ECOLOGICAL, RED DATA & BIODIVERSITY REPORT

FOR THE

CONSTRUCTION OF A DAM ON THE FARM KLEINE POS 420 MR

WITHIN BLOUBERG LOCAL MUNICIPALITY
CAPRICORN DISTRICT

LIMPOPO PROVINCE

Project Reference: 12/1/9/2-C8S
NEAS Reference LIM/EIA/0001755/2023

TUA CONSERVA
ENVIRONMENTAL & CONSERVATION SERVICES c.c

SEPTEMBER 2023

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ACRONYMS

DFFE:	Department of Forestry, Fisheries and Environment
DM:	District Municipality
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment
EMP:	Environmental Management Plan
NFEPA	National Freshwater Ecosystem Protected Areas
IBA	Important Bird and Biodiversity Area
LEDET:	Limpopo Department of Economic Development, Environmental and Tourism
LEMA	Limpopo Environmental Management Act
LIHRA:	Limpopo Heritage Resource Agency
NEMA:	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NPAES	National Protected Areas Expansion Strategy (for South Africa)
PA	Protected Areas
PAA	Protected Agriculture Areas
SCC	Species of conservation concern
SANBI	South African National Biodiversity Institute
SAHRA	South African Heritage Resources Act
WUL:	Water Use License

1. ASSIGNMENT

Mr. I. Enslin (the applicant and owner) strategic plan is conservation farming by practicing rotational farming practices. Loadshedding is hampering the irrigation program. To negate this, he intends to construct a dam to serve as reservoir into which he can pump water and use it to irrigate by gravity. This will take place on the farm Kleine Pos 420 MR.

Tua Conserva Environmental & Conservation Services cc undertook the Ecological Assessment, Red Data and Biodiversity surveys on the farm to determine the impact of the removal of vegetation to the ecological functioning and subsequent biodiversity status. The surveys were done in early summer (mid-winter, June-July 2023). Survey points that reflect the natural vegetation was identified and surveyed. The surveys thus concentrated on the proposed footprint.

The Swartwater area was settled on in 1906 when farming commenced, mainly cattle and crops for own use and trading for commodities (personal comments from Mr. K. Janse van Vuuren, resident farmer, September 2021). Early explorers[1] provide an insight of the natural environment and conditions. Eugene Marais[2] a prominent South African scientist provides an insight of the Waterberg-and Swartwater area (circa 1898-1930's).

More resent interpretation was done using monochrome aerial photographs dating back to 1956. The area was settled on in 1906 for farming purposes and provides a specific reference of the spatial landscape and the anthropological change. Later dated monochrome aerial photographs provides the change in landscape. More visual insight in recent changes is made possible by Google Earth.

Using the above historical sequence information, the project areas was visited for surveys and to compare the information from the Screening tool. The present biophysical information was assessed in the present setting to interpret the context of information gathered to provide an indication of the state of environment and conservation value.

1.1 Information Sources

The following information sources were obtained:

1. Relevant topographical maps, aerial photographs and information (own-and environmental databases) related to the ecological components in the study area.
2. Information from Screening Tool.
3. Requirements regards the fauna and flora as required by SANBI guidelines;
4. Fauna and Flora species lists (including red data lists) from the South African National Biodiversity Institute (SANBI) and own databases.
5. Confirming Fauna and Flora species historical presence and anthropological influences by personal interviews.
6. Design Report by Engineer.

[1] F. C. Selous: Hunters Wanderings in Africa, 1881. Captain Sir William Cornwallis Harris: Wild Sports of Southern Africa, 1963; and R. G. Cumming: Hunters Life in South Africa, 1850.
[2] E. N. Marais: Versamelde Werke, 1984.

1.2 Regulations governing this report

1.2.1 National Environmental Management Act, 1998 (Act No. 107 of 1998) - Regulation No. R982

This report was prepared in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) Gazette No. 38282 Government Notice R. 982. Appendix 6 – Specialist reports include a list of requirements to be included in a specialist report:

- A specialist report or a report prepared in terms of these regulations must contain: Details of
  - i. The specialist who prepared the report; and
  - ii. The expertise of that specialist to compile a specialist report, including a curriculum vitae.
- A declaration that the specialist is independent in a form as may be specified by the competent authority.
- An indication of the scope of, and purpose for which, the report was prepared.
- The date and season of the site investigation and the relevance of the season to the outcome of the assessment.
- A description of the methodology adopted in preparing the report or carrying out the specialized process.
- The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure.
- An identification of any areas to be avoided, including buffers.
- A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.
- A description of any assumptions made and any uncertainties or gaps in knowledge.
- A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment.
- any mitigation measures for inclusion in the EMPr.
- any conditions for inclusion in the environmental authorisation.
- any monitoring requirements for inclusion in the EMPr or environmental authorisation
- a reasoned opinion –
  - (i) As to whether the proposed activity or portions thereof should be authorised and
  - (ii) If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr and where applicable, the closure plan.
  - (iii) A description of any consultation process that was undertaken during the course of preparing the specialist report.
- A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and
- Any other information requested by the competent authority.

- This Act also embraces all three fields of environmental concern namely: resource conservation and exploitation; pollution control and waste management; and land-use planning and development. The environmental management principles include the duty of care for wetlands and special attention is given to management and planning procedures.

1.2.2 **National Environmental Management Act, 1998 (Act No. 107 of 1998) - Regulation No. R698**

An Environmental Impact Application in terms of NEMA.

1.2.3 **Conservation of Agricultural Resources Act (Act No. 43 of 1983)**

This Act regulates the utilization and protection of wetlands, soil conservation and all matters relating thereto; control and prevention of veld fires, control of weeds and invader plants, the prevention of water pollution resulting from farming practices and losses in biodiversity.

1.2.4 **National Environmental Management Biodiversity Act (NEMBA: Act 10 of 2004)**

The following aspects of the NEMBA (2004) are important to consider in the compilation of an ecological report. It must include:

- Listing of ecosystems that are threatened or in need of national protection;
- Links to Integrated Environmental Management processes; and
- Must be taken into account in EMF and IDPs; and
- The Minister may make regulations to reduce the threats to listed ecosystems.

1.2.5 **The National Forest Act (Act No 84 of 1998)**

The National Forest Act:

- Promotes the sustainable management and development of forests for the benefit of all;
- Creates the conditions necessary to restructure forestry in State Forests;
- Provide special measures for the protection of certain forests and protected trees;
- Promotes the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes.
- Promotes community forestry.

1.2.6 **Preservation and Development of Agricultural Land Bill. (Gazette No 43723, 18 September 2020)**

To provide for:

- Management of agricultural land.
- Evaluation of agricultural land evaluation and classification.
- Preparation purposes and content of provincial agriculture sector plans.
- Declaration of Protected Agriculture Areas.
- Providing general objectives of agri-ecosystem management, agri-ecosystem authorizations.

1.2.7 **Capricorn Bio-Regional Plan (February 2019**).

- Data related to conservation planning.
- Data on species of conservation concern.
- Biodiversity areas and planning requirements and restrictions.

1.2.8 **Limpopo Environmental Management Act (Act No 3 of 2004)**

The Limpopo Environmental Management Act (2004) deals with the conservation of wild animals, freshwater fish and the conservation and protection of flora in the Limpopo

Province. Animals and plants are both listed in the schedules with different degrees of protection afforded to each.

1.3 TERMS OF REFERENCE

1.3.1 Objectives

1. To assess the project area's environmental attributes and identify the ecological functioning to make objective recommendations on the state of environment on proposed project area footprint. Options include:
    a. Protection of indigenous vegetation for minimizing habitat fragmentation.
    b. Minimize of impacts to the native flora and fauna and their habitats during development and operational phases of the proposed development.
    c. Plan and integrated conservation plan inclusive of rehabilitation and monitoring which will provide future habitat values.
    d. Identify the Site Sensitivity Verification description
    e. Identify the cause-and-effect of the development to the receiving environment and in specific to Biodiversity Priority Areas.
    f. Identify no-go and buffer zones.
2. To produce a clear and agreed species and habitat priorities for conservation actions. This includes the following:
    a. Determine the potential ecological impacts and actions the developments will have on the biodiversity on a species and habitat level.
    b. Conduct a risk analysis of the impacts identified to determine the significance of the impacts on the fauna and flora of the study area.
    c. Identify and protection and enhancement of vegetation/habitats of high conservation importance.
    d. The retention of a substantial amount of native vegetation/habitat of adequate size and configuration to promote the conservation of the existing flora communities.
    e. The retention and/or creation for vegetation links, wildlife corridors and vegetation buffers wherever possible, subject to appropriate carrying capacity for overgrazing and bush fire risk management.
    f. The protection of soil and water quality in the locality and direct surroundings to not threaten native surface drainage and flora of watercourses.
3. To provide management recommendations on the ecological mitigation measures to be implemented by the developer on the remaining natural areas.

1.3.2 Scope

1. Flora survey in vegetation type/plant community(s) on site:
    a. Identify vegetation surveys of project area from aerial photos and reconnaissance site visits
    b. Identify species of conservation concern, protected species, encroacher species and exotic species presence and extend, firstly by desktop-and own data and conduct site visit and survey and compile list of plant species.
    c. Identify communities, survey area to confirm structure and composition and ecosystem delimitation.
    d. Identify species of conservation concern and protected tree species with densities.
    e. Process data and describe the vegetation and habitat it supports for species of

conservation concern.

f. Provide a sensitivity-and conservation value for the footprints and buffers.
g. Veld Condition Assessment. Describe the vegetation condition for game utilization.

2. Fauna Survey
   a. List potential species that occur in the area and habitat in specific by desk top study, SANBI data and own data from previous studies (8) in the direct area within 17 km radius.
   b. Identify the presence and habitat potential of Red Data and protected species.
   c. Interview farmer(s) on presence of specific species of concern, e.g., African Wild dog (Lycaon pictus), Cheetah (Acinonyx jubatus) and Leopard (Panthera pardus), important raptors, vultures and other species under threat.
   d. Assess habitat integrity and functioning for species needs current and after development.
   e. Indicate species mitigation measures and long-term management measures to prevent negative impacts.
3. Identify wetlands
   a. Confirm presence of wetlands/watercourses
   b. Indicate planning and mitigating measures with buffers.
4. Describe biodiversity and its:
   a. Function on area at ecosystem-, species-and genotypes level
   b. Influence of development
   c. Determine conservation importance of project site
5. Identify ecological sensitive areas
   a. Describe sensitive ecological areas
   b. Indicate planning and mitigating measures
   c. Provide a Sensitivity Map

1.3.3 Limitations and assumptions

1. Time constraints allowed vegetation surveys to be conducted in mid-winter (July 2023). Long-term surveys are not always possible due to strategic planning of developers. In this case, farming where crop planting is depended on seasonal planning and water availability.
2. The project area and in specific the development footprint represented vegetation on the study area was homogeneous and representative sample areas were surveyed by identifying sites from aerial images and re-aligning on-site during surveys. Ecosystems are linked over distance in the landscape and surveys was only conducted on the project area. Ecosystem identification outside the project boundaries was identified by aerial photos and data from EPA's knowledge of the area since 1975.
3. Encroached species limited visibility and movement which might have resulted where plant species were not observed. Change in vegetation over time was also used using monochrome aerial photographs which provided an indication in vegetation structure change over time.
4. The presence for species of conservation concern (SCC) identified in the Screening Tool and from SANBI data for raptors, vultures and cheetah was placed in context to their spatial range use with discussion of their likelihood of visiting the preferred development footprint taking into account the human influences which place restrictions on their presence.

2. STUDY AREA LOCATION

2.1 Location and description of activity

The farm is in Capricorn District. Footprints is located inland from The Limpopo River in terrestrial landscape. Farm is enclosed by electrified game fences. Spatially the project area is hemmed in by adjoining farms (crop, cattle and game, existing croplands) and a district road on three sides. It is further isolated mainly by surrounding farms with electrified game fences and district-and provincial roads. In depth and spatially it is isolated by the various farming activities on adjoining farms (in depth) and the international border with Botswana.

Type of development

- Dam Site: ±20ha
- Gross storage capacity: 361 500m³
- Wall height: ± 22 m
- Embankment length: (excluding spillway: 314m
- Water surface area at FSL: 5.80 ha
- Outlet works: Single 450mm Dia Class 9 mPVC pipe

Listed activities

Listed activity in terms of the National Environmental Management Act (Act No 107 of 1998):

- Regulation 983, 4 December 2014, Listing Notice 1:
  - Activity 9(i): The development of infrastructure exceeding 1000 meters in length for the bulk transportation of water with an internal diameter of 0,36metres or more and **(ii)** with a peak throughput of 120 liters per second or more.
- Regulation 984, 4 December 2014. Listing Notice 2:
  - Activity no 15: The clearance of an area of 20 hectares or more of indigenous vegetation.
  - Activity 16: The development of dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 meters or higher or where the high-water mark of the dam covers an area of 10 hectares or more.
- Regulation 985, 4 December 2014, Listing Notice 3:
  - Activity 12 (e): Clearance of an area of 300m² or more of indigenous vegetation: (ii) within CBA 1 as per Capricorn Bioregional Plan.

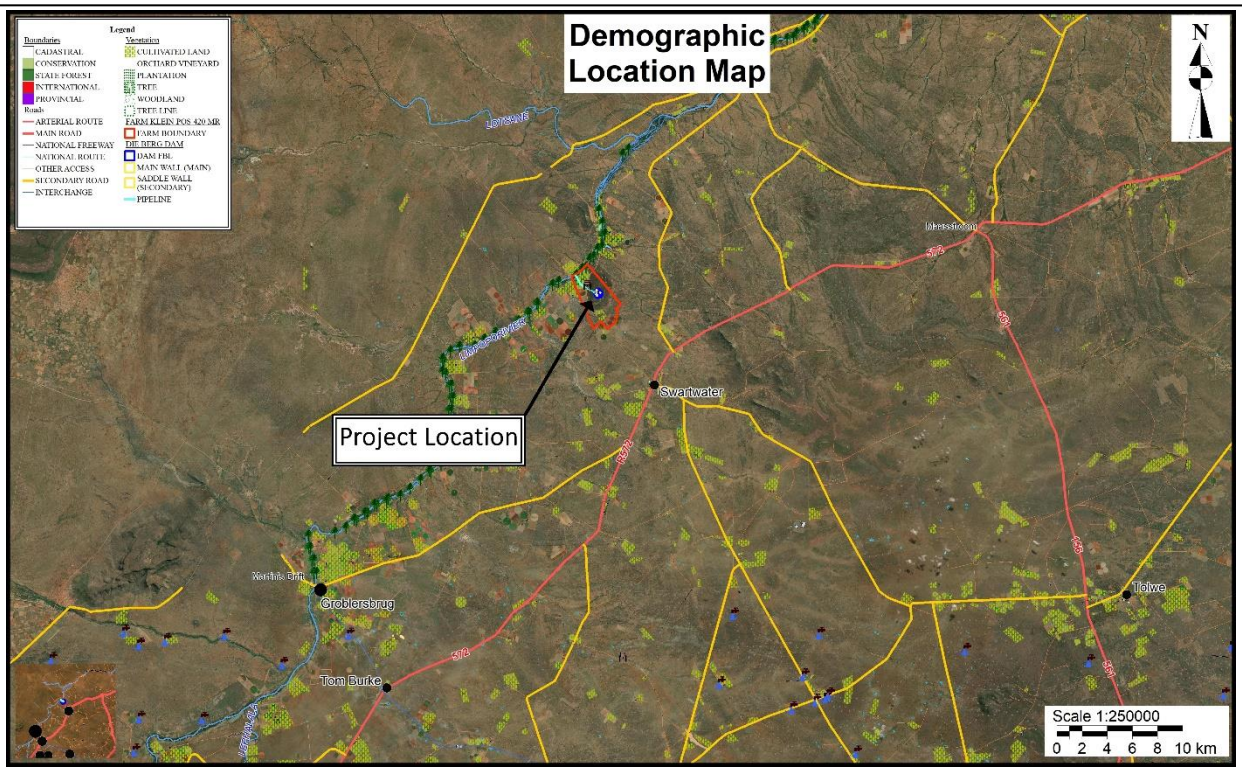

Figure 1: Geographic location

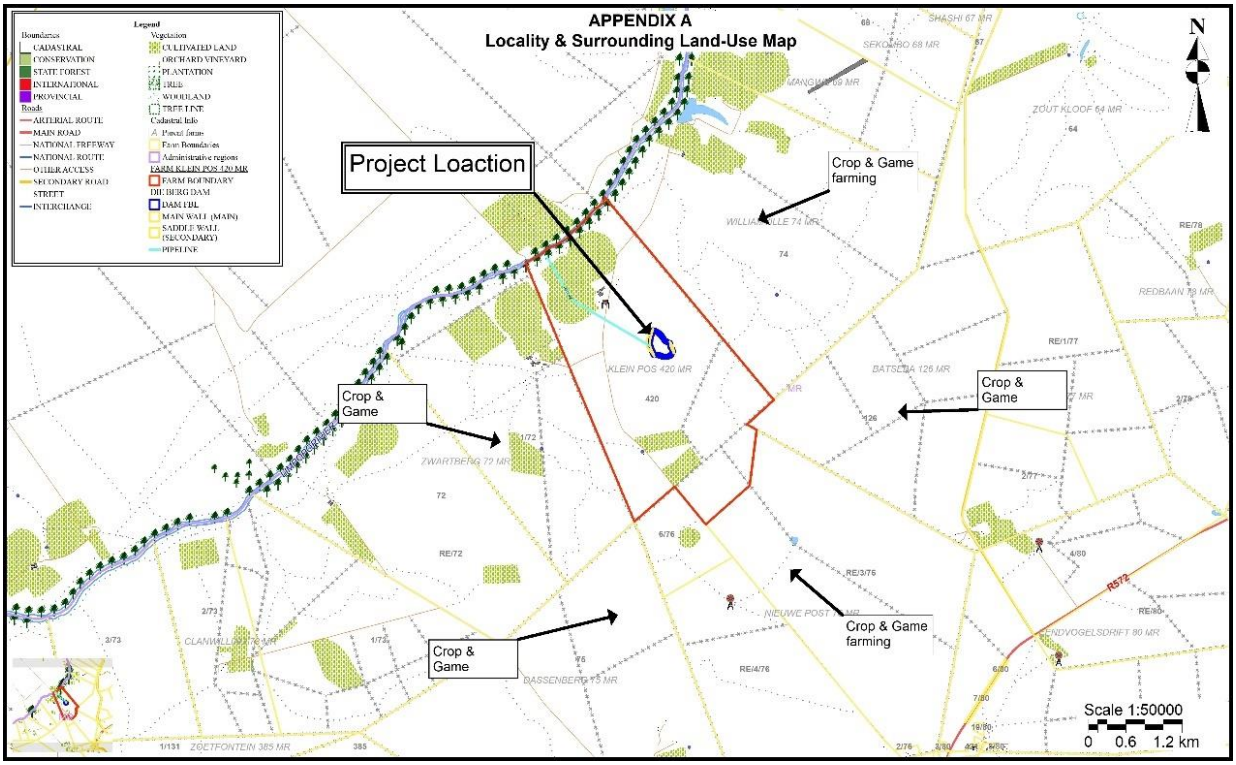

Figure 2: Site location

The centre co-ordinates of the dam are Latitude 22º 47’ 23.4” S and Longitude 28º 09’ 34.04” E.

The dam footprint is ± 20 hectares . Water will be pumped into the dam. Two options for the pipeline deliniation is indicated in Figure 3. The first option (in blue) is a direct route and will result in clearing of vegetation on a footprint of ± 4 meters wide.

The second option (in red) is on existing farm roads and will have a minimal need of vegetation removal. The slope is also more gentle.

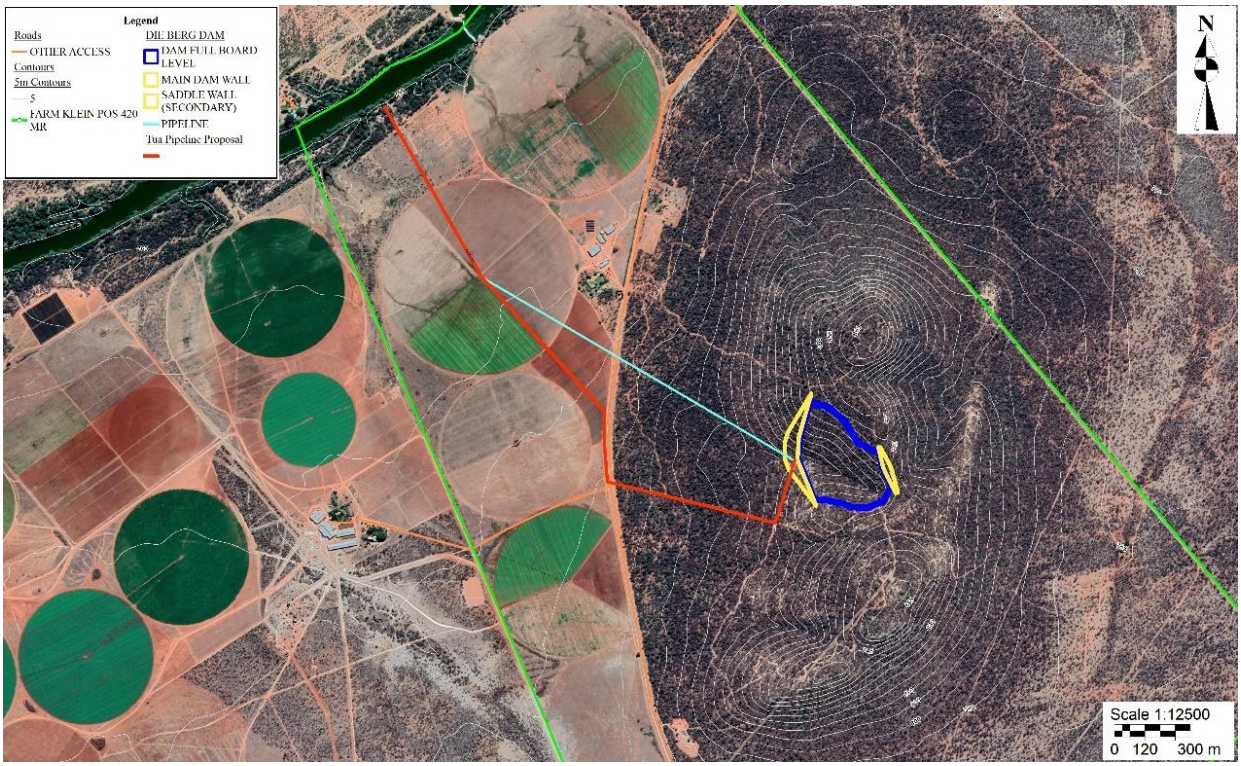

Figure 3: Footprint of dam and two options for pipeline.

2.2 Climate

Climate

The project areas is situated in a semi-arid zone with a mean annual rainfall ranging from 300-500 mm. Rainfall is predominantly during summer.

Evaporation rate within the site ranges from 93.5 mm during the months of June and reaches a maximum of 229.6 mm during the months of January, with annual evaporation of 2020.6 mm/a.

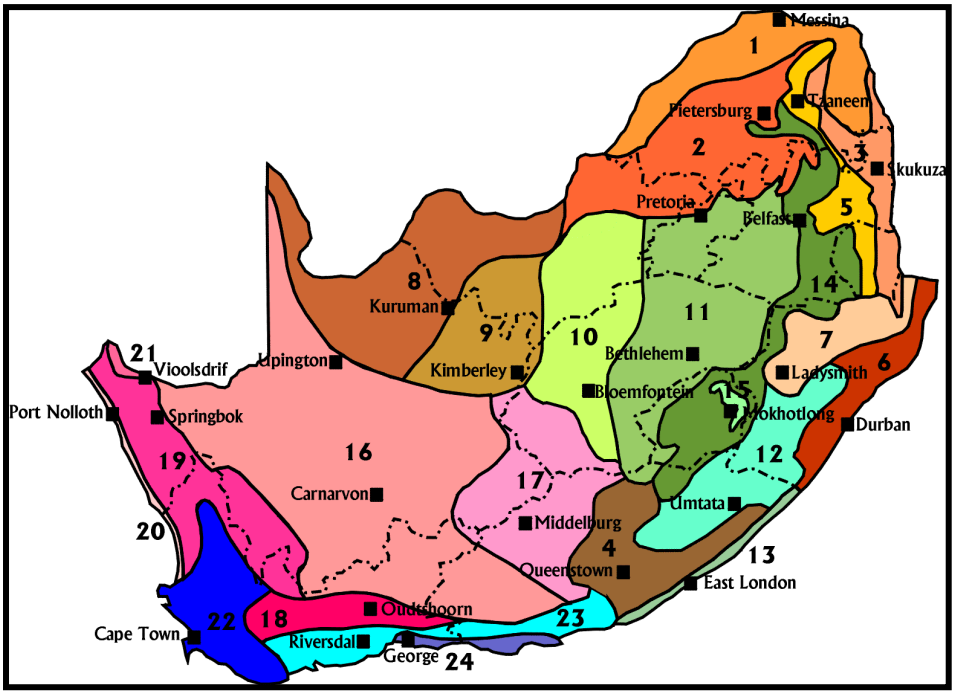

Figure 4: Climatic Regions for South Africa

Table 1: Region climate properties

Region	Climatic properties	Locality	Vegetation	Economic Uses
1. Northern Arid Bushveld	**Lower than average (300 – 500 mm p.a.) and somewhat erratic precipitation for the Savanna type regions, with semi-arid and hot conditions in the Limpopo and Olifants River basins. Rainy season lasts from about Nov to Mar, with the peak falling in Jan. Winds are light to moderate and blow mostly from the north-eastern sector. Almost frost free.**	**Northern and north-western parts of Limpopo Province.**	**Dominated by stunted shrubby growth with mostly *Acacia* species (*Vachellia)* and Baobab *Adansonia digitata*, Shepherd's Tree *Boscia albitrunca*, Grass layer includes *Stipagrostis uniplumis* (Silky Bushmans Grass) , Common Nine-awn grass (*Enneapogon cenchroides)*, Guinea Grass (*Panicum maximum)* and Tassel Three-awn (*Aristida congesta)*.**	**Ecotourism, cattle and game farming, citrus, and vegetables (mainly through irrigation).**

The areas is suitable for various crops produced during the favourable winter climate zone for the markets. Frost occurs infrequent but can be catastrophic. Temperatures mean monthly maximum and minimum average for Lephalale are between 38.2° (December) and 2.1°C (June).

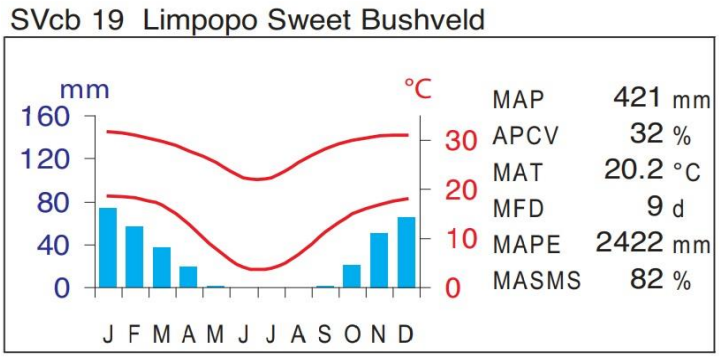

Figure 5: Climatogram

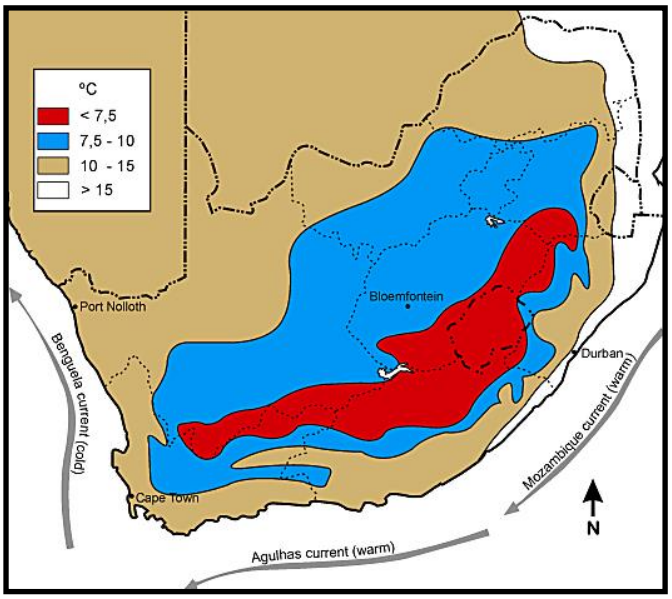

Figure 6: Minimum climate zones for South Africa

2.3 Geology and soil types

Geology and soil types

The area is underlain by Sandstone and Shales of the Karoo Supergroup into which some diabase dykes, quarts and pegmatite veins have intruded. Geology is directly related to soil types and plant communities that may occur in a specific area (Van Rooyen & Theron, 1996).

2.4 Topography and drainage

Contours

The project is situated in the Central Limpopo River Valley (landscape morphology) with associated inland plains with larger and lesser drainage lines. The project area ranges between the highest at 840 meters above sea level and lowest 805 meters above sea level. Drainage direction NW. Slope is 1:16.

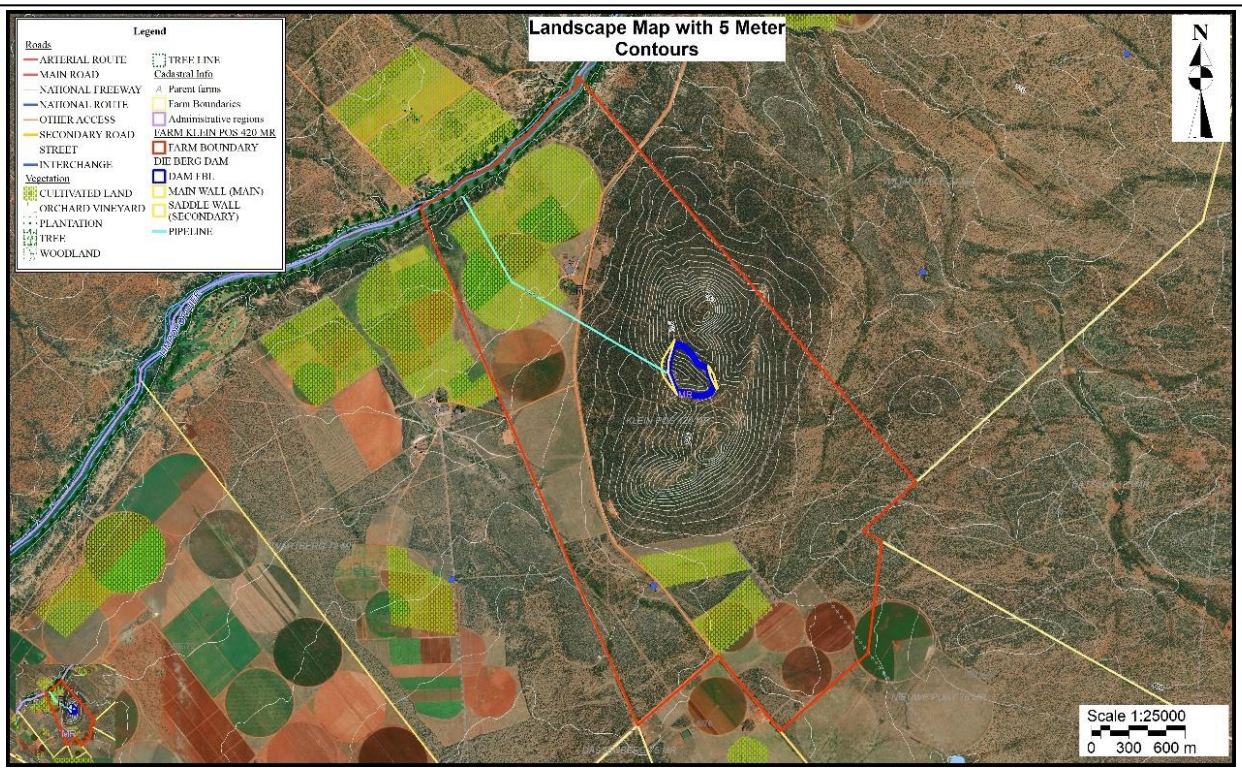

Figure 7: Drainage and contours for area

Drainage

The Eco-region is Limpopo Plain.

The project areas drain through surface flow collecting into ephemeral watercourses outside the preferred footprint area towards the Limpopo River Ecosystem north-west of the site. No prominent drainage line was found on the footprint (Figure 7).

FEPA and Catchment: Limpopo Water Management Area

FEPA and Quaternary Catchment Area: A50J.

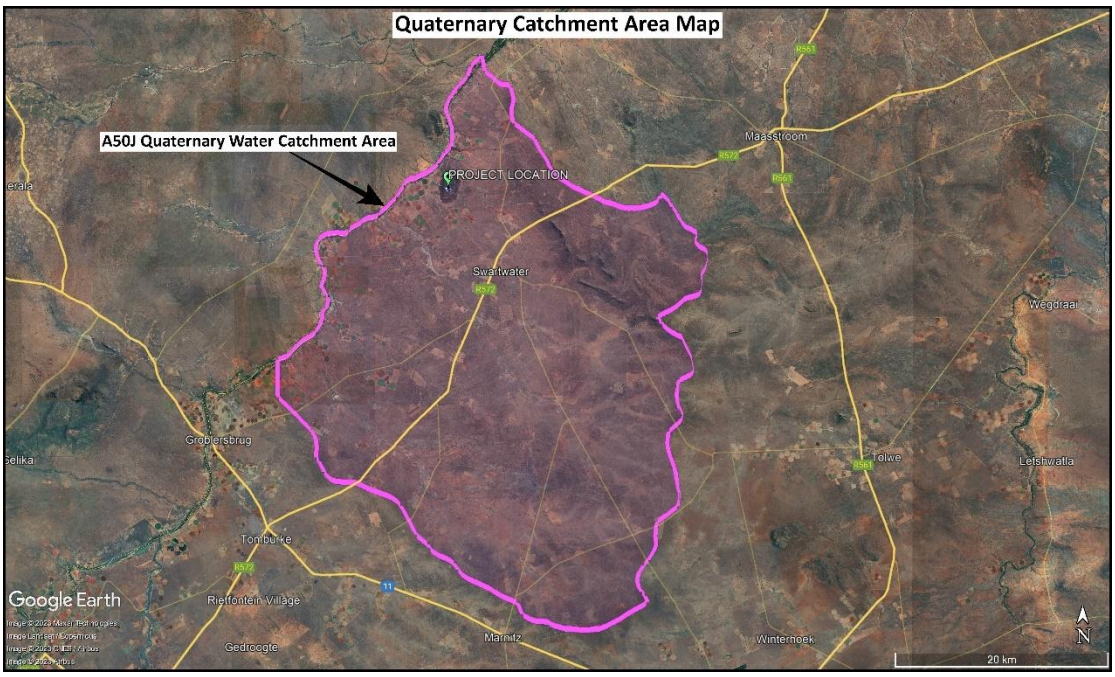

Figure 8: FEPA Area

2.5 Land use and existing infrastructure

The farm has been historically occupied since 1906 and utilised for cattle and croplands. The current land-use is for game only with internal-and fence roads.

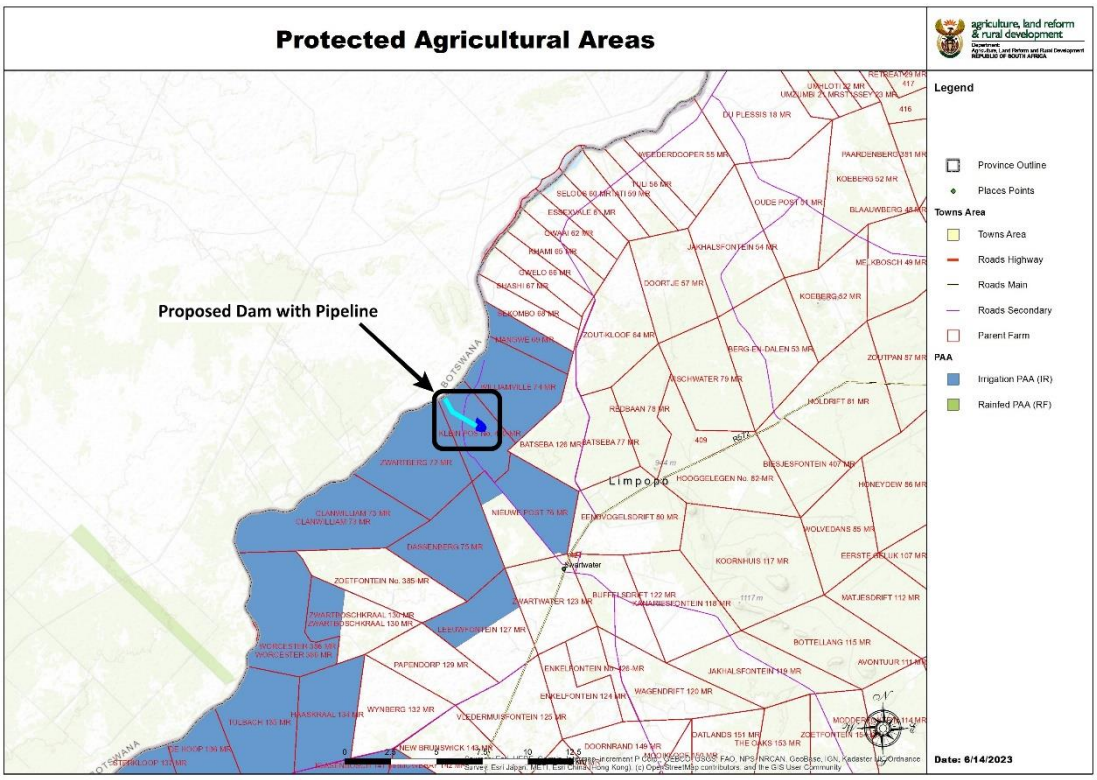

Figure 9: Protected Agriculture Areas

3. METHODS

3.1 Vegetation survey

One method was used during vegetation surveys:

Line transects (two) were walked on the site surveyed to record the plant species present on the north-and south aspects found on the footprint. Rare and threatened plant species and any botanically sensitive sites or habitats were searched for in the vegetation unit.

The vegetation structure was in a moderate condition and typical of with the rocky nature, most species could be identified, bush encroachment is evident.

3.1.1 Data recorded

Plant names used in this report are in accordance with Arnold & De Wet (1993), with the exception of a few newly revised species. The name change of the African Genus *Acacia* to new Genus's (*Vachellia*) was not used as explained by Nico Smit (2008)[3], the rational being that the general public (e.g., farmers know the name *Acacia*), Mucina & Rutherford (2006) also use *Acacia*. A list of all plant species present, including trees, shrubs, grasses, forbs, geophytes and succulents were compiled. All identifiable plant species were listed. Notes were additionally made of any other features that might have an ecological influence as well as potential habitats that might occur.

A species list of the species causing bush encroachment (Regulation 16) was obtained from NFA (Act 84 of 1998).

[3] Field Guide to the Acacias of South Africa. N. Smit. 2008.

3.1.2 Red Data species

A species list of the red data species previously recorded in the vicinity of the proposed development was obtained from the South African Biodiversity Institute (SANBI), South Africa as classified by the IUCN red data list categories.

3.1.3 Protected trees

A species list of the protected tree species was obtained from the Department of Forestry. These trees are listed by the National Forestry Act (No. 84 of 1998) as protected.

3.1.4 Data processing

A classification of vegetation data was done to identify, describe and map vegetation types. The descriptions of the vegetation units include the tree, shrub and herbaceous layers. Conservation priority of each vegetation unit was assessed by evaluating the plant species composition in terms of the present knowledge of the vegetation of the Limpopo Province, as well as the vegetation types and Savanna Biome of South Africa. The following four conservation priority categories were used for vegetation unit description:

- High: Ecologically sensitive and valuable land with high species richness that should be conserved, and no development allowed.
- Medium-High: Ecologically sensitive land that should be conserved but on which low impact development could be considered with the provision of mitigation measures.
- Medium-Low: Ecologically sensitive land that has some conservation value but on which development could be considered with limited impact on the vegetation / ecosystem. It is recommended that certain sections of the vegetation be maintained.
- Low: Ecologically sensitive land that has little conservation value and that could be considered for developed with little to no impact on the vegetation / ecosystem

Scoring	0-6	7-9	10-13	14-19
Sensitivity	Low	Medium-Low	Medium-High	High

The following six criteria are used in conservation importance assessment.

- Conservation status of a regional vegetation unit
- Listed ecosystem (e.g., wetlands, hills and ridges etc.)
- Legislative protection (e.g., threatened ecosystems, SANBI & DEAT 2009)
- Plant species of conservation concern (e.g., red listed, nationally or provincially protected plant species, habitat or potential habitat to plants species of conservation concern, protected plants or protected trees);
- Situated within ecologically functionally important features (e.g., wetlands or riparian areas; important habitat for rare fauna species)
- Conservation importance (e.g., untransformed and un-fragmented natural vegetation, high plant species richness, important habitat for rare fauna species).

3.2 Fauna survey

The faunal survey was conducted as follows:

- A checklist was compiled from consultants' own data (since 1975) of species for the area.
- Above checklist was personally discussed and compared with resident landowner's observations on the farm and surrounding area of Swartwater.
- Potential habitats identification was done during site survey after the identifying the vegetation unit. Fauna survey done during day where species were noted, their spoor, scats/droppings/pellets and sound. The type of indication was recorded in the species list.
- A scoping survey was then conducted by comparing the habitat types identified with the

preferred habitats of species occurring in the area.

3.2.1 Data recorded:

The checklist was updated with the fauna observed on sites or that could possibly occur on the site. The corridors and connectivity of the sites were placed in context to the spatial landscape for species such as cheetah, vultures and birds-of-prey for range use.

3.2.2 Red data species (Species of conservation concern)

A species list of red data species of the fauna classes was obtained from following references:

- Red Data Book of the Mammals of South Africa (Friedman & Daly, 2004).
- Bird distribution data of the Southern African Bird Atlas Project2 (SABAP 2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species, occur in the pentads where the proposed line is located, in this case the Quarter Degree Grid Square. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km.
- Atlas and red data book of the frogs of South Africa, Lesotho and Swaziland (Minter et al. 2004).
- South African Red Data Book – Reptiles and Amphibians. National Scientific Programmes Report no. 151.

3.2.3 Data processing

A comparison of the habitats (vegetation units) occurring on the property was made to the preferred habitats of the faunal species. In addition to species observed on the site, lists of the potential mammal, bird, reptile, amphibian and insect species were compiled and mitigating measures recommended if needed. Refer to 3.1.4 above.

3.3 Wetland delineation and classification

The National Water Act, Act 36 of 1998, defines wetlands as follows:
"Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."
Wetlands were delineated according to the delineation procedure given in "A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas" (DWAF, 2003).
Wetland indicators are divided into different unit indicators which need to be given consideration in the delineation of wetlands[4] The outer edge of the temporary zone requires the delineator to take the following specific indicators into account:

- The terrain unit indicator helps to identify those parts of the landscape where wetlands are more likely to occur.
- The Soil Form Indicator identifies the soil forms, as defined by Macvicar (1991), which are associated with prolonged and frequent saturation.
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation.
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

[4] Classification System for Wetlands and other Aquatic Ecosystems in South Africa.

3.4 Sensitivity assessment

The ecological sensitivity of any piece of land is based on its inherent ecosystem service and overall preservation of biodiversity.

3.4.1 Ecological function

The ecological function relates to the degree of ecological connectivity between systems within a landscape matrix. Therefore, systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive and will be those contributing to ecosystem service or overall preservation of biodiversity.

3.4.2 Conservation importance

Conservation importance relates to species diversity, endemism (unique species or unique processes) and the high occurrence of threatened and protected species or ecosystems protected by legislation. See 3.1.4 above.

3.4.3 Sensitivity scale

- High – sensitive ecosystem with either low inherent resistance or low resilience towards disturbance factors or highly dynamic systems considered being important for the maintenance of ecosystem integrity. Most of these systems represent ecosystems with high connectivity with other important ecological systems or with high species diversity and usually provide suitable habitat for a number of threatened or rare species. These areas should be protected;
- Medium – These are slightly modified systems which occur along gradients of disturbances of low-medium intensity with some degree of connectivity with other ecological systems or ecosystems with intermediate levels of species diversity but may include potential ephemeral habitat for threatened species;
- Low – Degraded and highly disturbed / transformed systems with little ecological function and which are generally very poor in species diversity.

3.5 Impact rating assessment

Methods

The methods and format of the impact tables used in this chapter are in accordance with the requirements of the 2014 Regulations.

- The **nature,** which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **probability (P)** *of occurrence,* which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is define (impact will occur regardless of any prevention measures).
- The **duration (D),** wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0-1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) – assigned a score of 2;
  - medium-term (5-15 years) – assigned a score of 3;
  - long term (>15 years) – assigned a score of 4; or
  - permanent – assigned a score of 5;

- The **extent (E),** wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high);
- The **magnitude (M),** quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 5 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **significance (S),** which shall be determined through a synthesis of the characteristic described above and can be assessed as low, medium, or high;
    - The significance rating is calculated by the following formula:
      S (significance) = (E + D + M) x (P)
- The **status,** which will be described as either positive, negative, or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be *mitigated.*

Impact should be identified for the construction and operational phases of the proposed development. Proposed mitigation measures should be practical and feasible such that they can be realistically implemented by the applicant.

4. ECOLOGICAL DESCRIPTION

4.1 Vegetation Description

4.1.1 Biome: Savannah

Bio-Region: Central Bushveld.

The vegetation of the study area belongs to the broad vegetation group of the Savannah Biome (Low and Rebelo 1996). The Savannah Biome is the largest Biome in Southern Africa, occupying 46% of its area, and over one-third the area of South Africa. It is well developed over the northern-, eastern-and north-western part of the country. A grassy ground layer and a distinct upper layer of woody plants (trees and shrubs) are characteristic of the Savannah Biome. Where this upper layer is near the ground (low growing) the vegetation may be referred to as Shrubveld, where it is tall and dense, as Bushveld, and the intermediate stages are locally known as Bushveld.

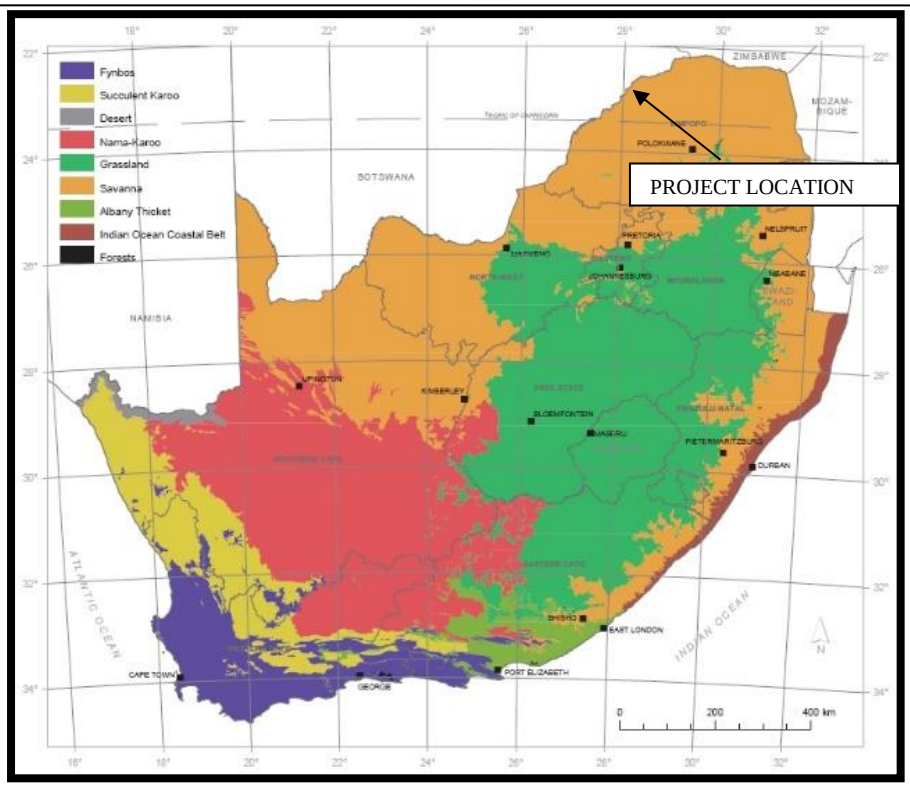

Figure 10: Biome map

The environmental factors delimiting the biome are complex and include (Low and Rebelo 1996); altitude ranges from sea level to 2 000m; rainfall varies from 235 to 1 000 mm per year; frost may occur from 0 to 120 days per year; and almost every major geological and soil type occurs within the biome. Representation of the Savannah Biome in conservation areas in South Africa, Limpopo Province is good in general, mainly due to the presence of the Kruger-, Marekele- and Mapungubwe National Parks as well as the provincial nature reserves e.g., Blouberg-, Langjan-, Musina-, Nwanedi-, Makuya-, Manyeleti-, Letaba Ranch and Hans Merensky Provincial Nature Reserves within the biome in Limpopo province. Most of the area from the Soutpansberg and Blouberg towards the Limpopo River is used for game farming and can thus be considered moderately preserved, provided that sustainable stocking rates and sound environmental practices are maintained, which unfortunately is not always true. The importance of tourism and game hunting in the conservation land use of the area must also not be underestimated especially in the Limpopo province. Geographically the same type of savannah is found in Botswana directly to the north and will have a role in the spatial functioning of connectivity and corridors.

4.1.2 Veldtypes (Vegetation types)

Mucina & Rutherford (2006), indicates that the two Site areas is situated in the Central Bushveld Bioregion with Veldtype Limpopo Sweet Bushveld (SVcb 19)., Figure 11. It has an Ecosystem with an extent of 1, 200, 516 hectares (Limpopo Conservation Plan V2, 2013).

- Ecosystem Status is Least Threatened.

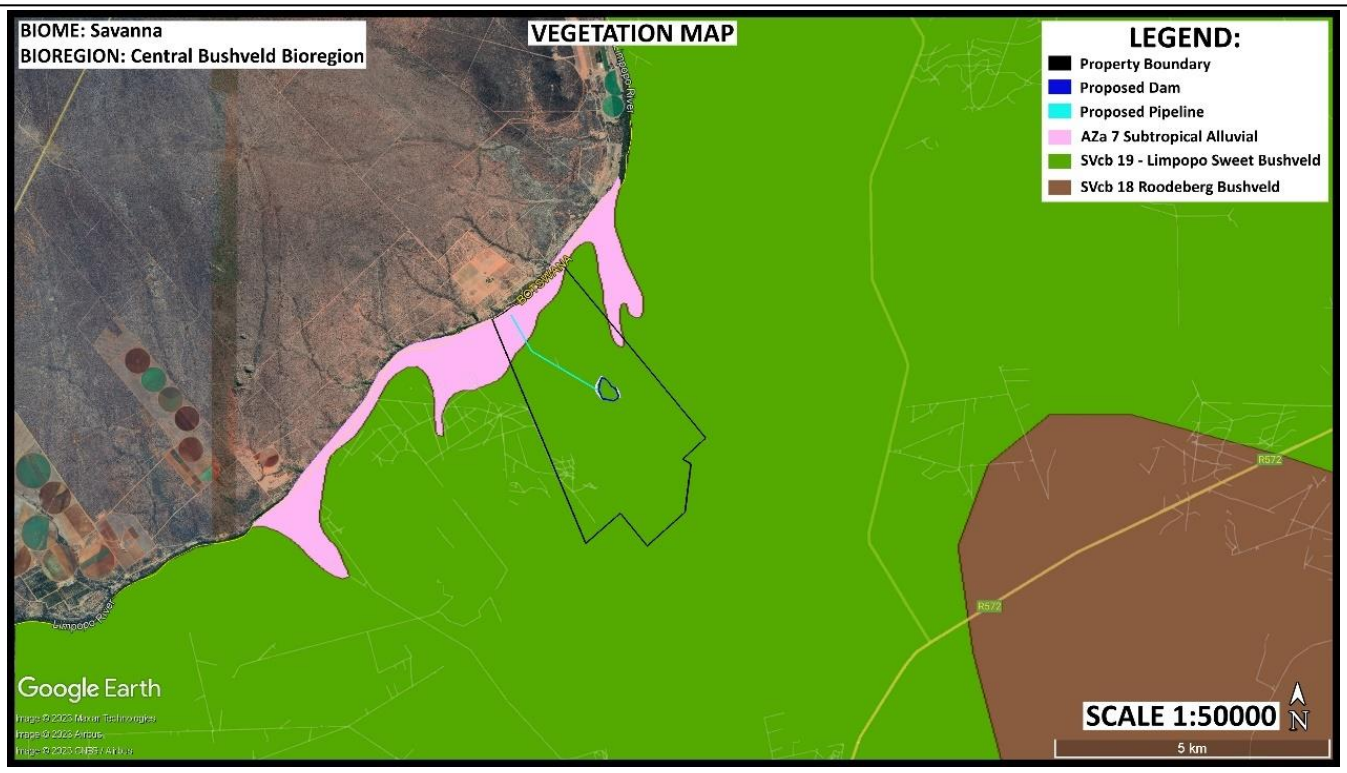

Figure 11: Limpopo Sweet Bushveld Veldtype (SVcb19)

The Veldtype is well conserved in Provincial Nature Reserves, as well as private nature reserves and game farms, but is not considered as not properly protected (<5% of biodiversity target met in protected areas). Effectiveness of conservation of veld in the private conservation areas is however determined by the level of ecologically sound management that is applied. Very high summer temperatures occur, and temperatures range from 1.5°C 0 42.5°C, with an average of 22°C (Figure 3). Therefore, evaporation rates are very high in summer. Frost occurs very seldom and is, for all practical consideration, regarded as absent with no influence on the vegetation, although when it occurs it is catastrophic. Rainfall and especially fire resulting in grazing pressure have always been important ecological driving forces in this vegetation type, and certain changes in the vegetation composition and structure can be expected (and was found) if these driving forces change. These two ecological driving forces has been influenced by human interference actions. The position in the landscape (crest, scarp, mid slope, valley floor) generally strongly influences the qualities of the soil and therefore the characteristics of the vegetation as well as the species composition thereof. The position of the project is on flat plains. Currently the most common economic uses for this veld type are a combination of game- and cattle farming as well as ecotourism with agriculture irrigation activities localized on the inland terrestrial plains spaced along the rivers mentioned. Fire and grazing determine the structure of this vegetation type, and certain changes in the vegetation composition and structure can be expected if these driving forces change. It is threatened by increasing mining exploration and mining applications as well as surface and groundwater in this semi-arid zone.

4.1.3 Vegetation Units (Communities)

One homogenous plant community occurs on the preferred footprint: *Acacia nigrescens, Kirkia acuminata, Sclerocarya birrea* and *Grewia species* rocky bushveld was identified on the footprint area.

A comprehensive species list of forbs, climbers, bulbous plants, succulents, dwarf shrubs, parasites, and epiphytes, was not deemed necessary to be compiled.

Figure 12: Southern aspect of project site

Figure 13: Northern aspect of project site

Table 2: Vegetation Type and Plant community

Vegetation Type: Limpopo Sweet Bushveld No 17 (SVcb19) and Acocks (Arid Sweet Bushveld: A 14) Plant Community: *Acacia nigrescens, Kirkia acuminata, Sclerocarya birrea* and *Grewia species* rocky hillside bushveld			
No	Plant community	Botanical name	Common name
1a	**Woody Structure** Highest trees: 11 m Average height trees: 6.5 m Density trees: 50-65 % Average height shrubs: 3.5 m Density *shrubs: 15- 25 %* **Herbaceous Structure:** • Grasses: Average height: 20 cm Ground cover: 10 % • Forbes: Average height: 0.4 m Ground cover: 5 %	*Acacia burkei*	Black Monkey Thorn
		Acacia caffra	Common hook-thorn
		Acacia erubescens	Blue thorn
		Acacia mellifera	Black Thorn
		Acacia nigrescens	Knob Thorn
		Acacia nilotica	Scented-pod Thorn
		Acacia senegal var. leiorhachis	Slender Three-hook Thorn
		Ficus abutilifolia	Large-leaved rock fig
		Kirkia acuminata	White seringa
		Terminalia prunioides	Lowveld cluster-leaf
		Boscia albitrunca	Shepherd's Tree
		Boscia foetida subs. rehmanniana	Stink shepherd's tree
		Catophractes alexandri	Trumpet thorn
		Combretum apiculatum	Red bushwillow
		Commiphora africana	Hairy corkwood
		Commiphora edulis	Rough-leaved corkwood
		Commiphora neglecta	*Green-stemmed corkwood*
		Commiphora schimperi	*Glossy-leaved corkwood*
		Commiphora glandulosa	*Tall common corkwood*
		Commiphora pyracanthoides	Common corkwood
		Commiphora mollis	Velvet Corkwood
		Dichrostachys cinerea	Sickle Bush
		Grewia bicolour	White Raisin
		Grewia monticola	Silver Raisin
		Grewia tenax	Small-leaved cross-berry
		Grewia flavescens	Sandpaper Raisin
		Sclerocarya birrea subsp. *caffra*	Marula
		Peltophorum africanum	Weeping wattle
		Grasses	
		Aristida congesta subsp. *barbicolis*	Spreading Three-awn

		Aristida adscensionis	Annual Three-awn
		Brachiaria deflexa	False Signal Grass
		Digitaria eriantha	Finger Grass
		Digitaria velutina	Flaccid Finger Grass
		Enneapogon cenchroides	Nine-awned Grass
		Eragrosti rigidior	Broad -leaved Curly Leaf
		Melinis repens	Natal Red Top
		Stipagrostis uniplumis	Silky Bushman Grass
		Panicum maximum	Guinea Grass
		Pogonarthria squarrosa	Herringbone Grass
		Schmidtia pappophoroides	Sand Quick
		Tragus berteronianus	Common Carrot-seed Grass
		Urochloa mosambicensis	Bushveld Signal Grass

4.2 Flora: Species level assessment

South Africa has been recognized as having remarkable plant diversity with high levels of endemism. The major threats to plants in the study area are urban expansion, non-sustainable harvesting, collecting, overgrazing/browsing, mining and agriculture. The objective of this section was to compile a list of plant species for which there is conservation concern. This included threatened, rare, declining, protected and endemic species.

4.2.1 Species of conservation concern

Species of conservation concern (SCC) are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient – Insufficient Information (DDD). It should also be noted that not all species listed as protected are threatened or vice versa. Threatened species are also seen as indicators of the overall health of an ecosystem (Hilton-Taylor, 1996). No individuals of the endemic or biogeographically important plants listed by Mucina & Rutherford for the relevant vegetation types were observed during the survey as a result of the habitat not being suitable, while the degraded state of the vegetation for the remainder of the area makes the probability of findings these species improbable, even though it might have been previously found in the larger area. Habitat degradation is one of the main reasons for plant species becoming extinct in a particular area. A list of SCC plant species previously recorded in the study area in which the proposed development is planned was obtained from the Plants of Southern Africa (POSA) database of SANBI. Figure 14 indicates the classification system used by S**ANBI** for SCC.

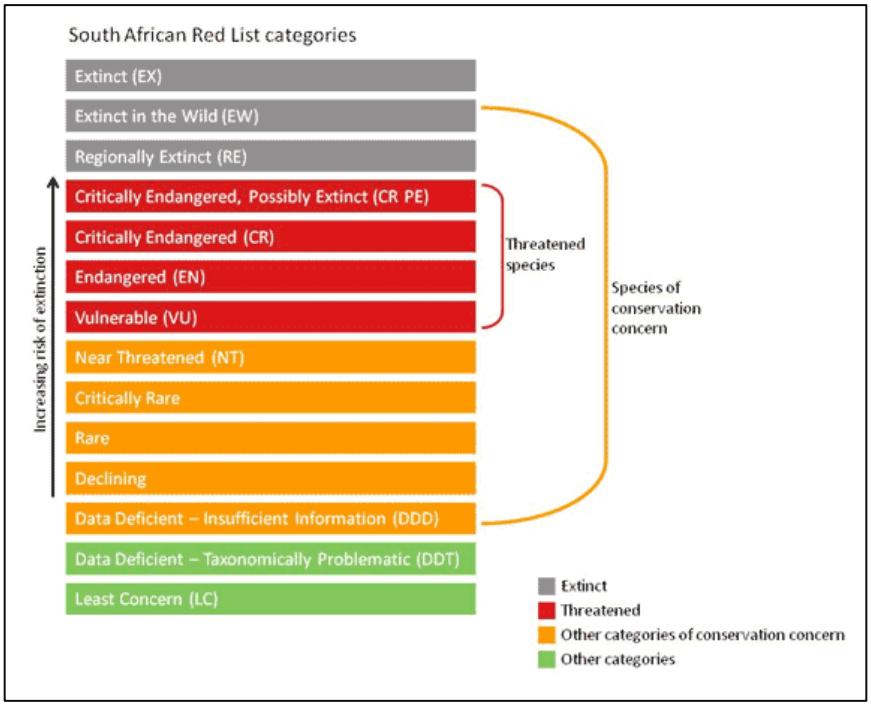

Figure 14: SOUTH AFRICAN red list categories indicating the categories to be used for Species of Conservation Concern

Table 3: Flora list for Species of Conservation Concern

Scientific Name	Common Name	Endemic	Does suitable habitat occur on site?	Probability of the species occurring on site (High/Medium/ Low)
Critically Endangered				
Delosperma macellum	Rooibergpypie	Yes	No	Low
Euphorbia clivicola	-	Yes	No	Low
Gasteria disticha	Great Karoo ox tongue	Yes	No	Low
Orbea elegans	Carrion flower	Yes	No	Low
Endangered				
Brachystelma gerrardii	-	No	No	Low
Ceropegia stentiae	-	Yes	No	Low
Encephalartos eugene-maraisii	Waterberg Cycad	Yes	No	Low
Eulophia coddii	-	Yes	No	Low
Vulnerable				
Brachycorythis conica	Orchid	Yes	No	Low
Corchorus psammophilus	-	Yes	No	Low
Cucumis humifructus	Aardvark cucumber/Aardvark pumpkin	No	No	Low
Cullen holubii	-	Yes	No	Low
Cyphostemma hardyi	-	Yes	No	Low
Elytrophorus globularis	-	No	No	Low
Jamesbrittenia bergae	-	Yes	No	Low
Marsilea farinosa subsp. arrecta	Four-leaf clover/Water clover	No	No	Low
Oryza longistaminata	Longstamen rice	No	No	Low
Prunus africana	African almond	No	No	Low
Sartidia jucunda	-	Yes	No	Low

Least Concern				
Ledebouria atrobrunnea	-	Yes	Yes	Low

No Red Data species were identified.

4.2.2 Protected tree species (DAFF)

Protected trees and plants identified, from literature references, that occurs spatially in the surrounding areas (Table 1) of the proposed development area included Baobab, Camel Thorn, Shepherd's Tree, Leadwood, Apple Leaf and Marula. Baobab, leadwood, Appel Leaf and Camel Thorn was not found on Site.

Table 4: Protected tree species of concern

Species	Common name	National Conservation status	Status in project region	Habitat of species
Adansonia digitata	Baobab	Protected (NFA)	Widespread	Outcrops and slightly undulating terrain in the project area. Occurs in most habitats of the area Not present on Site
Boscia albitrunca	Shepherds' tree	Protected (NFA)	Widespread	Mostly deep sandy areas further away from rivers although isolated individuals might occur in the riparian bushveld due to lack of flood conditions Present on Site
Combretum imberbe	Lead wood	Protected (NFA)	Localised	Riparian bushveld Not present
Philenoptera violacea	Apple-leaf tree	Protected (NFA)	Localised	Riparian bushveld Not present
Sclerocarya birrea	Marula	Protected (NFA)	Widespread	Mostly deep sandy areas further away from river although isolated individuals might occur in the riparian bushveld due to lack of flood conditions. Present, individual trees widely dispersed.
Vachellia erioloba	Camel thorn tree	Protected (NFA)	Widespread	Mostly deep sandy areas further away from any drainage lines. Not present

4.2.3 Protected plants (LEMA)

Plant species (other than trees) are also protected in the Limpopo Province according to the Limpopo Environmental Management Act. According to LEMA, no person may pick, import, export, transport, possess, cultivate or trade in a specimen of a specially protected or protected plant species. The Appendices to the act provide an extensive list of species that are protected, comprising a significant component of the flora expected to occur on site. Permits is required for all these species, if they are expected to be affected by the proposed project. None of the listed protected species in LEMA was found in the footprint areas of the project area.

4.2.4 Invasive alien species

The Alien and Invasive Species Regulations (GNR of 2014) are stipulated as part of the National Environmental Management: Biodiversity Act (10/2004). The regulation listed a total of 559 alien species as invasive and further 560 species are listed as prohibited and may

not be introduced into South Africa. Below is a brief explanation of the four categories of Invasive Alien Plants as per the regulation.

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control program. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management program. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species.

The problem plants that could occur include alien (exotic) invaders and weed species that have been classified as alien weeds or invasive plants by NEMBA regulations. Refer to table below of the list of plants with potential to be present and those positively identified.
What can be expected is that *Eichhornia crassipes* (water hyacinth) an aquatic CARA category 1 and NEMBA category 1b, can be introduced into the dam basin by the pumping process and/or by birds. This process has to be monitored and controlled.

Table 5: List of foreign problem plants

Species	Vernacular (English)	Priority	Present
Achyranthes aspera	Burweed	Low	No
Agave sisalana	Sisal	Medium	No
Argemone ochroleuca subsp. *ochroleuca*	White flowered Mexican poppy	Very low	No
Aristolochia elegans	Dutchman's pipe / calico flower		No
Arundo donax	Giant reed, Spanish reed	Medium	No
Azolla filiculoides	Red water fern	Very low	No
Cardiospermum grandiflorum	Balloon vine, heart pea vine	Medium	No
Catharanthus roseaus	Graveyard flower, Madagascar periwinkle	Very low	No
Cereus jamacaru	Queen of the night	Medium	No
Cinnamomum camphora	Camphor tree	Low	No
Cuscuta campestris	Common dodder	Low	No
Cylindropuntia fulgida var. mamillata	Rosea cactus		No
Datura ferox	Large thorn apple	Low	No
Datura inoxia	Downy thorn apple	Low	No
Datura stramonium	Common thorn apple	Low	No
Flaveria bidentis	Smelter's bush	Low	No

Hedychium spp.	Ginger lily	Low	No
Macfadyena unguiscati	Cat's claw creeper	High	No
Nicotiana glauca	Brazilian tree tobacco, wild tobacco	Low	No
Ricinus communis	Castor oil plant	Low	No
Xanthium spinosum	Spiny cocklebur, burweed	Low	No
Xanthium strumarium	Large cocklebur	Low	No

The level of infestation by foreign problem plants can be described as non-existent to low. The same situation prevails on the remaining areas of the farm. Species (indigenous) that can have an effect due to their ability to encroach is also listed according to the Conservation of Agriculture Resources, 1983 (Act No 43 of 1983). Species found to be prominent are:

- *Acacia erubescens*
- *Acacia tortillis*
- *Acacia mellifera*
- *Dichrostachys cinerea*
- *Grewia bicolour*
- *Grewia flavescens*

4.3 Faunal assessment

4.3.1 Background

Historical perspective

The project area is spatially located in an area which has been settled on and developed since 1906. It was registered in December 1907 and was initially named Graaf Reinett.

Although the existing human activities is clearly visible in surrounding areas, the more recent presence of other human interference such as impacts (direct or in-directly) on vegetation and fauna by fencing and roads in the area was found in-situ on a low scale and can be attributed to the topography. Mostly terrestrial medium-and large mammal species (which has a low presence currently) are already being impacted on by restricting their movement, arboreal species were not influenced as severely. On the other hand, the question of what impact the development will have on the current species, this can partly be described due to the experience and observations on developments in the area. Normally it is found that species will disperse to surrounding areas and adapt to new patterns. What was also evident was the presence of specific species inside the existing project area fenced as well as croplands directly adjoining, this indicates levels of tolerance and adaptability. Species presence and/or signs found indicate that the remaining mammals, birds, and reptiles are surviving. The presence of migrating birds and other non-endemic species found supports the aforementioned. The habitat has been used for more than 120 years (starting prior to 1906 with settlement by trek-farmers after the Anglo-Boer War) with the last 70 years for farming activities initially consisting mainly for cattle and dryland croplands with a shift to extensive irrigation croplands and game production.

Since the mid-1980 the surrounding areas have been placed increasingly under further farming development as seen on aerial photos. The location is terrestrial rocky hill-side landscape. Terrestrial species is driven mostly by the need of water and large ranging areas for food in this arid landscape and in specific the project area. The rangeland for larger mammals and large predators was further restricted by removing natural prey in earlier

farming activities. Predation on cattle also resulted in extermination by farmers using various forms of which DDT (and Temik) was one such lethal substance. This changed in the mid-1970's when game was recognised as a specific financial commodity for hunting and ecotourism. A change in legislation also allowed for ownership of game on farms adequately fenced and issued and exemption permit. Farms were game fenced and electrified. In 2010 a new trend in intensive breeding programs for colour and horn size developed and resulted in fences upgraded with mesh and even more intensely electrified. This resulted in a total barrier blocking of medium and larger mammal movement and having an impact on various species being electrocuted (snakes, pangolins, tortoises etc). Thus, corridors were severed for landbound movement and migration disrupted for large and medium mammal species. Cumulatively the afore mentioned changed the habitat connectivity and migration before the implementation of LEDET's guidelines on Critical Biodiversity Areas and Ecological Support Areas. The timeline of events described above was not fully assessed or taken into consideration for the Biodiversity Priority Areas (BPA) in the CBA delineation and mapping.

Recent perspective

Species of conservation concern mentioned in Screening Tool, from SANBI data and by consultants' own records were used to provide a better understanding of habitat on site and in depth for spatial interpretation. For cheetah the national metapopulation range includes the farm. The in-situ population conservation indication is unrealistic. Results from surveys and personal communication with third and fourth generation farmers which farms on said properties, adjoining properties and in nearby spatial range on-site confirmed that cheetah were not recorded for the last decade and more. A reality map was compiled for the Tomburke/Groblersbridge/Swartwater area indicating aspects that will hamper and restrict the movement of cheetah using the corridors created by the connectivity remaining from the human development. The nature and type of farming in the above-mentioned areas changes from mixed farming (irrigation croplands, livestock, game and ecotourism) along the Limpopo River with livestock and game farming further inland. The probability of movement through those corridors is highly unlikely and is based on the intrinsic adaptability of the species to these restrictive activities in their adapted behaviors for surviving in a changing receiving environment.

Vultures, birds-of-pray, Kori Bustard, Ground Hornbill and Secretary Birds are species with ranging patterns and specific nesting requirements. Vultures and birds-of-pray use large trees (mostly Knobthorn) in areas not subjected to human activities as found with crop farming for nesting. Knobthorn trees has been used for fencing in decades preceding 1950's. Southern Ground-Hornbill occupy territories of about 100–250 km^2 per group, depending on habitat quality and their presence could not be confirmed from farmers in the study area. Secretary birds and Kori Bustards (single and breeding pairs) were identified in the study area on rested croplands. For the Aves species mentioned above the "island biographical" also known as "stepping stones" apply seasonally.

4.3.2 Fauna habitats of the project area

(i) One major fauna habitat was found namely arid rocky bushveld.

4.3.3 **Common fauna occurring on development site**

4.3.3.1 Mammals

Signs were present for various large, medium, and small mammal species including rodents, hare, small omnivores-, and predators with small antelope. The study area borders onto land

uses, e.g., crop-, cattle and game farming as the most prominent on all the adjoining farms for the site.

Active movement of smaller wildlife between properties is active but not predominant, although some of the fences are electrified. The Table below provides a list of animals positively identified as well as species that were confirmed in their occurrence with the farming personnel on the project area, the remainder of the farm and adjoining farms. Where no positive information was obtained the consultants, knowledge based on 44 years' experience of the area as well as checklist on species for (5) provincial reserves in the area was used as control. In Table 6 under column PRESENT the presence or occurrence of species is indicated by:

- Y= positive identification by writer either by a sighting* (which include trap cameras), spoor** or scats***.
- N= no possibility of occurrence, due to management or financial constrains as well as isolation of the area.
- P= strong possibility of occurrence.
- H= historically present.
- New= New distribution

Many of the smaller mammals, e.g., mongooses etc. we're not listed although mentioned where necessary in discussions.

Table 6: List of mammals identified

SCIENTIFIC NAME	COMMON NAME	Site 1 PRESENT
Pappio ursinus	Baboon	Y*
Tragelaphus scriptus	Bushbuck	P
Cencerus caffra	Buffalo	N
Potamochoerus larvatus	Bushpig	Y*
Sylvicapra grimmia	Common Duiker	Y*
Acinonyx jubatis	Cheetah	N
Tragelaphus oryx livingstonii	Eland	H
Loxodonta africana	Elephant	H
Oryx gazella	Gemsbok	H
Camelopardus giraffe	Giraffe	H
Aepyceros melampus	Impala	Y*
Tragelaphus strepsiceros	Kudu	Y*
Panthera pardalus	Leopard	P
Cercopithecus aethiops	Monkey Vervet	Y*
Hippotragus equinus	Roan	H/N
Ceratotherium simum	Rhinoceros White	H/N
Hippotragus niger	Sable	N
Raphicerus campestris	Steenbok	Y
Damaliscus lunatus	Tsessebe	N
Phacochoerus africanus	Warthog	Y*

Kobus ellipsiprymnus	Waterbuck	Y
Connochaetus taurinus	Wildebeest Blue	Y
Equus burchellii	Zebra	N
Manis temminckii	Pangolin	N
Orycteropus afer	Aardvark	N
Mellivora capensis	Badger	P
Canis mesomelas	Black-backed Jackal	Y**
Otocyon megalotis	Bat-eared Fox	P
Lycaon pictus	African Wild dog	N
Crocuta crocuta	Spotted hyena	H/P
Crocuta brunnea	Brown hyena	Y
Felis serval	Serval	N
Felis caracal	Caracal	N
Proteles cristalus	Aardwolf	N
Felis lybica	African Wild Cat	P
Genetta genetta	Small-spotted Genet	P
Genetta tigrina	Large-spotted Genet	P
Mungos mongo	Banded mongoose	Y

4.3.3.2 Avifauna

The habitats found on the project Site are deciduous bushveld savanna of medium height. No nests were seen during surveys in large trees. This can also be ascribed to high human movement and farming activities. The main part of the Site can be described as moderately low suitable habitat for raptors and vultures. While no detailed bird assessment was conducted for the site, notes were made during the various site visits of birds seen. The best nesting sites is along the Limpopo River.

Table 7: Important Birding Area's in Limpopo Province

NUMBER	NAME	SIZE = Ha	COORDINATES SOUTH	COORDINATES EAST	PROTECTION STATUS
SA001	Mapungubwe NP	2500	22º13’	29º19’	Fully
SA002	Kruger Park NP & Adjacent areas	2 142 528	22º23’-26º	30º50’- 32º 02’	Fully
SA003	Soutpansberg	260 000	22º 57’	29º 20’ – 30º 30’	Partially
SA004	Blouberg	30 000	23º 07’	28º 52’ – 29º 03’	Partially
SA005	Wolkberg	65 000	23º 38’	29º 50’ – 30º 15’	Partially
SA006	Pietersburg Nat. Reserve	3 200	23º 56’	29º 30’	Fully
SA007	Waterberg System	375 000	24º 10’ – 24º 25’	27º 30’ – 28º 40’	Partially

SA008	Nylriver & Floodplain	16 000	24º 39'	28º 42'	Partially
SA009	Northern Turf Thornveld	50 000	24º 43' – 24º 56'	27º 10' – 27º 30'	Unprotected

Of the nine IBA's in Limpopo province the nearest is Blouberg System (SA004). The Limpopo River can be considered as important on its own (spatial context). The permanent open water which has been created by the weirs can be considered as important to the birdlife population and in specific species associated with permanent water. These impoundments supply the water needed by birds not being able to survive along the Limpopo River as it is not permanently flowing throughout the winter and early summer.

Species Status quo

Several common bird species were observed during those visits to the project area, such as Helmeted guineafowl (*Numida meleagris),* Lilac breasted Roller (*Coracias caudata),* European bee-eater (*Merops apiaster),* Diederick cuckoo (*Chrysococyx caprius),* Redchested Cuckoo, *(Cuculus solitarius)* Greyheaded bush shrike (*Malaconotus blanchoti),* Wattled Starling (*Creatophora cinerea)* and Klaas's Cuckoo (*Chrysococcyx klaas),* Spotted Sandgrouse *(Pterocles burchelli),* Pale Chanting Goshawk (*Melierax canorus*), Blackbreasted Snake Eagle *(Circaetus gallicus)* and Kori Bustard (*Ardeotis kori*).

The Lilac breasted Roller and Wattled Starlings and Guinee Fowl were observed actively hunting in cropland areas (forming part of their natural foraging range in natural habitat) which implicates presence of insects which in-turn implicates low chemical-and pesticide use. Exotic species (mynah and mallard) found in Limpopo province was not encountered at the Site area.

Habitat description

One habitat is present:

- Arid Rocky Bushveld

The type of habitat found as low hill outcrops with medium and prominent big trees in arid bushveld savannah. The main part of the area can be described as homogeneous terrestrial habitat.

Habitat assessment

The area, in which the project is situated, is not considered as an Important Birding Area (refer to Table 7). With nearby food sources, Limpopo River, Koedoes Rante 9 km (isolated maintain range) to the south-east and Blouberg Mountain vegetation (± 83 km away) also contributes to the habitats and presence of representing species for this arid area (and providing more suitable nesting sites). The savannah is rated as third most important vegetation type for threatened species (Barnes, p11; 2000). Table 8 provides the range use size for species of conservation importance to illustrate the possibility for these species to be present on the Site.

Table 8: Range use by raptors and vultures

Bird Species	Common name	Conservation Status	Range use
Torgos Tracheliotus	Lappetfaced Vulture	Endangered	Less than 1 pair in 500 km^2
Gyps Africanus	White backed Vulture	Critically Endangered	1 Pair in 197,6 km^2

Polemaetus Bellicosus	Martial Eagle	Endangered	1 Pair in 239 km^2
Aquila Rapax	Tawny Eagle	Vulnerable	1 Pair in 416 km^2
Terathopius Ecaudatus	Bateleur	Endangered	1 Pair in 95 km^2
Bucorvus leadbeateri	Ground Hornbill	Vulnerable	1 Pair in 100 km^2

The presence of vultures and raptors mentioned in Table 8 is occasional and irregular and not semi-permanent presence.

Habitat after construction

What can be expected is that the open water will serve as food reservoir in the late winter and early summer when trophic bottlenecks occur. Connectivity between the Limpopo River and terrestrial vegetation will still be able to function for arboreal movement.

The newly created open water aquatic habitat will contribute to the presence and supporting birdlife. The project will contribute to maintaining birding potential of the area. The habitat for Aves species of conservation concern will not be irreversibly.

4.3.3.3 Herpetology fauna

The terrestrial habitat including vegetation cover available for reptiles. A number of common reptile species, can be expected to occur on the footprint, including Puff adders *(Bitis arietans),* Rhombic night adders (*Causus rhombeatus),* Brown house snake (*Lamprophis fuliginosus),* Ground agama (*Agama aculeate),* Leopard tortoise (*Geochelone pardalis),* Flap-neck chameleon *(Chamaeleo dilepis)* and Striped skinks (*Trachylepis striata).* No specific habitat features for species were found.

Species Status Quo

Reptile lists provided are for the species most likely to occur on the study site using alternative habitats as indicators for reptile fauna present on the site. As control the reptile list for the Messina-, Langjan Provincial nature Reserves and Mapungubwe National Park (formerly the Vhembe Provincial Nature Reserve) were used (fine scale data).

Table 9: Herpetofauna checklist

Table 9: Herpetofauna list		
TORTOISES AND TERRAPINS		
NO	SCIENTIFIC NAMES	**COMMON NAMES**
1	*Geochelone pardalis*	Leopard Tortoise: Present. Least Concerned.
2	*Kinixys spekii*	Bell's Hinged Tortoise
LIZARDS		
1	*Afroedura t. transvaalica*	Transvaal Gecko
2	*Hemidactylus mabouia*	Moreau's Tropical House Gecko
3	*Lygodactylus c. capensis*	Cape Dwarf Gecko
4	*L. stevensoni*	Stevenson's Dwarf Gecko
5	*L. bradfieldi*	Bradfield's Dwarf Gecko
6	*Ptenopus g. garrulus*	Barking Gecko

7	*Pachydactylus punctatus*	Speckled Gecko
8	*Pachydactylus tigrinus*	Tiger Gecko
9	*P. c. capensis*	Cape Gecko
10	*P. bibronii*	Bibron's Gecko
11	*Agama atricollis*	Tree Agama
12	*A. armata*	Not available
13	*Chamaeleo d. dilepis*	Flap-necked Chameleon
14	*Scelotus limpopoensis albiventris*	Limpopo Dwarf Burrowing Skink
15	*Mabuya quinquetaeniata margaritifer*	Rainbow Skink
16	*Mabuya capensis*	Cape Skink
17	*Mabuya variegata punctulata*	Speckled Skink
18	*M. varia*	Variable Skink
19	*M.s. striata*	Striped Skink
20	*Lygosoma s. sundavallii*	Sundevall's Writhing Skink
21	*Panaspis wahlbergii*	Wahlberg's Snake-eyed skink
22	*Acontias percivalli occidentalis*	Percival's Legless Skink
23	*Nucras caesicaudata*	Blue-Tailed Sandveld Lizard
24	*Nucras taeniolata holubi*	Ornate Longtailed Lizard
25	*N. intertexta*	Spotted Longtailed Lizard
26	*Heliobolus lugubris*	Bushveld Lizard
28	*Ichnotropis squamulosa*	Common Rough-scaled Lizard
29	*Cordylus tropidosternum jonesi*	Tropical Girdled Lizard
30	*Platysaurus intermedius rhodesians*	Common Flat Lizard
31	*Platysaurus i. Intermedius*	Common Flat Lizard
32	*Gerrhosaurus v. validus*	Giant Plated Lizard
33	*G. flavigularis*	Yellow-throated Plated Lizard
34	*G. nigrolineatus*	Black-striped Plated Lizard
35	*Varanus albigularis*	Rock or white-throated Monitor
36	*V.n. niloticus*	Nile or Water Monitor
37	*Monopeltis s. sphenorhynchus*	Slender Spade-snouted Worm Lizard
SNAKES		
NO	**SCIENTIFIC NAMES**	**COMMON NAMES**
1	*T. s. schlegelii*	Schlegels' Blind Snake
2	*Leptotyphlops longicaudus*	Long-tailed Thread Snake
3	*Python sebae natalensis*	African Rock Python
4	*Lamprophis fuliginosus*	Brown House Snake
5	*Lycophidion c. capense*	Cape Wolf snake
6	*Mehelya capensis*	Cape File Snake
7	*M. nyassae*	Black File Snake
8	*Psammophylax tritaeniatus*	Striped Skaapsteker

9	*Rhamphiophis oxyrhynchus rostratus*	Rufous Beaked Snake
11	*Psammophis s. subtaeniatus*	Stripe-bellied Sand Snake
12	*P. angolensis*	Dwarf Sand Snake
13	*P. jallae*	Jalla's Sand Snake
14	*Aparallactus capensis*	Cape Centipede Eater
15	*Atractaspis bibronii*	Southern or Bibron's Burrowing Asp
16	*Philothamnus s. semivariegatus*	Spotted Bush Snake
17	*Crotaphopeltis hotamboeia*	Herald or Red-lipped Snake
18	*Telescopus s. semiannulatus*	Eastern Tiger Snake
19	*Dispholidus t. typus*	Boomslang
20	*Thelotornis c. capensis*	Bird or Twigg Snake
21	*Dasypeltis scabra*	Commong or Rhombic Egg Eater
22	*Elapsoidea sundevallii longicauda*	Sundevall's Garter Snake
23	*Aspidelaps s. scutatus*	Shield-nose Snake
24	*Naja haje annulifera*	Snouted Cobra
25	*N. mossambica*	Mozambique Spitting Cobra
26	*Dendroaspis polylepsis*	Black Mamba
27	*Causus rhombeatus*	Common Night Adder
28	*Bitis caudalis*	Horned Adder
29	*Bitis a. arietans*	Puff Adder

4.3.3.4 Amphibian's survey

Breeding of African frogs is strongly dependant on rain, especially in the drier parts of the country where surface water only remains for a short period. The species which will occur will be mostly tropical savannah species. The combination of rainfall, temperature and humidity is particularly conducive to frog life. Most frog species in the drier regions of Limpopo province are classified as explosive breeders.

The new open water will create suitable habitat for amphibians.

Species Status Quo

The list below provided are for the species most likely to occur on the study site using alternative habitats as indicators.

Table 10: Amphibian list that can occur on project area

Scientific name	**Common name**	**Conservation Status**
Family: Artholeptidea		
Genus: Bufo	**Toads**	
Bufo fenoulheti	Northern Pygmy Toad	Least Concern
Bufo garmani	Eastern olive Toad	Least Concern
Bufo gutturalis	Guttural Toad	Least Concern
Bufo maculatus	Flat-backed Toad	Least Concern
Bufo poweri	Western Olive Toad	Least Concern

Bufo poweri	Western Olive Toad	Least Concern
Family: Hemisotidea		
Genus: Hemisis		
Hemisis marmoratus	Mottled Shovel-nosed Frog	Least Concern
Family: Hyperoliidae		
Genus: Hyperolius		
Hyporelius marmoratus	Painted Reed Frog	Least Concern
Hyporelius pusillus	Water Lily Frog	Least Concern
Genus: Kassina		
Kassina maculata	Red-legged Kassina	Least Concern
Kassina senegalensis	Bubbling Kassina	Least Concern
Genus: Leptopelis		
Leptopelis mossambicus	Brown-backed Tree Frog	Least Concern
Family: Microhylidea		
Genus: Breviseps		
Breviseps aspersus	Bushveld Rain Frog	Least Concern
Genus: Phrynomantis		
Phyronomantis annectens	Banded Rubber Frog	Least Concern
Family: Petropedetidea		
Genus: Cacosternum		
Cacosternum boettgeri	Boettger's Caco	Least Concern
Genus: Phrynobatrachus		
Phrynobatrachus mababiensis	Dwarf Puddle Frog	Least Concern
Phrynobatrachus natalensis	Snoring Puddle Frog	Least Concern
Family: Ranidae		
Genus: Afrana		
Afrana angolensis	Common River Frog	Least Concern
Genus: Ptychadena		
Ptychadena mossambica	Broad-banded Grass Frog	Least Concern
Ptychadena porosissima	Striped Grass frog	Least Concern
Ptychadena uzungwensis	Udzungwa Grass frog	Least Concern
Genus: Pyxicephalus		
Pyxicephalus adspersus	Giant Bullfrog	Threatened
Pyxicephalus edulis	Edible Bullfrog	Least Concern
Genus: Tomopterna		
Tomopterna cryptonis	Tremelo Sand Frog	Least Concern
Tomopterna delandii	Cape Sand Frog	Least Concern
Tomopterna marmorata	Russet-backed Sand Frog	Least Concern
Family: Ranidae		
Genus: Chiromantis		
Chiromantis xerampelina	Foam Nest Frog	Least Concern

What can be expected is that the aquatic habitat will result in an increase in amphibians. Monitoring could provide interesting sightings.

4.3.4 Fauna Red Data Species

Figure 15 provides the classification of categories of fauna used in Species of Conservation Concern.

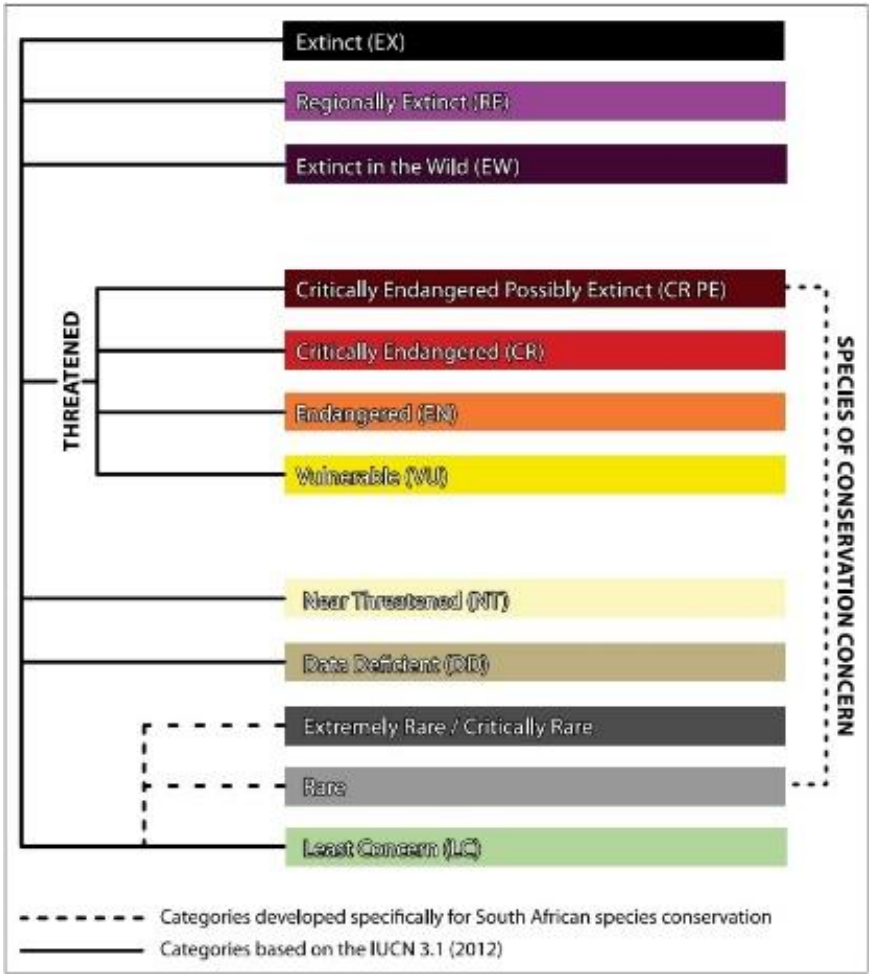

Figure 15: Red Data categories for fauna

4.3.4.1 Mammals red data

Species from existing databases, own data and field survey were identified and listed that can potentially be found on the footprint area (Table 11).

Table 11: Red data list of potential mammals' fauna for the study area

Scientific Name	Common Name	Endemic	Does suitable habitat occur on site?	Probability of the species occurring on site (High/Medium/Low)
Critically Endangered				
Amblysomus julianae	Juliana's golden mole	Yes	No	Low
Cloeotis percivalli	Short-eared trident bat	Yes	No	Medium
Diceros bicornis	Black Rhino	No	Yes	Low
Endangered				

Loxodonta africana	Elephant	No	Yes	Low (Historically present)
Lycaon pictus	African wild dog	No	Yes	Low
Vulnerable				
Acinonyx jubatus	Cheetah	No	Yes	Low
Hippopotamus amphibious	Hippopotamus	No	No	Medium
Manis temminckii	Pangolin	No	Yes	Medium
Panthera leo	Lion	No	Yes	Low (Historically present)
Rhinolophus blasii	Peak-saddle horseshoe bat	No	Yes	Low
Least Concern				
Cricetomys gambianus	Giant rat	No	Yes	High
Damaliscus lunatus	Tsessebe	No	Yes	High
Hippotragus equinus	Roan Antelope	No	Yes	High
Hippotragus niger	Sable Antelope	No	Yes	High
Laephotis botswanae	Botswana long-eared bat	No	Yes	Low

The possibility of the large carnivores to use the areas in their range movements (new ranges for younger animals or even necessitated by drought conditions) is possible as there is still free-roaming species movement, electrified fences however have an influence on their rangeland movement, which will mostly be from north and inland (south). The high presence of human activity deters the specie to use the area for hunting, resting and rangeland due to surrounding activities in-depth. The likelihood of lion, cheetah and African Wild dog visiting the area is highly unlikely. Leopards will benefit by the open water as it serves as localised hunting “trap” zone.

4.3.4.2 Avi fauna red data

Species from existing databases, own data and field survey were identified and listed that can potentially be found on the footprint area (Table 12):

Table 12: Red data list of potential Avian fauna for the study area

Scientific Name	Common Name	Endemic	Does suitable habitat occur on site?	Probability of the species occurring on site (High/Medium/Low)
Critically Endangered				
Gyps africanus	White-backed Vulture	No	Yes	High
Endangered				
Polemaetus bellicosus	Martial Eagle	No	Yes	High
Terathopius ecaudatus	Bateleur	No	Yes	High
Vulnerable				
Anthropoides paradiseus	Blue crane	Yes	No	Low
Gyps coprotheres	Cape Vulture	No	Yes	High

Poicephalus robustus	Cape Parrot	Yes	No	Low
Near Threatened				
Ardeotis kori	Kori bustard	No	Yes	High
Least Concern				
Botaurus stellaris	Bittern	No	No	Low
Ephippiorhynchus senegalensis	Saddle-billed stork	No	No	Low
Podica senegalensis	African finfoot	No	No	Low
Scotopelia peli	Pel's fishing owl	No	No	Low
Tyto capensis	African grass owl	No	No	Low

Habitat description

One habitat is present:

- Savannah Bushveld

The type of habitat found includes medium and big trees in arid wooded savannah. The main part of the area can be described as homogeneous terrestrial habitat. What should also be considered is the open water habitat created.

Habitat assessment

The human interference and presence on the project area act as daily disturbance. The area, in which the project is situated, is not considered as an Important Birding Area. Nearby food sources, the Limpopo River and the Blouberg- and Waterberg Mountain Vegetation (±130 km away) contributes to habitat and more suitable nesting sites. With the new open water, the importance rating for Birding Area can be considered to be higher.

4.3.4.3 Herpetological fauna red data

Red Data Species as listed by McLachlan (1978) indicates that the following species has a possibility to occur (Table 13).

Table 13: Reptiles red data list

SCIENTIFIC NAMES	COMMON NAMES	PRESENCE
VULNERABLE		
Python sebae	African Rock Python	Possible
Varanus exanthhematicus	Veld Monitor	Possible
Varanus niloticus	Water Monitor	No water habitat
LEAST CONCERNED		
*Geochelone pardalis**	Leopard Tortoise	Present

*This species is not indicated in Capricorn Bio-Regional Plan.

None of the three vulnerable species were found. The habitat is suitable for all three species due to the water habitat created by water drainage from croplands and watering points for game. Species of conservation concern survival on the preferred site will not be threatened.

Habitat description

Habitat consisting mainly of semi-arid savannah (bushveld) is found outside the proposed development footprints.

Habitat assessment

Surrounding natural veld provides suitable refuge and permanent habitat.

Habitat after construction

Influence by the development will be low-medium as the areas is mostly semi-arid savannah. The new open water habitat will benefit the mentioned species.

4.3.4.4 Amphibian red data

One Threatened species were identified that could possibly occur on the project area. *Pyxicephalus adspersus* is dependent on seasonal rainfall in specific waterlogged areas such areas were not found during surveys. A list of species that can potentially be found is provided (Table 10).

Habitat Description

The rainy period plays an important role in species presence and is functional for short periods. The Limpopo River nearby the project area serves as excellent habitat for amphibian species where they can escape to.

Habitat Assessment

The habitat potential for the project area at present is limited to the rainy period and is also influenced by the amount its precipitation and the subsequent follow-up rains to ensure that species complete their life cycle. The amphibians will benefit by the new open water habitat.

4.4 National Freshwater Ecosystem Priority Areas

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) was considered. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels. In addition, the method also includes the assessment of structural features at the lower levels of classification (Ollis et al, 2013).

No sites are present. Due to location in landscape. Figure 16.

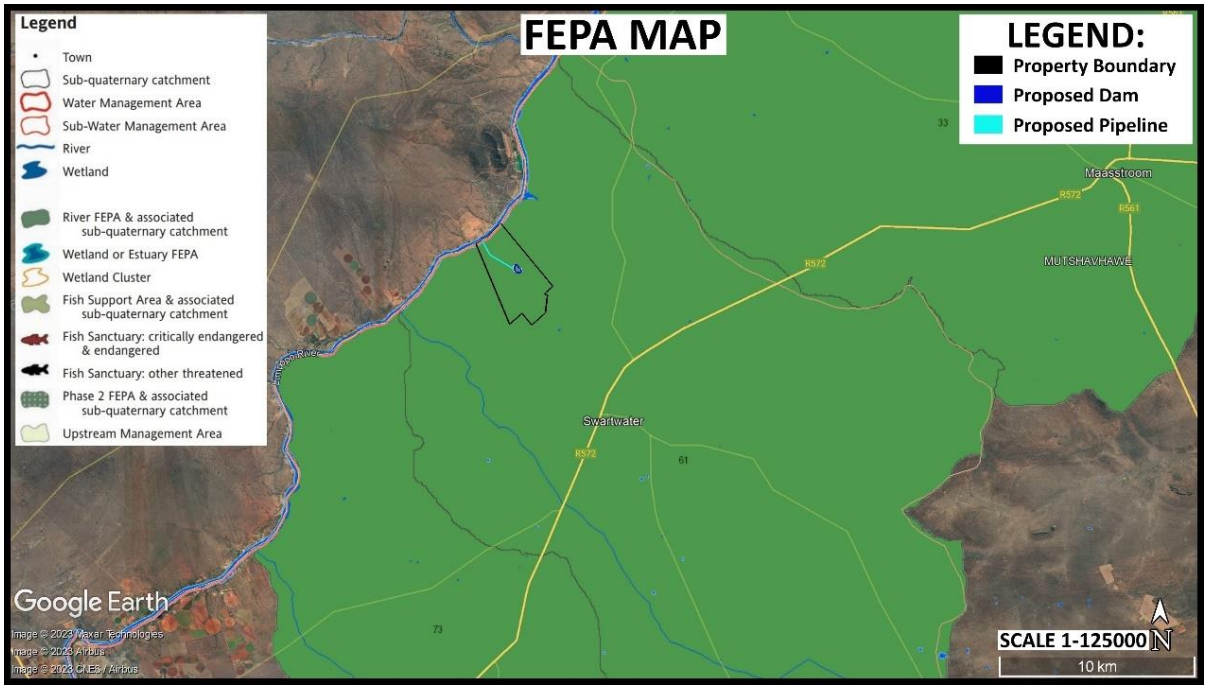

Figure 16: Location in relation to NFEPA

5 SITE ECOLOGICAL IMPORTANTCE (SEI)

5.1 Project area of Influence

Spatial location is indicated by Figures 1 and 2.

Preferred footprint sites are indicated by Figure 3 & 17.

Buffer Zones and SEI is indicated in Figure 17.

The SEI is limited to the FSL and the location of the pipeline. Once the dam is operational the SEI can change to support the site ecological importance by the aquatic habitat created.

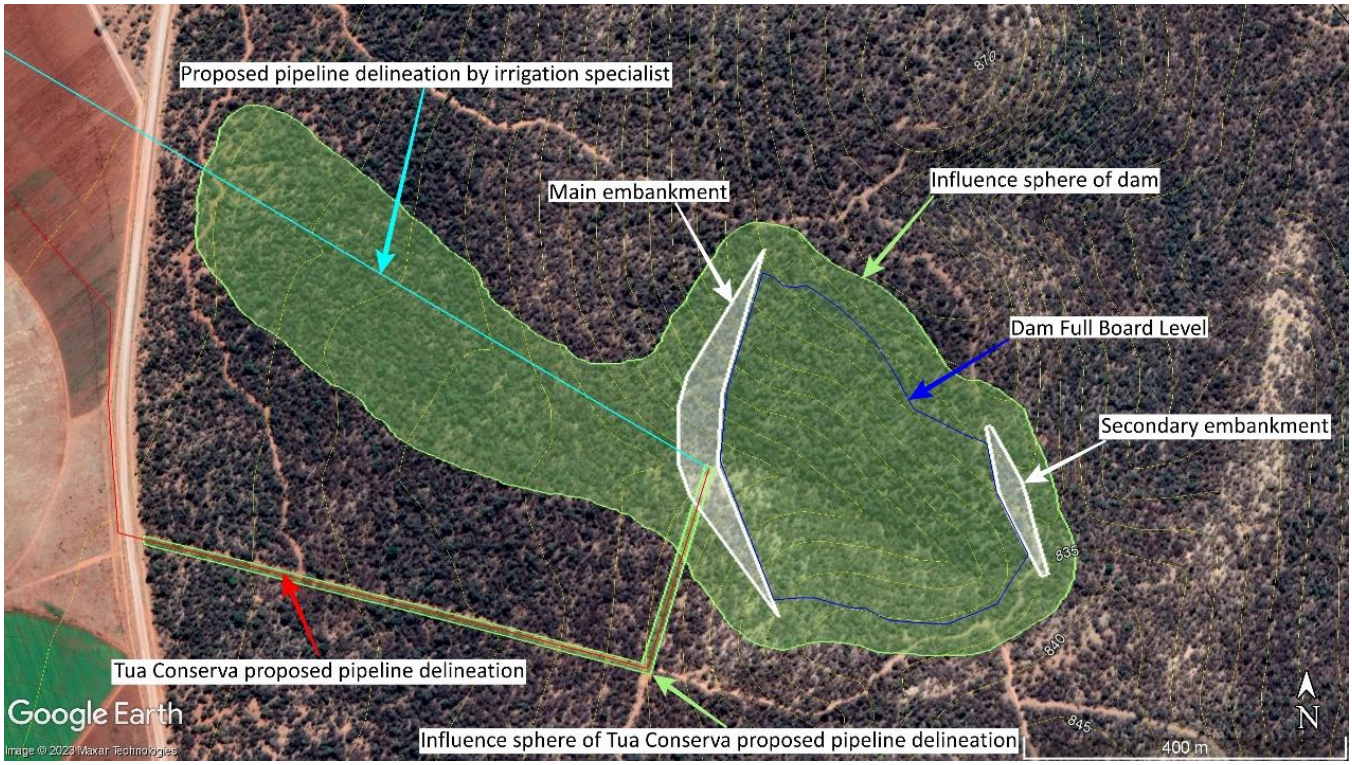

Figure 17: Site Ecological Influence

5.2 Conservation Importance (CI)

5.2.1 Habitat Integrity

A stable habitat provides a template for a certain level of biotic integrity to be realised.

Habitat integrity is linked to Biodiversity Integrity; it is the supporting structure in nature. To determine the HI the elements of habitat must be in balance. They are:

Habitat: Vegetation

Vegetation forms the main component of habitat and was found to not be in a near natural state. Past human related impacts, overgrazing and fire transformed the open bushveld to a dense shrub-bushveld. Surveys indicated that the remaining vegetation support some ecological functions, although at a lower intensity. Over time these ecological functions will stabilise at new levels of functioning which will have to be managed for game.

The project has a low importance of vegetation as habitat. An area of ± 20ha (project footprint) of 558 ha (area of Kleine Pos on which project is located) will be transformed a percentage of 3.6%.

Habitat: Water and food sources

Water is a primary part of any biotic lifeform, with availability as a driver in organisms (mainly plant-and wildlife) found in an area. Wildlife as secondary food source or producers needs water and forms part of the food cycle. The open water will provide new food sources. The new water habitat can be considered as of have high importance.

Habitat: Location and Space

Biotic lifeforms need space and in some instances are space specific in the habitat. Depending on a species needs and social needs the locations and space varies in size. The undeveloped vegetated areas surrounding the proposed new open water will support be inclusive in the forage and range use of the species. The loss transformation of the vegetation is considered of low importance due to size and importance in landscape.

Habitat: Availability

To survive seasonal change (droughts and or floods) lifeforms has specific needs to survive, mate, reproduce and interact in social behaviour and interaction with other lifeforms in an area. The natural bushveld ecosystem and the new open water ecosystem has a distinct ecotone. Species will adapt to the change and utilise the "opportunity" that was created. Species are opportunistic and the level tolerance of their presence can be measured in the level of destructive feeding habits. Habitat will be more diverse with the addition of open water habitat.

Habitat loss

Loss of natural habitat occurs with most forms of development and is also the case with this proposed development. It is sometimes referred to as habitat transformation. Habitat loss (**conversion**) may be irreversible, meaning that biodiversity patterns and processes can never be restored e.g., such as human settlements and most forms of mining for the study areas. In other instances, habitat loss (**degradation**) is more-or-less reversible, meaning that local biodiversity features may be restores to some extent, e.g., aquatic habitat. Habitat loss (**fragmentation)** through sub-dividing landscapes by international borders and/or disease control fences of larger areas and between countries at a large scale and human development on a smaller scale. Halting biodiversity loss depends on avoiding habitat loss in areas that are important for achieving biodiversity targets and slowing the rate of loss in adjoining and supporting other areas. Habitat loss creates "islands" of remaining habitat supported by systems to maintain the "islands "or it can create a new "island" (open water habitat) The more interference on the systems and habitats the higher the impact on ecological integrity. The preferred site footprint will not influence the irreplaceable loss or impact of biodiversity, either in habitat and ecosystem functioning. Any spatial component of an ecological process that may occur at a site or location or in its vicinity (i.e., corridors such as watercourses, upland-lowland gradients, migration routes, and vegetation boundaries such as edaphic interfaces, upland-lowland interfaces, or biome boundaries) were considered. It was found that the habitat on the farm and surrounding areas has already been fragmented. This has already influenced the presence of biota. The proposed dam will provide new permanent habitat for existing species and will expand their range use and presence.

Pollution

Background

Pollution is a direct contributor to habitat loss (which inhibits corridors and connectivity) and includes waste that is generated by farming, construction or from human settlement and for crop farming indiscrete use of fertilisers, chemical compounds, pesticides application and erosion (soil loss) which impacts on Biodiversity Integrity (BI). There are three forms of waste,

firstly domestic waste (which includes damaged crop products), secondly general waste (which include construction waste and can include rocks and stone removed from development) and thirdly hazardous (which includes fertilisers, pesticides, and chemicals) waste. Other forms of pollution include noise, light and dust commonly found during construction and operational phases of development.

Situation

The level of pollution is localised and is mostly dust and noise during the construction phase. It is however prudent that a monitoring plan is compiled to source data over time. This monitoring should be directly linked to the water quality as required by DWS in the WUL and chemical soil analysis conducted yearly and erosion. The "safety net" is a due-diligence monitoring plan (mentioned above).

Summary

(i) No signs of pollution were found.
(ii) No erosion was found.
(iii) There is remaining habitat.
(iv) The existing terrestrial ecosystem present will be supported by the aquatic habitat that will be created.
(v) Probability of endangering wildlife diversity is low.
(vi) No Red Data species were identified, and none found during surveys on adjoining control areas. No species of conservation concern will be affected.
(vii) Protected trees will be destroyed, the same species was found in abundance during surveys on adjoining control areas.
(viii) The risk of malaria from open water was found to be insignificant.

5.2.2 Species of Conservation Concern (SCC)

Acinonyx jubatis (Cheetah) as well as various vultures and birds-of-prey was mentioned in the Screening Tool. The geographic distribution for said species includes the project site. Surveys conducted in the geographic area of Tomburke, Groblersbrug, Swartwater and Marnitz provided information on anthropological activities that can prevent the movement and presence of cheetah. Interviews with landowners surrounding the project area was also conducted to confirm or deny sightings.

No SCC was found to be permanent on the farm. The project footprint of ±20 ha is also too small to support SCC.

5.2.3 Key Biodiversity Areas

The purpose of the Limpopo Conservation Plan version 2 (LCPv2) is to develop the spatial component for the Capricorn Bio-Regional Plan. Biodiversity importance is indicated as CBA 1 (Figure 18), on-site conditions. CBA2 is more realistic taking into consideration the human influences and developments such as roads, electrified game fences, powerlines and agriculture activities over time that changed the landscape character, structure of the vegetation as well as loss of larger mammal species that already occurred on-site and the surrounding farms and further away. The effective habitat on Kleine Pos, with habitat where vegetation has not been removed for croplands is ±558 ha. This is 54 % of the surveyed Title Deed area of 1026,49 ha (total area of Kleine Pos). The dam development footprint is ±20ha and represent 3.6 % that will be transformed from terrestrial to aquatic habitat on the ±558 ha. The aquatic habitat will contribute and support the CBA2: Optimal status. The indication

of ESA 1 (south) on the portion of Kleine Pos where the project is located not correct and is more representative as CBA2: Optimal.

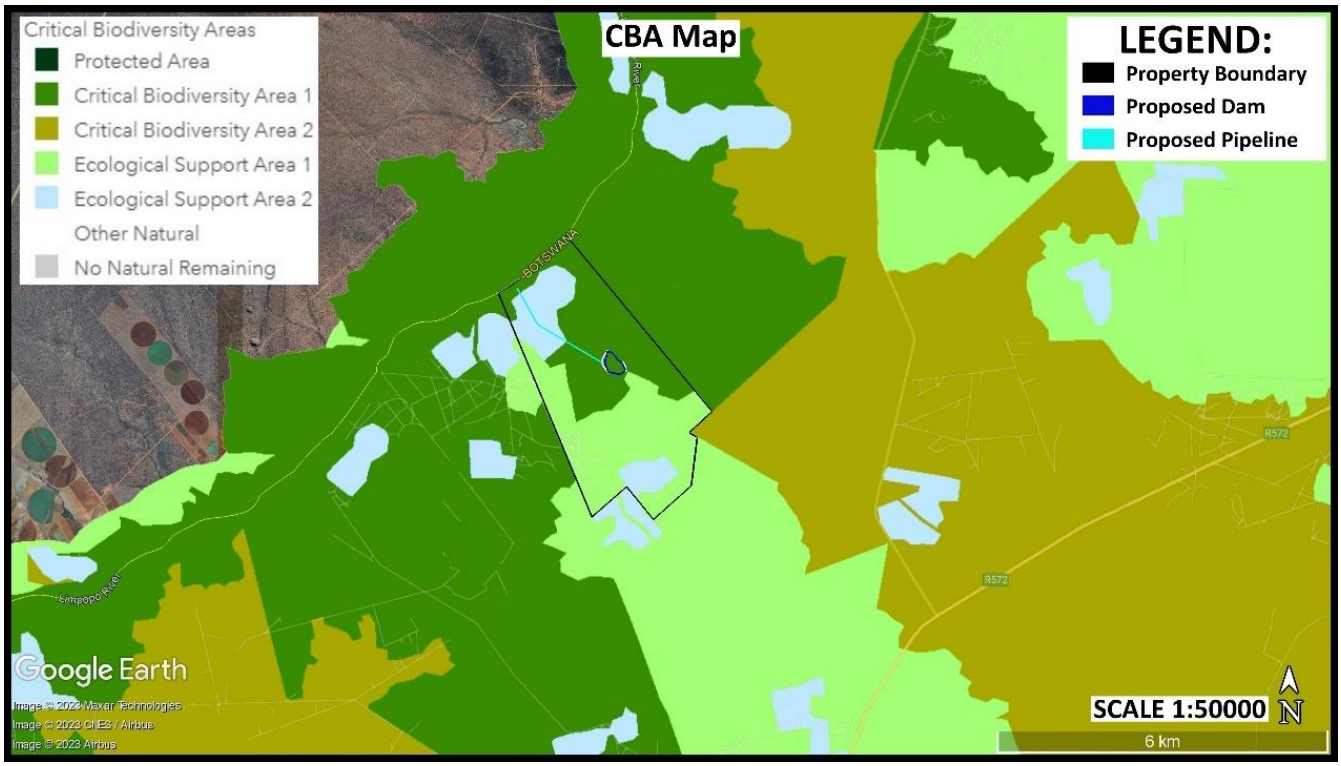

Figure 18: CBA/ESA for site

The objective for CBA mapping is sites (spatially) selected to be the most efficient configuration in landscape. The survey was conducted to collect and verify factual information on the actual situation (not an office generated large-scale model) for the site located in the landscape and to provide rational recommendations on buffer zones and mitigation. The rational below were applicable as per the Bioregional Plan.

- **Land management objective**

  Land cover category on the farm can be described as moderately uniform (the portion of Kleine Pos which has been isolated from the rest of the farm by a road, croplands and fences), Figure 2. Collectively it can be described as moderately degraded (low sensitivity). The farming practices now implemented on the "isolated" portion of Kleine Pos is for game. It can still function after the proposed development of ±20 ha.

  Current-and future biodiversity function:

  Composition

  Farming activities will not have an irreversible influence on biodiversity. What was found on site during surveys on existing croplands (in surrounding landscape) indicated that a co-existence has developed between ***"pure natura and pure agriculture".*** The presence of indicator species is proof of the on-site situation. The new aquatic habitat will be beneficial.

  Structure

  The aquatic habitat will contribute and support the biodiversity structure as an "stepping stone and island" in the spatial placing of the ecosystem.

  Function

Corridors found in proximity of the footprints is active, mostly used by medium to small mammal species. The Limpopo River is a Mega corridor that bisects various ecosystems up-and-downstream, and access is possible both via and from outside the project influence area.

Source of harvestable goods including food (croplands, cattle and game) are integrated on the farm. The natural primary production of biomass still functional.

Contribute on essential regulation of natural processes and the earth's life ecological support system, e.g., carbon sequestration, nitrogen, hydrogen, soil formation, and purification of water.

Essential pollination of commercially valuable crops and habitat for biological lifeforms in natural habitat and on agriculture habitats.

Evolution and adaptation to the changing environment in a controlled system for survival of biota.

Biodiversity values found:

Economic values:

Biodiversity goods and products are sold for income or used as inputs to other economic activities, e.g., ecotourism. Replacement or substitution of the services provided by biodiversity (e.g., engineered flood defence to replace coastal protection by dunes or mangroves) often requires large financial investment.

Social values:

Employment, health, quality of life, social security, appreciation.

Intrinsic values:

In many cultures and societies, all or some components of biodiversity have "intrinsic" value, irrespective of any material contribution to human wellbeing. Wherever this is the case, these values should be incorporated in socio-political decision making and should also be reflected in IA.

- **Conservation importance current and future**
  (i) Ecosystem Red List: Least Concern
  (ii) Veld type: Limpopo Sweet Bushveld: Least Threatened Status.
  (iii) Rocky ridges present as niche habitats: will maintain its functionality.
  (iv) New open water will be created: new niche habitat.
  (v) No Important Birding Areas in proximity: will benefit by new open water habitat.
  (vi) No Species of Conservation Concern

  Context of surrounding landscape is that habitat change also took place on all the surrounding farms. Provincial-, district roads and Eskom lines also contributed to habitat change. This caused the effect of disrupting "flow" along corridors and ultimately connectivity in the broader context of the spatial areas and biodiversity functionality. The latter two functionality will benefit.

Criteria

A = IUCN Red Data

B = Red list: Ecosystems

C = Veldtype: Threatened Status

D = Habitat: special/niche

Table 14: Conservation Importance Criteria

Conservation Importance	Fulfilling criteria	A	B	C	D
Very high	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare species or Critically Rare species which have a global EOO of >10km²				
	Any area of natural habitat of a CR ecosystem type or large area (>0.1% of the total ecosystem type extent) of natural habitat of ecosystem type.				
	Globally significant populations of congregatory species				
High	Confirmed or highly likely occurrence of CR, EN, VU species which have a global EOO of >10km²				
	Small area (>0.01% but <0.1% of the total ecosystem type extent) of natural habitat if EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type.) of natural habitat				
	Presence of Rare species				
	Globally significant populations of congregatory species (>1% of global population).				
Medium	Confirmed presence or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU)				√
	Any area of natural habitat of threatened ecosystem type with status of VU.				
	Presence of range-restricted species				
	>50% of receptor contains natural habitat with potential to support SCC.				
Low	No confirmed or highly unlikely populations of SCC				
	No confirmed or highly likely populations of range-restricted species				
	<50% of receptor contains natural habitat with limited potential to support SCC				
Very low	No confirmed and highly unlikely populations of SCC	√	√	√	
	No confirmed and highly unlikely populations of range-restricted species				
	No natural habitat remaining				

Cumulative value: Very Low-Medium

Can change to Medium after completion of dam (positive outcome)

- **<u>Compatibility land use current and future</u>**

  (i) Conservation and associated activities.

  (ii) Is zoned as Protected Agriculture Area (PAA) and can continue functioning as CBA 2: Optimal.

- **<u>Present ecological state</u>**

  (iii) Land use zoning for ecosystems has been modified with some species restricted and opportunities created for other, e.g., a shift took place in apex predators, mega-herbivores and other large ungulates were removed or movement restricted. These species created the corridors and promoted connectivity in “pure natura”.

  (iv) The area does not have a high irreplaceable value. It is the largest Veldtype in the province and is found in adjoining countries.

  (v) Collectively the remaining farming areas can function and has a role in existing ecological processes with existing and new agri ecosystem.

  (vi) The terrestrial ecosystem does have specific features for specific species of importance on the farm as CBA 2: Optimal.

  (vii) The rationale is that the presence of rare/endangered/ threatened biodiversity (plants/fauna/reptiles/amphibians/birds) for species of conservation concern are low (none were identified as being temporary present or were found). The aquatic habitat created will provide habitat for various natural biota and will still provide a role in connectivity for the ecosystem and serves reservoirs as refugia zones and

storage of carbon (and other ecological processes) in the landscape that mitigate climate change in adaption support that can minimize climate change impacts.

Composition:

(i) Vegetation has a low level of only one biological unit present on the farm and are abundant spatially. Consisted mainly of drought adapted woody plants, shrubs, forbs, and herbaceous layer. Veld condition is fair. Consist of homogenous veld type with low communities' diversity and is not threatened. Alien plants of concern is not in abundance.

(ii) Fauna has a low-medium presence and diversity for large ungulates. Apex species such as large predators not present. Common medium and small ungulates are present. Specific large ungulates are still naturally present. The mammal species (large and medium game species) are managed and utilized. Aves species were found throughout the farm. Although observed in the area no large raptors or vultures were seen, or nesting sites identified in large trees, this can be attributed to the ranges these species need. Smaller common seed and insect feeders were found around artificial watering points. No snakes or other reptiles were observed. No amphibian species observed at artificial water point. Dung-beetles were found in abundance as well as butterflies and bees at artificial water points.

Structure (or pattern):

(i) Vegetation was found to be homogenous with low community biological units are organized in time and space in a terrestrial landscape. Human influence was seen in structure due to absence of large trees, specific Knobthorn and Black Monkey Thorn with and abundance of medium size *Acacias spp (Vachellia)* encroaching and forming thickets with shrubs. Herbaceous was mostly in Ecological Index Value of Increasers II a&b.

Function:

(i) Vegetation provides the necessary habitat for species. No species or communities of concern are found.

(ii) Fauna has adapted to physical conditions brought about by anthropological change. The abundance of smaller mammals found in a zone around croplands indicate a functional symbiosis with the "artificial" agri ecosystem. This can be seen that the focus should not be on larger mammal species but rather Indeed, there is a strong theoretical and empirical basis to suggest that habitat diversity is a principal determinant of species richness within islands, fragments, and entire landscapes (Hortal et al., 2009; Kadmon & Allouche, 2007; Rosenzweig, 1995). The ecology of a species encompasses primarily reactions to the environment that drives the evolutionary adaption to conditions, created by human activities (for this document specific farming), resulting in the interrelationship in an ecosystem among different species and individuals.

- **Terrestrial and aquatic biodiversity features historic perspective:**

(i) Landscape fragmentation: The adjoining farms has already been developed for croplands and cattle farming historically and game more recent. The remaining undeveloped area (where the project site is located), of Kleine Pos, can serve as an "island". Over time the landscape has been fragmented by anthropological development and started when the farms were surveyed in 1905 and consequent development thereafter by permanent settlement. Connectivity and natural migration (on macro scale for most wildlife) has been disrupted in most areas within a radius of 100km by fences, roads, mining and rural settlements which includes aquatic ecosystems.

(ii) Connectivity: Since 1905 (even earlier from literature on human presence) connectivity has

been interrupted by human activities. Historical corridors (better known as migration) for larger mammals were interrupted and progressive development and hunting effectively stopped megaherbivores, large ungulates, medium and smaller herbivores from using corridors. Decimation of normally large herds in the terrestrial landscape were hunted and herds fragmented into smaller family-or individual groups, predators were actively exterminated (*temik* poison application and trapping) to stop predation on cattle. Occupation of natural water habitats (seepage, semi-wetlands, and pans) were occupied by humans and fenced for cattle before water wells were dug or windmills erected.

Mammals (mostly large and medium) were affected. Other living organisms such as birds, amphibians and reptiles survived. With the advent of game farming and eventual electrified fences the wildlife was put under more strain. Game species once present were more recently re-introduced onto farms (game farming era), restoring some form of biota "balance". No special habitat feature is present on the footprints with specific and outstanding ecological functions.

5.3 Functional Integrity (FI)

5.3.1 Corridor's description

Types and class of corridors

The type of corridors found on the preferred site is not natural and unrestricted, the receiving environment on the farm and surrounding areas has been altered. A linear corridor class, unnamed ephemeral watercourse, for the project being terrestrial- and arboreal biota which is located to the south and north on the neighboring farms. Low levels of pollination occur on the site, no specific migration routes are present movement is randomly on the fenced farm with movement underneath bordering fences by small mammals. No specific complex processes were identified, and normal migration has long since been interrupted. Processes are mostly managed such as fire and grazing regimes. The existing semi-arid ecological processes are present and persistent for biodiversity i.e., species on the farm and surrounding landscape.

The ecological processes most obvious are those involving species movement and connectivity, i.e., those that are thwarted by habitat fragmentation on the farm and surrounding properties by anthropological developments since 1906. These processes were spatially represented and are incorporated into LEDET as ecological corridors in their "Conservation Plan" and Capricorn Bio-Regional plan. To be effective they must provide relatively uninterrupted strips of natural habitat in perpetuity, ultimately with special measures provided to encourage biological movement along their full length on a seasonal pattern. This is not the situation on site. The CBA's and ESA's maps were found to not be reliable and placed unrealistic "pressure" on landowner(s), most of them being farmers. Conflicting with this is the Protection of Agricultural Areas in which the project area is located. This application is by a farmer whose primary activity is crop farming with game farming as secondary, but not less important, farming activity.

Corridors found

The most prominent corridors found are firstly for the terrestrial biota and secondly the arboreal biota, no aquatic biota was present on the preferred site. The new dam will change this. The corridors function mostly laterally (linear) along watercourses and ridges (as found on project area) or along fence lines and roads as well as cross-sectional outward to the

terrestrial area. It must be understood that the mentioned corridors function in the Limpopo Valley Physiological Region either inland from both banks, thus from the South African and Botswana sides of the Limpopo River (to the terrestrial zones) and up-or downstream. Thus, the Limpopo River is the main corridor for supporting various ecosystems. The "depth" to which this support functions depends on the condition of the receiving environment and the human activities that restrict, hamper, or direct specific species movement.

The terrestrial corridors are used mostly by mammals and birds. Influence on wildlife and biota movement is mostly by man-made activities, thus artificial influences. In this project the terrestrial movement is mostly influenced by game fencing (around farms and croplands) as well as the human development (roads) inland from the Limpopo River.

The same phenomena were found when the first game fences were erected and later electrified on inland game farms. What can be said is that aggressive small breachers off fences such as warthogs and porcupines breached fences at random when no special measures are taken. The primates, birds and bats are the prominent species that are not adversely influenced. Fences have a minimum influence on the birds and bats movement. It is when the large trees are removed over the whole along the length of the watercourses that flows into the Limpopo River that serious impact on the niche habitats for those species are influenced.

Buffer Zones

A buffer zone is defined as "A strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another." (Macfarlane, et al., 2014).

Buffer zones protect terrestrial habitats and water resources in a variety of ways, such as:

- Maintenance of basic ecological- and aquatic processes.
- The reduction of impacts on terrestrial habitat- and water resources from activities and adjoining land uses.
- The provision of habitat for terrestrial-and aquatic and semi-aquatic species.
- The provision of societal benefits.
- Strengthen the functioning of migration and corridors, supports connectivity and serves as ecotones.

Findings:

Terrestrial species

Most of the game farmers erected their own fences (some with electrification) for complying with game laws and for security purposes. The species soon come to accept the "barrier" and do not continuously force the "barrier". This is in line with what has been experienced on game farms fenced to keep in game. Little impact is expected by larger type game species as they adapted to on-site conditions. Some medium and smaller species still breach the fence by digging and crawling. This can be controlled by inspections.

The presence of large predators was restricted and presence of species eliminated. Leopard does occur in the area and will remain unchanged. Cheetah does not occur or is likely to visit.

Arboreal species

The arboreal species will be impacted on when vegetation, especially large trees are removed. Trees will remain on undeveloped areas of the farm. The open water will serve as "island" for species range use and breeding.

Cumulative impacts from the removal of large trees on destruction of habitat (nesting-and roosting sites) for bird species such as:

Species of conservation concern which is indicated in the distribution range is listed in Tables

9-13). The species has an extensive range which includes adjoining Botswana and further north- and east. The Limpopo River can be considered as a preferred nesting sites for some of the species.

These species are found in a larger range zone and includes other ecosystems. The species needs in foraging and nesting requirements is also not present on the preferred footprint site. The consequence of removal of large trees should thus be placed in context in a larger range context (including Botswana which has a low human development influence). The project area and past-and-present farming activities would be a disturbance factor for species nesting. Most of the species will prefer the undeveloped adjoining areas further inland or in Botswana with White backed vulture preferring riverine vegetation for breeding. Species associated with aquatic habitat such as fish eagle, osprey and fish owl will benefit.

Mitigating measures

(i) By keeping to the footprint, the impacts on terrestrial species can be kept to a minimum.
(ii) The remaining areas will be natural habitat.

Conclusion

(i) Large-, medium and small mammal species adapted to the situation and management action for larger species are taking place, although with no specific management guidelines.
(ii) Game specie numbers will have to be monitored and adapted downwards.
(iii) Habitat will be lost with a low significance on movement of species.

5.3.2 Connectivity description

Connectivity refers to the ecological connectedness of the pattern of habitats and distribution of species within a particular area. High connectivity facilities the free movement of individuals and species. Habitats in the area are fragmented by development, present obstacles to biological movement and reduced connectivity in proportion to the intensity and type of development. Connectivity is either by land and arboreal and can be vertical or horizontal. Both landscape, terrain forms and vegetation play a role and does not have a significant role on the preferred site. Habitats in isolation can be seen as "biodiversity islands" and is referred to as the "Island Biographical Theory"[5]. The linear movement of land-based species along existing corridors have long since been partly severed; movement will still be possible using the remaining corridors mostly by smaller mammals and birds. Larger mammals are fenced "in". The farm on which the preferred site is located can be seen as an "island" that serves as steppingstone for movement. As "steppingstone" the farm plays a role in the landscape connectivity and can continue to do so after development. The aquatic habitat that will be created will support this function. Additionally, the structure characterizing how system components are connected appears to play a role. Thus, the effect of connectivity on the provision of ecosystem services is highly contextual (in specific anthropological) dependent for the preferred site and farm[6].

[5] Implications of Island Biography for Ecosystem Conservation. South African National Scientific Programmes Report No 61. September 1982.
[6] Principles for Building Resilience: Sustaining Ecosystem Services in Social–Ecological Systems, eds R. Biggs, M. Schlüter and M. L. Schoon. Published by Cambridge University Press. © Cambridge University Press 2015.

5.3.3 Range use

Historical migration by megaherbivores and herbivore herds has been eliminated in the larger landscape which includes Botswana. Game fences placed further restrictions on all terrestrial wildlife. The range use of cheetah into the spatial location of the farm (and the footprint) has already been effectively isolated from the species range.

5.3.4 Migration and dispersal

Migration is mostly by Aves in a regional context (which includes Botswana to the north). Small-to medium mammal's roam and disperse between farms and towards the Limpopo River. Large mammal movement is not possible due to fencing and available habitat. The project area on the portion of Kleine Pos can be considered as an "island" for current species found.

Aspects:

- A= Functional ecological corridors
- B= Habitat connectivity
- C= Range Use: biota
- D= Migration/dispersal patterns

Table 15: Function Integrity Criteria

Functional Integrity	Fulfilling criteria	A	B	C	D
Very high	Very large (>100ha) intact area for any conservation status of ecosystems type or >5 ha for CRITICAL ecosystem types. High habitat connectivity serving as functional corridors, limited road network between intact habitat patches. No minimal current negative ecological impacts with no signs of major past disturbance (e.g., ploughing, feedlot pens, homesteads).				
High	Large (>20 ha but <100 ha) intact area for any conservation status of ecosystem type or 10> ha for ENDANGERED ecosystem types. Poor habitat connectivity with potentially functional ecological corridors and can a regular used road network between intact habitat patches. Only minor current negative ecological impacts (e.g., few livestock utilising area) with no signs of major past disturbance (e.g., ploughing, cattle feedlots, homesteads) and good rehabilitation potential.				
Medium	Medium (>5 ha but <20 ha) semi-intact area for any conservation status of ecosystem type or >20 ha for VULNERABLE ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major ecological impacts (e.g., established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitate potential.	√	√	√	√
Low	Small (>1 ha but < 5 ha) area Almost no connectivity but migration still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.				
Very low	Vert small (<1 ha) area. No habitat connectivity except for flying species or flora with wind dispersed seeds. Several major current negative ecological impacts.				

Function Integrity: Medium Functional Integrity

5.4 Biodiversity Importance (BI)

Levels of biodiversity

- *Ecosystems* containing rich biodiversity, large numbers of threatened or endemic species, that are important for migrating species; have social, economic, cultural, or scientific significance, or support key processes.
- *Species* and communities of species that are threatened, related to domesticated or cultivated species, have medicinal, agricultural, or other economic, social, cultural, or scientific significance, and indicator species.
- *Genotypes* with social, scientific, or economic significance.

To provide an understanding of how biodiversity is likely to respond to a proposed activity, impacts at **each level** of diversity can be best assessed in terms of:

- *Composition:* what biological units are present and how abundant they are.
- *Structure* (or pattern): how biological units are organized in time and space.
- *Function:* the role different biological units play in maintaining natural processes and dynamics.

There are several planning guide documents produced by SANBI for South Africa as a whole, as well as the Conservation Plan for Limpopo (2013) and Capricorn Bio-Regional Plan by LEDET on provincial levels that allow for conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential the source for desktop studies for proposed development projects. The information from said guides together with the onsite surveys and subsequent reports form an important part of the sensitivity analysis. In addition, sensitivity analysis during field surveys provides finer scale data to be used to ground truth the larger scale assessments and put it into a more localised context. The sensitivity for both preferred footprints should be seen in context of the total surrounding area to be able to properly understand the sensitivity issues and to place them in context.

Biodiversity Important Areas

These are the areas that has a regional influence on the biodiversity and is entrenched in legislation and planning guidelines according to the NEMA: Biodiversity legislation. The proposed development is considered in relation to its influence on these areas.

(i) CBA's and ESA's
(ii) Protected Areas
(iii) Protected Areas Buffers
(iv) Priority Areas for Protected Areas Expansion
(v) Terrestrial Red List Ecosystem areas
(vi) NFEPA
(vii) Indigenous Forests
(viii) Important Birding Areas
(ix) Species of Conservation Concern (SCC)

Biodiversity Importance = Conservation importance + Functional integrity.
Biodiversity Importance Value = Medium (marked in blue in Table 16)

Table 16: Biodiversity Importance Value

Biodiversity importance		Conservation importance				
		Very high	High	Medium	Low	Very low
Functional integrity	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

Biodiversity Importance: Medium-Low

5.5 Receptor Resilience (RR)

Ability of habitat to recover impacts over time naturally or with interference.
For this project the approach was to consider the open water body to establish and provide an aquatic habitat.
Aspects for consideration:

- A = Potential: Habitat recovery to/from disturbance
- B = Adaptability
- C = Resilience of ecological cycles
- D = Heterogeneity and diversity of species

Table 17: Receptor Resilience Criteria

Resilience	Fulfilling criteria	A	B	C	D
Very high	Habitat can recover rapidly (~ less than 5 years) to restore to >75% of original species composition and functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.				
High	Habitat can recover relative quickly (~ 5-10 years) to restore to >75% of original species composition and functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.	√	√	√	√
Medium	Will recover slowly (~ more than 10 years) to restore to >75% of original species composition and functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.				
Low	Habitat is unlikely to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the species composition and functionality of the receptor functionality, or species that have a low likelihood of returning to the site once the disturbance or impact has been removed.				
Very low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.				

Receptor Resilience Value = High

5.6 Site Ecological Importance (SEI)

SEI: BI+RR
SEI = Biodiversity Importance (Medium) + Receptor Resilience (High)
SEI = Medium

Table 18: Site Ecological Importance description

Site 1 and 2			
DETERMINING SEI FOR PAOI			
Procedure		Rational	References
Step 1	Location of project Footprint area Ecosystems present	Kleine Pos: ± 558 hectares. Preferred footprint area: 20 ha Terrestrial: Limpopo Arid Bushveld Vegetation unit SVcb19 Status: Least Concerned	SANBI National list of threatened terrestrial ecosystems for South Africa. Mucina and Rutherford (2006) for veld types.
Step 2	What habitat types are found on PAOI and relevance to taxon's	One terrestrial bushveld habitat type found which has been moderately disturbed.	Monochrome aerial photos. Google Earth Imagery. Chapter 4, paragraph 4.1.3 and 4.3.3, this report.
Step 3	SCC fauna and flora found in project footprint	No species were identified or found on PAOI.	Chapter 4, paragraph 4..2.1 and 4.3.4, this report.
Step 4	What is SEI for habitat types in PAOI that are relevant	The PAOI for irrigation dam comprises habitat with very low SEI area.	SANBI Species Environmental Assessment guideline.

Table 19: SEI Interpretation

Site ecological importance	Interpretation in relation to proposed development activities
Very high	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/ unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

6 SENSITIVITY DESCRIPTION

The planning guidelines for conservation planning for meeting biodiversity targets as discussed above provide data for consulting and using in providing a sensitivity analysis. Areas were earmarked for conservation and buffer zones in the future, that are essential to contribute to biodiversity and conservation functionality. In addition, sensitivity analysis during the field surveys provided in much finer scale data that was used to ground truth the larger scale assessments and put it into a more localised context. This enabled the development of a Site Ecological Influence, Figure 17, which reflects the sensitivity.

- No species of conservation concerned.
- Veldtype Least Concerned
- No FEPA on footprint.

- Habitat moderately changed.
- Infrastructure limited.

7 IMPACTS IDENTIFIED

7.1 Habitat Destruction

General

Removing vegetation from an area effectively removes various forms of natural habitat occupied by various life forms of mammals, birds, reptiles, amphibians, and insects. Larger trees such as *Vachellia (Acacia) nigrescens* could be used for nesting by the larger birds of prey. Smaller less agile species is more prone to be affected by habitat loss. It can be expected that reptiles will be the component most affected due to their mobility. Mammals (those found to be currently present) and birds are more agile and can move quicker away from disturbances. Most species affected would be able to move as soon as disturbances occur by bush-clearing activities to surrounding areas.

Vegetation

The largest portion of vegetation that will be removed is dominated by *Acacia (Vachellia) species*. The remaining bushveld on the farm will still be able function ecologically. The transformed terrestrial area will be replaced by an open water that will create a new aquatic habitat which will function as minor ecosystem in the larger ecosystem context.

Various large trees, e.g., Knob Thorn, Black Monkey Thorn trees being the most prominent large trees (also referred to as trees of importance) with medium size trees consisting of *Acacia-, Commiphora-and Terminalia species* with *Grewia species* as shrub stratum is in abundance. Existing large trees found on the footprints which provide specific habitat for nesting-and roosting sites for birds were minimal. The only protected tree species found were Shepherd's Trees.

Operational Phase

What can be expected is that the remaining surrounding vegetation will be maintained by seepage from the water source along a fringe by the full-board level in dry periods. The remaining vegetation will however mostly be dependent on annual rainfall.

(i) Removal of natural vegetation

The removal of vegetation of will take place and contribute to the ever-increasing loss of vegetation and could also result in possible fragmentation thereof and severing corridors.

The locations of the footprint allow movement of wildlife species along natural vegetated corridor areas, connectivity will also be possible. The area (±20 ha) to be cleared of natural vegetation will be replaced by open water. It can be expected that the carbon footprint of the natural vegetation will be partly compensated for by the fringe vegetation which will be able to be in foliage for longer periods.

Past impacts consisted of infrastructure development for farming activities, mostly fences, Eskom power lines (with cut lines), roads, communication tower, watering points and pipelines. Past overgrazing and impacts by drought (and fire) have left the area with dense patches of woody cover. The woody component is well established but has densified.

No sensitive vegetated areas will be directly affected.

(ii) Removal of protected species

Tree species that are considered protected in accordance with the National Forest Act 1998 (Act No 84 of 1998) were recorded:

- Shepherd's tree (*Boscia albitrunca)*.

(iii) Altering carrying capacity for grazers and browser species

The clearing of vegetation will effectively remove grazing and browsing from the carrying capacity for game. The impact of overgrazing can be managed by adapting game numbers. During surveys the field conditions was assessed by using a practical method for veld condition assessment. Veld Condition is unsatisfactory. No browse lines were observed.

Identified impacts for Habitat destruction

The following impacts have been identified:

- Removal of natural vegetation and in effect habitat.
- Removal of a trees of importance (nesting).
- Destruction portions of one specific veld type (Least Concerned).
- Altering carrying capacity for grazers and browser species habitat.
- Influence on habitat availability for species.

7.2 Impacts on the vegetation

State of vegetation (plant communities found)

Vegetation type: Limpopo Sweet Bushveld No 17 (SVcb19) and Acocks (Arid Sweet Bushveld: A 14)

Plant community: *Acacia burkei, Acacia nigrescens, Boscia albitrunca, Commiphora species, Terminalia prunioides and Grewia species* bushveld.

This vegetation type occurs over the largest portion of the region. The areas have been settled on since 1906. Cattle farming was historically present and still present which resulted in overgrazing and subsequent bush encroachment consisting mainly of *Acacia species*, *Commiphora pyracanthoides* and *Grewia species*. *Acacia burkei and A. nigrescens* is the dominant tree species. *Sclerocarya birrea* subsp. *caffra* was found sparsely and individually at low level of occurrence over large areas.

Figure 19: Aerial view from 15 m over eastern aspect towards western aspect

Table 20: State of vegetation

State of vegetation	Semi-Natural
Conservation priority	Low-Medium
Characteristics description	Structure: The vegetation unit is characterized by a woody layer mostly dominated by medium-large sized trees and medium shrubs that form a dense structure. The prominent woody species is Black Monkey Thorn, Knob Torn, Lowveld cluster leaf, *Commiphora*- and *Grewia* species throughout its distribution in the local context. The presence of bush encroachment by *Acacia erubescens, A. mellifera* and *Grewia spp* indicates bush encroachment caused by past overgrazing. Vegetation has been structurally altered by past overgrazing, fire and utilising large trees for building etc. Drainage is by surface flow. Prominent trees: *Acacia burkei*, *Acacia nigrescens, Kirkia acuminata, Boscia albitrunca, Sclerocarya birrea* Soils: Mostly rocky and shallow sandy soil which drains freely on flat landscape. Calcareous soils derived from limestone also found where topography change.
Trees	Highest height: 9.5 m Average height: 5.4 m Density: 65%
Shrubs	Average height: 2.3m

	Density: 75%
Herbaceous	Grasses average height: 0.4 m Grasses basal cover: Low Forbes average height: 0.3 m Forbes basal cover: Moderate
Sensitivity	Moderate
Protected Trees (on footprints)	*Boscia albitrunca* (Shepherd's tree) and *??? birrea* (Marula).
Red Data species (SCC)	No species of conservation concern observed
Current land use	Game.
Veld condition	Unsatisfactory

The following specific considerations for the vegetation unit regarding the proposed development is relevant.

- The vegetation unit is classified as least concerned and has a wide distribution.
- The development is considered as highly suitable on the specific site.

Identified impacts on vegetation

- The eradication of protected trees would need a permit from DFFE.
- Trees of interest that will be removed (knobthorn and wild fig).
- Water will benefit woody component along waterline and below the wall where seepage will create new aquatic conditions. This will result in a corridor and support connectivity for arboreal migrant species.

7.3 Faunal Findings

7.3.1 Habitat assessment

The habitat for game farming with ecotourism has been altered moderately before this survey. Fauna species have various levels of mobility and presence is also dependant on seasonal change. Human interference and activities also have a marked influence on larger mammals. In-situ conservation of cheetah is not attainable as discussed in this report. The conservation of all biota found will not be placed under stress, the opposite will occur with the permanent water. It will benefit the presence of leopard in the area (more intensely) who will hunt the area due to prey species availability.

Habitat after construction

In the literature studies it was evident that species associated with the typical terrestrial Limpopo Sweet Bushveld was historically distributed in the region, this can be confirmed by the author who has worked in the region and along the Limpopo River since 1975 as a nature conservator. Smithers (1983) provides distribution descriptions and maps for species mentioned in Table 11.

The habitat remaining after development will be able to support most of the species currently present. Corridors along terrestrial is still linked to spatial surrounding terrestrial landscape. Corridors will be created by the attraction of open water.

Habitat on adjoining areas

The habitats of the project area should not be considered in isolation as it would be unwise if adjoining land uses to the adjoining land-uses is available for ecological processes. Movement of larger mammal game species will be further restricted by the game fences with movement possible by medium and smaller mammals. Connectivity between habitats is along corridors

and has an influence on the survival of species and faunal communities. Taken into consideration the size of properties representing faunal species and communities can still function albeit with supporting management input from farmers, and this they do as the game is an economic asset. The activities associated with crop farming is a deterrent for species that need a large foraging range for instance cheetah. The aforementioned with electrified fences and provincial and district roads will deter species to move into these areas.

7.3.2 Impact on species

Direct impacts on survival of species indicated that the layout footprint configuration will moderately influence species movement positively. The carrying capacity of the area will be able to be sustainable for the existing number of game. The prominent game species found were duiker, impala, kudu and warthog. Predators are caracal, landowner mentioned the presence of leopard (which the author supports although it is only for its larger range use), no leopard signs were found during survey. The probability for cheetah to be present on site are low due to the location of the site in relation the existing developments in the surrounding landscape that restrict their movement.

Birds were found to be abundant for most common species with sensitive species also present. No nesting sites were observed for vultures, raptors all of them preferring large trees (>9m) and secretary birds preferring Umbrella Acacia. Red Billed Oxpeckers were observed on game. The findings indicate presence of fauna although larger mammal species are mostly excluded, they are found directly adjoining farming areas.

Density-dependent factors have varying impacts according to population size. Different species populations in the same ecosystem will be affected differently. Factors include: food availability, predator density and disease risk. Density-independent factors are not influenced by a species population size.

The natural conditions for both the above-mentioned regulation of populations cannot be considered as natural thus questioning the role of corridors and connectivity for the farm in the biodiversity role it was earmarked for by the Bio-Regional Plan, systems have been disrupted.

<u>Identified impacts on fauna</u>

- Little or few buffer prey species available which will result in demise of smaller species in food chain.

7.4 Pollution

7.4.1 Background

Pollution is a direct contributor to habitat loss and includes waste that is generated by farming, construction of infrastructure or from human settlement and indiscrete use of fertilisers, chemical compounds, pesticides application and erosion (soil loss) which impacts on Biodiversity Integrity (BI). There are three forms of waste, firstly domestic waste (which includes damaged crop products during production phase), secondly general waste (which include construction waste and can include rocks and stone removed from site) and thirdly hazardous (which includes fertilisers, pesticides, and chemicals) waste during operational phase and which can pollute the soil destroying the micro-organisms and in effect the soil biodiversity (also referred to as soil health), the same compound can pollute the water in suspension in the soil and can cause salination and pollute groundwater. Other forms of pollution include noise, light and dust commonly found during construction and operational

phases of development, this however is transient. Soil erosion is mostly from incorrect engineered drainage of the project area which, when concentrated can cause erosion and scouring, it is also a potential medium of distributing chemicals over distances outside the footprint.

7.4.2 Situation

The level of pollution is localised and will be mostly dust and noise during the construction phase. It is however prudent that a monitoring plan is compiled to source data over time. This monitoring should be directly linked to the water quality as required by DWS in the WUL and chemical soil analysis conducted yearly and erosion. In the operational phase no occurrence of pollution is expected. The "safety net" is a due-diligence monitoring plan (mentioned above).

7.4.3 Summary

(i) No signs of pollution were found or identified as a possibility.
(ii) No erosion was found.
(iii) There is sufficient remaining habitat surrounding the proposed development area.
(iv) The existing terrestrial ecosystem present will benefit by the developments. The aquatic habitat can support and provide habitat for various biota.
(v) The future level of pollution can be expected to be low; it should still be monitored.
(vi) No probability of risk of infecting wildlife with sicknesses was found.
(vii) Probability of negative impacts on endangering wildlife diversity is low. It is expected to have a positive impact.
(viii) No Red Data species were identified, and none found during surveys on adjoining control areas.
(ix) Protected trees will be destroyed, the same species was found in abundance during surveys on adjoining control areas.
(x) The risk of malaria from ponding stagnant open water was found to be insignificant.
(xi) Foot-and-Mouth Disease should be considered as a risk and should be closely monitored and controlled by bio-security measures.

8 IMPACTS ASSESSMENTS

Description	Definition	Ranking
Extent (E)	The extent of the impact refers to the spatial dimension to which an impact will be felt (i.e., site, study area, local, regional, or national scale).	5- International 4- National 3- Regional 2- Local 1-Site only
Duration (D)	In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the receiving environment	5- Permanent 4- Long-term 3- Medium-term (5-15 years) 2- Short-term (0-5 years) 1-Immediate

Magnitude (M)	A description must be given as to whether an impact is destructive, or benign. It determines whatever the intensity of the impact on the natural environment or society is permanently, significantly changes its functionality or slightly alters it.	5- Very high 4- High 3- Moderate 2- Low 1-Minor
Probability (P)	The criteria used for rating the likelihood of impact occurrence	5- Definite 4- High probability 3- Medium probability 2- Low probability 1-Improbable

FORMULA

Environmental Significance of each potential impact was assessed using the following formula:

Significance Points (SP)= (Extent + Duration + Magnitude) x Probability

Maximum value is 75 Significance points (SP)

SP> 50	Indicates high environmental significance	The impact could influence the decision regardless of any possible mitigation An impact which could influence the decision about whether or not to proceed with the project
SP 25-49	Indicate Moderate environmental significance	The impact could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance-could influence the decisions about the project if left unmanaged
SP < 24	Indicates Low environmental significance	The impact will not have an influence on the decision. Impacts will have little real effect and which should not have an influence on or require modification of the project design or alternative mitigation.
Confidence of outcome		Positive indicated as (+) Negative indicated as (-)

8.1 Impact on Vegetation assessment

The footprint is in a hill outcrop in homogenous terrestrial landscape.

In summary the impact significance of the loss of habitat will be Low without mitigation and Low. During the operational phase, impacts will be Low with or without mitigation.

Table 21: Vegetation impact

Loss of indigenous vegetation or indigenous plant species due to clearing of areas of the specific Veldtype. Nature: ±20 ha of vegetation clearing will take place. Protected trees are present in footprint areas. Vegetation is main component of habitat for fauna and flora species.				
	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Site only	1	Site only	1
Duration	Short-term	2	Short-term	2
Magnitude	Low	2	Low	2
Probability	High probability	4	High probability	4
Significance	**Low**	**20**	**Low**	**20**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Extent	Site only	1	Site only	1
Duration	Permanent	5	Long-term	4
Magnitude	Low	2	Low	2
Probability	High probability	4	High probability	4
Significance	**Moderate**	**32**	**Moderate**	**28**
Status (positive or negative)	Negative		Negative	
Reversibility	Low		Medium	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			
Mitigation: (i) Destruction permits be sourced from DFFE for protected trees which cannot be removed. (ii) Large trees found along the full-board level should be left intact for bird species.				
Cumulative impacts: Expected that very little accumulative effects will occur for vegetation. Similar habitat is available on farm and surrounding areas for fauna allowing for ecosystem functioning.				

8.2 Impact on Fauna assessment

Most of the species would be associated with natural bushveld which is found directly adjoining the areas. The habitat remaining will be able to support existing species.

Table 22: Faunal assessment

Mammal-, bird-, amphibian-, reptile and insects will be killed or prevented to survive the development and thereafter.

Nature: Clearing of ±20 hectare for Full Supply Level (FSL) will take place and faunal live forms could be killed in the processes of development phase. The open water surface will be directly linked with terrestrial habitat for the circumference (±1.2 km) of the FSL				
	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Site only	1	Site only	1
Duration	Short-term	2	Short-term	2
Magnitude	Low	2	Low	2
Probability	High probability	4	High probability	4
Significance	**Low**	**20**	**Low**	**20**
Status (positive or negative)	Negative			
OPERATIONAL PHASE				
Extent	Site only	1	Site only	1
Duration	Permanent	5	Medium-term	3
Magnitude	Moderate	3	Low	2
Probability	High probability	4	High probability	4
Significance	**Moderate**	**36**	**Low**	**24**
Status (positive or negative)	Negative		Positive	
Reversibility	Low		High	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			
Mitigation: (i) Remove less mobile species before construction. (ii) Monitor continues during construction.				
Cumulative impacts: Expected that very little cumulative effects will occur as the existing wildlife is mobile and will move away during site preparation. It can be expected that they will establish in the remaining area surrounding the Full-Service Level.				

8.3 Impact on habitat assessment

Connectivity is limited for large animal species mostly due to range use. Movement along the various sheltered corridors for smaller species into the terrestrial landscape is still possible. The significance of the impacts during the operation phase will be Moderate (positive) with mitigation.

Table 23: Habitat assessment

Terrestrial habitat will be destroyed and an aquatic habitat will be created Nature: Transformation of habitat ± 20 hectares leaving remaining terrestrial habitat (±533 ha) to function naturally. An aquatic ecosystem of ± 6 ha will be created with an ecotone to the remaining natural areas.

	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Site only	1	Local	2
Duration	Short-term	2	Short-term	2
Magnitude	Low	2	Low	2
Probability	High probability	4	High probability	4
Significance	**Low**	**20**	**Low**	**24**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Extent	Site only	1	Local	2
Duration	Short-term	2	Permanent	5
Magnitude	Low	2	Moderate	3
Probability	High probability	4	High probability	4
Significance	**Low**	**20**	**Moderate**	**40**
Status (positive or negative)	Positive		Positive	
Reversibility	Low		Medium-High	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			
Mitigation: 1. The dam will create an aquatic ecosystem, serving as habitat (and "island") with an ecotone to the adjoining natural areas as habitat for species. 2. The ecotone transition zone should be supported by not removing specific trees (design alternative) to create a spatially linear connectivity zone that function horizontally over distance (from-and-to) and in height. 3. The terrestrial-and water habitat will function as other natural area that can support ecological areas. 4. The four natural cycles of nitrogen, water, carbon, and oxygen can function on the developed area. 5. To test the "health" of the systems a Farming Conservation Management and Monitoring Plan should be compiled that is audited bi-annually.				
Cumulative impacts: Expected that positive accumulative effects for species will occur, especially smaller mammals. Species, especially birds, will also benefit in the winter-and early summer period when food and water is low.				

8.4 Impacts on sensitive systems assessment

Construction activities affected present habitat and species compositions directly through the alteration and disturbance of habitat, the displacement and probable destruction of species through negligence. Secondary impacts, such as the generation of noise and dust, are likely to displace some faunal species temporarily (particularly common bird species). Mitigation measures to minimise the impact on species and their habitats, as listed under Mitigation Measures, must be implemented during this phase.

Table 24: Sensitive systems assessment

Sensitive systems that could be impacted on Nature: The proposed development will transform part of the terrestrial ecosystem No sensitive system is present. The terrestrial ecosystem Veldtype is the largest in the province.				
	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Local	2	Local	2
Duration	Long-term	4	Long-term	4
Magnitude	Minor	1	Minor	1
Probability	High probability	4	High probability	4
Significance	**Moderate**	**28**	**Moderate**	**28**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Extent	Regional	3	Regional	3
Duration	Long-term	4	Long-term	4
Magnitude	Moderate	3	Moderate	3
Probability	High probability	4	Definite	5
Significance	**Moderate**	**40**	**High**	**50**
Status (positive or negative)	Positive		Positive	
Reversibility	Low		Low	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			
Mitigation: (i) No further damage should be allowed outside of the development footprint. (ii) The four main ecological cycles found in nature will still function. (iii) The ecotone zone between dam and natural veld can be supported by leaving large trees in-situ that will support and enhance the ecotone zone. (iv) Farming Conservation Management and Monitoring Plan must be compiled and implemented.				
Cumulative impacts: An aquatic "island" will be established that will provide a "stepping stone" being created that will support connectivity from Limpopo River and inland. New migration routes will be established for arboreal species. Amphibians present in Limpopo system will also establish. Nesting for birds-of-prey, vultures and owls will also benefit.				

8.5 Impact on biodiversity assessment

Biodiversity supports various lives and livelihoods. It does this by providing essential services.

Biodiversity is:

- A source of harvestable goods including food, medicines and building materials.

- Essential for regulation of natural processes and the earth's life support system, e.g., carbon sequestration, soil formation, and purification of water.
- Essential for pollination of commercially valuable crops and biological control of pests and diseases.
- A source of spiritual and religious enrichment and well-being.

Perhaps most important of all, biodiversity is the basis for evolution and adaption to changing environment, making it essential for survival of life. The following issues and aspects were considered.

At the gene level, to what extent will the proposal have significant effects on?

- Genetic diversity of species, particularly rare and declining species, and those with identified as priorities in NBSAPs and/or sub-national biodiversity plans?
- Opportunities for species populations to interact, e.g., by increasing habitat fragmentation and isolation.
- Risk of extinction?
- Persistence of locally adapted populations.

At the species level, to what extent will the proposal:

- Alter the species-richness or species-composition of habitats in the study area?
- Alter the species-composition of communities?
- Cause some species to be lost from the area?
- Affect species identified as priorities in NBSAPs and/or sub-national biodiversity plans?
- Increase the risk of invasion by alien species?

At the ecosystem level, to what extent will the proposal:

- Change the amount, quality, or spatial organization of habitat?
- Affect plans to enhance habitat availability or quality?
- Damage ecosystem processes and services, particularly those on which local communities rely?

Table 25: Biodiversity at gene level

Biodiversity: At gene level Genetic diversity of species, particularly rare and declining species, and those with identified as priorities in NBSAPs and/or sub-national biodiversity plans				
	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Local	2	Local	2
Duration	Long-term	4	Long-term	4
Magnitude	Minor	1	Minor	1
Probability	High probability	4	High probability	4
Significance	**Moderate**	**28**	**Moderate**	**28**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Extent	Local	2	Regional	3

Duration	Short-term	2	Long-term	4
Magnitude	Minor	1	Moderate	3
Probability	Medium probability	3	High probability	4
Significance	**Low**	**15**	**Moderate**	**40**
Status (positive or negative)	Positive		Positive	
Reversibility	Low		Medium-High	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			

Mitigation:

(i) A Farming Conservation Management and Monitoring Plan must be compiled and bi-annually audited.

(ii) No further damage should be allowed to remaining natural areas.

(iii) Fences separating natural areas must be removed to allow natural movement on the farm.

(iv) Water quality for existing and new agriculture developed areas should be monitored to assess the quality released downstream onto the vegetation and receiving environment.

Cumulative impacts:

Expected that positive accumulative effects for small mammal and various bird species will occur. Red Data species, especially birds, will benefit in the winter-and early summer period. Other wildlife will also benefit from permanent water and will promote and stimulate local breeding.

The permanent water will result in maintaining corridors and connectivity in the region.

Biodiversity: At gene level

Opportunities for species populations to interact, e.g., by a new water habitat that will help combatting fragmentation and isolation.

	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Local	2	Local	2
Duration	Long-term	4	Long-term	4
Magnitude	Minor	1	Minor	1
Probability	High probability	4	High probability	4
Significance	**Moderate**	**28**	**Moderate**	**28**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Extent	Local	2	Regional	3
Duration	Short-term	2	Long-term	4
Magnitude	Minor	1	Moderate	3
Probability	Medium probability	3	High probability	4
Significance	**Low**	**15**	**Moderate**	**10**
Status (positive or negative)	Positive		Positive	

Reversibility	Low		Medium-High	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			
Mitigation: (i) Damage should not be allowed to the remaining landscape and remaining terrestrial habitat and corridors as buffer zones. (ii) The buffer zones along the dam edges will also be able to function as ecotone as suitable habitat for species survival. (iii) Watercourses outside the development footprint remain unchanged and can act as corridors for small mammal species connectivity.				
Cumulative impacts: Expected that positive accumulative effects for small mammal species will occur. Red Data species, especially birds, will benefit in the winter-and early summer period when area is dry and food and water availability low.				
Biodiversity: At gene level Risk of extinction				
	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Local	2	Local	2
Duration	Long-term	4	Long-term	4
Magnitude	Minor	1	Minor	1
Probability	High probability	4	High probability	4
Significance	**Moderate**	**28**	**Moderate**	**28**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Extent	Local	2	Regional	3
Duration	Long-term	4	Long-term	4
Magnitude	Minor	1	Moderate	4
Probability	High probability	4	Definite	5
Significance	**Moderate**	**28**	**High**	**55**
Status (positive or negative)	Positive		Positive	
Reversibility	Low		Medium-High	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			
Mitigation: (i) No further damage should be allowed to the remaining landscape of remaining terrestrial habitat for species use and process functioning. (ii) Smaller mammal species can move freely in-and-out of surrounding fenced croplands that serve as feeding niche areas.				

(iii) Birds and smaller mammals also use the outcrop as "island" in the rotation program for breeding.
(iv) The surrounding bushveld vegetation will receive seepage water which will benefit the trees along the seepage edges watercourse and subsequent supply habitat for the species. The trees will flourish even in the winter temperatures with the constant seepage water supply, providing niche habitats.
(v) Buffer zones will restore and function of providing breeding and survival.

Cumulative impacts:
Expected that positive accumulative effects for small mammal species will occur. Red Data species, especially birds, will benefit in the winter-and early summer period. Species along the drainage line bushveld vegetation will also benefit by the seepage water.

Biodiversity: At gene level
Persistence of locally adapted populations

	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Local	2	Local	2
Duration	Long-term	4	Long-term	4
Magnitude	Minor	1	Low	2
Probability	High probability	4	High probability	4
Significance	**Moderate**	**28**	**Moderate**	**32**
Status (positive or negative)	Negative		Positive	
OPERATIONAL PHASE				
Extent	Local	2	Regional	3
Duration	Long-term	4	Long-term	4
Magnitude	Low	2	Moderate	4
Probability	High probability	4	Definite	5
Significance	**Moderate**	**28**	**High**	**55**
Status (positive or negative)	Positive		Positive	
Reversibility	Low		Moderate	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			

Mitigation:
(i) Remaining terrestrial habitats is still preserved.
(ii) A Water quality monitoring plan to detect pollution will serve as early warning of possible built-up of pesticides.

Cumulative impacts:
Expected that positive accumulative effects from water benefitting small mammal species will continue. Red Data species, especially birds, benefit in the winter-and early summer period when the area has little to no surface water. Species along the bushveld vegetation will also benefit by the seepage water. Browsing capacity, nesting sites and general habitat will benefit.

Table 26: Biodiversity at species level

Biodiversity: At species level, to what extent will the development:

- Alter the species-richness or species-composition of habitats in the study area?
- Alter the species-composition of communities?
- Alter the Conservation Value?
- Caused some species to be lost from the area?
- Affected species identified as priorities in NBSAPs and/or sub-national biodiversity plans?
- Increased the risk of invasion by alien species?

	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Local	2	Local	2
Duration	Long-term	4	Long-term	4
Magnitude	Moderate	3	Low	2
Probability	High probability	4	High probability	4
Significance	**Moderate**	**36**	**Moderate**	**32**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Extent	Local	2	Regional	4
Duration	Long-term	4	Long-term	4
Magnitude	Moderate	3	High	4
Probability	Definite	5	Definite	5
Significance	**Moderate**	**45**	**High**	**80**
Status (positive or negative)	Positive		Positive	
Reversibility	Yes		Yes	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			

Mitigation:

(i) A monitoring program must be designed to collect data at the new aquatic habitat. Information must be collected on species observed seasonally and annually.

(ii) The possibility of water hyacinth (*Eichhornia crassipes)* infection from the Limpopo River is definite. Infestation will occur through pumping and by waterfowl. By monitoring the presence and implementing a due-diligence eradication process must be implemented. Record keeping is a requirement.

(iii) Eradication is a permanent action.

Cumulative impacts:

The creation of a permanent aquatic habitat in an arid terrestrial ecosystem will benefit the collective biota in the area.

The area has a low number of large and medium size herbivores which normally is used as indicator species. The species richness is low and does not reflect the expected historical

species richness due to continuous farming and human development activities. The species present will however be able to function naturally on the remaining farming areas.
The shift in indicator species from large to smaller mammals is also a benchmark against which negative impacts can be measured and the effect of the open water on populations.
New apex predators will develop such as the leopard and caracal which can have a marked effect on heavy predation on smaller species.

Table 27: Biodiversity at ecosystem level

Biodiversity: At the ecosystem level, to what extent will the development:

- Changed the amount, quality, or spatial organization of habitat?
- Affected plans to enhance habitat availability or quality?
- Damaged ecosystem processes and services, particularly those on which local communities rely?

	Without Mitigation		**With Mitigation**	
CONSTRUCTION PHASE				
Extent	Local	2	Local	2
Duration	Long-term	4	Long-term	4
Magnitude	Moderate	3	Low	2
Probability	High probability	4	High probability	4
Significance	**Moderate**	**36**	**Moderate**	**32**
Status (positive or negative)	Negative		**Positive**	
OPERATIONAL PHASE				
Extent	Local	2	Regional	3
Duration	Long-term	4	Long-term	4
Magnitude	Moderate	3	High	4
Probability	High probability	4	High probability	4
Significance	**Moderate**	**36**	**Moderate**	**44**
Status (positive or negative)	Positive		**Positive**	
Reversibility	Yes		Yes	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			

Mitigation:

1. The remaining habitat can function naturally, although at a lower intensity, due to size on the farms. It can still function as a collectively whole with the adjoining farming areas for natural processes spatially. It should be managed by a Farming Conservation Management and Monitoring Plan.
2. The terrestrial habitat remaining outside the footprints will not be developed further and used as corridors and reserves for connectivity.
3. Fire must not be allowed in remaining landscape of farm.

4. ECO implement due diligence training and auditing for monitoring.
5. Monitoring plans must be compulsory for soil-water quality be conducted seasonally.

Cumulative impacts:

The main driver for the area is the Limpopo River Ecosystems aa the primary habitat with highest biodiversity. The terrestrial landscape and ecosystem can be seen as inter-dependant on the river in a larger spatial context. Without water both ecosystems will progressively deteriorate as it will not be able to maintain its equilibrium of survival without water from yearly rainfall in the catchment. The changing climate conditions, droughts, human settlements (and associated erosion in those areas), water users along the upper reaches of the river's catchment and the local farming activities of the farming sites all contribute to the "stress" placed on the ecosystems and the communities it supports This is only the South African perspective. The same considerations have also to be taken into consideration for Botswana. Adapting to conservation farming practices, better irrigation options and integrating croplands into being "utilised" by wildlife can support the survival of species and communities. **Cumulative monitoring** should be considered as an integrated planned option for farming and ecosystem stability and captured in a Farming Conservation Management and Monitoring Plan

9 MITIGATION MEASURES

9.1 Impact on Vegetation

9.1.1 Trees, shrubs, and forbs should be protected and incorporated into the layout, such as:

(i) No uncontrolled fires must be allowed in remaining areas of farm.

(ii) Ecotone areas must be established and maintained between the new open water-and existing natural ecosystem. This can be done by not removing more natural vegetation on Kleine Pos.

9.1.2 The vegetation must be left intact for 10 meters to both sides of the Full-Service Level which will develop along FSL of dam which will develop into an ecotone zone.

9.1.3 Permits for destruction of protected trees must be applied for.

9.1.4 Trees of Importance must be left intact. These includes large knob thorns, weeping willows and the single rock-fig.

9.2 Impact on Fauna

9.2.1 Watercourses outside development footprint, and located on the farm north-east, should be maintained as corridors. This is a function that LEDET should execute by informing and consultation with landowners.

9.2.2 The fences of Kleine Pos must not be further "strengthened" by further electrification to allow for small-medium mammal movement.

9.2.3 The number of large game species (on the remining area of Kleine Pos) need not to be adapted downwards to prevent trophic stress and impact on vegetation and resultant erosion.

9.3 Impact on Habitat

9.3.1 The connectivity and corridors for larger mammals has already been interrupted by previous anthropological development. For medium and small species, it will re-establish after completion of works and the "new aquatic habitat" created is seasonally established.

9.3.2 An inclusive **Farming Conservation Management and Monitoring Plan** to maintain the ecological and conservation integrity of the dam and to measure water quality (eutrophication, hyacinth pollution). This must form part of the Global-Gap Program.

9.4 Cumulative impact on farm

9.4.1 Farming and conservation both occupied space (read farms) in the landscape. These farms should be managed holistically for various sustainable resources (soil, water, natural flora and fauna). Thus, the cumulative objectives of a farm should be embodied in a single management plan. For purposes of clarification, it is referred to as the ***Farming Conservation Management and Monitoring Plans*** where a farm has various land uses.

10 SUMMARY OF FINDINGS

10.1 Farm was occupied for decades since 1906 by farmers. This left the farms (and surrounding/adjoining farms in spatial context) with a moderately-largely changed environment. From open bushveld savanna to closed bushveld savanna. Roads, fences, fires and overgrazing resulted in the changed vegetation structure and presence of encroacher species.

10.2 Change in the receiving environment was historically linked to human presence, change in farming activities, change in farming technology, change in farming practices (conservation farming currently), changes in market needs for products (food demand and food security). Each influenced the receiving environment.

10.3 The **Veldtype** is classified as **Least Concerned** and **is the largest** in the Limpopo Province. It is also found in adjoining Botswana and Zimbabwe.

10.4 **No** species of conservation concern are found permanently on the farms remaining habitat.

10.5 The **biodiversity category** is more correctly representing CBA2: Optimal.

10.6 **Corridors** are present and will continue to develop and function during the operational phase. Signs thereof was found on site.

10.7 **Ecological sensitivity** for site is Low.

10.8 The open water aquatic habitat created favor various wildlife species. It will also support the survival and breeding of species in the area that is dependent on open permanent water.

10.9 The development created an agriculture ecosystem linked by a changed natural area as an ecotone zone linking with the remaining natural habitat on the farm. This will provide corridors and support connectivity.

10.10 No erosion was found.

10.11 Indicator wildlife species were found on the farm. The farm provides habitat for species which is not a complete list of species for the region but when listed collectively with the adjoining farms provides a "broader" list of species as indication of the functioning of populations.

10.12 The location for the dam does not pose any adverse effects on the receiving environment. The open water will create a new aquatic habitat.

10.13 For the pipeline location the second option (in blue) is recommended as it will have a lower impact on the receiving environment. This contributes to the biodiversity guidelines.

11 RECOMMENDATIONS

It is recommended that the following is incorporated in the EIR:

VEGETATION

11.1 The two existing farm roads must be used for construction purposes. No new roads must be developed outside the Area of Influence for construction. Turn-around locations must be identified by the ECO for project together with contractor and located in the footprint identified.

11.2 Trees of Interest and the single Rock-fig tree must not be removed.

11.3 Option two (indicated in red on Figure 3 & 17) is recommended for the pipeline.

11.4 The vegetation for a distance of 10 meters on both sides along the Full-Supply-Level must not be removed.

11.5 An eradication plan must be compiled and submitted to CA on the control of the Category 1 Exotic Aquatic Invader (hyacinth).

GENERAL

11.6 That the mitigation measures in this report is incorporated in the environmental impact assessment-and environmental management reports.

11.7 That all mitigated and other issues are incorporated and implemented through an environmental management plan.

11.8 That a ***Farming Conservation Management and Monitoring Plan*** is compiled and audited bi-annually. These audited reports can be submitted with the Global G. A. P. inspections. This Plan must be compiled by a conservation specialist and should be updated every year to incorporated new farming activities and techniques. This will serve as support document for the preservation and promotion of Biodiversity.

11.9 As safeguard it is recommended that monitoring for soil "health" and water quality is conducted every year for pollution detection and assessment and included in the above plan.

COMPLIANCE MONITORING

11.10 That an independent environmental assessment practitioner is appointed as environmental control officer (ECO) to report and monitor bi-annually on the implementing of the EMP for twelve months to audit compliance and assess monitoring results as benchmarks for the future.

11.11 That the environmental management plan is implemented and updated with such information as deemed necessary during the operational phase for a period of 24 months from operational phase.

11.12 That the ECO is appointed until such time as all the mitigating measures has been implemented and activated and the final ECO report has been submitted to LEDET: Compliance Monitoring and a completion certificate has been issued.

12 STATEMENT

12.1 The area has been progressively altered by past human activities.

12.2 The portion of Kleine Pos (±558ha) can still function as CBA2: Optimal.

12.3 The aquatic habitat that will contribute to CBA2 contribution and maintenance. It will also create an ecological "island footprint".

12.4 The Conservation Value of the area is that of Low with average species richness, no presence of exotic vegetation was found but evidence of human related disturbances observed.

12.5 Habitat was altered by overgrazing and fire. It should be placed in context to the region (including Botswana) to interpret the level of change on the effect thereof on biodiversity, this

is mostly relevant for raptors and vultures. The remaining areas of the farm can still function as part of the ecosystem.

12.6 The availability of similar habitats under conservation (private initiative) protection in the immediate surrounds was used in consideration of assessments in this report.

12.7 The proposed development on the preferred footprint on the farm will not have an irreparable influence on the terrestrial ecosystem and biodiversity which can still function and support- and being supported by the aquatic ecosystem created bordering on existing CBA Optimal areas.

12.8 The current species richness will not be affected and/or specific communities adversely effectuated in such a manner that they will lead to their demise. The opposite is likely to occur with the open water created.

12.9 No species of conservation concern will be negatively affected.

12.10 Connectivity and corridors will still be able to function (at same level as before development) and will be supported by the open water aquatic habitat.

STATEMENT OF INDEPENDENCE

I, Johannes Claassens, as the appointed terrestrial ecosystem specialist, hereby declare the correctness of the information in this compliance statement, and that I:

- Meet the general requirements to be independent and have no business, financial, personal or other interest in the proposed development and that no circumstances have occurred that may have compromised my objectivity; and
- Am aware that a false declaration is an offence in terms or regulation 48 of the EIA Regulations (2014).

12 September 2023

…….. ……

J. Claassens Date

SACNASP Registered: No 137875 (Conservation Science)

EXPERIENCE

Mr. Claassens worked as professional conservationist for 23 years in governmental Conservation, Environmental and Tourism institutions (Deputy Director). His experience includes being the Regional Director Conservation, Environmental and Tourism for the Limpopo Province areas bordering onto Botswana, Zimbabwe and Kruger National Park. Before leaving governmental service, he was Head: Scientific Support Services for the Limpopo Province (game censuses, endangered species breeding programs, species protection, environmental impact assessment, habitat monitoring and veldt carrying assessment, breeding projects, etc.). Extensive knowledge of problem animal control (elephant, lion, leopard, buffalo and hippopotamus) in lowveld and along border of National Parks and international borders with Botswana and Zimbabwe.

Established the Directorate: Environmental Impact for LEDET.

Founded the specialist environmental company Tua Conserva in 2000 after working free-lance for three years abroad. Being actively involved in wildlife industry and environmental issues since. Company is actively involved throughout South Africa and other countries as mentioned. Have a professional staff component of three experienced personnel with combined field knowledge of 96 years.

Compiled Environmental Spatial Rational for Waterberg District Municipality (the largest of six district municipalities in Limpopo Province)

Compiled State of the Environment, Policy and Guidelines for Lephalale-and Mookgophong municipalities in Limpopo Province.

Ecological-and Conservation Management Plans for provincial nature reserves and game farms.

Ecological surveys for community projects, conservancies, protected areas and game ranches.

Ecological reports for relocation of elephant, black-and white rhinoceros, large carnivores and endangered herbivores (Roan-, Sable antelope etc.)

Specialist on large predators' management.

Ecological viability studies for projects in Namibia, Botswana, Malawi and Zambia.

Ecological viability studies for ecotourism projects in Mozambique's Gaza-and Inhambane Provinces.
Compiled the Biodiversity survey on contract for South Africa National Parks for new national park (Blyderiver) that was promulgated by the Cabinet in 2004.
Compiled the Protocol Document for introduction of Protected species into Mauritius.

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ECOLOGICAL DEFINITIONS

Alien invasive species – are plants or animals that are introduced by man, accidentally or intentionally, outside of their natural geographic range into an area where they are not naturally present. They are often introduced as a result of the globalisation of economies, for instance by ships, shipment of wood products infested with insects, or the transport of ornamental plants that then establish themselves into the wild and spread in a manner that modifies ecosystems, habitats or species and is difficult to control e.g., Lantana camara. Not all introduced alien species are invasive and not all invasive species are necessarily alien.

Alien species – (a) a species that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside of its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

Allelopathy - is a biological phenomenon by which an organism produces one or more biochemicals that influence the germination, growth, survival, and reproduction of other organisms. These biochemicals are known as **allelochemicals** and can have beneficial (positive allelopathy) or detrimental (negative allelopathy) effects on the target organisms and the community.

Anthropogenic – an activity originating due to human activity.

Area of influence – the spatial extent of all direct, indirect, and cumulative impacts and risks on receptors by project activities, including all ancillary project components. This can be within and/or extend beyond the development footprint of the proposed project.

Aquatic ecosystem – for the purposes of these guidelines, an aquatic ecosystem is an assemblage of living organisms in an environment that is permanently or periodically inundated by flowing or standing (fresh, brack, or saline) water, or which has soils that are permanently or periodically saturated within 0.5 m of the soil surface, the interactions between them and their physical environment.

Avifauna – taken to mean the birds (Class: Aves) of a specific area (region, habitat etc) or time period.

Biodiversity corridor – a geographically defined area which provides connectivity between landscapes, ecosystems, and habitats, natural or modified, and ensures the maintenance of biodiversity and ecological and evolutionary processes.

Biodiversity Management Plan – plan adopted in terms of NEMBA, to provide for the long-term survival of a species in the wild and to provide a platform for an implementing organisation or responsible entity as appointed by the Minister to monitor and report on the progress regarding the implementation of the BMP.

Biodiversity specialist – there is no one 'biodiversity specialist'. Rather, the term is used to cover a range of specialists in the field of biodiversity, from broad areas of expertise (e.g., terrestrial / marine / freshwater ecologist) to specialised expertise (e.g., botanist, mammologist, herpetologist, avian specialist, conservationist, ichthyologist etc.).

Biological diversity or biodiversity – the variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.

Biomes – groupings based on dominant forms of plant life and prevailing climatic factors. Biomes have plants and/or animals living together with some degree of permanence, and one can observe large-size patterns in global plant cover. Biomes broadly correspond with climatic regions as moisture and temperature strongly influence plant establishment and survival, although other environmental controls are sometimes important.

Bioregional plan – plan adopted in terms of NEMBA, highlighting CBA's, ESA's, and other natural areas, and in line with the Guidelines for Bioregional Plans published in terms of

NEMBA. They are the biodiversity sector's input into a range of multi-sectoral planning and assessment processes They are based on systematic biodiversity plans developed using best available science, and are intended to inform land-use planning, environmental assessments, and natural resource management by a range of sectors whose policies and decisions impact on biodiversity, and to support and streamline environmental decision-making.

Catchment – in relation to a watercourse or watercourses or part of a watercourse, means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points.

Coprophagous – an organism that consumes the faeces/excrement of another animal, for example dung beetles.

Critical Biodiversity Areas (CBAs) – sites selected to be the most efficient configuration in the landscape for meeting biodiversity targets of representivity and persistence. CBAs are irreplaceable or 'important and necessary' in terms of meeting targets for biodiversity patterns and processes and are large enough and connected enough to be functional and persist in the long term.

Cumulative impact – in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Development footprint - the surface area of the proposed development at the applicant's preferred site, including all associated activities and infrastructure (e.g., vegetation clearing, buildings, stormwater infrastructure, roads, gardens etc.)

Direct impact – an impact that occurs through direct interaction of an activity with an environmental, social, or economic component (e.g., discharge by any industry of an effluent from their effluent treatment plant into a river that results in a reduction in water quality and a die off of fish).

Ecological corridor - a clearly defined geographical space that is governed and managed, and/or required, over the long term to maintain or restore effective ecological connectivity. The following terms are often used similarly: 'linkages', 'safe passages', 'ecological connectivity areas', 'ecological connectivity zones', and 'permeability areas'.

Ecological drivers – ecological processes that maintain specific ecosystems and underpin their persistence (e.g., fire in fynbos, grassland, and savanna).

Ecological functioning – the roles, or functions, that species (of plants, animals, and microbes) and the effects of their activities (e.g., feeding, growing, moving, excreting waste etc) play in the community or ecosystem in which they occur. In this approach, physiological, anatomical, and life history characteristics of the species are emphasised. The term "function" is used to emphasize certain physiological processes rather than discrete properties, describe an organism's role in a trophic system, or illustrate the effects of natural selective processes on an organism.

Ecological processes - the interactions between plants, animals, and the non-living components (e.g., climate, rocks etc.) of the environment. These processes are crucial for maintaining healthy ecosystems and supporting the long-term persistence of biodiversity. Ecological processes include, amongst others, population abundance, range shifts (e.g., season or long-term migration), community structure and species turnover, trophic interactions, pollination, invasive species, shrub expansion/loss, forest expansion/loss, fire (frequency, severity, timing, extent), pathogens, pest outbreaks, acidification, succession, nutrient cycling, herbivory, phenology, and primary productivity/biomass. Various anthropological, atmospheric, biogeochemical, geomorphic, hydrological, and oceanographic processes also exist, but these are not ecological in nature. Ecological processes such as primary producers, respiration, energy-, carbon-, water and nutrient flow through food webs, reproduction and composition are represented as rates of change repeated measurement over time.

Ecoregions – Regions that share similar ecological characteristics and are based on the understanding that ecosystems and their biota display regional patterns that mirror causal factors such as climate, soil, geology, physical land surface and vegetation.
Ecosystem – a dynamic complex of animal, plant and micro-organism communities and their non-living environment interacting as a functional unit.
Ecosystem keystone species – species whose influence on ecosystem function and diversity are disproportionate to their numerical abundance. Although all species interact, the interactions of some species are more profound and far-reaching than others, such that their elimination from an ecosystem often triggers cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the food web.
Ecotone – a transition area between two habitat types or where two communities meet and integrate. It may be narrow or wide, and it may be local or regional (e.g., the transition between forest and grassland ecosystems).
Endemic – a species that is naturally restricted to a particular, well-defined region. This is not the same as the medical definition, which is 'occurring naturally in a region'.
Environmental authorisation – the authorisation by a competent authority of a listed activity or specified activity in terms of an Act, and includes a similar authorisation contemplated in a specific environmental management Act.
Environmental impact assessment – a systematic process of identifying, assessing, and reporting environmental impacts associated with an activity and includes basic assessments and S&EIR (see below for definition).
Euthanise – the act of inducing humane death in an animal by a method that induces rapid loss of consciousness and death with a minimum of pain, discomfort, or distress.
Fatal flaw – in the context of EIA, is a problem, issue, or conflict (real or perceived) that could result in the application for a proposed development being rejected or modified by the competent authority. When related to biodiversity, a fatal flaw is usually due to an anticipated impact that would result in irreplaceable and / or irreversible loss of biodiversity and this should ideally be identified during the screening stage (Brownlie, 2005).
Heterogeneity – the difference or diversity in kind or arrangement of component elements or constituents that occur across both space and time. In the context of habitat these elements can be topography, soil chemistry, temperature, moisture, and biological factors.
Indigenous species (NEMBA) – a species that occurs, or has historically occurred, naturally in a free state in nature within the borders of the Republic but excludes a species that has been introduced in the Republic because of human activity; the bontebok *Damaliscus pygragus pygargus* is indigenous to only South Africa, but according to a previous definition would only be indigenous to the Western Cape.
Indigenous – occurring naturally in a defined area (contrast with endemic) – the area must be specified and is normally taken to the historical range of a species, notwithstanding the effects of naturally initiated range expansions/contractions. Thus, the baobab (Adansonia digitata) is indigenous but not endemic to South Africa, but it is not indigenous to KwaZulu-Natal.
Indirect impact - an impact that occurs through indirect interaction of an activity with an environmental, social, or economic component. Indirect impacts are induced by, or 'by-products' of, project activities (e.g., discharge by any industry of an effluent from their effluent treatment plant into a river that results in a reduction in water quality and a die off of fish, which leads to a reduction in available fish for communities along the river who rely on such fish as their primary source of protein. The indirect impact is on the communities along the river, not the fish. The impact on the fish is direct).
Invertebrate – an animal without a vertebral column (backbone), such as an arthropod, mollusc, annelid.
Irreversibly modified- The ecosystem has been modified completely, with an almost complete loss of composition and structure. All or most ecological function has been destroyed and the

changes are irreversible. Examples include urban areas, industrial areas, mined areas, roads, dams, canalised rivers.

IUCN Red List Categories and Criteria – the threatened species and ecosystem categories used in Red Data species, based on the IUCN Red List categories and criteria. Books and Red Lists have been in place for almost 30 years. The IUCN Red List Categories and Criteria provide an easily and widely understood system for classifying species and ecosystems at high risks of global extinction, so as to focus attention on conservation measures designed to protect them.

Key Biodiversity Areas – 'sites contributing significantly to the global persistence of biodiversity. They represent the most important sites for biodiversity conservation worldwide and are identified nationally using globally standardised criteria and thresholds', in terrestrial, freshwater and marine ecosystems.

Landowner – a person or authorised representative of such a person, that is the owner of the land, is in control of the land or that has the right to use the land.

Mitigation – means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible.

Moderately modified / semi-natural - Ecological function is predominantly unchanged even though composition and structure have been compromised. Examples include rangelands that have been moderately overgrazed, "improved" pastures, old lands (previously ploughed) that have recovered some of their structure and function, areas moderately infested with invasive plants.

NEMA EIA regulations – R324-R327 as amended on 7 April 2017, in terms of Chapter 5 of NEMA.

Permit – a permit issued in terms of Chapter 7 of NEMBA; or any other legislation for that matter.

Preferred site - the applicant's preferred location for the proposed development.

Protected area – any of the protected areas referred to in section 9 of the National Environmental Management: Protected Areas Act, 2003.

Provincial conservation authority – the provincial department or provincial organ of state responsible for the conservation of biodiversity in a province.

Quaternary catchment – a fourth order catchment in a hierarchal classification system in which a primary catchment is the major unit. Each primary catchment in South Africa has been sub-divided into secondary catchments, which in turn have been divided into tertiary. All tertiary catchments have been divided into interconnected quaternary catchments. A total of 1946 quaternary catchments have been identified for South Africa, Swaziland, and Lesotho. These sub-divided catchments provide the main basis for hydrological assessment and integrated catchment planning and management.

RAMSAR site – a wetland site designated to be of international importance under the Ramsar Convention. The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO, which came into force in 1975.

Rapid Biological Assessments – a cost-effective solution for reliable, standardized, and replicable methodologies for quickly assessing key ecosystem values that typically requires at least one week per site.

Receptor – in the context of impact assessments on biodiversity, receptors are environmental components (e.g., flora/ fauna species / communities or habitat type) that may be affected, adversely or beneficially, by the proposed project activities within the area of influence.

RED DATA: Definitions of the national Red List categories

> **Extinct (EX)** A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.

Extinct in the Wild (EW) A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.

Regionally Extinct (RE) A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.

Critically Endangered, Possibly Extinct (CR PE) Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.

Critically Endangered (CR) A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.

Endangered (EN) A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.

Vulnerable (VU) A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.

Near Threatened (NT) A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.

Critically Rare A species is Critically Rare when it is known to occur at a single site, but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.

Rare A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows:

- Restricted range: Extent of Occurrence (EOO) <500 km^2, OR
- Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km^2, OR
- Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR
- Small global population: Less than 10 000 mature individuals.

Declining A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.

Least Concern A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.

Data Deficient - Insufficient Information (DDD) A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.

Data Deficient - Taxonomically Problematic (DDT) A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.

Not Evaluated (NE) A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status.

Rehabilitation – in the context of EIA, this means the repairing of a habitat / ecosystem so that processes and productivity remain functional, but it does not specifically imply that the original condition of the habitat / ecosystem will be restored (see restoration). Rehabilitation of a habitat / ecosystem is easier to achieve than restoration. For example, an opencast mining pit established on pristine rocky grassland in the Highveld can be rehabilitated after mine closure to serve as grazing pastures for cattle but cannot be fully restored to pre-mining ecological state.

Restoration – in the context of EIA, this means recovering a habitat / ecosystem that has been degraded or destroyed by an activity / action to its pre-existing condition prior to the activity / action that caused the degradation or destruction. See also “rehabilitation” above for a distinction between these terms.

Riparian habitat – includes the physical structure and associated vegetation of the areas adjacent to a watercourse which are commonly characterised by a high-water table sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

S&EIR – the scoping and environmental impact reporting process contemplated in regulation 21 to regulation 24 of the NEMA EIA regulations 2014, as amended on 7 April 2017.

Scoping – the scope of an environmental assessment is defined by the range of issues and alternatives to be considered, and the approach towards the assessment that will follow. Through scoping, priorities are set, efficiency is improved and focus for advice to decision-makers is provided by limiting the environmental assessment procedure to significant issues and reasonable alternatives (scoping may well be considered the critical stage in the IEM procedure. The success of a proposal will largely be determined by the adequacy of the scoping exercise).

Screening – in the context of integrated environmental management (IEM), screening determines whether or not an individual development proposal requires further environmental assessment, and if so, what level of assessment is appropriate. Screening is thus a decision-making process that is initiated during the early stages of the development of a proposal.

Severely modified - Loss of composition, structure and ecological function is extensive. Examples include cultivated land, subsistence agriculture, old lands (previously ploughed) that have not yet recovered any of their structure or function, severely overgrazed rangelands,

severely eroded areas, turf-covered recreation areas (such as golf courses), low density settlement, areas very densely infested with certain invasive plants.

Soil Biodiversity – Where most biodiversity of natural and agricultural systems reside. Food web interactions among soil biota (including plant roots) have large effects on quality of crops and vegetation (affecting human and animal nutrition), the incidence of soil-borne plant and animal pests and diseases (affecting production/growth levels), and the beneficial organisms that e.g., cycle nutrients or are predators of pest species. This is caused by availability of water, nutrients and certain microorganisms at the root surface is mediated by such interactions. Is important for sustainable use of resources. Is one of the biggest "reservoirs" for biodiversity on earth.

Specialist – a person that is generally recognised within the scientific community as having the capability of undertaking, in conformance with generally recognised scientific principles, specialist studies or preparing specialist reports, including due diligence studies and socio-economic studies inter alia.

Species – a kind of animal, plant or other organism that does not normally interbreed with individuals of another kind, and includes as subsets, any subspecies, cultivar, variety, geographic race, strain, hybrid, or geographically separate population.

Taxon – (plural taxa) a taxonomic group of any rank, such as a species, family, or class.

Terrestrial ecosystems – An assemblage of living organisms that occur on land, the interactions between them and their physical environment.

Threatened ecosystem – An ecosystem type that has been classified as Critically Endangered, Endangered or Vulnerable, based on an analysis of ecosystem threat status. A threatened ecosystem has lost or is losing vital aspects of its composition, structure, or function. Threatened ecosystems are listed in terms of the Biodiversity Act by the Minister of Environmental Affairs.

Threatened species – species that are facing a high risk of extinction. Any species classified in the IUCN categories Critically Endangered, Endangered or Vulnerable is a threatened species.

Translocation – a deliberate and mediated movement of wild individuals or populations from one location to another.

Water management area – an area established as a management unit in the national water resource strategy within which a catchment management agency will conduct the protection, use, development, conservation, management, and control of water resources for the country as a whole.

Watercourse – a river / spring or a natural channel in which water flows regularly / intermittently, or a wetland, lake, or dam into which, or from which, water flows as well as any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse.

WET-Health – an assessment method for determining the health or present ecological state of wetlands using indicators of modifications to geomorphology, hydrology, and wetland vegetation.

WET-IHI – an assessment method for determining the present ecological state of wetlands using indicators of modifications to geomorphology, hydrology, water quality and wetland vegetation.

Wetland – land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.