecosystems, rehabilitation and preferably restoration of areas in modified condition (i.e. no longer natural or near-natural) is seen as an integral part of the required management of the offset site. The guidelines state it is optimal for candidate biodiversity offset sites to be in a good ecological condition (natural or near-natural state), to minimise the additional burden of having to rehabilitate or restore an area (DFFE, 2022); however, some level of rehabilitation of natural habitats with a low level of disturbance is normally anticipated.

Wetland offsets, on the other hand, are often focussed in systems that are moderately modified, where the greatest potential for functional gain can be feasibly achieved via implementation of a wetland rehabilitation plan.

Candidate offset sites and required biodiversity outcomes for wetland and terrestrial habitat are therefore proposed to include:

- Unaffected wetland habitat within the study area:
    - The presence of extensive areas of modified wetland habitat within the LSA, representing each of the HGM units that will be lost, presents an opportunity for implementation of a

wetland rehabilitation programme within the LSA to compensate wetland loss, through securing functional gains via rehabilitation.

  - In targeted wetlands, the objective will be to increase the PES score/category through improvement of wetland health as a result of rehabilitation activities, thereby securing functional gains.
  - Both the ecosystem conservation target and functional ha-eq target will be easily achievable within the LSA.
  - It is envisaged that any necessary wetland offset will be secured via the necessary landowner agreement for the Water Use License that will be required for the implementation of rehabilitation structures/works in wetlands and watercourses. The wetland offset will therefore be done via the WULA process (separate to the EA process).

- Unaffected terrestrial habitat within the study area:
  - Grassland: areas of natural habitat (i.e. Disturbed Grassland, Dry Mixed Grassland, Moist Grassland and Rocky Grassland) within the LSA; particularly those areas situated within CBA1/CBA2 areas, and adjacent to areas of loss; since landowners of areas where construction will take place are already engaged. The final areas and required extent of offset will be confirmed once the selected Alternative is finalised, final residual impacts quantified, and agreements with landowners secured.
  - Stewardship agreements with landowners and local communities – support conservation and enhancement of dry mixed, disturbed and rocky grasslands, and linked fauna species, through management and protection of high ecological importance natural grasslands in the LSA. Conservation servitudes may be utilised to give effect to landowner agreements.
  - Areas where land use consists primarily of livestock grazing of open veld, if incorporated into protection-based offset areas, can potentially provide biodiversity support and demonstrate improved ecological integrity in the long-term, if targeted by suitable management plans e.g. grazing management plans, fire management.

8.1 OFFSITE ACTIONS FOR PRIORITY BIRD SPECIES

Since area-based offsets for residual impacts on affected bird species are not feasible, several offsite actions have been proposed in an effort to achieve no net loss of these species. These include:

- Partnering with the local Rehabilitation Centre to rehabilitate injured birds.
- Donating 5000 Bird diverters to EWT to target high-risk powerlines every 10 years of the project.
- Support of ongoing bird research programmes, particularly for threatened and endemic species, in partnership with universities, and conservation NGOs (e.g. BLSA, EWT).
- Support of improved management of current or potential protected areas that are important sites for the species of concern present within the LSA.
- Support of existing conservation programmes/sites, such as Middelpunt Wetland Trust Initiative, Rietvlei Private Nature Reserve, African Crane Conservation and Threatened grasslands Species Programme.

It is noted that the finalised agreed offsite actions will be included in the Project BAP subject to determination of the final Project layout.

8.2 CONCEPTUAL MANAGEMENT MEASURES AND PROGRAMME

The conceptual management measures that would need to be employed as part of the biodiversity offset, and programme for implementation, for which the Project developer would be responsible, are summarised in Table 8-1.

Table 8-1 – Conceptual offset management measures and programme for implementation

Management actions	Pre-construction	Construction	Operation
Agree extent and location of offset sites with authorities			
Secure landowner agreements, including legal processes to register conservation servitudes			
Legal mechanism(s), in terms of which the biodiversity offset site would be secured			
Draft Biodiversity Offset Management Plan			
Public Participation			
Final Biodiversity Offset Management Plan			
Offset management activities, including offsite actions for priority bird species			
Biodiversity monitoring (fauna, operation phase avifauna monitoring) in operational area, and of offset sites			
Adaptive management			

9 RECOMMENDED CONDITIONS FOR ENVIRONMENTAL AUTHORISATION

The below-listed conditions are proposed for inclusion in the environmental authorisation, should the Project be authorised, based on the guidance provided in the draft National Biodiversity Offset Guideline:

- The Environmental Authorisation (EA) holder must select a biodiversity offset site(s) from the identified candidate portfolio that is sufficient to meet the targets for offset, to be confirmed based on the footprint of the final design (to be determined post EA).
- Only in situations that the proposed offset sites within the LSA are not feasible can the EA holder select a biodiversity offset site that is not identified in the Biodiversity Offset Report but still meets the requirements for a biodiversity offset under the circumstances – in this situation, the guidance of the relevant conservation planning authority, i.e. MPTA, DFFE will be sought.
- A request for the declaration of the chosen biodiversity offset site as a protected area should be submitted to the Minister or an MEC. Other means of securing the biodiversity offset site (such as the registration of a conservation servitude) may be pursued if the Minister or MEC refuses to declare a protected area under the circumstances.
- A Biodiversity Offset Management Plan must be prepared for the biodiversity offset site, and incorporated into the EMPr or a Biodiversity Offset Implementation Agreement.
- A Biodiversity Action Plan (BAP) should be prepared for the Project, subsequent to the finalised layout, in consultation with the relevant authorities and conservation organisations.
- A Water Use License must be obtained for road crossings in wetlands, and the need for an offset investigated as part of the Water Use License Application (WULA) process.

10 REFERENCES

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Appendix A

FLORA SPECIES OF CONCERN

Table A1-1 List of flora species listed as nationally and provincially threatened or considered of conservation concern recorded and potentially occurring in the study area.

Family	Scientific Name[#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Aizoaceae	*Khadia carolinensis*	Vulnerable	Vulnerable	-	Range-restricted species, occurring in Highveld grasslands between 1700m. AOO is estimated at 28.34 km2 (SANBI, 2020). Favours on well-drained sandy loam soils amongst rock outcrops, or along the edges of sandstone sheets (Lötter *et al*., 2007a)	Probable – suitable habitat present.
Apocynaceae	*Aspidoglossum xanthosphaerum*	Vulnerable	Vulnerable	-	Favours marshy habitats in montane grasslands around 1800 m. Only known from four locations, within an EOO of < 500 km2 (Nickolas & Victor, 2006), and an AOO estimated at 15.90 km2 (SANBI, 2020). Recorded at Breyten to the west of the town of Ermelo.	Possible - suitable habitat present.
Apocynaceae	*Miraglossum davyi*	Vulnerable	Vulnerable	-	Found on sloping grasslands in heavy black loam soils at high altitudes. Known from only five locations, with an EOO of <15 000km2 (Lötter et al., 2005) and a AOO estimated at 10.78 km2 (SANBI, 2020).	Possible - suitable habitat present.
Apocynaceae	*Pachycarpus suaveolens*	Vulnerable	Vulnerable	-	Favours short, annually burnt grassland between 1400-2000 m. Known from eight locations with an EOO of 19 900 km2 (Lötter *et al*., 2007b).	Probable – suitable habitat present.
Hyacinthaceae	*Eucomis autumnalis*	Least Concern	Declining	Protected	Favours damp open places (Williams, *et al.,* 2016b).	Probable – suitable present.

Family	Scientific Name#	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
Orchidaceae	*Eulophia cooperi*	Least Concern	Rare	Protected	Widespread species. Found on rocky quartzite ridges between 1000 and 1800 m.	Probable – suitable habitat present.
Asphodelaceae	*Kniphofia ensifolia* subsp. *ensifolia*	Least Concern	Near Threatened	Protected	Generally occurs on heavy clay soils, along streams in grassland habitats.	Recorded (S26 19.732 E29 46.738)
-	Sensitive species 1252	Vulnerable	Vulnerable	Protected	Moist bushveld habitats, including wooded mountain kloofs. AOO estimated at 73.01 km^2 (SANBI, 2020).	Unlikely/ Possible – limited suitable habitat present.
-	Sensitive species 41	Vulnerable	Vulnerable	Protected	Widespread but rare species, with a EEO of <19 940 km^2 and a AOO of <2000 km^2. Favours high altitude wetlands that remain damp throughout the year.	Probable – suitable habitat present.
-	Sensitive species 691	Vulnerable	Near Threatened	-	EOO is between 455 and 11 158 km^2, and thought to occur at less than 10 locations, with an AOO estimated at 3.06 km^2 (SANBI, 2020). Prefers moist areas in undulating grassland.	Probable – suitable habitat present.
-	Sensitive species 851	Vulnerable	-	-	Uncertainty surrounding distribution due to taxonomic confusion. EOO is estimated at 6244 km^2, but it could be as large as 22 664 km^2. Known from only 10 locations. Occurs in shallow wetlands and marshes in high altitude montane	Probable – suitable habitat present.

Family	Scientific Name[#]	National Red List Status	Mpumalanga Red List Status	Mpumalanga Protected Status	Habitat Preferences	Probability of Occurrence
					grassland. Population known from the close-by Bethal area.	
-	Sensitive species 1200	Endangered	Endangered	-	The range of this species is between Breyton, Lothair, Middelburg and Stoffberg. Its EOO has reduced by more than 50% due to agriculture. Habitat preferences are poorly understood, but thought to favour edges of pans.	Unlikely – limited suitable habitat present.
[#]The names of specific taxa that are regarded as being susceptible to overexploitation have been redacted and are not presented in this report. These species are referred to by their assigned 'sensitive species number', as per the species assessment guidelines (SANBI, 2020).						
Source: List based on data from MPTA, BODATSA and Environmental Screening Report Output.						

Appendix B

AFFECTED TERRESTRIAL HABITATS

Table B-1 – Terrestrial habitat

Subcategory	Vegetation Type	Name	TYPE	FREQUENCY	Area_ha
CBA Irreplaceable	Eastern Highveld Grassland	Mixed Dry Grassland		6	2.44981050629
CBA Irreplaceable	Eastern Highveld Grassland	Moist Grassland		2	0.42084305667
CBA Irreplaceable	Eastern Highveld Grassland	Old Lands		1	0.04858587648
CBA Irreplaceable	Soweto Highveld Grassland	Moist Grassland		1	0.00005926216
CBA Irreplaceable	Soweto Highveld Grassland	Mixed Dry Grassland		10	10.55121092610
CBA Irreplaceable	Soweto Highveld Grassland	Mixed Dry Grassland	Patch, no roads	5	16.74545856250
CBA Irreplaceable	Soweto Highveld Grassland	Moist Grassland		3	0.48254652923
CBA Irreplaceable	Soweto Highveld Grassland	Moist Grassland	Patch, no roads	2	0.07396950775
CBA Irreplaceable	Soweto Highveld Grassland	Old Lands		2	0.25453747715
CBA Irreplaceable	Soweto Highveld Grassland	Old Lands	Patch, no roads	1	0.10845144885
CBA Optimal	Eastern Highveld Grassland	Mixed Dry Grassland		16	4.31786529646
CBA Optimal	Eastern Highveld Grassland	Moist Grassland		5	1.30044515995
CBA Optimal	Eastern Highveld Grassland	Old Lands		2	0.23327232841
CBA Optimal	Soweto Highveld Grassland	Mixed Dry Grassland		1	0.00006831112
CBA Optimal	Soweto Highveld Grassland	Mixed Dry Grassland		11	22.65474446170
CBA Optimal	Soweto Highveld Grassland	Mixed Dry Grassland	Patch, no roads	5	10.50784446710
CBA Optimal	Soweto Highveld Grassland	Moist Grassland		4	0.19960914968
CBA Optimal	Soweto Highveld Grassland	Moist Grassland	Patch, no roads	2	0.42283004712

Subcategory	Vegetation Type	Name	TYPE	FREQUENCY	Area_ha
CBA Optimal	Soweto Highveld Grassland	Old Lands		2	0.06726374726
CBA Optimal	Soweto Highveld Grassland	Old Lands	Patch, no roads	2	1.60022799595
CBA Optimal	Soweto Highveld Grassland	Rocky Shrubland		3	7.04453980884
ESA Landscape corridor	Soweto Highveld Grassland	Mixed Dry Grassland	Patch, no roads	1	0.02390034789
ESA Local corridor	Soweto Highveld Grassland	Mixed Dry Grassland		2	0.01807425308
ESA Local corridor	Soweto Highveld Grassland	Moist Grassland		1	0.11628447240
Heavily modified	Eastern Highveld Grassland	Mixed Dry Grassland		28	3.56713072088
Heavily modified	Eastern Highveld Grassland	Moist Grassland		4	0.02926150241
Heavily modified	Eastern Highveld Grassland	Old Lands		5	0.31435535754
Heavily modified	Soweto Highveld Grassland	Mixed Dry Grassland		36	6.44890842727
Heavily modified	Soweto Highveld Grassland	Mixed Dry Grassland	Patch, no roads	2	0.01037808697
Heavily modified	Soweto Highveld Grassland	Moist Grassland		2	0.00437215186
Heavily modified	Soweto Highveld Grassland	Old Lands		8	5.69425192685
Moderately modified- Old lands	Eastern Highveld Grassland	Mixed Dry Grassland		29	2.55145850164
Moderately modified- Old lands	Eastern Highveld Grassland	Moist Grassland		8	0.72729493315
Moderately modified- Old lands	Eastern Highveld Grassland	Old Lands		8	3.53823865932
Moderately modified- Old lands	Soweto Highveld Grassland	Mixed Dry Grassland		40	7.50962453782
Moderately modified- Old lands	Soweto Highveld Grassland	Mixed Dry Grassland	Patch, no roads	5	0.06933348316
Moderately modified- Old lands	Soweto Highveld Grassland	Moist Grassland		2	0.01753308688

Subcategory	Vegetation Type	Name	TYPE	FREQUENCY	Area_ha
Moderately modified- Old lands	Soweto Highveld Grassland	Old Lands		7	4.30905147086
Moderately modified- Old lands	Soweto Highveld Grassland	Old Lands	Patch, no roads	2	0.00168876592
Other Natural Areas	Eastern Highveld Grassland	Mixed Dry Grassland		11	2.51135696717
Other Natural Areas	Eastern Highveld Grassland	Mixed Dry Grassland	Patch, no roads	2	0.13677767147
Other Natural Areas	Eastern Highveld Grassland	Moist Grassland		5	0.58888226333
Other Natural Areas	Eastern Highveld Grassland	Old Lands		1	0.01143667682
Other Natural Areas	Eastern Highveld Grassland	Rocky Shrubland		1	1.26167227067
Other Natural Areas	Soweto Highveld Grassland	Mixed Dry Grassland		1	0.03727567203
Other Natural Areas	Soweto Highveld Grassland	Mixed Dry Grassland		16	11.92907725010
Other Natural Areas	Soweto Highveld Grassland	Mixed Dry Grassland	Patch, no roads	5	7.42798979575
Other Natural Areas	Soweto Highveld Grassland	Moist Grassland		4	0.51277587946
Other Natural Areas	Soweto Highveld Grassland	Moist Grassland	Patch, no roads	1	0.57268212207
Other Natural Areas	Soweto Highveld Grassland	Old Lands		4	0.35246681290

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