PROPOSED MINING PERMIT APPLICATION AND STOCKPILE AREA ON THE REMAINING EXTENT OF ELANDS SPRUIT NO 5523, ALFRED DUMA MUNICIPAL, KWAZULU-NATAL

Terrestrial Biodiversity Impact Assessment Report

Version 1.1

Date: 16th February 2023

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Report No: EP671-02

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SPECIALIST ASSESSMENT REPORT DETAILS AND DECLARATION OF INDEPENDENCE

This is to certify that the following assessment and report has been prepared independently of any influence or prejudice and as per the requirements of:

1. Section 32 (3) of the NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (Act No. 107 OF 1998) ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS 2014 as per Government Notice No. 38282 GOVERNMENT GAZETTE, 4 DECEMBER 2014 (as amended in 2017).
2. Procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of Section 24(5)(a) and (h) of the NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998, when applying for Environmental Authorisation, as per Government Notice No. 648 in Government Gazette No. 42451 (10 May 2019).

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Location:	The Remaining Extent of Elands Spruit NO. 5523, Alfred Duma Municipal, KZN
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Client:	Greenmined Environmental

I, **Ryan Kok**, hereby declare that this report has been prepared independently of any influence or prejudice as may be specified by the relevant environmental authorities.

Signed:  Date: 16th February 2023

Details of Specialist Team

The relevant experience of specialist team members involved in the compilation of this report are briefly summarized below. *Curriculum Vitae's* of the specialist team are available on request.

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EXECUTIVE SUMMARY

Raubex KZN (Pty) Ltd intends to establish an open-cast quarry (~4.9ha) and an area for stockpiling and crushing of material (~10.5ha) that is mined at the quarry on the Remaining Extent of the farm Elands Spruit No 5523, near Ladysmith, within the Alfred Duma Municipal, KZN. The applicant intends to apply for Environmental Authorisation. An assessment of the terrestrial vegetation communities, habitats, ecosystems and associated biodiversity was undertaken by Eco-Pulse Environmental Consulting Services in January/February 2023.

The main findings of the report have been summarized below.

Summary of Baseline Terrestrial Biodiversity Assessment:

One (1) terrestrial vegetation community was observed within the proposed project development, namely Northern KwaZulu-Natal Moist Grassland (see summary Table A).

Table A. Summary of vegetation communities with ecological condition and EIS ratings.

Vegetation Community Type	Threat Status[1]	Condition	Ecological Importance / Sensitivity	Protected Plants Present?
Northern KwaZulu-Natal Moist Grassland	VU	Poor	Medium	Yes

One (1) conservation important plant species was recorded within the project area that was assessed, *Aloe marlothii*, which is provincially protected in accordance with the KwaZulu-Natal Nature Conservation Management Amendment Act, 1999 (No. 5 of 1999). Northern KwaZulu-Natal Moist Grassland is endemic to KwaZulu-Natal and listed as a 'vulnerable' threatened ecosystem nationally.

Fauna of conservation concern were not observed during the site visit, however based on the habitat requirements and ranges of species, several might potentially utilise the grassland habitat in the study area for refuge, feeding/foraging, nesting and breeding purposes.

Terrestrial Biodiversity Impacts and Impact Management/Mitigation:

Construction phase impacts (cumulative) associated with this project were predicted as being most significant ranging from 'High' to 'Moderately Low' under a 'poor/standard' mitigation scenario, with key

[1] Threat Status (Jewitt, 2016):

CR: Critically Endangered; EN: Endangered; VU: Vulnerable; LT: Least Threatened

impacts being to protected plants. Under a 'good' or 'best-practical' mitigation scenario that seeks to avoid sensitive protected plant species, most construction phase impacts can be avoided or reduced in terms of intensity and probability by restricting impacts to the 'vulnerable' vegetation community, thereby reducing impact significance to 'Moderately Low' to 'Low' levels overall.

Most operational phase impacts (cumulative) will be linked to post-construction disturbance that could open up key natural areas to further impact by Invasive Alien Plants (IAPs) and weeds, leading to further loss of biodiversity and leading to reduced ecosystem condition and functioning. Under a 'poor' mitigation scenario (no follow-up clearing of IAPs post-construction), impacts are generally expected to be of 'Moderate' significance where poorly mitigated/managed. Overall, operational impacts under 'good' mitigation scenario range from 'Moderate' to 'Low' significance.

Key mitigation recommendations include:

1. Avoiding nearby/ surrounding ecologically important and sensitive grassland habitat and protected plants;
2. Implementing a protected plant permitting, rescue and translocation plan where impacts to protected plants cannot be avoided;
3. Implementing best-practice construction phase management in terms of access control, demarcations, vegetation clearing, waste and pollution management, erosion control on steep slopes, fire management, alien plant control and wildlife management;
4. Undertaking follow-up alien plant control post-construction; and
5. Implementing a post-construction rehabilitation programme that includes re-vegetation where necessary.

Note that given the fact that most of the habitats degraded and/or already infested by IAPs, the potential success of clearing operations will require a more comprehensive and holistic programme to manage IAPs within the target degraded vegetation community at the site.

Biodiversity offsets can be avoided where impacts to protected plants and grassland patches are avoided through protected plant relocation. Under a best practical mitigation scenario, the project is considered to be environmentally acceptable from a terrestrial biodiversity perspective, provided that the mitigation and management recommendations in Chapter 6 of this report are strictly adhered to.

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1 INTRODUCTION

1.1 Project Background and Locality

The applicant Raubex KZN (Pty) Ltd currently holds a mining permit (DMRE Ref No: KZN 30/5/1/3/2/10518 MP) to mine aggregate from a 4.9 ha area on the Remaining Extent of the farm Elands Spruit No 5523, uThukela District, which is valid until February 2023. Due to the mining of the area being dependent on the upgrade of the N11 (SANRAL tender still to be awarded), mining has not yet commenced at the site. With the forthcoming lapsing of the existing mining permit, Raubex identified the need for a new mining permit. In addition to the mining of the quarry, Raubex also intends to establish an area for stockpiling and crushing of material that is mined at the quarry, on 10.5ha on the Remaining Extent of the farm Elands Spruit No 5523. The property is ±26 km north-east of Ladysmith between Collings Pass Road and the N11 national road. The earmarked area has an existing quarry that was historically mined but abandoned without rehabilitation.

In light of this, Raubex appointed Greenmined as the independent Environmental Assessment Practitioner (EAP) to undertake an Environmental Impact Assessment (ESIA) for the proposed project. Eco-Pulse Environmental Consulting Services (Eco-Pulse) were subsequently appointed Greenmined to conduct a terrestrial ecosystem assessment for the project to inform planning and to meet the requirements for an Application for Environmental Authorisation (EA).

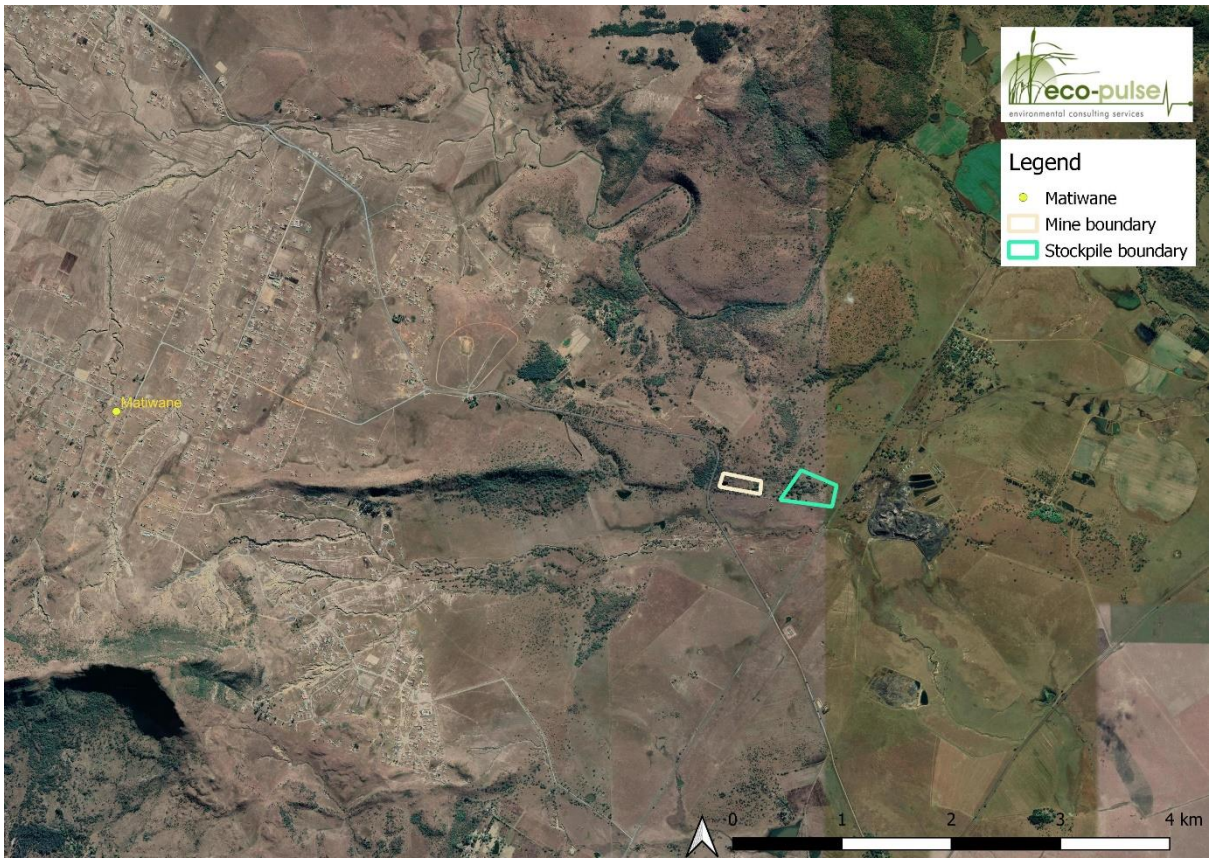

Figure 1 Mining and stock piling areas in relation to key locality feature, Matiwane.

1.2 Project Description

The development of the mine and stock piling area is to be undertaken in a phased approach. Therefore, the project will comprise of activities that can be divided into three key phases.

1.2.1 Phase 1: Site Establishment

The site establishment or construction phase will involve the demarcation of the authorised area. Site establishment will also necessitate the clearing of vegetation, the stripping and stockpiling of topsoil, and the introduction of machinery and equipment.

Demarcation of Boundaries

Pursuant to receipt of the Environmental Authorisation (EA) and prior to site establishment, the boundaries of the approved area will be demarcated with visible beacons.

Access Road

The proposed stockpile area will be reached via the existing farm track turning from Collings Pass. No equipment or vehicles will access the N11 directly from the stockpile area without prior approval from

SANRAL. The Applicant proposes to upgrade ±700 m of the road to allow comfortable movement of project related equipment and vehicles. The surface of the access road will be improved, re-gravelled where needed, and the width increased to ±10 m.

An application for Access to Roads was submitted (in 2017) as part of the Raubex mining permit application to the KZN Department of Transport (DoT). The application was for the turning of project vehicles from the farm onto the Collings Pass Road. Thus far no response was received on the said application, and the DoT was again invited to comment as stakeholders on this application (EA for the stockpile area). No comments were received that could be incorporated into the FBAR.

Clearing of Vegetation

The proposed activity will require the removal of indigenous vegetation during the site establishment- and operational phases. The vegetation type of the earmarked footprint is classified as Northern KwaZulu-Natal Moist Grassland (Gs 4), and mainly consists of open grassland with a patch of woody trees. No species of conservation concern (SCC) were observed by the ecologist on site. The Applicant will strive to conserve as much vegetation as possible and revegetate the area with locally adapted species once it is no longer required for stockpiling.

Topsoil Stripping

It is proposed that topsoil removal will be restricted to the exact footprint of areas required during the operational phase of the activity. The topsoil will be stockpiled at a designated signposted area within the approved boundary to be replaced during the rehabilitation of the area. It will be part of the obligations of site management to prevent the mixing of topsoil heaps with other soil heaps. The complete A-horizon (the top 100 – 200 mm of soil which is generally darker coloured due to high organic matter content) will be removed. If it is unclear where the topsoil layer ends the top 300 mm of soil will be stripped. The topsoil berm will measure a maximum of 2 m in height to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.

Introduction of Machinery and Site Equipment

The infrastructure to be used on site will all be of temporary and mobile nature. Containers will be used for office and storage purposes, and a temporary weigh bridge will be established. The storage of fuel, if any, will be below the threshold of the NEMA EIA listed activities. No water will be abstracted from the proposed stockpile area, and the plant will be powered with generators. The ablution facilities will be chemical toilets that will be serviced by a registered contractor. The office and storage containers, weigh bridge and ablution facilities will most likely be placed at the entrance to the site, while the crushing plant will be of mobile nature, moving around the site as needed.

The following infrastructure/equipment required is expected to consist of at least:

- A temporary wash bay;
- ADT trucks;
- Chemical ablution facilities;

- Containers used as site office, workshop, and storage room;
- Crushing and screening plant (mobile);
- Earthmoving- and excavating equipment;
- Weighbridge with control room;
- Generators; and
- Water truck.

1.2.2 Phase 2: Operational Phase

Raubex submitted this application for environmental authorisation in anticipation of a SANRAL road works tender to upgrade the N11 in the vicinity of Ladysmith. Presently it is proposed that the product to be generated at the quarry on the property will be used, by Raubex, as fill material for the intended road works project. The use of the proposed stockpile area will therefore be of temporary nature corresponding with the duration of the construction works needed on the N11 (±6 years).

Raubex will transport the material from the quarry into the stockpile area. The rock will then be delivered to the crushing and screening plant where it will be reduced to various sized gravels. The screened material will be delivered to various size category stockpiles. Transportation of the final product will be from the stockpile area to the end point by means of trucks.

Raubex intends to:

- Demarcate the boundaries of the stockpile area;
- Strip the topsoil off the earmarked area and stockpile it for later use in rehabilitation;
- Stockpile the processed material in various size categories within the boundaries of the approved area;
- Process the material through crushing and screening;
- Load and transport the material from the stockpiles.

Water Use

Any water required for the implementation of the project will be bought from a lawful source and transported to the stockpile area (in a truck) where it will be stored in tanks until used. Presently, no washing of material is proposed, and Raubex will therefore mainly use water for dust suppression purposes on denuded areas, the processing plant, and access road.

Dust generation will, as far as possible, be managed through alternative dust suppression methods to restrict water use to the absolute minimum.

These measures will include a combination of the following:

- The speed of all equipment/vehicles will be restricted to 40 km/h on the internal farm road to minimize dust generation;
- Site management will attempt to lessen denuded areas (dust source) to the absolute minimum;
- Strips of used conveyor belts can be attached to the drop end of the crusher plant where crushed material falls onto the stockpiles. This lessens the blowing of fines from the minerals;
- Compacted dust will weekly be cleaned of the crusher plant to eliminate it as a dust source.

Under very windy/dusty conditions the EA holder might have to substitute the above dust suppression methods with the spraying of water, in which case a water truck will moisten the problem areas, and sprayers at the processing plant will moisten the material to alleviate dust generation at the conveyor belts. The water truck driver will receive proper training to ensure effective use of the water on problem areas preventing water wastage. It is proposed that approximately 20 000 litres of water will be needed per day during the dry months (amount to decrease during the rainy season). At present no water is proposed to be drawn from dams or other surface water sources/courses.

Electricity Use

The proposed project will make use of diesel generators to power the infrastructure. All generators will have secondary containment in the form of a bund wall/drip tray that can contain 110% of the generator's maximum fuel capacity. Personnel will be trained in the safe refuelling of the generators from bowsers and/or containers, and drip trays will be used at all times.

Servicing and Maintenance

A temporary workshop and wash bay will be established on site where minor servicing and emergency repairs of project related equipment/machinery will take place. The wash bay will have an impermeable floor and drain into an oil sump that will be serviced by a qualified contractor. No wash water will be allowed to drain into the surrounding environment. No bulk storing of fuel (>80 000 l) will take place on site, and any chemicals needed at the workshop will be stored in accordance with the product specific material safety data sheet in temporary containers/secured cages.

Waste Handling

Solid (general) waste, generated during the operational phase, will be contained in sealable refuse bins that will be placed at the office area until the waste is transported to a registered general waste landfill site. A registered contractor will service the chemical toilets that will serve as ablution facilities to the employees.

Due to the nature of the project very little generation of hazardous waste is expected and will mainly be the result of accidental spillages or breakdowns. Such contaminated areas will be cleaned up immediately (within two hours of the occurrence) and the contaminated soil will be contained in designated hazardous waste containers that will be kept in a bunded area with impermeable surface until it is removed from site by a registered hazardous waste handling contractor to an approved facility.

The future land use of the proposed area will likely be grazing related. Upon replacement of the topsoil, the area will once again be available for grazing purposes, and the reseeding of the area will tie in with the proposed land use.

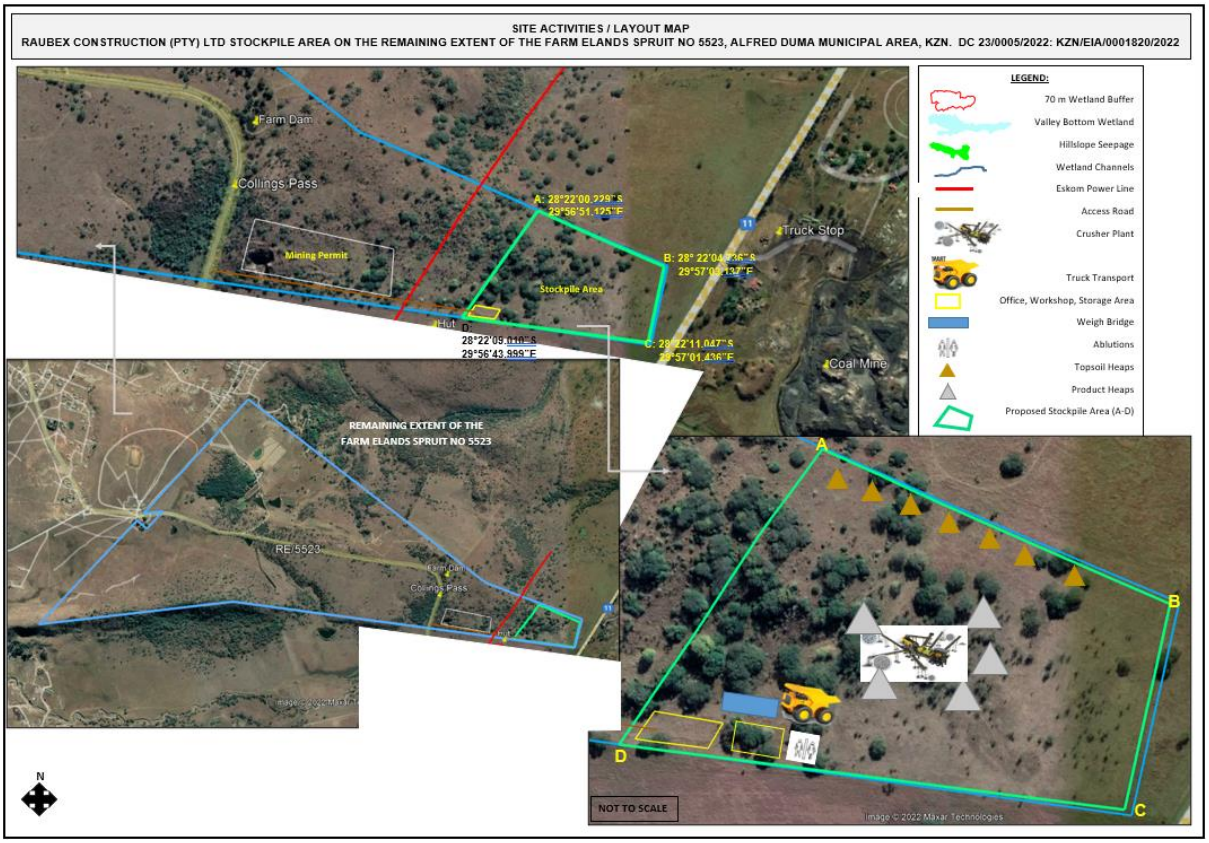

Figure 2 Conceptual site layout map.

1.3 Purpose of the Assessment

The mining and stock piling project stands to impact (both directly and indirectly) on terrestrial ecosystems. A Terrestrial Ecosystems Impact Assessment that addresses the Terrestrial Biodiversity Theme, the Plant Species Theme and the Animal Species Theme is therefore required to inform the MRA and Environmental Impact Assessment (EIA) requirements for the project in terms of the latest National Environmental Management Act (NEMA): EIA Regulations (2020). This assessment aims to address the Terrestrial Biodiversity and Plant Species Themes; however, it does not address the Animal Species Theme under the new gazetted requirements, and a separate assessment/s will need to be conducted by suitably qualified faunal taxon specialists to address this Theme. This report does however include a desktop faunal Potential Occurrence (POC) assessment and a rapid site verification based on SCC, which flags faunal species that potentially occur within the study area.

Note that whilst the Screening Report outputs also highlight 'Very High Sensitivity' associated with the Aquatic Biodiversity Theme, this has been verified to be associated with wetlands downstream, which is covered under the separate 'Wetland Assessment Report' (Eco-Pulse, 2023; EP671-01).

1.4 Scope of Work

The following scope of work was undertaken:

- Review of any documented and available studies/information for the site and surrounding areas.
- Desktop level mapping of remaining untransformed terrestrial habitat and vegetation within the development footprint and immediate adjacent areas.
- Contextualisation of the study area in terms of important biophysical characteristics and conservation planning using available spatial datasets and conservation plans including:
    - National Vegetation Types (Mucina & Rutherford, 2006);
    - Available faunal species records/atlases for the study area;
    - Plants of Southern Africa (POSA) database records for the study area (SANBI);
    - KZN Terrestrial Biodiversity Sector Plan (KZNBSP) (EKZNW, 2010/2016) – with a focus on identifying Critical Biodiversity Areas (CBAs); and
    - Local level conservation planning assessments and tools.
- Desktop POC assessment of the floral and faunal SCC (SCC) that may occur within the broader study area based on available species records for the region (e.g., POSA database, SABAP2, faunal Red Data Lists, etc.) and which takes into account habitat condition, habitat suitability based on species requirements, species ranges and threat status.
- Undertaking a site walkover and field survey of the key/priority untransformed vegetation and habitat to record necessary information required to assess vegetation condition and the Ecological Importance and Sensitivity (EIS) of mapped communities as well as habitat suitability for key species. This entailed the following:

  - Field survey of vegetation[2] and habitat along transects across terrestrial habitat types identified including identification of pioneer and alien plant species and description of habitat and vegetation type, and ecological condition rating.
  - Identification and mapping of the geographic location of any terrestrial plant SCC (rare/protected plants and trees) noted during the site assessment.
  - Basic survey (limited to day-time survey) to validate the POC of fauna of conservation concern potentially occurring in the area (where possible) using visual observations of species as well as evidence of their occurrence on the site (e.g., burrows, nests, excavations, animal tracks, etc.)[3],
- Compile plant species lists for the delineated vegetation communities based on available desktop information and site visits with a key focus on noting any species of conservation significance.
- Description of any significant landscape features (including rare or important floral associations).
- A description of the terrestrial biodiversity and ecosystems, including:
  - Main vegetation types[4]
  - Threatened ecosystems, including Listed Ecosystems and locally important habitat types identified;
  - Ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats;
  - Species, distribution of important habitats and movement patterns identified.
  - Identification of ecological corridors that the development could impede, including migration and movement of flora and fauna.
- Identify the location of all floral SCC recorded during site visits on the property using a hand-held GPS.
- Record general information on fauna (direct sightings or tracks/signs of faunal activity) where possible in order to refine the desktop POC assessments.
- Allocation of condition classes to mapped vegetation communities based largely on a review of aerial photography and supplemented with field data including species composition, vegetation structure and the presence of ruderal, pioneer and invasive alien species.
- Extrapolation of data through ground-truthing (i.e., data from field investigations will be extrapolated where possible to cover areas not investigated in the field and where access was

[2] **Note:** *The scope of work excludes any detailed site-based assessments to verify the occurrence of any cryptic species that may occur on the site. If these are flagged as having a high likelihood of occurring on the site, a separate quotation will be provided to undertake further specialist work.*

[3] **Note**: The scope of work excludes any detailed fauna trapping. If the potential cryptic faunal species is flagged as having a high likelihood of occurring on the site, this can be addressed by a suitable qualified faunal taxon specialist.

[4] Descriptions of the main vegetation communities will be provided, with an emphasis on reporting on dominant species and species of conservation significance (e.g., rare, protected, red-data listed flora).

a particular challenge, in order to reduce information gaps). This will be done for similar ecosystem/habitat types identified at a desktop level.

- Assessment of the ecological importance/sensitivity of terrestrial habitat based on key criteria such as threat status, presence of red data species or suitability to support key species of conservation significance, habitat condition, etc.
- Provision of an ecological sensitivity map for the site, including the location of sensitive habitat/vegetation types, protected plants and any recommended terrestrial biodiversity buffer zones (development set-backs) with motivation provided together with preliminary planning and design mitigation / recommendations to avoid and minimise direct and indirect terrestrial ecological impacts (including potential biodiversity buffer zones according to best practice guidelines) for consideration by the client/applicant (i.e. Draft Baseline Report) which will then be discussed prior to the assessment of impacts and report finalisation (designs/layout plans will typically be reviewed and updated as necessary at this stage).
- Describe any assumptions made and any uncertainties or gaps in knowledge, as well as identifying the need for any future specialist inputs should these be deemed relevant to the project (e.g., focal faunal species assessments). This would include recommendations for additional seasonal surveys if necessary.
- Identification and description of the various direct and indirect terrestrial ecological impacts for the various phases of the development project (includes construction and operation phases), including:
    - Impact on vegetation species composition and structure
    - Impact on ecosystem threat status
    - Impact on explicit subtypes in the vegetation
    - Impact on overall species and ecosystem diversity
    - Impact on populations of species of special concern
    - Impact on ecological processes and functionality
    - Impact on ecological connectivity
- Provision of impact mitigation measures / recommendations to avoid and minimise direct and indirect impacts, including alternatives in terms of location and design of the development.
- Identification of key impacts that should be monitored as part of on-going management of the site, and recommendation of simple guidelines/methods for ecological monitoring.
- Identification and reporting on any other permit/licensing requirements that may be relevant to the site (for example protected plant/tree permits/license requirements).
- Describe any assumptions made and any uncertainties or gaps in knowledge, as well as identifying the need for any future specialist inputs should these be deemed relevant to the project (e.g., focal faunal species assessments).
- Reporting: Compilation of a single Specialist Terrestrial Biodiversity Impact Assessment Report including all relevant maps and supporting information. *Reports will comply with the relevant requirements of the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes when Applying for EA (GN R320 of 2020). The assessment will be conducted in accordance with the minimum requirements of the protocols prescribed for the*

themes of Terrestrial Biodiversity as specified in the DFFE National Web-based Environmental Screening Tool Report. These protocols replace the requirements of Appendix 6 of the EIA Regulations GN R982, 2014 (as amended) in terms of NEMA.

1.5 Relevant Environmental Legislation

Terrestrial ecosystems, their relevant species, vegetation, habitats and biodiversity in general are governed in South Africa by the following legislation:

- National Environmental Management Act (NEMA) No. 107 of 1998 inclusive of all amendments;
- National Environmental Management: Biodiversity Act (NEMBA) No. 10 of 2004;
- The National Environmental Management: Protected Areas Act No. 57 of 2003;
- Conservation of Agricultural Resources Act No. 43 of 1983; and
- National Forests Act No. 84 of 1998.
- At a Provincial level, flora and fauna (plants and animals) of conservation significance are protected by the KwaZulu-Natal Nature Conservation Management Act 9 of 1997.
    - KwaZulu-Natal Nature Conservation Management Amendment Act, 1999 (No. 5 of 1999)

2 APPROACH AND METHODS

2.1 Desktop Assessment

2.1.1 Confirmation of Terrestrial Ecosystem Context

The data sources and GIS spatial information listed in Table 1 was consulted to inform the biophysical and conservation context of the biodiversity onsite. The data type, relevance to the project and source of the information has been provided.

Table 1. Data sources and GIS information consulted to inform the Terrestrial Habitat Impact Assessment.

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
Colour aerial photography	Desktop mapping of vegetation communities	Bing / Google Earth™ Imagery
Latest Google Earth ™ imagery	To supplement available aerial photography in mapping vegetation communities	Google Earth™ On-line
5m Elevation Contours (GIS Coverage)	Desktop mapping of vegetation communities	Surveyor General
KZN Geology (GIS Coverage)	Assessment of underlying geology controlling soil formation and consequently vegetation types	Surveyor General
South African Vegetation Map (GIS Coverage)	Classification of vegetation types and determination of reference primary vegetation	SANBI (2018)
KwaZulu-Natal Vegetation Map (GIS Coverage)	Classification of vegetation types and determination of reference primary vegetation	Scott-Shaw & Escott (2011)
National Biodiversity Assessment – Threatened Ecosystems Remaining Extent 2020 (GIS Coverage)	Identification of conservation important ecosystems	SANBI (2020)

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
National Biodiversity Assessment – Threatened Ecosystems (GIS Coverage)	Identification of conservation important ecosystems	SANBI (2018)
KZN Terrestrial Conservation Plan (GIS Coverage)	Identification of fauna, flora and ecosystems of conservation importance.	EKZNW (2010)
KZN Systematic Conservation Assessments (SCAs) (GIS Coverage)	Identification of fauna, flora and ecosystems of conservation importance	EKZNW (2016)
SANBI On-line threatened species database	Assessment of threatened plant species potentially occurring on site	SANBI on-line database
SANBI's PRECIS (National Herbarium Pretoria Computerized Information System) (electronic database)	Determination of conservation important plant species	http://posa.sanbi.org
Red Data Books (Data Lists of Plants, Mammals, Reptiles and Amphibians)	Determination of conservation important plants, mammals, reptiles and amphibians	Various sources
Second Southern African Bird Atlas Project (SABAP2) (electronic database)	Determination of conservation important birds	SABAP2 (2017)
South African National Land-Cover (SANLC) 2020 (GIS Coverage)	Desktop mapping of vegetation communities and documenting current land-use impacts	DFFE (2020)

2.1.2 Species of Conservation Concern Potential Occurrence (POC) Assessment

The purpose of undertaking the potential occurrence assessment was to flag the possible occurrence of Species of Conservation Concern (SCC) in order to highlight floral and faunal species to look out for and/or inform the need for additional focussed floral or faunal surveys. SCC are species that have a high conservation importance in terms of preserving South Africa's high biological diversity. South African conservation agencies use the internationally endorsed IUCN Red List Categories and Criteria to determine the conservation status of biota, which are published in various Red Lists for specific orders of animals and plants. However, the IUCN Red List is considered a global assessment, therefore, South Africa uses a revised system of the IUCN criteria which has been developed to serve as a regional assessment for the country. The regional assessment only accounts for the distribution or range of a species falling within the borders of South Africa, this means that any species not endemic to South Africa will be assessed based on their distribution and numbers within the country and populations and distributions that extend beyond our borders have not been considered as part of the regional assessment.

Consequently, a species' status on the national Red List may differ from its global status on the IUCN Red List. In addition, to including species that are assessed according to the IUCN Red List Criteria as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), or Data Deficient (DD); at the regional scale, South Africa has further revised the list of SCC in the country to include: range-restricted species which are not declining and are Nationally Listed as Rare or Extremely Rare [also referred to in some Red Lists as Critically Rare]. The National Web-based EIA Screening Tool has also included endemic or range-restricted species, and some provincially protected species as part of its modelling efforts. Refer to Figure 3 for an overview of the relevant categories of SCC.

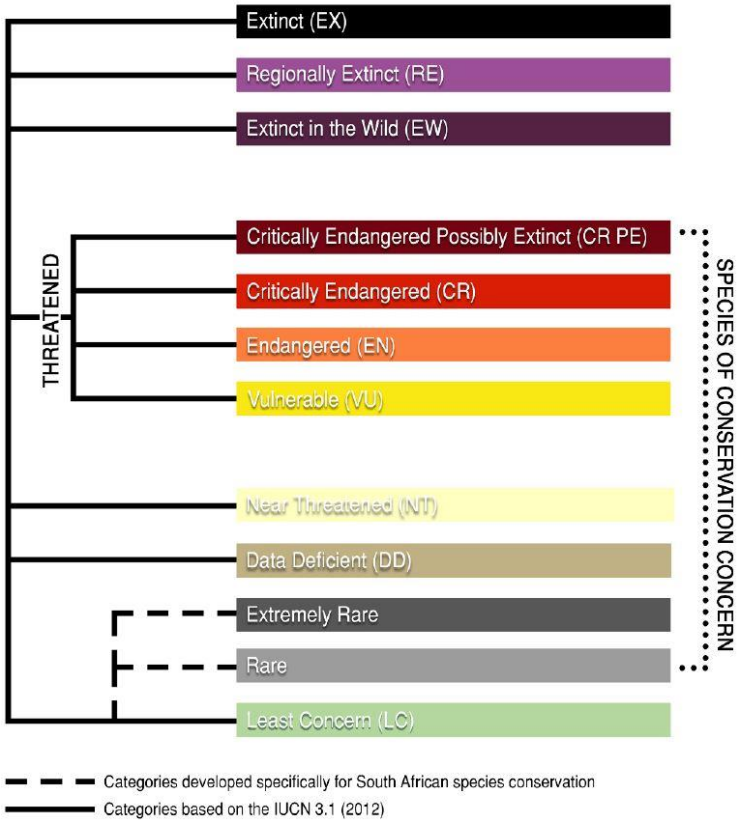

Figure 3 The different categories of SCC modified from the IUCN's extinction risk categories (reproduced in part from IUCN, 2012) - *extracted directly from* SANBI (2020).

A description of the different South African Plant Red List categories as well as all species that form part of the larger complement considered as SCC is provided in Table 2 (Categories marked with N are non-IUCN national Red List categories for species not in danger of extinction but considered of conservation concern; the IUCN equivalent of these categories is Least Concern (LC).

Table 2. Description of South African Plant Red List Categories (Source: SANBI on-line at http://redlist.sanbi.org/eiaguidelines.php).

Status		Category	Description
SPECIES OF CONSERVATION CONCERN	EXTINCT/APPROACH-ING EXTINCTION	**Extinct (EX)**	A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
		Regionally Extinct (RE)	A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
		Extinct in the Wild (EW)	A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
	THREATENED SPECIES	**Critically Endangered, Possibly Extinct (CR PE)**	Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet

Status		Category	Description
			been completed. A small chance remains that such species may still be rediscovered
		Critically Endangered (CR)	A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
		Endangered (EN)	A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
		Vulnerable (VU)	A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
	OTHER SPECIES OF CONSERVATION CONCERN	**Near Threatened (NT)**	A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
		Critically Rare[N]	A species is Critically Rare when it is known to occur at a single site, but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
		Rare[N]	A species is Rare when it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria.
		Declining	A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.
		Data Deficient - Insufficient Information (DDD)	A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.
OTHER CATEGORIES		**Data Deficient - Taxonomically Problematic (DDT)**	A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
		Least Concern (LC)	A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
		Not Evaluated (NE)	A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

Flora and fauna of conservation significance (including threatened, protected and rare species) likely to occur in the various habitats of the study area were assessed at a desktop level using information obtained from the following documents, on-line services and GIS information:

- List of SCC obtained from the EIA screening tool[5]
- SANBI's Plants of South Africa website (POSA) that allows the interrogation of the Botanical Database of Southern Africa (BODATSA) (http://posa.sanbi.org);
- Outputs of the KZN Terrestrial Conservation Plan (CPLAN) (EKZNW, 2010 & 2016);
- Outputs of the South African Bird Atlas Project (SABAP) (http://sabap2.adu.org.za/);
- Outputs of the South African Frog Atlas Project (SAFAP) (http://safap2.adu.org.za/);
- Atlas of African Orchids (http://vmus.adu.org.za/);
- iNaturalist (https://www.inaturalist.org);
- Geographical distribution data in Biodiversity Management Plans;
- Data from the Animal Demography unit (ADU, 2021);
- Various resources and references for Red Data listed species in South Africa (such as the Red Data Lists of Plants, Mammals, Reptiles and Amphibians); and
- Specialist knowledge and experience on the flora and fauna of KZN, their ranges and habitat requirements.

The habitat requirements/preferences for each plant/animal SCC was reviewed (based on available literature) and then compared with the habitat occurring on the site in order to estimate the likelihood of these species occurring on the target property (as per the assessment matrix in Table 3).

Table 3. Generic matrix used for the estimation and rating of flora/fauna species potential occurrence based on known habitat requirements/preferences and ranges.

		SPECIES HABITAT REQUIREMENTS/PREFERENCES			
		Fully met	**Largely met**	**Partially met**	**Not met**
		Natural condition	**Fair condition**	**Poor-Fair condition**	**Poor condition/ Transformed**
SPECIES DISTRIBUTION/ RANGE	**Habitat occurs within known species geographic/altitudinal range**	Highly Probable	Possible	Unlikely	Highly unlikely or Improbable
	Habitat occurs on the edge of known species geographic/altitudinal range	Possible	Possible	Unlikely	Highly unlikely or Improbable
	Habitat occurs outside of known species geographic/altitudinal range	Unlikely	Unlikely	Highly unlikely or Improbable	Highly unlikely or Improbable

[5] **Note**: In the event that a SCC is either not listed in the Screening Tool Report or it erroneously lists a SCC as highly unlikely to occur within the proposed development footprint, this will be indicated and an explanation/motivation for exclusion or inclusion of the relevant SCC will be provided. Moreover, in the event that the inclusion or exclusion of an SCC affects the outcome of the impact significance assessment, this will also be stipulated as part of the reporting process.

The presence/absence of plant species only was then verified during field surveys. While general field observations for fauna were made, no taxon specific faunal sampling was undertaken (such verification would need to be undertaken by a qualified zoologist and taxon specialist who would conduct a faunal survey for the relevant taxa flagged for the site). Faunal features like dens, spoor[6] and skat[7] were recorded where possible but were not sought out. Table 4 below was then used to rate the likelihood of occurrence as either being "Low", "Medium" or "High" or "Confirmed[8]" (if species were observed during fieldwork on site within the development footprint, they were categorised as confirmed).

Table 4. Likelihood of occurrence rating derived from rationale base on distribution and habitat preferences of species at a desktop level, and field-based observations at a site level.

Likelihood of Occurrence Rating	Rationale
Confirmed	Species was observed on-site
High: probable	Highly Probable
Medium: possible	Possible
Medium: unlikely	Unlikely
Low	Highly unlikely or Improbable

2.2 Baseline Assessment

2.2.1 Vegetation Survey

A field survey was undertaken from the **25th of January (mid-summer)** to collect baseline data and to inform the impact assessment. The site visit and field survey entailed undertaking a site walkover within the study areas, with the following data collected in the field at points rated as high or moderate priority during the desktop prioritisation process:

- **Broad vegetation and structural type** – The vegetation communities encountered were classified into broad vegetation structural types e.g., grassland, bushland, scrubland etc. where applicable. Overall morphology and architecture of the plant community were also recorded where applicable.
- **Quantitative plant species composition** – Species composition refers to the relative proportions (%) of various plant species cover in relation to the total vegetation cover of a given area. The relative abundance of each species encountered was rated qualitatively on a 3-point scale of low, moderate and high based on visual observations.

[6] Spoor refers to a track of an animal e.g., print made by hooves.

[7] Skat refers to animal droppings.

[8] Definitive answers regarding the presence or absence of a particular SCC are not always possible. In such situations, the precautionary principle is applied so that preventative action is taken in the face of uncertainty. For species that are difficult to detect, it is not always possible to provide compelling evidence that a species does not occur. Therefore, if the habitat conditions appear suitable and there is data to suggest that the species did or could occur (e.g., confirmed records on adjacent properties), then the precautionary approach is to assume that the species does indeed occur there, and mitigation and management decisions need to be made accordingly.

- **Species of conservation concern (SCC)** – SCC are species that have a high conservation importance in terms of preserving South Africa's biodiversity and include rare and threatened species. This category also includes those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient - Insufficient Information (DDD).
- **Observable onsite impacts** – Evidence of the physical disturbance to vegetation and soils and indirect impacts like erosion, sedimentation, contamination etc. were recorded.
- **Distinct vegetation boundaries** – Clear boundaries between distinct vegetation communities were recorded onsite. Between sampling points boundaries were extrapolated using the latest colour aerial photography for the area.

The location of protected plant species was recorded using a handheld GPS device. Where species could not be identified in the field, samples and photographs were taken to confirm at a later stage using available literature.

Note that no formal vegetation plots were undertaken, and no formal faunal sampling or searches were undertaken. Faunal features such as dens, spoor and skat were recorded where possible, including other visible evidence confirming highly probable evidence of presence.

2.2.2 Vegetation Mapping & Classification

Distinct vegetation communities were broadly mapped based on a combination of observed changes in species composition that were recorded with GPS points during the field visit and a review of available google earth imagery and the latest South African National Land Cover GIS layer (available from DFFE (2020) online at https://egis.environment.gov.za/).

The National Land Cover data in particular was used as a starting point to map secondary and transformed areas.

2.2.3 Ecological Condition Assessment

Vegetation communities / habitat units defined for the study area were assessed qualitatively in terms of their ecological condition. Ecological condition refers to the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a natural reference condition. Table 5 below was used for providing a description and indicators of each ecological condition class. The descriptions provided are based on the Lexicon of Biodiversity Planning in South Africa (SANBI, 2016).

Table 5. Description and indicators of Ecological Condition Classes.

High-level classes	Description	Detailed classes	Description	Indicators
Good	Composition, structure and function are still intact or largely intact.	**Natural**	Unmodified. No significant changes in composition, structure or function have taken place.	• Characterised by native flora typical of reference sites. • Structural characteristics resemble that of reference plant communities. • Low to no disturbances evident.
		Near-natural	Small changes in composition and structure may have taken place, but ecosystem functions are essentially unchanged.	• A very minor change to vegetation composition is evident at the site. • Abundance of ruderal/pioneer species is slightly higher than natural. • Limited disturbances evident.
Fair	Ecological function is maintained even though composition and structure have been compromised.	**Moderately Modified/semi-natural**	Ecological function is predominantly unchanged even though composition and structure have been compromised.	• Natural vegetation composition has been moderately altered. • Introduced alien and/or increased ruderal/pioneer species are still clearly less abundant than native species characteristic of the natural species composition. • Moderate change in structural characteristics (e.g., moderate increase / decrease in woody plants). • Moderate disturbances evident
Poor	Ecological function has been severely compromised or lost in addition to structure and composition.	**Severely Modified**	Loss of composition, structure and ecological function is extensive.	• Natural vegetation composition has been largely altered. • Introduced alien and/or increased ruderal/pioneer species occur in approximately equal abundance to the characteristic indigenous species. • High change in structural characteristics relative to reference plant communities. • High levels of grazing / disturbance evident.
		Irreversibly Modified	The ecosystem has been modified completely, with an almost complete loss of composition and structure. All or most ecosystem function has been destroyed and the changes are irreversible.	• Natural vegetation composition has been substantially altered but some characteristic species remain. • Vegetation consists mainly of introduced, alien and/or ruderal/pioneer species. • Evidence of erosion or compaction based on or reflecting high levels of disturbance. • Evidence of recent transformation (e.g. agriculture).
Lost	Composition, structure and function destroyed.	**Outright Loss**	(The result of a hard surface e.g., concrete, as opposed to "irreversibly modified" which may be a soft surface such as irrigated cropland.)	• Present cultivated lands (crops, forestry, etc.). • Developed land (Houses, Roads, etc.)

2.2.4 Site Ecological Importance

Site Ecological Importance (SEI) was assessed based on the approach outlined in the "Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols" compiled by SANBI (2020) according to recommended best-practice for environmental impact assessments in South Africa. The approach detailed below is largely reproduced verbatim with minor adjustments from the document referenced above.

All the vegetation communities that have been mapped as well as any rare or threatened flora recorded occurring on-site were considered 'receptors of impacts' within this terrestrial assessment report. Each receptor (e.g., a threatened floral species or a mapped vegetation community) was taken into consideration to determine the Floral SEI associated with the development project. The process of assessing SEI is described in more detail below (SANBI, 2020).

SEI is considered to be a function of the Biodiversity Importance (BI) of the receptor (e.g., species of conservations concern, the vegetation /community or habitat type present on the site) and its resilience to impacts – Receptor Resilience (RR) as follows:

SEI = BI + RR

BI in turn is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows:

BI = CI + FI

CI is defined here as: "*The importance of a site for supporting biodiversity features of conservation concern present e.g., populations of IUCN Threatened and Near-Threatened species (CR, EN, VU & NT), Rare, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes.*"

Key criteria used to inform the CI at a site include the following (SANBI, 2020):

- IUCN Threatened and Near-Threatened Species (CR, EN, VU & NT) - either the global or national assessments, where the global and national assessments differ for the same taxon, the most recent evaluation of status was used in calculating SEI.
- Rare species i.e. those included on South Africa's National Red List as Rare or Critically Rare or Extremely Rare. These are highly restricted species that are currently not declining. However, should any development impact on a population of these species they will immediately qualify under one of the IUCN categories of threat.
- Range-restricted species – the presence of terrestrial flora with a global population extent of occurrence (EOO) of 10 000 km^2 or less.

- Significant areas of threatened vegetation types – this is a function of both the area (size) being considered in relation to the total extent of that vegetation type (i.e. proportion) and how threatened (CR, EN, VU) the vegetation types are; and
- Natural processes – natural unmanaged areas with low levels of ecological disturbance have largely intact natural processes such as pollination, seed dispersal and migration, and thus have greater intrinsic conservation importance than those that are modified through ecological disturbance.

Please note that no faunal species have been assessed as receptors within this report as this should be done by the relevant faunal taxon specialist and is beyond the scope of this vegetation assessment. Moreover, the SEI has only been assessed for vegetation communities that fall within the project footprint and does not extend to the entire Project Area of Influence which falls beyond the project footprint. Assessment of Conservation Importance will include an assessment of the suitability/potential of the vegetation communities to support floral populations which fall under one of the criteria included for threatened and rare species.

Table 6. Conservation Importance Criteria (SANBI, 2020)

Conservation Importance	Fulfilling Criteria
Very High	• Confirmed or highly likely occurrence of CR, EN, VU or Critically Rare species that have a global EOO of < 10 km^2 • Any area of natural habitat[9] of a CR ecosystem type or large area (> 0.1 % of the total ecosystem type extent[10]) of natural habitat of 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 > 10 km2. 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 NT species, threatened species (CR, EN, VU) listed under A criterion 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

[9] This excludes areas of transformed habitat within a defined ecosystem even if these are partially restored, e.g. Highveld grasslands that have been converted to maize fields and then abandoned so that some form of functional grassland is restored; this is not natural habitat as it does not and will not in the future have species composition representative of the original natural habitat.

[10] Calculated from the threatened ecosystem of South Africa shapefile available from the SANBI (current available version 2011: http://bgis.sanbi.org/Projects/Detail/49)

Conservation Importance	Fulfilling Criteria
	• 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

FI of the receptor (e.g., the vegetation/fauna community or habitat type) is defined here as the receptors' current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions.

Simply stated, FI is: "*A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts.*" (SANBI, 2020)

These criteria can be defined as (SANBI, 2020):

- **Connectivity to other natural areas** - connectivity, which can also be measured conversely as the degree of habitat fragmentation, refers to how connected habitat patches are to each other, which has a significant influence on numerous ecological processes, such as migration and dispersal opportunities of biota and therefore genetic exchange between populations. Connectivity to other similar habitats becomes more important as the remaining intact and functional area of a habitat decreases, mainly because population sizes decrease and are therefore at greater risk from ecological perturbations and inbreeding effects. The degree of connectivity between habitat patches varies greatly with the dispersal ability of the taxon or taxon group (e.g., fossorial reptiles) in question;
- **Degree of current persistent negative ecological impacts** - persistent negative impacts such as uncontrolled spread of alien and invasive flora effectively decreases both the remaining intact area and ecosystem functioning of a particular habitat; and
- **Remaining intact and functional area** – the proportion of the receptor that supports natural habitat with intact ecological processes - small areas are less likely to withstand ecological degradation compared to large areas and are therefore better able to maintain structure and function allowing for intact ecological processes.

Ecological processes can be considered to be mostly intact and functional if the receptor area has low levels of current ecological disruptors, has good connectivity to other areas and is a relatively large area.

Table 7. Functional Integrity Criteria (SANBI, 2020).

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

Functional Integrity	Fulfilling Criteria
	• 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 (e.g. ploughing)
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 (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) 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 (e.g. established population of alien and invasive flora) 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 transformed 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

Recalling that BI is a function of CI and the FI of a receptor, BI was thereafter derived from a simple matrix of CI and FI as follows:

Table 8. Biodiversity Importance Matrix (SANBI, 2020).

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

RR is defined here as: "*The intrinsic capacity of the receptor to resist major damage from disturbance and /or to recover to its original state with limited or no human intervention.*" (SANBI, 2020)

The fulfilling criteria to evaluate RR is based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor (Table 9). Each rare and threatened species and mapped vegetation community will be assigned a RR Rating ranging from Very High Resilience to Very

Low Resilience with a short rational provided for each rating. Receptor resilience is dependent on the nature of the disturbance or impact and therefore needs to be assessed in relation to these factors in the accompanying rationale for each rating assigned. Thus, a receptor is likely to have multiple ratings associated with a suite of anticipated impacts linked to the proposed development. However, only the lowest receptor resilience rating assigned to each receptor will be reported on to highlight the most notable vulnerability associated with a receptor and the relevant anticipated impact that represents the greatest threat.

Table 9. Receptor Resilience Criteria (SANBI, 2020).

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 70 % of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed
High	Habitat that can recover relatively quickly (~ 5-10 years) to restore > 70 % of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed
Medium	Will recover slowly (~more than 10 years) to restore > 70 % of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of 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 remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of 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 remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed

Finally, once both BI and RR were assessed SEI was determined from the final matrix as follows:

Table 10. SEI Matrix (SANBI, 2020).

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	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	High	Medium	Medium	Low	Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

SEI was then clearly mapped for each vegetation community in relation to the proposed development activities and infrastructure. Interpretation of SEI in the context of the proposed development activities was then provided according to Table 11 below.

Table 11. Interpretation of SEI in relation to proposed development activities (SANBI, 2020).

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. Minimization 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	Minimization & restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimization & restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimization mitigation - Development activities of medium to high impact acceptable and restoration activities may not be required.

2.3 Biodiversity Impact Assessment Framework

The Biodiversity Impact Assessment has been aligned closely with the minimum criteria and requirements for Terrestrial Biodiversity Impact Assessments contained in the "*Procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes of Section 45 (a) and (h) of the National Environmental Management Act, 1998, when applying for Environmental Authorization*", contained in Government Gazette No. 648 (10 May 2019).

For the purposes of this assessment, the assessment of potential impacts was undertaken using an "*Impact Assessment Methodology for EIAs*" adopted by Eco-Pulse (2019). This assessment was informed by baseline terrestrial biodiversity information contained in this report relating to the importance and sensitivity of terrestrial habitats and potential occurrence of protected species as well as available information on the proposed development provided by the client and experience in similar projects in South Africa and KZN.

The process begins with a description of the proposed development and associated activities (for the various phases, including construction and operation); with the various environmental stressors and direct/indirect risks associated with development activities then defined. Based on the stressors and anticipated risks, impacts are then described under six (6) distinct categories with impact significance assessed for each impact category based on a range of assessment criteria. The general framework for the biodiversity impact assessment is shown below in Table 12.

Table 12. Terrestrial Biodiversity Impact Assessment Framework for the development project.

TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT FRAMEWORK	
DEVELOPMENT TYPE & ACTIVITIES	
Construction Phase Activities: *To be described and defined*	Operational Phase Activities: *To be described and defined*
ENVIRONMENTAL STRESSORS & RISKS	
Construction Phase Stressors & Risks: *To be identified and described*	Operational Phase Stressors & Risks: *To be identified and described*
TERRESTRIAL BIODIVERSITY IMPACTS	
1	Impact on vegetation structure and plant species composition
2	Impact on populations of species of special concern
3	Impact on targets for threatened ecosystems
4	Impact on ecological processes and functionality of ecosystems
5	Impact on overall species and ecosystem diversity
6	Impact on ecological connectivity

The significance of the potential impacts of the proposed development on terrestrial biodiversity and ecosystems was assessed for the following scenarios:

- **Realistic "poor mitigation" scenario** – this is a realistic worst-case scenario involving the poor implementation of construction mitigation, bare minimum incorporation of recommended design mitigation, poor operational maintenance, and poor onsite rehabilitation.
- **Realistic "good" scenario** – this is a realistic best-case scenario involving the effective implementation of construction mitigation, incorporation of the majority of design mitigation, good operational maintenance and successful rehabilitation. Please note that this realistic scenario does not assume that unrealistic mitigation measures will be implemented and/or measures known to have poor implementation success (>90% of the time) will be effectively implemented.

The general approach to impact significance assessment is to rate intensity as the realistic worst-case consequence (endpoint) of an activity (according to Table 13). Thereafter, the next step would be to assess the likelihood of this consequence occurring, as well as the extent and duration of the impact. This is repeated for each ultimate ecological consequence.

Impact significance = (impact intensity + impact extent + impact duration) x impact likelihood

This formula is based on the basic risk formula: **Risk = consequence x probability**

Table 13. Criteria and numerical values for rating ecological impacts.

Score	Rating	Description
Intensity (I) – defines the magnitude and importance of the impact		
16	**High**	Loss of human life. Deterioration in human health. High impacts to resources: · Critical / severe local scale (or larger) ecosystem modification/degradation and/or collapse. · Critical / severe local scale (or larger) modification (reduction in level) of ecosystem services and/or loss of ecosystem services. <u>Critical / severe ecosystem impact description:</u> Impact affects the continued viability of the systems/components and the quality, use, integrity and functionality of the systems/components are irreversibly compromised (system collapse). Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation. · Extinction of habitat type or serious impact to future viability of a critically endangered habitat type. · Extinction of species or serious impact to survival of critically endangered species.
8	**Moderately High**	· Loss of livelihoods. · Individual economic loss. Moderately high impacts to resources: · Large local scale (or larger) ecosystem modification/degradation and/or collapse. · Large local scale (or larger) modification (reduction in level) of ecosystem services and/or loss of ecosystem services. <u>Large ecosystem impact description:</u> Impact affects the continued viability of the systems/components and the quality, use, integrity and functionality of the systems/components are severely impaired and may temporarily cease being effective. High costs are associated with rehabilitation and remediation, but still considered possible. · Measurable reduction in extent of endangered and critically endangered habitat types. · Measurable reduction in endangered and critically endangered floral and faunal populations.
4	**Moderate**	Moderate impacts to resources: · Moderate local scale (or larger) ecosystem modification/degradation and/or collapse. · Moderate local scale (or larger) modification (reduction in level) of ecosystem services and/or loss of ecosystem services. <u>Moderate ecosystem impact description:</u> Impact alters the quality, use and integrity of the systems/components but the systems/ components still continue to function but in a moderately modified way (integrity and functionality impaired but major key processes/drivers somewhat intact / maintained). · Measurable reduction in vulnerable habitat types. · Measurable reduction in non-threatened habitat types resulting in an up-listing to threatened status. · Measurable reduction in near-threatened and vulnerable floral and faunal populations. · Measurable reduction in non-threatened floral and faunal populations resulting in an up-listing to threatened status.
2	**Moderately Low**	Moderately low impacts to resources: · Small but measurable local scale (or larger) ecosystem modification / degradation. · Small but measurable local scale (or larger) modification (reduction in level) of ecosystem services and/or loss of ecosystem services. <u>Small ecosystem impact description:</u> Impact alters the quality, use and integrity of the systems/components but the systems/ components continue to function, although in a slightly modified way. Integrity, function and major key processes/drivers are slightly altered but are still intact / maintained. · Reduction in non-threatened endangered habitat types with no up-listing to threatened status.

Score	Rating	Description
		· Reduction in non-threatened floral and faunal populations with no up-listing to threatened status.
1	**Low**	Negative change to onsite characteristics but with no impact on: · Human life. · Human health. · Local resources, local ecosystem services and/or key ecosystem controlling variables. · Threatened habitat conservation/representation. · Threatened species survival.
Extent (E) – relates to the extent of the Impact Intensity		
5	**Global**	The scale/extent of the impact is global/worldwide.
4	**National**	The scale/extent of the impact is applicable to the Republic of South Africa.
3	**Regional**	Impact footprint includes the greater surrounding area within which the site is located (e.g. between 20-200km radius of the site).
2	**Local**	Impact footprint extends beyond the cadastral boundary of the site to include the areas adjacent and immediately surrounding the site (e.g., between a 0-20km radius of the site).
1	**Site**	Impact footprint remains within the cadastral boundary of the site.
Duration (D) – relates to the duration of the Impact Intensity		
5	**Permanent**	The impact will continue indefinitely and is irreversible.
4	**Long-term**	The impact and its effects will continue for a period in excess of 30 years. However, the impact is reversible with relevant and applicable mitigation and management actions.
3	**Medium-term**	The impact and its effects will last for 10 – 30 years. The impact is reversible with relevant and applicable mitigation and management actions.
2	**Medium-short**	The impact and its effects will continue or last for the period of a relatively long construction period and/or a limited recovery time after this construction period, thereafter it will be entirely negated (3 – 10 years). The impact is fully reversible.
1	**Short-term**	The impact and its effects will only last for as long as the construction period and will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 3 years). The impact is fully reversible.
Probability (P) – relates to the likelihood of the Impact Intensity		
1	**Definite**	More than 75% chance of occurrence. The impact is known to occur regularly under similar conditions and settings.
0.75	**Highly Probable**	The impact has a 41 – 75% chance of occurring and thus is likely to occur. The impact is known to occur sporadically in similar conditions and settings.
0.5	**Possible**	The impact has a 10 – 40% chance of occurring. This impact may/could occur and is known to occur in low frequencies under similar conditions and settings.
0.2	**Unlikely**	The possibility of the impact occurring is low with less than a 10% chance of the impact occurring. The impact has not been known to occur under similar conditions and settings.
0.1	**Improbable**	The possibility of the impact occurring is negligible and only under exceptional circumstances.

Table 14. Impact significance categories and definitors.

Impact Significance	Impact Significance Score Range	Definition
High	**18 - 26**	Unacceptable and fatally flawed. Impact should be avoided and there is limited opportunity for offset/compensatory mitigation. The proposed activity should only be approved under special circumstances.
Moderately High	**13 – 17.9**	Generally unacceptable unless offset/compensated for by positive gains in other aspects of the environment that are of critically high importance (i.e. national or international importance only). Strict conditions and high levels of compliance and enforcement are required. The potential impact will have a strong influence on the decision regarding the proposed activity and thus, a

Impact Significance	Impact Significance Score Range	Definition
		clear and substantiated need and desirability for the project needs to be provided, to justify the associated ecological risks.
Moderate	**8 – 12.9**	Impact has potential to be significant but is acceptable provided that there are strict conditions and high levels of compliance and enforcement. If there is reasonable doubt as to the successful implementation of the strict mitigation measures, the impact should be considered unacceptable. The potential impact should influence the decision regarding the proposed activity and requires a clear and substantiated need and desirability for the project to justify the risks.
Moderately Low	**5 – 7.9**	Acceptable with moderately-low to moderate risks provided that specific/generic mitigation is applied and routine inspections undertaken. The potential impact may not have any meaningful influence on the decision regarding the proposed activity.
Low	**0 – 4.9**	The potential impact is very small or insignificant and should not have any meaningful influence on the decision regarding the proposed activity. Basic duty of care must be ensured.

A confidence rating was also given to the impacts rated in accordance with the table below:

Table 15. Confidence ratings used when assigning impact significance ratings.

Level of confidence	Contributing factors affecting confidence
Low	A low confidence level is attributed to a low-moderate level of available project information and somewhat limited data and/or understanding of the receiving environment.
Medium	The confidence level is medium, being based on specialist understanding and previous experience of the likelihood of impacts in the context of the development project with a relatively large amount of available project information and data related to the receiving environment.
High	The confidence level is high, being based on quantifiable information gathered in the field.

2.4 Assumptions and Limitations

The following limitations and assumptions apply to this assessment:

2.4.1 Sampling limitations and assumptions

- The study focused on 'terrestrial' or 'dryland' vegetation occurring within the study area. Wetland/aquatic vegetation and habitats were not included as these were dealt with separately in the Specialist Wetland Assessment Report compiled by Eco-Pulse (Report No. EP671-01).
- The field assessment was undertaken in mid-summer (January 2023) within the recommended sampling season as prescribed in both the "Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols" compiled by SANBI (2020) as well as the "Guidelines for Biodiversity Impact Assessments in KZN" compiled by EKZNW (2013a).
- With ecology being dynamic and complex, there is the likelihood that some aspects (some of which may be important) may have been overlooked.

- Rapid sampling and rapid habitat assessment tools were used due to time and budget constraints and the inherent low sensitivity of the majority of the receiving terrestrial environments at the site. Thus, formal vegetation plots and detailed habitat sampling and analyses were not undertaken, limiting the resolution of the information captured and produced in this study.
- The location of plant species of conservation concern was recorded using a Garmin Montana™ Global Positioning System (GPS) and captured on a map of the area using a Geographical Information System (GIS). GPS accuracy was limited to 3-5m.
- While an assessment of the potential occurrence of species of conservation concern has been undertaken, and is informed by readily available information, this provides only a surrogate indicator of the likelihood of such species occurring. This is however regarded as appropriate given the level of habitat degradation/transformation across much of the project area.
- The accuracy of desktop species information is limited to historic data and available databases for the area apply. Note that data and information obtained from published articles, reference books, field guides, official databases or any other official published or electronic sources are assumed to be correct, and no review of such data was undertaken by Eco-Pulse.
- Information on the threat status of plants species was informed by the SANBI Threatened Species Online database, which was assumed to be up to date and accurate at the time of compiling this report. Any changes made after the compilation of the report are therefore not covered.
- The assessment of the potential occurrence of fauna was informed by the presence and condition of ideal habitat for each faunal species. The habitat condition / integrity was used as a surrogate indicator of the likelihood of a particular species being present.
- In terms of faunal surveys and assessments, no formal faunal sampling or surveys were undertaken, and this report does not serve as a substitute for detailed and taxon-specific specialist reports required for faunal species flagged as being of very high – medium sensitivity and where habitat requirements are largely met and evidence of occurrence is found.
- Due to the complexities of ecological systems and the sensitive dependence on initial conditions, any predictions of the effects of perturbation are made with very low confidence.
- Additional information used to inform the assessment was limited to data and GIS coverage's available for the province and district municipality at the time of the assessment.

2.4.2 Vegetation community mapping limitations and assumptions

- Limited GPS data and the SANLC 2020 layer were used to inform the mapping of vegetation communities and assign their condition classes. Therefore, it should be noted that a high degree of uncertainty is associated with this coarse-scale mapping, with the high likelihood that these may be revised following further sampling.

2.4.3 Potential Occurrence Assessment

- Information on the threat status of plants species was informed largely by the SANBI Threatened Species Online database, which was assumed to be up to date and accurate at the time of compiling this report. Any changes made after the compilation of the report are therefore not covered.

- The assessment of the POC of fauna was informed by the presence and condition of ideal habitat for each faunal species. The habitat condition / integrity was used as a surrogate indicator of the likelihood of a particular species being present.
- Additional information used to inform the assessment was limited to data and GIS coverage's available for the province and district municipality at the time of the assessment.
- In terms of faunal surveys and assessments, no formal faunal sampling or surveys were undertaken, and this report does not serve as a substitute for detailed and taxon-specific specialist reports required for faunal species flagged as being of very high – medium sensitivity and where these are likely to occur at the site.

2.4.4 General assumptions and limitations

- This report deals exclusively with a defined area and the extent and the nature of terrestrial habitat and ecosystems in that area.
- Additional information used to inform the assessment was limited to desktop data and GIS coverage's available for the Province at the time of the assessment.
- It is assumed that all limitations will be clearly communicated by the EAP to the Commenting and Competent Authorities responsible for reviewing the EIA.
- It is assumed that all relevant Commenting Authorities will be consulted as part of the Application for EA process to establish their requirements for the site and that they will be provided the opportunity to make an input into the formal EIA process required prior to the development of the site.

2.4.5 Impact Assessment

- At the time of this impact significance assessment finalised site plans were available. However, this impact assessment should be regarded as preliminary and subject to more detailed impact evaluations for specific activities if site plan changes are made.
- Also not taken into consideration in this report are incidental issues such as those related to all new roads, powerlines, pipelines and the like. The omission of these items is not an oversight.
- The assessment of impacts and recommendation of mitigation measures was undertaken at a desktop level and based on the assessor's working knowledge and experience.
- The impact assessment was only undertaken for a single development scenario (cumulative impacts) under two mitigation scenarios referred to as the 'realistic poor mitigation' and 'realistic good mitigation' scenarios.
- The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the field survey and based on the assessor's working knowledge and experience with similar development projects.
- The impact descriptions and assessment are based on the author's understanding of the proposed development based on information provided.
- Evaluation of the significance of impacts with mitigation considers mitigation measures provided in this report and standard mitigation measures.

3 ECOSYSTEM CONTEXT

Understanding the biophysical and conservation context of the study area and surrounding landscape is important as it informs decision making regarding the significance of the area to be affected. In this regard, national, provincial and regional biophysical and conservation datasets were screened, the results of which are presented in the sections that follow.

3.1 Biophysical Setting & Context

A summary of key biophysical setting details for the study area is presented in Table 16 below.

Table 16. Key biophysical setting details of the study area.

Biophysical Aspects	Desktop Biophysical Details	Source
Elevation	1136 – 1191m a.m.s.l. (above mean sea level)	Google Earth™
Mean annual precipitation (MAP)	600 - 1000mm	DWA, 2005
Rainfall seasonality	Early – late summer	DWA, 2005
Geology	Mudstones, sandstones and shales of the Beaufort and Ecca Groups of the Karoo Supergroup predominate and are intruded by dolerites of Jurassic age. Land types Bb, Ac, Fa and Ca.	Mucina & Rutherford, 2006
Quaternary catchment	V60C & V60B	DWS
Main collecting river(s) in the catchment	Sundays River	NFEPA Rivers (NBA, 2018)
Ecoregion	14.02 - North-Eastern Uplands	DWAF. 2007

3.2 Ecological and Conservation Context

To inform the appraisal of current existing disturbances and impacts, as well as the assessment of residual impacts associated with the proposed mining area and stock piling area development under a post-mitigation scenario, the reference vegetation type and additional spatial conservation data sets ranging from species-specific to landscape scale were interrogated and are summarised below.

The national vegetation classification indicates that the reference terrestrial vegetation for the study area located within the development footprint on the property comprises Northern KwaZulu-Natal Moist Grassland (SANBI, 2018) and according to the National Environmental Management: Biodiversity Act or NEMBA: revised national list of threatened terrestrial ecosystems[11] (18 November 2022) this vegetation type is considered 'Vulnerable' (Table 17). The provincial vegetation map identified the same vegetation types along the development footprint with the provincial status of 'Least Concern' for Northern KwaZulu-Natal Moist Grassland (Table 17). According to the NPAES (National Protected Area Expansion Strategy)

[11] No spatial dataset exists for the revised NEMA list of ecosystems that are threatened and in need of protection.

(SANBI, 2010) spatial outputs, there are no national protected areas found within the study area. Additionally, the study area has not been flagged for future formal protection.

Table 17. National and provincial vegetation classification and threat status (SANBI, 2018; Scott-Shaw & Escott, 2011)

Vegetation Types	National Threat Status	Provincial Threat Status
Northern KwaZulu-Natal Moist Grassland	Vulnerable (VU)	Least Threatened (LT)

Figure 4 National vegetation map (SANBI, 2018).

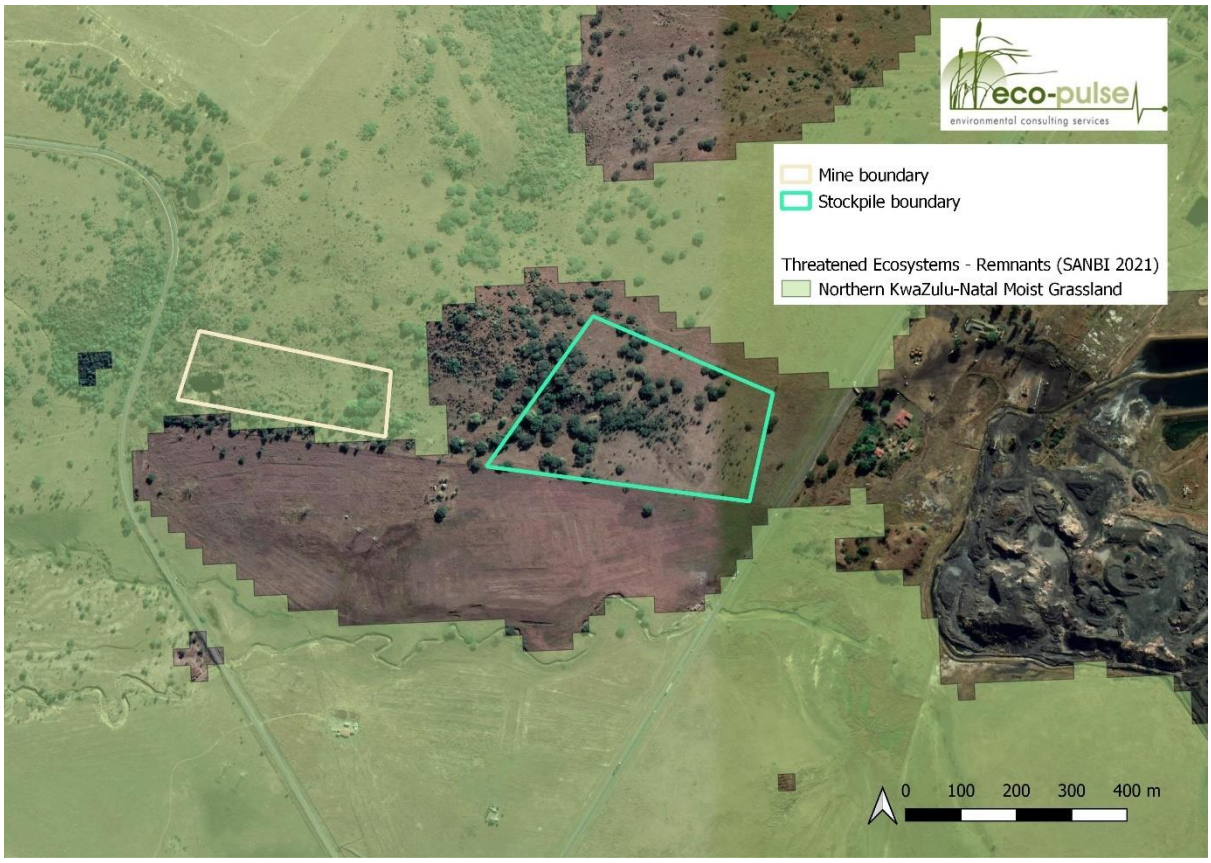

Figure 5 Red list for threatened ecosystems - remnants (SANBI, 2021).

The probable reference vegetation type assigned above are characterised by the following important/diagnostic, biogeographically significant and endemic taxa:

Northern KwaZulu-Natal Moist Grassland (Mucina & Rutherford, 2011):

Important taxa

Graminoids: *Alloteropsis semialata subsp eckloniana, Aristida congesta, Cynodon dactylon, Digitaria tricholaenoides, Elionurus muticus, Eragrostis patentissima, E. racemosa, Harpochloa falx, Hyparrhenia hirta, Themeda triandra, Tristachya leucothrix, Abildgaardia ovata, Andropogon appendiculatus, A. eucomus, A. schirensis, Aristida junciformis subsp galpinii, Brachiaria serrata, Cymbopogon caesius, C. pospischilii, Cynodon incompletes, Digitaria monodactyla, D. sanguinalis, Diheteropogon amplectens, D. filifolius, Eragrostis chloromelas, E. plana, E. planiculmis, Eragrostis sclerantha, Festuca scabra, Heteropogon contortus, Hyparrhenia dregeana, Melinis nerviglumis, Microchloa caffra, Panicum natalense, Paspalum scrobiculatum, Setaria nigrirostris, Sporobolus africanus*. Herbs: *Acanthospermum austral, Argyrolobium speciosum, Eriosema kraussianum, Geranium wakkerstroomianum, Pelargonium luridum, Acalypha penduncularis, Chamaecrista mimosoides, Dicoma anomala, Euryops transvaalensis subsp setilobus, Helichrysum caespititium, H. rugulosum, Hermannia depressa, Ipomoea crassipes, Pearsonia grandiflora, Pentanisia prunelloides subsp latifolia, Sebaea grandis, Senecio inornatus, Thunbergia atriplicifolia, Zaluzianskya microsiphon*.
Geophytic Herbs: *Chlorophytum haygarthii, Gladiolus aurantiacus, Asclepias aurea, Cyrtanthus tuckii var transvaalensis, Gladiolus crassifolius, Hypoxis colchicifolia, H. multiceps, Morea brevistyla, Zantedeschia rehmannii.*
Succulent Herbs: *Aloe ecklonis, Lopholaena segmentate.*
Low shrubs: *Anthospermum rigidum subsp pumilum, Erica oatesii, Hermannia geniculate.*
Succulent shrubs: *Euphorbia pulvinate*
Biogeographically important taxa: *Aloe modesta and Bowkeria citrina.*

Table 18 below and Figure 6 that follow indicate the location and extent of provincial vegetation types within the study area as contained in the KwaZulu-Natal Vegetation Map (EKZNW, 2011). Northern KwaZulu-Natal Moist Grassland is Vulnerable, covering just 15.4 ha of the study area respectively.

Table 18. Conservation targets, ecosystem status and level of protection based on 2011 accumulated transformation statistics of the KwaZulu-Natal vegetation types that occur on-site (extracted from Jewitt, 2018), and the extent in hectares of the vegetation types that occur within the two properties.

KZN vegetation type	Conservation target (%)	Ecosystem status	Level of protection	Original extent (ha)	Remaining natural (ha)	Extent on site (ha)
Northern KwaZulu-Natal Moist Grassland	24	Vulnerable	Poorly Protected	696 920	391 958	15.4

Figure 6 Provincial vegetation map (EKZNW, 2011).

The Systematic Conservation Assessments (SCAs) is a strategic conservation plan developed in 2016 by the Provincial Conservation Authority, Ezemvelo KZN Wildlife (EKZNW) to ensure that representative samples of biodiversity are conserved. It is used as a land use decision support tool in KwaZulu-Natal and replaced the 2010 Terrestrial Systematic Conservation Plan (MINSET). The SCAs are derived from merging the Provincial Terrestrial Systematic Conservation Plan (TSCP) with other conservation datasets. In terms of terrestrial conservation, three conservation categories were developed including (i) CBA:

Irreplaceable, (ii) CBA: Optimal, and (iii) Ecological Support Area. These conservation categories are described in Table 19 below.

Table 19. Description and derivation of conservation categories.

Conservation Category	Description	Development Process
Critical Biodiversity Area: Irreplaceable	Areas considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.	The coverage was created by merging the following datasets: • 2010 MINSET – Irreplaceable and highly irreplaceable categories. • National Threatened Ecosystems – Critically endangered category • KZN Threatened Ecosystem – Critically Endangered and Endangered category. • Landscape Corridor critical linkages - Corridor type
Critical Biodiversity Area: Optimal	Areas that represent an optimised solution to meet the required biodiversity conservation targets while avoiding high-cost areas as much as possible.	The coverage was created by merging the following datasets: • 2010 MINSET – Optimal categories. • Local Knowledge – aquatic and terrestrial optimal categories.
Ecological Support Area	ESA are functional but not necessarily entirely natural terrestrial or aquatic areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs.	The coverage was created by merging the following datasets: • Local Knowledge – aquatic and terrestrial ESA categories. • Local corridor • Landscape corridor

According to the KwaZulu-Natal Terrestrial Systematic Conservation Plan (TSCP) (EKZNW, 2016) areas of **CBA: Optimal** are present within the project footprint as shown in Figure 7. It is evident from the TSCP (EKZNW, 2011) spatial coverage that the 'CBA: Optimal' status assigned to these areas is vegetation driven due to the current and potential presence of the Northern KwaZulu-Natal Moist Grassland. Other species driving the classification include the **mollusc:** *Cochlitoma simplex*. *C. simplex* distribution has been depicted as having a marginal presence within the mining area, as shown in Figure 7. Given that this is species is fairly data deficient and has not been previously recorded in the area, and that the quality of Northern KwaZulu-Natal Moist Grassland within this area is highly degraded and Invasive Alien Plant cover is dense, the inclusion of a CBA: Optimal within the mining area is not considered as a definitive concern.

Figure 7 Map showing the location and extent of areas identified as 'CBA: Optimal' (shaded in 'blue') according to the terrestrial CPLAN (EKZNW, 2016), in relation to the study site.

According to the KZN Biodiversity Sector Plan (2014), no ecological corridor falls within the study area, nor within close proximity to the study area. No areas in the immediate vicinity of the property have been flagged for future conservation as part of the KwaZulu-Natal Protected Areas Expansion 20-year Strategy (EKZNW, 2010) spatial coverage, and likewise no provincial protected areas or forests occur within the study area.

3.3 Historic Land Use & Disturbance Regime

An understanding of historic land use and disturbance at the site was gained by reviewing historical imagery and orthophotos. It appears the site does appear the surrounding areas have been impacted by clearing of vegetation for subsistence agriculture and the development of roads since 1944. Additionally, the quarry is evident in historic imagery which suggests land transformation occurred prior to 1944.). Furthermore, the project area appears to have been impacted by grazing, local encroachment and alien plant infestations (Figure 8 – 11).

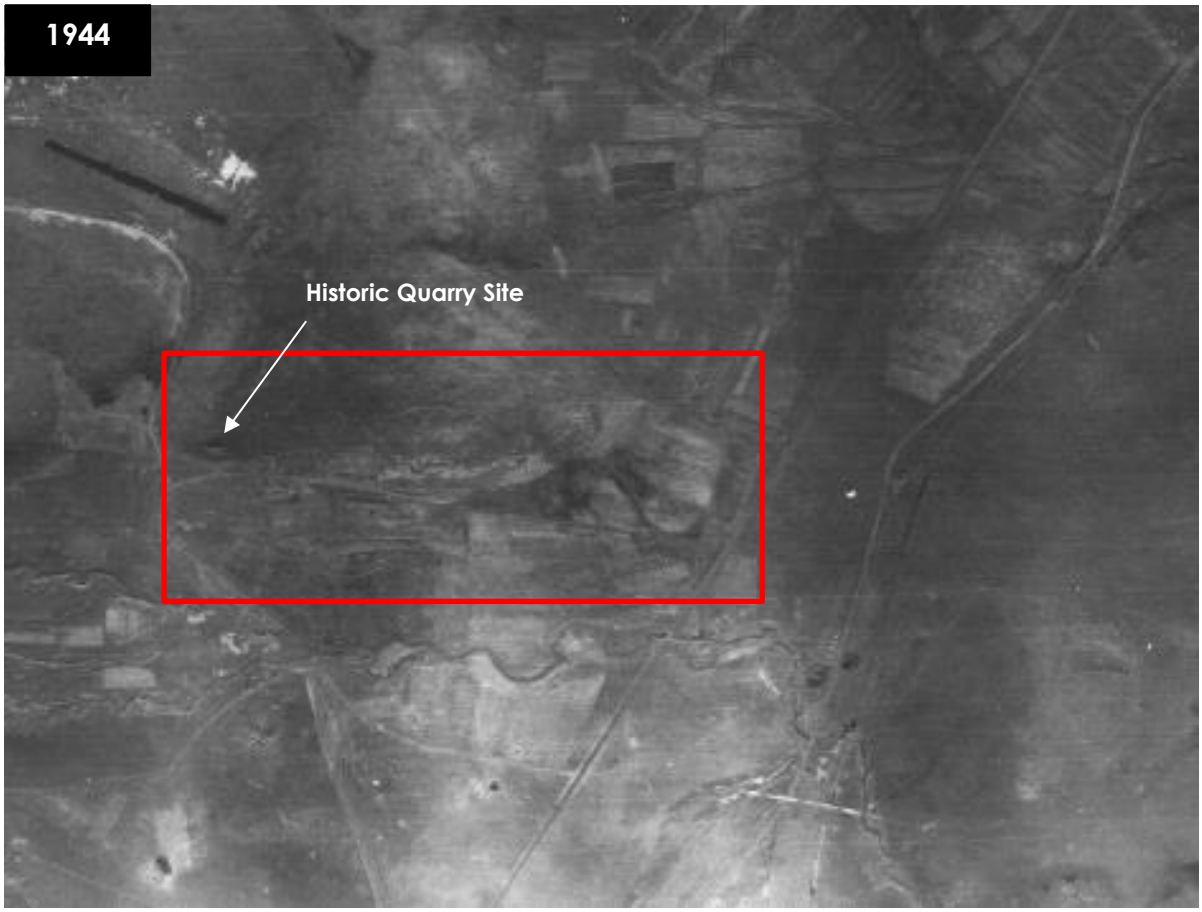

Figure 8 Historical image (aerial photograph) dating back to 1944, the focus area is estimated shown outlined in "red", indicating what has been interpreted as 'open grassland' vegetation cover.

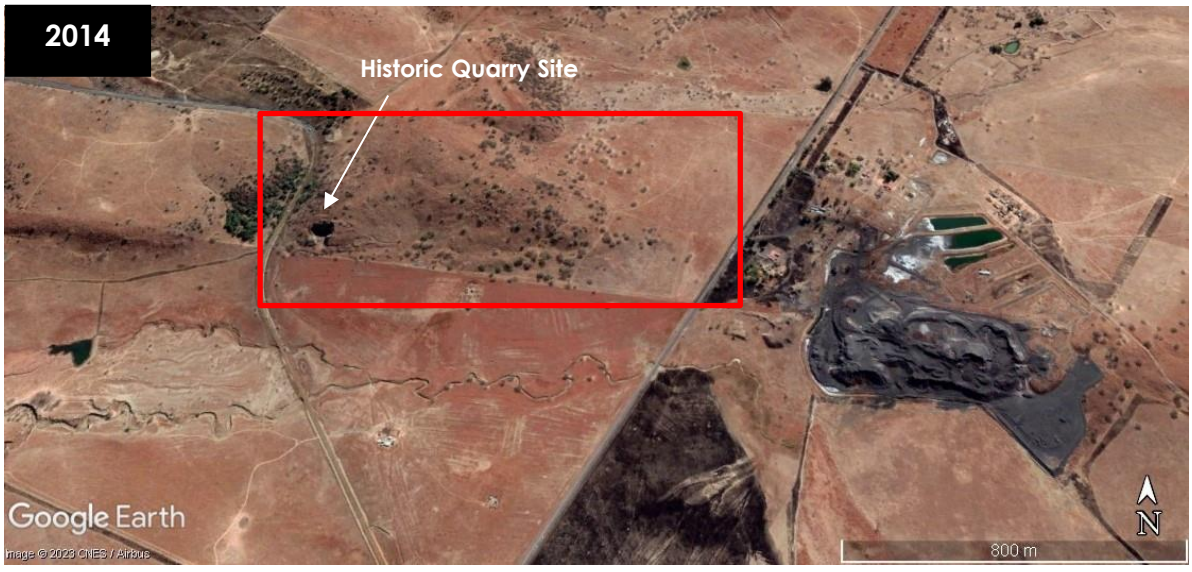

Figure 9 Google Earth™ satellite imagery of the project area dating back to 2014.

Figure 10 Google Earth™ satellite imagery of the project area in 2016.

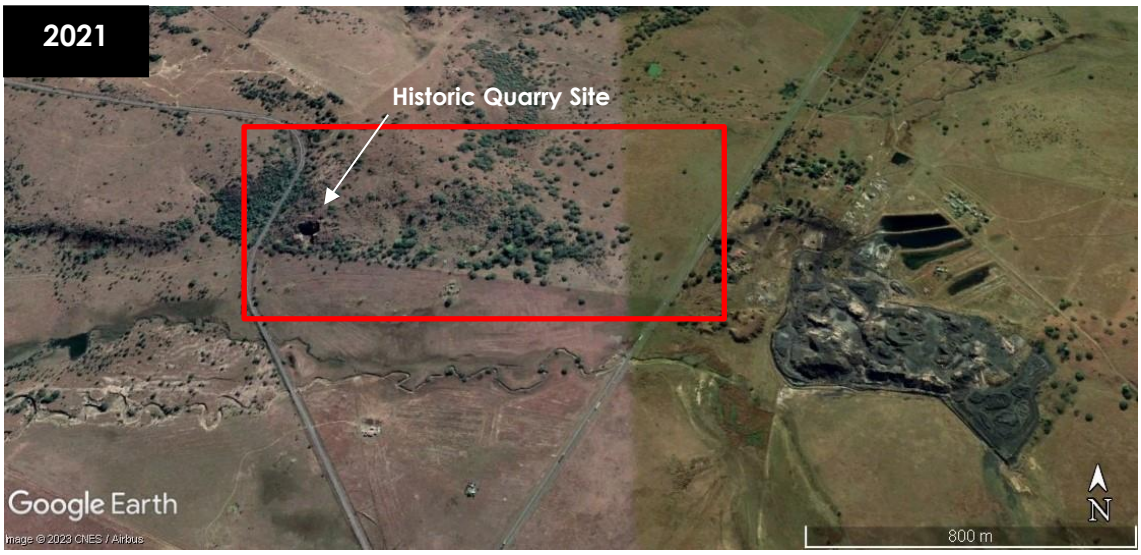

Figure 11 Google Earth™ satellite imagery of the project area in 2021.

A review was undertaken of the uThukela District Municipality Draft IDP 2022/2023-2026/2027 Report. The project area has not been highlighted for planned developments or as a prioritised area for local conservation targets.

4 BASELINE VEGETATION & HABITAT ASSESSMENT

4.1 Description of the Vegetation Community

Vegetation and habitat was surveyed on the two study sites (mining permit area and stockpiling site) and within 32m of the property boundaries. One distinct terrestrial vegetation community was identified and classified according to topographic location, plant species composition, vegetation structure and level of degradation. This vegetation community is described in detail below. *A full list of the individual plant species identified within the study area as part of the terrestrial vegetation survey has been provided in* ***Annexure A*** *at the back of this report.*

Table 20. Summary of the terrestrial vegetation community and land use type identified and classified for the site in January 2023.

Vegetation Community Type	Threat Status[12]	Condition	Protected Plants Present?
Degraded Northern KwaZulu-Natal Moist Grassland	VU	Poor: degraded	Yes
Transformed*	N/A	Lost: irreversibly modified	No

**Note that 'Transformed areas' (i.e., existing developments, roads and infrastructure, bare ground were excluded from the vegetation assessment but are shown mapped in Figure 12 as 'transformed'.*

Detailed descriptions of each vegetation community are presented below. Note that alien/exotic plant species are shown in "**red**" text in the vegetation descriptions presented.

4.1.1. Degraded Northern KwaZulu-Natal Moist Grassland

This grassland community was observed occurring within untransformed areas of the study area and was found to be in a relatively **'poor'** condition and was classified as a degraded Northern KwaZulu-Natal Moist Grassland community that has resulted from an unnatural burning regime, disturbance linked to historic quarry activities, cattle grazing and human movement and encroachment, and road infrastructure construction. The community was dominated by *Eragrostis curvula, Themeda triandra and Hyparrhenia hirta,* and *Vachellia sieberiana*. No threatened species were found within the project footprint.

The degraded grassland community had a particularly low diversity of indigenous forbs. The provincially protected plant, *Aloe marlothii* (Mountain Aloe) can also be found scattered within the grassland community and occurring within large colonies. *A. marlothii* is protected by the KwaZulu-Natal Nature Conservation Management, but is not considered to be threatened.

[12] Threat Status (Jewitt, 2016):

CR: Critically Endangered; EN: Endangered; VU: Vulnerable; LT: Least Threatened

In the western region near the existing quarry, the area is mapped in the KwaZulu-Natal Terrestrial Systematic Conservation Plan (TSCP) (EKZNW, 2016) areas of **CBA: Optimal**, but is in fact heavily disturbed and degraded. While the slopes are associated with rocky outcrops, the area was previously mined and is representative of a dense and well-established community of Invasive Alien Plants.

A significant number of Invasive Alien Plant (IAP) species were recorded within the grassland community, dominated by *Lantana camara*, *Melia Azedarach* and *Solanum mauritianum*. Given the extent of densely distributed Invasive Alien Plants scattered amongst the grassland it was not considered as a distinct vegetation type, but rather was noted as a key factor for the overall degree of disturbance and degradation of the vegetation community.

Signs of bushland/woody plant encroachment were apparent, with species such as observed such as many pioneer *Vachellia sieberiana*, scattered within the grassland amongst Invasive Alien Plants.

Photo 1. View of the degraded grassland community with scattered alien plant species, edge effects from existing roads, historic quarry and woodland encroachment.

Photo 2. View of a degraded fairly homogenous grassland community with short grassland and woody encroachers.

This alien/exotic plant dominated layer was found to comprise a significant portion of the non-transformed area within the study area and has essentially been artificially created as a result of anthropogenic disturbance including: unnatural burning regime, disturbance linked to cattle grazing and human movement, power line and road infrastructure construction, cultivation and removal of indigenous plants.

This community was found to be overgrown with Invasive Alien Vegetation, with a mix of woody and herbaceous plants species recorded, including: *Agave americana, Ageratum conyzoides, Chromolaena odorata, Lantana camara, Melia azedarach, Senna didymobotrya,* and *Solanum mauritianum.*

Although indigenous vegetation was present, it was mainly tolerant and locally common species of least concern recorded including woody tree and shrub species such as *Vachellia karoo* and *Vachellia sieberiana*. The grass/graminoid layer was found to consist mainly of indigenous species of least concern, and mainly disturbance-tolerant and pioneer/increaser grasses such as *Cynodon dactylon, Eragrostis curvula* and *Hyparrhenia hirta*.

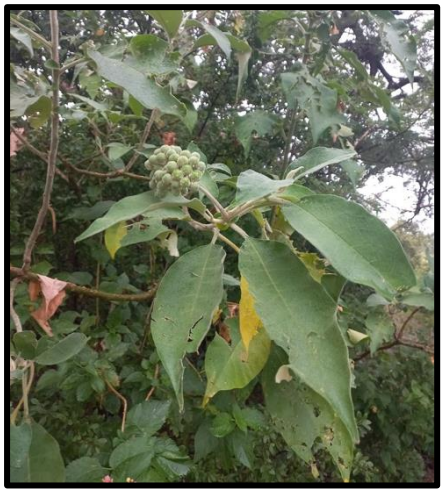

Photo 3. Solanum mauritianum, (Bugweed), which is prolific on site

Photo 4. *Lantana camara* (tick berry), encroaching indigenous vegetation.

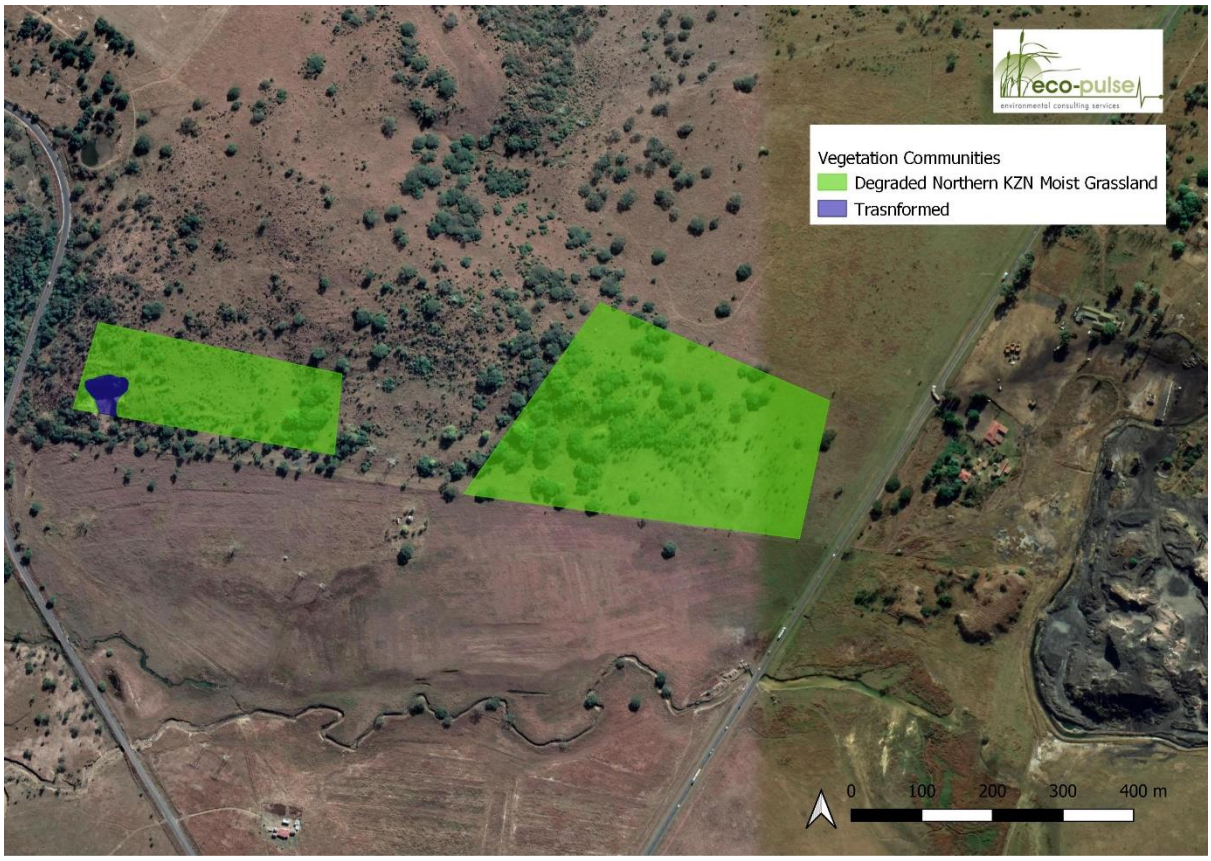

Figure 12 Mapped vegetation communities and habitat types identified and described within 32m of the study area.

4.2 Protected Plant Species

Provincially protected plants in terms of Schedule 12 of the KwaZulu-Natal Nature Conservation Management occurring within grassland and thornveld included:

- *Aloe marlothii*

The conservation importance and recommended best management practices for the conservation of this species is discussed briefly in the table below, with their location on-site indicated in the map in Figure 13.

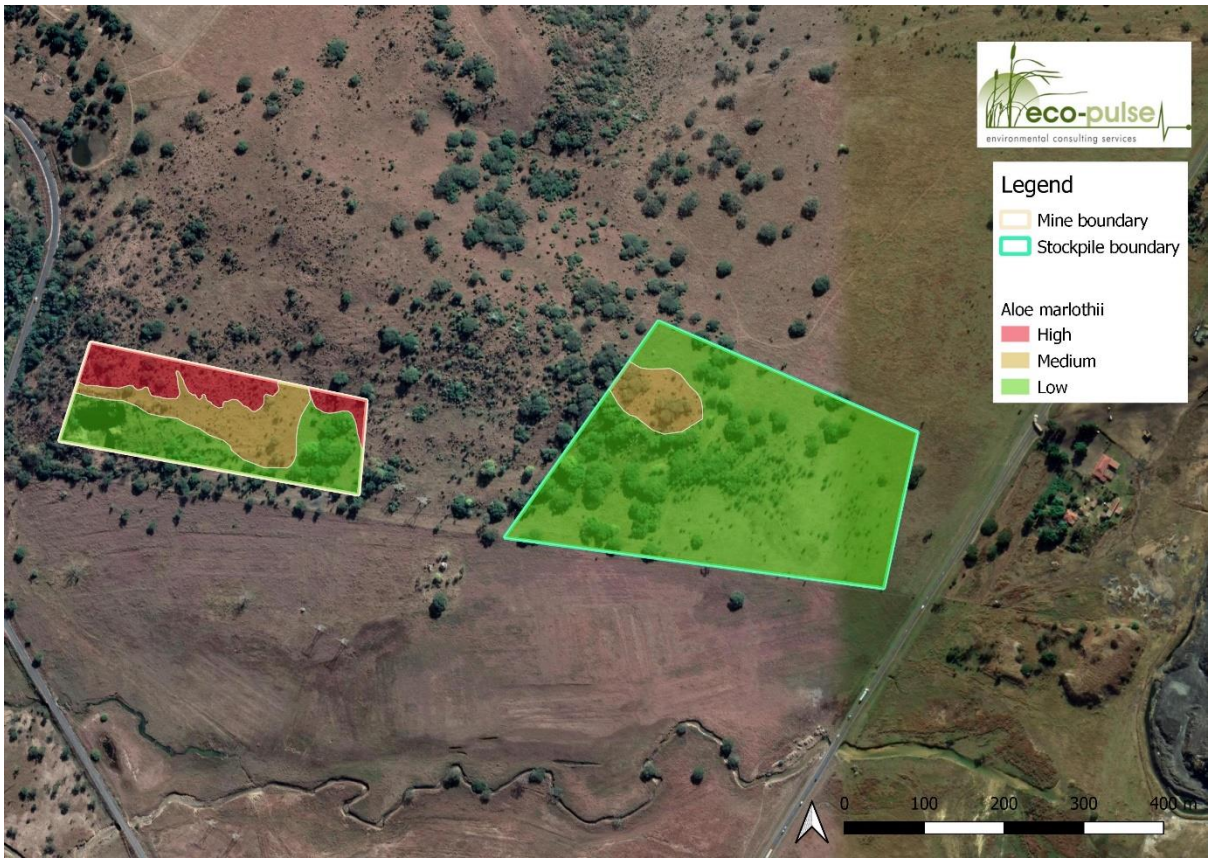

Figure 13 Map showing the distribution of *Aloe marlothii* confirmed to be on-site.

4.3 Ecological Importance Assessment

The results of the site ecological importance assessment are shown in Table 21 and shown graphically on the map in Figure 14. The ecological importance and sensitivity (EIS) of the only vegetation community and habitat type assessed generally relates back to the ability of the ecosystem to meet conservation targets, maintain important biodiversity features, the ecosystems sensitivity to ecological change and how significant such change would be. The proposed mine and stock piling area covers ~15ha of Medium SEI Vegetation.

Table 21. Summary of terrestrial habitat ecological importance ratings.

	1. Degraded Northern KZN Moist Grassland
CONSERVATION IMPORTANCE	Medium
FUNCTIONAL INTEGRITY	Medium
BIODIVERSITY IMPORTANCE	Medium
RECEPTOR RESILIENCE	Medium
SITE ECOLOGICAL IMPORTANCE RATING	**Medium**

Figure 14 Map showing site ecological importance ratings for terrestrial vegetation community and habitat.

4.3.1. Other noteworthy findings and ecological concerns

1. Remaining natural linkages/corridors

Anthropogenic development (informal infrastructure as well as substance / commercial agriculture) in the vicinity of the study area has led to the transformation of natural habitat. As such, any remaining intact ecological assets and ecological form important linkages and 'islands' for local biodiversity in a proverbial encroachment and agricultural land use. Grassland habitat form important ecological linkages and provide refugia for local species of flora and fauna, as well as forming important seed dispersal sites/nuclei. It is considered critical that remaining intact natural habitat be preserved wherever possible. Vegetation composition and structure and the condition of natural habitat in these areas should be maintained in as natural a state as possible such that movement of local wildlife is not jeopardized any further.

However, given that the greater surrounding environment is largely untransformed, there are opportunities to allow movements of fauna across the landscape. Given the relatively small size of the project development and the existing land use of the area (disturbed and encroached grasslands used for grazing) impacts to faunal movement is unlikely to be a significant concern.

2. Steep slopes and erodible soils

The majority of the site is characterized by gentle slopes where soil erosion and instability is unlikely to be of great concern. The western parts of the study area are characterised by steeper slopes where soil erosion risk is likely to be of concern, however terrestrial habitat degraded in degraded areas as a consequence of human settlement and overgrazing.

Erosion and sediment risks are therefore likely to be restricted mainly to watercourses and aquatic environments and this has been dealt with separately in the ***Specialist Freshwater Impact Assessment Report*** *by Eco-Pulse (refer to Eco-Pulse Report No. EP 671-01).*

3. Faunal Taxa

While it is not within the limitations of this assessment to undertake a conclusive faunal assessment, visual presence (droppings, scat, nests, etc.) were prioritised to confirm the probable presence of faunal SCC. However, no faunal SCC were observed, and evidence was not found indicating their probable occurrence within the project area. It is therefore unlikely, given the present habitat conditions and degree of disturbance that faunal species of CC occur within the proposed project area.

5 ECOLOGICAL IMPACT ASSESSMENT

Natural ecosystems are inherently vulnerable to human activities and these activities can often lead to irreversible damage or longer term, gradual/cumulative changes to ecosystems. This chapter of the report deals with the identification, description, prediction and significance assessment of the potential construction and operational impacts and risks posed to terrestrial ecosystems, vegetation, habitat and species by the mining and stock piling development project.

5.1 Description of Development Activities

In order to anticipate potential risks and impacts to terrestrial biodiversity associated with the project, an understanding of the construction and operational processes and development activities is first required.

5.1.1. Construction Phase Activities and Infrastructure

Construction activities will likely include (i) Site clearing of terrestrial vegetation and disturbance of soil, stripping and stockpiling, (ii) Construction of the property boundary & main site (temporary) camp, (iii) Blasting & development of supporting infrastructure, (iv) Construction of stormwater management infrastructure, pollution control dam, office & sediment management, and hazardous substances handling and storage, and (v) Construction of internal access road.

Note that construction impacts within and/or crossings watercourses will affect freshwater ecosystems only and have therefore not been addressed in this report.

5.1.2. Operation Phase Activities and Infrastructure

Operationally, this will include blasting, excavation, stockpiling, crushing and haulage of aggregate.

Note that operation impacts within and/or crossings watercourses will affect freshwater ecosystems only and have therefore not been addressed in this report.

5.2 Impact Identification

The general framework for the risk and impact assessment is shown in Table 22, which presents the expected risks, stressors and impacts for the construction and operational phase of the project.

Table 22. Terrestrial biodiversity impact assessment framework.

TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT FRAMEWORK	
DEVELOPMENT TYPE & ACTIVITIES: *Mining and Stock Piling*	
Construction Phase Activities: Construction activities required to establish the mining and stockpile areas and associated infrastructure (cumulative).	Operational Phase Activities: Operation activities of the mining and stockpile areas and associated infrastructure (cumulative).
ENVIRONMENTAL STRESSORS/RISKS	
Construction Phase Stressors/Risks:	**Operational Phase Stressors/Risks:**
• Direct loss of vegetation & habitat (overall biodiversity) • Reduced ground cover, exposed soils • Soil erosion & resultant sedimentation • Noise / light disturbance • Accidental pollution (spills)	• Altered runoff patterns and processes • Colonisation by alien plants / weeds • Reduced vegetation cover, exposed soils • Accidental vegetation removal • Increased erosion • Windborne dust from exposed stockpile
TERRESTRIAL BIODIVERSITY IMPACTS	
1	Impact on vegetation structure and plant species composition
2	Impact on potential populations of species of special concern
3	Impact on targets for threatened ecosystems or vegetation types
4	Impact on ecological processes and functionality of ecosystems
5	Impact on overall species and ecosystem diversity
6	Impact on ecological connectivity

5.3 Impact Significance Assessment

A summary of the terrestrial ecological impact significance assessment for the construction and operational phases of the mining and stock piling project is contained in Tables 23 and 24, respectively.

Note that while an attempt has been made to separate impacts into categories, there is inevitably some degree of overlap due to the inherent interrelatedness of many ecological impacts.

5.3.1. Construction Phase Impact Assessment

Table 23. Summary results of the terrestrial ecological impact significance assessment for construction phase impacts associated with the mining permit area and stockpiling area (cumulative).

Construction Phase Impact Assessment		Impact Significance	
		'poor' mitigation scenario	'good' mitigation scenario
C1	**Impact on vegetation structure and plant species composition**	**Moderate**	**Moderately Low**

This impact refers to the direct physical destruction and/or modification of terrestrial habitat and includes habitat loss impacts, habitat and vegetation degradation impacts (e.g., species composition and abundances changes) and invasive alien plant invasion.

The phase 1 plan will involve the construction of various (temporary) infrastructure that will run through 'Medium' SEI vegetation communities which would result in a loss of habitat within the development footprint itself, and modification of habitat through anticipated edge effects in areas immediately adjacent to the proposed infrastructure. Direct loss of habitat (15.4 ha of habitat loss in total), based on the footprint provided and included in the Primary Project Area of influence under a poor mitigation scenario (without mitigation) would include:

1. Degraded Northern KwaZulu-Natal Moist Grassland ('Medium' SEI) – 15.4 ha.

Key mitigation recommendations:

- Restrict the development to the 32m development buffer.
- Avoid impacts to primary grassland areas outside the development footprint which are to be 'no-go' areas for development and construction crews.
- No temporary construction site camps, vehicle parking or material stockpiling / laydown areas to be located outside of the development area.
- Impacts to the surrounding natural grassland must be avoided by staying within the development footprint. Alien vegetation must be removed and managed throughout the construction phase.
- Ensure all protected and threatened plants are relocated in accordance to the protected plant rescue and translocation plan.

		Impact Significance	
		'poor' mitigation scenario	'good' mitigation scenario
C2	**Impact on populations of species of special concern (i.e., Protected species)**	**High**	**Moderately Low**

This impact relates to the potential alteration of habitat that supports threatened plant and animal species, including alteration to the ambient environment by nuisance factors such as noise, vibrations, light pollution, etc. produced by people, machinery and vehicles. It also refers to the loss of important habitat that represent sources of food, shelter, etc. for faunal species of conservation concern.

If construction of infrastructure were to take place in areas of 'Medium' SEI, impacts to populations of protected plant species are likely, which could eliminate or reduce the size of protected plant populations on-site. However, it will be important to develop a plant rescue, relocation and protection plan, which would include a detailed search of the footprint for any threatened and/or protected plant species. Faunal impacts associated with infrastructure construction are likely to be of lower significance, given that large portions of the study area have already been transformed or degraded, with any fauna persisting in the area likely habituated to the existing disturbance regime (subsistence cultivation, livestock grazing, domestic animals and working dirt roads). However, the exception to this would be invertebrate species flagged as potentially occurring as part of the POC and TSCP which may have specific habitat requirements.

Fauna of conservation concern highlighted as possibly being present within the more intact habitats are unlikely to be breeding within the degraded habitats, and where foraging at the site, these should be easily flushed-out of their habitats and move to adjacent intact areas during construction, with the arrival of noisy construction machinery and labourers. Impacts to fauna of conservation concern are therefore likely to be unlikely and inconsequential overall.

Flora of conservation concern include the provincially protected plant *Aloe marlothii*, which although not currently threatened at a national level are increasingly threatened at a provincial level due to habitat loss, over-harvesting and human population expansion. The project development threatens to destroy or damage a substantial population of this protected plant species if not avoided. Given the population size of this provincially protected plant, that stand to be impacted, the impact significance where not mitigated is therefore expected to be relatively 'High'. The translocation of protected plants species can help mitigate this impact.

Key mitigation recommendations:

- Restrict the development to the 32m development buffer.
- Avoid impacts to primary grassland areas outside the development footprint which are to be 'no-go' areas for development and construction crews.
- No temporary construction site camps, vehicle parking or material stockpiling / laydown areas to be located outside of the development area.
- Where protected/threatened plants may be impacted or lost, permits need to be obtained and a protected plant translocation plan must be compiled and implemented to the satisfaction of the provincial conservation authority.

		Impact Significance	
C3	**Impact on targets for threatened ecosystems**	'poor' mitigation scenario	'good' mitigation scenario
		Moderately Low	**Moderately Low**

This impact refers to the loss of a vegetation unit representative of a rare and/or threatened ecosystem, habitat or vegetation community or a vegetation unit that could be reinstated to such an example with good management and/or rehabilitation.

Where proposed site activities and associated infrastructure traverse Northern KwaZulu-Natal Moist Grassland (Vulnerable), loss of approximately 15.4ha of this vegetation type is unlikely to reduce the capacity to meet provincial and national conservation targets. Further, the proposed development encompasses poor/degraded secondary grassland and alien dominated plant communities.

Where protected species are translocated and rescued successfully and the development footprint is adhered to as much as possible to avoid further permanent loss, impacts should be restricted to take place within degraded 'vulnerable' grassland, this impact can be considered to be of 'Moderately Low' significance.

Key mitigation recommendations:

- Avoid impacts to surrounding primary grassland areas which are to be 'no-go' areas for development and construction crews.
- No temporary construction site camps, vehicle parking or material stockpiling / laydown areas to be located within the mapped primary grassland areas.

		Impact Significance	
C4	**Impact on ecological processes and functionality of ecosystems**	'poor' mitigation scenario	'good' mitigation scenario
		Moderately Low	**Moderately Low**

This impact refers to the indirect impacts of adjacent land cover modification and transformation on surface runoff, soil moisture and rates of erosion and sedimentation, and associated ecological impacts like invasion by invasive alien plants and habitat degradation. This impact also includes the alteration or deterioration in the chemical and biological characteristics of soil and water, which inevitably impacts negatively on flora and fauna.

Impacts to the structure and condition of vegetation will likely affect ecological processes and the functioning of surrounding intact ecosystems which are known to provide a variety of valuable ecosystem goods and services. Impacts to degraded vegetation will be less significant. Overall impact significance can be regarded as 'Moderately Low'.

Key mitigation recommendations:

- Avoid impacts to primary grassland areas outside the development footprint which are to be 'no-go' areas for development and construction crews.
- No temporary construction site camps, vehicle parking or material stockpiling / laydown areas to be located within the mapped primary grassland areas.
- Rehabilitate any primary grassland that may be accidentally impacted.
- Refer to section 6.4 mitigation measures to be implemented.

		Impact Significance	
C5	**Impact on overall species and ecosystem diversity**	'poor' mitigation scenario	'good' mitigation scenario
		Moderately Low	**Low**

This impact refers to the loss of genetic, species, habitat/ecosystem and/or functional diversity.

Overall species and ecosystem diversity at the site can be considered moderately low to low, with key habitat hosting a low diversity of plant species. Overall, where poorly managed, impact significance can be considered 'Moderately Low' should direct impacts to degraded grassland habitat be incurred, however where protected species are translocated and rescued successfully and development footprint is restricted as much as possible, this impact can be considered to be of 'Low' significance.

Key mitigation recommendations:

- Restrict the development to the 32m development buffer.
- Avoid impacts to primary grassland which are to be 'no-go' areas for development and construction crews.
- No temporary construction site camps, vehicle parking or material stockpiling / laydown areas to be located within the primary grassland and thornveld areas.
- Where protected plants may be impacted or lost, permits need to be obtained and a protected plant translocation plan must be compiled and implemented to the satisfaction of the provincial conservation authority.

		Impact Significance	
C6	**Impact on ecological connectivity**	'poor' mitigation scenario	'good' mitigation scenario
		Moderately Low	**Low**

This impact refers to the potential reduction in ecological connectivity between the study area being assessed and adjacent habitats/ecosystems and the effects this may have on the movement of faunal species.

Whilst the clearing of vegetation along the project area will likely result in direct impacts to vegetation and habitat, vegetation and habitat can recover with time. Impacts on habitat connectivity will likely be a temporary impact following construction and since no key wildlife corridors will be severed, the significance of the impact is likely to be 'Moderately Low'.

There will still be some habitat connectivity surrounding the project area, albeit reduced. Avoiding habitat outside of the project area will assist with maintaining local level connectivity and reducing impact significance to an overall 'Low' level.

Key mitigation recommendations:

- Avoid impacts to primary grassland areas outside the development footprint which are to be 'no-go' areas for development and construction crews.

5.3.2. Operation Phase Impact Assessment

Table 24. Summary results of the terrestrial ecological impact significance assessment for operational phase impacts associated with the mining permit area and stockpiling area (cumulative).

Operation Phase Impact Assessment		Impact Significance	
		'poor' mitigation scenario	'good' mitigation scenario
O1	**Impact on vegetation structure and plant species composition**	**Moderate**	**Moderately Low**
This impact refers to the direct physical destruction and/or modification of terrestrial habitat and includes habitat loss impacts, habitat and vegetation degradation impacts (e.g., species composition and abundances changes) and invasive alien plant invasion. The stock piling footprint intersects with large portions of 'Medium' SEI vegetation communities, resulting in direct physical habitat loss in these areas or modifications of habitat as the stock piling area is established as mining progresses. During the mine operation phase terrestrial habitat could also be impacted by workers and machinery during repair and maintenance of onsite infrastructure, and through the potential injudicious movement of vehicles and people across the site that may cause unnecessary habitat disturbance. Natural habitat must therefore be appropriately safeguarded as no-go areas.			
O2	**Impact on populations of species of special concern (i.e., Protected species)**	**Impact Significance**	
		'poor' mitigation scenario	'good' mitigation scenario
		Moderate-High	**Moderate**
This impact relates to the potential alteration of habitat that supports threatened plant and animal species, including alteration to the ambient environment by nuisance factors such as noise, vibrations, light pollution, etc. produced by people, machinery and vehicles. It also refers to the loss of important habitat that represent sources of food, shelter, etc. for faunal species of conservation concern. During the expansion and establishment, areas of 'Medium' SEI vegetation communities will be lost. At the local scale the potential loss of important ecological corridors for faunal species movement as well as the loss of seed sources for certain plant species is an anticipated impact. During the planning and design phase it will be important to consider the maintenance of existing ecological corridors as far as possible for faunal species and to ensure the exchange of genetic material between threatened plant populations is not compromised. During the operational phase, impacts to remaining intact vegetation outside of the project footprint may also occur as a result of increased human activity and disturbance. Potential impacts include increased levels of alien plant infestations, edge effects, and increased grazing pressure on patches of undeveloped land leading to further habitat degradation and biodiversity loss. In addition, blasting during the operational phase may be a temporary nuisance factor for faunal species still within the study area.			
O3	**Impact on targets for threatened ecosystems**	**Impact Significance**	
		'poor' mitigation scenario	'good' mitigation scenario
		Moderate	**Moderate**
This impact refers to the loss of a vegetation unit representative of a rare and/or threatened ecosystem, habitat or vegetation community or a vegetation unit that could be reinstated to such an example with good management and/or rehabilitation. The development of site activities could result in the loss of Northern KwaZulu-Natal Moist Grassland (Vulnerable) with the same implications and mitigation measures recommended as above. In addition, the direct loss associated with the project footprint, it will be important to combat alien plant invasions associated with the edge effects created by the development through the implementation of a comprehensive alien plant control programme. Ongoing engagement with local stakeholders and the development of a sustainable grassland management programme would also be critical in ensuring surrounding remaining intact primary grassland outside			

the development footprint is not further degraded through increased anthropogenic pressures such as grazing and too frequent burning.

		Impact Significance	
O4	**Impact on ecological processes and functionality of ecosystems**	'poor' mitigation scenario	'good' mitigation scenario
		Moderately Low	**Low**

This impact refers to the indirect impacts of adjacent land cover modification and transformation on surface runoff, soil moisture and rates of erosion and sedimentation, and associated ecological impacts such as invasion by invasive alien plants and habitat degradation. This impact also includes the alteration or deterioration in the chemical and biological characteristics of soil and water, which inevitably impacts negatively on flora and fauna.

Impacts to vegetation of Medium SEI adjacent to and outside of the development footprint during the operational phase may occur as a result of increased human activity and associated disturbance (e.g., increased alien plant invasion and grazing pressure, as well as light and noise pollution – with respect to faunal species). This is likely to continue to impact on terrestrial ecosystem processes and functioning, reducing overall biodiversity and ecosystem functional services/values

		Impact Significance	
O5	**Impact on overall species and ecosystem diversity**	'poor' mitigation scenario	'good' mitigation scenario
		Moderately Low	**Low**

This impact refers to the loss of genetic, species, habitat/ecosystem and/or functional diversity.

Impacts to remaining primary vegetation outside of the project footprint during the operational phase may occur as a result of increased human activity and associated disturbance, as well as indirect impacts to ecosystems. This is likely to continue to impact on ecosystem processes and functioning, reducing overall biodiversity should the remaining primary vegetation communities continue to be mismanaged. Therefore, an invasive alien plant control programme and a grassland rehabilitation plan for the site would be important mitigation measures

		Impact Significance	
O6	**Impact on ecological connectivity**	'poor' mitigation scenario	'poor' mitigation scenario
		Moderately Low	**Low**

This impact refers to the potential reduction in ecological connectivity between the study area being assessed and adjacent habitats/ecosystems and the effects this may have on the movement of faunal species.

Vegetation on site still is largely degraded and in poor condition.

Overall Comment for The Above Cumulative Impacts O1 – O6: Impact Significance 'Poor' And 'Good' Mitigation Scenario

Most operational phase impacts will be linked to post-construction disturbance that could open up key natural areas to further impact by Invasive Alien Plants (IAPs) and weeds, leading to further loss of biodiversity and leading to reduced ecosystem condition and functioning. Under a poor mitigation scenario (no follow-up clearing of IAPs post-construction), impacts are generally expected to be of 'Moderate' significance where poorly mitigated/managed.

Through onsite IAP control, eradication and basic rehabilitation of disturbed habitat post-construction, operational impacts of alien plants on terrestrial biodiversity can be potentially mitigated and reduced from 'Moderate' to 'Moderately Low' to 'Low' significance levels. Given the fact that habitats are somewhat already infested by IAPs, the potential success of clearing operations will require a more comprehensive and holistic programme to manage IAPs within the target grassland and thornveld vegetation community.

*For further details on impact assessment scores and ratings refer to **Annexure C** of this report.*

6 IMPACT MITIGATION & MANAGEMENT

A strong legislative framework which backs up South Africa's obligations to numerous international conservation agreements creates the necessary enabling legal framework for the protection and management of terrestrial ecosystems and biodiversity in the country. According to the National Environmental Management Act No. 107 of 1998 (NEMA): sensitive, vulnerable, highly dynamic or stressed ecosystems (such as terrestrial forests and grasslands) require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure. NEMA also requires "*a risk-averse and cautious approach which takes into account the limits of current knowledge about the consequences of decisions and actions*". The 'precautionary principle' therefore applies and cost-effective measures must be implemented to pro-actively prevent degradation of the region's natural resources, biodiversity and the social systems that depend on terrestrial ecosystems and habitats. ***Ultimately, the risk of ecological degradation and biodiversity reduction/loss must drive sustainability in development design.***

Of particular importance is the requirement of 'duty of care' with regards to environmental remediation stipulated in Section 28 of NEMA (National Environmental Management Act No.107 of 1998):

> **Duty of care and remediation of environmental damage**: "(1) *Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot be reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.*"

6.1 Mitigation Hierarchy

The protection of terrestrial ecosystems (grasslands in this instance) and associated biodiversity typically begins with the mitigation of risks and avoidance of adverse impacts and where such avoidance is not feasible; to apply appropriate mitigation in the form of reactive practical actions that minimizes or reduces impacts. The management of ecosystems should aim to prevent the occurrence of large-scale damaging events as well as repeated, chronic, persistent, subtle events which can in the long-term be far more damaging (e.g., as a result of sedimentation and pollution).

'Impact Mitigation' is a broad term that covers all components involved in selecting and implementing measures to conserve biodiversity and prevent significant adverse impacts as a result of potentially harmful activities to natural ecosystems. The mitigation of negative impacts on terrestrial vegetation, habitat and associated biodiversity is a legal requirement for authorisation purposes and must take on different forms depending on the significance of impacts and the particulars of the target area being affected. This generally follows some form of 'mitigation hierarchy' (see Figure 15) which aims firstly at avoiding disturbance of ecosystems and loss of biodiversity, and where this cannot be avoided, to minimise, rehabilitate, and then finally offset any remaining significant residual impacts.

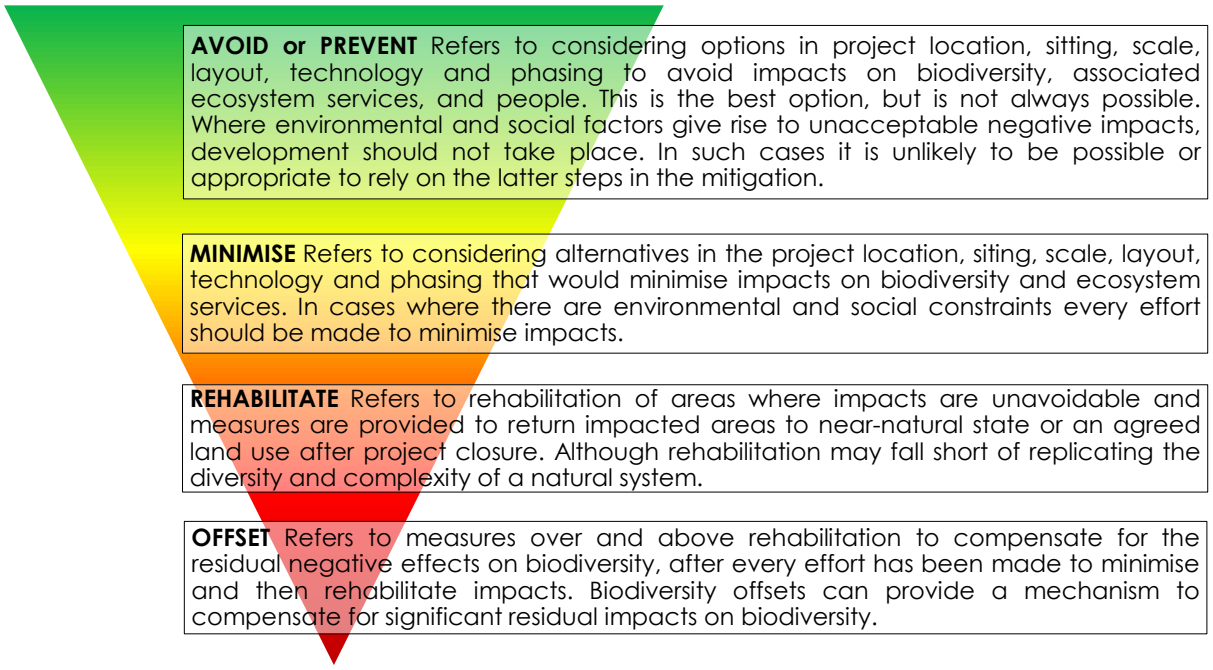

Figure 15 Diagram illustrating the 'mitigation hierarchy' (after DEA *et al*., 2013).

The mitigation hierarchy is inherently proactive, requiring the on-going and iterative consideration of alternatives in terms of project location, siting, scale, layout, technology and phasing until the proposed development can best be accommodated without incurring significant negative impacts to the receiving environment. In cases where the receiving environment cannot support the development or where the project will destroy the natural resources on which local communities are wholly dependent for their livelihoods or eradicate unique biodiversity; the development may not be feasible and the developer knows of these risks, and can plan to avoid them, the better. In the case of particularly sensitive or threatened/endangered ecosystems, where ecological impacts can be severe, the guiding principle should generally be "*anticipate and prevent*" rather than "*assess and repair*".

Examples of mitigation can include changes to the scale, design, location, siting, process, sequencing, phasing, and management and/or monitoring of the proposed development activities, as well as the restoration or rehabilitation of habitats and vegetation disturbed during construction. Where environmental impacts can be severe, the guiding principle should be "anticipate and prevent" rather than "assess and repair". In dealing with potential development risks and impacts to terrestrial ecosystems and biodiversity, during both the construction and operation phases of the development project, mitigation would be best achieved through phases or stepped approach to the project which should be implemented as follows:

1. **Avoiding 'direct impacts'** to terrestrial ecosystems wherever possible through appropriate and informed development planning;
2. Secondly, **attempting to reduce the risk of incurring significant 'indirect impacts'** through the integration of appropriate management of storm water, erosion control and pollution control into the development design and through relevant onsite control measures (where relevant);

3. Thirdly, **addressing residual impacts to areas** through onsite post-construction phase **rehabilitation and re-vegetation**; and
4. Lastly, applying relevant **biodiversity offsets** as a means of compensating for residual impacts associated with the loss of primary vegetation/habitat and/or conservation important species of flora/fauna (*not applicable to this project*).
5. flora/fauna (*not applicable to this project*).

6.2 Implementation of Mitigation Measures

In terms of Section 2 and Section 28 of NEMA (National Environmental Management Act, 1998), the landowner/developer is responsible for any environmental damage, pollution or ecological degradation caused by their activities "inside and outside the boundaries of the area to which such right to, permission relates". In dealing with the range of potential ecological impacts to natural ecosystems and biodiversity highlighted in this report, this would be best achieved through the incorporation of the management & mitigation measures (recommended in this report) into the Construction Environmental Management Programme (EMPr) for the development project.

The EMPr should define the responsibilities, budgets and necessary training required for implementing the recommendations made in this report. This will need to include appropriate monitoring as well as impact management and the provision for regular auditing to verify environmental compliance. The EMPr should be enforced and monitored for compliance by a suitably qualified/trained ECO (Environmental Control Officer) with any additional supporting EO's (Environmental Officers) having the required competency skills and experience to ensure that environmental mitigation measures are being implemented and appropriate action is taken where potentially adverse environmental impacts are highlighted through monitoring and surveillance. The ECO will need to be responsible for conducting regular site-inspections of the construction process and activities and reporting back to the relevant environmental authorities with findings of these investigations. The ECO will also need to be responsible for preparing a monitoring programme to evaluate construction compliance with the conditions of the EMPr and RoD/EA, once issued.

6.3 Development Planning: *Environmental Guidelines and Principles*

At the forefront of mitigating impacts to terrestrial vegetation, habitat and biodiversity should be the incorporation of ecological and environmental sustainability concepts into the design of the development project, with a central focus on the following:

1. Ensuring that direct impacts to sensitive vegetation and habitat are avoided wherever possible through ecologically sound and sustainable development layout planning that takes into account the location and sensitivity of the remaining ecological infrastructure at the site;
2. Employing creative design principles and ecologically sensitive methods in infrastructure design and layouts to minimise the risk of indirect impacts;

3. Ensuring that storm water management design and implementation takes into account the requirements of the environment; and
4. Taking necessary efforts aimed at minimising/reducing potential waste streams.

6.3.1. Protected Plant Rescue and Translocation

There are three key pieces of legislation in South Africa applicable to the Province of KwaZulu-Natal that provide for the protection of threatened plant species in need of protection to ensure their survival in the wild. Furthermore, they provide for the protection of ecosystems that are threatened or in need of protection. These include the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), the National Forest Act, 1998 (Act No. 84 of 1998) and the KwaZulu-Natal Nature Conservation Management Amendment Act, 1999 (No. 5 of 1999).

One (1) conservation important plant species were recorded within the project site area that was assessed (see map in Figure 16), namely *Aloe marlothii,* which is provincially protected in accordance with the Nature Conservation Management Amendment Act, 1999 (No. 5 of 1999). An appropriate protected plant rescue and translocation plan will need to be developed with a focus on rescuing and transplanting >150 protected plants if the development project is authorised.

Note that Ordinary Permits will be required from Ezemvelo KZN Wildlife if protected species listed are to be handled in any manner during construction of the proposed development. These permits must be acquired prior to plant translocation proceeding.

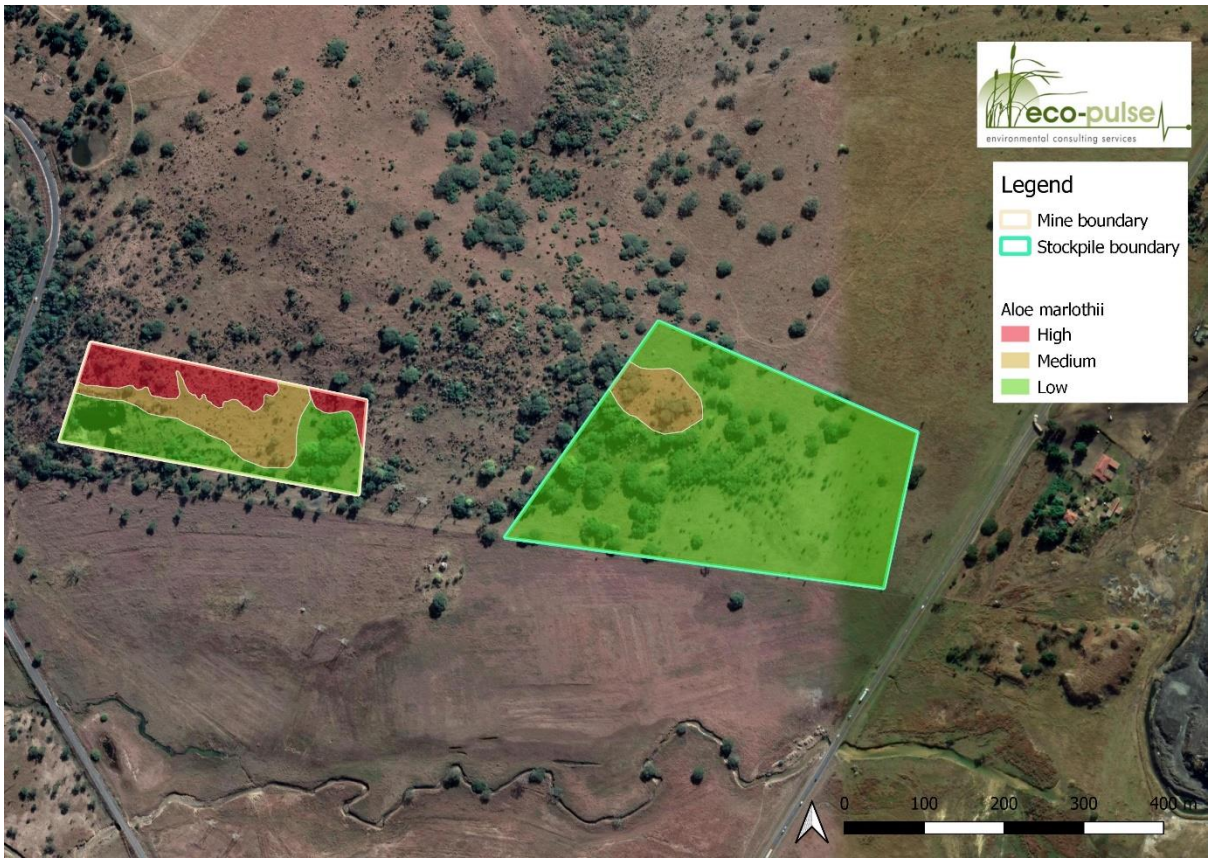

Figure 16 Map showing the spatial distribution of provincially protected Aloe marlothii. Note that due to its high occurrence the project area has been divided to indicate a likelihood rating of its occurrence.

Photographs of protected plants taken in the field:

Photo 5 and 6. *Aloe marlothii* present extensively within the project site area.

6.4 Construction Phase Impact Mitigation Measures

The following project-specific mitigation measures are recommended during the construction phase of the project. The following mitigation measures must be implemented in conjunction with any generic measures provided in the Environmental Management Programme (EMPr).

6.4.1 'No-Go' Areas and Working Area Demarcations

- 'No-Go' areas to be shown on a site layout map and demarcated on the ground (where practically possible).
- Demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences.
- Demarcations are to remain until construction and rehabilitation is complete.
- All areas outside of this demarcated project area must be considered 'no-go' areas for the entire construction phase.
- No equipment laydown or storage areas must be located outside of the development footprint.
- Access to and from the development area should be either via existing roads or within development footprint.
- Any contractors found working inside the 'no-go' areas (areas outside the construction/ working footprint) should be fined as per a fining schedule/system setup for the project.

6.4.2 Vegetation Management

- Vegetation removal/stripping must be limited to the construction footprint.
- No clearing of indigenous vegetation outside of the defined project footprint is permitted for any reason (i.e., for firewood or medicinal use).
- Grubbing is not permitted as a method of clearing vegetation. Any trees needing clearing must be cut down using chain saws and hauled from the site using appropriate machinery where practically possible.
- Vegetation clearing/stripping must only be done as the construction front progresses.

6.4.3 Invasive Alien Plant control

- All alien invasive vegetation that colonises the construction site must be removed, preferably by uprooting. The contractor should consult the ECO regarding the method of removal.
- All bare surfaces across the construction site must be checked for IAPs every two weeks and IAPs removed by hand pulling/uprooting and adequately disposed of.
- Herbicides should be utilised where hand pulling/uprooting is not possible. ONLY herbicides which have been certified as safe for use by an independent testing authority are to be used. The ECO must be consulted in this regard.

6.4.4 Management of Wildlife

- Education of workers/employees onsite focused on avoiding unnecessary harm to wildlife will assist in mitigating this impact. Contractor induction and staff/labour environmental awareness training needs are to be identified and implemented through staff/contractor environmental induction training. This should include basic environmental training based on the requirements of the EMPr, including training on avoiding and conserving local wildlife.
- No wild animal may under any circumstance be hunted, snared, captured, injured, killed, harmed in any way or removed from the site. This includes animals perceived to be vermin (such as snakes, rats, mice, etc.).
- Any fauna that are found within the construction zone must be moved to the closest point of natural or semi-natural habitat outside the construction area.
-
- The handling and relocation of any animal perceived to be dangerous/venomous/poisonous must be undertaken by a suitably trained individual.
- All vehicles accessing the site should adhere to a low-speed limit (30km/h is recommended) to avoid collisions with susceptible species such as reptiles (snakes and lizards).
- No litter, food or other foreign material should be disposed of on the ground or left around the site or within adjacent natural areas and should be placed in demarcated and fenced rubbish and litter areas that are animal proof.
- Ensure that workers accessing the site conduct themselves in an acceptable manner while on site, both during work hours and after hours.

6.4.5 Fire Management

- No open fires to be permitted on construction sites. Fires may only be made within the construction camp and only in areas and for purposes approved by the ECO.
- Fire prevention facilities must be present at all hazardous storage facilities.
- Ensure adequate fire-fighting equipment is available and train workers on how to use it.
- Ensure that all workers on site know the proper procedure in case of a fire occurring on site.
- Smoking must not be permitted in areas considered to be a fire hazard.

6.4.6 Nuisance Management

- Temporary noise pollution associated with construction works should be minimized by ensuring the proper maintenance of equipment and vehicles, including the tuning of engines and mufflers as well as employing low noise equipment where possible.
- Water trucks will be required to suppress dust by spraying water on affected areas producing dust. This will likely be required daily.
- No lights must be established within the construction area near the watercourses and buffer zones.
- No activities should be permitted at the site after dark (between sunset and sunrise), except for security personnel guarding the development site.

6.4.7 Rehabilitation of accidental / unintended physical disturbance

Any damage to 'no-go' areas that takes place during the construction phase must be rehabilitated immediately. A site-specific rehabilitation plan would need to be developed in this instance and a terrestrial ecologist consulted in this regard should such disturbance occur.

6.4.8 Construction phase monitoring measures

- Compliance monitoring will be the responsibility of a suitably qualified/trained ECO (Environmental Control Officer) with any additional supporting EO's (Environmental Officers) having the required competency skills and experience to ensure that monitoring is undertaken effectively and appropriately.
- A photographic record of the state of the terrestrial ecosystems prior to the commencement of clearing/construction must be kept for reference and rehabilitation monitoring purposes.
- The ECO must undertake weekly compliance monitoring audits. Terrestrial ecosystem aspects that must be monitored related to monitoring freshwater ecosystem impacts include:
    - The condition of the demarcation fence/barrier.
    - Evidence of any 'no-go' area incursions.
    - The condition of the temporary runoff, erosion and sediment control measures and evidence of any failures or sediment deposits within watercourses.
    - Evidence of erosion.
    - The condition of waste bins and the presence of litter within the working area.
    - Evidence of solid waste within the no-go areas.
    - Evidence of hazardous materials spills and soil contamination.
    - Presence of alien invasive and weedy vegetation within the working area.
    - Rehabilitation and re-vegetation methods and success.
- Once the construction and rehabilitation has been completed, the ECO should conduct a close-out site audit within a month of completion of rehabilitation.

6.4.9 Stormwater Management

Construction phase storm water management measures are documented in the Specialist Freshwater Impact Assessment Report compiled for the project (Eco-Pulse 2022, Report No. EP671-01) and should be referred to in all instances. These have not been duplicated here.

6.4.10 Soil Management & Erosion Control

Construction phase soil management and erosion control measures are documented in the Specialist Freshwater Impact Assessment Report compiled for the project (Eco-Pulse 2022, Report No. EP671-01) and should be referred to in all instances. These have not been duplicated here.

6.4.11 Pollution Prevention

Hazardous substances management is documented in the Specialist Freshwater Impact Assessment Report compiled for the project (Eco-Pulse 2022, Report No. EP671-01) and should be referred to in all instances. These have not been duplicated here.

6.4.12 Management of Solid Waste

Solid waste management is documented in the Specialist Freshwater Impact Assessment Report compiled for the project (Eco-Pulse 2022, Report No. EP671-01) and should be referred to in all instances. These have not been duplicated here.

6.5. Post-Construction Rehabilitation Guidelines (disturbed terrestrial habitat)

The clearing of vegetation during construction will require some form of rehabilitation, at the very least to produce a temporary vegetation cover that can assist with controlling erosion and inhibiting alien plant colonisation of the site whilst the vegetation recovers naturally. This is also in line with a number of laws that compel the rehabilitation of disturbed natural areas. Of particular importance is the requirement of 'duty of care' with regards to environmental remediation: stipulated in Section 28 of NEMA (National Environmental Management Act, Act 107 of 1998):

- **Duty of care and remediation of environmental damage**: "(1) *Every person who causes has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot be reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.*"

The following strategy and guidelines provide a clear and practical means of implementing basic / simple post-construction revegetation of affected grassland habitat within the project once construction activities have ceased:

1. General Land preparation measures

The following are general land preparation requirements for all areas requiring rehabilitation (prior to any re-vegetation occurring):

- All rubble, litter, foreign materials and waste products need to be removed from the construction area and disposed of at licensed local waste disposal/landfill facilities. Minimise additional disturbance by limiting the use of heavy vehicles and personnel during clean-up operations.
- Any soil stockpiles/spoil material must spread evenly on the ground to match the natural slope.
- All Invasive Alien Plants (IAPs) and weeds must be removed from target sites, preferably by uprooting.
- All embankments are to be shaped to the specification of the project or recommendations of the engineer/ECO.
- Any erosion features within the construction site must be stabilised. Compacted soil infill, rock plugs, gabions, excavation and reshaping or any other suitable measures can be used for this purpose.
- Where significant soil compaction has occurred, the soil may need to be ripped in order to reduce its bulk density thus improving the chances that vegetation can become established at the site. Rip and / or scarify all disturbed and compacted areas of the construction site. The ECO, with the assistance of the engineer, will specify whether ripping and / or scarifying is necessary, based on the site conditions.
- Immediately after ripping and scarifying disturbed areas, about 300mm of topsoil must be applied on top. The thickness of the topsoil may be reduced at the instruction of the engineer only if the recommended 300mm of topsoil compromises the integrity of the works.
- Topsoil must be placed in the same area from where it was originally stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas. Where topsoil is lost during construction as a result of erosion, topsoil will need to be imported to the site and re-established. Such topsoil must be sourced commercially and legally.
- The topsoil must be compacted to similar compaction levels as natural soils in the area. The engineer will provide detailed advice on this.
- For seeding, the soil needs to be prepared to optimise germination. This is typically undertaken by hand hoeing to loosen the soil in the seedbed but should be firm enough to facilitate good contact between the seeds and the soil.

2. Stabilising slopes

The following is recommended for stabilisation of slopes:

Prior to revegetation:

- Prior to rehabilitation the site must be stabilised where necessary using soft interventions including Grass Fences, Sandbags, geo-cells, fibre rolls and creating benches on the slope. The purpose of these mitigation measures is to reduce soil erosion which may compromise rehabilitation efforts.
- Where necessary, sediment retaining structures such as silt fences, sandbags, hay bales, brush packs, timber logs must be placed in continuous lines across the slope at regular intervals. The interval between rows of sediment retaining structures will depend on the slope gradient. The steeper it is, the shorter the interval.
- Temporary sediment barriers will need to remain in place until such time as re-vegetation and stabilization of disturbed areas is judged to be a success and the risk of erosion/sedimentation has been reduced to a respectfully low level.
- Creating a benched slope will also help in controlling the velocity of runoff.
- It is important to note that bioengineering interventions are vulnerable to failure if not adequately implemented or poorly maintained.

3. <u>Revegetation of disturbed terrestrial areas</u>

Immediately after preparing the soil, re-vegetation must commence in order to help bind the soil and prevent soil erosion and to inhibit IAP/weed establishment which will compete with the natural vegetation for space, light, nutrients and water. In this regard, the following mitigation measures is to be implemented for disturbed terrestrial habitats/vegetation:

<u>Re-vegetation Method 1</u>: Planting of plugs / sprigs (for disturbed grassland areas)

The following recommendations apply to re-vegetation of areas disturbed during construction:

- The timing of planting is best done shortly before or at the beginning of the growing season (i.e. spring, or at the onset/early summer).
- Once the soil surface is prepared and stabilised, plugs are to be established at moderate densities in alternating rows / patches with areas to be planted. The pattern of planting is to be determined as part of the detailed plan for implementation.
- When using vegetation plugs, the spacing of plugs should not be too wide and planting should be done in patches rather than wider spacing.
- If the soil into which the plugs are to be planted is dry, it will be necessary to add a suitable hydroscopic gel to the receiving cavity at the time the plug is planted (Granger, 2014).
- It is essential that when a plug is planted that the receiving cavity is slightly deeper than the length of the root ball so that when the cavity is pinched closed a slight depression remains around the base of the leaves. This is especially important if the plugs are small and planted into dry soil even though hydroscopic gel has been added to the cavity.
- Live plugs of suitable indigenous grasses such as *Aristida junciformis, Digitaria eriantha, Cynodon dactylon* and *Eragrostis curvula* can be obtained from a commercial source.

- Note that any harvesting from donor grassland areas must be undertaken with caution so as not to unduly disturb the donor site. For whole/growing plants, ensure that plants are dug up with as much of their roots intact and such that the soil around the roots is not disturbed (i.e. intact root ball). Care also needs to be taken that weeds/alien plants are not transplanted with the donor plants.
- Collected plants should be replanted as quickly as possible following removal (i.e., within hours of harvesting).
- Large clumps of plants can be carefully separated into smaller clumps or into several individual stems with attached roots, known as slips.
- The plants should be planted with their roots in as much of the original soil medium as possible from which they were removed.
- When planting the material, dig a hole deep enough to ensure that the roots do not bend upwards.
- The soil around the plant should be firmly compacted.
- Temporary erosion protection measures must only be removed once good vegetation cover has established.
- It is essential that survival of all plants be monitored closely for at least the first eight weeks from the day following their planting and any dead plants be replaced as soon as possible.
- No exotic/alien plants are to be used in re-vegetation.

Re-vegetation Method 2: Seeding by broadcasting or hydroseeding (for areas with bare soils/completely cleared of vegetation)

- Hydroseeding or manual broadcasting of seed is the second preferred option to re-vegetating slopes and areas with bare soils completely void of vegetation. The advantages of hydroseeding include faster germination, increased plant survival, and the ability to cover large, often inaccessible areas rapidly.
- The slurry (basic materials) for hydroseeding must consist of water, seed, fertiliser, anti-erosion compounds (soil binders) and organic supplements to enhance grass growth.
- Prior to seeding, water must be sprayed over the target area to provide added moisture.
- The target groundcover of re-vegetated areas shall be no less than 80% of specified vegetation and there must be no bare patches of more than 500 x 500 mm in maximum dimension.
- Ideal species for seeding are mat forming or tufted pioneer grasses that can become quickly established at the site to provide immediate cover in order to stabilise soils and reduce erosion risk. Recommended pioneer grasses for attaining an initial cover at disturbed sites (based on the climate and soil occurring at the site) may include a number of fast-growing and mat-forming (stoloniferous or rhizomatous) runner grasses such as *Cynodon dactylon*[13] (Couch grass), *Chloris gayana* (Rhodes grass) and/or *Eragrostis tef*.
- No exotic/alien plants are to be used in re-vegetation.

[13] Note that *Cynodon dactylon* has recently been listed as an "invasive" species in terms of NEMBA and requires a plant permit to be obtained for the use this species in planting projects. A sterile (non-invasive) cultivar should be sourced if this species is to be used and the relevant permit obtained.

4. Post-revegetation

- Immediately after planting the recommended seed mix (hydroseeding / broadcasting of seed), slopes may be covered with an erosion control blanket such as a SoilSaver, which serves to conserve moisture and hold seeds and soil firmly in place.
- The SoilSaver will require pegging with wooden pegs which can be made from vegetation cleared from the construction footprint.

6.5 Operational Phase Impact Mitigation Measures

The following mitigation measures are recommended to address the operational impacts.

6.5.1 Invasive Alien Plant Control

Regular alien plant control within the project footprint and associated access roads is necessary to ensure that revegetated and disturbed areas affected during the construction phase are not colonised by invasive alien plants during the operational phase of this project. Initial clearing which takes place during the construction phase should be supplemented by periodic follow-up IAP clearing phases every 3 months for the first year of operation and thereafter on a quarterly to annual basis depending on IAP infestation levels observed on-site which should be determined by the relevant appointed ECO for the project. Recommendations regarding IAP clearing outlined in the construction phase mitigation measures should likewise be adhered to and are applicable also to the operational phase.

6.5.2 Ecosystem Rehabilitation & Management

Where maintenance and repair work may be needed and requires access to the project area, disturbance of areas may require rehabilitation and the guidelines provided in 6.5 should be referred to in this regard.

6.6 Biodiversity Offsets

Biodiversity offsets are typically required in certain situations to compensate for residual impacts to ecosystems and biodiversity once all other forms of mitigation have been considered. Should it be possible to avoid protected plants, direct impacts of 'High' significance will be avoided, such that the only impacts will be incurred by degraded grassland which is 'vulnerable'. Given that impacts to grassland is unlikely to negate meeting conservation targets set for this type at this stage, biodiversity offsets are not considered relevant to this project.

Note that where the plant rescue and translocation efforts are either not practically possible or are unsuccessful, a biodiversity offset may be required by the relevant environmental authorities to compensate for the loss of ecologically important habitat.

The need for biodiversity offsets can therefore be avoided appropriately through acquiring plant rescue and translocation permits from the competent authority.

7 CONCLUSION

The Specialist **Terrestrial Biodiversity Impact Assessment** contained in this report was undertaken by Eco-Pulse Consulting in January/February 2023. This report outlines the conservation context assessments for the study area and contains the baseline terrestrial ecosystem assessment findings. Based on the findings of this assessment, one broad vegetation community (Degraded Northern KwaZulu-Natal Moist Grassland) was described on-site, considered to be of poor condition with a 'Medium' SEI rating. In addition, the vegetation community, Northern KwaZulu-Natal Moist Grassland, is endemic to KwaZulu-Natal and listed nationally as a 'vulnerable' ecosystem. Following the initial site inspection, no SCC were confirmed to occur within the study area. Furthermore, one provincially protected plant under the Natal Conservation Ordinance, *Aloe marlothii*, was recorded to occur prolifically within the north-western area of the project site. Necessary plant permits, including rescue and relocation plans from the relevant authorities are required. Concerning faunal species identified as SCC and the mollusc: *C. simplex,* a desktop assessment and field verification exercise was undertaken, however no evidence was found confirming probable occurrence. The vegetation community is no longer representative of good condition Northern KwaZulu-Natal Moist Grassland and is highly degraded due to disturbance (grazing) and a dense Invasive Alien Plant Community. There is no evidence supporting concern for probable occurrence of SCC, except the confirmed observation of *A. martholii*.

Recommendations have been provided to try and avoid and minimise potential impacts in accordance with the first two steps of the mitigation hierarchy. A key recommendation is to avoid protected plants through appropriate plant rescue and translocation efforts provided by the ecologists from Eco-Pulse for consideration. Given the fact that the habitat is largely degraded and/or already infested by IAPs, the potential success of clearing operations will require a more comprehensive and holistic programme to manage IAPs within the target degraded vegetation community at the site.

Biodiversity offsets can be avoided where impacts to protected plants are avoided through protected plant relocation. Under a best practical mitigation scenario, the project is considered to be environmentally acceptable from a terrestrial biodiversity perspective, provided that the mitigation and management recommendations in Chapter 6 of this report are strictly adhered to.

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9 Annexures

ANNEXURE A: List of Species encountered during rapid site walkover

- Agave americana
- Ageratum conyzoides
- Aloe marlothii
- Aristida congesta
- Chromolaena odorata
- Cussonia paniculate
- Cynodon dactylon
- Digitaria eriantha
- Eragrostis curvula
- Hyparrhenia hirta
- Hypoxis hemerocallidea
- Imperata cylindrica
- Lantana camara
- Ligustrum sinense
- Melia azedarach
- Millettia grandis
- Oncosiphon suffruticosum
- Senna didymobotrya
- Solanum mauritianum
- Themeda traindra
- Vachellia karoo
- Vachellia sieberiana

ANNEXURE B: Desktop SCC Likelihood of Occurrence Assessment

The determination of ecological importance requires the consideration of whether the vegetation community described and classified in this assessment provide habitat for rare or threatened flora and fauna. In order to inform the EIS assessment and flag the need for additional floral or faunal surveys, a desktop likelihood of occurrence assessment of threatened flora and fauna was undertaken based on available data on species records and distributions, habitat preference and the recorded vegetation condition that acted as proxy for habitat condition and suitability.

Flora Likelihood of Occurrence

Interrogation of SANBI's online New POSA species database and the EIA online screening tool highlighted the potential occurrence of numerous protected, endemic and threatened species within the study area. Review of the habitat preference of threatened species against vegetation communities recorded within the study area highlighted the potential presence of four species which are considered Endangered, Vulnerable, Near Threatened, Data Deficient, Rare and/or Endemic. No species were flagged by POSA. Details of the assessment results are provided in Table 25. Field verification during the current assessment (January 2023) did not confirm the presence any species flagged by the online tools on-site.

Table 25. Potential occurrence of flora species within the study area.

Scientific Name	Threat Status[14]	Habitat Preference	Rationale	POC	Source
Polygala practicola	unknown	unknown	unknown	unknown	EIA Screening Tool
Sensitive species	VU	Northern KwaZulu-Natal Moist Grassland among a host of other grasslands and bushveld vegetation communities.	Yes – study area has the appropriate vegetation types present	Possible	EIA Screening Tool
Sensitive species	VU	Rocky outcrops, streambanks and vleis in Northern KwaZulu-Natal Moist Grassland	Yes – study area has the appropriate vegetation type present	Possible	EIA Screening Tool

[14] Key: CR PE – Critically Endangered Possibly Extinct; CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; DD – Data Deficient; ER – Extremely Rare; R – Rare

Scientific Name	Threat Status[14]	Habitat Preference	Rationale	POC	Source
Sensitive species	EN	Northern KwaZulu-Natal Moist Grassland among a host of other grasslands.	Yes – study area has the appropriate vegetation type present	Possible	EIA Screening Tool

Fauna Likelihood of Occurrence

The findings of the desktop faunal likelihood of occurrence (LOC) assessment have been summarised in this section of the report. Potential amphibians, avifauna (birds), mammals, reptiles and invertebrates of conservation concern (i.e., Red-Dated Listed Species: CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened) are documented below. *Note that species of Least Concern (LC), endemic species and species with restricted ranges have been excluded from the assessment, with the focus being on Red-Data species.*

A. Mammals

Review of the available Red List database highlighted 1 mammal SCC modelled to occur within and around the study area. Conservation important small mammal species are unlikely to occur within the degraded secondary vegetation in the study area given the lack of suitable habitat. (see Table 26 below for details).

Table 26. Potential occurrence of mammal species within the study area.

Species Name	Status[15]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Oribi *Ourebia ourebi ourebi*	EN (LC)	Oribi are found savanna wooldlands, floodplains and open grasslands, in a mosaic of long grass for shelter and short grass for feeding.	The presence of human activity and grazing decreases the likelihood that they occur on large portions of the site although may occur along open	Possible	EWT Regional Red List status (2016)

[15] Key: CR PE – Critically Endangered Possibly Extinct; CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; DD – Data Deficient; ER – Extremely Rare; R – Rare

Species Name	Status[15]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
			grassland areas that are further removed from human settlement.		

B. Avifauna (birds)

Birds of conservation concern were identified through use of the South African Bird Atlas Project (SABAP) database (available online at http://sabap2.adu.org.za/). Whilst the majority of species recorded by the SABAP2 are considered locally common birds, there are 13 bird species that are considered to be of conservation concern based on their threat status (Table 27, below). Of these species, eight may frequent the more intact vegetation communities on the property include the **African marsh-harrier** (Endangered), **Lanner Falcon** (Vulnerable), **Southern Bald Ibis** (Vulnerable), **Secretary bird** (Vulnerable) and **Crowned Eagle** (Vulnerable).

Table 27. Summary of the potential occurrence of bird species within the study area.

Species Name	Status[16]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Secretary bird *(Sagittarius serpentarius)*	VU	The species prefers open grassland and scrub, with the ground cover shorter than 50 cm and with sufficient scattered trees as roost/nest sites. It extends into savannah where sufficiently open areas exist (Boshoff and Allan 1997, Dean and Simmons 2005). It is absent from Mountain Fynbos, forest, dense woodland and very rocky, hilly or mountainous woodland (Boshoff and Allan 1997). It occurs from sea-level to montane grasslands over 2000 m. Nests are large, stick platforms usually built on top of isolated flat-crowned trees, and particularly Vachellia	Within distribution range and habitat requirements partially to largely met	Possible	SABAP2

[16] Key: CR PE – Critically Endangered Possibly Extinct; CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; DD – Data Deficient; ER – Extremely Rare; R – Rare

Species Name	Status[16]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
		(acacias); where indigenous thorny trees are not available, alien pines or wattles may also be used (Tarboton 2011).			
Denham's bustard *(Neotis denhami)*	NT	Widespread in KwaZulu-Natal, where it is found in both upland grasslands and low-lying coastal grasslands of north-eastern Zululand and adjacent Mozambique (Cyrus and Robson 1980).	Within distribution range and habitat largely met.	Possible	SABAP2
Blue crane	NT	Occur in three core areas, including the eastern grasslands, centred in KwaZulu-Natal (McCann et al. 2007).	Within distribution range and habitat requirements partially to largely met	Possible	SABAP2
Grey crowned crane	EN	Occur in three core areas, including the eastern grasslands, centred in KwaZulu-Natal (McCann et al. 2007).	Within distribution range and habitat requirements partially to largely met	Possible	SABAP2
Crowned Eagle (*Stephanoaetus coronatus*)	VU	In southern Africa, it is restricted to Zimbabwe, central Mozambique and eastern South Africa and Swaziland. The species is found mostly in forest, including gallery and riverine forest, but also occurs in woodland and forested gorges in savannah and grassland (Simmons 2005). Crowned Eagles are readily found in plantations of exotic trees. They normally perch for long periods, resting inside the forest canopy, but will sometimes soar high above the canopy.	Within distribution range and habitat requirements partially to largely met.	Possible	SABAP2
Lanner Falcon (*Falco biarmicus*)	VU	It generally favours open grassland, cleared or open woodland and agricultural land. While breeding it is most common around cliffs used as nesting and roost sites, although it may also use buildings, electricity pylons and trees.	Within distribution range, and habitat requirements fully met.	Possible	SABAP2
Southern Bald Ibis (*Geronticus calvis*)	VU	It prefers high rainfall (>700 mm p.a.), sour and alpine grasslands, characterised by an absence of trees and a short, dense grass sward. It also occurs in lightly wooded and relatively arid country. It forages preferentially on recently burned ground, also using unburnt natural grassland, cultivated pastures,	May visit open grassland and there is suitable breeding habitat present.	Possible	SABAP2

Species Name	Status[16]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
		reaped maize fields and ploughed areas. It has a varied diet, mainly consisting of insects and other terrestrial invertebrates. It has high nesting success on safe, undisturbed cliffs.			
White Bellied Korhaan *(Eupodotis senegalensis)*	VU	Restricted to eastern South Africa and adjacent south-western Swaziland (Allan 1997d, Barnes 2000k) Occurs in the upper districts and midlands of KwaZulu-Natal.	Within distribution range and habitat largely met.	Possible	SABAP2
Cape Vulture *(Gyps coprotheres)*	VU	One of the most limited distributions of any Old World vulture species, being restricted to southern Africa and predominantly South Africa and Lesotho (Mundy et al. 1992).	Study area occurs within distribution range/on edge of distribution range, however unlikely to be a lot of large mammalian carcasses available to feed on in the area aside from livestock. Therefore, although the species may occasionally pass through the area it is unlikely to occur with the exception of a few opportunistic scavenging events.	Unlikely	SABAP2
White-backed Vulture (*Gyps africanus*)	CR	In South Africa, it is only absent from two of the nine provinces, i.e. Western Cape and Eastern Cape provinces, and from Lesothohe White-backed Vulture inhabits the woodland regions of southern Africa (Mundy et al. 1992, Mundy 1997). Its feeding and foraging habits are similar to those of the congeneric Cape Vulture and it relies primarily on large mammalian carcasses and feeds communally (Piper 2005). It is reported to very occasionally take live prey, e.g. young Springbok Antidorcas marsupialis and Warthog Phacochoerus aethiopicus (Mundy et al. 1992). This vulture is capable of long-distance movements, as evidenced by ring recoveries (Oatley	Study area occurs within distribution range/on edge of distribution range, however unlikely to be a lot of large mammalian carcasses available to feed on in the area aside from livestock. Therefore, although the species may occasionally pass through the area it is unlikely to occur with the exception of a few	Unlikely	SABAP2

Species Name	Status[16]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
		1998), re-sightings of marked birds (Monadjem et al. 2013) and GPS-GSM tracked birds (Phipps et al. 2013) but is not migratory (Mundy 1997, Piper 2005). Movements can be on a sub-continental scale and GPS-GSM tracked immatures made daily movements up to about 200 km (Phipps et al. 2013). White-backed Vultures typically roost in trees and on pylons (Mundy et al. 1992).	opportunistic scavenging events.		
African marsh-harrier (*Circus ranivorus*)	EN	Inland and coastal wetlands as well as adjacent moist grassland. Breeding demands a stretch of undisturbed long grass with concealed clearings.Within the region, it occurs in high densities in higher rainfall coastal regions from Zululand down to Western Cape, as well as in Mpumalanga, Gauteng, Limpopo and North West provinces (Simmons 2005). It is absent from the drier parts of Northern Cape and inland areas parts of Western Cape.	Within distribution range, however limited wetlands on site that provide suitable habitat, although some intact moist grassland may provide some foraging opportunities for the species.	Possible	SABAP2
African Grass Owl *(Tyto capensis)*	VU	Largely confined to areas of higher rainfall in the eastern half of South Africa.	Within distribution range and habitat largely met.	Possible	EIA Screening Tool

C. Reptiles

All reptile species are sensitive to major habitat alteration and fragmentation. As a result of human presence in the area coupled with disturbance, alterations to the original reptilian fauna are expected to have already occurred and reptiles of conservation concern are therefore less likely be present within the degraded secondary habitat on site. However, there is a possibility that some reptile species may occur within the more intact open savannah/grassland and thicket habitat on site where anthropogenic impacts are limited. One reptile species was assessed as being potentially present on site based on the available habitat and its reported distribution range namely, the Southern African Python (Least Concern – Protected) (Table 2, below).

Table 28. Potential occurrence of reptile species within the study area.

Species Name	Status[17]	Habitat Requirements/Preferences (SANBI, 2021)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Southern African Python (*Python natalensis*)	LC **(protected)**	Variety of habitats but usually in riverine or rocky areas and often in association with large animal burrows.	All vegetation communities provide habitat for this species	Possible	Atlas and Red List of Reptiles of South Africa, Lesothos and Swaziland

D. Amphibians

No frog SCC were identified as potenitally occuring on site**.**

E. Invertebrates

Very few formal surveys of invertebrates have been carried out in the study area. A review of the EIA Screening Tool Report for the site, LepiMap, SpiderMap, ScorpionMap, OdonataMap accessed from http://vmus.adu.org.za/; highlighted seventeen (2) species that could potentially occur in vegetation that is in good ecological condition on site (see Table 29, below).

[17] Key: CR PE – Critically Endangered Possibly Extinct; CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; DD – Data Deficient; ER – Extremely Rare; R – Rare

Table 29. Summary of noteworthy invertebrates that could occur within the study area.

Scientific & Common Name	Type	Status[18]	Habitat	Relevant Onsite Habitat	POC	Source
Lalande's Black-winged Clonia (Clonia lalandei)	Hemiclonia	VU	This species occurs in grassland and savanna biomes but nothing is known about its specific habitats or ecology	Could occur in vegetation.	Possible	EIA Screening Tool
Thukela Agte Snail *Cochlitoma simplex*	Mollusc	DD **(Endemic)**	Steep rocky outcrops in grasslands.	Could occur in rock outcrops.	Possible	KZN SCA

[18] Key: CR PE – Critically Endangered Possibly Extinct; CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; DD – Data Deficient; ER – Extremely Rare; R – Rare

ANNEXURE C: Impact Significance Assessment Summary Tables

Terrestrial Biodiversity Impact Significance Assessment: Construction Phase								
IMPACT SIGNIFICANCE: Realistic Poor Mitigation Scenario								
No.	**Description**	**Status**	**Extent**	**Intensity**	**Duration**	**Probability**	**Significance**	**Confidence**
C1	Impact on vegetation structure and plant species composition	Negative	Regional	Moderate	Permanent	Highly Probable	Moderate	Medium
C2	Impact on populations of species of special concern	Negative	Provincial / National	Moderately-High	Permanent	Highly Probable	High	Medium
C3	Impact on targets for threatened ecosystems	Negative	Provincial / National	Moderate	Permanent	Possible	Moderately-Low	Medium
C4	Impact on ecological processes and functionality of ecosystems	Negative	Local	Moderate	Long-term	Highly Probable	Moderately-Low	Medium
C5	Impact on overall species and ecosystem diversity	Negative	Local	Moderately-Low	Permanent	Highly Probable	Moderately-Low	Medium
C6	Impact on ecological connectivity	Negative	Local	Moderately-Low	Permanent	Probable	Moderately-Low	Medium
IMPACT SIGNIFICANCE: Realistic Good Mitigation Scenario								
No.	**Description**	**Status**	**Extent**	**Intensity**	**Duration**	**Probability**	**Significance**	**Confidence**
C1	Impact on vegetation structure and plant species composition	Negative	Local	Moderate	Long-term	Highly Probable	Moderately-Low	Medium
C2	Impact on populations of species of special concern	Negative	Provincial / National	Moderately-High	Immediate	Probable	Moderately-Low	Medium
C3	Impact on targets for threatened ecosystems	Negative	Provincial / National	Moderate	Permanent	Unlikely	Moderately-Low	Medium
C4	Impact on ecological processes and functionality of ecosystems	Negative	Surrounding Area	Moderate	Long-term	Probable	Moderately-Low	Medium
C5	Impact on overall species and ecosystem diversity	Negative	Surrounding Area	Moderately-Low	Long-term	Probable	Low	Medium
C6	Impact on ecological connectivity	Negative	Surrounding Area	Moderately-Low	Long-term	Highly Probable	Low	Medium

Terrestrial Biodiversity Impact Significance Assessment: Operational Phase								
IMPACT SIGNIFICANCE: Realistic Poor Mitigation Scenario								
No.	**Description**	**Status**	**Extent**	**Intensity**	**Duration**	**Probability**	**Significance**	**Confidence**
O1	Impact on vegetation structure and plant species composition	Negative	Regional	Moderate	Long-term	Highly Probable	Moderate	Medium
O2	Impact on populations of species of special concern	Negative	Provincial / National	Moderate	Long-term	Highly Probable	Moderately-High	Medium
O3	Impact on targets for threatened ecosystems	Negative	Provincial / National	Moderate	Long-term	Probable	Moderate	Medium
O4	Impact on ecological processes and functionality of ecosystems	Negative	Local	Moderately-Low	Long-term	Probable	Moderately-Low	Medium
O5	Impact on overall species and ecosystem diversity	Negative	Local	Moderately-Low	Long-term	Probable	Moderately-Low	Medium
O6	Impact on ecological connectivity	Negative	Local	Moderate	Long-term	Probable	Moderately-Low	Medium
IMPACT SIGNIFICANCE: Realistic Good Mitigation Scenario								
No.	**Description**	**Status**	**Extent**	**Intensity**	**Duration**	**Probability**	**Significance**	**Confidence**
O1	Impact on vegetation structure and plant species composition	Negative	Local	Moderate	Long-term	Probable	Moderately-Low	Medium
O2	Impact on populations of species of special concern	Negative	Provincial / National	Moderate	Long-term	Probable	Moderate	Medium
O3	Impact on targets for threatened ecosystems	Negative	Provincial / National	Moderate	Long-term	Probable	Moderate	Medium
O4	Impact on ecological processes and functionality of ecosystems	Negative	Surrounding Area	Moderately-Low	Long-term	Probable	Low	Medium
O5	Impact on overall species and ecosystem diversity	Negative	Surrounding Area	Moderately-Low	Long-term	Probable	Low	Medium
O6	Impact on ecological connectivity	Negative	Surrounding Area	Moderate	Long-term	Possible	Low	Medium