The Terrestrial Ecology Baseline & Impact Assessment for the Transalloys Solar Photovoltaic (PV) Facility

Emalahleni, Mpumalanga Province

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CLIENT

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a terrestrial ecology (fauna and flora) baseline and impact assessment for the proposed 55 MW Solar Photovoltaics (PV) Energy Facility at Transalloys, Mpumalanga Province. The project area is located approximately 10 km west of Emalahleni, in the Mpumalanga Province.

In order to assess the baseline ecological state of the area and to present a detailed description of the receiving environment, both a desktop assessment as well as a field survey were conducted during July 2022. Furthermore, the desktop assessment and field survey both involved the detection, identification and description of any locally relevant sensitive receptors and habitats, and the manner in which these sensitive features may be affected by the proposed development was also investigated. It is important to note that this assessment considers terrestrial fauna and flora with the exclusion of avifauna, as this aspect is considered as part of a separate assessment.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (No. 326, 7 April 2017) of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020 as well as the Government Notice 1150 in terms of NEMA dated 30 October 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation”. The National Web based Environmental Screening Tool has characterised the terrestrial biodiversity theme for the area as ‘Very High’ sensitivity (National Environmental Screening Tool, 2022).

The purpose of conducting the specialist study is to provide relevant input into the overall Environmental Authorisation application process, with a focus on the proposed activities and their impacts associated with the projects. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Registered Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making as to the ecological viability of the proposed projects.

1.2 Project Description

Transalloys (Pty) Ltd proposes to develop PV Energy Facility with a capacity of up to 55 MW and associated infrastructure on Portions 34 and 35 of the Farm Elandsfontein 309 JS and Portions 20 and 24 of the Farm Schoongezicht 308 JS within the Emalahleni Local Municipality. The subject property is located adjacent to the Transalloys existing smelter complex on Clewer Road 1034 in Emalahleni and the site is within the Emalahleni Renewable Energy Development Zone (REDZ 9). The purpose of this Solar PV Energy Facility is to partially meet Transalloys’ current electricity demands and future expansion requirements. The plant will be a captive generating plant from which generated electricity will be fed directly into the existing Transalloys’ smelter complex for direct consumption.

The Solar PV Energy Facility will include the following:

- Solar PV array comprising PV modules and mounting structures (Bifacial panels with single axis tracking system);
- Inverters and transformers;
- Cabling between the project components;
- 33 kV underground powerline;

- On-site facility substation and a power line to connect the solar PV facility to the existing Transalloys Substation;
- Security office, operations and control, and maintenance and storage laydown areas; and
- Access roads and internal distribution roads.

1.3 Project Area of Influence

A 777 ha Project Area of Influence (PAOI) is delineated to incorporate the proposed development footprint and represents the total area to be assessed. The proposed development footprint is approximately 67.9 ha and falls within a development area of 100 ha, which is situated on a 235 ha property. A map of the PAOI in relation to the local region is presented in Figure 1-1, and a detailed map of the PAOI and associated development area is presented in Figure 1-2.

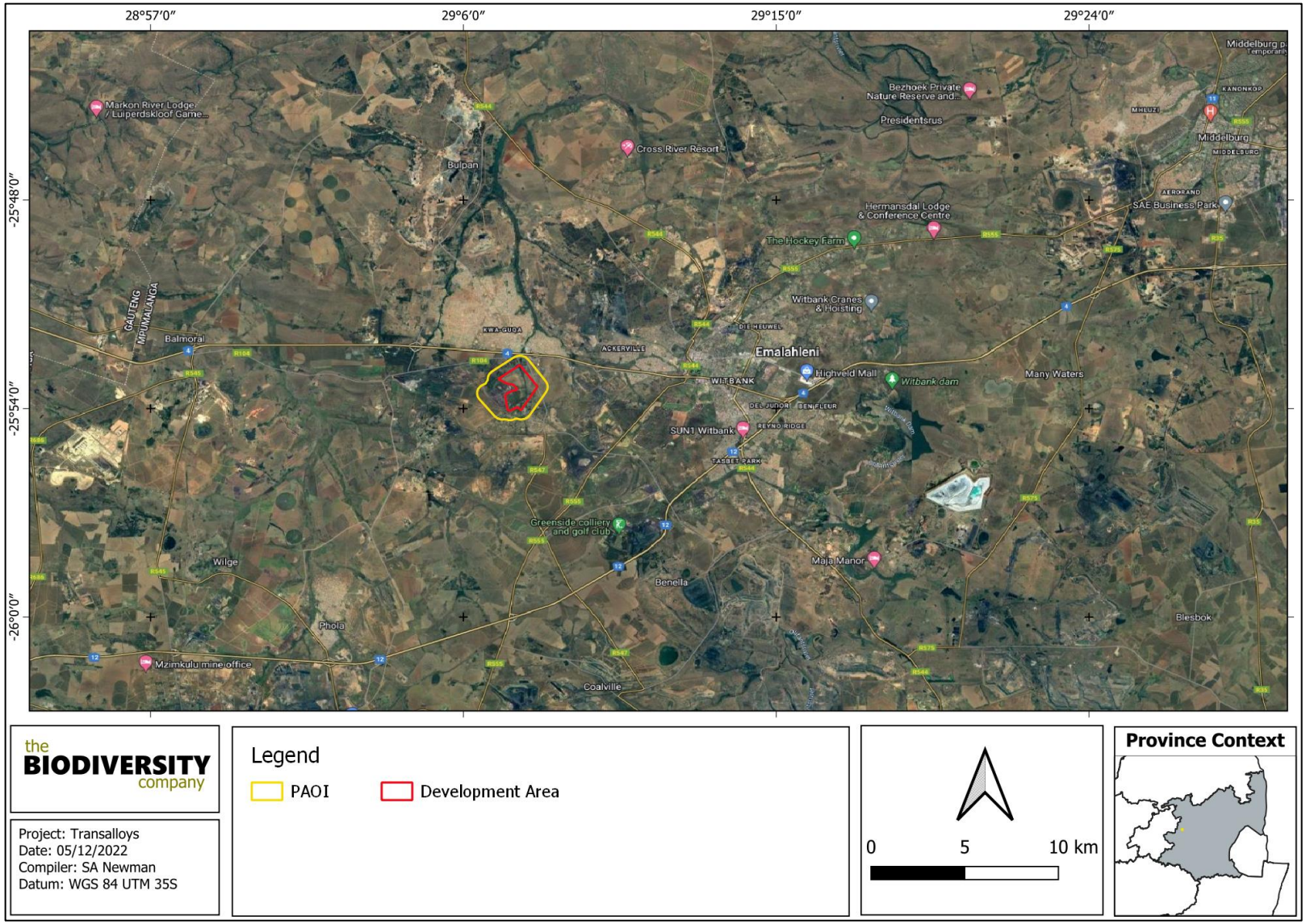


Figure 1-1 Map illustrating the regional context of the PAOI

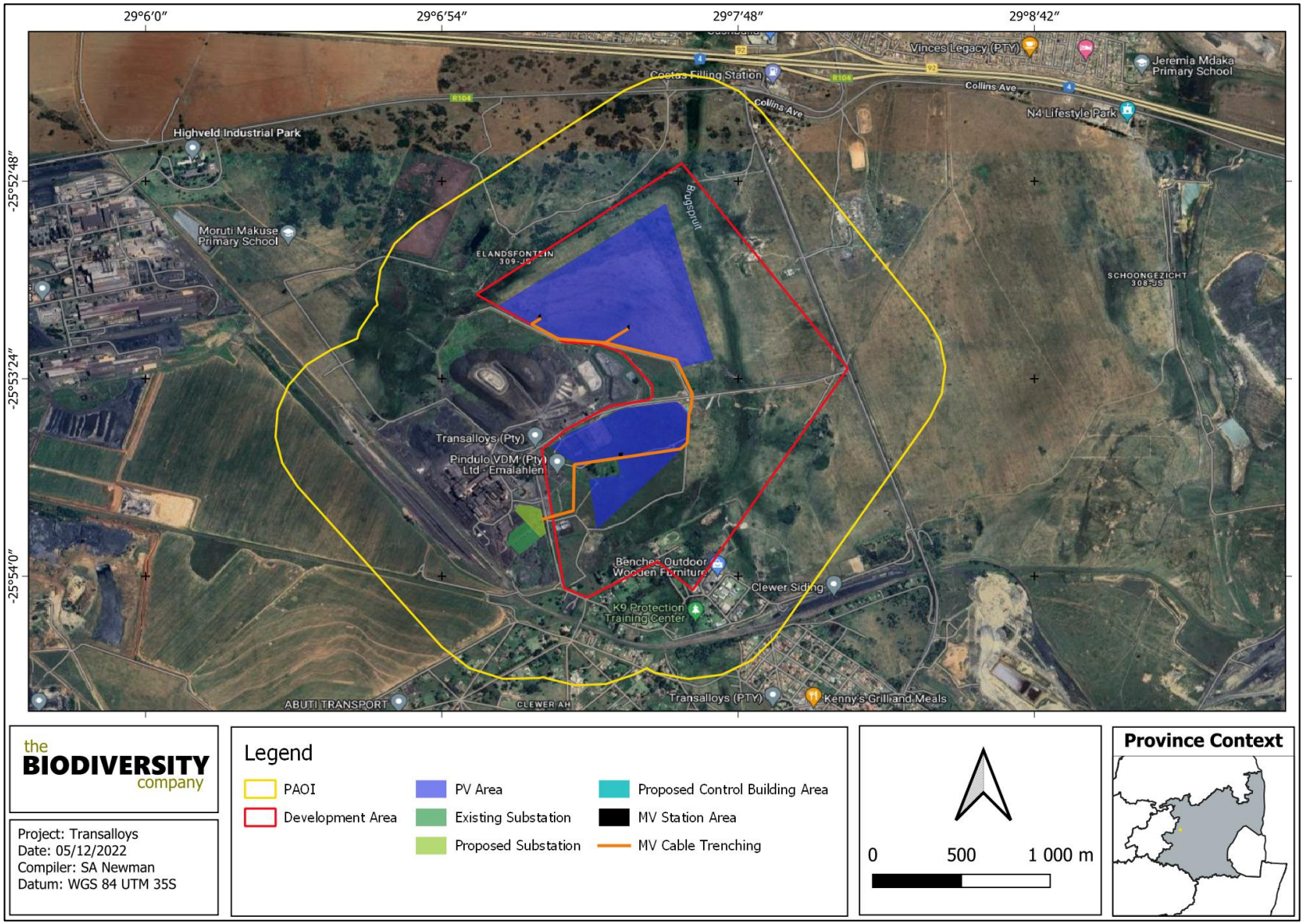
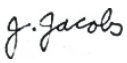


Figure 1-2 Map illustrating the details of the PAOI

1.4 Specialist Details

Report Name	**The Terrestrial Ecology Baseline & Impact Assessment for the Transalloys Solar Photovoltaic (PV) Facility**
Reference	Transalloys Solar PV Project
Submitted to / Client	savannah environmental
Report Writer (Fieldwork)	Jan Jacobs 
	Jan Jacobs completed his BSc Honours degree in Biodiversity and Conservation Biology at the University of the Western Cape in 2016. He completed his Master of Applied Science degree in Nature Conservation at the Tshwane University of Technology in 2022.
Report Writer	Carami Burger 
	Carami Burger has completed her Bachelor of Science Honours degree in Ecological Interactions and Ecosystem Resilience. Carami is an ecologist and has completed various studies as part of Basic Assessments and Environmental Impact Assessments.
Reviewer	Andrew Husted 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

1.5 Scope of Work

The principle aim of the assessment was to provide information to inform on the risk that the proposed activity has on the associated ecosystems within the PAOI. This was achieved through the following:

- Identification and description of any sensitive receptors that occur in the PAOI, and the manner in which these sensitive receptors may be affected by the proposed activity;
- Conducting of a desktop assessment to identify the relevant ecologically important geographical features within or nearby to the PAOI;
- Conducting of a desktop assessment to compile an expected species list and identify flora and fauna Species of Conservation Concern (SCC) that may occur within the PAOI;
- Conducting of a field survey to ascertain the baseline species composition of the present flora and fauna community within the PAOI;
- Delineation and mapping of the habitats and their respective sensitivities that occur within the PAOI;
- Identification of the manners in which the proposed project impacts the flora and fauna communities, and an evaluation of the level of risk that these potential impacts present; and
- The prescription of mitigation measures and associated recommendations for the identified risks.

2 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 2-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 2-1 A list of key legislative requirements relevant to biodiversity and conservation in the Mpumalanga Province

Region	Legislation / Guideline
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
	Threatened or Protected Species Regulations and lists (No. R. 152 of Government Gazette No. 29657 of 23 February 2007, and No. R. 1187 of Government Gazette No. 30568 of 14 December 2007)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43110 (March 2020); and GNR 1150 of Government Gazette 43855 (October 2020)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and Alien and Invasive Species List 2014-2020, published under NEM:BA
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)

Provincial	Mpumalanga Parks Board Act 6 of 1995
	Mpumalanga Conservation Act, 1998 (Act 10 of 1998)
	Mpumalanga Tourism and Parks Agency Act, No 5 of 2005
	Mpumalanga Biodiversity Sector Plan

3 Definitions

3.1 Species of Conservation Concern

In accordance with the National Red List of South African Plants website, managed and maintained by the South African National Biodiversity Institute (SANBI), a Species of Conservation Concern (SCC) is a species that has a high conservation importance in terms of preserving South Africa's rich biodiversity. This classification covers a range of red list categories as illustrated in Figure 3-1 below.

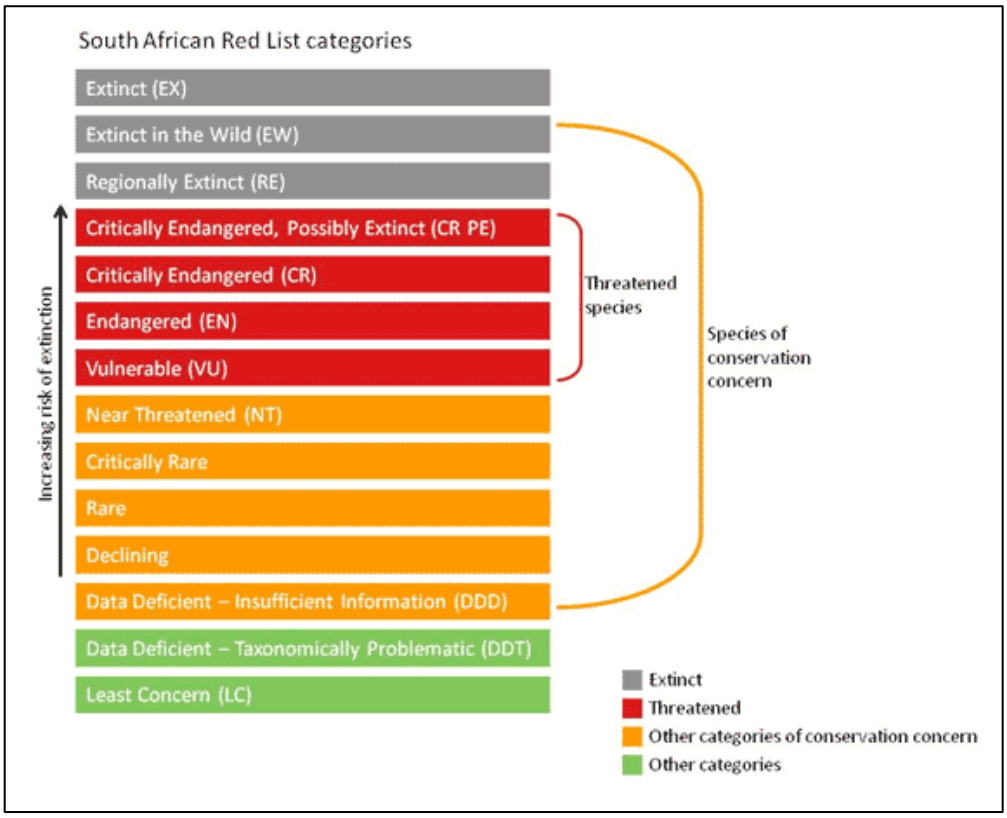


Figure 3-1 Threatened species and Species of Conservation Concern (SANBI, 2016)

South Africa uses the internationally endorsed International Union for Conservation of Nature (IUCN) Red List Categories and Criteria (IUCN, 2012). This scientific system is designed to measure species' risk of extinction and its purpose is to highlight those species that are in need of critical conservation action. As this system has been adopted from the IUCN, the definition of an SCC as described and categorised above is extended to all red list classifications relevant to fauna as well as the IUCN categories, for the purposes of this report.

3.2 Protected Species

Protected species include both floral and faunal species that are protected according to some form of relevant legislation, be it provincial, national, or international. Provincial legislation may include that published in the form of a provincial ordinance, bill, or act, and national legislation includes that which is published in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) or the

National Forest Act (Act No. 84 of 1998). Relevant international legislation includes the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2021).

4 Methods

4.1 Desktop Assessments

The desktop assessment was principally undertaken using a Geographic Information System (GIS) to access the latest available spatial datasets to develop digital cartographs and species lists. These datasets and their respective dates of publishing are provided below.

4.1.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into GIS software to establish how the proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- Mpumalanga Biodiversity Sector Plan (MBSP) (MTPA, 2014);
- 2018 National Biodiversity Assessment (NBA, 2018) (Skowno *et al.,* 2019);
- Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018);
- South Africa Protected and Conservation Areas Databases, 2021 (DFFE, 2021 & DFFE, 2021a);
- National Protected Areas Expansion Strategy, 2016 (DEA, 2016);
- Important Bird and Biodiversity Areas, 2015 (Marnewick *et al.,* 2015);
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Awuah, 2018 & Van Deventer et al., 2019);
- National Freshwater Priority Areas, Rivers and Wetlands, 2011 (Nel *et al.,* 2011); and
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021).

Descriptions of these datasets, and their associated relevance to terrestrial biodiversity, are provided below.

4.1.1.1 Provincial Conservation Plan

The MBSP CBA map delineates Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas, Protected Areas, and areas that have been irreversibly modified from their natural state (MTPA, 2014). The MBSP uses the following terms to categorise the various land used types according to their biodiversity and environmental importance:

- Critical Biodiversity Area (CBA);
- Ecological Support Area (ESA);
- Other Natural Area (ONA);
- Protected Area (PA); and
- Moderately or Heavily Modified Areas (MMA's or HMA's).

  - **CBAs** are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (MTPA, 2014). Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met.

Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017). CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (MTPA, 2014).

- The Mpumalanga Biodiversity Sector Plan (MBSP) specifies two different CBA areas, **Irreplaceable CBA's and Optimal CBA's**. Irreplaceable CBA's include: (1) areas required to meet targets and with irreplaceability biodiversity values of more than 80%; (2) critical linkages or pinch-points in the landscape that must remain natural; or (3) critically Endangered ecosystems (MTPA, 2014).

- **ESAs** are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic (SANBI-BGIS, 2017).

- **ONAs** consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (SANBI-BGIS, 2017).

- **Moderately or Heavily Modified Areas** (sometimes called 'transformed' areas) are areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets (MTPA, 2014). Some of these areas may still provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly, and in many cases irreversibly, compromised.

4.1.1.2 National Biodiversity Assessment 2018

The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the then Department of Environmental Affairs (DEA), and other stakeholders including scientists and biodiversity management experts throughout the country over a three-year period (Skowno *et al.,* 2019).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The two headline indicators assessed in the NBA are Ecosystem Threat Status and Ecosystem Protection Level (Skowno et al., 2019).

- **Ecosystem Threat Status (ETS)** outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), based on the proportion of each ecosystem type that remains in a good or healthy ecological condition (Skowno et al., 2019). CR, EN, or VU ecosystem types are collectively referred to as threatened ecosystems.

- **Ecosystem Protection level (EPL)** informs on whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected (NP), Poorly Protected (PP), Moderately Protected (MP) or Well Protected (WP), based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al.,* 2019). NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

4.1.1.3 South Africa Protected and Conservation Areas

The South African Protected Areas Database (SAPAD) and the South Africa Conservation Areas Database (SACAD) contains spatial data critical for the conservation of South Africa's natural resources. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection,

such as conservation areas. These databases are updated regularly and form the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act (Act 57 of 2003).

Formally protected areas are categorised according to several different types, and each type is subject to specific legislative restrictions and management guidelines, many of which restrict development to some degree. Generally, these areas are assigned a buffer of influence of between 5 and 10 km (the latter pertaining to National Parks and World Heritage Sites), within which certain laws and management actions may apply. Many of the protected area types are further classified into sub-types as well. Formally protected area types include:

- National Parks;
- Nature Reserves;
- Special Nature Reserves;
- Mountain Catchment Areas;
- World Heritage Sites;
- Protected Environments;
- Forest Nature Reserves and Forest Wilderness Areas;
- Specially Protected Forest Areas; and
- Marine Protected Areas.

4.1.1.3.1 National Protected Areas Expansion Strategy

The Department of Environmental Affairs (now the Department of Forestry, Fisheries and the Environment) led the development of the National Protected Areas Expansion Strategy (NPAES) in consultation with the protected area agencies and other key private and public sector stakeholders. The need for the development of the NPAES was established in the National Biodiversity Framework in 2009. The NPAES is a 20-year strategy with 5-year implementation targets aligned with a 5-year revision cycle. (DEA, 2016).

South Africa's protected area network currently falls far short of representing all ecosystems and maintaining healthy functioning ecological processes. In this context, the goal of the NPAES is to achieve cost effective protected area expansion thus enabling better ecosystem representation, ecological sustainability, and resilience to climate change. A comprehensive set of priority areas was compiled based on the priorities identified by provincial and other agencies in their respective protected area expansion strategies. These focus areas are generally large, intact and unfragmented and are therefore of high importance for biodiversity, climate resilience and freshwater protection (DEA, 2016).

4.1.1.4 Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are sites of international significance for the conservation of the world's birds, and other conservation significant species, as identified through multi-stakeholder processes using globally standardised, quantitative, and scientifically agreed criteria. These sites are also Key Biodiversity Areas; sites that contribute significantly to the global persistence and health of biodiversity (Birdlife, 2020).

The selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge on the sizes and trends of bird populations. The criteria ensures that sites selected as IBAs have true significance for the international conservation of bird populations, and it also ensures classification consistency among sites at all geographic levels.

IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. Approximately 60% of the IBA network is unprotected, leaving these sites vulnerable to habitat transformation and mismanagement. Additionally, habitats within many IBAs are poorly managed, leading to habitat degradation, especially in unprotected sites. (BirdLife SA, 2022)

4.1.1.5 Aquatic Habitats

Three inland aquatic habitat datasets are used to identify the ecological sensitivity of the project area with regards to local aquatic habitat, which is critical for the healthy functioning of both aquatic and terrestrial biodiversity. The presence of aquatic ecosystems is often a strong indicator for the presence of unique flora as well as the regular presence of fauna. Many national SCC are only found within or near to aquatic habitat.

- **The South African Inventory of Inland Aquatic Ecosystems (SAIIAE):** Established during the 2018 NBA, the SAIIAE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and their associated categorisations, are applied as with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type had been altered from its natural condition.
- **National Freshwater Ecosystem Priority Areas, Rivers and Wetlands (NFEPA):** In an attempt to better conserve aquatic ecosystems, South Africa has categorised its inland aquatic systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs). The FEPAs are intended to be conservation support tools and it is envisioned that they will guide the effective implementation of measures to achieve the National Environment Management: Biodiversity Act's biodiversity conservation goals (Nel *et al.,* 2011).
- **Strategic Water Source Areas (SWSAs):** SWSAs are defined as areas of land that supply a disproportionate quantity of mean annual surface water runoff in relation to their size, and therefore contribute considerably to the overall water supply of the country, as well as national aquatic and terrestrial biodiversity resources. These are considered key ecological infrastructure assets and the effective protection of SWSAs is vital for national security because a lack of water security will compromise national security and human wellbeing on all levels.

4.1.2 Desktop Flora Assessment

The desktop flora assessment encompassed an assessment of all the vegetation units and habitat types within the PAOI as well as the identification of expected plant species and any locally occurring flora SCC.

The Vegetation of South Africa, Lesotho, and Swaziland (Mucina & Rutherford, 2006) and the 2018 Terrestrial & Freshwater Assessment by SANBI (2018) was used to identify the vegetation types that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA, 2019) database was accessed to compile a list of expected flora species within the PAOI (Figure 4-1). The Red List of South African Plants website (SANBI, 2016) was used to provide the most current account of the national conservation status of flora.

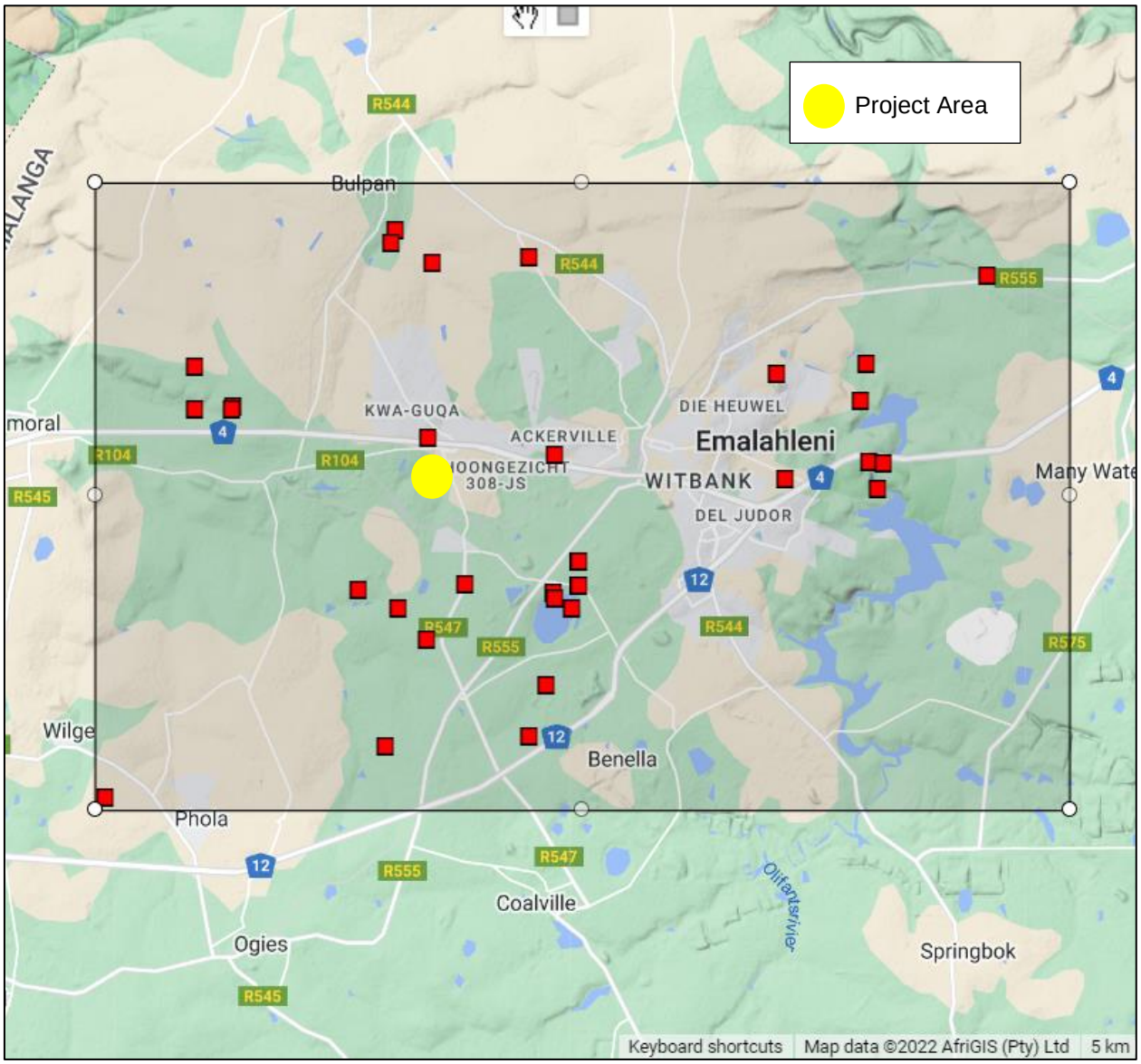


Figure 4-1 ***Map illustrating the extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. The yellow dot indicates the approximate location of the PAOI. The red squares are cluster markers of botanical records as per POSA data***

The latest information regarding provincially, and nationally protected flora was obtained from the following published legislative sources:

- Provincially Protected Plant Species (Mpumalanga Nature Conservation Act No. 10 of 1998); and
- List of Nationally Protected Tree Species (DEFF, 2022).

4.1.3 Desktop Fauna Assessment

The faunal desktop assessment involved the compilation of expected species lists and the identification of any protected and/or SCC fauna potentially occurring in the area. The respective species lists, and international Red-List statuses, were obtained from the IUCN spatial dataset (2017), in addition to the following sources:

- Mammal list: Generated from the ADU MammalMap database using the 2529CC Degree Square (ADU, 2020);

- Reptile list: Generated from ADU ReptileMap database using the 2529CC Degree Square (ADU, 2020a); and
- Amphibian list: Generated from ADU FrogMap database using the 2529CC Degree Square (ADU, 2020b).

For data concerning the expected avifaunal species refer to the project avifaunal assessment.

South Africa's official site for Species Information and National Red Lists (SANBI, 2022) was used to provide the most current national Red-List status of fauna. The latest information regarding provincially, and nationally protected fauna was obtained from the following published legislative lists:

- Provincially Protected Wildlife Species (Mpumalanga Nature Conservation Act No. 10 of 1998); and
- Nationally Protected Wildlife species (The 2007 lists of Threatened or Protected Species (TOPS), published in terms of Section 56(1) of the NEM:BA, No. 10 of 2004).

4.2 Biodiversity Field Survey

A single season field survey was undertaken from the 26th to the 27th of July 2022, which constitutes a dry season survey, to determine the presence of any local SCC and to achieve the delineation of local habitat types and their associated sensitivities. Effort was made to cover all the different habitat types within the PAOI, within the limits of time and access.

4.2.1 Flora Survey

The dry season fieldwork and sample sites were placed within targeted areas (i.e., target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps (confirmed during the field survey). The floristic diversity and search for protected plants and flora SCC were conducted through timed meanders within representative habitat units. Emphasis was placed on sensitive habitats, especially those overlapping with the PAOI.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting protected plants and flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling observed flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al*. (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g., roads, erosion etc.), and this included the subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, rock outcrops etc.). In addition, opportunistic observations were made while navigating through the area.

Relevant field guides and texts consulted for identification purposes included the following:

- A field guide to Wild flowers (Pooley, 1998);
- Field Guide to the Wild Flowers of the Highveld (van Wyk & Malan, 1998);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);

- Medicinal Plants of South Africa (Van Wyk *et al*., 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016), and Aquatic and Wetland Plants of Southern Africa (van Ginkel & Cilliers, 2020);
- Identification guide to southern African grasses (Fish *et al.,* 2015);
- Field guide to trees of Southern Africa, Struik Publishers (Van Wyk & Van Wyk, 1997); and
- Problem Plants and Alien Weeds of Southern Africa (Bromilow, 2018).

4.2.2 Fauna Survey

The faunal component of this report pertains only to mammals and herpetofauna (reptiles and amphibians). The faunal field survey utilised a variety of sampling techniques, including but not limited to:

- Visual and auditory searches: This involves strategic meandering and the use of binoculars and specialist camera equipment to view species from a distance without them being disturbed;
- Active hand-searches: Used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.);
- The identification of tracks and signs, and listening to species calls; and
- Utilization of local knowledge.

The relevant field guides and texts consulted for identification purposes included the following:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Bats of Southern and Central Africa (Monadjem *et al*., 2010);
- Spiders of Southern Africa (Leroy & Leroy, 2003);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Tortoises, Terrapins, and Turtles of Africa (Branch, 2008);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009); and
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart & Stuart, 2000).

4.3 Terrestrial Site Ecological Importance

The different habitat types within the PAOI were delineated and identified based on observations made during the field survey, and information from available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of SCC and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present in the project area) and Receptor Resilience (RR) (its resilience to impacts).

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor. The criteria for the CI and FI ratings are provided in Table 4-1 and Table 4-2 respectively.

Table 4-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Extremely Rare or CR species that have a global extent of occurrence (EOO) of < 10 km^2. 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 an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of Near Threatened (NT) species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. 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 likely 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.

Table 4-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts, with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts, with no signs of major past disturbance 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 VU 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 impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations 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	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 4-3.

Table 4-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

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

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor, as summarised in Table 4-4.

Table 4-4 Summary of Receptor Resilience (RR) criteria

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a 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: (i) remain at a site even when a disturbance or impact is occurring, or (ii) return to a site once the disturbance or impact has been removed.

After the determination of BI and RR, the SEI can be ascertained using the matrix as provided in Table 4-5.

Table 4-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance		Biodiversity Importance				
		Very high	High	Medium	Low	Very low
Receptor Resilience	Very Low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the proposed project is provided in Table 4-6.

Table 4-6 Guideline for interpreting Site Ecological Importance in the context of proposed activities

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.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

4.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- It is assumed that all information received from the client is accurate;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- The assessment area was based on the footprint areas as provided by the client, and any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- The area was only surveyed during a single site visit and therefore this assessment does not consider temporal trends (note that the data collected is considered sufficient to derive a meaningful baseline, however a wet-season walkthrough has been recommended);
- The single site visit was conducted during the dry season, and this means that certain flora and fauna would not have been present or observable due to seasonal constraints;
- Whilst every effort was made to cover as much of the PAOI as possible, representative sampling is completed, and by its nature it is possible that some plant and animal species that are present within the PAOI were not recorded during the field investigations; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by up to 5 m.

5 Results & Discussion

5.1 Desktop Assessments

5.1.1 Ecologically Important Landscape Features

Table 5-1 below has been produced as a result of the spatial data collected and analysed (as provided by various sources such as the national and provincial environmental authorities and SANBI). It presents a summative breakdown of the ecological boundaries considered and the associated relevance that each has to the region or PAOI. Where a feature is regarded as relevant it is considered an ecologically important landscape feature and discussed further as part of the sub-sections that follow.

Table 5-1 Summary of the spatial relevance of the PAOI to local ecologically important landscape features

Desktop Information Considered	Relevant?	Reasoning	Section
Provincial Conservation Plan	Yes	The PAOI intercepts a heavily modified area, a moderately modified -old lands area as well as fall over a CBA: optimal and a CBA: Irreplaceable area	5.1.1.1
NBA 2018: Ecosystem Threat Status	Yes	PAOI overlaps with a 'Vulnerable' ecosystem	5.1.1.2
NBA 2018: Ecosystem Protection Level	Yes	PAOI overlaps with a 'Poorly Protected' ecosystem	5.1.1.2
Protected and Conservation Areas (SAPAD & SACAD)	No	The PAOI is approximately 6.8 km from the John Cairns Private Nature Reserve	5.1.1.3
National Protected Areas Expansion Strategy (NPAES)	Yes	The PAOI overlaps with NPAES priority focus areas for expansion	5.1.1.4
Mpumalanga Protected Areas Expansion Strategies	Yes	The PAOI overlaps with a MPAES Area.	5.1.1.5
Important Bird and Biodiversity Areas (IBA)	Yes	The PAOI is 37 km from the Loskop Dam Nature Reserve IBA.	5.1.1.6
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Yes	The development area's 500 m regulated area overlaps with a CR river and a network of CR wetlands	5.1.1.7
National Freshwater Ecosystem Priority Areas	Yes	The development area's 500 m regulated zone overlaps with unclassified NFEPA wetlands and an unclassified FEPA river	5.1.1.8
Mpumalanga Highveld Grassland Wetlands	Yes	Mpumalanga Highveld Grassland Wetlands occur within/nearby to the PAOI	5.1.1.9
Strategic Water Source Areas	No	The project area is 101 km from the closest SWSA.	-
Renewable Energy Development Zones	Yes	The PAOI falls within the phase 2 Emalahleni REDZ area.	5.1.1.10
Powerline Corridor	Yes	The PAOI overlaps with the International Corridor.	5.1.1.11

5.1.1.1 Provincial Conservation Plan

The key output of this systematic biodiversity plan is a map of biodiversity priority areas (MTPA, 2014). The MBSP CBA map delineates Critical Biodiversity Areas, Ecological Support Areas, Other Natural Areas, Protected Areas, and areas that have been irreversibly modified from their natural state (MTPA, 2014). The MBSP uses the following terms to categorise the various land used types according to their biodiversity and environmental importance:

- Critical Biodiversity Area (CBA);
- Ecological Support Area (ESA);
- Other Natural Area (ONA);
- Protected Area (PA); and
- Moderately or Heavily Modified Areas (MMA's or HMA's).

Figure 5-1 shows the project area superimposed on the MBSP Terrestrial CBA map. Based on this, the proposed development areas will potentially overlap with:

- Heavily modified;
- Moderately modified -old lands area;
- CBA: optimal; and
- CBA: Irreplaceable Area.

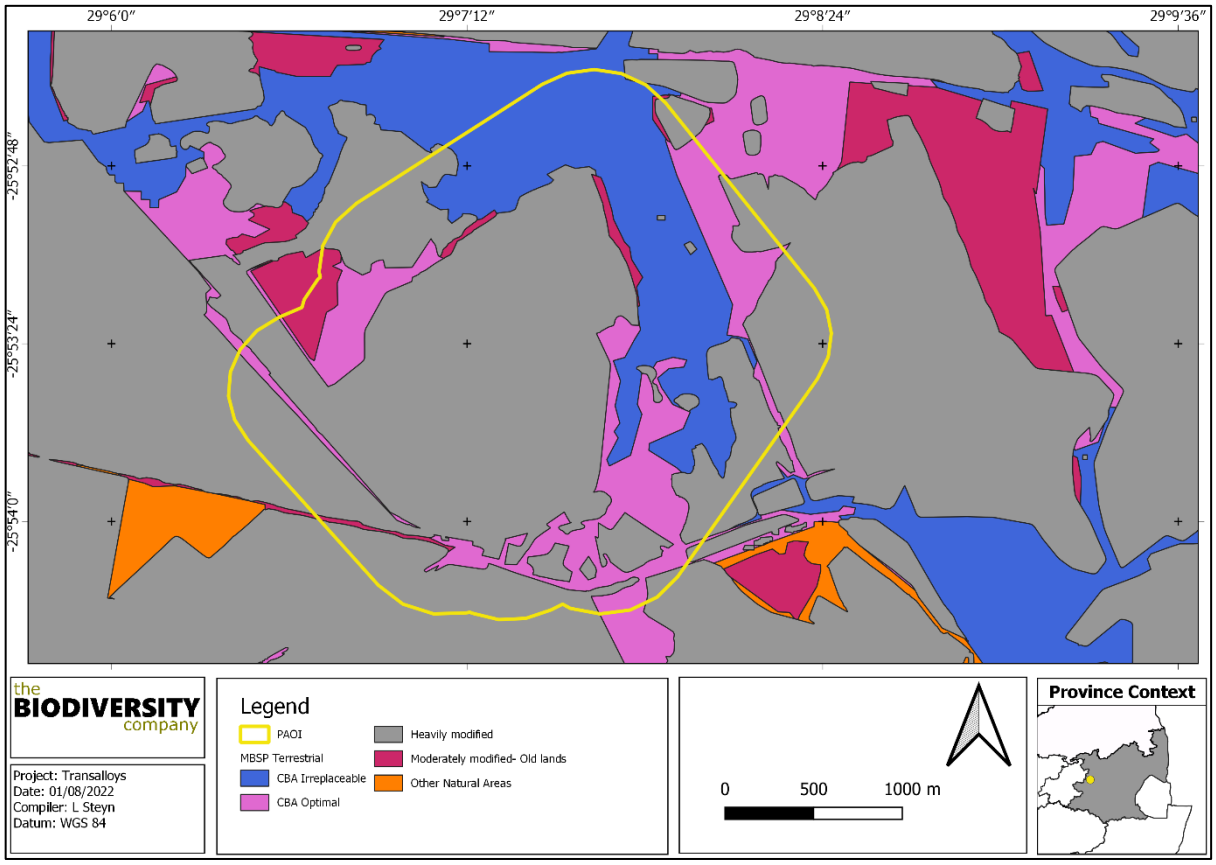


Figure 5-1 Map illustrating the locations of CBAs in the project area

5.1.1.2 National Biodiversity Assessment

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorized as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.

The Ecosystem Protection Level is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorized as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

According to the 2018 NBA spatial dataset the PAOI overlaps with a 'Vulnerable' and 'Poorly Protected' ecosystem (Figure 5-2 and Figure 5-3).

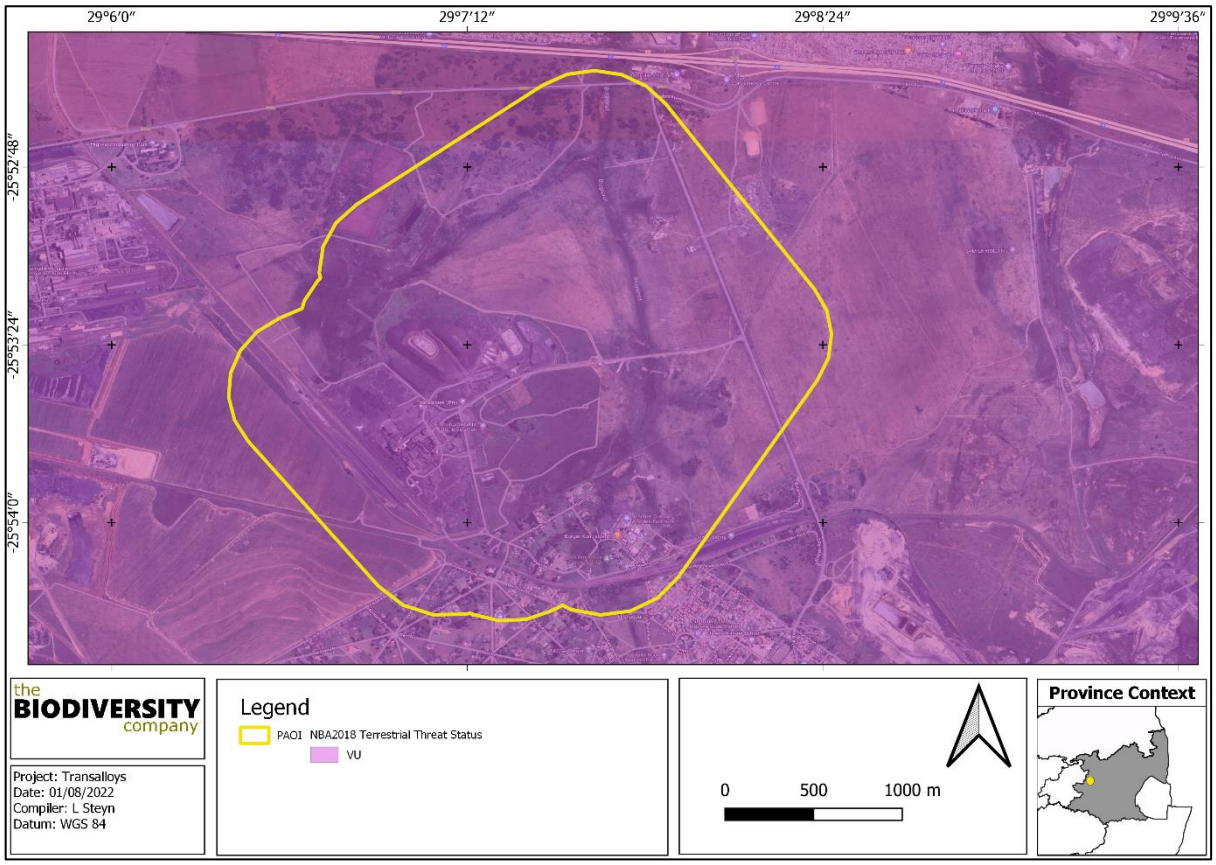


Figure 5-2 Map illustrating the Ecosystem Threat Status associated with the PAOI

Figure 5-3 Map illustrating the Ecosystem Protection Level associated with the PAOI

5.1.1.3 Protected Areas

According to the protected area spatial datasets from SAPAD (2021) and SACAD (2021), the project area is approximately 6.8 km from the John Cairns Private Nature Reserve (Figure 5-4).

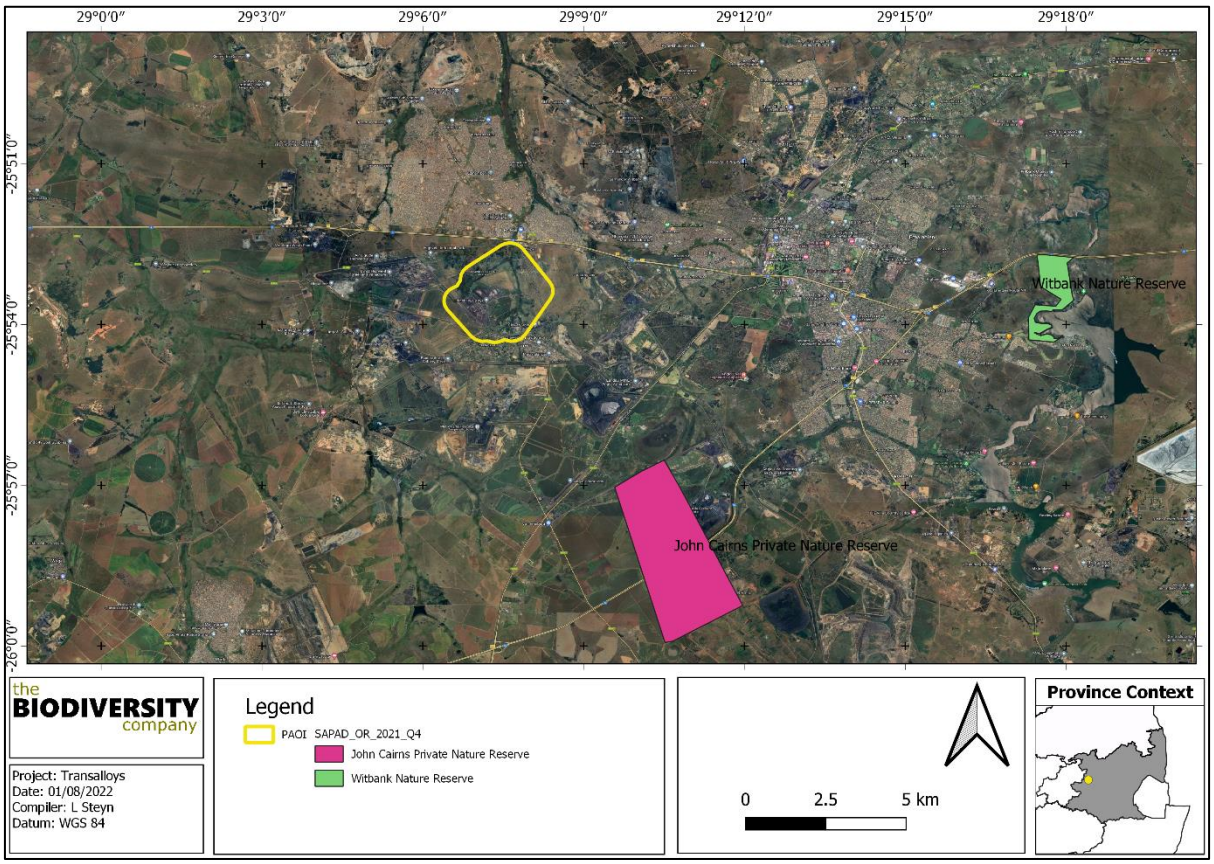


Figure 5-4 The project area in relation to the protected areas

5.1.1.4 National Protected Areas Expansion Strategy

National Protected Area Expansion Strategy 2016 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for finescale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2016).

The PAOI overlaps with priority focus areas for protected area expansion (Figure 5-5).

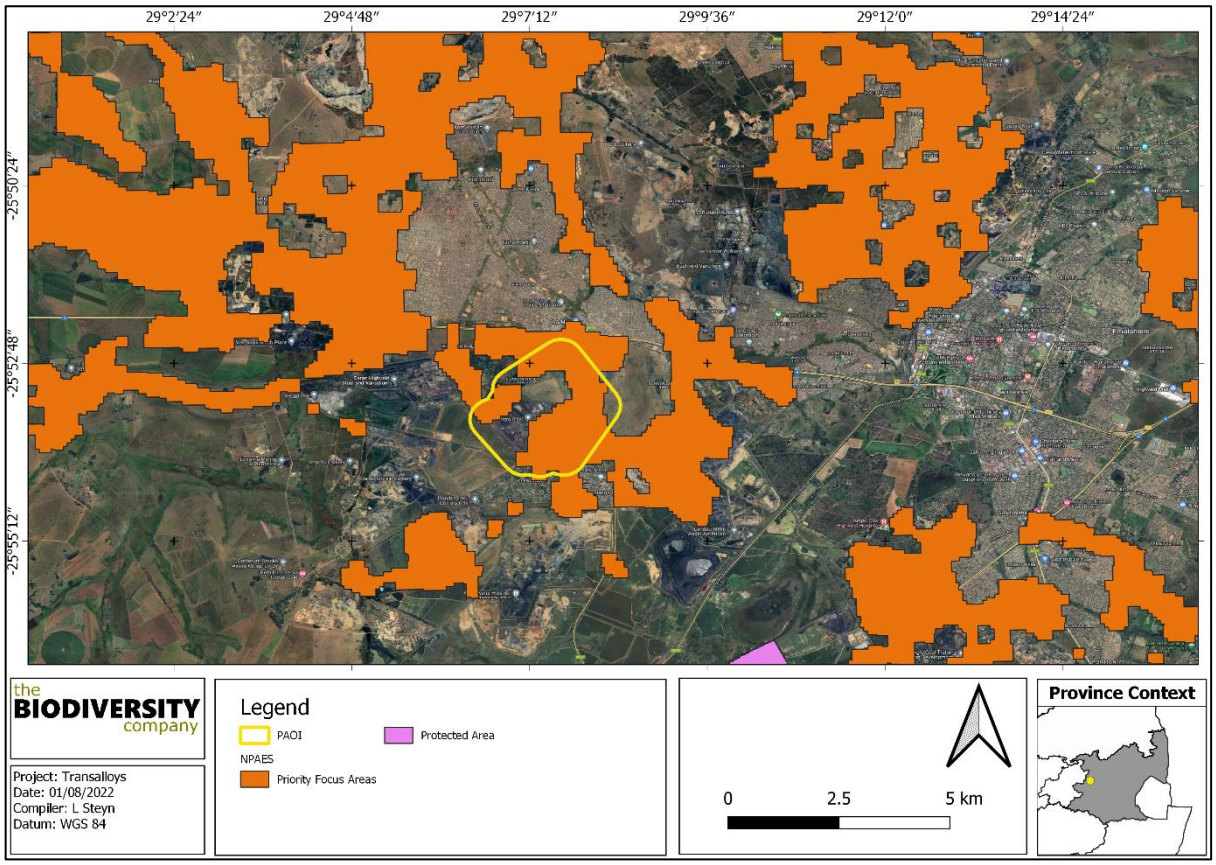


Figure 5-5 Map illustrating the PAOI location in relation to the 2016 NPAES dataset

5.1.1.5 Mpumalanga Protected Areas Expansion Strategy

The Mpumalanga Protected Area Expansion Strategy (MPAES, 2013), commissioned by the MTPA, serves to function as a provincial framework for an integrated, coordinated and uniform approach in the expansion and consolidation of the Provincial PAs, in line with the requirements of the NPAES.

The priority areas for PA Expansion within Mpumalanga were spatially established based on the premise that the primary goal of these areas is to protect biodiversity targets. Several biodiversity data sources were used for the assessment, namely the: Threatened Ecosystems, MBCP Terrestrial Assessment, MBCP Aquatic Assessment, MBCP Irreplaceability, C-plan Irreplaceability, and the National Spatial Biodiversity Assessment Priority areas. A combination of all these were used, together with the spatial priorities established within the NPAES, to establish the spatial priority areas that will guide the MPAES over the next 20 years.

Figure 5-6 shows the project area superimposed on the MPAES (2013) spatial data. As can be seen in this figure, the project area impacts on an area identified as part of the protected area expansion strategy.

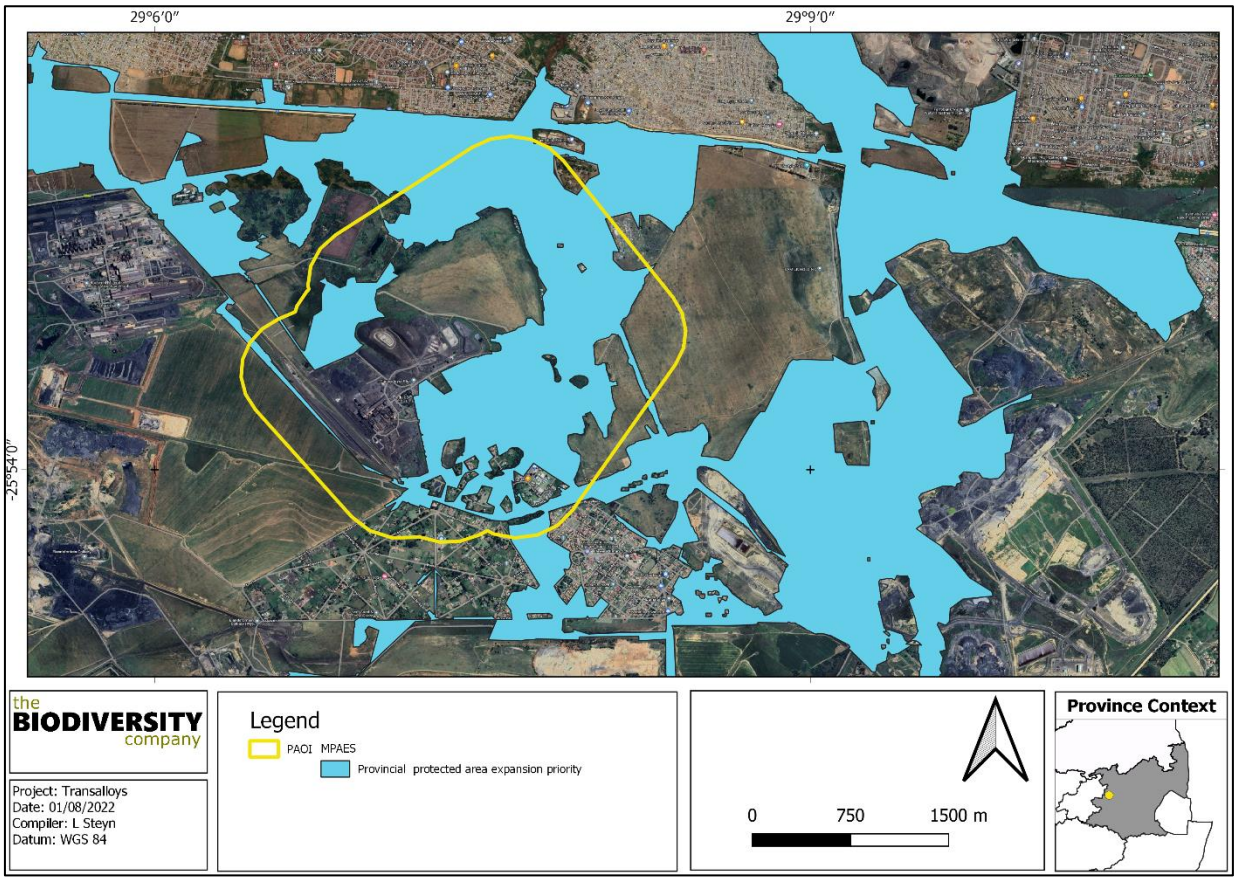


Figure 5-6 The project area in relation to the Mpumalanga Protected Area Expansion Strategy

5.1.1.6 Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife South Africa, 2017).

According to Birdlife South Africa (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels. Figure 5-7 shows that the project area is 37 km from the Loskop Dam Nature Reserve IBA.

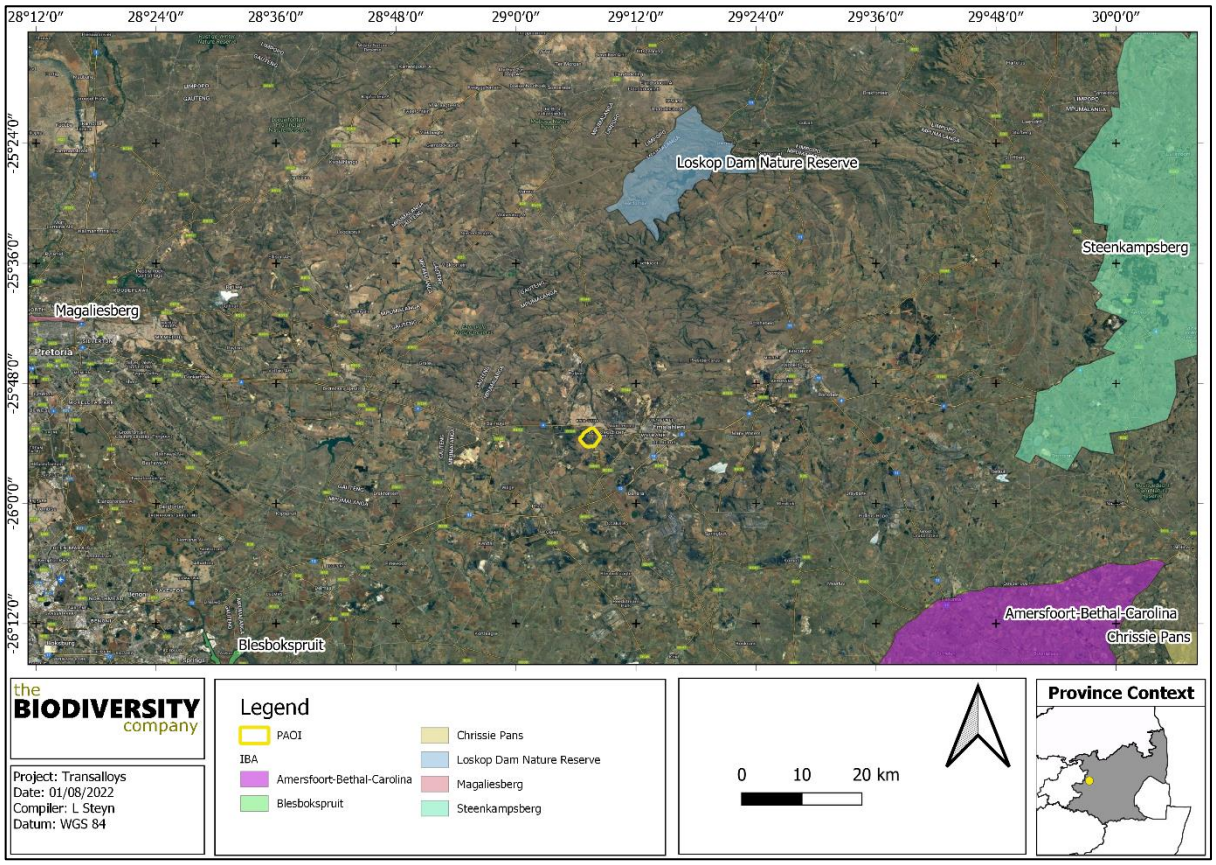


Figure 5-7 Map illustrating the PAOI location in relation to the 2015 IBA dataset

5.1.1.7 Hydrological Setting

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The project area's 500 m regulated area overlaps with a CR river and a CR wetland (Figure 5-8).

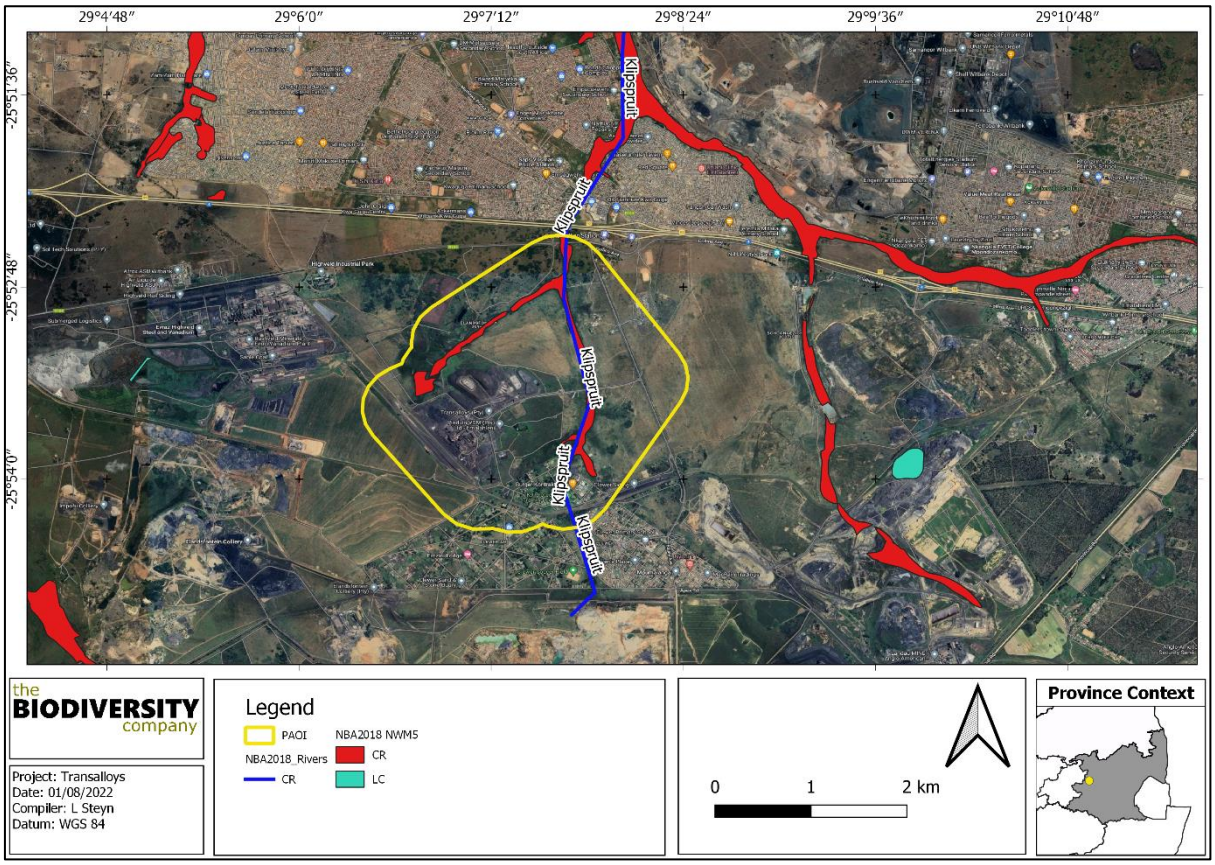


Figure 5-8 Map illustrating ecosystem threat status of rivers and wetland ecosystems in the project area

5.1.1.8 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel *et al.,* 2011).

Figure 5-9 shows that the project area's 500 m regulated area overlaps with a non-FEPA river and a number of non-FEPA wetlands.

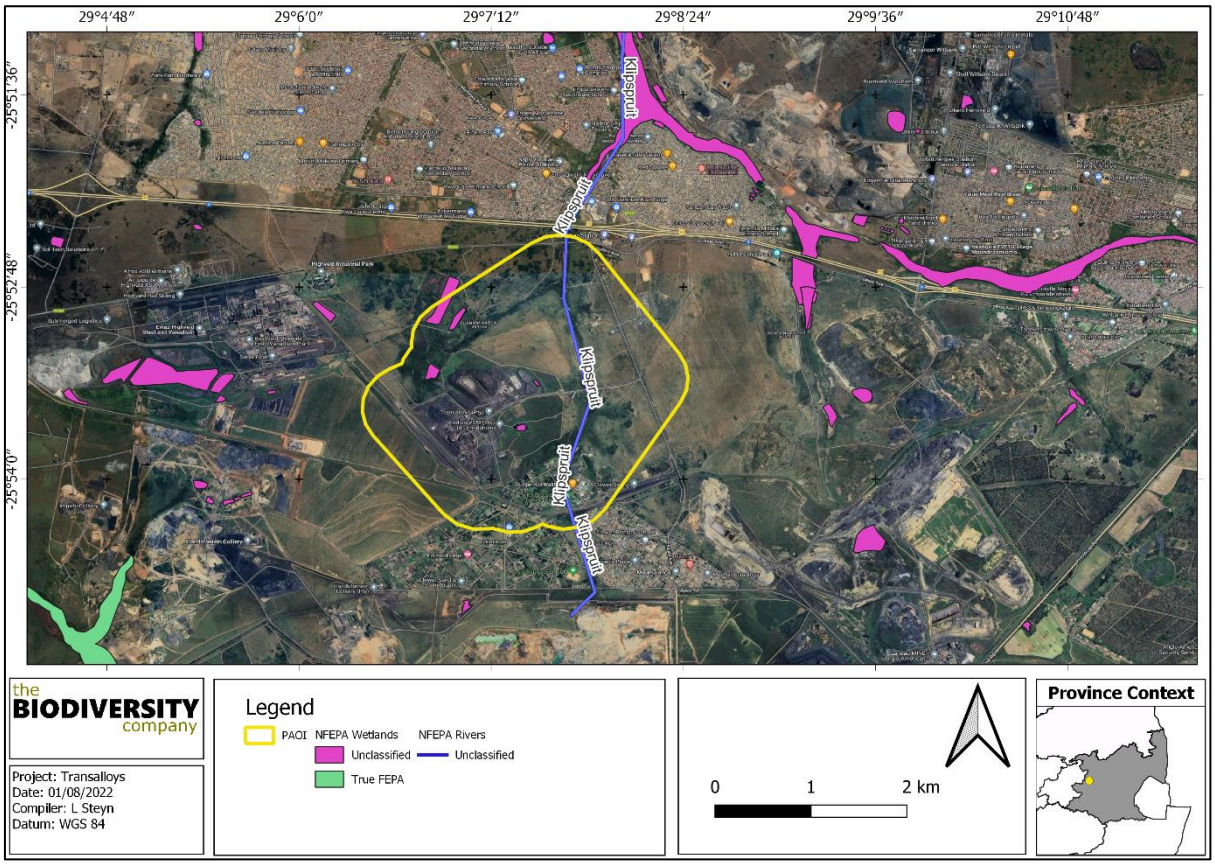


Figure 5-9 The project area in relation to the National Freshwater Ecosystem Priority Areas

5.1.1.9 Mpumalanga Highveld Grassland Wetlands

The purpose of the Mpumalanga Highveld Grasslands (MPHG) Wetlands project was to: Ground-truth and refine the current data layers of the extent, distribution, condition and type of freshwater ecosystems in the Mpumalanga Highveld coal belt, to support informed and consistent decision-making by regulators in relation to the water and biodiversity (SANBI, 2012). The MPHG dataset, has several classes.

The MPHG Wetlands data also classifies NFEPA land cover based on the defined condition of each area. These are known as the NFEPA wetland conditions categories. The categories are listed in Table 5-2 and are represented in relation to the project area in Figure 5-10.

Table 5-2 A breakdown of the NFEPA wetland condition categories as defined by the MPHG dataset

Description of NFEPA wetland conditions categories.
PES equivalent provides a description of the condition category that is broadly equivalent to that used by the Department of Water Affairs to describe Present Ecological State. Percentage of total area in each condition category is also provided.

PES equivalent	NFEPA condition	Description	% of total wetland area*
Natural or Good	AB	Percentage natural land cover ≥ 75%	47
Moderately modified	C	Percentage natural land cover 25-75%	18
Heavily to critically modified	DEF	Riverine wetland associated with a D, E, F or Z ecological category river	2
	Z1	Wetland overlaps with a 1:50,000 "artificial" inland water body from the Department of Land Affairs: Chief Directorate of Surveys and Mapping (2005-2007)	7
	Z2	Majority of the wetland unit is classified as "artificial" in the wetland delineation GIS layer	4
	Z3	Percentage natural land cover < 25%	20

** This percentage excludes the unmapped wetlands that have been irreversibly lost due to draining, ploughing and concreting*

Figure 5-10 shows the project area in relation to the Mpumalanga Highveld Grasslands Wetlands data as provided by SANBI. This dataset also reveals that wetlands with a PES of D (largely modified) can be found

in the eastern part of the property. Class AB (natural or good) wetlands can be found mainly in the northwestern section.

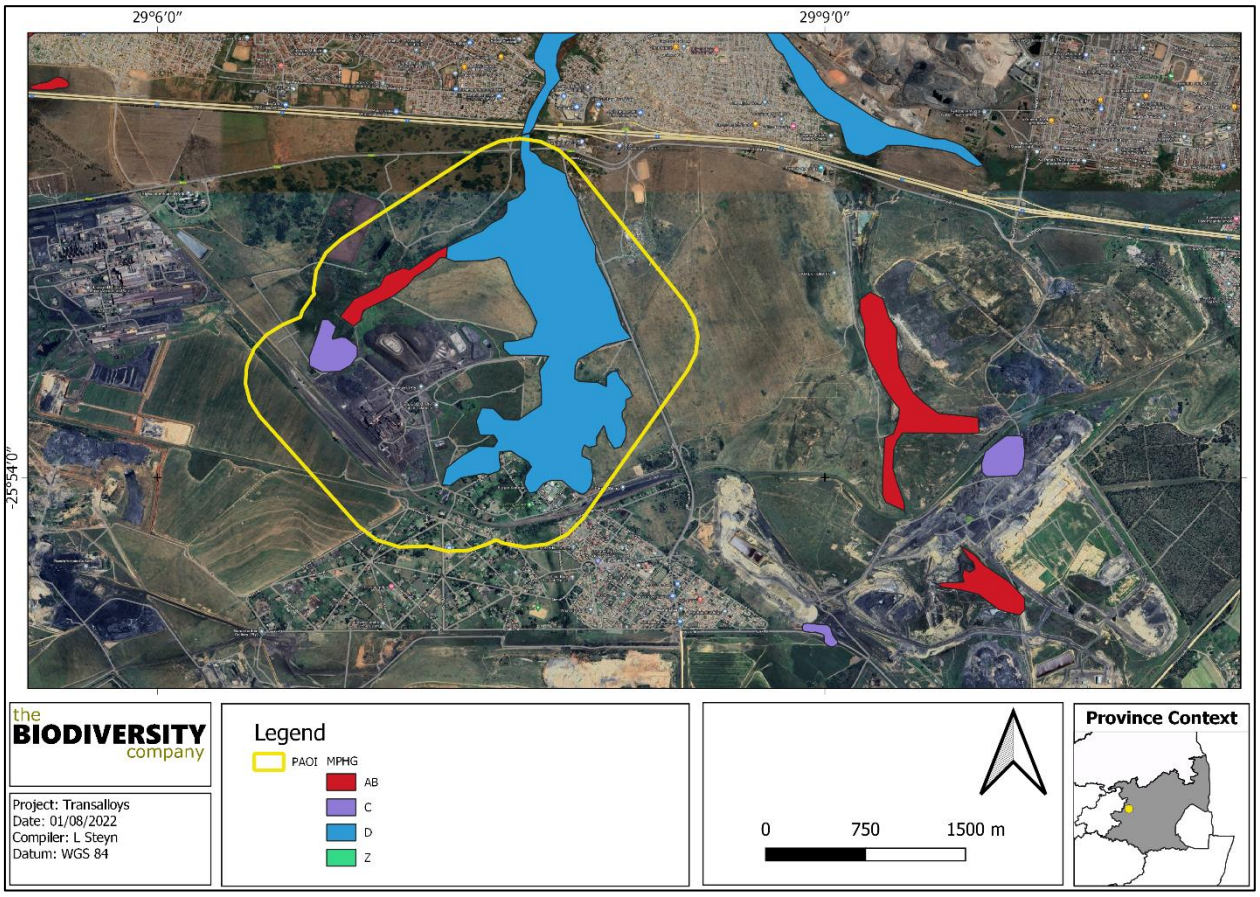


Figure 5-10 The project area in relation to the Mpumalanga Highveld Grassland Wetlands

5.1.1.10 Strategic Transmission Corridors (EGI)

On the 16 February 2018 Minister Edna Molewa published Government Notice No. 113 in Government Gazette No. 41445 which identified 5 strategic transmission corridors important for the planning of electricity transmission and distribution infrastructure as well as procedure to be followed when applying for environmental authorisation for electricity transmission and distribution expansion when occurring in these corridors.

On 29 April 2021, Minister Barbara Dallas Creecy published Government Notice No. 383 in Government Gazette No. 44504, which expanded the eastern and western transmission corridors and gave notice of the applicability of the application procedures identified in Government Notice No. 113, to these expanded corridors. More information on this can be obtained from https://egis.environment.gov.za/egi.

Figure 5-11 shows the project area in relation to the international corridor.

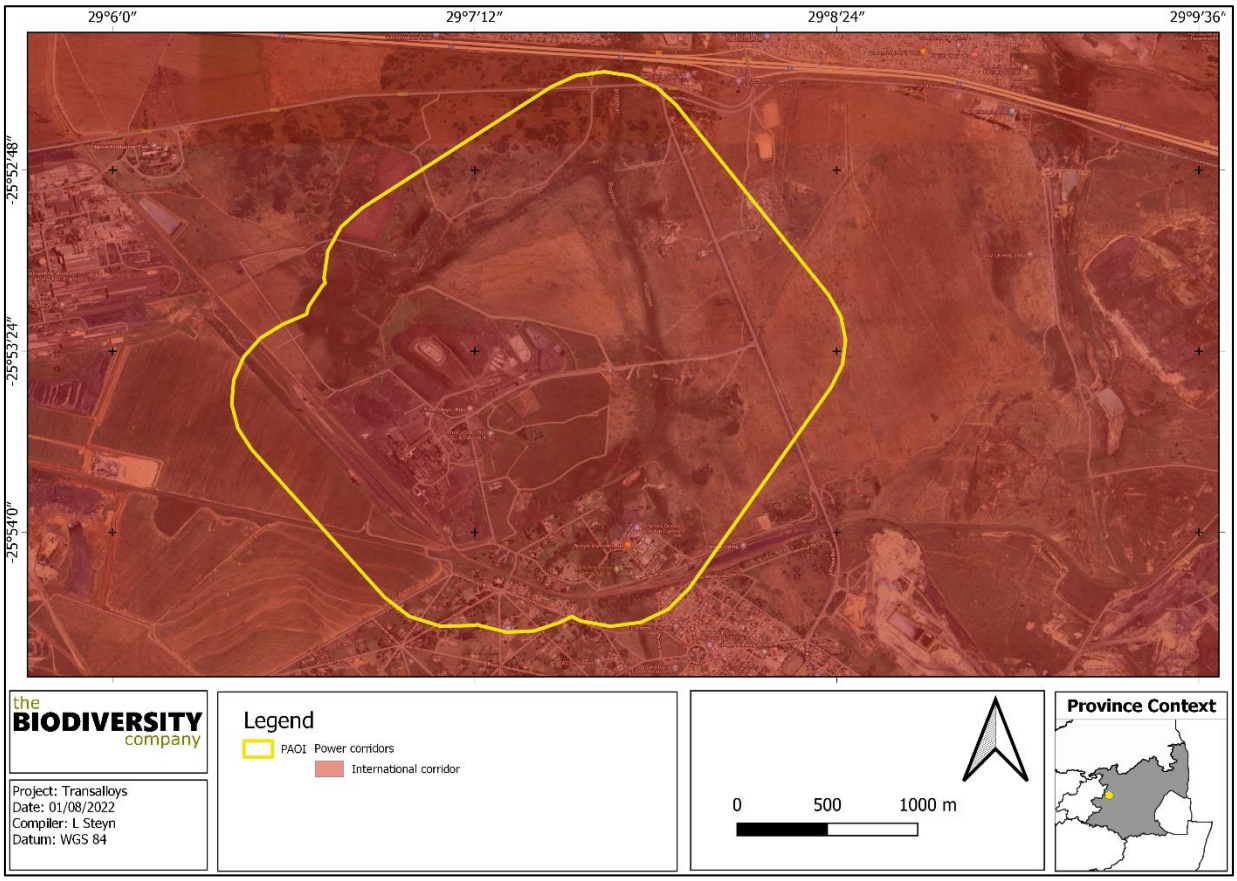


Figure 5-11 The project area in relation to the EGI corridors

5.1.1.11 Renewable Energy Development Zones (REDZ)

In 2018 the Government Notice No. 114 in Government Gazette No. 41445 was published where 8 renewable energy development zones important for the development of large scale wind and solar photovoltaic facilities were identified. In 2021 an additional 3 sites were included. The REDZs were identified through the undertaking of 2 Strategic Environmental Assessments.

More detailed information can be obtained from https://egis.environment.gov.za/redz. The project area falls within the phase 2 Emalahleni REDZ area (Figure 5-12).

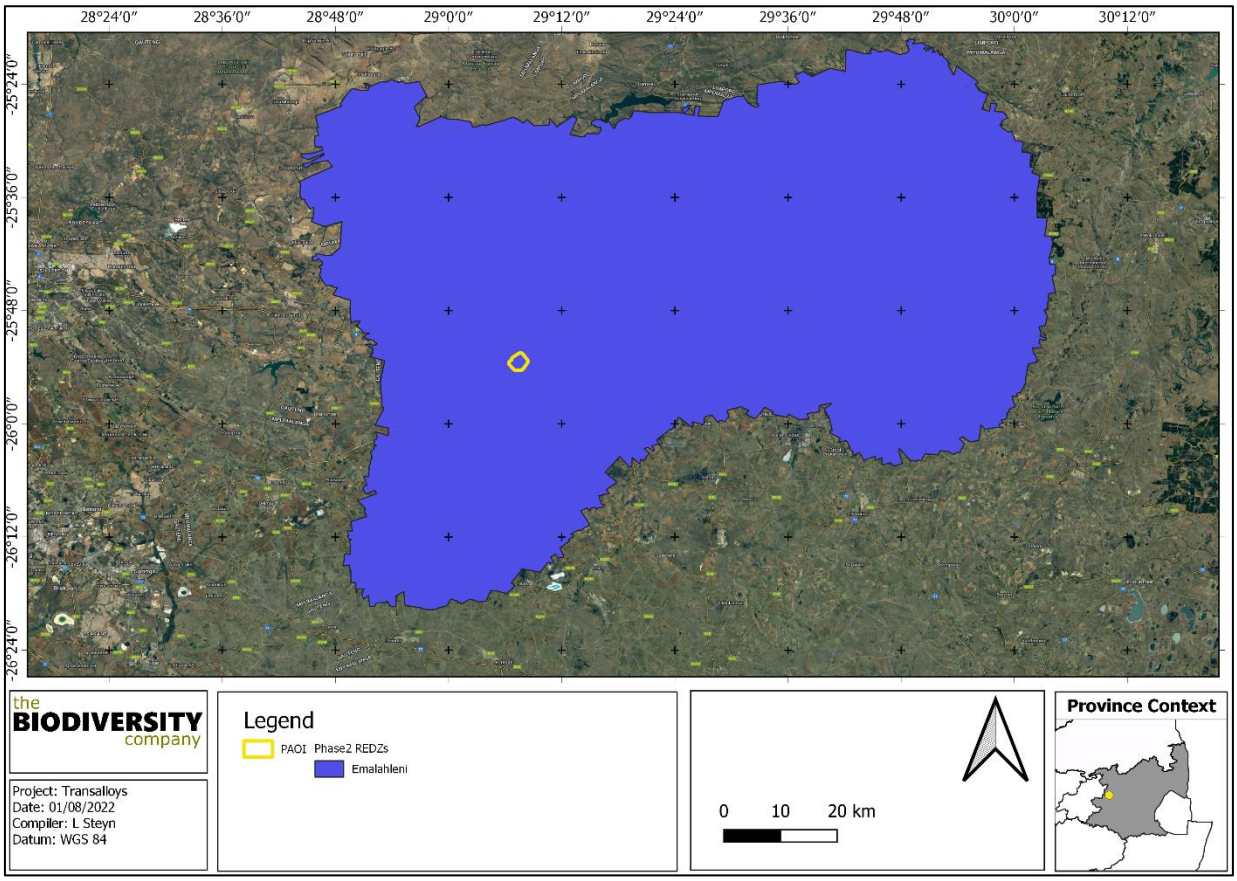


Figure 5-12 The project area in relation to the REDZ

5.1.2 Flora Assessment

This section is divided into a description of the local vegetation type that would be expected under natural conditions, and the expected flora species.

5.1.2.1 Vegetation Type

The project area is situated in the Grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

a) Seasonal precipitation; and

b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

On a fine-scale vegetation type, the project area overlaps with the Eastern Highveld Grassland vegetation type (Figure 5-13).

Figure 5-13 Map illustrating the vegetation type associated with the project area

5.1.2.1.1 Eastern Highveld Grassland

This vegetation type occurs on slightly to moderately undulating planes, including some low hills and pan depressions. The vegetation is a short dense grass land dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya* etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species. Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. No serious alien invasions are reported (Mucina & Rutherford, 2006).

Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence, or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are considered important in the Eastern Highveld Grassland vegetation type (d = dominant):

Graminoids: *Aristida aequiglumis (d), A. congesta (d), A. junciformis subsp. galpinii (d), Brachiaria serrata (d), Cynodon dactylon (d), Digitaria monodactyla (d), D. tricholaenoides (d), Elionurus muticus (d), Eragrostis chloromelas (d), E. curvula (d), E. plana (d), E. racemosa (d), E. sclerantha (d), Heteropogon contortus (d), Loudetia simplex (d), Microchloa caffra (d), Monocymbium ceresiiforme (d), Setaria sphacelata (d), Sporobolus africanus (d), S. pectinatus (d), Themeda triandra (d), Trachypogon spicatus (d), Tristachya leucothrix (d), T. rehmannii (d), Alloteropsis semialata subsp. eckloniana, Andropogon appendiculatus, A. schirensis, Bewsia biflora, Ctenium concinnum, Diheteropogon amplectens, Eragrostis capensis, E. gummiflua, E. patentissima, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyrium sanguineum, Setaria nigrirostris, Urelytrum agropyroides.*

Herbs: *Berkheya setifera (d), Haplocarpha scaposa (d), Justicia anagalloides (d), Pelargonium luridum (d), Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvaalensis subsp. setilobus, Helichrysum aureonitens, H. caespititium, H. callicomum, H. oreophilum, H. rugulosum,*

Ipomoea crassipes, Pentanisia prunelloides subsp. latifolia, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata.

Geophytic Herbs: *Gladiolus crassifolius, Haemanthus humilis subsp. hirsutus, Hypoxis rigidula var. pilosissima, Ledebouria ovatifolia.*

Succulent Herb: *Aloe ecklonis.*

Low Shrubs: *Anthospermum rigidum subsp. pumilum, Stoebe plumosa.*

Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006) this vegetation type is classified as 'Endangered, with the national target for conservation protection for Eastern Highveld Grassland being 24%.

Only a very small fraction is conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and private reserves (Holkranse, Kransbank, Morgenstond). Some 44% has been transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed sites (Mucina and Rutherford, 2006).

5.1.2.2 Expected Flora Species

The POSA database indicates that over 300 species of plants could be expected to occur within and around the PAOI. Three (3) of the expected species is classified as SCC, based on its conservation status (Table 5-3).

Table 5-3 SCC flora species that may occur within the Project Area of Influence

Family	Species	Author	SANBI Red-List Status	Ecology
Asphodelaceae	*Aloe ecklonis*	Salm-Dyck	NT	Indigenous; Endemic
Asphodelaceae	*Kniphofia porphyrantha*	Baker	NT	Indigenous; Endemic
Iridaceae	*Gladiolus paludosus*	Baker	VU	Indigenous

5.1.3 Fauna Assessment

This section of the report details the lists of expected SCC fauna species that may occur within the PAOI, where the fauna species considered include mammals, reptiles, and amphibians. Where the likelihood of a particular species occurring within the PAOI is rated by the specialist as being either moderate or high, based on the known habitat and prey/forage preferences of a particular species (linked with the field survey data obtained), the relevant species is then further discussed below a given table.

5.1.3.1 Mammals

The IUCN Red List spatial database, in addition to the MammalMap database, lists over 80 mammal species that could be expected to occur within and around the PAOI. This list excludes large mammal species that are limited to protected areas. Fifteen (15) of these expected species are regarded as SCC (Table 5-4), and of these SCC five (5) have a moderate to high likelihood of occurrence based on the presence of suitable habitat and food sources in the area.

Table 5-4 SCC mammal species that may occur within the Project Area of Influence

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Aonyx capensis	Cape Clawless Otter	NT	NT	High
Atelerix frontalis	South Africa Hedgehog	NT	LC	Moderate

Cloeotis percivali	Short-eared Trident Bat	EN	LC	Low
Crocidura maquassiensis	Makwassie musk shrew	VU	LC	Low
Dasymys incomtus	African Marsh rat	NT	LC	Moderate
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	Low
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	High
Leptailurus serval	Serval	NT	LC	High
Mystromys albicaudatus	White-tailed Rat	VU	EN	Low
Ourebia ourebi	Oribi	EN	LC	Low
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Pelea capreolus	Grey Rhebok	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Low

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. Based on the presence of a perennial river and wetland habitat present across the project area, the likelihood of occurrence of this species occurring in the project area is considered to be high.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016*), A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is suitable habitat in the project area and therefore the likelihood of occurrence is rated as moderate.

Dasymys incomtus (African Marsh Rat) is listed as NT on a regional scale and LC on a global scale. This species has a wide distributional range that includes Central Africa, East Africa and parts of Southern Africa. This species has been recorded from a wide variety of habitats, including forest and savanna habitats, wetlands and grasslands (IUCN, 2017). Based on the presence of a river as well as wetlands in the project area the likelihood of occurrence of this species in the project area is rated as moderate, the proximity of the urban area may cause the species to be absent.

Hydrictis maculicollis (Spotted-necked Otter) inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes (IUCN, 2017). Suitable habitat may be available along the river and wetland areas associated with the project area and therefore the likelihood of occurrence is high.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Due to the presence of suitable habitat along portions of the project area, the likelihood of occurrence is rated as high.

5.1.3.2 Reptiles

Based on the IUCN Red List spatial database and the ReptileMap database, over 90 reptile species may be expected to occur within and nearby to the PAOI.

Six (6) of these expected species are regarded as SCC (Table 5-5), and of these SCC three (3) have a moderate likelihood of occurrence based on the presence of suitable habitat and food sources in the area.

Table 5-5 SCC reptile species that may occur within the Project Area of Influence

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Chamaesaura aenea	Coppery Grass Lizard	NT	LC	Low
Chamaesaura macrolepis	Large-scaled Grass Lizard	NT	LC	Moderate
Crocodylus niloticus	Nile Crocodile	VU	LC	Low
Homoroselaps dorsalis	Striped Harlequin Snake	NT	LC	Moderate
Psammophis leightoni	Cape Sand Snake	VU	LC	Low
Tetradactylus breyeri	Breyers's Long-tailed Seps	VU	NT	Moderate

Chamaesaura macrolepis (Large-scaled Grass Lizard) is categorised as NT on both a regional and an international scale. Endemic to South Africa (KwaZulu-Natal, Mpumalanga and Limpopo), Swaziland and Zimbabwe. They occur in the Savanna, Indian Ocean Coastal Belt and Grassland biomes where they are found in the grassland, especially on rocky, grassy hillsides. Threatened by transformation of land for crop farming and plantations, overgrazing by livestock, infrastructural development, frequent anthropogenic fires and use of pesticides. The likelihood of occurrence in the project area is rated as moderate.

Homoroselaps dorsalis (Striped Harlequin Snake) is partially fossorial and known to inhabit old termitaria in grassland habitat (IUCN, 2017). Most of its range is at moderately high altitudes, reaching 1,800 m in Mpumalanga and Swaziland, but it is also found at elevations as low as about 100 m in KwaZulu-Natal. The likelihood of occurrence was rated as moderate.

Tetradactylus breyeri (Breyers's Long-tailed Seps) is categorised as VU regionally and NT internationally. Found in montane and Highveld grasslands of the Grassland Biome at altitudes of 1,400-2,000m. Threatened by transformation of land for crops, timber plantations, overgrazing by livestock causing depletion of sheltering sites and insect prey, infrastructure development in some areas, frequent fires and the use of pesticides. Due to the availability of suitable habitat the likelihood of the species occurring in the project area is rated as moderate.

5.1.3.3 Amphibians

Based on the IUCN Red List spatial database and FrogMap, over 20 amphibian species may be expected to occur within and nearby to the PAOI. One (1) of these is regarded as an SCC and it is assigned a high likelihood of occurrence due to the presence of suitable wetland habitat (Table 5-6).

Table 5-6 SCC amphibian species that may occur within the Project Area of Influence

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Pyxicephalus adspersus	Giant Bull Frog	NT	LC	High

Pyxicephalus adspersus (Giant Bullfrog) is listed as NT on a regional scale. It is a species that inhabits drier savannahs where it is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rain season and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017). The presence of a wide variety of aquatic habitat within and nearby to the PAOI means that this species has a high likelihood of occurrence.

5.1.4 Previous Studies

In 2014 an ecological study was undertaken as part of the Environmental Impact Assessment (EIA) process for the proposed Transalloys Circulating Fluidised Bed Power Station by Gerhard Botha (Eco-Care Consultancy, 2014). The main points drawn from the assessment are:

- The majority of the area has been severely transformed and degraded with little of the original vegetation character still present;
- The natural veld and wetlands have furthermore been severely degraded due to overgrazing and trampling (cattle and goats from adjacent township) and the invasion of large numbers of alien plants especially large stands of *Acacia dealbata*;
- Over 100 flora species were recorded during the assessment, including 26 exotics;
- No rare, endangered or endemic species were found whilst only one species, *Satyrium longicauda* (Orchid species), was found which is provincially protected according to Schedule 11 of the Mpumalanga Nature Conservation Act (Act 10 of 1998);
- The sensitivity of the area ranged from low to high, with the wetland habitat designated as high sensitivity, and the rest of the habitats' sensitivities rated as low and medium low.

In March 2019 Fauna and Flora Pre-Construction Walkthrough Report was compiled by Nkurenkuru Ecology & Biodiversity. The findings of the walkthrough and report included the following:

- The vegetation of the proposed development footprint is in a highly degraded and transformed condition;
- During the walk-through survey, no conservation important species were recorded within the development footprint of Site 1 whilst only one conservation important plant species were confirmed within the development footprint of Site 2, which is protected under provincial regulations (Mpumalanga Nature Conservation Act, 1999 (Act no. 10 of 1998)). This species is *Crinum macowanii* and approximately 77 individuals were found (Figure 5-);
- A single fairly large mammalian burrow was recorded within Site 1, but was determined to be abandoned and was likely made by Aardvark - *Orycteropus afer*;
- Of the mammal species, or signs of them, recorded within the proposed footprint, only one species are protected within the relevant provincial conservation act (Aardvark), whilst none are listed Red Data species.

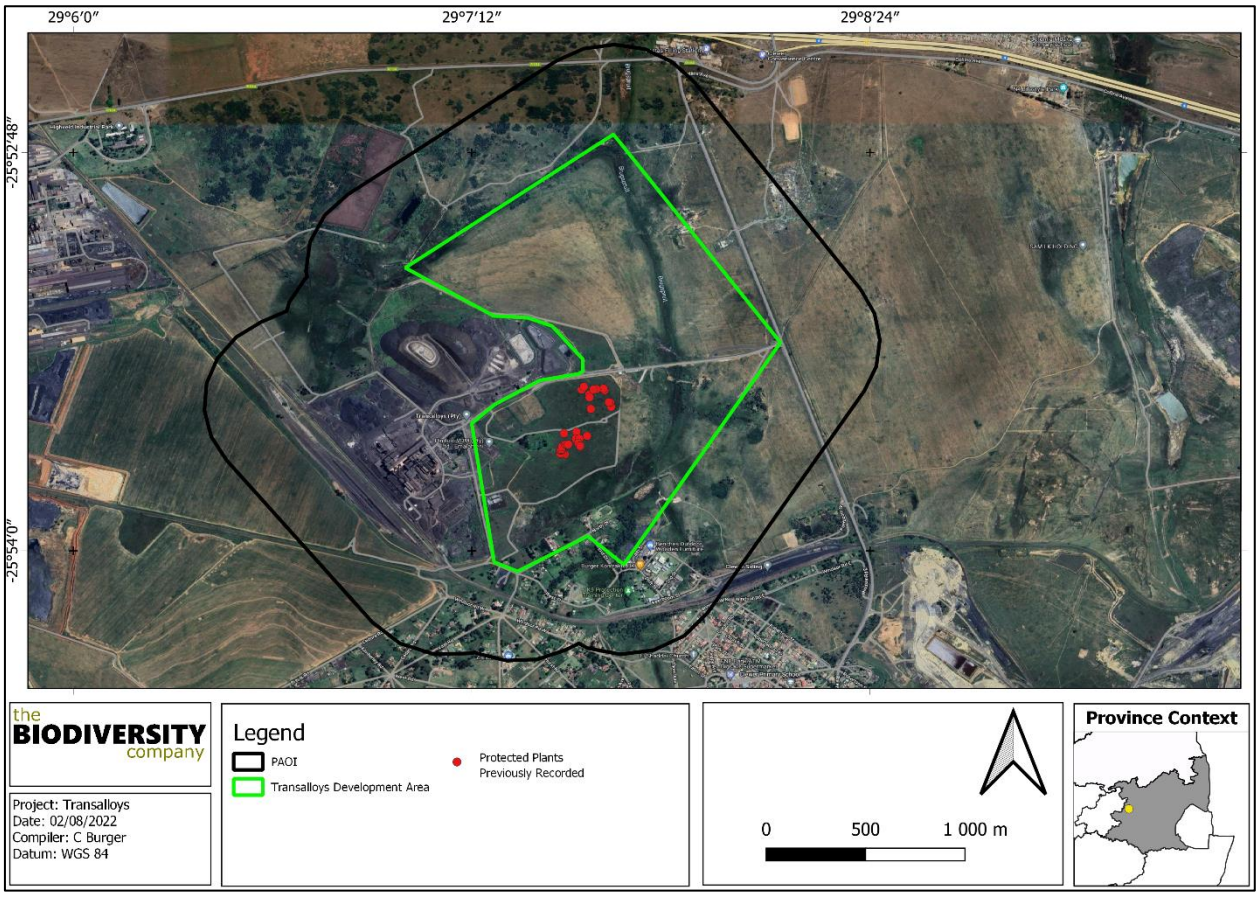


Figure 5-14 Protected plant, Crinum macowanii, recorded during the 2019 Walkthrough (Nkurenkuru Ecology & Biodiversity, 2019)

5.2 Biodiversity Field Survey

The following sections discuss the results from the field survey that was conducted for the proposed project, which was undertaken during the 26th and 27th of July 2022.

5.2.1 Flora Survey

This section is further divided into two subsections:

- Indigenous flora recorded; and
- Invasive Alien Plants (IAPs) of the project area.

5.2.1.1 Indigenous Flora

The vegetation profile of the landscape was composed of large areas of open grassland, with the secondary grassland dominated by *Aristida congesta subsp. Congesta, Cynodon dactylon, Hyparrhenia hirta* and *Sporobolus africanus,* while the degraded grassland was dominated by *Hyperthelia dissolute, Pogonarthria squarrosa* and *Tagetes minuta.* Various wetland features were identified along the project area with the most prominent being a channel valley bottom wetland that traverse the project area in two directions. Hydrophytic vegetation frequently found within the wetland habitat comprised of *Schoenoplectus brachyceras, Typha capensis, Imperata cylindrica* and *Phragmites australis*. Numerous alien and invasive species such as *Eucalyptus grandis, Acacia dealbata* and *Verbena bonariensis* were observed across the project area.

No SCC flora species were recorded, however, several individuals of the species *Zantedeschia aethiopica* and *Crinum macowanii* were observed along the wetland habitat within the PAOI boundary. *Zantedeschia aethiopica* and *Crinum macowanii* are provincially protected according to Schedule 11 of the Mpumalanga Nature Conservation Act (Act 10 of 1998), and no individual may be disturbed without the appropriate permit.

Figure 5-15 presents photographs of some of the species observed within the PAOI, including the protected *Zantedeschia aethiopica*.

Note: Due to the effects of the dry season on the vegetation of the region many indigenous plants occurring in the area may not have been observable or identifiable. Therefore, it is recommended that a wet season walkthrough of the PAOI be conducted prior to the commencement of the project construction phase. This walkthrough may be a requirement of the Environmental Authorisation.

Figure 5-15 Photographs illustrating some of the indigenous flora species recorded – A) Zantedeschia aethiopica (Protected); B) Imperata cylindrica; and C) Lopholaena bainesii.

5.2.1.2 Invasive Alien Plants

The National Environmental Management: Biodiversity Act, Act No. 10 of 2004, (NEM:BA) is the national legislation that incorporates the mandatory regulation of Invasive Alien Plant (IAP) species, and in September 2020 the most current lists of IAP Species were published in terms of NEM:BA (in Government Gazette No. 43726 of 18 September 2020). The Alien and Invasive Species Regulations serve to define and regulate the various categories of Alien and Invasive Species and were recently updated and published in terms of NEM:BA in the Government Gazette No. 43735 of 25 September 2020. The 2020 Alien and Invasive Species Regulations and Lists were recently extended as published in the Government Gazette No. 44182, 24th of February 2021.

The legislation calls for the removal and/or control of IAP species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEM:BA:

- **Category 1a:** Invasive species requiring compulsory eradication. 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 programme. 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 programme. 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. Species existing outside of a regulated area shall be classified as category 1b.
- **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. No permits will be issued for Category 3 plants to exist in riparian zones as these will be classified as category 1b species.

Note that according to the regulations, any person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing;
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the NEM:BA;
    - The relevant local invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the NEMBA.

Fifteen (15) IAP species were recorded during the field survey. Four of these species are Category 1b species which must be controlled through the implementation of an IAP Management Programme. Common weeds such as *Tagetes minuta* and *Bidens pilosa* were observed invading certain sections. It is noted that a 2014 study (utilising wet season data) recorded the presence of numerous additional IAP species, including *Campuloclinium macrocephalum*, *Nicotiana glauca*, and *Cirsium vulgare.* Photographs of the observed species are presented in Figure 5-16 below.

Figure 5-16 ***Photographs illustrating the IAP flora species recorded within the Project Area of Influence – A) Datura ferox, B) Acacia dealbata, and C) Solanum incanum.***

5.2.2 Fauna Survey

Mammal activity was low-moderate, as would be expected from an area showing clear signs of long-term historical disturbance and the close proximity to various anthropogenic activities, including a town and mining areas. Two (2) mammal species were recorded during the assessment (Table 5-7). No reptile or amphibian species were observed during the survey.

No fauna SCC were recorded, however a larger number of mammal and herpetofauna species are expected to occur in the area, and longer-term multi-season surveys would be required in order to ensure sufficient sampling.

Refer to Figure 5-17 for photographs of some of the recorded fauna species.

Table 5-7 The fauna species recorded during the field survey

Species	Common Name	Conservation Status	
		SANBI (2022)	IUCN (2021)
Mammals			
Cynictis penicillata	Yellow Mongoose	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC

Note: For results pertaining to the avifaunal species of the area refer to the avifaunal specialist assessment report.

Figure 5-17 Photographs: Mammal species recorded during the survey – A) Herpestes sanguineus (Slender Mongoose) and B) Cynictis penicillate (Yellow Mongoose))

5.3 Habitat Assessment

The main habitat types identified across the PAOI were initially delineated largely based on aerial imagery, and these main habitat types were then refined based on the field coverage and data collected during the survey. Four habitats were delineated in total, and these are mapped in Figure 5-18 below. Emphasis was placed on limiting timed meander searches to within the most functional habitats, and therefore habitats with a higher potential of hosting SCC.

The four habitats are briefly discussed in the sub-sections that follow, and a summary of the habitat types delineated within the Project Area of Influence can be seen in Table 5-8.

Table 5-8 Summary of habitat types delineated within the Project Area of Influence

Habitat Type	Description	Dominant Flora	Habitat Sensitivity
Transformed	The transformed areas comprised of agricultural fields, residential areas and active operational areas associated with the Transalloys Smelter.	Little to no remaining natural vegetation due to land transformation by various anthropogenic activities.	Very Low
Degraded Grassland	Open grassland on gently sloping landscapes, which has previously been transformed to accommodate agricultural practices and has a low species diversity.	*Aristida congesta subsp. Congesta, Cynodon dactylon,* and *Hyparrhenia hirta,* all species which are considered to be increaser 1 and 2 species which are commonly associated with disturbance.	Low
Secondary Grassland	Gently sloping grassland habitat with a low – moderate functionality, impacted by grazing and alien and invasive species in many areas. The area has a higher diversity of flora species than the degraded grassland areas.	*Hyperthelia dissolute and Pogonarthria squarrosa* grasses with alien and invasive species *Bidens Pilosa, Tagetes minuta* and *Seriphium plumosum.*	Medium
Wetland	Perennial river and seasonally wet portions of land as delineated by the wetland specialist. Important movement corridor and foraging resource for local fauna.	*Typha capensis, Imperata cylindrica* and *Phragmites australis* as well as alien and invasive species such as *Eucalyptus grandis* and *Acacia dealbata.*	High

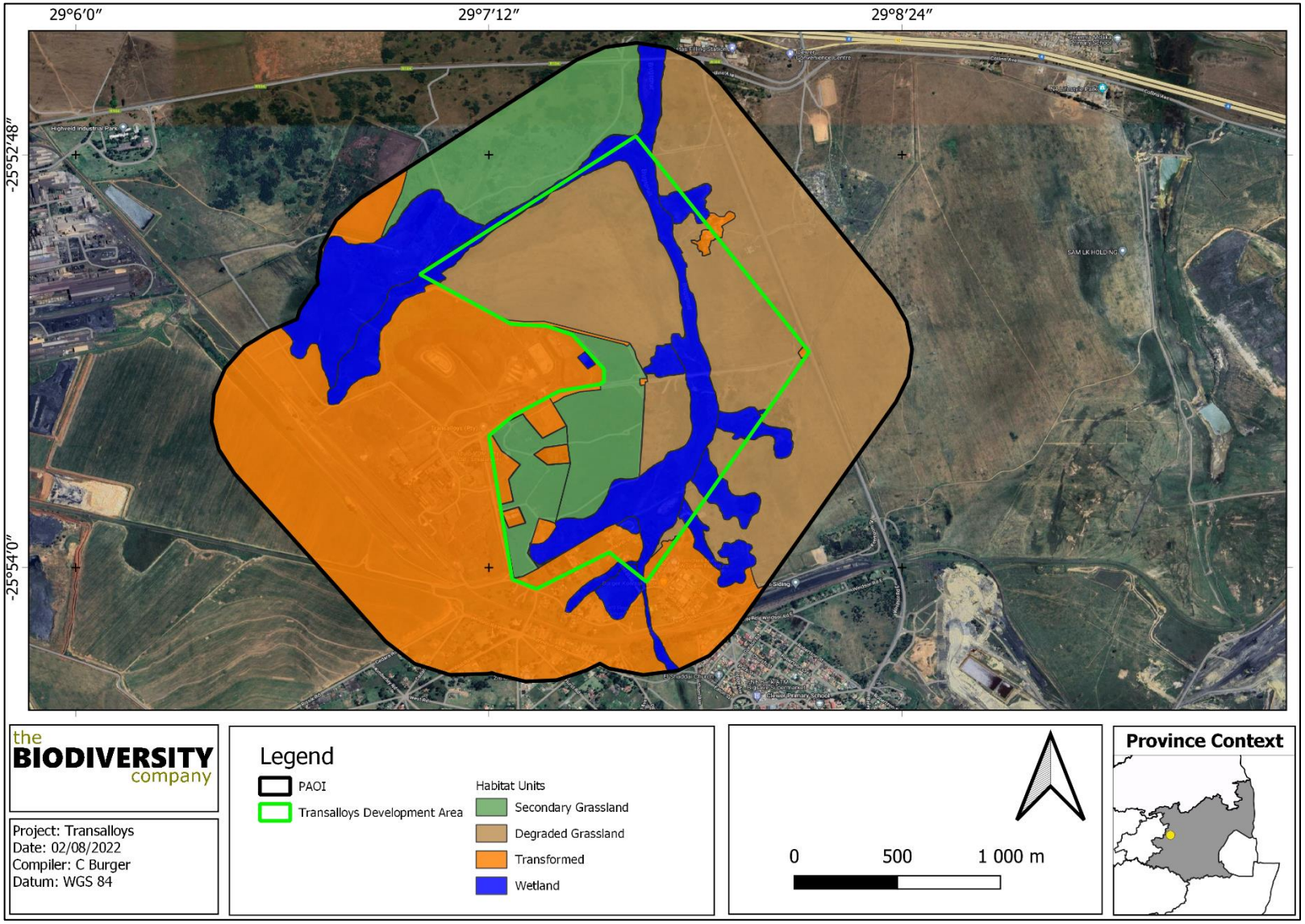


Figure 5-18 Map illustrating the habitats identified in the Project Area of Influence

5.3.1 Degraded Grassland Habitat

The degraded grassland habitat can be found along the majority of the north and eastern section of the POAI. This habitat is regarded as areas that have been impacted on more by historic mismanagement and land use. Historical vegetation clearing to make way for agricultural practices has led to alterations of the natural grassland habitat and current utilisation of the area for grazing as well as ongoing human infringement, especially in areas close to residential and operational buildings, are still impacting on this habitat unit. This habitat is not entirely transformed but in a constant disturbed state, as it cannot recover to a more natural state due to ongoing disturbances and impacts as a result of grazing and anthropogenic related activities. The habitat has a low level of functionality in its current state and is likely to only support the occasional foraging of regional SCC fauna species. The occurrence of flora SCC in these areas is regarded as unlikely.

Figure 5-19 presents a representative photograph of this habitat type.

Figure 5-19 A representative photograph of the Degraded Grassland habitat

5.3.2 Secondary Grassland Habitat

The secondary grassland habitat is located in the north and central section of the PAOI. This habitat is associated with grassland habitat that has been exposed to modifications due to land use and mismanagement but differs from the degraded grassland in the extent of disturbance that has taken place, with the degraded grassland being exposed to more severe disturbance.

Based on the current ecological condition of this habitat the driving forces are inconsistent due to the current land uses. The condition difference within this habitat depends on the extent of the disturbance in some areas being more severe, usually related to one being more overgrazed, invaded by alien and invasive species and/or exposed to current anthropogenic activities than the other. As a result of the

ongoing and historic disturbances the plant community is no longer considered as being fully representative of the reference vegetation.

Figure 5-20 presents a photograph of the Secondary Grassland habitat type.

Figure 5-20 A representative photograph of the Secondary Grassland habitat

5.3.3 Wetland Habitat

Wetland habitat was found predominantly traversing the central portion of the PAOI. These areas provided habitat to various hydrophytic plant species such as *Typha capensis, Imperata cylindrica* and *Phragmites australis* as well as alien and invasive species such as. Some portions of the wetland systems along the PAOI were encroached by the alien and invasive species *Eucalyptus grandis and Acacia dealbata*, which is listed as category 1b and category 2 invasive species as per the latest NEMBA legislation. During the assessment *Zantedeschia aethiopica* and *Crinum macowanii* listed as protected under Schedule 11 of the Mpumalanga Nature Conservation Act (Act 10 of 1998) were recorded within the wetland habitat.

These habitats were assessed in the TBC Wetland Baseline and Impact Assessment (2022). Even though somewhat disturbed in certain areas, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system, movement corridor and an important habitat for various fauna and flora.

Figure 5-21 presents a representative photograph of the watercourse habitat unit.

Figure 5-21 A representative photograph of the wetland habitat

5.3.4 Transformed Habitat

The transformed areas can be found along the majority of the western section of the PAOI and in smaller scattered areas. The transformed areas comprised of agricultural fields, residential areas and active operational areas associated with the Transalloys Smelter. The transformed areas have little to no remaining natural vegetation due to land transformation by various anthropogenic activities. These habitats exist in a constant disturbed state as it cannot recover to a more natural state unless through human intervention. No protected or SCC flora species were observed in this habitat unit and is not expected to occur due to the modified nature of the majority of the area.

Figure 5-22 presents a representative photograph of the transformed habitat unit.

Figure 5-22 A representative photograph of the transformed habitat

5.4 Site Ecological Importance

Based on the criteria provided in section 4.3 of this report, the four delineated habitat types have each been allocated a sensitivity category, or SEI, and this breakdown is presented in Table 5-9 below. In order to identify and spatially present sensitive features in terms of the relevant specialist discipline, the sensitivities of each of the habitat types delineated within the PAOI are mapped in Figure 5-23 below.

It is important to note that this map does not replace any local, provincial, or national government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

Table 5-9 Sensitivity summary of the habitat types delineated within the Project Area of Influence

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Transformed	Very Low	Low	**Very Low**	High	**Very Low**
Degraded Grassland	Low	Low	**Low**	Medium	**Low**
Secondary Grassland	Medium	Medium	**Medium**	Medium	**Medium**
Watercourse	High	High	**High**	Medium	**High**

Consider the following guidelines when interpreting SEI in the context of any proposed development or disturbance activities (noted in conjunction with provincial guidelines pertaining to CBA and ESA areas):

- Very Low: Minimisation mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required.

- Low: Minimisation and restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities.
- Medium: Minimisation and restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities.
- High:
    - Avoidance mitigation wherever possible;
    - Minimisation mitigation – changes must be made to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable; and
    - Offset mitigation may be required for high impact activities.

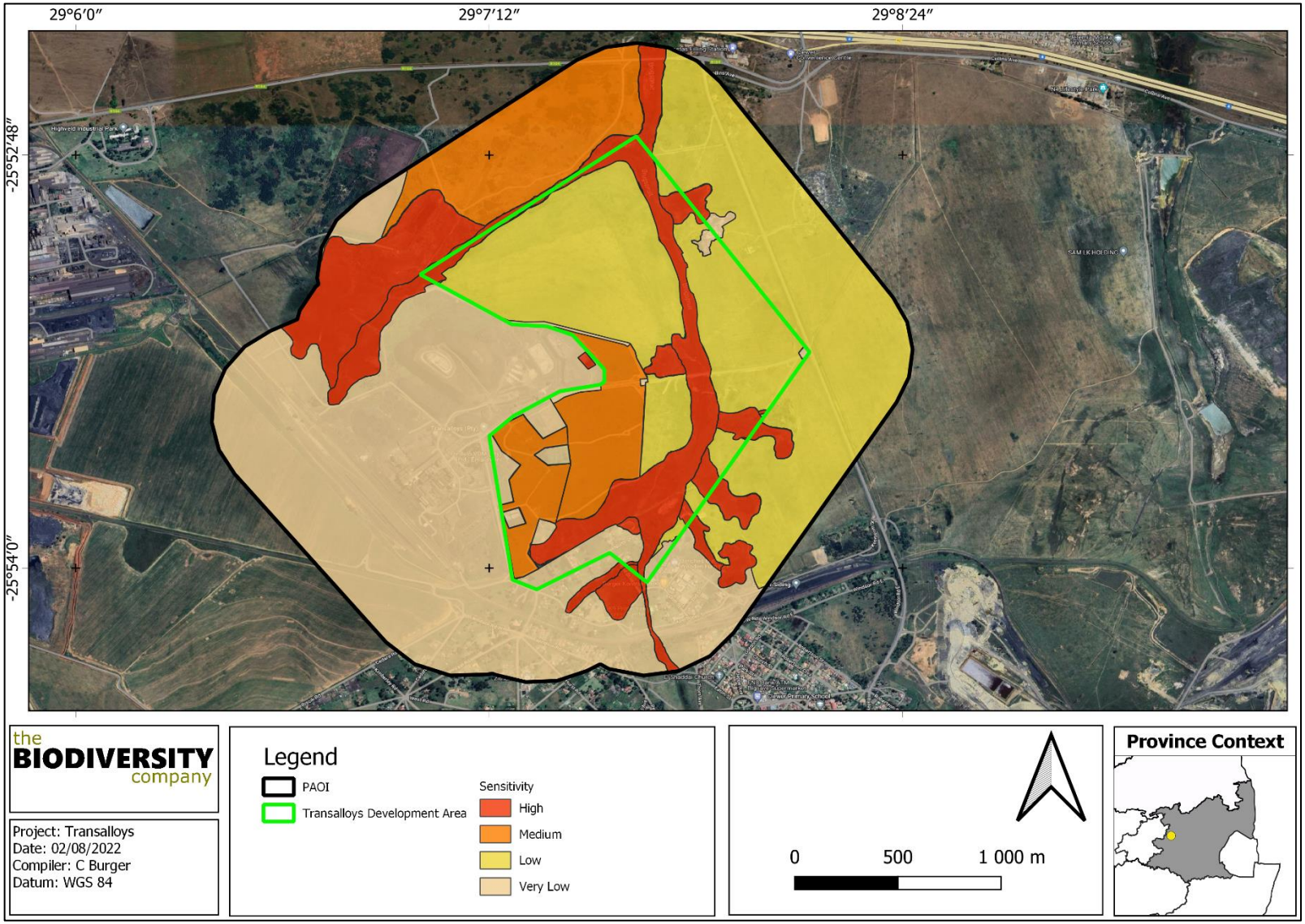
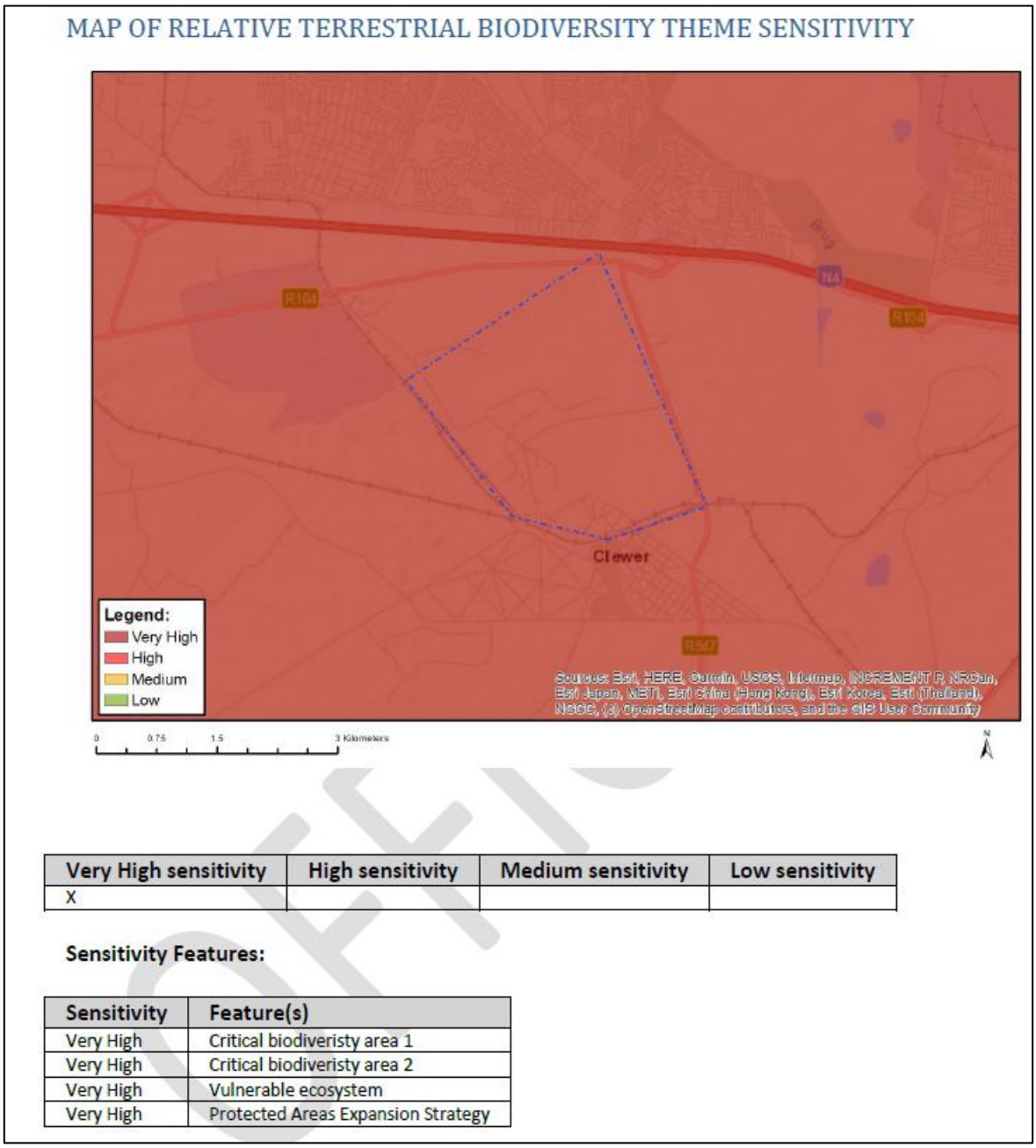


Figure 5-23 Map illustrating the sensitivities of the habitats delineated within the overall Project Area of Influence

5.4.1 Screening Tool Comparison

The terrestrial biodiversity theme sensitivity as indicated by the screening tool report for the PAOI was derived to be 'Very High' (Figure 5-24), due to the CBA 1 & 2, VU Ecosystem and NPAES status of the area.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 1
Very High	Critical biodiveristy area 2
Very High	Vulnerable ecosystem
Very High	Protected Areas Expansion Strategy

Figure 5-24 Terrestrial Biodiversity Theme Sensitivity for the Project Area of Influence (National Environmental Screening Tool, 2022)

The completion of the terrestrial desktop and field studies disputes the 'Very High' sensitivity presented by the screening report. As discussed above, most of the area represents Degraded Grassland habitat which has been exposed to significant levels of historical disturbance and is thus assigned a 'Low' sensitivity. Portions of land within the PAOI, namely the Wetland habitats, maintain a higher level of functionality and are assigned a 'High' sensitivity.

The screening report classified the animal species theme sensitivities as being of a 'High' sensitivity and the plant species theme sensitivities as being of a 'Medium' sensitivity. Following the findings of the field survey, the animal species theme should be assigned a 'Medium' sensitivity due to the modified nature of the project area which reduces the ability of the area to provide habitat to faunal SCC. While the plant species theme should retain its rating, based on the likely presence of suitable habitat to certain SCC.

6 Impact Risk Assessment

The section below and associated tables serve to indicate and summarise the significance of perceived impacts on the terrestrial ecology of the project area. Potential impacts were evaluated against the data captured during the desktop and field assessment to identify relevance to the project area. The relevant impacts associated with the proposed construction of the development were then subjected to a prescribed impact assessment methodology which was provided by Savannah Environmental and is available on request.

6.1 Biodiversity Risk Assessment

6.1.1 Present Impacts to Biodiversity

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the project area (Figure 6-1). These include:

- Mining activities;
- Present energy distribution infrastructure, including powerlines;
- Historical land clearing and land-use;
- Grazing and trampling of natural vegetation by livestock;
- Invasive species;
- Roads and associated vehicle traffic and wildlife road mortalities; and
- Fences.

Figure 6-1 ***Some of the identified impacts within the project site; A) Mining Activities, B) Alien Invasive Plants, C) Powerlines and D) Fences***

6.1.2 Terrestrial Impact Assessment

This section describes the potential impacts on flora, mammals and herpetofauna associated with the construction and operational phases of the proposed development. The impact section also takes into account the sensitivities and SCCs/protected species recorded in the Nkurenkuru Ecology & Biodiversity (2019) report, as this survey was conducted in the summer season.

Anthropogenic activities drive habitat destruction, causing displacement of fauna and flora and possibly direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area.

6.1.3 Alternatives Considered

No alternatives were provided for the development.

6.1.4 Loss of Irreplaceable Resources

- Water resources; and
- Degraded CBA may be lost.

6.1.5 Anticipated Impacts

The impacts anticipated for the proposed activities are considered in order to predict and quantify these impacts and assess & evaluate the magnitude on the identified terrestrial biodiversity (Table 6-1).

Table 6-1 Anticipated impacts for the proposed activities on terrestrial biodiversity

Main Impact	Project activities that can cause loss/impacts to habitat (especially with regard to the proposed infrastructure areas):	Secondary impacts anticipated
1. Destruction, fragmentation and degradation of habitats and ecosystems	Physical removal of vegetation, including protected species.	Displacement/loss of flora & fauna (including possible SCC)
	Access roads and servitudes	Increased potential for soil erosion
	Soil dust precipitation	Habitat fragmentation
	Dumping of waste products	Increased potential for establishment of alien & invasive vegetation
	Random events such as fire (cooking fires or cigarettes)	Erosion
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**
2. Spread and/or establishment of alien and/or invasive species	Vegetation removal	Habitat loss for native flora & fauna (including SCC)
	Vehicles potentially spreading seed	Spreading of potentially dangerous diseases due to invasive and pest species
	Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents	Alteration of fauna assemblages due to habitat modification
	Creation of infrastructure suitable for breeding activities of alien and/or invasive fauna	
Main Impact	**Project activities that can cause direct mortality of fauna**	**Secondary impacts anticipated**
3. Direct mortality of fauna	Clearing of vegetation	Loss of habitat
		Loss of ecosystem services
	Roadkill due to vehicle collision	

	Pollution of water resources due to dust effects, chemical spills, etc.	Increase in rodent populations and associated disease risk
	Loss of breeding sites	
	Intentional killing of fauna for food (hunting)	
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**
4. Reduced dispersal/migration of fauna	Loss of landscape used as corridor	Reduced dispersal/migration of fauna
		Loss of ecosystem services
	Compacted roads	Reduced plant seed dispersal
	Removal of vegetation	
Main Impact	**Project activities that can cause pollution in watercourses and the surrounding environment**	**Secondary impacts anticipated**
5. Environmental pollution due to water runoff, spills from vehicles and erosion	Chemical (organic/inorganic) spills	Pollution in watercourses and the surrounding environment
	Erosion	Faunal mortality (direct and indirectly)
		Groundwater pollution
		Loss of ecosystem services
Main Impact	**Project activities that can cause disruption/alteration of ecological life cycles due to sensory disturbance.**	**Secondary impacts anticipated**
6.Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust and light pollution.	Operation of machinery (Large earth moving machinery, vehicles)	Disruption/alteration of ecological life cycles due to noise
		Loss of ecosystem services
	Project activities that can cause disruption/alteration of ecological life cycles due to dust	Secondary impacts associated with disruption/alteration of ecological life cycles due to dust
	Vehicles	Loss of ecosystem services
Main Impact	**Project activities that can cause staff to interact directly with potentially dangerous fauna**	**Secondary impacts anticipated**
8. Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	All unregulated/supervised activities outdoors	Loss of SCCs

6.1.6 Unplanned Events

The planned activities will have anticipated impacts as discussed; however, unplanned events may occur on any project and may have potential impacts which will need management.

Table 6-2 is a summary of the findings of an unplanned event assessment from a terrestrial ecology perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 6-2 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Spills into the surrounding environment	Contamination of habitat as well as water resources associated with a spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural areas.	An appropriate/adequate fire management plan needs to be implemented.
Erosion caused by water runoff from the surface	Erosion on the side of the road	Storm water management plan must be compiled and implemented.

6.1.7 Identification of Additional Potential Impacts

6.1.7.1 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as the implementation of post-mitigation scenarios. Additional mitigations can be seen in section 6.1.8.

6.1.7.2 Construction Phase

The following potential main impacts on the biodiversity (based on the framework above) were considered for the construction phase of the proposed development. The construction of the associated infrastructure and the PV site has been assessed collectively as their impacts overlap. The construction phase refers to the period during construction when the proposed features are constructed; and is considered to have the largest direct impact on biodiversity. The following potential impacts to terrestrial biodiversity were considered:

- Destruction, further loss and fragmentation of habitats (including watercourses), ecosystems and vegetation community (Table 6-3),
- Introduction of alien species, especially plants (Table 6-4);
- Destruction of protected plant species (Table 6-5); and
- Displacement of the faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration and poaching) (Table 6-6).

Table 6-3 Construction Phase Impacts: Loss of vegetation within the development footprint

Impact Nature: Loss of vegetation within the development footprint		
Destruction, further loss and fragmentation of the habitats, ecosystems and vegetation community, including protected species.		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Permanent (5)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Highly probable (4)
Significance	**High (85)**	**Medium (52)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the loss of vegetation is unavoidable.	
Mitigation:		
• **Limiting the impact area and construction activities to the proposed footprint area and the associated infrastructure servitude only.** • **Existing roads/servitudes should be considered first option over the construction of new roads/servitudes and must only be made where necessary.** • **Minimise the extent of vegetation clearing for the infrastructure. Areas to be cleared must be clearly/visibly demarcated to avoid unnecessary clearing.**		

• **Fire management plan must be in place for the areas surrounding the project area and the road to restrict the impact from fire on the natural flora and fauna communities.** • **Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank. Surplus rehabilitation material can be applied to other areas in need of stabilisation and vegetation cover.**
Residual Impacts:
The loss of currently intact vegetation and destruction of protected flora species is an unavoidable consequence of the project and cannot be entirely mitigated. The disturbance may also cause some erosion and invasive alien plant encroachment. Faunal movement corridors will be disrupted in the area.

Table 6-4 Construction Phase Impacts: Introduction of alien species, especially plants

Impact Nature: Introduction of alien species, especially plants		
Degradation and loss of surrounding natural vegetation arising from construction activities and dust precipitation		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Long term (4)	Moderate (3)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**High (64)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• **Compile and implement an alien vegetation management plan from the onset of construction. The plan must identify areas for action (if any) and prescribe the necessary removal methods and frequencies to be applied. This plan must also prescribe a monitoring plan and be updated as/when new data is collated.** • **Remove organic waste from site weekly to prevent pest species from becoming a problem. A waste management plan must be compiled and implemented from the onset of the construction phase. The plan must designate collection areas, define the separation of waste and also prescribe removal measures and frequencies from the areas. This plan must be also prescribing a monitoring plan and be updated as/when new data is collated.**		
Residual Impacts:		
Long-term broad scale IAP infestation if not mitigated.		

Table 6-5 Construction Phase Impacts: Destruction of protected plant species

Impact Nature: Destruction of protected plant species		
Loss of protected plant species, these are mainly provincially protected species		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Moderate (6)

Probability	Highly probable (4)	Probable (3)
Significance	**High (68)**	**Medium (42)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	The plant SCCs require a permit for destruction and/or relocation.	

Mitigation:

- **Any individual of the protected plants that are present needs a relocation or destruction permit in order for any individual to be removed or destroyed due to the development.**
- **High visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.**
- **All protected plants should be relocated where possible.**

Residual Impacts:

The loss of some of the protected species are unavoidable.

Table 6-6 Construction Phase Impacts: Displacement of faunal community due to habitat loss, direct mortalities and disturbance

Impact Nature: Displacement of faunal community due to habitat loss, direct mortalities and disturbance (including possible SCC)

Construction activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills and persecution. Disturbance due to dust and noise pollution and vibration may disrupt behavior.

	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Long term (4)	Moderate (3)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Highly probable (4)
Significance	**High (80)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, to some extent. Noise and disturbance cannot be well mitigated. Impacts on fauna due to human presence, such as vehicle collisions, poaching, and persecution can be mitigated.	

Mitigation:

- **Signs must be put up stating that should any person be found poaching any species they will be fined.**
- **Construction must take place in the winter months as much is feasible.**
- **The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments, access to these areas must be controlled. Signs must be put up to enforce this.**

- **Areas should be cleared and disturbed on a needs basis only, as opposed to clearing and disturbing a number of sites simultaneously.**
- **Any holes/deep excavations must be done in a progressive manner on a needs basis only. No holes/excavations may be left open overnight. In the event holes/excavations are required to remain open overnight, these areas must be covered to prevent fauna falling into these areas.**
- **Where possible, work should be restricted to one area at a time and be systematic. This is to reduce the number and extent of on-site activities, allowing fauna to move off as the project progresses. This will give the smaller mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.**
- **All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of SCC, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr.**
- **Prior to vegetation clearing activities, the area to be cleared should be walked on foot by 1-2 individuals to create a disturbance in order for fauna to move off. Sites should be disturbed only prior to the area having to be cleared, not more than 1 day in advance.**
- **The timing between clearing of an area and subsequent development must be minimized to avoid fauna from re-entering the site to be disturbed.**

Residual Impacts:

It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

6.1.7.3 Operation Phase

It is anticipated that daily activities associated with the operation phase will lead to further spread the IAP, as well as the deterioration of the habitats due to the increase of dust and edge effect impacts. Dust reduces the ability of plants to photosynthesize and thus leads to degradation/retrogression of the veld. Moving maintenance vehicles do not only cause sensory disturbances to fauna, affecting their life cycles and movement, but will lead to direct mortalities due to collisions.

The following potential impacts were considered:

- Continued fragmentation and degradation of habitats and ecosystems (Table 6-7);
- Spread of alien and/or invasive species (Table 6-8); and
- Ongoing displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration) (Table 6-9.)

Table 6-7 Operational phase impacts: Continued fragmentation and degradation of habitats and ecosystems

Impact Nature: Continued fragmentation and degradation of habitats and ecosystems		
Disturbance created during the construction phase will leave the project area vulnerable to erosion and IAP encroachment.		
	Without Mitigation	**With Mitigation**
Extent	Local Area (3)	Footprint & surrounding areas (2)
Duration	Permanent (5)	Moderate term (3)

Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (56)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated.	

Mitigation:

- **It should be made an offence for any staff to /take bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.**
- **Implementation of an alien vegetation management plan.**

Residual Impacts

There is still some potential for erosion and IAP encroachment even with the implementation of control measures. Impacts will however be low with the implementation of control measures.

Table 6-8 Operational phase impacts: Spread of alien and/or invasive species

Impact Nature: Spread of alien and/or invasive species		
Degradation and loss of surrounding natural vegetation		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Footprint & surrounding areas (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (56)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- **Implementation of an alien vegetation management plan.**
- **Implementation of a waste management plan. Waste management must be a priority and all waste must be collected, stored and disposed of adequately. It is recommended that all waste be removed from site on a weekly basis (as a minimum) to prevent rodents and pests entering the site.**
- **Refuse bins must be emptied and secured.**
- **Temporary storage of domestic waste must be in covered waste skips.**
- **Maximum domestic waste storage period will be 7 days.**

• **A pest control plan must be put in place and implemented; it is imperative that poisons not be used.**
Residual Impacts:
Long term broad scale IAP infestation if not mitigated.

Table 6-9 Operational phase impacts: Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)

Impact Nature: Ongoing displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration) **The operation and maintenance of the proposed development may lead to disturbance or persecution of fauna in the vicinity of the development.**		
	Without Mitigation	**With Mitigation**
Extent	Local Area (3)	Footprint & surrounding areas (2)
Duration	Long term (4)	Moderate term (3)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (60)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• **Lighting should be kept to a minimum to avoid disturbing crepuscular and nocturnal species. Lighting fixtures should be fitted with baffles, hoods or louvres and directed downward, to minimize light pollution which could attract night migrating species.** • **Lighting should be directed towards to footprint area and avoid unnecessary illumination of the adjacent undeveloped areas.** • **Where feasible, motion detection lighting must be used to minimise the unnecessary illumination of areas** • **Avoid using any road during the night.** • **In the security fence surrounding the project areas, small areas of 30cm x30cm must be left open to allow fauna species to move through the area and to avoid a barrier effect created by the development.**		
Residual Impacts		
Disturbance from maintenance activities will occur albeit at a low and infrequent level. Less migratory species will be found in the area. Road killings are still a possibility. Migratory routes of fauna will change, fauna and flora species composition will change.		

6.1.7.4 Decomissioning Phase

This phase is when the scaling down of activities ahead of temporary or permanent closure is initiated. During this phase, the operational phase impacts will persist until the activity reduces, and the rehabilitation measures are implemented.

The following potential impacts were considered:

- Continued fragmentation and degradation of habitats (Table 6-10); and
- Displacement of faunal community (including SCC) due to disturbance (road collisions, noise, dust, vibration) (Table 6-11).

Table 6-10 Decommissioning activities impacts: Continued fragmentation and degradation of habitats

Nature:		
Continued fragmentation and degradation of habitats		
	Without mitigation	With mitigation
Extent	Local area (3)	Footprint and surrounding areas (2)
Duration	Long term (4)	Very short term (1)
Magnitude	High (8)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (60)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		
• **Implementation of a rehabilitation plan.** • **Implementation of an alien invasive management plan and monitoring on an annual basis for 3 years post construction.** • **There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.**		
Residual Impacts:		
No significant residual risks are expected, although IAP encroachment and erosion might still occur but would have a negligible impact if effectively managed.		

Table 6-11 Decommissioning activities impacts: Displacement of faunal community due to disturbance

Nature:		
Displacement of faunal community due disturbance (road collisions, noise, dust, vibration).		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Long term (4)	Moderate term (3)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**High (64)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low

Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

- **Dust management needs to be undertaken in the areas where the infrastructure will be removed. This includes wetting of the soil. This area must be rehabilitated as soon as possible.**
- **All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the decommissioning area.**
- **All vehicles (construction or other) accessing the site should adhere to a low-speed limit on site (40 km/h max) to avoid collisions with susceptible fauna, such as nocturnal species which sometimes forage or rest on roads, especially at night.**
- **The area must be walked through prior to decommissioning to ensure fauna species are not affected by the removal of the infrastructure.**

Residual Impacts:

If this is mitigated and monitored correctly no residual impacts should be present.

6.1.7.5 Cumulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general habitat loss and transformation resulting from other activities in the area.

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for fauna and flora. Localised cumulative impacts include the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers, dust deposition, noise and vibration, disruption of corridors or habitat, groundwater drawdown, groundwater and surface water quality, and transport.

According to the 2018 National Biodiversity Assessment, the total amount of Eastern Highveld Grassland habitat within 30 km of the project amounts to 140923,26 ha, but when considering the transformation that has taken place within this radius – only 87727,46 ha remains. Therefore, the area within 30 km of the project has experienced approximately 62,25 % loss in natural habitat of this vegetation type. Considering this context, the project footprint is 235 ha (assuming only the development footprint will be used), and four additional similar project exists in the 30 km region measuring a maximum of 1846,38 ha (as per the latest South African Renewable Energy EIA Application Database). This means that the total amount of remaining habitat lost as a result of solar projects in the region amounts to 2,37% (the sum of all related developments as a percentage of the total remaining habitat). Table 6-12 outlines the calculation procedure for the spatial assessment of cumulative impacts.

Table 6-12 Loss of Eastern Highveld Grassland habitat within a 30 km radius of the project

	Total Habitat (ha)	Tot. Remaining Habitat (ha)	Total Historical Loss	Project Footprint (ha)	Similar Projects (ha)	Cumulative Habitat Lost

Solar Development Cumulative Lost	140923,26	87727,46	**62,25%**	235	1846,38	**2,37%**

Only a few functional corridors remain, and this means that the 2,37% lost in remaining habitat due to solar developments is relatively significant, the cumulative impact of the project is thus rated as 'High'. This means that the careful spatial management and planning of the entire region must be a priority, and existing large infrastructure projects must be carefully monitored over the long term.

Table 6-13 Cumulative Impacts to biodiversity associated with the proposed project.

The development of the proposed infrastructure will contribute to cumulative habitat loss, especially in the ecological corridors like the wetlands and thereby impact the water resource and ecological processes in the region.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local Area (3)	Regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Highly probable (4)
Significance	**Medium (39)**	**High (64)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		
Should the vegetation be removed, the impact cannot be mitigated.		
Residual Impacts:		
Will result in the loss of: • Watercourses; • CBA; • Protected plants; and • SCC fauna species (the species listed in the Nkurenkuru Ecology & Biodiversity (2019) report.		

6.1.8 Impact Management and Mitigation Plan

The aim of the management outcomes is to present mitigation actions in such a way that they can be incorporated into the Environmental Management Programme (EMPr), and possible biodiversity management programme, for the project, which should in turn allow for a more successful implementation and auditing of the mitigations and monitoring guidelines. Table 6-14 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators relative to the terrestrial assessment.

The focus of mitigation measures is to reduce the significance of the likely impacts associated with the development, and thereby to:

- Prevent the significant loss and fragmentation of vegetation communities within the CBA areas in the vicinity of the PAOI;
- Reduce the negative fragmentation effects of the development and enable the safe movement of fauna species;
- Prevent the direct and indirect loss and disturbance of flora and fauna species and communities, including SCC and protected species; and
- Adequately follow the guidelines for interpreting the Site Ecological Importance ratings assigned to the Project Area of Influence (see Table 4-6).

Special attention must be paid to the ‘Vegetation and Habitats’ and ‘Fauna’ sections below as these sections provide recommended and important mitigation measures pertaining to the possible presence of SCC and confirmed protected species.

Table 6-14 Project specific mitigation measures including requirements for timeframes, roles and responsibilities

Management outcome: Vegetation and Habitats				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Areas rated as High sensitivity and their buffers in proximity to the development areas should be avoided as much as what is feasible. Avoided areas must be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas from construction workers and machinery. Mitigated development in medium sensitivity areas is permissible.	Construction Phase	Project manager & Environmental Officer	Development footprint	Ongoing
Laydown and construction preparation activities (such as cement mixing, temporary toilets, etc.) must be limited to the 'Low' and 'Very Low' sensitivity areas.	Construction Phase	Project manager, Environmental Officer	Development footprint	Ongoing
Areas outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. The clearing of vegetation must be minimized where possible. All activities must be restricted to within the authorised areas. It is recommended that areas to be developed be specifically and responsibly demarcated so that during the construction phase only the demarcated areas be impacted upon.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
All protected flora must be clearly demarcated prior to the commencement of site clearing. If construction activities are likely to affect any protected plants, these individuals should be relocated as part of a plant search and rescue plan and a permit must be obtained before doing so.	Planning Phase	Environmental Officer	Protected plants	During phase
Existing access routes, especially roads, must be made use of.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
Any materials may not be stored for extended periods of time and must be removed from the PAOI once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas.	Construction and Operational Phase	Environmental Officer, Design Engineer, and Contractor	Laydown areas	Ongoing

Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by invasive alien plant species. All grazing mammals must be kept out of the areas that have recently been re-planted.	Operational phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. • **Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.** • **No servicing of equipment on site unless necessary.** • **All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.** • **Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.** • **Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem.** • **All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.**	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
It must be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire would have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
All construction waste must be removed from site at the closure of the construction phase.	Construction phase	Environmental Officer & Contractor	Construction waste	During Phase
Management outcome: Fauna				
Impact Management Actions	**Implementation**		**Monitoring**	

	Phase	Responsible Party	Aspect	Frequency
A qualified environmental control officer must be on site when activities begin. A site walk through is recommended by a suitably qualified ecologist prior to any activities taking place and any SSC or protected species should be noted. In situations where these species are observed and must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development and implementation of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated.	Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal SCC	During phase
Clearing and disturbance activities must be conducted in a progressive linear manner, from the west to the east of the PAOI and over several days, so as to provide an easy escape route for all small mammals and herpetofauna.	Construction Phase	Environmental Officer & Contractor	Progressive land clearing operations and the movement of fauna	Ongoing
The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this.	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing
The duration of the activities should be minimized to as short a term as possible, to reduce the period of disturbance on fauna.	Construction	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to reptile species and nocturnal mammals.	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed and Signs must be put up to enforce this. Monitoring must take place in this regard.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light	Ongoing

All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training	Ongoing
Schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day	Ongoing
Any holes/deep excavations must be dug and planted in a progressive manner and shouldn't be left open overnight. Should any holes remain open overnight they must be properly covered temporarily to ensure that no small fauna species fall in, and subsequently inspected prior to backfilling.	Planning and Construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.	Planning and construction	Environmental Officer & Contractor, Engineer	Fauna movement corridor	Ongoing
Use environmentally friendly cleaning and dust suppressant products.	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Once the development layout has been confirmed, the footprint area must be fenced off appropriately in segments pre-construction to allow animals to move or be moved out of these areas before breaking ground activities occur. Construction activities must take place systemically and the perimeter fence should not be completed (i.e., leaving sections unfenced to allow fauna to escape) until systematic clearing is completed. Drilling etc. should start one side of the site and progress towards the section of the site where fences are incomplete (ideally east to west).	Planning/Construction Phase	Environmental Officer & Design Engineer	Areas not to be developed and construction direction	Ongoing
Management outcome: Alien species				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
An Invasive Alien Plant Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in IAP composition.	Life of operation	Project manager, Environmental Officer & Contractor	Manage and assess presence and encroachment of alien vegetation	Twice a year
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation

Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. A location specific waste management plan must be put in place to limit the presence of rodents and pests and waste must not be allowed to enter surrounding areas.	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.	Life of operation	Environmental Officer & Health and Safety Officer	Evidence or presence of pests	Life of operation

Management outcome: Dust				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes the wetting of exposed soft soil surfaces. **No non-environmentally friendly suppressants may be used as this could result in the pollution of water sources.**	Construction phase	Contractor	Dustfall	Dust monitoring program.

Management outcome: Waste management				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored effectively and responsibly according to a site-specific waste management plan. Dangerous waste such as metal wires and glass must only be stored in fully sealed and secure containers, before being moved off site as soon as possible.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Litter, spills, fuels, chemical and human waste in and around the project area must be minimised and controlled according to the waste management plan.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
Cement mixing may not be performed on the ground. It is recommended that only closed side drum or pan type concrete mixers be utilised. Any spills must be immediately contained and isolated from the natural environment, before being removed from site.	Construction Phase	Environmental Officer & Contractor	Cement mixing and spills	Every occurrence

A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility within every 10 days at least.	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site or buried on open pits.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste	Ongoing
Refuse bins will be responsibly emptied and secured. Temporary storage of domestic waste shall be in covered and secured waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days

Management outcome: Environmental awareness training				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. **Discussions are required on sensitive environmental receptors within the PAOI to inform contractors and site staff of the presence of sensitive fauna species, their identification, conservation status and importance, biology, habitat requirements and management requirements in line with the Environmental Authorisation and within the EMPr.** **Contractors and employees must all undergo the induction and must be made aware of the sensitive areas to be avoided.**	Pre-construction phase	Health and Safety Officer, Environmental Officer	Compliance to the training	Ongoing

Management outcome: Erosion				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Existing access routes and walking paths should be made use of.	Life of operation	Project manager, Environmental Officer	Routes used within the area	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events etc.	Life of operation	Project manager, Environmental Officer	Re-establishment of indigenous vegetation	Progressively
A stormwater management plan must be compiled and implemented.	Life of operation	Project manager, Environmental Officer	Management plan	Before construction phase: Ongoing

7 Conclusion and Impact Statement

The PAOI overlaps with CBA irreplaceable and CBA optimal areas according to the provincial conservation plan, however, following the findings of this assessment most of the local habitat is considered to exist in a degraded state. It is noted that certain sections of the PAOI represent more intact areas of habitat (the wetland areas), and these are considered to be more functional with regards to the CBA status of the PAOI, whereby they should be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems, and land uses should maximise the retention of biodiversity pattern and ecological process. To ensure this it is important that the management outcomes presented above be adhered to, in order to properly mitigate the negative environmental impacts that will stem from the project activities.

Fauna and flora SCC have a moderate expectancy of occurrence across the PAOI. While two species, *Zantedeschia aethiopica* and *Crinum macowanii*, listed as protected under Schedule 11 of the Mpumalanga Nature Conservation Act (Act 10 of 1998) were recorded within the wetland habitat. The previous Pre-Construction Walk-Through Report compiled by Nkurenkuru Ecology & Biodiversity in 2019 found additional *Crinum macowanii* individuals along the secondary grassland habitat. As such it is recommended that a wet season walkthrough of the PAOI be conducted prior to the commencement of the project construction phase.

Completion of the terrestrial biodiversity assessment led to a disputing of the 'Very High' classification for the terrestrial biodiversity theme sensitivity as allocated by the National Environmental Screening Tool. The PAOI is instead assigned an overall sensitivity that ranges from 'Very Low' to 'Medium', with the exception of the wetland areas that has been assigned a 'High' sensitivity.

7.1 Impact Statement

The main impacts that may be expected to occur, as a result of the proposed activities, include the following:

- Direct habitat loss and fragmentation (including the loss of degraded CBA areas);
- Degradation of surrounding habitat;
- Disturbance and displacement of fauna (including direct mortality of fauna); and
- Introduction and further spreading of IAP and weed species.

All mitigation measures as described in this report must be implemented so as to reduce the significance of all anticipated impacts to an acceptable level (from 'High' to 'Medium' or 'Low'). The cumulative impact of the project, taking into account the transformation of surrounding land, is rated as 'High' and as such it is important to consider careful regional spatial planning and management in order to maintain the functionality of the remaining corridors of habitat.

It is the opinion of the specialists that the project may be favourably considered, on condition that all prescribed mitigation measures are implemented.

7.2 Specialist Recommendations

It is recommended that a wet-season walkthrough of the PAOI be conducted prior to the commencement of the project construction phase (and this should be a condition of the Environmental Authorisation). This is since certain species are likely to have been unobservable during the first survey as these were conducted during the dry season. It is possible that more SCC and/or protected species are found to occur within or nearby to the PAOI and this would necessitate the implementation of a search and rescue plan.

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9 Appendix Items

9.1 Appendix A – Specialist Declarations

DECLARATION

I, Carami Burger, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations, and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority.
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Carami Burger

Ecologist

The Biodiversity Company

August 2022

DECLARATION

I, Andrew Husted, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Andrew Husted

Terrestrial Ecologist

The Biodiversity Company

August 2022