APPENDIX G: TERRESTRIAL ECOLOGY STUDY

JINDAL MINE

KING CETSHWAYO MUNICIPALITY, KWAZULU-NATAL

Terrestrial Biodiversity Preliminary Impact Assessment Report

Version 5.0

Revision 3

Date: 11th May 2023

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Report No: EP561-02

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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).

Document Title:	**Terrestrial Biodiversity Assessment Report**
Project:	Jindal Iron Ore Mine
Location:	Between Melmoth and Eshowe, within the Mthonjaneni Local Municipality, KwaZulu-Natal
Report No.	561-02
Version No.	5.0
Revision:	Rev 3
Date:	11th May 2023
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Client:	SLR Consulting

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

This report sets out the findings of a **Specialist Terrestrial Biodiversity Assessment** to inform preliminary planning for the proposed Jindal Iron Ore Mine within the Mthonjaneni Local Municipality KwaZulu-Natal. An assessment of the terrestrial vegetation and habitats on the property was undertaken by Eco-Pulse Environmental Consulting Services in April 2021. The main findings of the terrestrial habitat/vegetation baseline assessment have been summarized below.

Vegetation Survey:

Five (5) broad but distinct terrestrial vegetation communities were identified and described for the southern properties (Figure A and B) assessed through a combination of rapid field verification and desktop mapping, including:

- Community 1: Ngongoni Veld/Eastern Valley Bushveld Open Savannah
- Community 2: Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland
- Community 3: Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah
- Community 4: Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland
- Community 5: Secondary Open Savannah/Thicket/Closed Woodland.

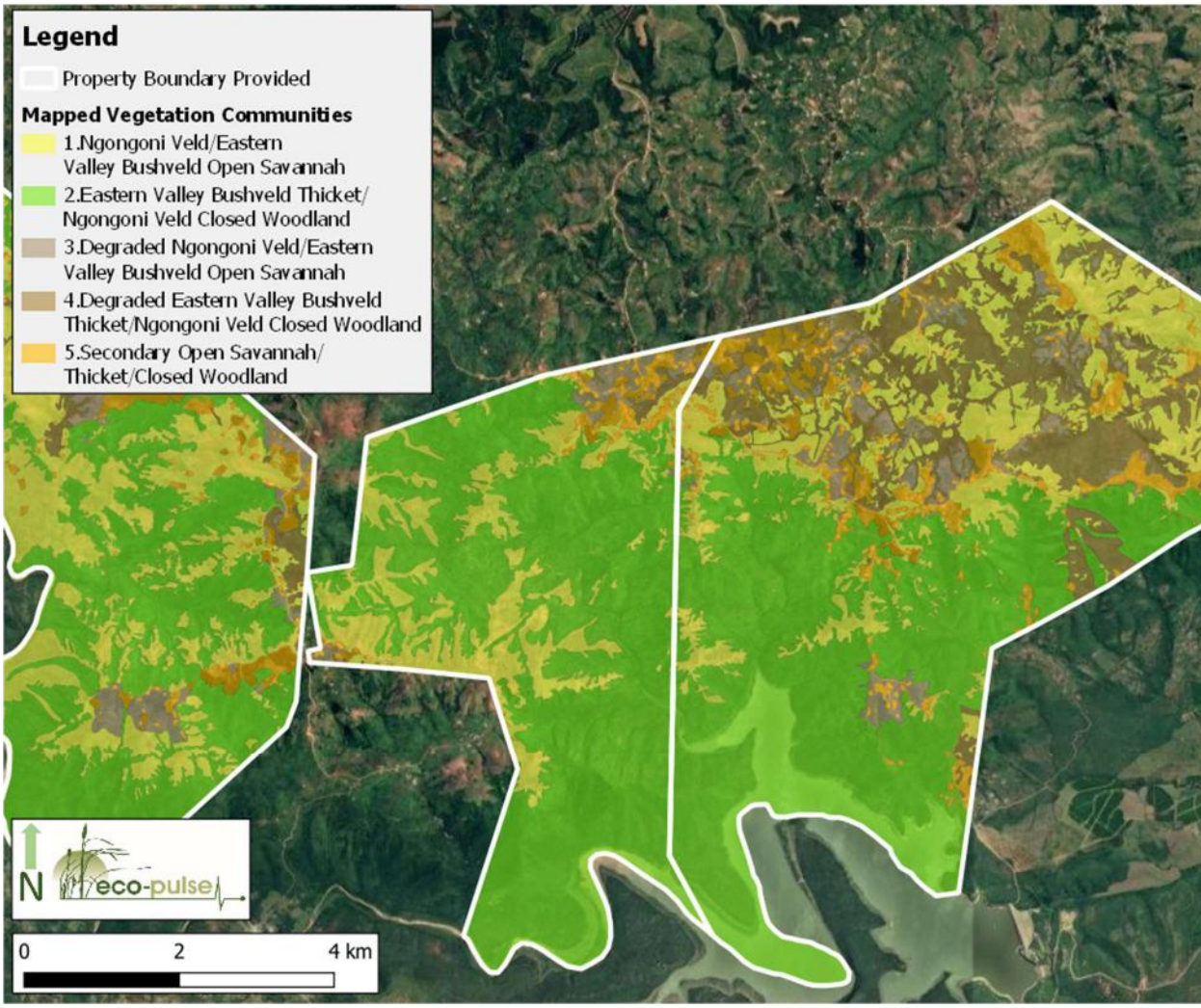

Figure A. Map showing the various terrestrial vegetation communities and habitat types identified within the South-Central ar

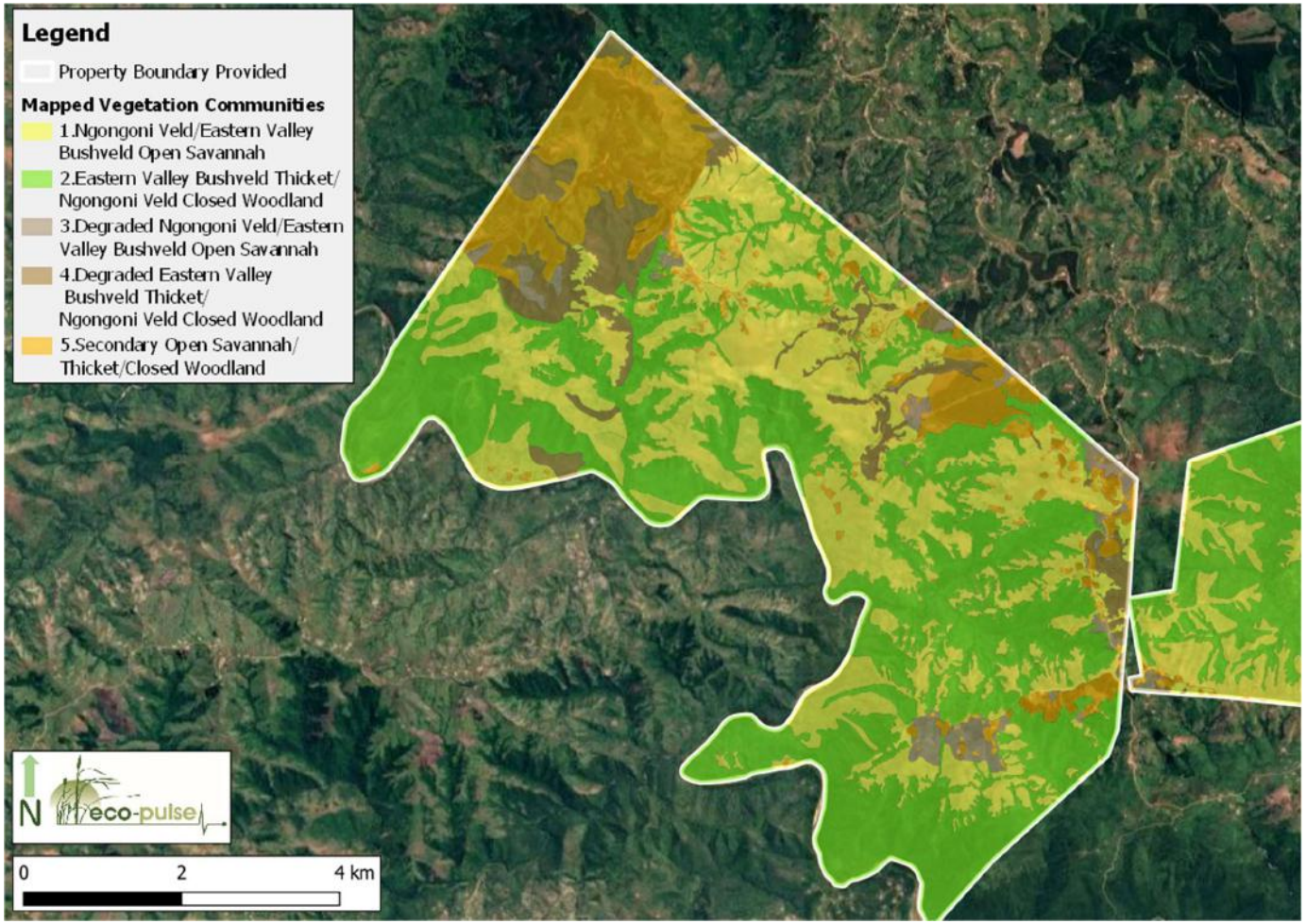

Figure B. Map showing the various terrestrial vegetation communities and habitat types identified within the South-Western Block.

An additional five (5) broad but distinct terrestrial vegetation communities were identified and described for the northern property assessed through desktop mapping of aerial imagery and based on available GIS datasets for national and provincial vegetation types indicated to occur within the property (Figure C), including:

- Community 6: Ngongoni Veld/Northern Zululand Sourveld Open Savannah
- Community 7: Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland
- Community 8: Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket
- Community 9: Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah
- Community 10: Secondary Open Savannah/Thicket/Closed Woodland

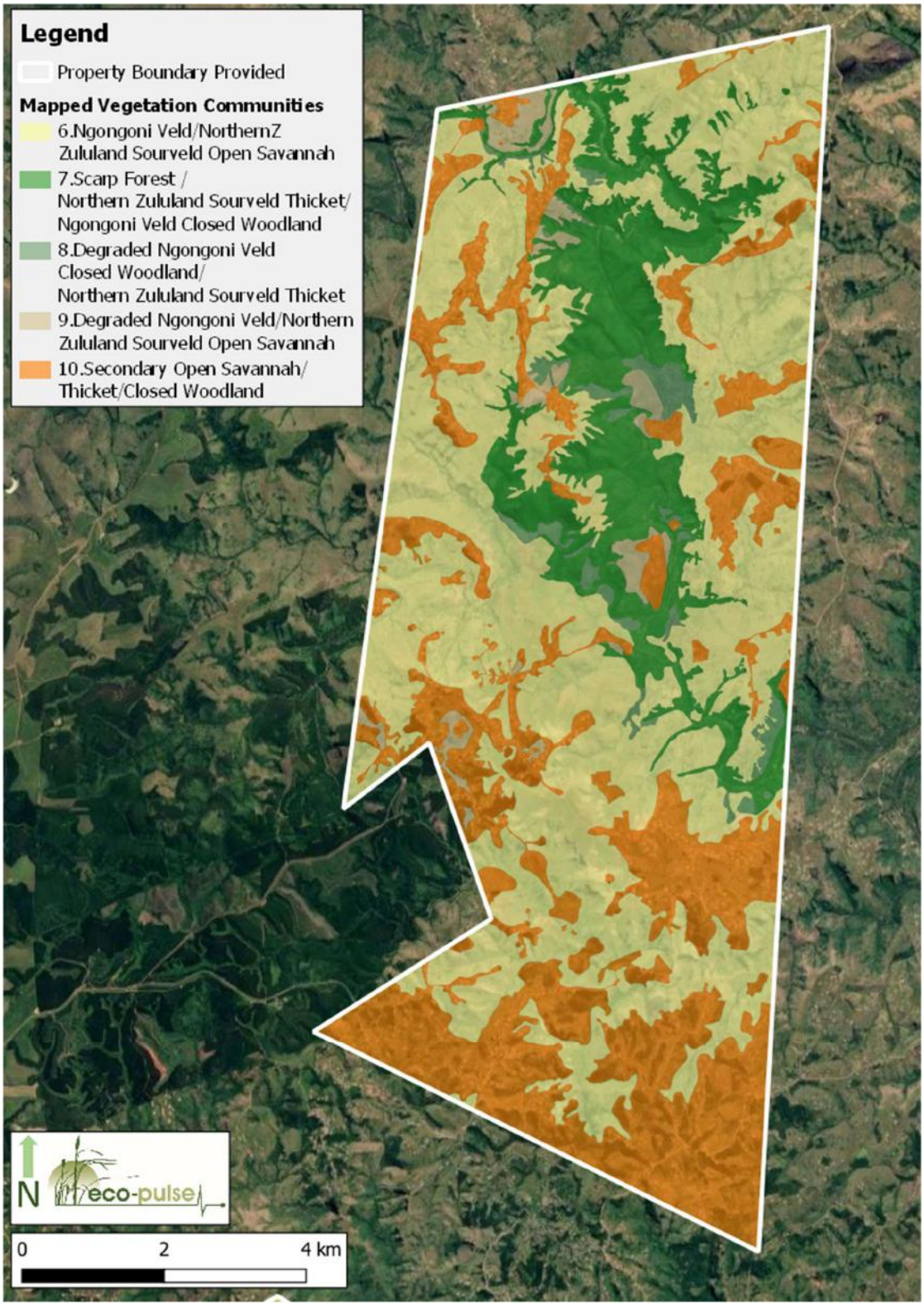

Figure C. Map showing the various terrestrial vegetation communities and habitat types identified within the Northern Block.

Biodiversity Importance Assessment:

Four of the ten vegetation communities mapped are considered to be in fair to natural condition and have a Very High Site Ecological Importance (SEI) rating (Communities 1, 2, 6 & 7). The remaining six vegetation communities on site range in SEI from Medium to Very Low. In addition to being in good to fair ecological condition the four largely intact vegetation communities are highly likely to support several floral Species of Conservation Concern (SCC) that are either red-listed, rare, or endemic.

However, sampling was undertaken at the end of the appropriate seasonal window (April 2021) and it is recommended that **additional in-field sampling during mid-summer is undertaken and an update of the floral component of this report used to better inform the ESIA for the project.**

Following the initial site inspection, two SCC were confirmed to occur within open savannah/grassland vegetation on-site, namely *a vulnerable sensitive plant species* and *Moraea graminicola subsp. graminicola* (Near Threatened, South African Endemic). In addition to the two threatened plant species occurring on site, which are protected under the National Environmental Management: Biodiversity Act, there are a number of plant species that are protected under the Natal Conservation Ordinance and National Forest Act that will also require relevant plant permits from the appropriate competent authorities (i.e., Department of Forestry, Fisheries and the Environment - DFFE - and Ezemvelo KwaZulu-Natal Wildlife).

Several faunal SCC have been flagged as potentially occurring within the study area and therefore **faunal surveys by appropriately qualified specialists for avifauna, mammal, frog, reptile, and invertebrate species will need to be conducted to address any potential impacts associated with the Animal Species Theme (which falls outside the scope of this report).**

Preliminary Impact Assessment

An initial assessment of the impacts of mining infrastructure planned as part of phase 1 on terrestrial biodiversity was assessed. All impacts were rated to have a very high, high or medium level of significance under a poor mitigation scenario given the large scale of the proposed project and the far-ranging impacts it will have on the surrounding region. Under a good mitigation scenario, impact significance ranges between medium and high during the constructional phase, with impact significance reduced to medium ratings for the operational phase and low ratings for the decommissioning phase. The most significant impacts are associated with the initial development of mine infrastructure during the construction phase leading to direct loss of habitat, loss of species of conservation concern and impacts of ecological processes. The risk of erosion and slumping and continued and increasing levels of pollution and alien plant invasion during the decommissioning phase are the most prominent risks during this phase.

Table A. Terrestrial impact significance assessment summary table for the iron ore mining project phases.

Impact Type	Impact Significance Rating	
	'poor' (pre-) mitigation scenario	'good' (post-) mitigation scenario
CONSTRUCTION (MINE DEVELOPMENT) PHASE		
C1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**Very high**	**High**
C1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**High**	**Medium**
C1-1b: Direct impacts to species and threatened species conservation	**High**	**High**
C1-2b: Indirect impacts to species and threatened species conservation	**Medium**	**Medium**
C1-1c: Direct impacts to local and regional ecological processes	**High**	**High**
C1-2c: Indirect impacts to local and regional ecological processes	**Medium**	**Medium**
OPERATIONAL (MINING) PHASE		
O1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**High**	**Medium**
O1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**High**	**Medium**
O1-1b: Direct impacts to species and threatened species conservation	**High**	**Medium**
O1-2b: Indirect impacts to species and threatened species conservation	**Medium**	**Medium**
O1-1c: Direct impacts to local and regional ecological processes	**Medium**	**Medium**
O1-2c: Indirect impacts to local and regional ecological processes	**Medium**	**Medium**
DECOMMISSIONING/CLOSURE (REHABILITATION) PHASE		
D1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**Medium**	**Low**
D1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**Medium**	**Low**
D1-1b: Direct impacts to species and threatened species conservation	**Medium**	**Low**
D1-2b: Indirect impacts to species and threatened species conservation	**Medium**	**Low**
D1-1c: Direct impacts to local and regional ecological processes	**Medium**	**Low**
D1-2c: Indirect impacts to local and regional ecological processes	**Medium**	**Low**

Layout Planning and Impact Mitigation

It is recommended that all the general site management measures outlined in section 6.6 of this report are incorporated into the EMPr for the project. A number of mitigation measures have been recommended but should be refined once any additional supplementary studies (e.g. vegetation assessment, faunal baseline assessments and the geohydrological assessment) has been provided. Likewise, the preliminary impact assessment contained within this report is based primarily on desktop

information and limited infield sampling and has limitations which fall short of the requirements in the latest NEMA Minimum Requirements and Protocol for Specialist Terrestrial Biodiversity Impact Assessment as 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) due to lack of infield faunal sampling and the vegetation survey taking place at the end of the appropriate seasonal window.

Recommended Terrestrial No-Go areas and siting infrastructure recommendations were provided in Section 6.2 and 6.3 of this report to try and avoid and minimise potential impacts in accordance with the first two steps of the mitigation hierarchy. For the purposes of this study however, the assumption has been that the project would be implemented according to the current layout provided by the client, without any refinements. Under this scenario, options to mitigate the loss of Very High SEI are limited and even with onsite rehabilitation will result in **impacts of high significance to terrestrial biodiversity**. **Based on best-practice guidelines, a biodiversity offset would therefore be required to compensate for these impacts should the application be approved (see section 7.7).** Protected plant permits will also need to be obtained from the relevant competent authorities (refer to section 6.4 for further details).

Several gaps in current knowledge and recommendations for supplementary assessments have been made to strengthen the confidence of this assessment and to inform offset planning requirements (see section 7.6). This includes (i) a baseline assessment for faunal SCC flagged at a desktop level, and (ii) a more detailed vegetation survey in the appropriate seasonal window.

Conclusion

The current terrestrial biodiversity impact assessment report sets out the specialist findings for the proposed development. This clearly illustrates the importance of the site for supporting a range of plant and animal species and associated ecological processes. Development will have a significant detrimental impact on biodiversity which has been rated as being of high significance, even under a good (post) mitigation scenario. If approved, compensation would be required to offset the residual impacts both on species of conservation concern and on terrestrial habitats. Such a plan would need to be informed by further supplementary assessments to ensure that impacts can be quantified more accurately and to inform the offset design process.

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LIST OF ACRONYMS

ADU - Animal Demography Unit

AMD - Acid Mine Drainage

BFS - Bankable Feasibility Study

BI - Biodiversity Importance

BIF - Banded Iron Formation

BODATSA - Botanical Database of Southern Africa

CARA - Conservation of Agricultural Resources Act

CBAs - Critical Biodiversity Areas

CI - Conservation Importance

CR -Critically Endangered

CR PE - Critically Endangered, Possibly Extinct

CSIR – Council for Scientific and Industrial Research

DAFF – Department of Agriculture Forestry and Fisheries

DD - Data Deficient

DDD - Data Deficient - Insufficient Information

DDT - Data Deficient - Taxonomically Problematic

DEA - Department of Environmental Affairs

DFFE - Department of Forestry, Fisheries and the Environment

DMRE - Department of Mineral Resources and Energy

DWA – Department of Water Affairs

DWAF - Department of Water Affairs and Forestry

DWS – Department of Water and Sanitation

EA – Environmental Authorisation

EAP - Environmental Assessment Practitioner

ECO - Environmental Control Officer

EDTEA - KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs

EIA - Environmental Impact Assessment

EIS - Ecological Importance and Sensitivity

EKZNW - Ezemvelo KwaZulu-Natal Wildlife

EMPr – Environmental Management Programme

EN - Endangered

EO – Environmental Officer

EOO - Extent of Occurrence

ER – Extremely Rare

ESA - Ecological Support Area.

ESIA - Environmental and Social Impact Assessment

EW - Extinct in the Wild

FI - Functional Integrity

GIS – Geographic Information System

GPS – Geographic Positioning System

HPGR - High Pressure Grinding Roll

IAP - Invasive Alien Plant

IDP - Integrated Development Plan

IUCN - International Union for the Conservation of Nature

KZN - KwaZulu-Natal

KZNBSP – KwaZulu-Natal Terrestrial Biodiversity Sector Plan

LC – Least Concern

MAP - Mean Annual Precipitation

MAR – Mean Annual Runoff

NBA – National Biodiversity Assessment

NE - Not Evaluated

NEMA - National Environmental Management Act

NEMBA - National Environmental Management: Biodiversity Act

NEMPAA - National Environmental Management: Protected Areas Act

NFA - National Forests Act

NFEPA – National Freshwater Ecosystem Priority Area

NPAES - National Protected Area Expansion Strategy

NT - Near Threatened

PAOI – Project Area of Influence

PCD – Pollution Control Dam

POC - Potential Occurrence

POSA - Plants of Southern Africa

PPP - Public Participation Process

PR - Prospecting Right

PRECIS - National Herbarium Pretoria Computerized Information System

R – Rare

RE - Regionally Extinct

ROM – Run of Mine

RR - Receptor Resilience

SABAP – South African Bird Atlas Project

SACNASP – South African Council for Natural Scientific Professions

SAFAP – South African Frog Atlas Project

SANBI – South African National Biodiversity Institute

SANLC - South African National Land-Cover

SANPARKS – South African National Parks

SCAs - Systematic Conservation Assessments

SCC - Species of Conservation Concern

SDF - Spatial Development Framework

SEI - Site Ecological Importance

SWSA – Strategic Water Source Area

TOPS - Threatened or Protected Species

TSF - Tailings Storage Facility

VU -Vulnerable

WRC – Water Research Commission

WRD – Waste Rock Dump

WSA – Water Source Area

WWF-SA – World Wildlife Fund South Africa

WWTP – Waste Water Treatment Plant

WWTW – Waste Water Treatment Works

1 INTRODUCTION

1.1 Project Background and Locality

Jindal Iron Ore (Pty) Ltd (Jindal) holds two Prospecting Rights (PR) within the Mthonjaneni Local Municipality in KwaZulu Natal. The prospecting rights were granted to Jindal by the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (EDTEA) in 2015. The prospecting right areas are referred to as 'North Block' (PR 10644) and 'South Block' (PR 10652). Together these prospecting blocks have an area of approximately 20 170ha. The South Block is located immediately north of Goedertrouw Dam along the Mhlathuze River, approximately 18km north of Eshowe and 17km south of Melmoth (Figure 1). The North Block is located approximately 12km east of Melmoth. The general project area is approximately 60km inland of Richards Bay.

Prospecting in the area by Jindal and other companies has revealed that the prospecting blocks contain Banded Iron Formations (BIF) in the form of magnetite, a magnetically recoverable mineral of high iron content, and as amphibole grunerite, a mineral of low iron content that is not recoverable. For a time, the global iron ore price was not sufficient to make mining feasible for Jindal within the study area. An increase in the iron ore price in 2019-2020 has however encouraged Jindal to pursue the Melmoth Iron Ore Project. Therefore, in January 2021 Jindal appointed SLR Consulting South Africa as the independent Environmental Assessment Practitioner (EAP) to undertake an Environmental and Social Impact Assessment (ESIA) and conduct a Public Participation Process (PPP) for a Mining Right Application (MRA) for the proposed project. Eco-Pulse Environmental Consulting Services (Eco-Pulse) were subsequently appointed by SLR Consulting to conduct a terrestrial ecosystem assessment for the project to inform planning and to meet the requirements for an Application for Environmental Authorisation (EA).

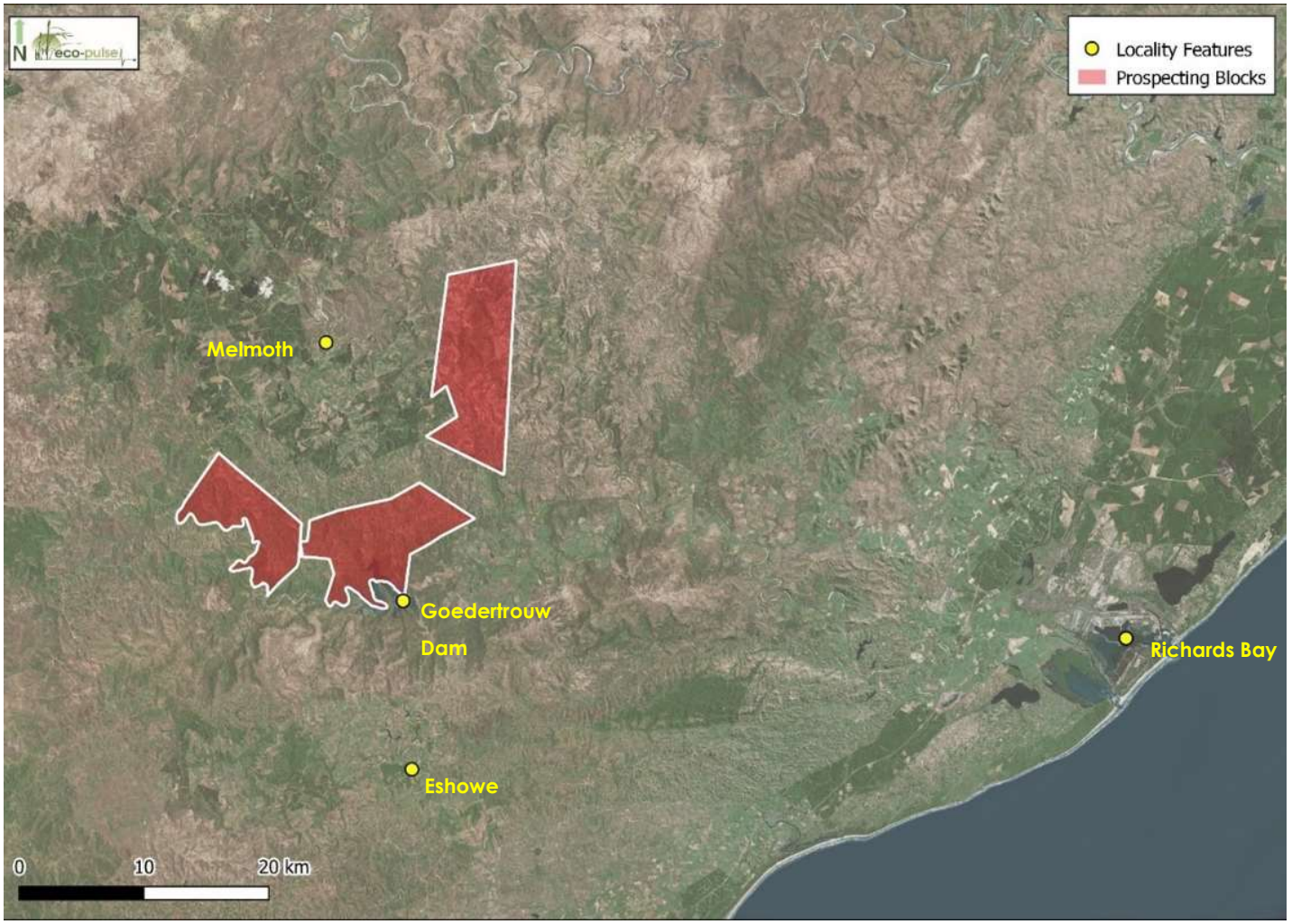

Figure 1. North and South prospecting blocks in relation to key locality feature.

1.2 Project Description

Whilst it is Jindal's intent to consolidate the Prospecting Rights for the North and South Blocks into a single Mining Right, the development of the mine and mining infrastructure is to be undertaken in a phased approach with mining only initially proposed in the south-eastern section of the South Block (Phase 1) (Figure 2). Therefore, while the MRA and ESIA will consider both the North and South Blocks, there will be a specific focus on Phase 1 of the Melmoth Iron Ore Project as described in this section.

1.2.1 Phase 1: Conceptual Design

The current Phase 1 mine plan is conceptual and has been derived from the AMEC Prefeasibility Engineering Study (2015) and the Geothetha (2023) TSF and WRD Design Report. The final scale and location of the Phase 1 mining and mine infrastructure will be determined by the Bankable Feasibility Study (BFS) presently underway, with inputs from this ESIA process. A conceptual description of the project is however outlined below:

An open pit mining operation is proposed to be developed in the south-eastern section of the South Block. Approximately 800 million tonnes of ore are expected to be mined from the pit over its lifetime (estimated to be approximately 25 years) generating approximately 32 million tonnes per annum (mtpa) of iron ore. Waste rock will be stripped from the pit at a ratio of approximately 0.5 tonnes of waste rock per 1 tonne of ore. The waste rock will be disposed of onto a Waste Rock Dump (WRD). This is to be located within the Mining Right Area. Drilling and blasting techniques will be used to excavate the iron ore. The excavated iron ore will be loaded onto trucks and transported to a Run-of-Mine (ROM) ore stockpile area before being transferred to the processing plant for milling and magnetic separation. The processing plant will produce iron ore concentrate and a tailings slurry. The approximately 7.5 mtpa of iron ore concentrate (consisting of 67% Fe) will be transported to the Richards Bay Port via either rail or pipeline (still to be determined). The concentrate will be exported as there are limited local markets. The tailings will be disposed of into a Tailings Storage Facility (TSF) (subject to a separate application process). Associated infrastructure to support the mine will include access and haul roads, electrical transmission lines and sub-stations, raw water abstraction and pipelines, stormwater management infrastructure, tailings pipelines, concentrate pipelines, offices, change house, workshops, and perimeter fencing (amongst others).

Some of the infrastructure required for the mine (e.g., the access road, pipelines and TSF) may be located outside of the Mining Right Area. While the access road and water supply pipelines are part of this application to the Department of Mineral Resources and Energy, certain other infrastructure will be subject to separate application, assessment, and approval processes, as required by the applicable legislation.

Additional detail on the major infrastructure is provided below.

South-East Pit:

The final dimensions of the South-East Pit have not yet been determined and the pit as shown in Figure 2 may end up being 2 or 3 separate pits. The South-East Pit as shown is approximately 4 km long (east to west) and approximately 1km wide (north to south) at its widest point. The final pit dimensions will

be defined in the BFS.

Waste Rock Dump:

WRD are required to accommodate overburden and waste rock excavated as part of the mining process. The WRD will be designed to fit into the existing contours to the extent practical for stability and ultimate closure rehabilitation. The conceptual position is included in Figure 2.

Crushing and Screening:

ROM ore will be transported via haul truck to a semi-mobile in pit primary crusher. Primary crushed ore will be transported from the in pit primary crusher to the ROM stockpile via overland conveyor. ROM ore will be reclaimed from the ROM stockpile for further crushing before being deposited onto the crushed ore stockpile.

Processing Plant:

Ore from the crushed ore stockpile will be fed into the processing plant. The processing plant will be designed to process 32 mtpa of iron ore. Iron ore will be processed using crushing, milling and magnetic separation techniques. The plant will produce wet iron ore concentrate which will be exported. The plant will also produce thickened wet tailings slurry which will be deposited on a TSF as discussed below). The following standard activities are proposed as part of the processing operations:

- Crushing and Screening.
- High Pressure Grinding Roll (HPGR) and ball/pebble milling.
- Magnetic separation and concentrate re-grind.
- Tailing's disposal (separate application process).
- Concentrate Dewatering and Filtration.
- Transport, storage, and shipment.

Water Infrastructure:

The mining operations will require water for the processing plant, dust control, for vehicle wash down and for the change house and office use. The conceptual design is for water to be recycled from the TSF and the concentrate filters, thereby minimising daily water usage. There will be a need for make-up water to replace water losses from seepage, evaporation, and interstitial. It is anticipated that the make-up water would be acquired from the KZN bulk water supply authority. However, a water supply analysis will be undertaken as part of this project, which will determine water demand and where water would come from. Water requirements are likely to reduce as the pit deepens due to the reuse of water that collects within the pit. In addition, water management infrastructure will be required including dirty water dams, pollution control dams and storm water management. The location and design of these will be identified as the Project progresses.

Office Complex:

An office complex is required to accommodate all management, technical, and administration staff for the mine. The office complex will include a car park, canteen, meeting rooms, hall, training complex, security and first aid station. The site will have a dedicated sewerage treatment plant the detail of which is to be considered as part of the BFS.

Workshops:

Engineering and vehicle workshops, tyre shops, wash down areas, garages, fuel depots and explosive magazines will be located at the centre of the activity that the facility services for ease of access. The detail will be considered as part of the BFS.

Access Road:

A conceptual access road has been indicated in Figure 2 (For illustration only at this stage). Further studies will be undertaken during the BFS, and enquiries will be made with landowners about potential route planning, to identify possible access routes for the transport of labour, equipment, and materials to the Phase 1 site during the construction phase and for other activities during the operational, decommissioning and closure phases.

Power Supply:

Existing 400 kV transmission lines owned by Eskom run through the South Block to a point approximately 700m from the envisioned main plant intake substation. The lines are relatively new and have adequate installed capacity for the mine requirements. Connecting distribution lines and a substation will be required for the mining operations. This would likely be adjacent to the processing plant as per Figure 2.

1.2.2 Proposed Activities to be Authorised Separately from the Current MRA

There are several processes and infrastructures that are integral to a mining operation that have not yet been finalised but will be required for the proposed Phase 1 operations and would have to be approved through an EA before any development or mining could take place. These are discussed in this section and conceptually shown in Figure 2.

Tailings Storage Facility and Associated Infrastructure:

The TSF study is currently underway but will be run as a separate ESIA process.

Transport of Concentrate to Richard's Bay for Export:

The final mode of transportation of the concentrate from the processing plant to the Richards Bay Port for export has not yet been finalised and further studies are being undertaken to assess which is the most economically viable, whilst at the same time determining the potential environmental and social impacts associated with each option. The following options are currently being assessed:

- Transport of concentrate by road (approximately 70 km).
- Transport of concentrate by rail (from the nearby Nkwalini rail siding) (approximately 80 km) – a slurry pipeline from the processing plant to the rail siding to be included (approximately 5 km); and
- A slurry pipeline from the processing plant to the Richards Bay Port (approximately 60 km)

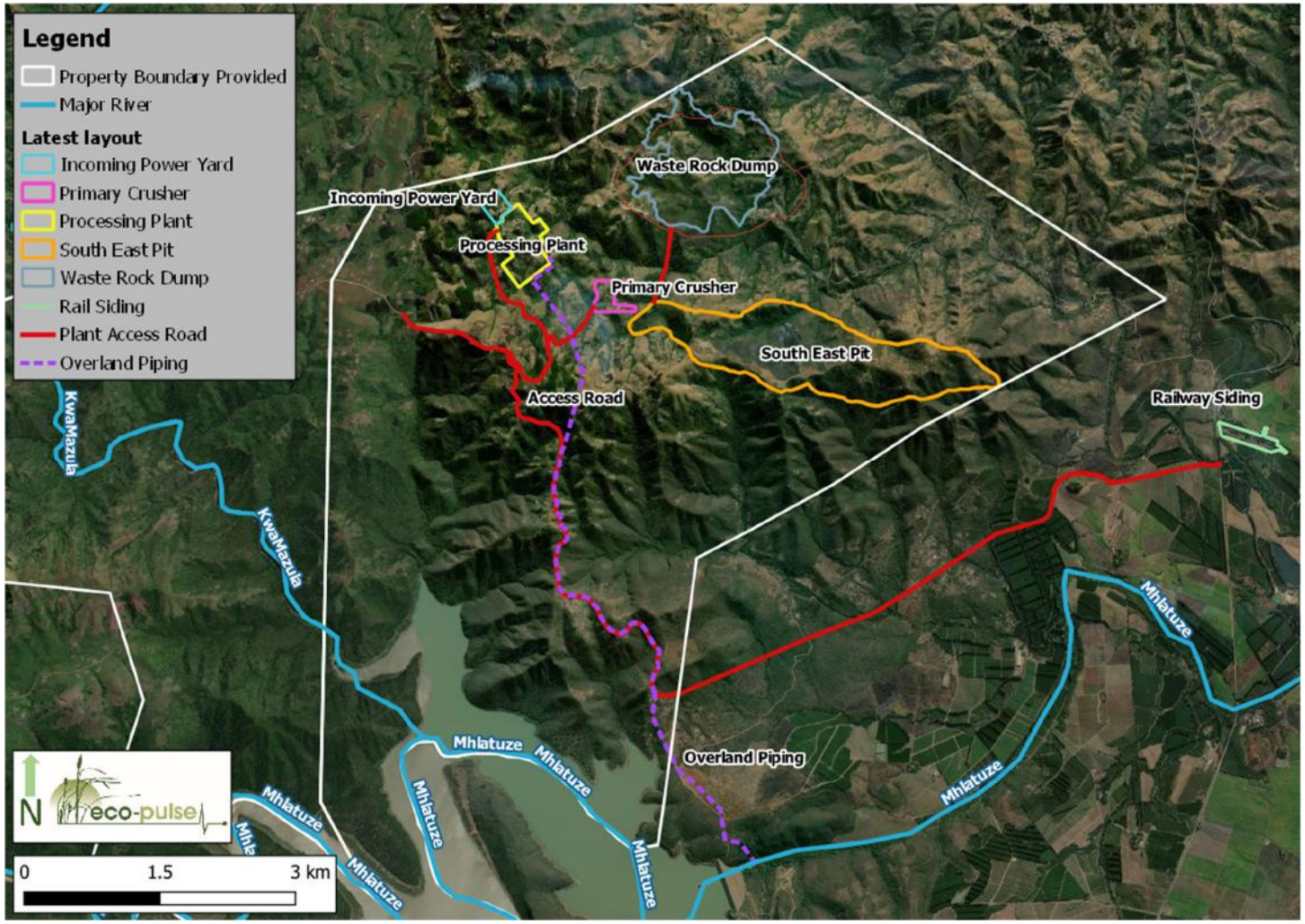

Figure 2. Conceptual site layout map.

1.3 Purpose of the Assessment

The iron ore mining project stands to impact (both directly and indirectly) on terrestrial ecosystems and associated biodiversity. The study was initiated prior to formal species environmental assessment guidelines being finalized. The assessment does however address the Terrestrial Biodiversity and Plant Species Themes and includes an initial desktop assessment relevant to the Animal Species Theme under the new gazetted requirements.

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 rivers and wetlands on the site and downstream, which is covered under the separate 'Freshwater Ecosystems Assessment Report' (Eco-Pulse, 2021).

1.4 Scope of Work

The following scope of work was undertaken by a SACNASP registered specialist (*Pr.Sci.Nat*.) for this assessment:

Phase 1: Baseline Terrestrial Biodiversity Assessment

- Review of any documented and available studies/information for the site and surrounding 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 mapping of all 'untransformed' terrestrial vegetation and habitat within the proposed mining footprint and immediate surrounding areas. For each discrete vegetation unit mapped, the specialist interpretation of colour digital imagery will be undertaken in order to rate:
    - Level of habitat disturbance due to human impact.
    - Structural intactness of the vegetation.
    - Level of naturalness, expressed as the percentage indigenous cover.
- Desktop POC assessment of the floral and faunal 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.

- Prioritisation of terrestrial habitat units mapped to determine focal areas for further detailed site assessment and ground-truthing.
- 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:
    - A field survey of vegetation[1] and habitat along transects across selected untransformed terrestrial (grassland/thicket/forest) 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.)[2],
- 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 the ecological drivers/processes of the system and how development will impact these.
- Description of the ecological functioning and ecological processes (e.g., fire, wildlife migration, etc.) that operate on the site.
- Identification of ecological corridors that the mine would impede including migration and movement of flora and fauna.
- Description of any significant landscape features (including rare or important floral associations).
- A description of the terrestrial biodiversity and ecosystems, including:
    - Main vegetation types[3];

[1] **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.*

[2] **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.

[3] 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).

  - Threatened ecosystems, including Listed Ecosystems and locally important habitat types identified;
  - Ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and
  - Species, distribution of important habitats and movement patterns identified.

- 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 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 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.

Phase 2: Terrestrial Biodiversity Impact Assessment

- Once the design/layout has been revised (if necessary) and finalised, then a formal Impact Assessment using industry accepted methodology will be conducted.
- Identification and reporting on any other permit/licensing requirements that may be relevant to the site (for example protected plant/tree permits/license requirements and translocation plans, etc.).

- Scientific Reporting: Compilation of a single Specialist Terrestrial Biodiversity Impact Assessment Report including all relevant maps and baseline 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, and Terrestrial Plant Species 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 KZN Nature Conservation Ordinance (No. 15 of 1974).

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 were consulted to inform the biophysical and conservation context of the biodiversity onsite. The data type, relevance to the project and source of the information have been provided.

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

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
2009 Colour aerial photography	Desktop mapping of vegetation communities	Surveyor General
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 2018 (GIS Coverage)	Identification of conservation important ecosystems	SANBI (2018)
National Biodiversity Assessment – Threatened Ecosystems 2011 (GIS Coverage)	Identification of conservation important ecosystems	DEA (2011)
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 Desktop prioritisation and screening assessment

Given the large extent of the study area it was not feasible to conduct a detailed baseline assessment across the entire site therefore a desktop prioritisation process was undertaken for the southern block whereby terrestrial habitat was broadly mapped into discrete units to determine focal areas for further detailed site assessment and ground-truthing. The prioritisation process was based on criteria such as accessibility, vegetation threat status, habitat intactness and connectivity, potential to harbour conservation important species flora and fauna, and impact potential based on proximity to the mining activity. This is based on the premise that the significance of impacts would be higher for more ecologically important and sensitive systems and that habitat directly associated with the development would be more significant than that on the periphery of the planned mining impact zone.

The desktop prioritisation process resulted in key field points which were rated from high to low in terms of ground truthing importance, which are represented spatially in Figure 3 and Figure 4 along with broad habitat units that were mapped to inform the field point ratings.

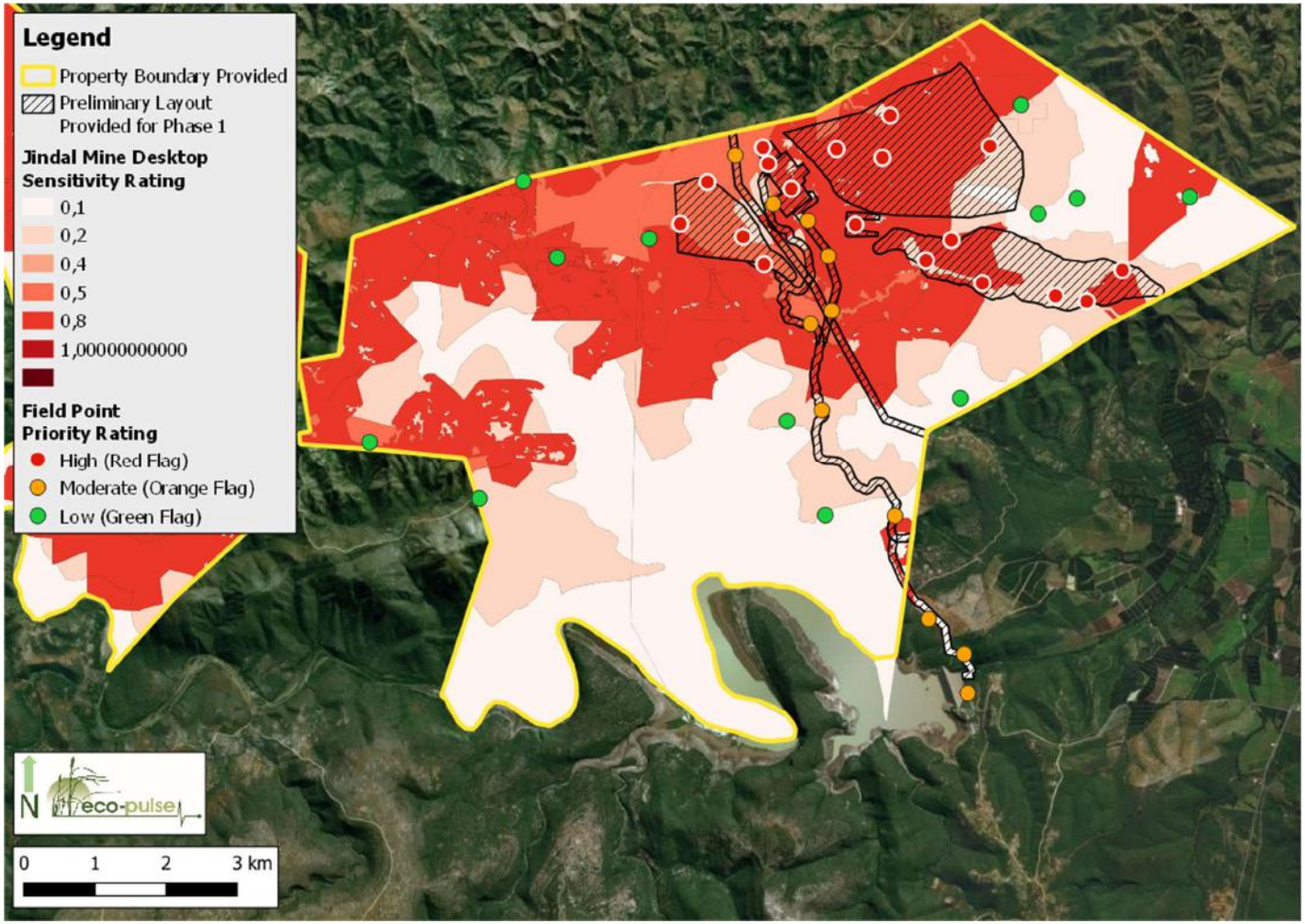

Figure 3. Desktop prioritisation process for the south-east and south-central blocks.

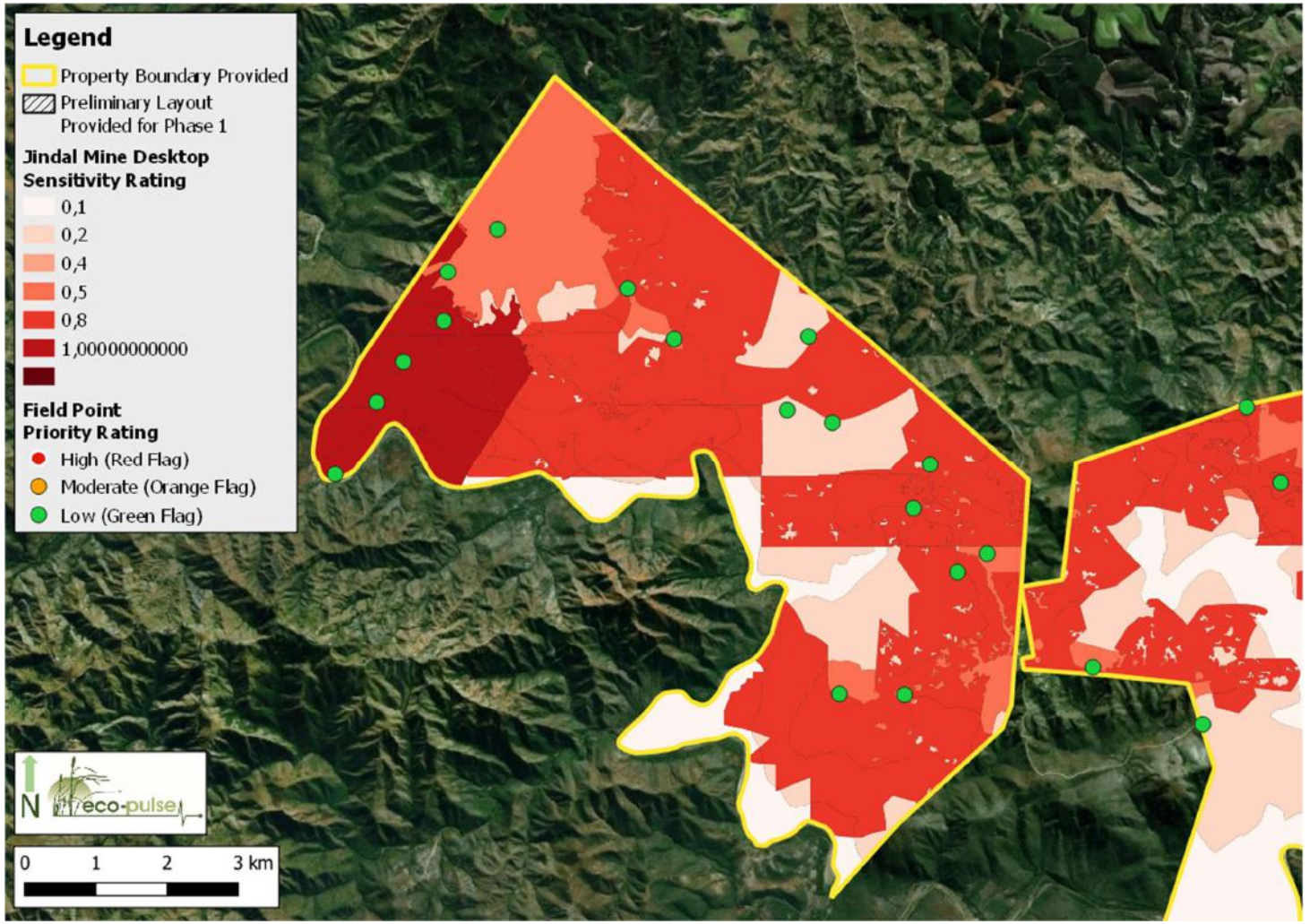

Figure 4. Desktop prioritisation process for the south-western block.

Note: given that phase 1 of the proposed iron ore mine is planned within the southern blocks and that limited time was available to assess a large area the northern block was not visited in the field and all assessments undertaken for this block were only desktop based.

2.1.3 SCC Potential Occurrence (POC) Assessment

The purpose of undertaking the POC 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 5 for an overview of the relevant categories of SCC.

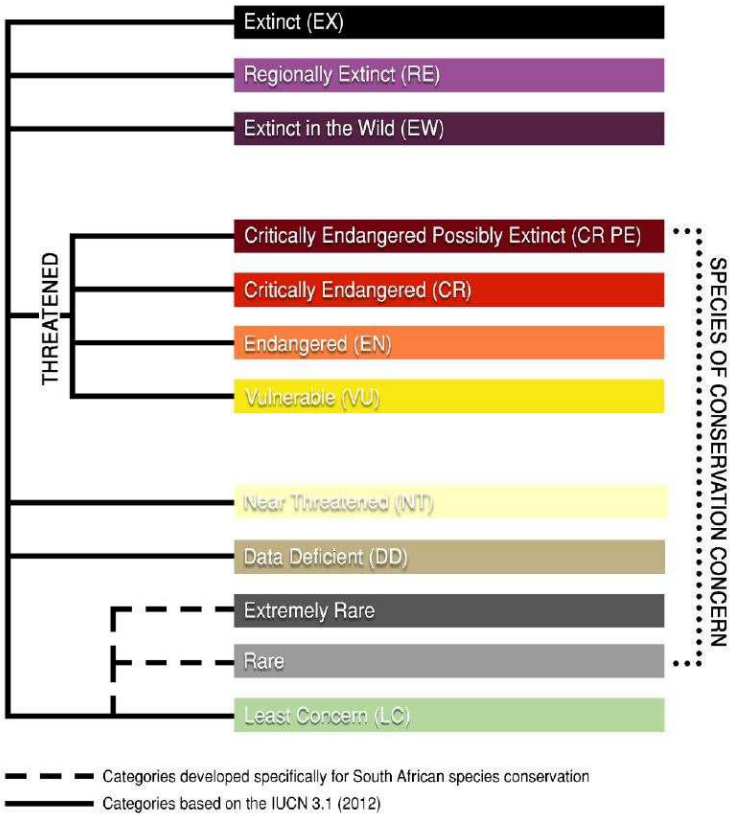

Figure 5. The different categories of SCC modified from the IUCN's extinction risk categories (reproduced in part from IUCN, 2012) - extracted directly from SANBI (2020).

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.
	TH RE AT EN	Critically Endangered,	Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but

Status		Category	Description
		Possibly Extinct (CR PE)	the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered
		Critically Endangered (CR)	A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
		Endangered (EN)	A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
		Vulnerable (VU)	A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
	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[4] ;
- 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).

[4] Note: in the event that a SCC is either not listed in the Screening Tool Report or it erroneously lists a SCC that is 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.

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

The presence/absence of plant species only was then verified during field surveys although it must be noted that no verification was undertaken for faunal SCC. Table 4 below was then used to rate the likelihood of occurrence as either being "Low", "Medium" or "High" or "Confirmed[5]" (if species were observed during fieldwork on site within the development footprint/within the property boundary, they were categorised as confirmed).

Table 4. Likelihood of occurrence rating derived from rationale based 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

[5] 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.

2.2 Baseline Assessment

2.2.1 Vegetation Survey

A field survey was undertaken from the **19th to the 21st of April (mid-autumn)** to collect baseline data and to inform the design and layout of the proposed development as well as the impact assessment. The site visit and field survey entailed undertaking a site walkover within the study area at key locations, 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, forest, 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.
- **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.

Where possible field points rated as low priority during the desktop prioritisation process were also sampled as above; however, due to time constraints some field points of low priority were not sampled with only a photo and GPS point recorded.

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.

Please note that no formal vegetation plots were undertaken, and no formal faunal sampling or searches were undertaken. Faunal features like dens, spoor[6] and skat[7] were recorded where encountered.

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

[7] Skat refers to animal droppings.

2.2.2 Vegetation Mapping and 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 as part of the Secondary Open Savannah/Thicket/Closed Woodland community in both the northern and southern blocks respectively. The following land cover classes were considered to be secondary/transformed and were grouped as part of this vegetation community:

1. Contiguous and Dense Planted Forest
2. Open and Sparse Planted Forest
3. Temporary Unplanted Forest
4. Artificial Dams (incl. canals)
5. Artificial Sewage Ponds
6. Eroded Lands
7. Cultivated Commercial Permanent Orchards
8. Cultivated Commercial Sugarcane Non-Pivot (all other)
9. Commercial Annual Crops Rain-Fed/Dryland/Non-irrigated
10. Subsistence/Small Scale Annual Crops
11. Fallow Land & Old Fields (Trees)
12. Fallow Land & Old Fields (Bush)
13. Fallow Land & Old Fields (Grass)
14. Fallow Land & Old Fields (Bare)
15. Residential Formal (Tree)
16. Residential Formal (Bush)
17. Residential Formal (low veg/grass)
18. Residential Formal (Bare)
19. Residential Informal (Tree)
20. Residential Informal (Bush)
21. Residential Informal (low veg/grass)
22. Residential Informal (Bare)
23. Village Scattered (bare only)
24. Village Dense (bare only)
25. Urban Recreational Fields (Tree)
26. Urban Recreational Fields (Bush)
27. Urban Recreational Fields (Grass)
28. Urban Recreational Fields (Bare)
29. Commercial
30. Industrial
31. Roads and Rail (Major Linear)
32. Mine: Extraction Sites: Open Cast & Quarries combined
33. Fallow Land & Old Field (wetlands)

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 pioneer/ weedy 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 weedy/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 weedy/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	• Natural vegetation composition has been substantially altered

High-level classes	Description	Detailed classes	Description	Indicators
			almost complete loss of composition and structure. All or most ecosystem function has been destroyed and the changes are irreversible.	but some characteristic species remain. • Vegetation consists mainly of introduced, alien and/or weedy/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., SCC, 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[8] of a CR ecosystem type or large area (> 0.1 % of the total ecosystem type extent[9]) of natural habitat of EN ecosystem type • Globally significant populations of congregatory species (>10% of global population)

[8] 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.

[9] 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
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 • 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 process, 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 • 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	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low

	Medium
	Low
	Very Low

High	Medium	Medium	Low	Very Low
Medium	Medium	Low	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. RR 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 RR 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 SLR. This assessment was informed by baseline biodiversity information contained in this report relating to the sensitivity of terrestrial habitats and potential occurrence of protected species as well as information on the proposed development

provided by the client and experience in similar projects in South Africa.

The process begins with a description of the proposed development and associated activities (for the various phases, including construction, operation and decommissioning); 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:	Operational Phase Activities:	Decommissioning Phase Activities:
ENVIRONMENTAL STRESSORS & RISKS		
Construction Phase Stressors & Risks: • E.g. Direct loss of vegetation & habitat	Operational Phase Stressors & Risks: • E.g. Altered runoff patterns and processes	Decommissioning Phase Stressors & Risks: • E.g. Colonisation by alien plants / weeds
TERRESTRIAL BIODIVERSITY IMPACTS		
1	Impact on vegetation structure and plant species composition	
2	Impact on populations of species of conservation concern	
4	Impact on ecological processes and functionality of ecosystems	

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 method used for the assessment of impacts is set out in Table 13. This assessment methodology enables the assessment of environmental impacts including cumulative impacts, the intensity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of

resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

Table 13. SLR ESIA Methodology

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of intensity, spatial extent and duration**
Criteria for ranking of the INTENSITY of environmental impacts	**VH**	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**VL**	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	VH	Very long, permanent, +20 years (Irreversible. Beyond closure)
Criteria for ranking the EXTENT of impacts	**VL**	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART B: DETERMINING CONSEQUENCE							
INTENSITY = VL							
DURATION	Very long	VH	Low	Low	Medium	Medium	High
	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High

VL	L	M	H	VH
A part of the site/ property	Whole site	Beyond the site, affecting neighbours	Extending far beyond site but localised	Regional/ National
EXTENT				

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Low	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VVH
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Insignificant	Inconsequential, not requiring any consideration.

***VH = very high, H = high, M= medium, L= low and VL= very low and + denotes a positive impact.**

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 dated July 2021 compiled by Eco-Pulse (Report No. EP561-01).
- The location of floral SCC was recorded using a Garmin Monterra™ Global Positioning System (GPS). GPS accuracy was limited to 3 – 5m.
- The field assessment was undertaken in mid-autumn (April 2021) and outside of the recommended sampling season (October to December) for the summer rainfall region 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). As such, further fieldwork is required to obtain a more robust understanding of the occurrence and distribution of floral SCC on the site.
- Large portions of the study area comprise steep topography often covered in dense thicket vegetation, some of which is practically impenetrable and as a result accessibility across large areas was an issue, this along with the fact that very few areas were ground-truthed relative to the large size of the study area (~20 000 ha in total) increase the likelihood that red listed species or other SCC on site were under-sampled and under-represented during the site visit.
- In light of the two points above additional fieldwork would be required to sample the entire northern block and further ascertain the condition of vegetation located within the southern blocks and the presence of additional red-listed species during appropriately timed seasonal sampling (refer to Figure 6 and Figure 7 for an indication of sampling intensity during the current rapid field verification assessment undertaken for the southern blocks).

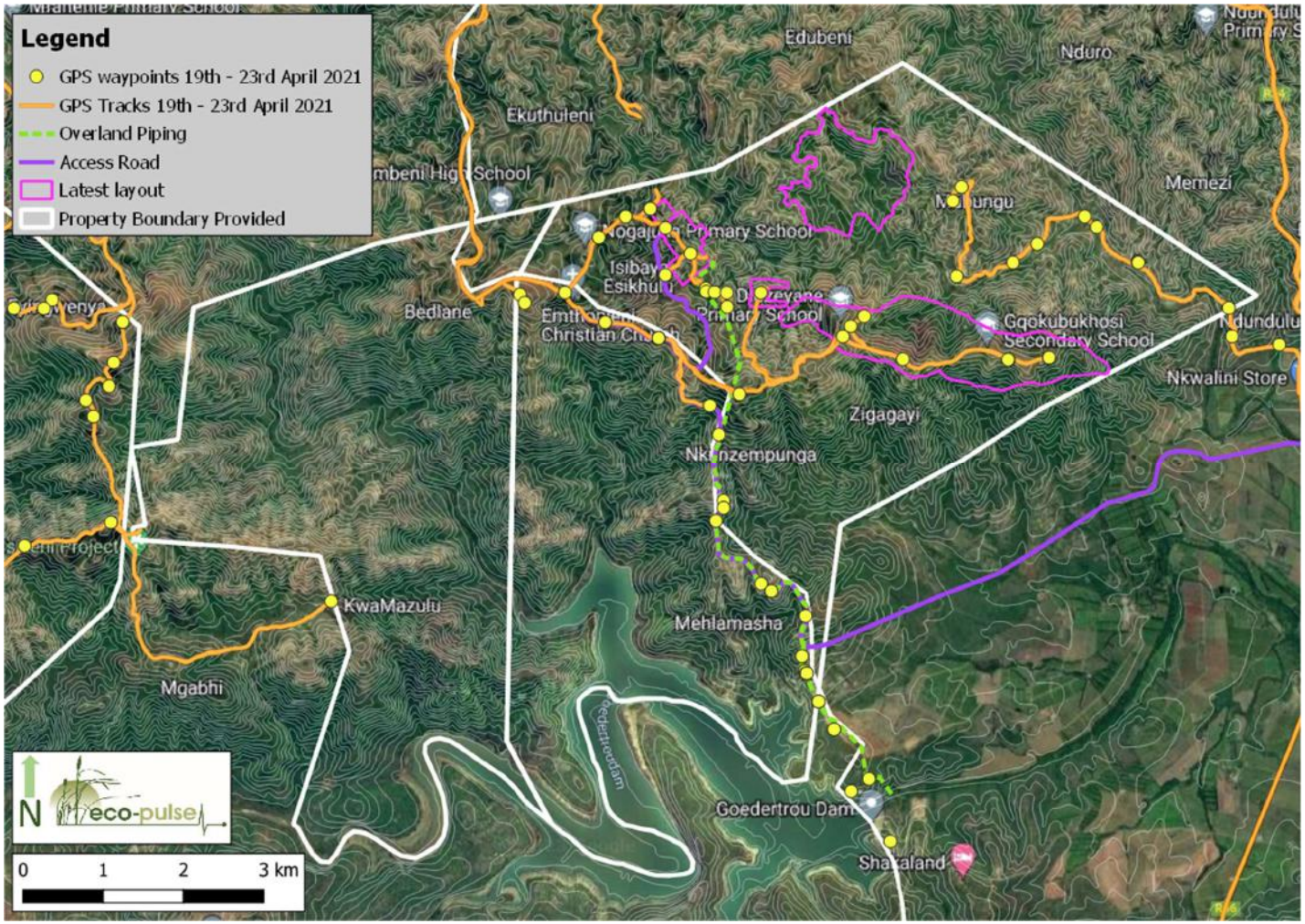

Figure 6. Map showing the extent of sampling in April 2021 in the south-eastern and south-central blocks.

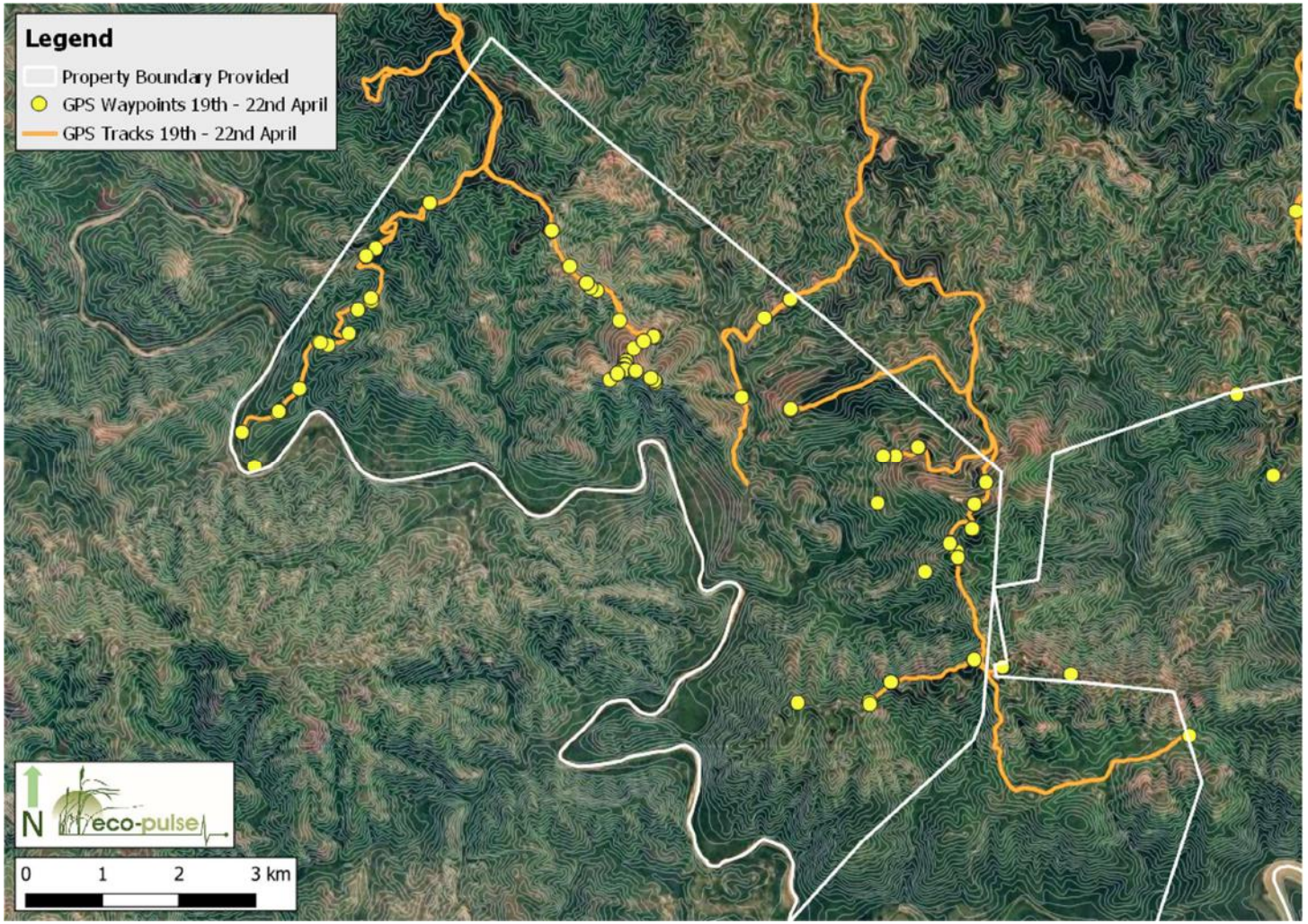

Figure 7. Map showing the extent of sampling in April 2021 in the south-western block.

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, which will need to be revised following further sampling. For example, ***there is a possibility that the secondary and degraded vegetation considered to be of medium to very low importance in the current assessment could be updated to be mapped as primary open savannah/grassland and thicket/closed woodland or scarp forest of high to very high SEI.***

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 ESIA.
- 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 ESIA 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 not available. As such, the impact assessment was based on the best available spatial layout information for the project which includes the location of the south-east pit, primary crusher, processing plant, incoming power yard, WRD, overland piping for bulkwater (raw) supply and raw water pump to the processing plant, conceptual plant access road, conceptual railway line.
- 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 but, because the development planning process was still in its early stages, limited details of such infrastructure were available at the time of this study.
- 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 with similar mining projects.
- The impact assessment was only undertaken for a single development scenario 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 included in the Environmental Management Programme (EMPr).
- All direct loss in extent associated with the footprint provided was assessed as part of the construction phase only.
- Accidental direct loss in extent impacts outside the mining footprint provided were assessed as part of the operational phase and the decommissioning phase.
- Permanent loss calculations presented under Impact (C1-1a) and further indicated in Section 7.7 'Terrestrial Biodiversity Offset Considerations' are based on the direct footprint for non-linear infrastructure and a 20m servitude for linear infrastructure (i.e. roads). When more detail is available regarding the width of roads planned, the permanent loss in extent calculations will need to be revised based on this more accurate and updated information, particularly in the event this project progresses further in terms of the planning process and offset investigations are pursued. Secondary/indirect impacts and disturbances are not accounted for in the direct loss calculations.
- At the time of this impact assessment, no faunal baseline assessment had been undertaken for the study area, only a very rapid desktop based potential occurrence assessment. In addition, the vegetation assessment undertaken, was conducted at the end of the appropriate seasonal window and therefore some threatened plant species are likely to have been overlooked and large portions of the study area are steep and inaccessible. As such the Site Ecological Importance assessment followed the guidance prescriptively and was based largely on available desktop information and mapping. Therefore impact significance ratings should be considered preliminary and may need to

be revised following completion of a faunal baseline assessment and an additional vegetation assessment.

- At the time of this impact assessment the geo-hydrological report for the project was still in the process of being compiled and therefore significance ratings assigned to indirect impacts should be considered preliminary until the geo-hydrological report is reviewed in order to inform the assessment of acid mine drainage and decant risks.
- Cumulative impacts were assessed at a very high level and coarse resolution and these significance ratings should be considered of low confidence.

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 Defining the Study Area

For the purposes of the terrestrial biodiversity assessment, the study area for which all conservation datasets and desktop information was interrogated comprised of the property on which proposed activities will take place (refer to Figure 1).

3.2 Biophysical Setting and Context

A summary of key biophysical setting details for the study area and catchment area is presented in Table 14 below.

Table 14. Key biophysical setting details of the study area.

Biophysical Aspects	Desktop Biophysical Details	Source
Elevation	230 – 760m a.m.s.l. (above mean sea level)	Google Earth™
Mean annual precipitation (MAP)	600 – 700m (North Eastern Uplands 14.05) or 700 – 1000mm (North Eastern Uplands 14.06)	DWA, 2005
Rainfall seasonality	Summer	DWAF, 2007
Geology	Most of the Southern Properties are underlain by Potassic Gneiss Granite and to a lesser extent by Metavolcanic rocks (mainly komatiitic basalt and andesite with some minor chert) of the Nondweni Group with a shift in the geology along the southern edge of the property to Schist, sunordinate amphibolite, quartzite and iron formation of the Mfongosi Group which transitions to Amphibolite, schist, metapelite, quartzite and marble of the Tugela Group. Most of the Northern Property is underlain by feldspathic and micaceous sandstone with subordinate quartz arenite, mudrock, granulestone and conglomerate with a band of by Potassic Gneiss Granite running through the centre of the Northern Property.	RSA 1:1000 0000 Geological Map (SA Geological Society)
Quaternary catchment	W12B & W12D	DWS
Main collecting river(s) in the catchment	KwaMazula and the Mhlatuze Rivers	NFEPA Rivers (CSIR, 2011)

Biophysical Aspects	Desktop Biophysical Details	Source
Strategic Water Resource Area	Parts of the study area form part of the Pondoland Coast SWSA (Category 2) and other portions form part of the Zululand Coast SWSA (Category 3)	NFEPA: SWSA (CSIR, 2011)
Ecoregion	14.05 & 14.06 (North-Eastern Uplands)	DWA, 2005

3.3 Desktop Review of Existing Conservation Datasets

A desktop review of available and/or relevant national, provincial and municipal conservation datasets was undertaken to inform the contextual analysis of the receiving terrestrial environment in the area of study.

3.3.1 National Conservation Datasets

A. National Threatened Ecosystems

A national process has been undertaken to identify and list threatened ecosystems that are currently under threat of being transformed by other land uses. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (National Environmental Management: Biodiversity Act or NEMBA: National list of ecosystems that are threatened and in need of protection, December 2011). The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems (SANBI, 2011). The NEMBA provides for listing of threatened or protected ecosystems, in one of four categories: CR, EN, VU or Protected. There are four key considerations that need to be taken into account for listed ecosystems:

- There are planning related implications which are linked to the requirement in the Biodiversity Act (Act 10 of 2004) for listed ecosystems to be taken into account in municipal Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs).
- The presence of listed ecosystems has environmental authorisation implications in terms of NEMA and the EIA regulations.
- Listed ecosystems need to be proactively managed as stipulated in the National Biodiversity Act.
- There are also monitoring, and reporting requirements associated with listed ecosystems in terms of the Biodiversity Act.

According to the Threatened Ecosystem coverage for the country, which was interrogated, most of the project area is classified as **Ngongoni Veld** (Vulnerable), with the remainder of the area classified as **Eastern Valley Bushveld** (Least Threatened), **Northern Zululand Sourveld** (Least Threatened) and **Scarp Forest** (Least Threatened). Only **Ngongoni Veld** (Vulnerable) is considered a listed ecosystem and is represented on Figure 8 and Figure 9 below.

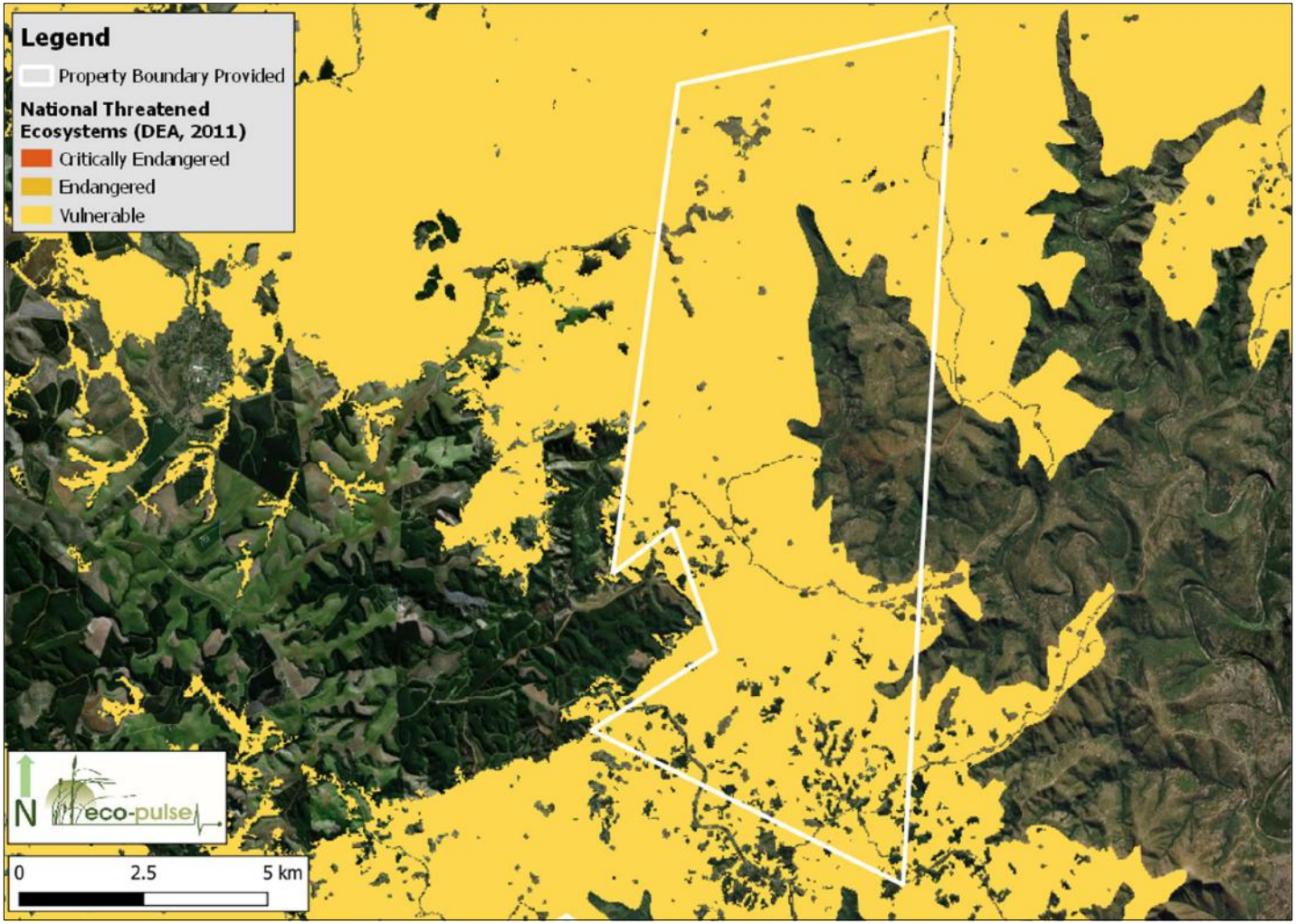

Figure 8. Map showing the location and extent of national threatened ecosystem types (remaining extent) in the northern block.

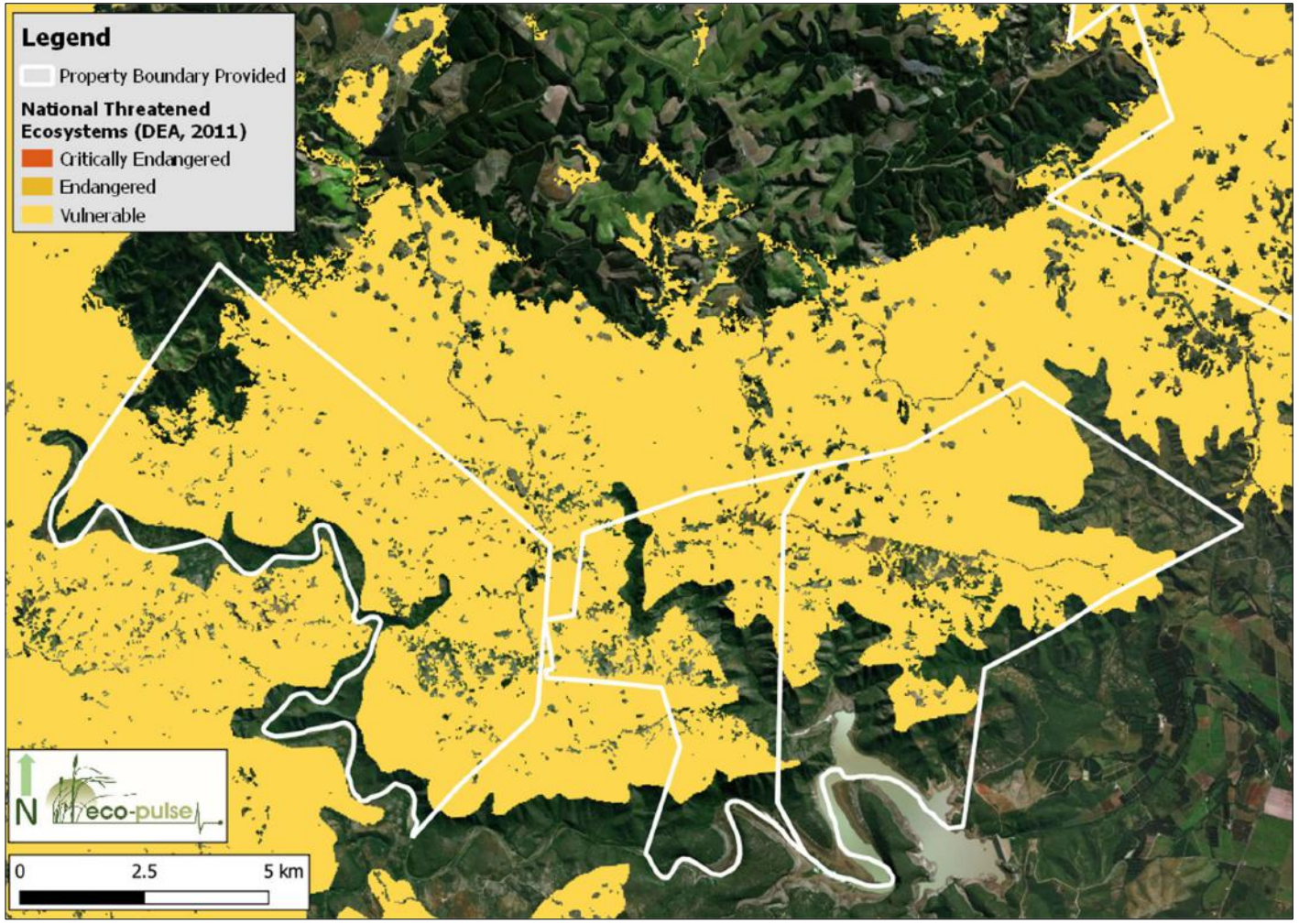

Figure 9. Map showing the location and extent of national threatened ecosystem types (remaining extent) in the southern blocks.

B. National Vegetation Map

The outputs of the National Vegetation Map undertaken as part of the latest National Biodiversity Assessment (SANBI, 2018) were used to inform the contextualisation of the study area and vegetation types occurring on the farm (Figure 10 and Figure 11). Five vegetation types have been mapped at the broad national level as:

- Eastern Valley Bushveld (Least Threatened and Not Protected)
- Moist Coast Hinterland Grassland – Formerly Moist Ngongoni Veld (Vulnerable and Not Protected)
- Dry Coast Hinterland Grassland – Formerly Dry Ngongoni Veld (Vulnerable and Not Protected)
- Northern Zululand Sourveld (Least Threatened and Poorly Protected)
- Scarp Forest (Least Threatened and Moderately Protected)

The maps in Figure 12, Figure 13 and Figure 14 show the remaining extent (remnants) of the national vegetation types according to the National Biodiversity Assessment (SANBI, 2018), which factors in transformed landcover classes. This reveals that although large portions of the northern block and smaller fragments in the southern block have been affected by land transformation there are still significant contiguous areas of all five vegetation types that remain intact.

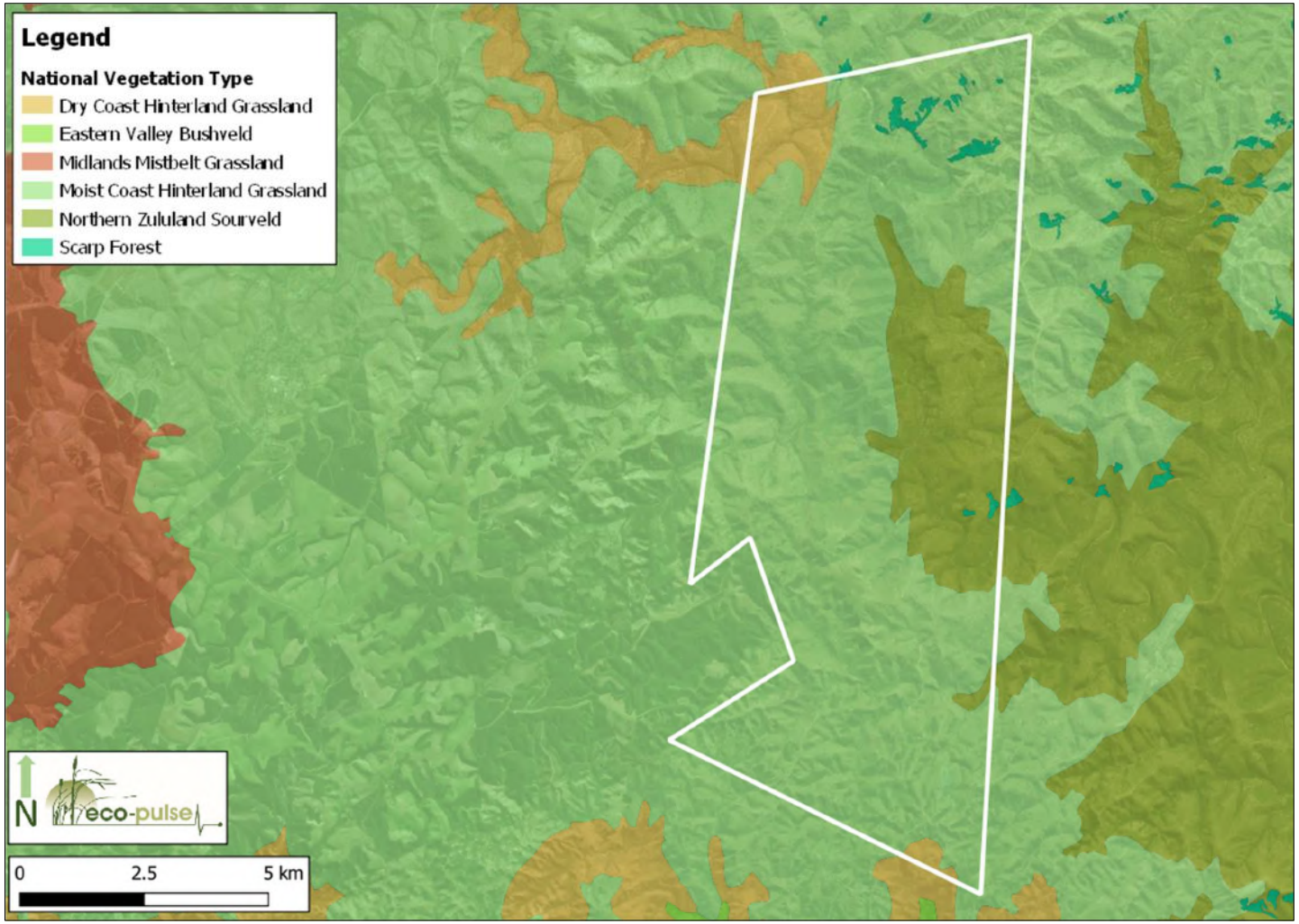

Figure 10. Map showing the location and extent of national vegetation types in the northern block.

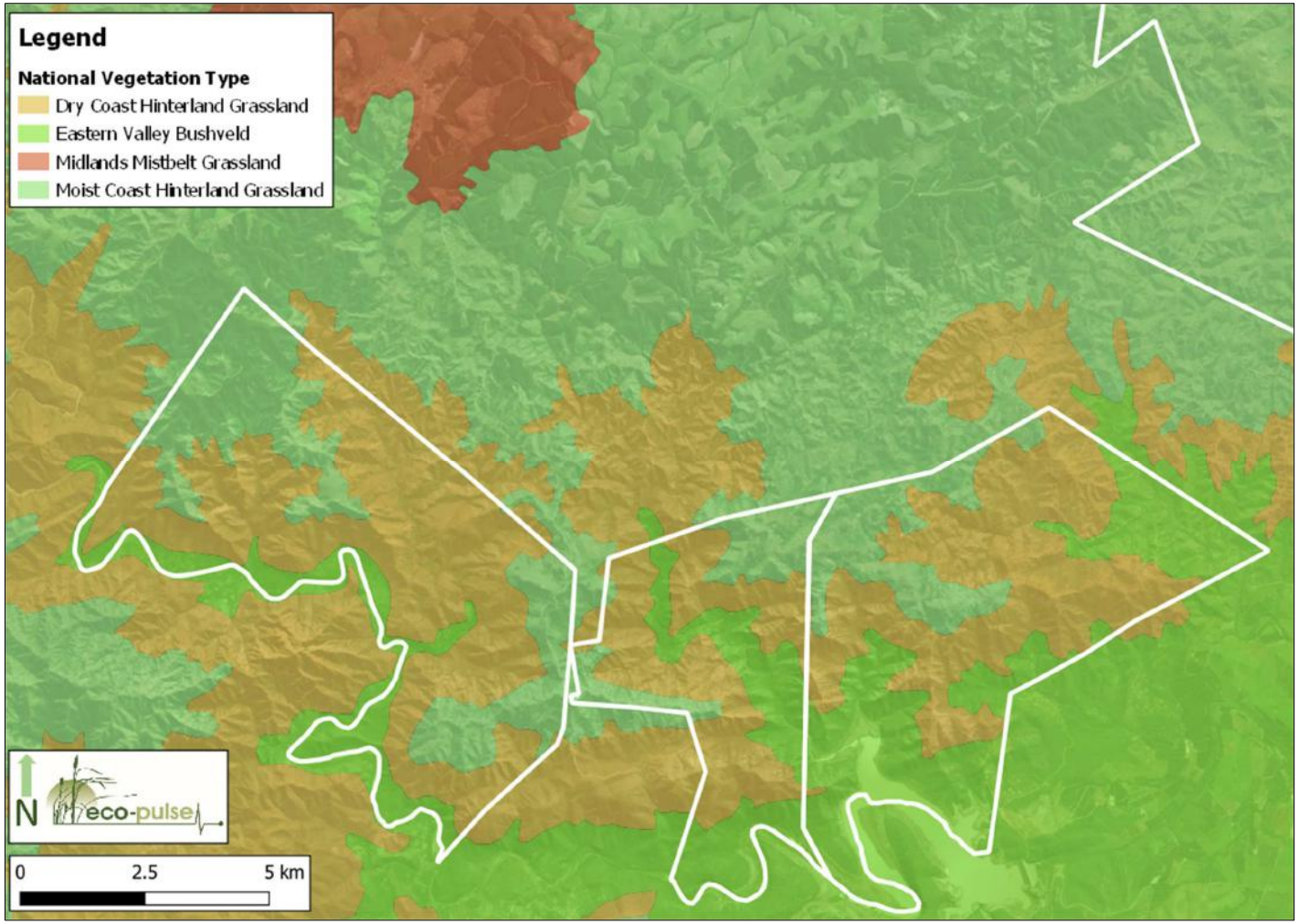

Figure 11. Map showing the location and extent of national vegetation types in the southern blocks.

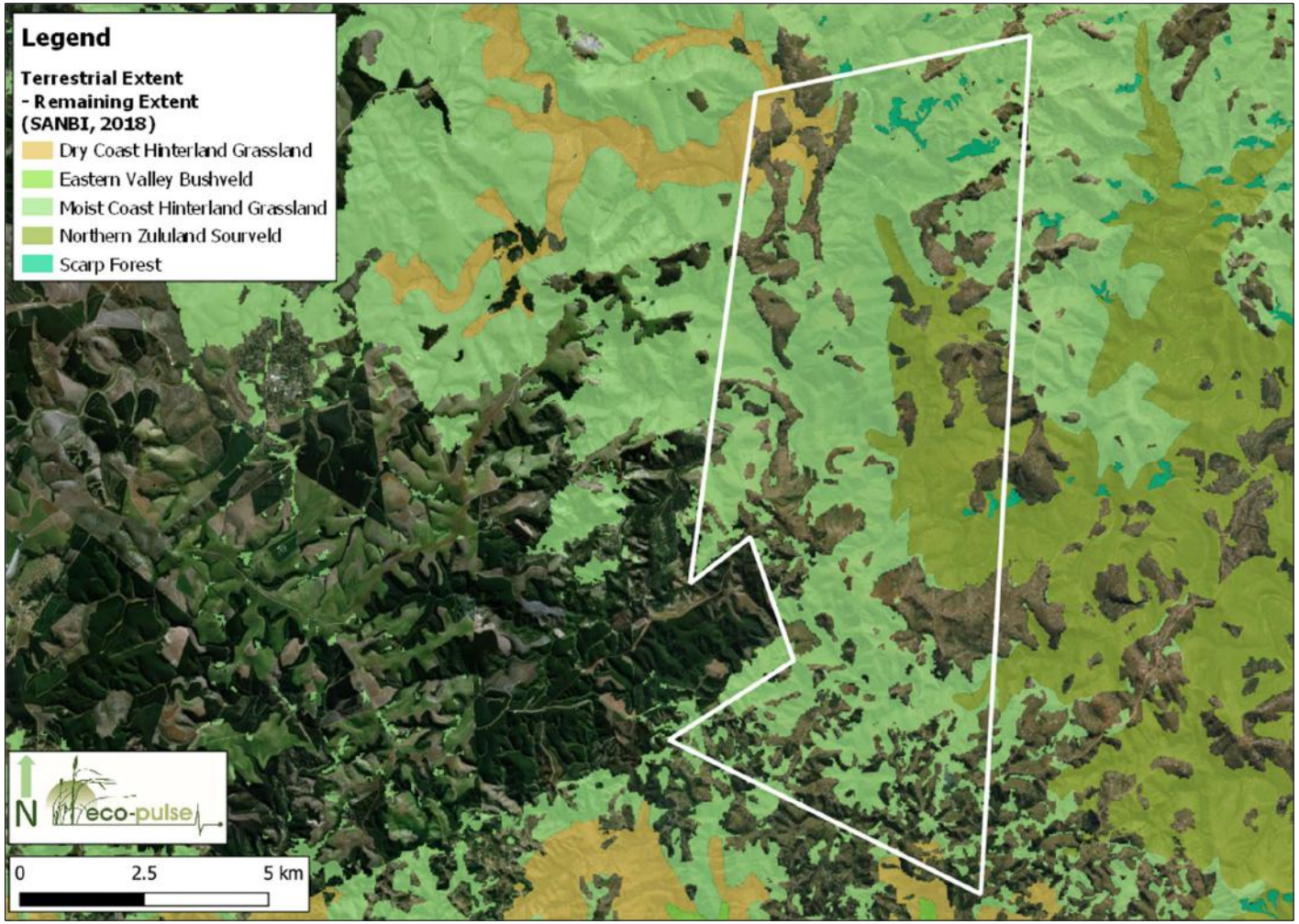

Figure 12. Map showing the location and remaining extent of national vegetation types in the northern block.

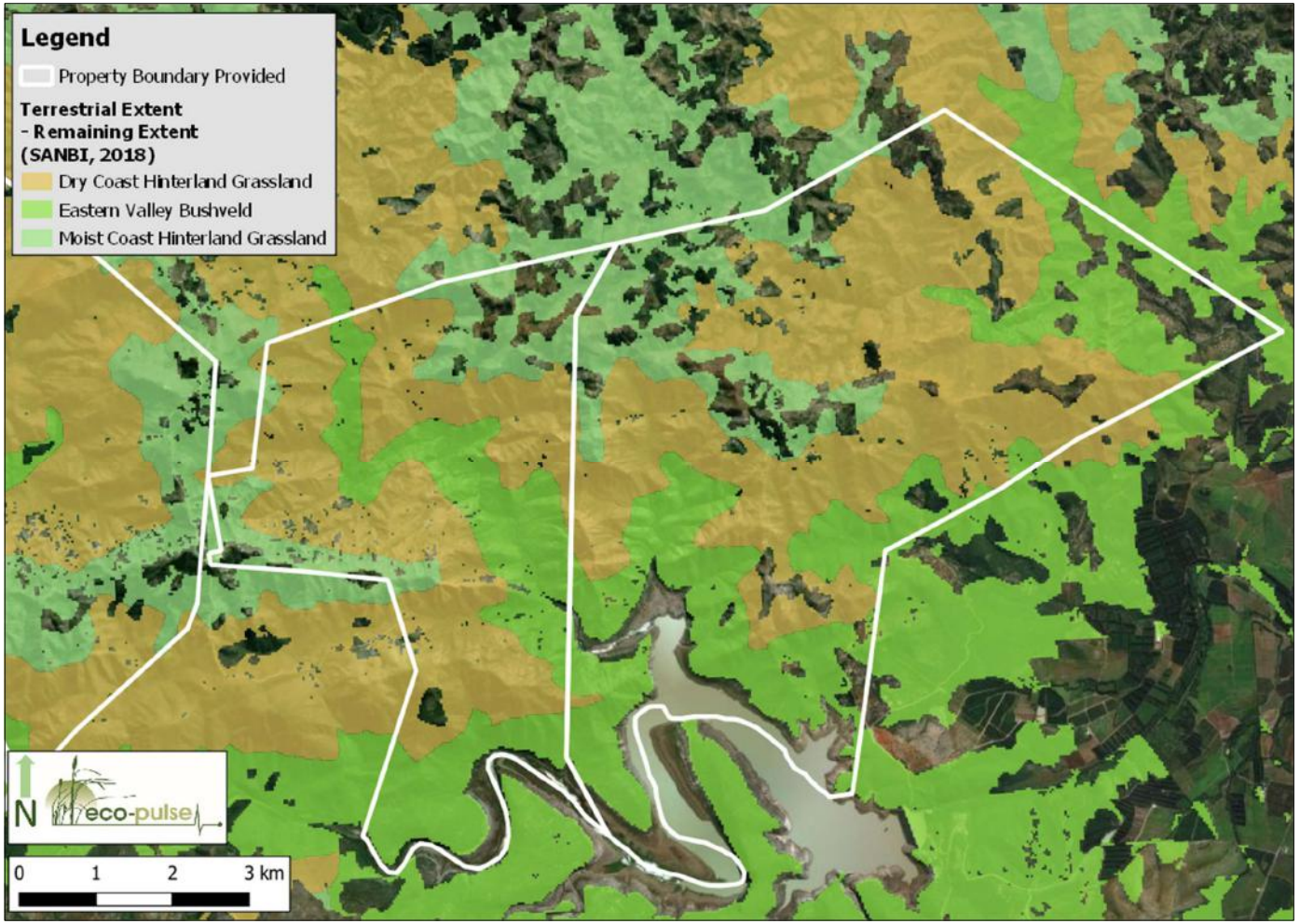

Figure 13. Map showing the location and remaining extent of national vegetation types in the south-eastern and south-central blocks.

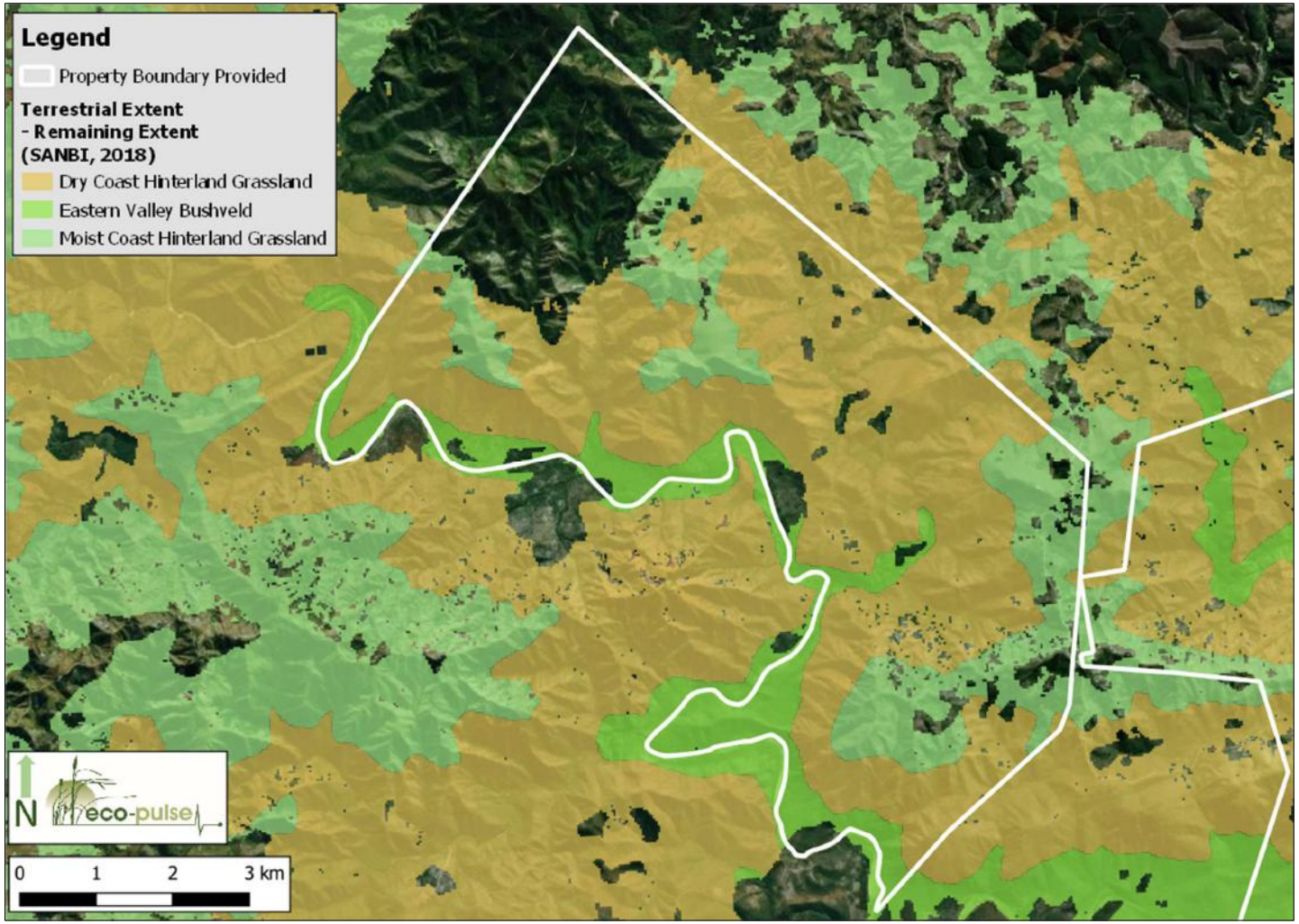

Figure 14. Map showing the location and remaining extent of national vegetation types in the south-western block.

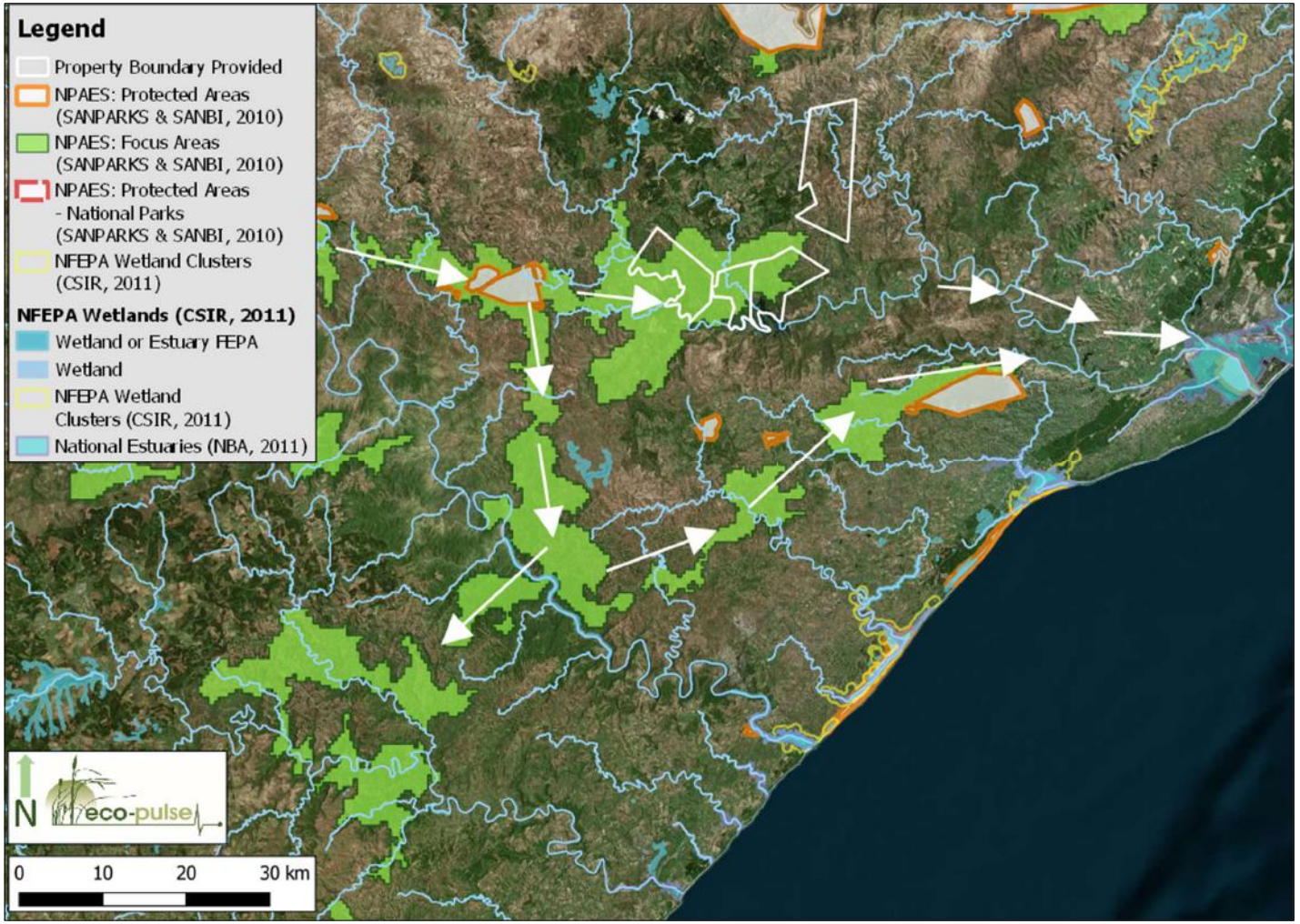

Figure 15. Map showing the location and extent of the NPAES and National PAs in relation to the proposed development.

C. National Protected Areas and National Protected Area Expansion Strategy (SANBI, 2010)

According to the NPAES (National Protected Area Expansion Strategy) (SANBI, 2010) spatial outputs, there are no national protected areas found within the study area. However, most of the southern block has been flagged for future formal protection (Figure 15) as part of the NPAES and appears to provide a critical linkage between a number of protected areas and forms part of an important ecological corridor.

D. Water Source Areas (WRC, WWF-SA & CSIR, 2017)

Water Source Areas (WSAs) have historically been defined using the criterion of the production of relatively large volumes of runoff which sustain lowland areas downstream. The National Freshwater Priority Areas (NFEPA) study applied this broad concept and identified sub-quaternary catchments with relatively high mean annual runoff as high-water yield areas, as well as identifying high groundwater recharge areas. This work was then taken further in a study by WWF-SA and CSIR which identified 21 Strategic WSAs for surface water (SWSA-sw) which covered 8% of South Africa and supplied 50% of the mean annual runoff. This dataset has now been archived and replaced by a new dataset produced by a Water Research Commission funded study which identified water source areas for both ground and surface water resources and involved extensive stakeholder inputs. Strategic Water Source Areas (SWSAs) are now defined as areas of land that either: (a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b). They include transboundary Water Source Areas that extend into Lesotho and Swaziland.

Surface water SWSAs

The 2018 national and transboundary surface-water SWSAs (refer to the map that follows – Figure 16) cover about 124 075 km^2 (10% of the region) and provide a MAR of 24 954 million m^3 (50% of the total MAR).

Groundwater SWSAs

The newly defined groundwater SWSAs cover around 9% of the land surface of South Africa (see Figure 16). They account for up to 42% of the river baseflow generated by these water source areas and have a key role in sustaining surface water flows during the dry season.

Their protection and importance

Only 11% of these areas receive some form of formal protection. There is a need to look closely at development plans in these areas to ensure we maintain and increase the benefits they provide. The study by WWF-SA and CSIR has shown that the water produced by these areas supports at least 50% of the population, 64% of the economy, and supplies about 70% of the water used by irrigated agriculture. Gauteng gets about 65% of its water from these areas, and Cape Town and eThekwini about 98%. About 24% of the settlements reliant on groundwater are located within groundwater SWSAs, which is equivalent

to 10% of all settlements in South Africa. These SWSAs supply about 46% of the groundwater used by agriculture and 47% of the groundwater used for industrial purposes in South Africa.

Most of the southern blocks of the proposed mining development form part of the Zululand Coast Surface Water Subnational Water Source Area which is an important area for water supply at a subnational scale.

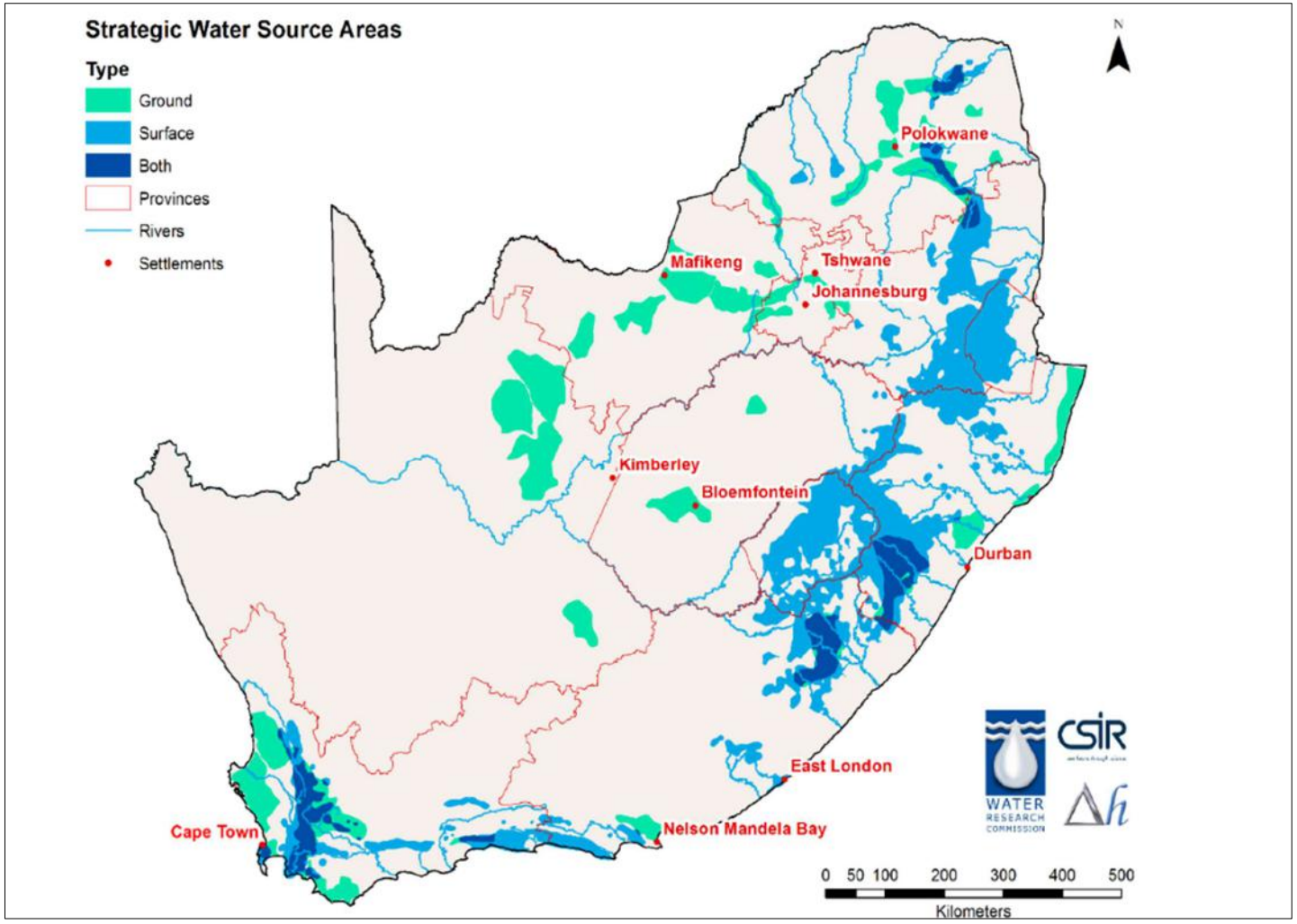

Figure 16. Map showing the location and extent of SWSAs at a national level.

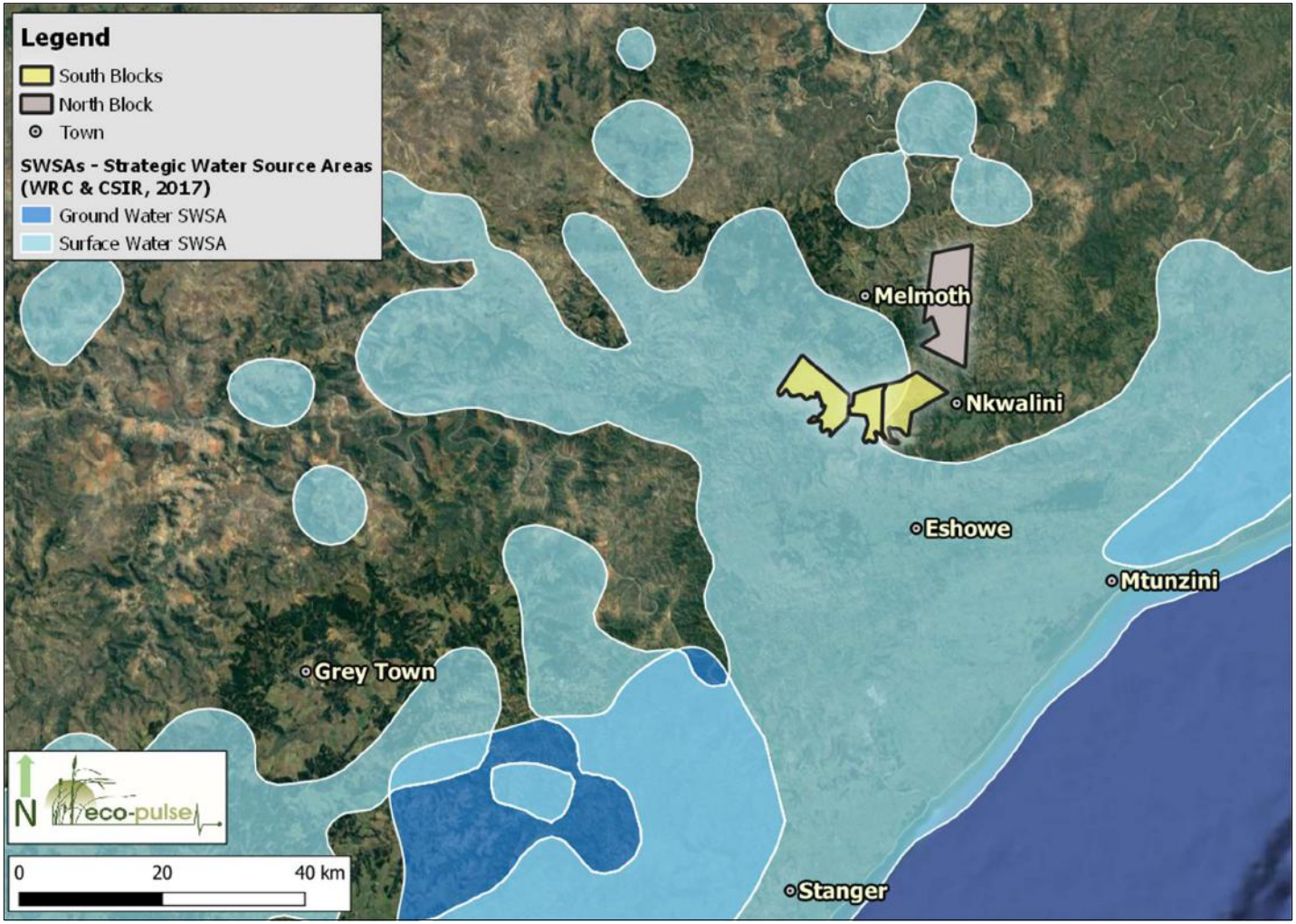

Figure 17. Map showing the location and extent of SWSAs in relation to the proposed development.

3.3.2 Provincial Conservation Datasets

A. Provincial vegetation types and threat status

Table 15 below and Figure 18, Figure 19 and Figure 20 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). Alluvial Wetlands: Temperate Alluvial Vegetation are considered Critically Endangered yet cover a small percentage of the study area, Moist Coast Hinterland Grassland is considered Endangered and Dry Coast Hinterland Grassland is considered Vulnerable, covering just 9 268,42 ha and 6 372,44 ha of the study area respectively. The other three vegetation types encountered on site are considered Least Threatened at the provincial level and cover the remaining ~3 994ha of the study area, with Eastern Valley Bushveld considered the third most represented vegetation type in the study area at just under 3 117,62 ha.

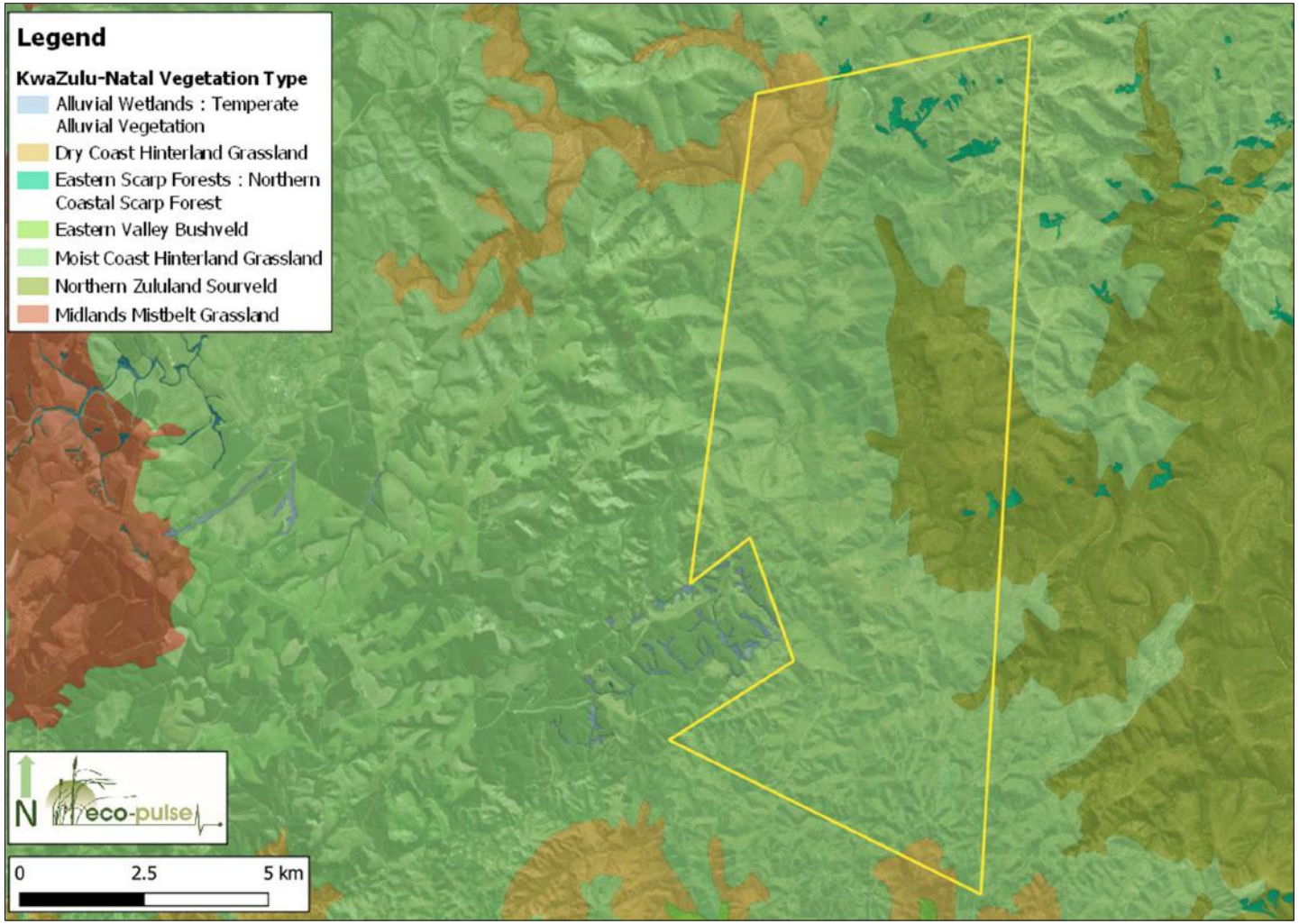

Figure 18. Map showing the location and extent of provincial vegetation types within the northern block.

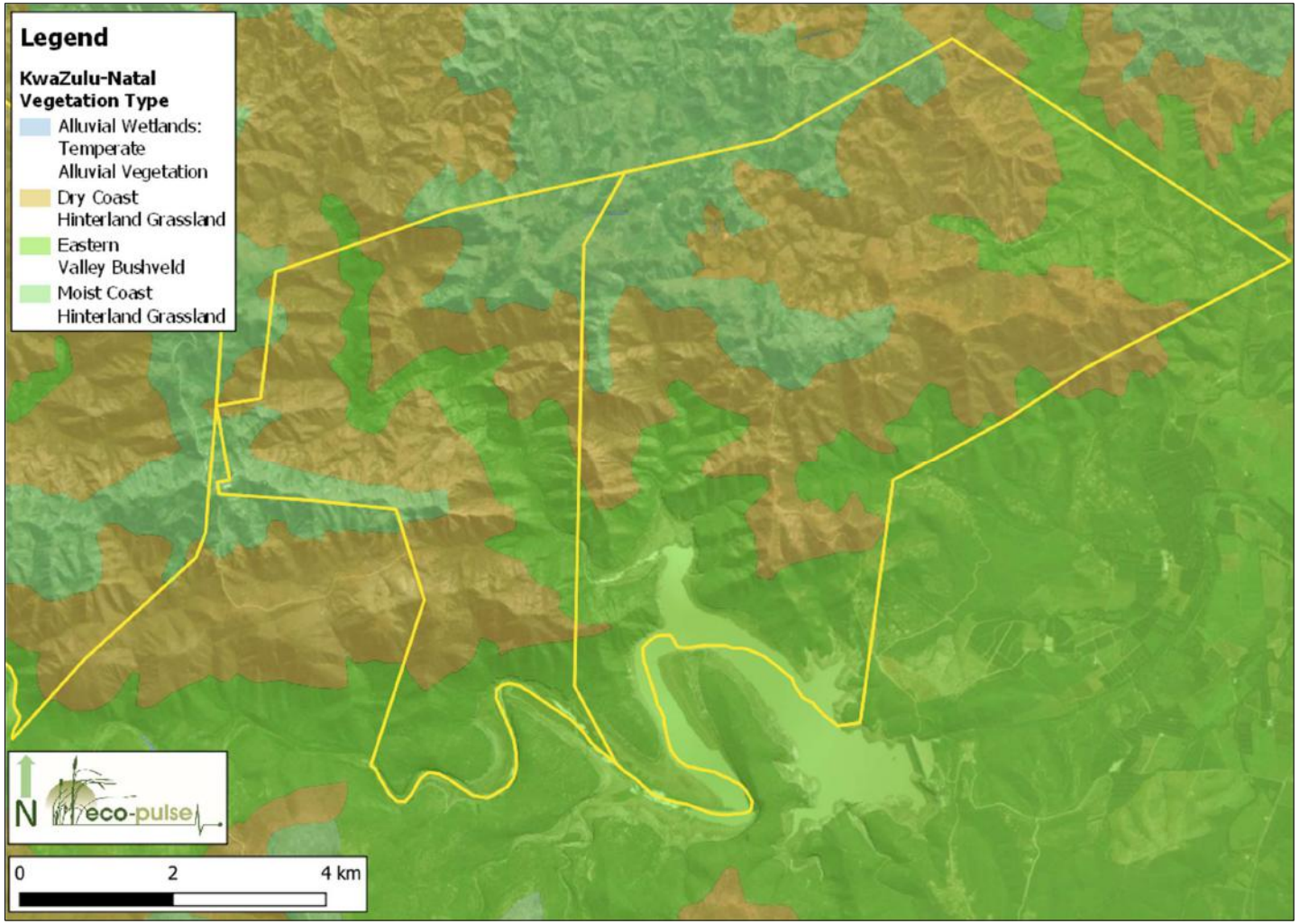

Figure 19. Map showing the location and extent of provincial vegetation types within the south-eastern and central southern block.

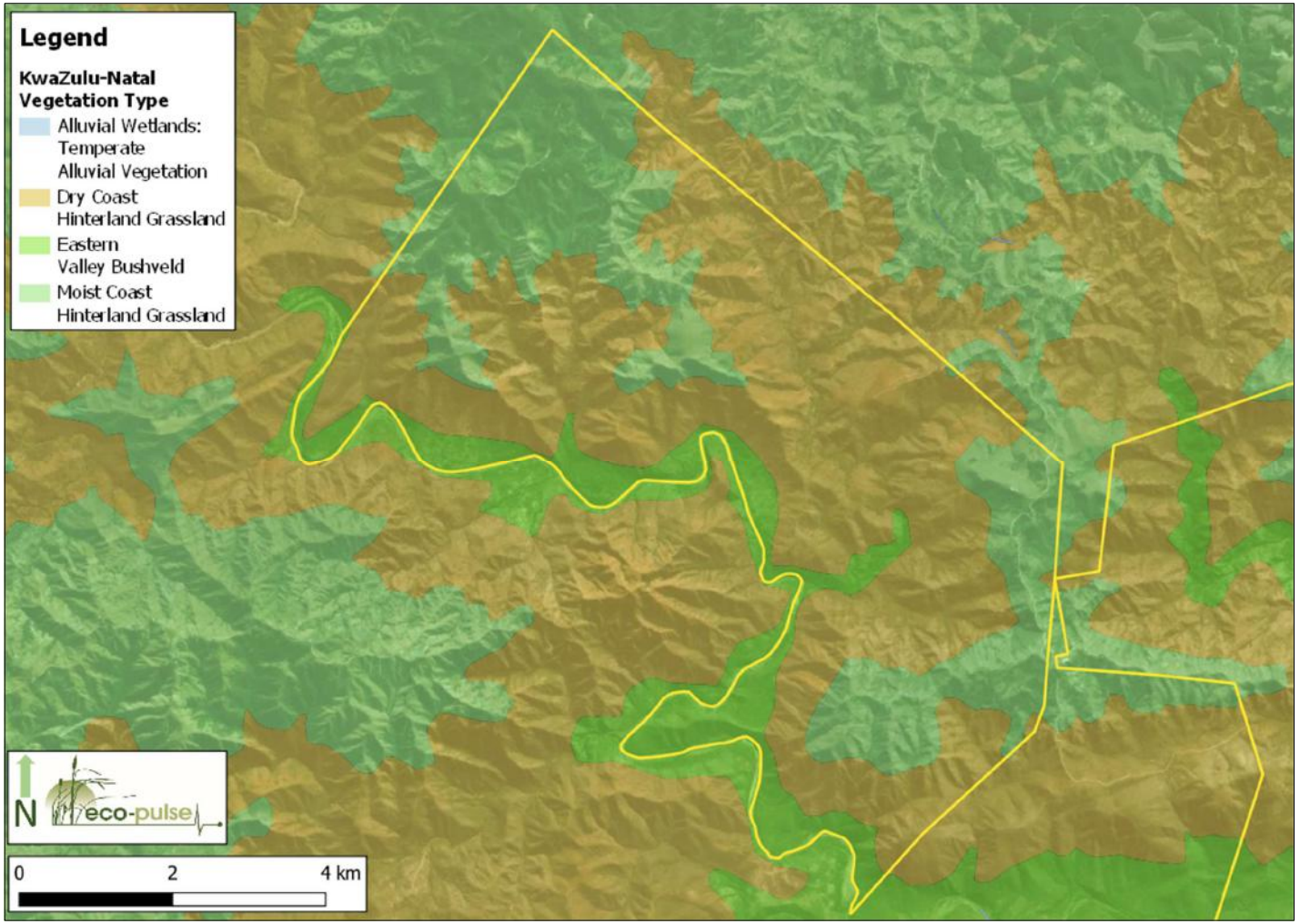

Figure 20. Map showing the location and extent of provincial vegetation types within the south-western block.

Table 15. 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)			
						South-Western Block	South-Central Block	South-Eastern Block	Northern Block
Dry Coast Hinterland Grassland	25	Vulnerable	Not Protected	276 406	125 199	2792,84	1140.90	2 098	340,70
Moist Coast Hinterland Grassland	25	Endangered	Not Protected	437 556	157 573	1459,42	430,80	661	6 717,20
Alluvial Wetlands: Temperate Alluvial Vegetation	24	Critically Endangered	Poorly Protected	207	42	0	0,78	1	0,14
Eastern Valley Bushveld	25	Least Threatened	Not Protected	313 748	211 707	582,92	781,70	1753	0
Eastern Scarp Forests: Northern Coastal Scarp Forest	61,6	Least Threatened	Moderately Protected	4 889	3 998	0	0	0	72,19
Northern Zululand Sourveld	19	Least Threatened	Poorly Protected	470 422	306 996	0	0	0	1 336,23

A brief description of the 5 terrestrial provincial vegetation types found on site is provided below extracted directly from (Scott-Shaw & Escott, 2011):

Dry Coast Hinterland Grassland Gs 19:

"Undulating plains and hilly landscape mainly associated with drier coast hinterland valleys in the rain-shadow of the rain-bearing frontal weather systems from the east coast. Sour sparse wiry grassland dominated by unpalatable Ngongoni grass (*Aristida junciformis*) with this monodominance associated with low species diversity. In good condition dominated by *Themeda triandra* and *Tristachya leucothrix*. Wooded areas are found in valleys at lower altitudes, where this vegetation unit grades into SVs 3 KwaZulu-Natal Hinterland Thornveld and SVs 7 Bisho Thornveld. Termitaria support bush clumps with *Acacia* species, *Cussonia spicata*, *Ehretia rigida*, *Grewia occidentalis* and *Coddia rudis*."

Moist Coast Hinterland Grassland Gs 20:

"Rolling and hilly landscape. Dense tall sour grassland dominated by unpalatable Ngongoni grass (*Aristida junciformis*) with this mono-dominance associated with low species diversity, when in good condition dominated by *Themeda triandra* and *Tristachya leucothrix*."

Eastern Valley Bushveld SVs6:

"Semi deciduous savanna woodlands in a mosaic with thickets, often succulent and dominated by species of *Euphorbia* and *Aloe*. Most of the river valleys run along a northwest-southeast axis which results in unequal distribution of rainfall on respective north-facing and south-facing slopes since the rain-bearing winds blow from the south. The steep north-facing slopes are sheltered from the rain and also receive greater amounts of insulation adding to xerophilous conditions on these slopes."

Scarp Forest FOz:

"Tall (15 – 25 m), species-rich and structurally diverse, multi-layered forests, with well-developed canopy and understory tree layers, but a poorly developed herb layer. Buttressed stems are common in the Scarp Forest. The most conspicuous trees are *Buxus macowanii, B. natalensis, Drypetes gerrardii, Englerophytum natalense, Harpephyllum caffrum, Heywoodia lucens, Memecylon natalense, Millettia grandis, Oricia bachmannii, Philenoptera sutherlandii, Rinorea angustifolia, Rothmannia globosa* and *Umtiza listeriana*.

There are five subtypes (Scott-Shaw (2011b)):

- Eastern Scarp Forests : Ngome-Nkandla Scarp Forest
- Eastern Scarp Forests: Northern Coastal Scarp Forest
- Eastern Scarp Forests : Northern Zululand Lebombo Scarp Forest
- Eastern Scarp Forests: Southern Coastal Scarp Forest
- Pondoland Scarp Forests"

Northern Zululand Sourveld:

"The dominant structural vegetation type is wooded grassland, in places pure sour grasslands and rarely also dense bushveld thickets. Terrain is mainly low, undulating mountains, sometimes highly dissected, and also some moderately undulating plains and hills."

B. KwaZulu-Natal Terrestrial Systematic Conservation Plan and Assessments (EKZNW: 2011, 2016)

The Systematic Conservation Assessments (SCAs) comprise 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) Critical Biodiversity Area: Irreplaceable, (ii) Critical Biodiversity Area: Optimal, and (iii) Ecological Support Area. These conservation categories are described in Table 16 below.

Table 16. 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: Irreplaceable**, **CBA: Optimal** and overlapping Ecological Support Areas are present within the northern block of the study area. More than half of the south-western block is flagged as either CBA: optimal or CBA: Irreplaceable while approximately half of the south-eastern and central southern blocks have been flagged as CBA: Optimal (See Figure 21, Figure 22 and Figure 23). This suggests that the proposed mining development may have significant negative impacts on provincial conservation planning targets potentially compromising Ezemvelo KZN Wildlife's ability to meet these targets.

There are a number of vegetation types as well as floral and faunal SCC that are flagged as potentially occurring within the study area according to the TSCP spatial coverage (EKZNW, 2011), which are collectively driving the various CBA ratings (outlined above) assigned to large portions of the study area. These include the **millipedes:** *Patinatius bidentatus simulator*, *Spinotarsus destructus*, *Doratogonus falcatus*, *Spinotarsus maritzburgensis, Allawrencius complex, Doratogonu peregrinus, Doratogonus natalensis. Centrolobus bifidus, Centrolobus rugulosus,* the **insect:** *Odontomelus eshowe,* the **molluscs:** *Gulella aliciae, Gulella barbarae, Gulella separata*, *Gulella euthymia*, *Eunonyma lymnaeformis Edouardia conulus,* and *Trachycystis clifdeni* (Critically Endangered), the **plants:** *Helichrysum woodii* (Rare), *Struthiola anomala* (Vulnerable), *Oxyanthus pyriformis (*Least Concern formerly Near Threatened), *Encephalartos woodii* (Extinct in the Wild), *Dahlgrenodendron natalense* (Endangered) and *Bolusiella maudiae* (Least Concern formerly Data Deficient) and the **vegetation types:** Alluvial Wetlands: Temperate Alluvial Vegetation (Critically Endangered), Moist Coast Hinterland Grassland (Endangered), Dry Ngongoni Veld (Vulnerable), Eastern Valley Bushveld (Least Threatened), Northern Zululand Sourveld (Least Threatened) and Eastern Scarp Forests : Northern Coastal Scarp Forest (Least Threatened).

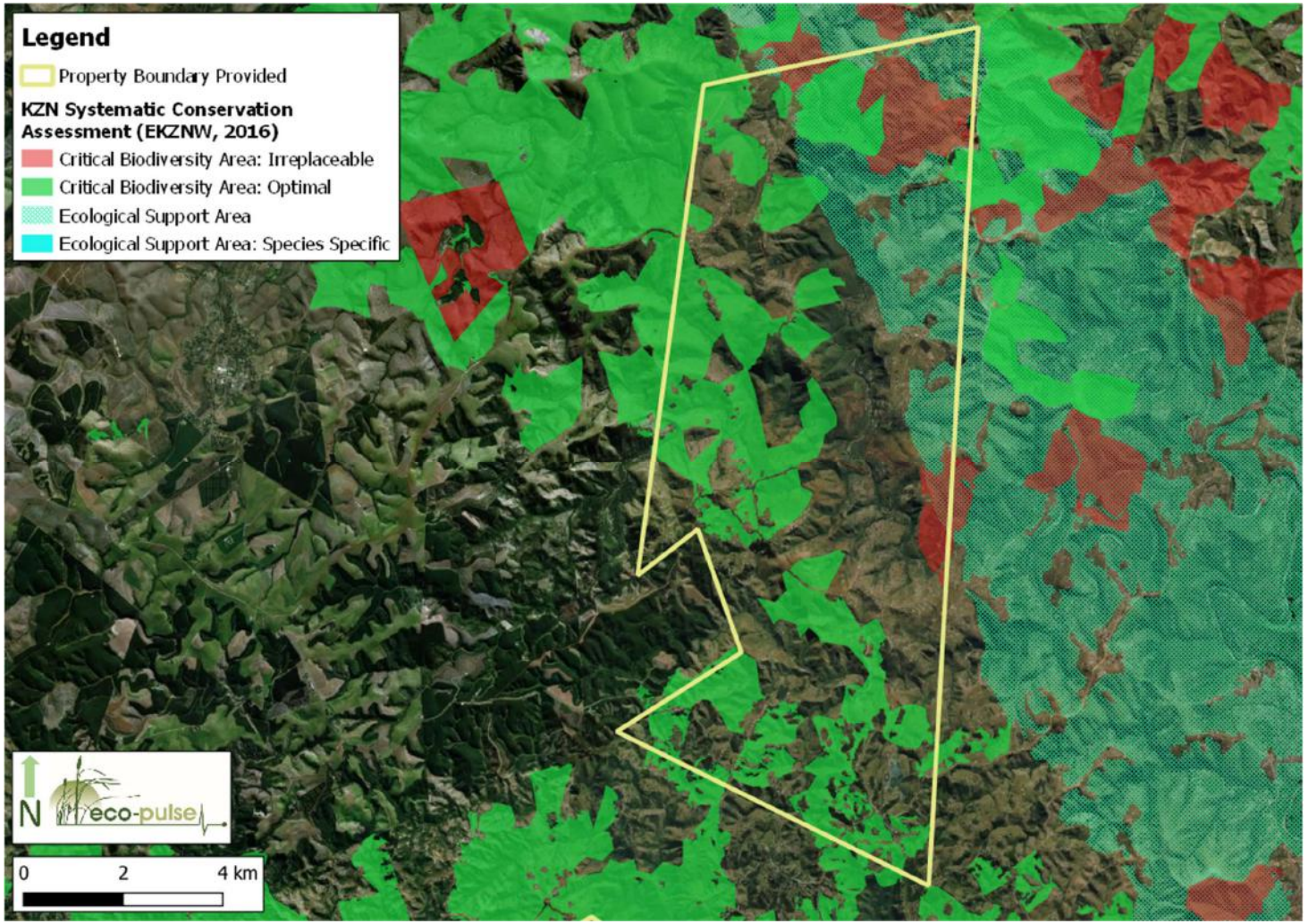

Figure 21. Map showing the location and extent of the CBAs and ESAs according to EKZNW (2016), in relation to the northern block of the study site.

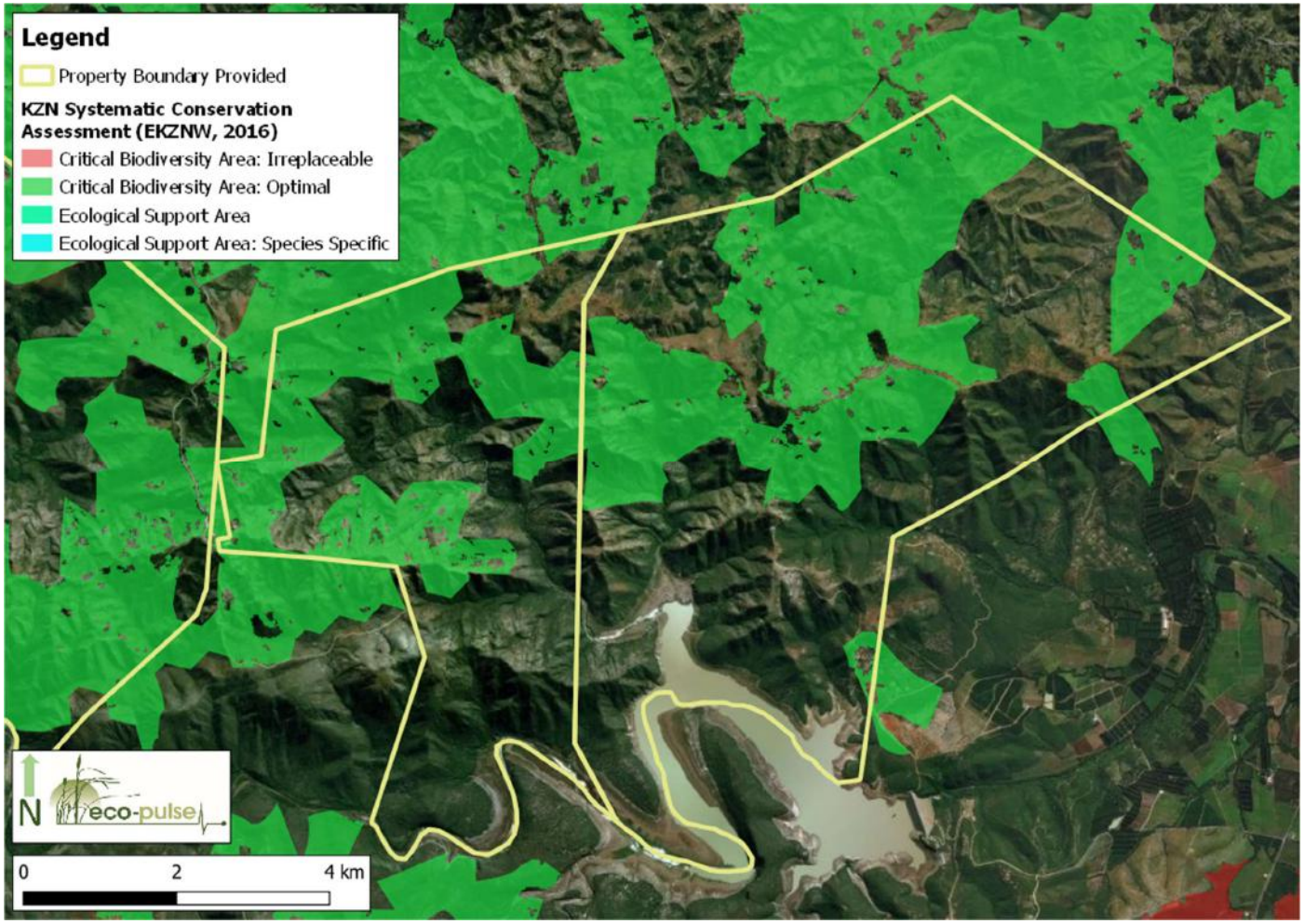

Figure 22. Map showing the location and extent of the CBAs and ESAs according to EKZNW (2016), in relation to the south-eastern block and central southern block of the study site.

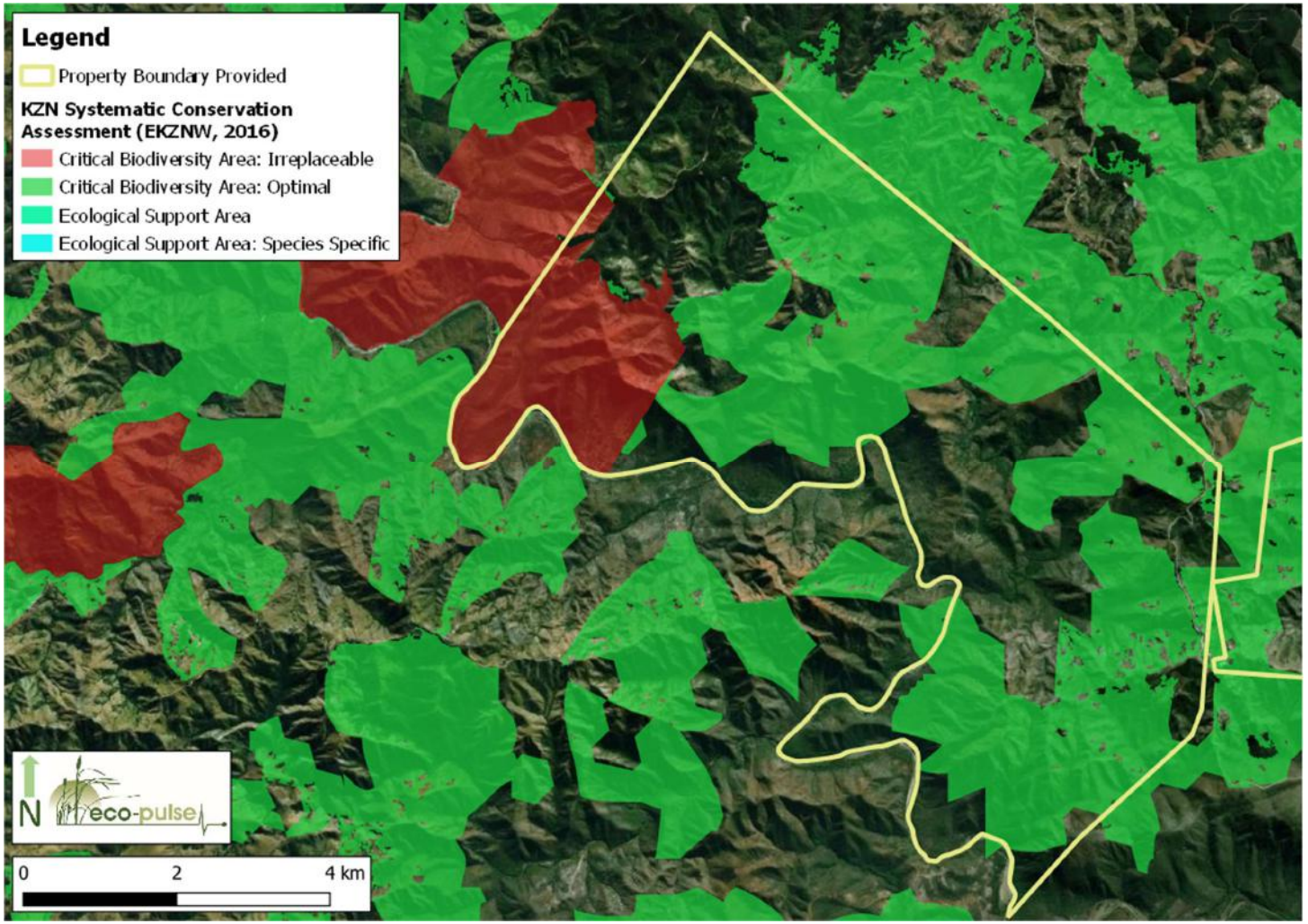

Figure 23. Map showing the location and extent of the CBAs and ESAs according to EKZNW (2016), in relation to the south-western block of the study site.

C. KZN Biodiversity Sector Plan Local Scale Ecological Corridor

Figure 24 shows the location and extent of the KZN Local Scale Northern Interior Corridor that falls within the north-eastern corner of the northern block of the proposed mining development. This area of the Northern Interior Corridor is considered a critical linkage that needs to be maintained to ensure connectivity between the coast and more inland ecosystems.

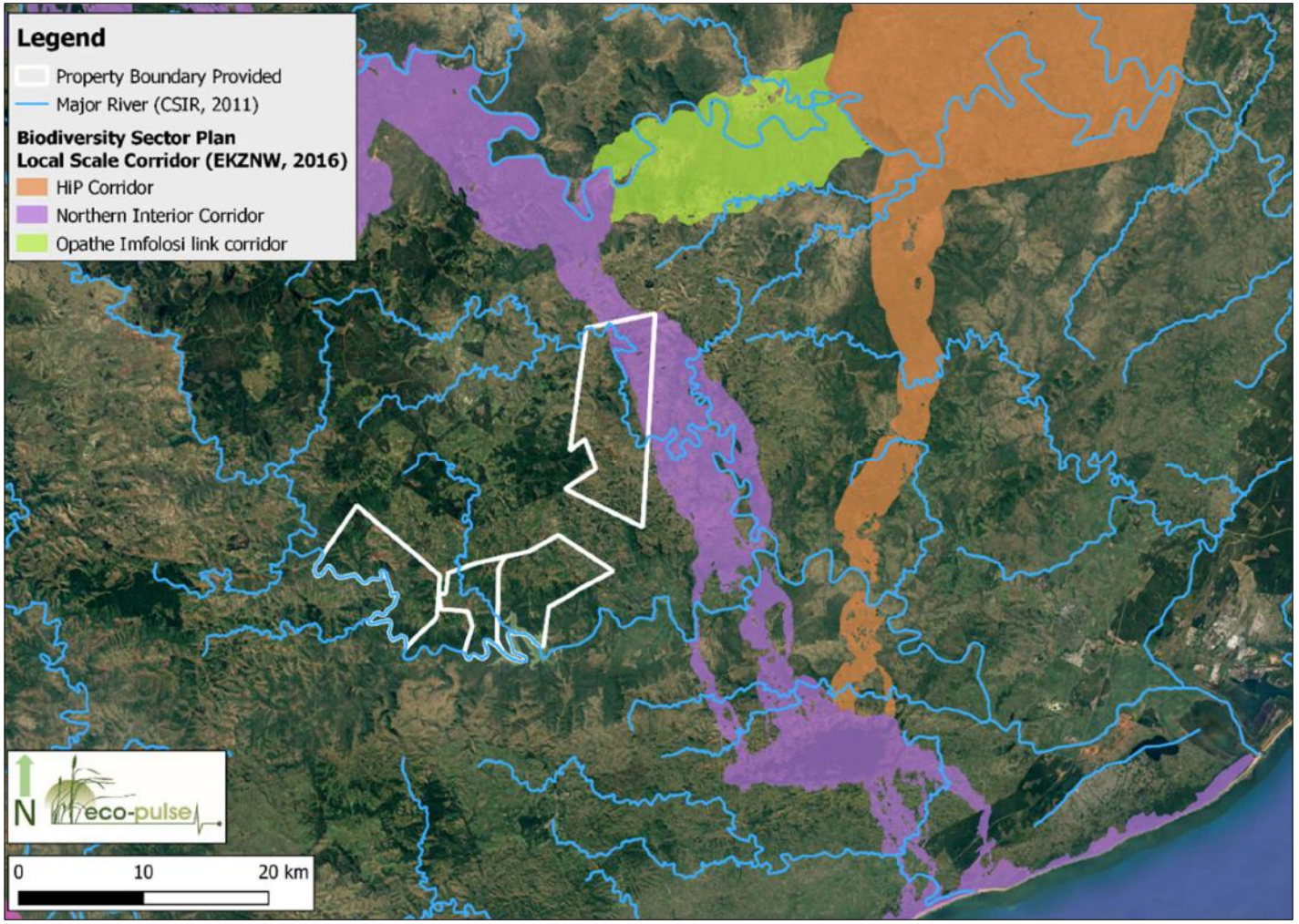

Figure 24. Map showing the location and extent of the Northern Interior Corridor in relation to the project study area (EKZNW, 2016).

D. Provincial Protected Areas and KwaZulu-Natal Protected Areas Expansion 20-year Strategy (EKZNW, 2010)

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.

3.3.3 Municipal Conservation and Spatial Planning Datasets

In addition to national and provincial scale conservation planning datasets available; at a local level Mthonjaneni Local Municipality has conservation planning datasets that inform priorities for protection at the local scale which are discussed below.

A. Environmental Management Areas and Terrestrial Minset

According to the latest IDP available (Mthonjaneni Local Municipality, 2021): "*The value of landscape forms in the municipality should be conserved. In terms of land use management, the specific ecosystems and vegetation communities that require specific environmental management are wetlands and grasslands, which contain the habitats of important species*."

Environmental landcover types that have been flagged as priority zones that need to be mapped and included as part of the spatial development plan for the municipality include (Mthonjaneni Local Municipality, 2021):

- Grassland and other;
- Natural Bush;
- Thornveld; and
- Active and Passive Open Space.

An Environmental Inventory including these priority zones will inform the SDF. Beyond the Priority Zones the following factors need to be considered and municipal guidelines/requirements have been outlined in the latest IDP with regard to these sensitive areas:

1) Indigenous forested areas;

2) Areas of High Biodiversity Value; and

3) Nature Reserves.

These areas are mapped on the Minset Map below extracted directly from the municipality's latest IDP. Terrestrial (MINSET) Minset identifies a "minimum set" of planning units that will assist in meeting conservation targets. The Minset map indicates areas that are already protected and areas of biodiversity priority in green. As can be seen from Figure 25 below large portions of the southern blocks and portions of the northern block have been flagged as areas of high biodiversity value/protected areas or indigenous forested areas. Mining in these areas would be in direct conflict with meeting the

"minimum set" of conservation targets that need to be met at the local scale by the municipality and therefore these areas should be avoided.

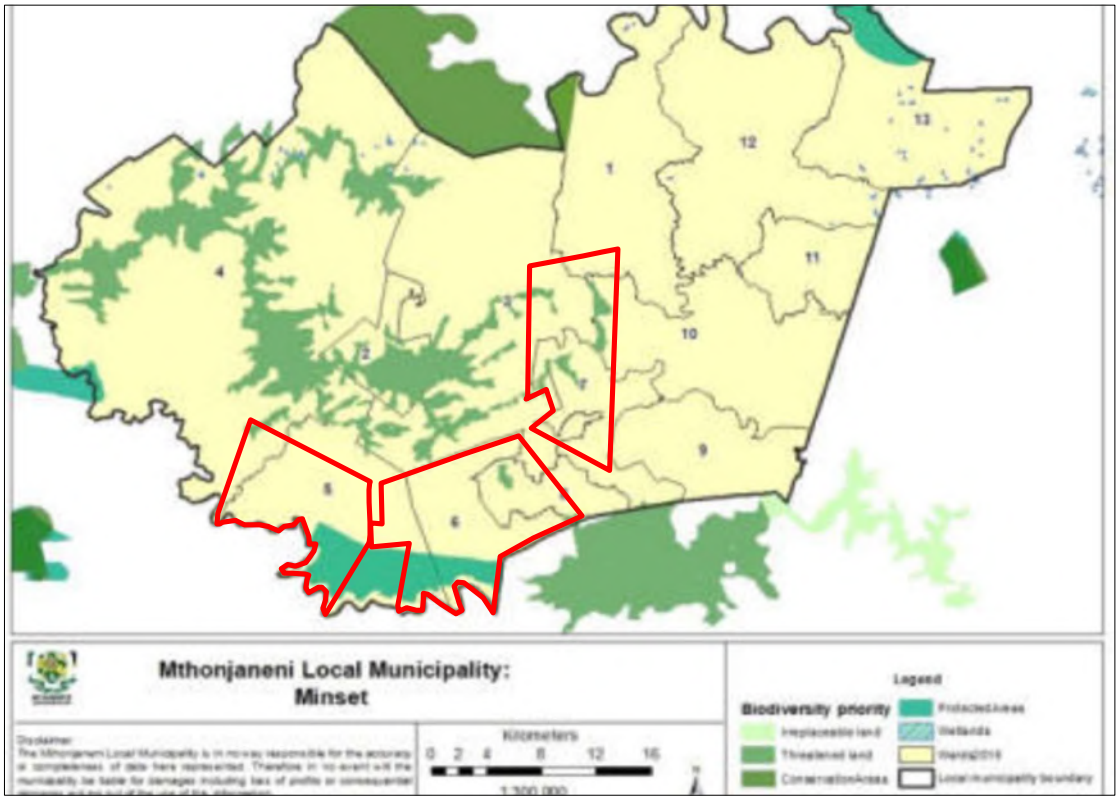

Figure 25. Map showing Mthonjaneni Local Municipality's Minset map (GIS Mthonjaneni, 2021) with Biodiversity Priorities highlighted in green in relation to the study area (roughly outlined in red).

B. **Mthonjaneni Local Municipality's Conceptual Plan**

Large portions of the study area in the southern blocks have been flagged for future tourism opportunities at the municipal scale, while portions of the northern block have been flagged as important environmental areas.

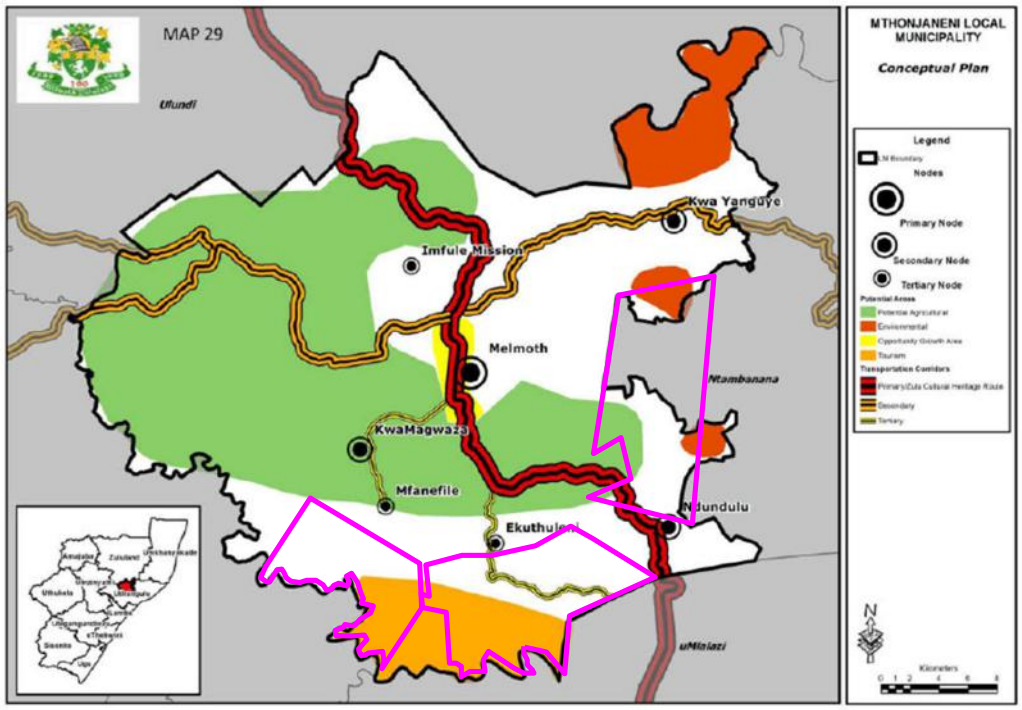

Figure 26. Map showing Mthonjaneni Local Municipality's Conceptual Plan with Tourism and Environmental Areas highlighted in orange and red respectively with the study area outlined in pink.

3.4 Historic Land Use & Disturbance Regime

An understanding of historic land use and disturbance on the properties was obtained by reviewing the latest South African National Land Cover GIS layer available from DFFE (2020) available online at https://egis.environment.gov.za/. All areas that had undergone some form of disturbance whether current or historical were grouped under the category of secondary/transformed and included the following landcover classes:

1. Contiguous and Dense Planted Forest
2. Open and Sparse Planted Forest
3. Temporary Unplanted Forest
4. Artificial Dams (incl. canals)
5. Artificial Sewage Ponds
6. Eroded Lands
7. Cultivated Commercial Permanent Orchards
8. Cultivated Commercial Sugarcane Non-Pivot (all other)
9. Commercial Annual Crops Rain-Fed/Dryland/Non-irrigated
10. Subsistence/Small Scale Annual Crops
11. Fallow Land & Old Fields (Trees)
12. Fallow Land & Old Fields (Bush)
13. Fallow Land & Old Fields (Grass)
14. Fallow Land & Old Fields (Bare)
15. Residential Formal (Tree)
16. Residential Formal (Bush)

17. Residential Formal (low veg/grass)
18. Residential Formal (Bare)
19. Residential Informal (Tree)
20. Residential Informal (Bush)
21. Residential Informal (low veg/grass)
22. Residential Informal (Bare)
23. Village Scattered (bare only)
24. Village Dense (bare only)
25. Urban Recreational Fields (Tree)
26. Urban Recreational Fields (Bush)
27. Urban Recreational Fields (Grass)
28. Urban Recreational Fields (Bare)
29. Commercial
30. Industrial
31. Roads and Rail (Major Linear)
32. Mine: Extraction Sites: Open Cast & Quarries combined
33. Fallow Land & Old Field (wetlands)

Remaining intact habitat was grouped into five broad classes namely:

1. Contiguous (indigenous) Forest, Low Forest & Thicket
2. Dense Forest, Woodland, Open Woodland and Low Shrubland
3. Natural Grassland
4. Natural River or Wetland
5. Natural Rock Surfaces or Bare Area

A map showing the estimated extent and location of current land use and disturbance within the three properties are shown in Figure 27, Figure 28 and Figure 29, below with secondary/transformed areas highlighted in orange, and the remaining intact landcover classes represented in 1) dark green, 2) light green, 3) yellow 4) blue and 5) beige respectively. Key current land-use impacts included human settlement, forestry, clearing of land for cultivation and alien plant invasion.

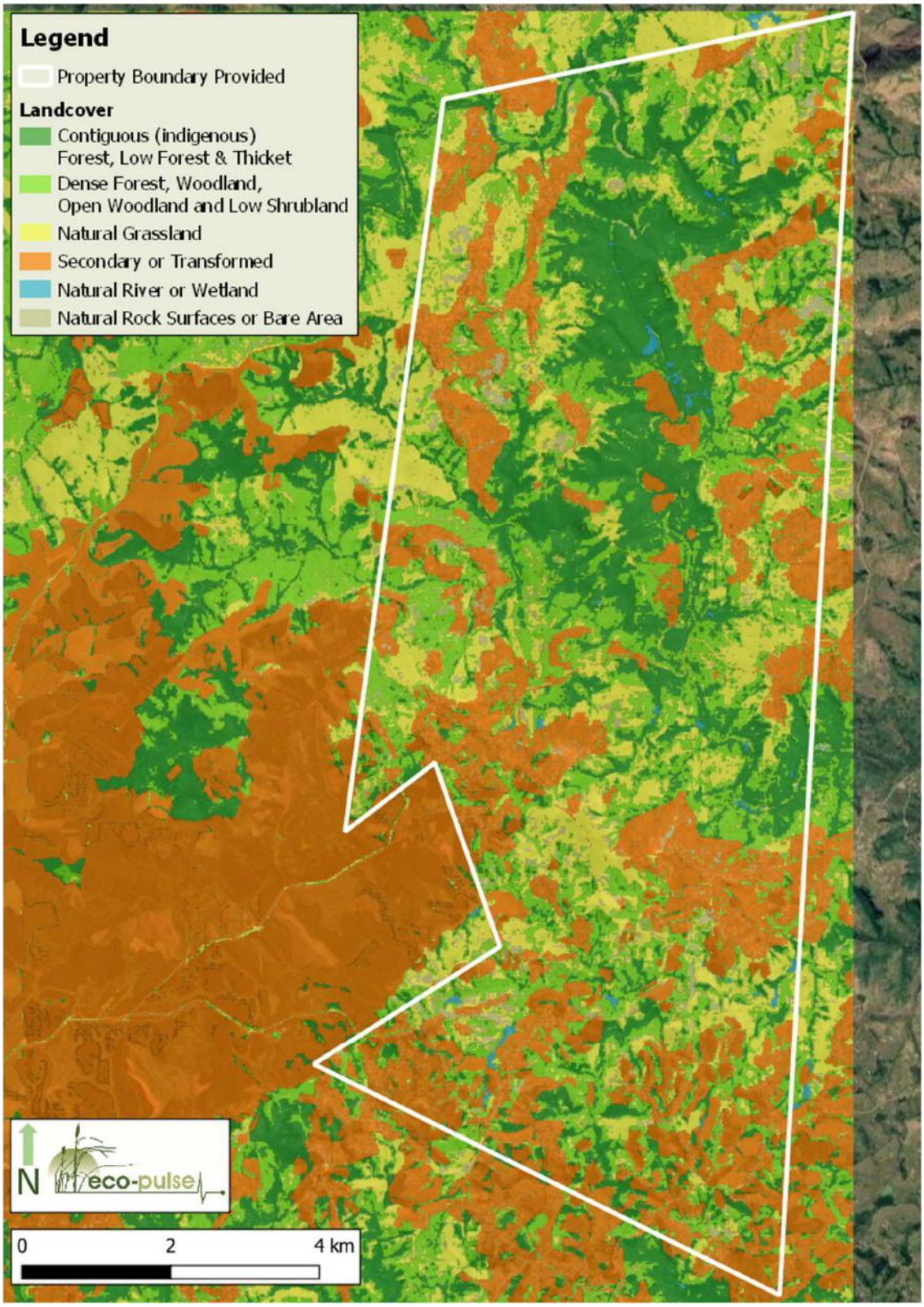

Figure 27. Map showing the existing land-use impacts observed on site within the northern block.

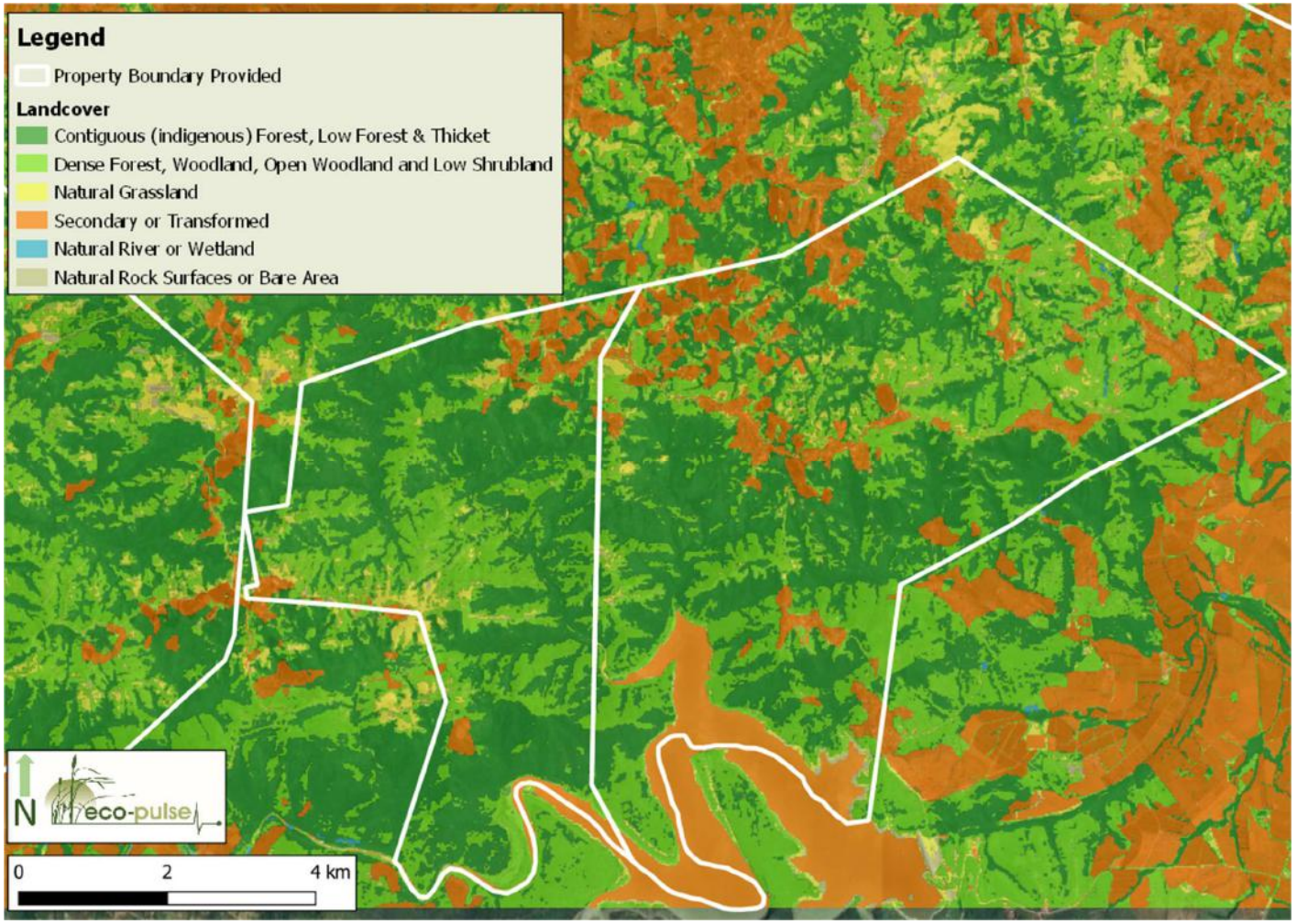

Figure 28. Map showing the existing land-use impacts observed on site within the south-eastern and south-central blocks.

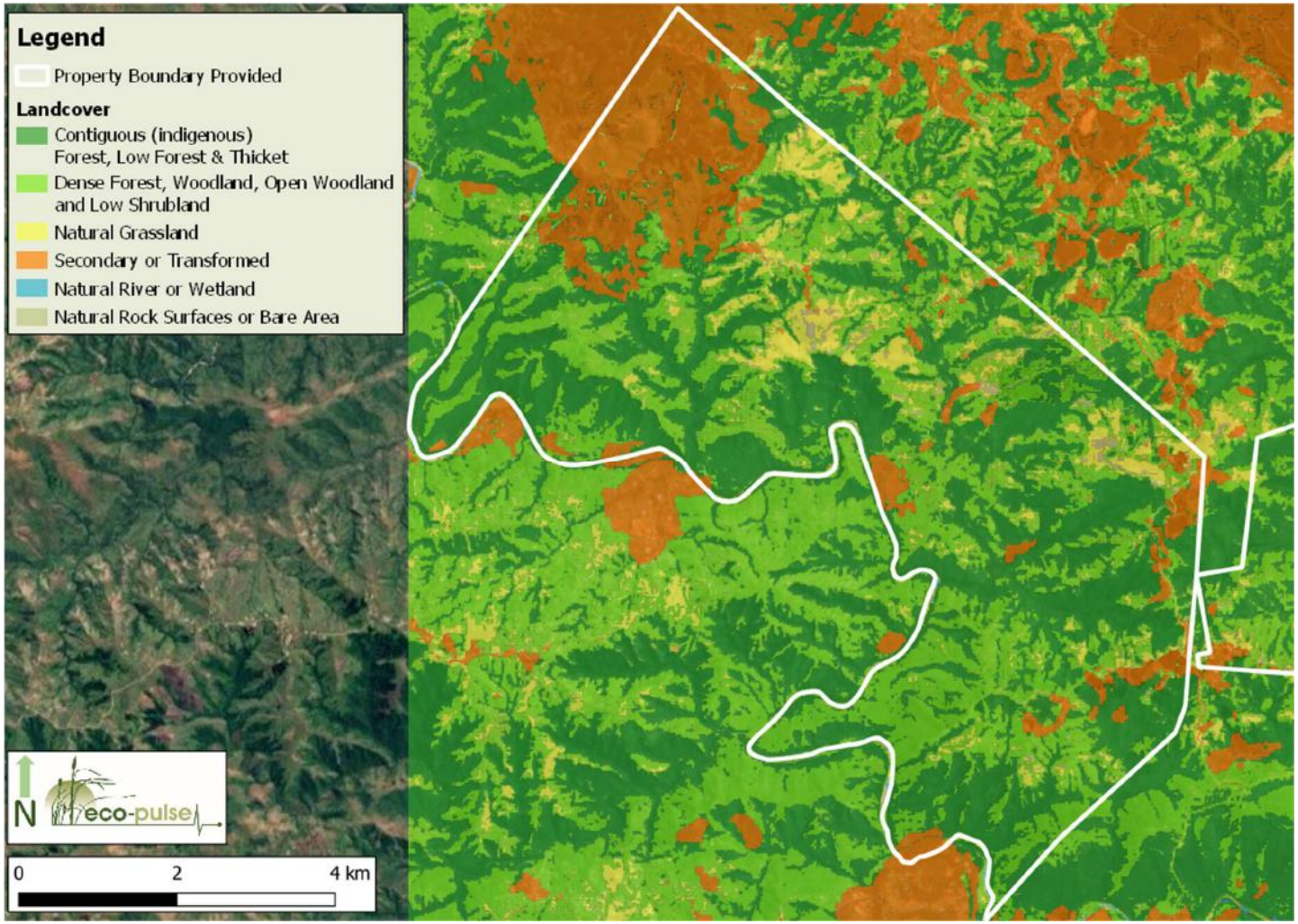

Figure 29. Map showing the existing land-use impacts observed on site within the south-western block.

4 BASELINE VEGETATION & HABITAT ASSESSMENT

4.1 General Comment on Savannah Vegetation in the Study Area

At the provincial level savannah vegetation within the study area has been separated into Eastern Valley Bushveld, Dry Coast Hinterland Grassland and Moist Coast Hinterland Grassland, with the latter two vegetation types formerly classified as Ngongoni Veld (Scott-Shaw & Escott, 2011). Ngongoni Veld (now Coast Hinterland Grassland) remains poorly resolved and is a conceptual dumping ground for all grassland spanning a long north-south extent and many geologies, in an area that has been settled and grazed for a long period of time. Where anthropogenic disturbance has been more prevalent, this grassland assumes a more homogenous composition (Styles, 2017a). Unfortunately, the current conception of Ngongoni Veld which is presented by Mucina & Rutherford (2006) is founded on degraded forms of *Aristida junciformis* dominated grassland (Styles, 2017a). This suggests that in its natural state grassland in the "Ngongoni Veld" area may differ considerably from what is captured in the literature with regards to both its grass and geophytic/herbaceous plant composition and it is possible that the "Ngongoni Veld" area is more complex than currently understood, including more than one grassland type (Styles, 2017a&b). This can only be ascertained by proper surveying of instances still in good condition, as opposed to degraded forms on which the current conception is mainly founded. The lack of detail regarding Ngongoni Veld has resulted in both Dry Coast Hinterland Grassland and Moist Coast Hinterland Grassland remaining floristically unresolved in the literature with little detail provided on the difference between the two (D. Styles Pers. Comm.). The only distinction cited is that Moist Coast Hinterland Grassland occurs in areas which receive higher levels of rainfall and exhibits a marginally higher level of floristic diversity (Scott-Shaw & Escott, 2011).

Therefore, for the purposes of this coarse scale vegetation assessment, vegetation communities encountered on site have not been separated into Moist and Dry variants of Ngongoni Veld/Coast Hinterland Grassland and Eastern Valley Bushveld but rather have been separated based on differences in vegetation condition and structure with a description of local scale vegetation communities on site described as part of the section that follows.

4.2 Description of Vegetation Communities: Southern Properties

Five (5) broad but distinct terrestrial vegetation communities were identified and described for the southern properties assessed through a combination of rapid field verification and desktop mapping, including:

1. **Ngongoni Veld/Eastern Valley Bushveld Open Savannah**
2. **Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland**
3. **Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah**
4. **Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland**

5. **Secondary Open Savannah/Thicket/Closed Woodland**

Transformed areas (existing/historical forestry and cultivated areas, dirt roads, grass tracks, buildings, recently cleared areas) were mapped as part of Community 5: Secondary Open Savannah/Thicket/Closed Woodland.

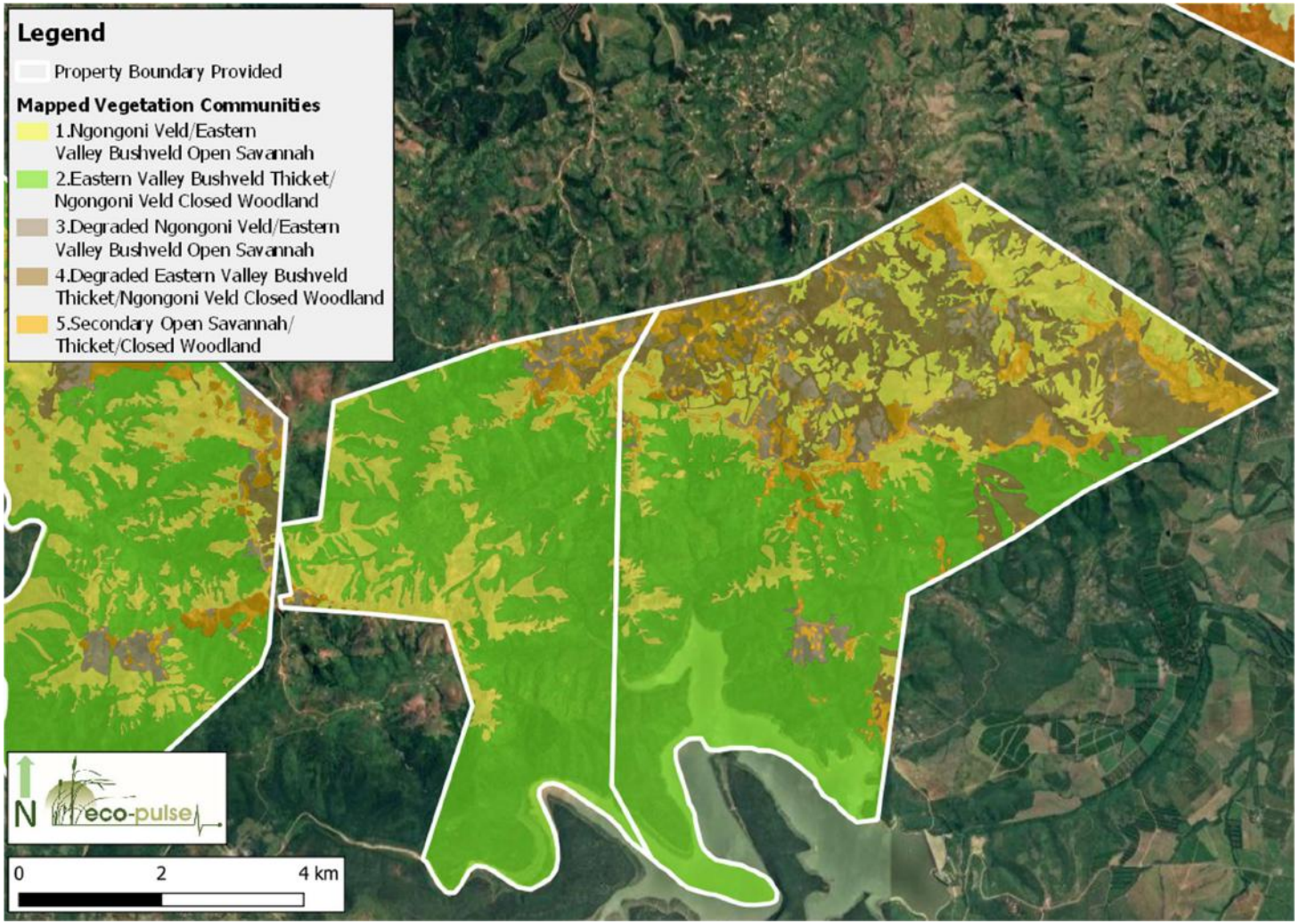

Figure 30. Map showing the distribution and extent of the five broad vegetation communities occurring in the south central and south-eastern blocks.

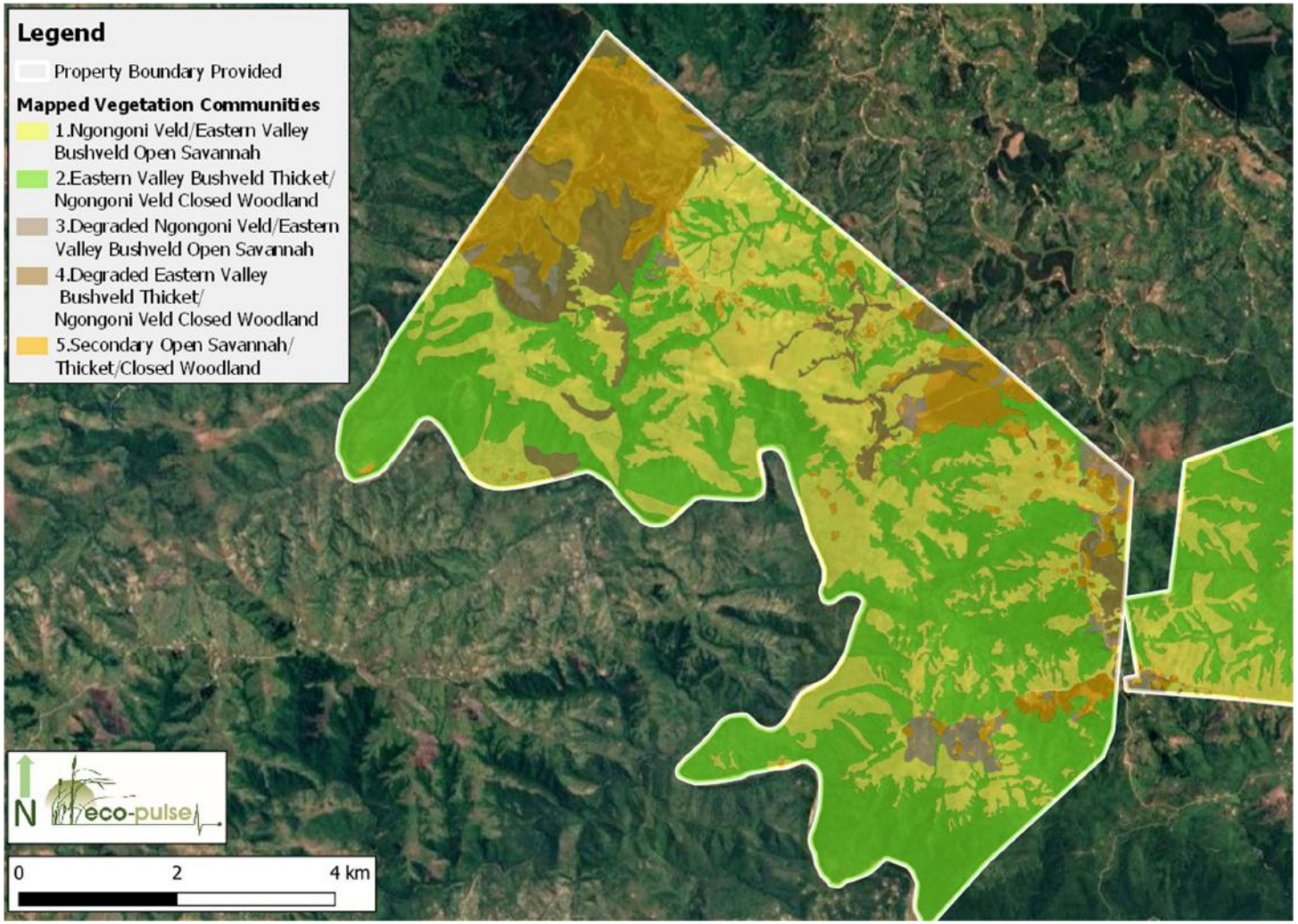

Figure 31. Map showing the distribution and extent of the five broad vegetation communities occurring in the south-western block.

A description of each key vegetation community/type is provided below. Note that exotic/alien plants have been highlighted in '**red**' text.

4.2.1 Community 1: Ngongoni Veld/Eastern Valley Bushveld Open Savannah

Vegetation cover mapped as part of this community included areas that have not experienced severe anthropogenic disturbances either due to inaccessibility associated with steep topography or as a result of being further removed from human settlement and the road network, thus retaining moderate to high levels of floristic diversity. Moreover, it should be noted that a number of red-listed species were likely overlooked during the site visit due to seasonal constraints and open grassland/savannah areas on site will require further sampling in the correct season at a later stage in the planning process.

For the purposes of this broad scale assessment this vegetation community includes all open grassland/savannah areas (based on examination of the latest aerial imagery available at the time of the assessment) that are either categorised as Moist/Dry Coast Hinterland Grassland or Eastern Valley Bushveld at the provincial level.

Open grassland/savannah in the area was dominated by *Aristida junciformis* with other grass species occurring at moderate to low levels of abundance including *Sporobolus africanus*, *S. pyramidalis*, *Eragrostis curvula*, *Monocymbium ceresiiforme*, *E. capensis, Setaria sphacelata, Cymbopogon nardus* and *Themeda triandra.* Commonly encountered scattered tree cover included a number of *Vachellia* species, *Heteropyxis natalensis* and *Erythrina latissima*, with the shrubs *Leonotis leonurus*, *Leonotis intermedia*, *Lippia javanica* also prevalent with *Lasiosiphon splendens*, *Psoralea pinnata* and *Eriosema salignum* noted in some areas. Common herbaceous cover observed included *Polygala hottentotta*, *Tephrosia grandiflora*, *Thunbergia atriplicifolia*, *Berkheya insignis*, *Senecio variabilis*, *Senecio latifolius* and *Senecio panduriformis* along with the fern *Cyclosorus interruptus*. At lower levels of abundance *Moraea graminicola subsp. graminicola* (**Near Threatened**, South African Endemic known from only 10 – 20 remaining locations in South Africa) was seen in a specific area. Often associated with rock outcrops in steeper areas; the forbs *Syncolostemon densiflorus*, *Chlorophytum krookianum* and *Crassula alba*, the tree *Anastrabe integerrima* and the vulnerable senditive plant species occurred. In addition, what may be *Helichrysum pannosum* (**Endangered**) scattered in some areas was noted, however, no flowering specimens were encountered on site to confirm this. Given the large areas that needed to be surveyed, and the patchy and uneven distribution of anthropogenic impacts across the study area, it was difficult to separate out areas of pristine grassland versus areas that have been degraded to a moderate degree. Therefore, this vegetation community encompasses areas that still retain some level of floristic diversity which range from natural to moderately modified open grassland/savannah in **fair to good ecological condition.** It should be noted that the timing of fieldwork fell outside of the recommended sampling period stipulated by EKZNW and in national guidelines and therefore it is very likely that a number of red-listed and protected plant species were either overlooked or under sampled during this rapid baseline assessment (refer to Annexure A for a full list of red-listed species that may occur within the study area).

Photo 1: Open grassland dominated by *Aristida junciformis* on the hill in the background located on the southern margin of the south block overlooking the Mhlatuze River below.

Photo 2: Open grassland dominated by *Aristida junciformis* in the foreground looking south towards the Goedertrouw Dam behind the hills in the background.

Photo 3,4 & 5: *Moraea graminicola subsp. gramincola* (Near Threatened) found scattered in the open grassland area in Photo 2.

Photo 6: Open savannah vegetation in the background with numerous scattered Aloes (Provincially Protected) which transitions into thicket/closed woodland vegetation in the foreground in good ecological condition (located in the south-western block).

4.2.2 Community 2: Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland

Vegetation within this community comprised a mixture of primary Eastern Valley Bushveld thicket along with, to a smaller degree, Ngongoni Veld closed savannah woodland, which have a larger component of *Vachellia* species and lower levels of woody diversity present. Frequently encountered species in savannah woodland patches included scattered tree cover with *Vachellia natalitia, V. nilotica*, *V. sieberiana*, *V. karroo*, and *Aloe marlothii* dominating while grass cover included *Eragrostis curvula*, *Sporobolus pyramidalis*, *S. africanus*, *Themeda triandra*, *Melinis repens* and *Aristida* species.

Dense Eastern Valley Bushveld thicket patches comprised a mixture of diverse tree species including *Combretum molle*, *Vachellia natalitia*, *V. nilotica*, *Tetradenia riparia*, *Dichrostachys cinerea*, *Vangueria infausta*, *Scutia myrtina*, *Cussonia spicata*, *Ziziphus mucronata*, *Dombeya rotundifolia*, *Spirostachys africana*, *Searsia pallens*, *S. pentheri*, *Grewia occidentalis, Senegalia ataxacantha,* and the succulent *Euphorbia ingens*. Undergrowth was dominated by *Asystasia gangetica*, *Hypoestes aristata, Barleria obtusa*, *Brachylaena elliptica* and *Peristrophe cernua* with the occasional climber or creeper observed i.e., *Cissus fragilis*, *Dalbergia obovata*, *Desmodium repandum* and *Smilax anceps*.

Less frequently encountered woody and succulent species observed at moderate to low levels of abundance in thicket patches included the following: *Calpurnia aurea*, *Euphorbia tirucalli*, *E. triangularis*, *Schotia brachypetala*, *Sclerocarya birrea*, *Vachellia sieberiana*, *V. tortilis*, *Euclea daphnoides*, *Olea europaea subsp. africana*, *Ximenia caffra*, *Pappea capensis*, *Vepris lanceolata*, *Commiphora harveyi*, *Trichilia emetica*, *Clerodendrum glabrum*, *Scolopia zeyheri*, *Gardenia volkensii*, *Diospyros simii*, *Gymnosporia senegalensis*, *G. maranguensis*, *Ficus glumosa*, *F. burkei*, *F. sur*, *G. buxifolia*, and *Maesa lanceolata*. In addition, *Aloe rupestris*, *Stapelia gigantea*, *Dioscorea cotinifolia*, *Scadoxus puniceus*,

Kalanchoe rotundifolia, *Plectranthus hadiensis* and *Sansevieria hyacinthoides* were occasionally observed in the undergrowth.

Where this thicket/woodland community adjoined human settlement, edge effects were noted with some alien plant species invasion and firewood harvesting taking place. However, for the most part, the high level of species diversity and heterogeneity observed suggests this vegetation community can be considered natural to moderately modified and can be considered in **fair to good ecological condition.**

Photo 7: Dense closed thicket in the background comprising a diverse array of woody and herbaceous species located near the southern edge of the south-western block.

Photo 8: Dense closed thicket comprising a diverse array of woody and herbaceous species (south-central block)

Photo 9 & 10: *Aloe rupestris* and *Scadoxus puniceus* (Both provincially protected under the Natal Conservation Ordinance) which occur in the undergrowth in thicket/closed woodland areas.

Photo 11: Dense closed thicket comprising a diverse array of woody and herbaceous species.

4.2.3 Community 3: Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah

Degraded areas of open savannah were situated closer to road networks and associated with less precipitous topography. Overgrazing by livestock and edge effects on grassland patches within this community have collectively lowered the floristic diversity and allowed the invasion of some alien plant species and woody pioneer species from a moderate to severe degree. This community can therefore be considered moderately to severely modified, and in **fair to poor condition**, depending on the level of alien plant invasion and the grazing and burning regime prevalent, with areas in fair condition potentially retaining some level of forb diversity that would need to be verified through seasonally appropriate sampling (to verify red-listed plant species flagged for the area). As with the vegetation community above the dominant grass was *Aristida junciformis* with common forbs species including *Polygala hottentotta*, *Tephrosia grandiflora*, *Thunbergia atriplicifolia*, *Berkheya insignis*, *Senecio variabilis*, *S.*

latifolius and *S. panduriformis* along with the fern *Cyclosorus interruptus*. Commonly encountered scattered tree cover included a number of *Vachellia* species, *Heteropyxis natalensis* and *Erythrina latissima*, with the shrubs *Leonotis leonurus*, and *L. intermedia*. Scattered alien plant species included *Lantana camara, Psidium guajava, Chromolaena odorata, Bidens pilosa* and *Ageratum conyzoides* amongst others.

Photo 12: Degraded open savannah in the background which has been moderately modified/severely modified by overgrazing and minor impacts but may still play host to red-listed or protected species (these areas would need to be sampled in a more seasonally appropriate window to verify this) and has become fragmented/is experiencing edge effects/bush encroachment/alien plant invasion in the south-eastern block.

4.2.4 Community 4: Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland

Degraded Eastern Valley Bushveld/Closed Ngongoni Woodland had been impacted negatively by edge effects, firewood harvesting, browsing by livestock (primarily goats), clearing of vegetation, and alien plant invasion. Consequently, although retaining some level of floristic diversity this was moderately diminished in comparison to the thicket/closed woodland vegetation community described above. Moreover, weedy/pioneer and alien invasive species were encountered at low to moderate levels of abundance within this vegetation community e.g., *Chromolaena odorata, Lantana camara*, *Trema orientalis*, *Cestrum laevigatum, Achyranthes aspera, Opuntia ficus-indica* and *Vachellia natalitia*. Therefore, this vegetation community is considered to be moderately to severely modified and in **fair to poor ecological condition** overall.

Photo 13: View of degraded thicket/closed woodland vegetation in the background (near the divide between the south central and south-eastern blocks, looking south-east) with an equal mixture of indigenous woody species and alien invasive shrubs and trees.

Photo 14: View of degraded thicket/closed woodland vegetation in the foreground along drainage lines and valley floor, with *Chromolaena odorata* evident.

4.2.5 Community 5: Secondary Open Savannah/Thicket/Closed Woodland

This vegetation suffered disturbance in the past (direct disturbance or disturbance sufficient to facilitate alien plant invasion that notably reduced the plant biodiversity) and as a result can be considered severely to critically modified, in **poor ecological condition** and no longer representative of reference vegetation types mapped for the study area. It comprised the following:

- Grassland or grassy parts dominated by *Aristida junciformis* or lawn grasses such as *Cynodon dactylon, Dactyloctenium australe* and very few common herbaceous species or weeds of disturbance e.g., *Polygala hottentotta*, *Richardia brasiliensis*.
- Invasion by pioneer woody or shrubby plants in historically open grassland areas, mainly *Vachellia natalitia* (a pioneer species, which is often misconceived as an important constituent of some vegetation, when in numbers it is instead an indicator of recent or secondary growth), *Triumfetta pilosa*, and *Lippia javanica*. Remnant or secondary regrowth of common/pioneer woody species along drainage lines including *Trema orientalis*, *Syzigium cordatum*, *Senegalia ataxacantha*, *Harpephyllum caffrum*, *Dalbergia obovata* and *Tetradenia riparia*.
- Woody or shrubby alien plant invasion, particularly by *Psidium guajava*, *Chromolaena odorata, Lantana camara* and *Tagetes minuta* although a diverse range of alien species occurred (see Annexure A which lists all species noted during the site visit undertaken).

Photo 15: View of degraded secondary vegetation occurring along road margin, dominated in this case by *Solanum mauritianum* and *Eucalyptus grandis*.

Photo 16: View of degraded secondary vegetation in the background including cultivated fields, lawn grass etc., with open savannah in good/fair condition in the immediate foreground with a leaf of *Moraea graminicola subsp. graminicola* (Near Threatened) on the left, demonstrating the patchy distribution of the various vegetation communities and large shifts in vegetation condition that were observed across relatively short distances on site.

Photo 17: View of area transformed to forestry on the left of the road which is included as part of this secondary vegetation community.

4.3 Desktop Mapping of Vegetation Communities: Northern Property

An additional five (5) broad but distinct terrestrial vegetation communities were identified and described for the northern property assessed through desktop mapping of aerial imagery and based on available GIS datasets for national and provincial vegetation types indicated to occur within the property (Figure 32), including:

6. Ngongoni Veld/Northern Zululand Sourveld Open Savannah
7. Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland
8. Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket
9. Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah
10. Secondary Open Savannah/Thicket/Closed Woodland

Transformed areas (existing/historical forestry and cultivated areas, dirt roads, grass tracks, buildings, recently cleared areas) were mapped as part of community 10: Secondary Open Savannah/Thicket/Closed Woodland.

A brief description of each key vegetation community/type is provided below which outlines their hypothesised ecological condition and important/key indigenous species (based on available information) that are likely to occur. With alien plant species highlighted in **red** text.

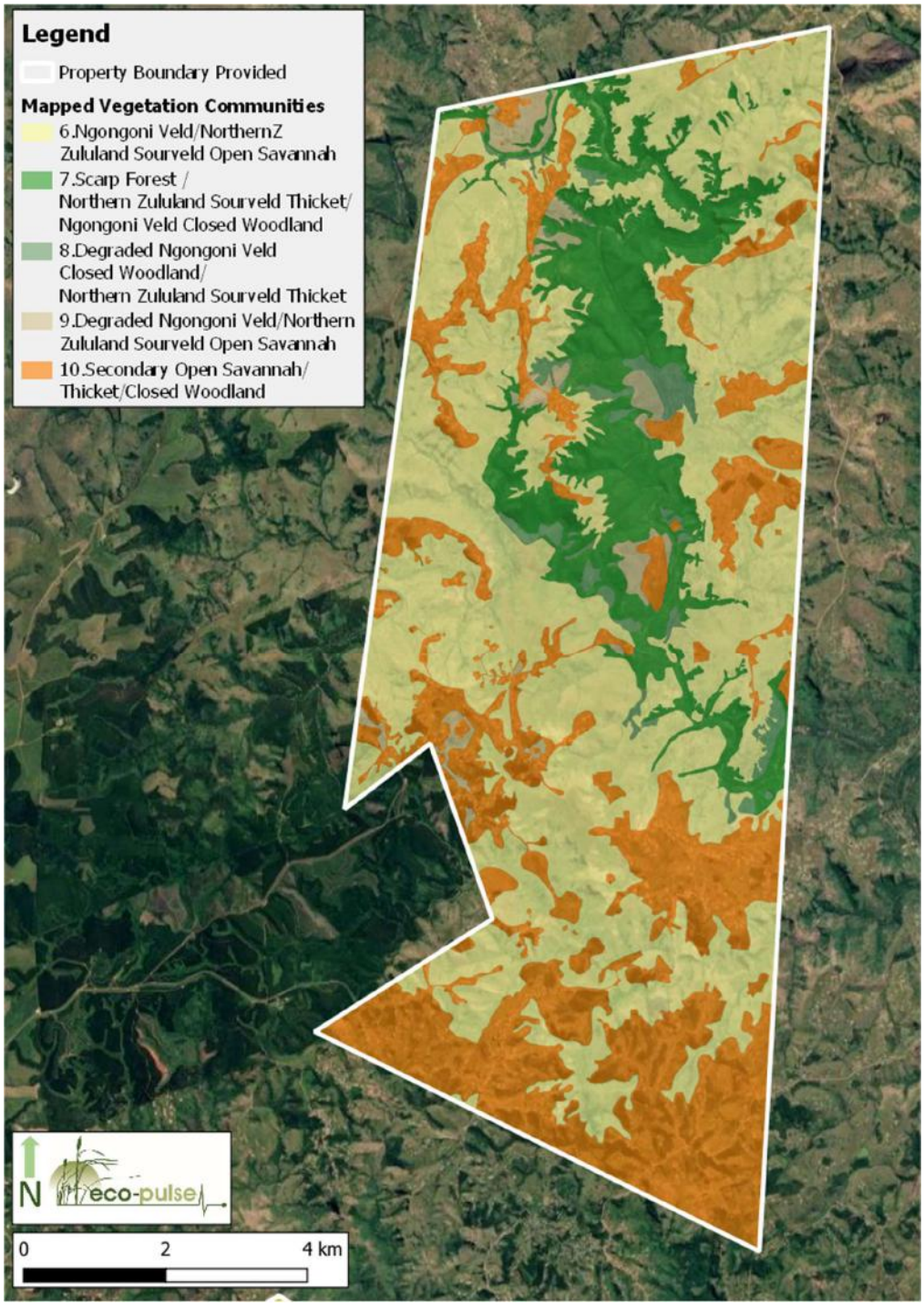

Figure 32. Spatial distribution of identified vegetation communities within the northern block.

4.3.1 Community 6: Ngongoni Veld/Northern Zululand Sourveld Open Savannah

Vegetation cover mapped as part of this community include areas of open savannah that are either categorised as Moist/Dry Coast Hinterland Grassland or Northern Zululand Sourveld at the provincial level. These areas appear to have been spared major anthropogenic disturbances and are hypothesised to retain moderate to high levels of floristic diversity. Based on this supposition, vegetation within this community is considered to be either moderately modified or near-natural and is likely in **fair to good ecological condition**. It should be noted that a number of red-listed and protected plant species are highly likely to occur in this vegetation community and will require further sampling at a later stage, if planning progresses further for this potential proposed development.

4.3.2 Community 7: Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket

Vegetation within this community likely comprises a mixture of degraded Ngongoni Veld/Natal Zululand Sourveld closed woodland or thicket areas which based on examination of aerial imagery are thought to be heavily invaded by invasive alien plant species such as *Chromolaena odorata, Lantana camara* and include areas which were historically open savannah under reference conditions which have now been adversely affected by bush encroachment associated with pioneer species such as *Vachellia natalitia, V. sieberiana, Dichrostachys cinerea* and *Lippia javanica*. These cumulative minor impacts have likely resulted in this vegetation community being **moderately to severely modified and primarily in poor ecological condition** at a desktop level. Nevertheless, this community has the potential to support red listed plant species and protected plant species and therefore may still retain some remnant biodiversity. These areas could be considered in **fair ecological condition** with the potential to be rehabilitated and improve their condition further. Given this vegetation community has the potential to support threatened or protected plant species, this would need to be verified through fieldwork in the appropriate seasonal window, if planning progresses further for this proposed development.

4.3.3 Community 8: Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah

Degraded areas of open savannah categorised as Moist/Dry Coast Hinterland Grassland or Northern Zululand Sourveld at the provincial level, which are situated closer to road networks and associated with less precipitous topography form part of this vegetation community. Likely existing impacts associated with this community include overgrazing by livestock, edge effects/habitat fragmentation, alien plant invasion and bush encroachment. This community has therefore been categorised as moderately to severely modified at a desktop level and is thought to be in **fair to poor ecological condition**, depending on the level of alien plant invasion and the grazing and burning regime prevalent. Areas in fair condition potentially retain some level of forb diversity that would need to be verified through seasonally appropriate sampling, if planning progresses further for this proposed development.

4.3.4 Community 9: Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland

Vegetation cover mapped as part of this community include areas of closed-canopy forest categorised as Eastern Scarp Forest: Northern Coastal Scarp Forest at the provincial level grading into dry thicket vegetation categorised as Ngongoni Veld or Northern Zululand Sourveld that has remained largely undisturbed by direct impacts due to the steep terrain in which it occurs. This vegetation community is hypothesised to retain moderate to high levels of floristic diversity and ranges from natural to moderately modified and is potentially in **fair to good ecological condition**. It should be noted that red-listed and protected plant species are highly likely to occur in this vegetation community and in-field verification and sampling of this vegetation community will be required, if planning progresses further for this proposed development.

4.3.5 Community 10: *Secondary* Open Savannah/Thicket/Closed Woodland

This vegetation has likely suffered disturbance in the past (direct disturbance or disturbance sufficient to facilitate alien plant invasion that has notably reduced the plant biodiversity) and as a result can be considered severely to critically modified and in **poor ecological condition** at a desk-top level. It is likely to contain a similar suite of weedyl pioneer and alien invasive species as community 5 that occurs throughout the southern blocks, however, this would require in-field verification and sampling, if planning progresses further for this proposed mining development.

4.4 Presence of Biota of Conservation Concern

4.4.1 Vegetation Survey Findings – Threatened Flora

The vegetation survey conducted during the rapid field visit to the site confirmed the presence of two floral SCC, namely: a vulnerable sensitive plant species and Butterfly Iris - ***Moraea subsp. graminicola* subsp. *graminicola* (Near Threatened, South African Endemic)**, in the open savannah and grassland areas.

Their conservation importance and recommended best management practices for the conservation of these species is discussed briefly in Table 17 below, with their location on-site indicated in the map in Figure 33. Note: it is likely other areas within the site also support these species and further field surveys within open/savannah grassland, on rock outcrops near the edge of intact thicket, and within intact thicket would need to be undertaken in the appropriate seasonal window for these red listed species, prior to finalisation of preliminary layouts and plans.

Table 17. Floral SCC confirmed to occur on site.

Scientific Name	Conservation status	Criterion	Guidelines[10]	Comment and Conservation Requirements
Sensitive species	Vulnerable	A	If the species has a restricted range, EOO < 2000km², recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable known subpopulation is formally conserved in terms of NEMPA, and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem, or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan, or (iii) on a site associated with additional ecological sensitivities.	Range size is larger than 2000km², however, the species occurs (i) within a threatened ecosystem on-site and (ii) within an area required for conservation in terms of the KZN SCA and (iii) within an area that has additional ecological sensitives i.e. other threatened plant species. On this basis no further loss in habitat is recommended. A minimum 200m buffer (refer to Figure 33) which is standard minimum best practice for red listed species, is likely insufficient for the continued persistence of populations of species on site as this runs the risk of populations becoming fragmented from other intact areas of vegetation, reducing their resilience to disturbance and ability to recover from anthropogenic impacts, resulting in their eventual decline and local extirpation from the study area. Therefore, protection of all habitat that may play host to this species is required. i.e., all natural/near natural/moderately modified open savannah/grassland or thicket/closed woodland vegetation on site. Namely, community 1 and 6 and Community 2 and 7.
Moraea graminicola subsp. graminicola	Near Threatened South African Endemic	A	If the species has a restricted range, EOO < 2000km², recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable known subpopulation is formally conserved in terms of NEMPA, and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem, or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan, or (iii) on a site associated with additional ecological sensitivities.	EOO is 9500km² therefore range size is larger than 2000km². However, the species is only known from 10 – 20 remaining locations and as above occurs (i) within a threatened ecosystem on-site and (ii) within an area required for conservation in terms of the KZN SCA and (iii) within an area that has additional ecological sensitives i.e., other threatened plant species. On this basis no further loss in habitat is essential. A minimum 200m buffer (refer to Figure 33) which is standard minimum best practice for red listed species, is likely insufficient for the continued persistence of populations of species on site as this runs the risk of populations becoming fragmented from other intact areas of vegetation, reducing their resilience to disturbance and ability to recover from anthropogenic

[10] South African National Biodiversity Institute (SANBI). 2020. *Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa*. South African National Biodiversity Institute, Pretoria. Version 1.2020.

Scientific Name	Conservation status	Criterion	Guidelines[10]	Comment and Conservation Requirements
		B	The species is approaching thresholds for listing as threatened but there are still a number of subpopulations in existence and therefore there is a need to minimise loss of habitat, **Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem**, or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan, or (iii) on a site associated with additional ecological sensitivities.	impacts, resulting in their eventual decline and local extirpation from the study area. Therefore, protection of all habitat that may play host to this species is required. i.e., all natural/near natural/moderately modified open savannah/ vegetation on site, namely, community 1 and 6.

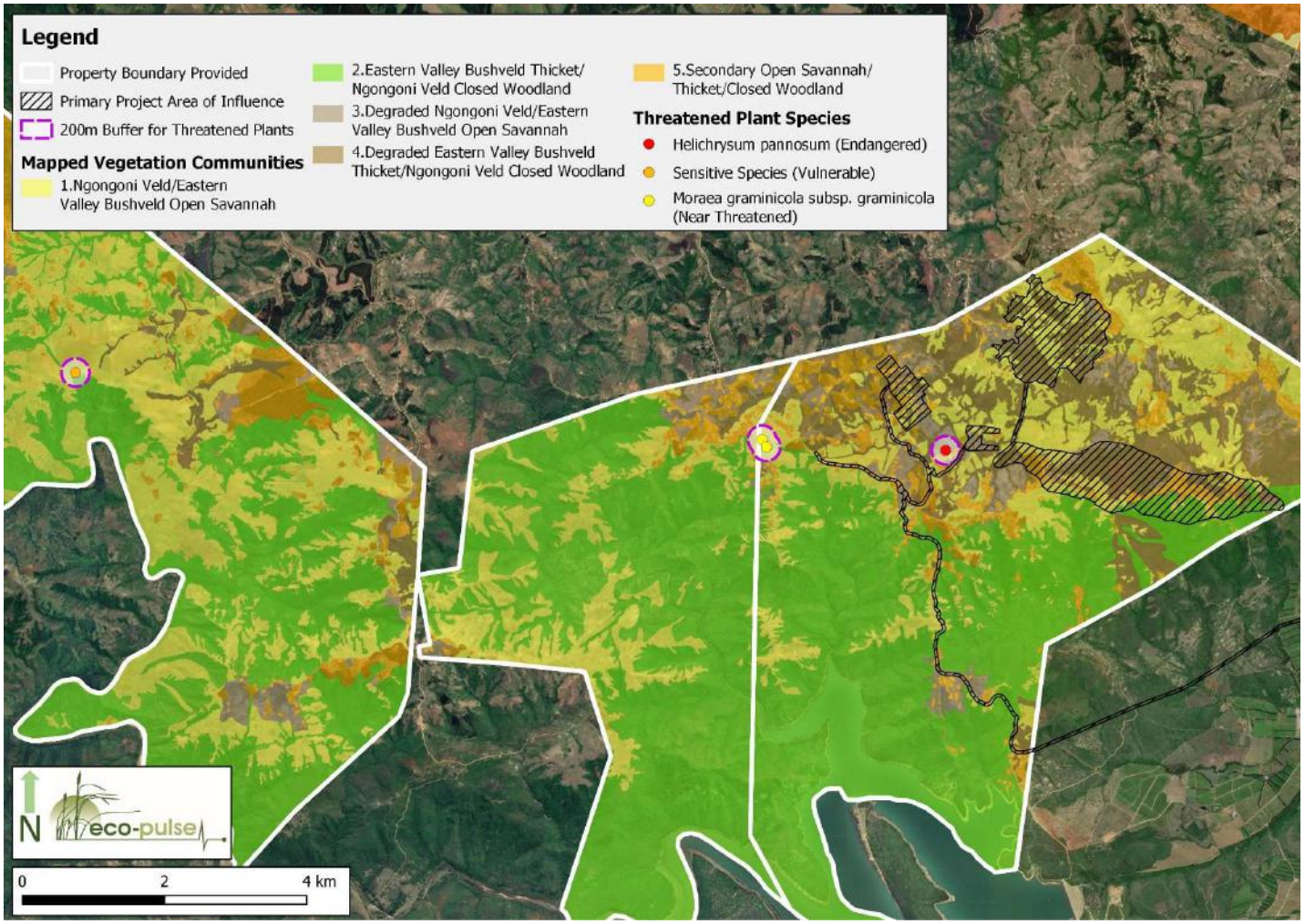

Figure 33. Map showing the distribution of red-listed plant species confirmed to be on-site along with their minimum best practice 200m buffer recommended in accordance with the recently published species guidelines (SANBI, 2020).

Given the confirmed presence of two red-listed plant species, the site's sensitivity with regards to the **Plant Species Theme is revised from Medium to Very High.**

4.4.2 Desktop Threatened Biota Potential Occurrence (POC) Assessment

A desktop POC assessment of biota (flora and fauna) of conservation concern was also undertaken for the project in order to inform the need for any further species-specific assessments. Detailed (individual) summaries of the desktop likelihood of occurrence assessment are included in **Annexure B** of the report. To summarise the desktop POC assessment:

- **Flora**: Field verification conducted in April 2021 confirmed the presence of 2 floral SCC in the grassland/open savannah vegetation on site. An additional 24 floral SCC either have a high or moderate possibility of occurring on site, namely:
    - *Acalypha entumenica* – Endangered Endemic (Medium: Possible)
    - *Sensitive species* – Endangered (Medium: Possible)
    - *Sensitive species* **– Endangered Endemic (High: Probable)**
    - *Brachystelma chlorozonum* – Near Threatened Endemic (High: Probable)
    - ***Brachystelma gerrardii* – Endangered (High: Probable)**
    - Cassipourea gummiflua var. verticillata -Vulnerable (High: Probable)
    - *Sensitive species* - Vulnerable Endemic (High: Probable)
    - *Sensitive species* – Vulnerable (High: Probable)
    - *Sensitive species* – Vulnerable Endemic (High: Probable)
    - *Sensitive species* – Vulnerable Endemic
    - *Dierama dubium* – Vulnerable Endemic (High: Probable)
    - *Sensitive species* – Vulnerable (High: Probable)
    - *Disperis woodii* – Vulnerable (High: Probable)
    - *Emplectanthus cordatus* – Vulnerable Endemic (High: Probable)
    - *Sensitive species* – Vulnerable (High: Probable)
    - *Faurea macnaughtonii* – Rare (Medium: Possible)
    - ***Gerbera aurantiaca* – Endangered Endemic (High: Probable)**
    - *Sensitive species* – Rare (Medium: Possible)
    - ***Helichrysum pannosum* – Endangered Endemic (High: Probable)**
    - *Mystacidium aliceae* - Vulnerable Endemic (High: Probable)
    - *Plectranthus esculentus* - Data Deficient (Insufficient Information) (Medium: Possible)

- *Prunus africana* – Vulnerable (High: Probable)
- *Salpinctium natalense* – Rare Endemic (Medium: Possible)
- ***Selago zuluensis* – Endangered (High: Probable)**

- **Fauna (mammals):** Conservation important mammal species are unlikely to occur within the degraded secondary vegetation and transformed habitats in the study area given the lack of suitable habitat, although nine (9) mammal species may potentially utilise the more intact thicket/closed woodland, open savannah and grassland patches on site. Either as residents or transient visitors that use intact vegetation as an important ecological corridor namely: Blue duiker - *Philantomba monticola bicolor* (Vulnerable), Maquassie Musk Shrew - *Crocidura maquassiensis* (Vulnerable), Serval - *Leptailurus serval* (Near Threatened), Water Rat - *Dasymys imcomtus* (Near Threatened), African Striped Weasel - *Poecilogale albinucha* (Near Threatened), Cape Clawless Otter - *Aonyx capensis* (Near Threatened), Leopard - *Panthera pardus* (Vulnerable), Swamp Musk Shrew - *Crocidura mariquensis (*Near Threatened), Samango Monkey - *Cercopithecus albogularis labiatus* (Endangered).
- **Fauna (birds):** Tawny Eagle - *Aquila rapax* (Endangered), African marsh-harrier - *Circus ranivorus* (Endangered), European Roller - *Coracias garrulus* (Near Threatened), Lanner Falcon - *Falco biarmicus* (Vulnerable), Southern Bald Ibis - *Geronticus calvis* (Vulnerable), Martial Eagle - *Polemaetus bellicosus* (Endangered), Secretary bird - *Sagittarius serpentarius* (Vulnerable) Crowned Eagle - *Stephanoaetus coronatus* (Vulnerable).
- **Fauna (reptiles):** There is a strong possibility that reptile species 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 - *Python natalensis* (Least Concern – Protected).
- **Fauna (amphibians):** Three frog SCC may occur within specific freshwater habitats on site, they include Bilbo's Rain Frog - *Breviceps bagginsi* (Vulnerable), the Natal Cascade Frog - *Hadromorphryne natalensis* (Not red listed but threatened by introduced trout and habitat destruction), and the Shovel-Nosed Frog - *Hemisus guttatus* (Vulnerable).
- **Fauna (invertebrates):** Very few formal surveys of invertebrates have been carried out in the study area. A review of available online/desktop databases highlighted seventeen (17) species that could potentially occur in vegetation communities that are in good ecological condition on site.

4.5 Grassland Ecosystems – Undervalued and Overlooked

Based on the desktop ecological context and baseline assessment above it is evident that large portions of the study area comprise savannah or grassland vegetation communities. It has been noted by authors such as Veldman *et al.* (2015), that until recently the value of ancient grassland ecosystems and their rich level of herbaceous plant diversity has been overlooked, largely due to a lack of understanding and research regarding the substantive differences between natural grassland ecosystems and their altered anthropogenic counterparts. Grasslands are deemed to be among the most biodiverse vegetation types on the planet and are reported to play host to more plant species at a fine spatial grain than tropical rainforests and the floristically diverse *sclerophyllous* fynbos of the south-western Cape (Scott-Shaw & Morris, 2015). "*Many of the world's grasslands are ancient ecosystems composed of communities that require centuries to assemble and perennial plants capable of living for decades to millennia*" (Veldman *et al*. 2015). These ancient ecosystems have in the past and are currently being lost to agriculture, tree plantations, mining and urban sprawl (Veldman *et al*. 2015; Parr *et al*. 2014). According to these authors, remaining grassland ecosystems are threatened by degradation in the form of alien plant invasion, poor domestic livestock management, altered fire regimes, elevated atmospheric carbon dioxide and nitrogen deposition. It is therefore important to take stock of the inherent value of these ecosystems when assessing their ecological importance and sensitivity to anthropogenic impacts i.e., when assessing Site Ecological Importance (Section 4.6 Site Ecological Importance Assessment) and when assessing the significance of impacts to these ecosystems i.e., during the impact assessment process (Section 7).The key values of intact grassland ecosystems are outlined below to provide a frame of reference/context for the site ecological importance assessment and impact assessment that follows.

4.5.1 Grassland forb diversity

Natural grassland ecosystems are characterised by a high level of forb diversity, which contribute the bulk of the total plant species richness in these ecosystems with grass species contributing 20% or less of the species richness, despite comprising the majority of the phytomass (Scott-Shaw & Morris, 2015). Globally and within southern Africa there has been a greater level of research focus on the autecology and community compositional response of grass species deemed important for livestock production (O'Connor et al. 2010; Scott-Shaw & Morris, 2015), and conversely, grassland forbs have been largely understudied or overlooked due to their low value as forage for livestock in grazed natural grasslands. As a result, very little is known about the possible functional roles of grassland forb species and the potential ecological consequences of any depletion of populations of forb species. This has unfortunately translated into a lack of concern over the anthropogenic impacts that have caused forb biodiversity loss in these important ecosystems (Veldman *et al*., 2015). To promote the recognition and conservation of natural grasslands, authors such as Veldman *et al.* (2015) propose extending the term "old growth", which is widely used to refer to intact ancient forest ecosystems, to intact ancient grassland ecosystems, which will aid in distinguishing ecosystems with high conservation value and unique ecological attributes from grassland vegetation that forms over short timescales in response to human land uses, which has been referred to as "secondary grassland" communities in this report.

There is a growing body of literature supported by empirical evidence that lends strength to the argument that conserving plant species diversity contributes to the sustained function of healthy ecosystems; with high levels of species richness linked to improving a number of ecosystem functions related to the use, storage and cycling of nutrients in dry rangelands and serving as a measure of ecosystem resilience against climate change and desertification (Scott-Shaw & Morris, 2015). Consensus between several individual experiments and meta-analyses is that loss of individual plant species, even rarer ones, will reduce overall productivity stability and efficiency of 'Ecosystem functions' and the ability of vegetation to sustain the delivery of various regulatory and provisioning ecosystem services (Scott-Shaw & Morris, 2015).

Given that grassland ecosystems are considered one of the most threatened ecosystems there is an urgent need to first and foremost conserve and secondly attempt to restore old growth grasslands – not only to preserve their biodiversity but also to concurrently retain their invaluable contributions with regards to provisioning and regulatory ecosystem services.

4.5.2 Functional Value of Grassland Ecosystems

Globally, grasslands cover close to one-third of the Earth's terrestrial landscapes and the important ecosystem services they supply represent invaluable environmental, economic and cultural values (Bengtsson *et al*., 2019; Zaloumis, 2013; O'Connor & Kuyler, 2009; Overbeck *et al*., 2007). However, their extent and condition are in decline worldwide, with 60% of the biome in southern Africa already irreversibly transformed (Bengtsson *et al*., 2019). Moreover, grasslands are still undervalued or overlooked in the paradigm of ecosystem service provision and have received less attention in the literature in comparison to other production systems such as forest and cropland (Bengtsson *et al*., 2019).

At the local scale grasslands contribute to food production and biodiversity maintenance, while at the landscape scale they are known to contribute to pollination, water regulation and recreational services and potentially climate regulation at the global scale (although their role in climate regulation and carbon sequestration still needs to be further investigated and more clearly defined with regards to how they fit into global carbon and energy cycles) (Bengtsson *et al*., 2019; Zaloumis, 2013).

Grasslands are important water production landscapes as they contribute significantly to maintaining the quality and quantity of water entering rivers, streams and ground water aquifers (SANBI, 2013). The herbaceous vegetation within grassland environments is effective at capturing water and optimising infiltration rates, thereby limiting surface run-off and reducing soil loss via erosion (SANBI, 2013). Consequently, grasslands are capable of enhancing and regulating stream flow by retaining water within their soil profile and gradually releasing this water into downstream streams and rivers through diffuse percolation and sub-surface flow which often ensures that base flows within these water resources are maintained during the dry season (SANBI, 2013). Moreover, by decreasing rates of surface runoff and the velocity of flows, grassland vegetation provides valuable flood attenuation services during high rainfall events (Bengtsson *et al*., 2019).

Within South Africa the value of grassland ecosystems with regards to regulating water supply is particularly pertinent, given the semi-arid climate and the fact that South Africa is already a water-scarce

country. According to SANBI (2013), "*Grasslands comprise more than half of the Strategic Water Source Areas of the country – areas that cover less than 5% of South Africa's land surface, but that receive the majority of its rainfall, and yield more than 80% of all water run-off. At least five major river systems have their headwaters in grasslands, and 34% of the country's remaining wetlands occur in grassland landscapes*."

Over the course of the next 20 years water demand in the country is projected to rise by roughly 50%, which will likely be compounded by unsustainable land-uses, additional loss of old-growth grassland habitat and the effects of climate change (SANBI, 2013). In this context, rehabilitation and maintenance of healthy grasslands and associated freshwater ecosystems represents one of many potential solutions desperately needed to strengthen South Africa's water security (SANBI, 2013).

4.5.3 Grasslands in South Africa: National & Provincial Perspectives

Grasslands within South Africa are poorly protected, with only 2% statutorily conserved in various protected areas and with the majority of these being a small fraction falling within the Drakensburg Transfrontier Park (O'Connor *et al.,* 2010). Consequently, conserved grasslands fall far short of representing the range of grassland types that occur in the country.

KwaZulu-Natal, as with many other parts of South Africa, is experiencing a rapid rate of habitat loss, which raises questions generally about whether sustainable resource extraction can be achieved while retaining a reasonable degree of ecosystem functioning, biodiversity and resilience (Jewitt, 2017). Within the province, grassland and savanna ecosystems (which comprise the majority of the land cover) have been largely transformed with a significant proportion of the remaining grass-dominated ecosystems being secondary or degraded vegetation communities, while "old growth" grasslands form a small fraction of the extant landcover (Jewitt, 2017). Furthermore, there is a paucity of empirical baseline data and records available that documents shifts in forb diversity in these grassland ecosystems from reference conditions, leading to a high degree of uncertainty regarding the extent of forb species loss that has already occurred (for example Zaloumis *et al*., 2008 ; Styles, 2017c).

In addition to insufficient baseline data, there is also a large degree of uncertainty relating to grassland restoration, both abroad and in the South African context, in particular, with regards to restoring the high level of forb diversity characteristic of "old growth" grassland systems (Prober & Thiele, 2005; Zaloumis *et al*., 2008 ; Zaloumis, 2013). Studies that have interrogated this challenge have concluded that grassland restoration is more complex than originally conceived and that passive restoration of grassland systems is unlikely to yield success in restoring the level of floral diversity observed in intact systems, with the need to investigate various avenues of active restoration identified as a key knowledge gap to be filled in future (Zaloumis *et al*., 2008 ; Zaloumis, 2013).

Although the rehabilitation of degraded/transformed grasslands does not restore similar levels of plant diversity, secondary grassland areas have been highlighted as essential for the provision of various supporting and regulating services; that at a landscape scale, can contribute to the resilience of grassland habitat networks namely by providing faunal movement corridors, enhancing nutrient cycling, carbon storage and water regulation processes while also providing tourism and recreational

opportunities and resources such as medicinal plants, fibres for crafts and thatching, forage for livestock and some edible food sources (SANBI, 2013 ; Bengsston *et al.,* 2019).

The above context was taken into consideration when assessing Site Ecological Importance (Section 4.6 below) and anticipated impacts associated with the proposed iron ore mine (Section 7 below).

4.6 Site Ecological Importance Assessment

The results of the SEI assessment are outlined in Table 18 for the vegetation communities mapped for the southern blocks (also see Figure 34 and Figure 35) and in Table 19 for the northern block, likewise, shown graphically in Figure 36 below. SEI ratings assigned at a desktop level to vegetation communities within the northern block are subject to revision following additional fieldwork.

Based on the SEI Assessment for the ten broad vegetation communities on site, the Very High Sensitivity assigned to the study area is retained for the Terrestrial Biodiversity Theme. The proposed mine layout covers ~193.8 ha of Very High SEI Vegetation.

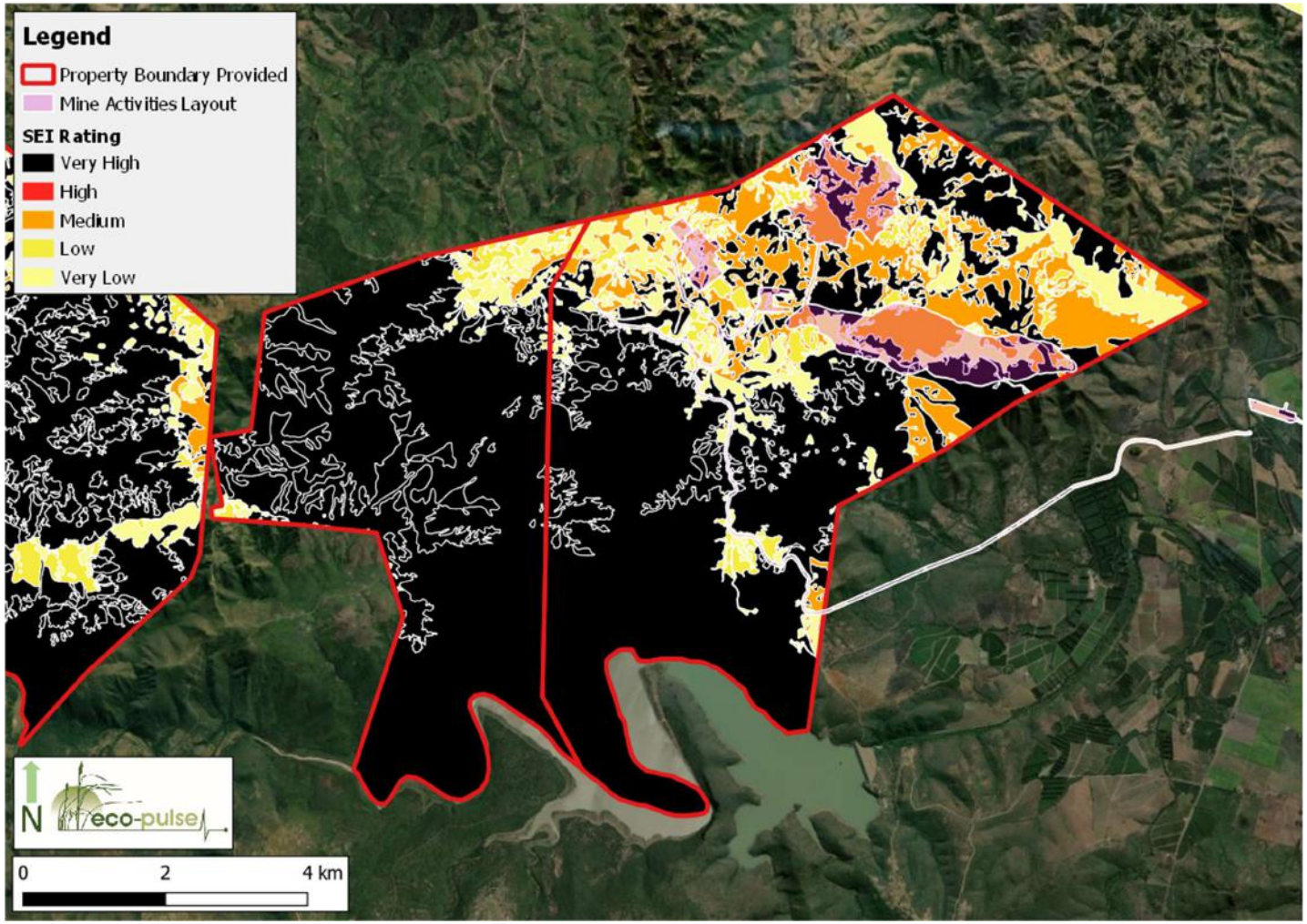

Figure 34. SEI Ratings for the vegetation communities mapped across the south central and south-eastern blocks.

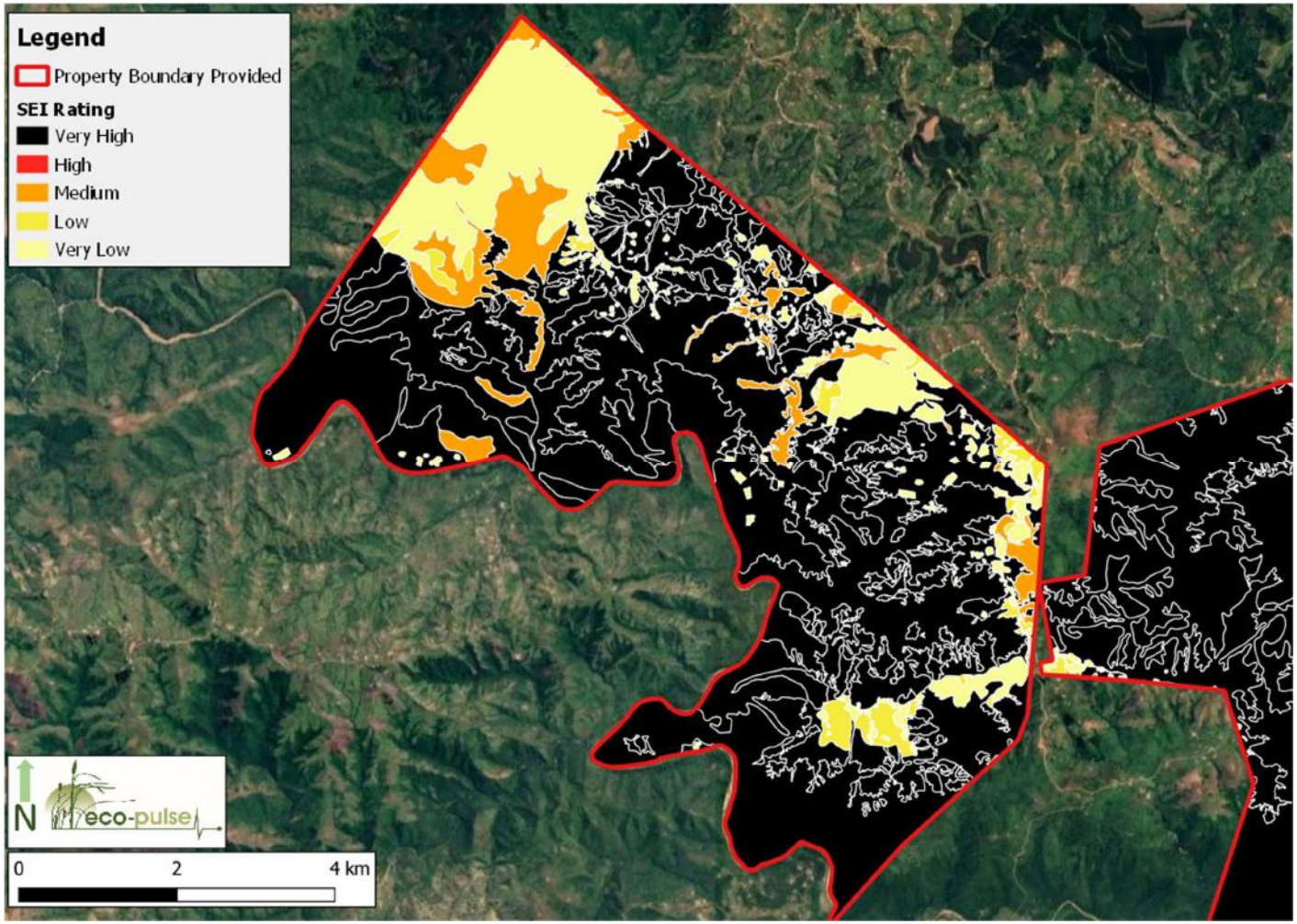

Figure 35. SEI Ratings for the vegetation communities mapped across the southwestern block.

Table 18. Summary of terrestrial habitat ecological importance ratings for vegetation communities mapped across the southern blocks.

	Community 1: Ngongoni Veld/ Eastern Valley Bushveld Open Savannah	Community 2: Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Community 3: Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah	Community 4: Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Community 5: Secondary Open Savannah/Thicket/Closed Woodland
CONSERVATION IMPORTANCE	**High** A number of threatened plant species listed under IUCN criteria other than A are highly likely to occur within this vegetation community, with Moist Coast Hinterland Grassland on site in good condition providing suitable habitat for these threatened species Moreover, this vegetation community contains a large area of natural habitat of VU ecosystem type.	**High** *Prunus africana* which is considered VU under criteria A and C, may occur within the thicket vegetation on site and it is estimated that less than 10 000 mature individuals of the species occur in the wild. Other species confirmed or likely to occur within this vegetation community include *two sensitive plant species* both listed under criterion A only as vulnerable.	**Low** <50% of receptor contains natural habitat with limited potential to support SCC	**Medium** > 50 % of receptor contains natural habitat with potential to support SCC	**Very Low** Minimal to no natural habitat remaining highly unlikely that populations of SCC occur
FUNCTIONAL INTEGRITY	**High** 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.	**Very High** Very large (>100 ha) intact area for any conservation status of ecosystem type.	**Medium** 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	**Medium** 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** Low rehab potential, but migrations still possible

	Community 1: Ngongoni Veld/ Eastern Valley Bushveld Open Savannah	Community 2: Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Community 3: Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah	Community 4: Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Community 5: Secondary Open Savannah/Thicket/Closed Woodland
			past disturbance; moderate rehabilitation potential.		
BIODIVERSITY IMPORTANCE	**High**	**Very High**	**Low**	**Medium**	**Very Low**
RECEPTOR RESILIENCE	**Very Low** This savannah retains a level of diversity not encountered in secondary systems as it has never been planted for cultivation or timber. Given the fact that savannah/ grassland systems have been shown to lose their resilience as a result of habitat fragmentation and the fact that once transformed in any way, they are unlikely to fully recover the system should be regarded as having Very Low Resilience i.e., it should be viewed as habitat unable to recover from major impacts such as reduction in extent.	**Low** This vegetation community may play host to a number of rare endemic and/or threatened species with limited/scattered occurrence which if lost may not be replaced and has a higher level of diversity which may be lost if affected by anthropogenic impacts with >15 years likely required to restore less than 50% species composition.	**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** Despite being invaded by IAPs this vegetation community may play host to remnant plant species of conservation concern, which if lost may not be replaced. However, may recover the majority of its current species complement after 10 years or more.	**Very High** Habitat that can recover rapidly (~ less than 5 years) to restore > 70 % of the original species composition and functionality of the receptor.
SITE ECOLOGICAL IMPORTANCE RATING	**Very High**	**Very High**	**Low**	**Medium**	**Very Low**

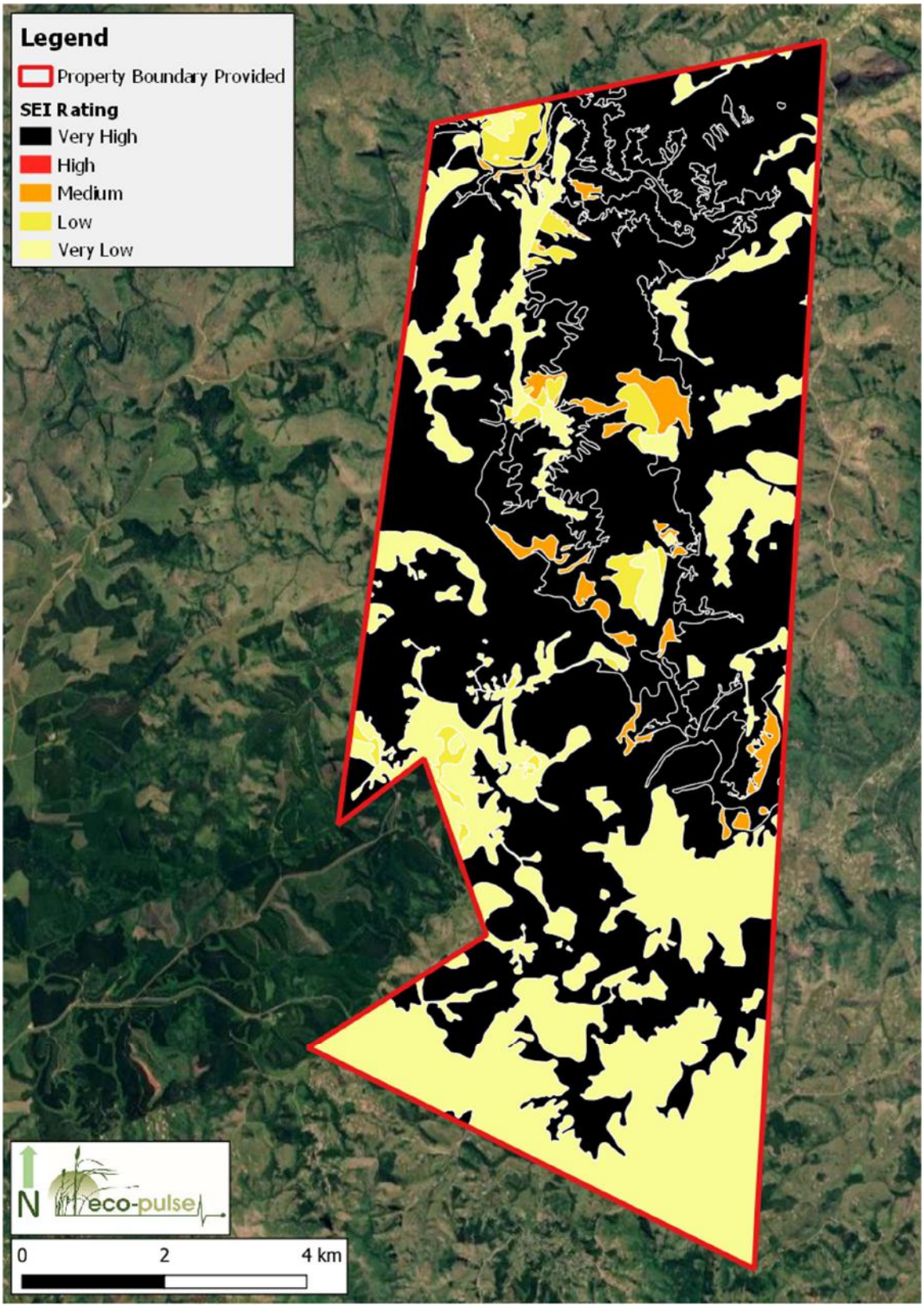

Figure 36. Map showing SEI ratings for vegetation communities mapped for the northern block.

Table 19. Summary of terrestrial habitat ecological importance ratings for vegetation communities mapped for the northern block.

	Community 6: Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Community 7: Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland	Community 8: Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket	Community 9: Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Community 10: Secondary Open Savannah/ Thicket/Closed Woodland
CONSERVATION IMPORTANCE	**High** A number of threatened plant species listed under IUCN criteria other than A are highly likely to occur within this vegetation community, with Moist Coast Hinterland Grassland on site in good condition providing suitable habitat for these threatened species Moreover, this vegetation community contains a large area of natural habitat of VU ecosystem type.	**High** *Prunus africana* which is considered Vulnerable under IUCN criteria A and C, may occur within the thicket vegetation on site and it is estimated that less than 10 000 mature individuals of the species occur in the wild. In addition, an *endangered sensitive species* and a vulnerable sensitive species may occur with steep Scarp Forest that forms part of this vegetation community which are also listed under IUCN criteria other than A, For this reason a 'High' rating is assigned to this vegetation community which is species driven. Other species confirmed or likely to occur within this vegetation community include *two vulnerable sensitive plant species* and a vulnerable sensitive species.	**Low** <50% of receptor contains natural habitat with limited potential to support SCC .	**Medium** > 50 % of receptor contains natural habitat with potential to support SCC .	**Very Low** Minimal to no natural habitat remaining highly unlikely that populations of SCC occur

	Community 6: Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Community 7: Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland	Community 8: Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket	Community 9: Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Community 10: Secondary Open Savannah/ Thicket/Closed Woodland
FUNCTIONAL INTEGRITY	**High** 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.	**Very High** Very large (>100 ha) intact area for any conservation status of ecosystem type.	**Medium** 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.	**Medium** 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** Low rehab potential, but migrations still possible
BIODIVERSITY IMPORTANCE	**High**	**Very High**	**Low**	**Medium**	**Very Low**
RECEPTOR RESILIENCE	This savannah retains a level of diversity not encountered in secondary systems as it has never been planted for cultivation or timber. Given the fact that savannah/grassland systems have been shown to lose their resilience as a result of habitat fragmentation and the fact that once transformed in any way, they	**Low** This vegetation community may play host to a number of rare endemic and/or threatened species with limited/scattered occurrence which if lost may not be replaced and has a higher level of diversity which may be lost if affected by anthropogenic impacts with >15 years likely required to	**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	**Medium** Despite being invaded by IAPs this vegetation community may play host to remnant plant species of conservation concern, which if lost may not be replaced. However, may recover the majority of its current species complement after 10 years or more.	**Very High** Habitat that can recover rapidly (~ less than 5 years) to restore > 70 % of the original species composition and functionality of the receptor.

	Community 6: Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Community 7: Scarp Forest /Northern Zululand Sourveld Thicket/Ngongoni Veld Closed Woodland	Community 8: Degraded Ngongoni Veld Closed Woodland/Northern Zululand Sourveld Thicket	Community 9: Degraded Ngongoni Veld/Northern Zululand Sourveld Open Savannah	Community 10: Secondary Open Savannah/ Thicket/Closed Woodland
	are unlikely to fully recover the system should be regarded as having Very Low Resilience i.e., it should be viewed as habitat unable to recover from major impacts such as reduction in extent.	restore less than 50% species composition.	likelihood of returning to a site once the disturbance or impact has been removed		
SITE ECOLOGICAL IMPORTANCE RATING	**Very High**	**Very High**	**Low**	**Medium**	**Very Low**

5 DEFINING IMPACTS

This section deals with defining the potential risks and impacts associated with the various phases of the planned iron ore mining operation. Each of the potential impact consequences discussed in this section of the report (section 5) are assessed separately for the mine construction, operational and decommissioning/closure phases under 'realistic poor' (pre-) and 'realistic good' or 'best practice' (post) mitigation scenarios as defined in the 'methods' section of the report (refer specifically to Section 2.3), this impact assessment is contained in section 7 of this report, following on from a description of the mitigation measures recommended under a realistic "good" mitigation scenario in section 6 of this report.

5.1 Project Area of Influence

To assess impacts to the study area, it's important to first define the Project Area of Influence (PAOI). For the proposed development, based on the development footprint provided below (Figure 37). In particular the focus of this assessment is on the infrastructure depicted In Figure 37and listed below:

- The South-East Pit (current estimated extent 4km long and ~1km wide at its widest point);
- Primary Crusher;
- Processing Plant;
- Incoming Power Yard;
- WRD;
- Overland Piping for Bulkwater (Raw) Supply and Raw Water Pump to the Processing Plant;
- Conceptual Plant Access Road; and
- Railway Siding.

Note the layout provided as part of this high-level impact assessment may change in terms of siting and extent, if this is the case changes will need to be assessed separately and are considered outside the scope of this impact assessment.

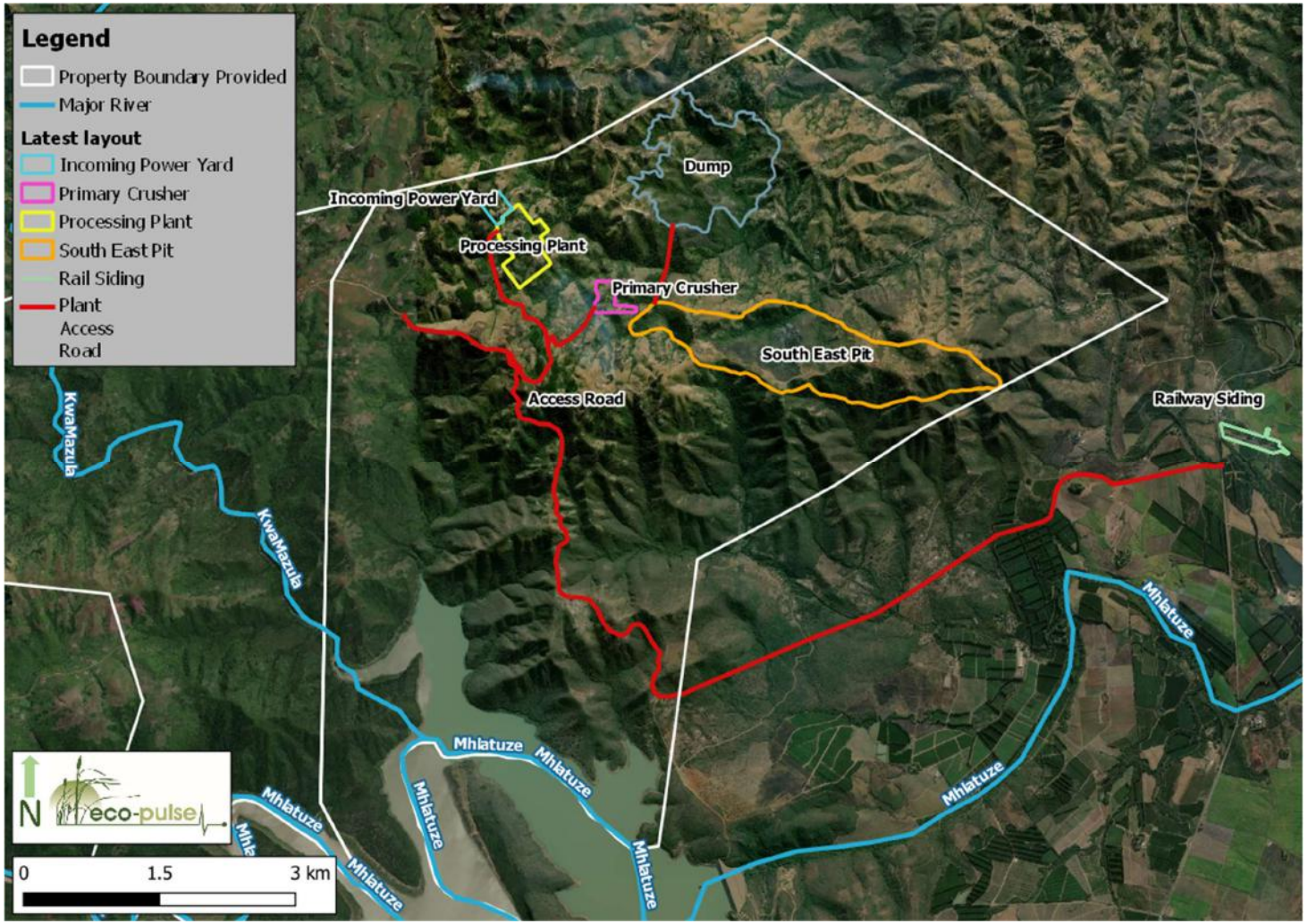

Figure 37. Conceptual layout provided by SLR to inform the high-level impact assessment for phase 1 of the proposed iron ore mine.

The PAOI was defined in terms of primary (direct footprint), and secondary and tertiary (indirect) influences.

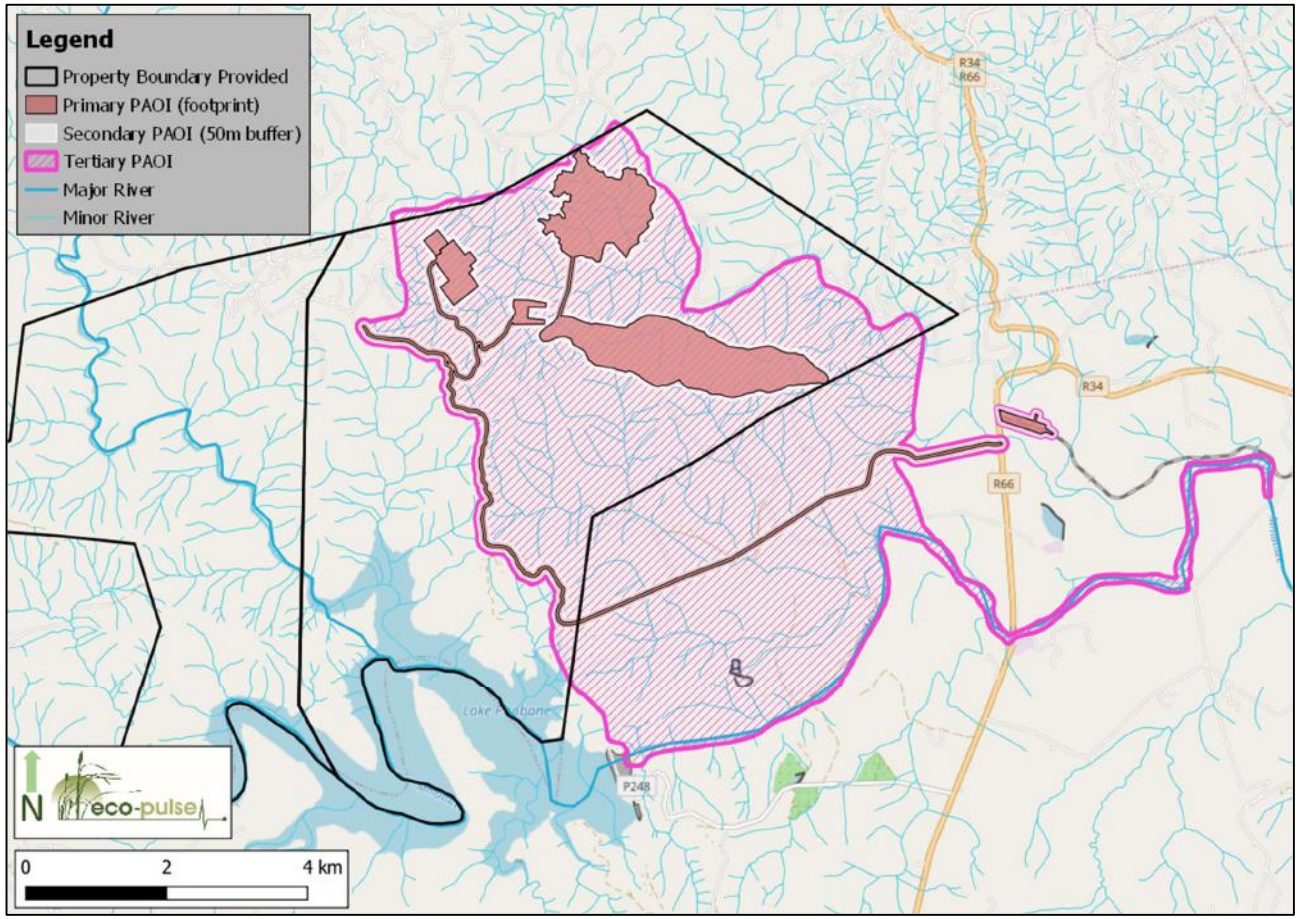

Figure 38. The project area of influence across the south central block and just beyond.

5.2 Defining Impact Receptors

Taking the PAOI into consideration, potential impact receptors within the study area were then defined. These were defined in terms of the kinds of floral species found on the site, the habitats, vegetation, or structural units they occur in, as well as important ecological processes that they depend on (Table 20; Figure 39).

Table 20. Impact receptors.

Potential Impact Receptor	Potentially Affected Species	Ecological Processes	Project Component/s
Community 1: Ngongoni Veld/Eastern Valley Bushveld Open Savannah	All open grassland SCC	Plant diversity; feeding habitat; specific habitat; pollination	Whole development footprint
Community 2: Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	All thicket/closed woodland SCC	Plant diversity; feeding habitat; specific habitat; pollination	South East Pit, overland piping, plant access road, railway line and railway siding
Community 3: Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah	All open grassland SCC	Plant diversity; feeding habitat; specific habitat; pollination	Whole development footprint
Community 4: Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	All thicket/closed woodland SCC	Corridors for movement, habitat, remnant specific plant habitat, pollination	Whole development footprint
Community 5: Secondary Open Savannah/Thicket/Close Woodland	All faunal SCC	Corridors for movement, limited habitat	Whole development footprint

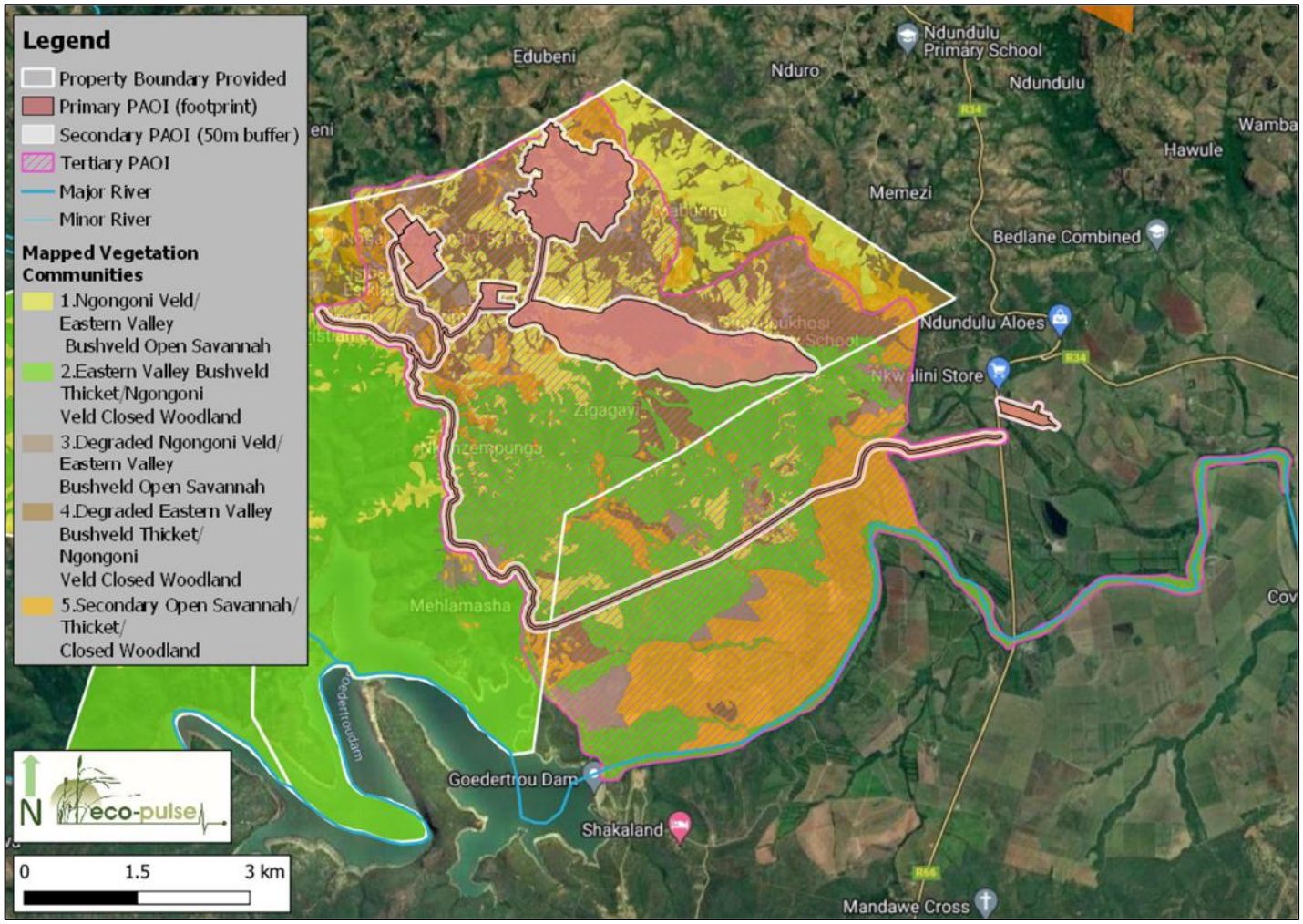

Figure 39. Vegetation communities /impact receptors affected within the mapped project area of influence.

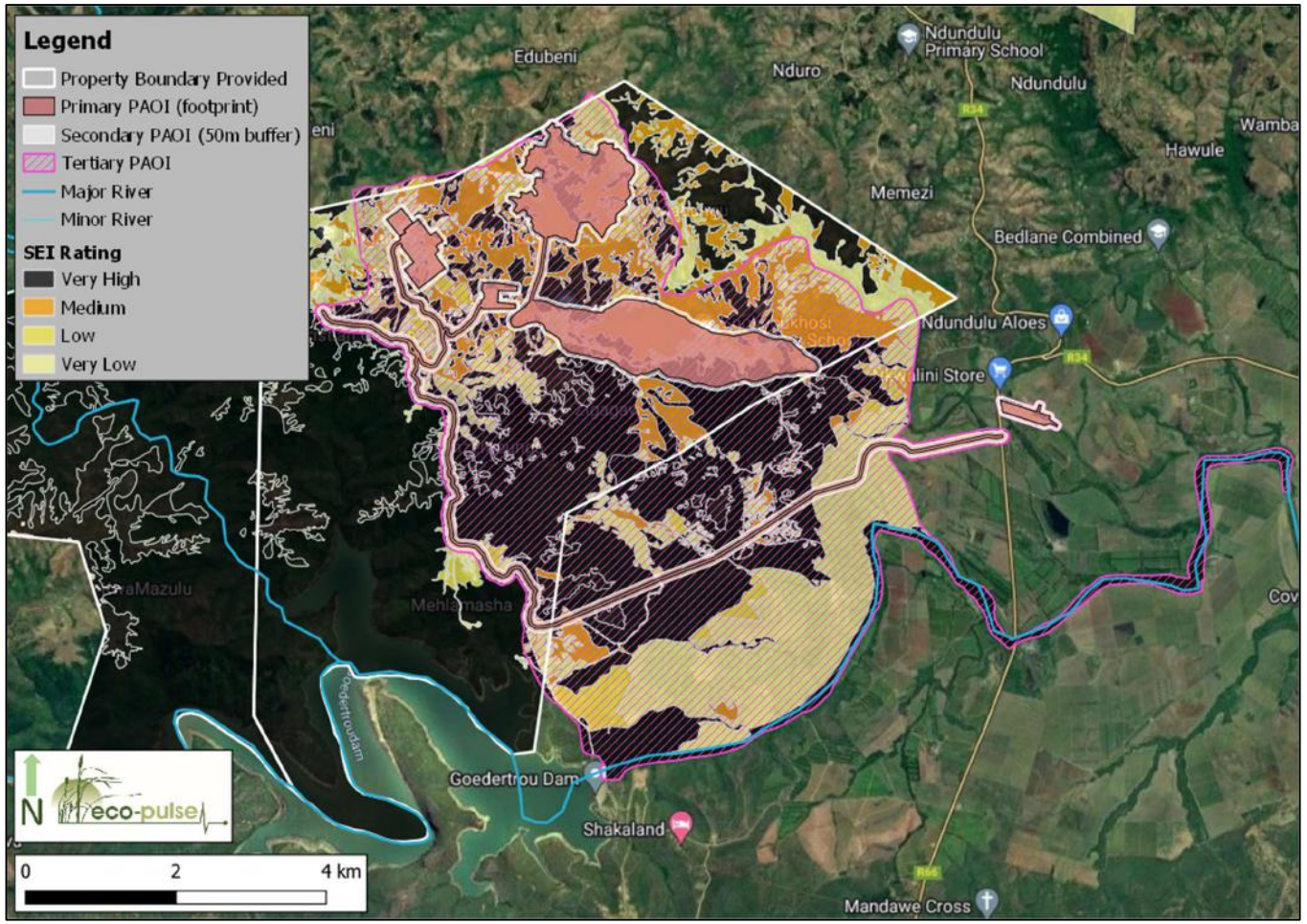

Figure 40. SEI Ratings for impact receptors within the project area of influence.

5.3 Impact Description

Mining and related activities can often lead to irreversible damage or longer term, gradual and cumulative changes to terrestrial ecosystems. This section of the report explores the potential impacts of mining on terrestrial ecosystems for the project area.

The impacts of mining on terrestrial ecosystems can be varied and depend on a range of factors, including:

- the scale and extent of mining
- the type of material being mined and waste products involved;
- the potential for Acid Mine Drainage (AMD);
- the type of terrain and associated climatic features (including the scarcity of water);
- the functioning, importance and sensitivity of the receiving environment; and
- the efficiency and effectiveness of any environmental management systems that are employed by the mine and the practicalities of implementation.

In addition, each stage of the mining project can have adverse effects on the environment, which can occur at various temporal scales ranging from short term impacts to longer term impacts and can also incur permanent/irreversible latent impacts that continue to affect biodiversity and ecosystem services well after mine closure (DEA *et al*., 2013). Typical mining activities and their associated environmental impacts identified by Ashton *et al*. (2001) have been summarized in Table 21(below) and are differentiated for the various mining phases. This was used primarily to inform the identification of potential impacts associated with the iron ore mining project. Impacts identified were based on an understanding of the 'stressors' likely to be associated with mining activities, the importance and sensitivity of the receiving environment (ascertained from the baseline assessment), the proposed development layout and the identification of factors that could affect the receiving environment through the various anticipated project phases.

STRESSOR → RISK → IMPACT

Potential impact-causing activities identified for the construction, operational and de-commissioning phases of the project are summarised in **Error! Reference source not found.**. The impact identification process considers the Phase 1 conceptual plan outlined in Section 1.2, and depicted in Figure 37 above, which has been derived from the AMEC Prefeasibility Engineering Study (2015) and the Geothetha (2023) TSF and WRD Design Report. At this time impacts have been described at a 'high' or conceptual level.

Note: This section does not contain an exhaustive list of impacts associated with the proposed project, and only briefly addresses what are deemed to be the most pertinent impacts to onsite terrestrial ecosystems.

For the purposes of this assessment, the potential impacts to the terrestrial flora and local terrestrial biodiversity resulting from the proposed activities can be grouped into the following impact categories:

- **Direct ecosystem destruction and modification impacts (C1-1, O1-1, D1-1)** – This impact refers to the direct physical destruction and/or modification of terrestrial vegetation communities and habitat during the construction, operational and decommissioning phases of the project and incudes habitat loss impacts, biota fatalities and population reductions, habitat fragmentation, habitat patch size reduction, and the occurrence of barriers to propagule and animal movement.
- **Indirect ecosystem disturbance impacts (C1-2, O1-2, D1-2)** – This impact refers to the indirect impacts to the biota and vegetation communities as a result of activities within close proximity that result in the following impacts: (i) alteration of abiotic soil and moisture conditions, (ii) increased rates of erosion and sedimentation, (iii) alteration of the chemical and biological characteristics of soil and water, (iv) increased alien invasive plant invasion, (v) noise pollution, (v) vibrations and (vi) light pollution, and (vii) expanded edge effects.

Each of the above-listed impacts were assessed in terms of impacts to:

a) Terrestrial ecosystems and habitats.
b) Terrestrial biota / species (flora and fauna).
c) Local and regional landscape ecological processes.

The activities requiring assessment for this study are summarised in Table 21 below and the associated potential impacts are summarised in Table 22 below.

Table 21. Mining activities identified for each project phase.

PHASES OF MINING ACTIVITIES		
PHASE 1: Construction (mine development)	**PHASE 2: Operation (mining and processing)**	**PHASE 3: Decommissioning, Closure and Rehabilitation**
• Surveying and levelling of sites. • Stripping and storing of material on the WRD (excludes assessment of tailings storage facility and topsoil, overburden and a run of mine ore stockpile area to store ore prior to transport to the processing plant). • Establishment of south eastern open pit. • Construction of central service area infrastructure including: o processing plant,	• Active open pit mining including blasting. • Storage of material on WRD. • Dewatering activities. • Separation of clean and dirty water, including use of storm water infrastructure and PCDs (note although the direct and indirect impacts associated with the establishment of this infrastructure is not assessed during the construction phase	• Decommissioning of haul roads. • Dismantling of buildings. • Reseeding/planting of disturbed areas. • Water quality treatment. • Fencing of dangerous areas. • Monitoring of seepage.

PHASES OF MINING ACTIVITIES		
PHASE 1: **Construction (mine development)**	**PHASE 2:** **Operation (mining and processing)**	**PHASE 3:** **Decommissioning, Closure and Rehabilitation**
○ incoming power yard ○ and the primary crusher • Construction of haul roads • Construction of overland piping • Construction of railway line • Establishing 400kV powerline • The following activities have been excluded from this impact assessment: ○ establishment of storm water management infrastructure and PCDs, ○ Establishing a run of mine ore stockpile area to store ore prior to transport to the processing plant ○ Establishing a tailings storage facility ○ Establishing overburden and topsoil stockpiles ○ Tailings pipelines ○ Establishing an office complex (including a car park, canteen, meeting rooms, hall, training complex, security, first aid station and a dedicated sewerage treatment plant) ○ Workshops (Engineering and vehicle workshops, tyre shops, wash down areas, garages, fuel depots and explosive magazines) ○ Perimeter fencing ○ And other ancillary infrastructure such as sewage pipelines	indirect impacts during the operational phase are assessed under a realistic poor and good mitigation scenario with the assumption that some level of storm water management system will be in place for the south eastern pit and processing plant). • Abstraction of water for processing, potable use and dust suppression. • Operation of processing plant, primary crusher and incoming power yard. • Use of haul roads by dump trucks to transport material. • Suppression of dust. •	

Table 22. Summary of impacts assessed for each of the project activities.

Activities	Impact Group	Impact Description
C1. Construction (mine development):	C1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	• Planned direct impacts to and loss of Very High, Medium, Low and Very Low SEI vegetation communities associated with vegetation removal, damage and destruction and waste rock dumping for mine development. • Accidental direct impacts to Very High, Medium, Low and Very Low SEI vegetation communities by heavy machinery during construction i.e. lack of no-go zone demarcations and/or poorly planned access roads.
	C1-1b: Direct impacts to species and threatened species conservation	• Rare, protected and/or threatened flora and fauna mortality / fatalities associated with vegetation removal, damage and destruction and waste rock dumping for mine development and heavy vehicle activity. • Reduced numbers of local populations associated with vegetation removal, damage and destruction and waste rock dumping for mine development and heavy vehicle activity.
	C1-1c: Direct impacts to local and regional ecological processes	• Habitat fragmentation leading to lower levels of ecological connectivity and ecosystem functioning.
	C1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	• Altered landforms, drainage and runoff flow patterns leading to major erosion and/or sedimentation downslope of Very High, Medium, Low and Very Low SEI vegetation communities and habitats due to soil and vegetation clearing and land cover disturbance during construction. • Pollution of downslope Very High, Medium, Low and Very Low SEI vegetation communities and habitats due to: o the mishandling of hazardous substances o and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills, o discharge or spillage of contaminants, o contamination of local ground water by drilling muds and exposed ore, o contamination of surface and ground water by seepage and effluent discharges o or discharge of contaminants via mine de-watering activities. • Demand on local water resources resulting in a lowered groundwater table and less surface water availability for uptake resulting in drier more water stressed conditions for vegetation communities of Very High, Medium, Low and Very Low SEI and reduced soil moisture. • Dust pollution affecting the ability of plants to photosynthesise effectively. • Noise and light pollution representing disturbance and nuisance impacts to faunal species moving through the area.
	C1-2b: Indirect impacts to species and threatened species conservation	• Indirect impacts to threatened biota resulting from the same above impacts to vegetation communities. • Wildlife disturbance due to noise / vibration and site illumination.

Activities	Impact Group	Impact Description
		• Windborne dust from large exposed bare areas negatively affecting the ability of rare and/or threatened flora to photosynthesise.
	C1-2c: Indirect impacts to local and regional ecological processes	• Increased alien plant invasion linked with erosion, soil. water and air pollution impacts resulting in a reduced extent of intact areas and disruption of local level ecological processes e.g. increased alien plant invasion and altered fire regimes.
O1: Operation of mine (mining and processing):	O1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	• Accidental direct impacts to Very High, Medium, Low and Very Low SEI vegetation communities by heavy machinery during operation i.e. lack of no-go zone demarcations and/or poorly planned access roads.
	O1-1b: Direct impacts to species and threatened species conservation	• Rare, protected and/or threatened flora and fauna mortality / fatalities associated with accidental incursion into no-go areas and vegetation removal, damage and destruction associated with heavy vehicle activity.
	O1-1c: Direct impacts to local and regional ecological processes	• Habitat fragmentation and biodiversity loss leading to lower levels of ecological connectivity and ecosystem functioning.
	O1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	• Altered landforms, drainage and runoff flow patterns leading to major erosion and/or sedimentation downslope of Very High, Medium, Low and Very Low SEI vegetation communities and habitats due to soil and vegetation clearing and land cover disturbance during the operational phase. • Pollution of downslope Very High, Medium, Low and Very Low SEI vegetation communities and habitats due to the mishandling of hazardous substances and/or improper maintenance of machinery during the operational phase e.g. oil and diesel leaks and spills, discharge or spillage of contaminants, contamination of local ground water by drilling muds and exposed ore, contamination of surface and ground waters by seepage and effluent discharges or discharge of contaminants via mine de-watering activities. • Demand on local water resources resulting in a lowered groundwater table and less surface water availability for uptake resulting in drier more water stressed conditions for vegetation communities of Very High, Medium, Low and Very Low SEI. • Dust pollution affecting the ability of plants to photosynthesise effectively. • Noise and light pollution representing disturbance and nuisance impacts to faunal species moving through the area.
	O1-2b: Indirect impacts to species and threatened species conservation	• Indirect impacts to threatened biota resulting from the same above impacts to vegetation communities. • Wildlife disturbance due to noise / vibration and site illumination • Windborne dust and associated pollutants from large exposed bare areas negatively affecting the ability of rare and/or threatened flora to photosynthesise.

Activities	Impact Group	Impact Description
	O1-2c: Indirect impacts to local and regional ecological processes	• Increased alien plant invasion due to: o Erosion and/or sedimentation downslope of Very High, Medium, Low and Very Low SEI vegetation communities and habitats. Pollution of downslope Very High, Medium, Low and Very Low SEI vegetation communities and habitats due to the mishandling of hazardous substances and/or improper maintenance of machinery during the operational phase e.g. oil and diesel leaks and spills, discharge or spillage of contaminants, contamination of local ground water by drilling muds and exposed ore, contamination of surface and ground waters by seepage and effluent discharges or discharge of contaminants via mine de-watering activities. • Resulting in a reduced extent of near-natural intact areas and disruption of local level ecological processes e.g. increased alien plant invasion can lead to altered fire regimes.
D1: Decommissioning, Closure and Rehabilitation:	D1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	• Accidental direct impacts to Very High, Medium, Low and Very Low SEI vegetation communities by heavy machinery during decommissioning i.e. lack of no-go zone demarcations and/or poorly planned access roads. • Poor rehabilitation –Potential accidental direct impacts on edge of mine footprint due to earthworks and use of heavy machinery •
	D1-1b: Direct impacts to species and threatened species conservation	• Rare, protected and/or threatened flora and fauna mortality / fatalities associated with poor rehabilitation practice i.e. lack of no-go zone demarcation and or poorly planned access roads leading to accidental direct impacts on edge of mine footprint due to earthworks and use of heavy machinery activity.
	D1-1c: Direct impacts to local and regional ecological processes	• Habitat fragmentation and biodiversity loss leading to lower levels of ecological connectivity and ecosystem functioning associated with accidental incursion and vegetation clearing/destruction due to earthworks and heavy machinery activity.
	D1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	• Subsidence, slumping and flooding of previously mined areas and major erosion, flooding and or sedimentation downslope of the mine within Very High, Medium, Low and Very Low SEI vegetation communities and habitats. • Poor rehabilitation leading to increased levels of alien plant invasion: o Reducing the extent and degrading the condition of Very High and Medium SEI vegetation communities further o Resulting in a decrease in the number of rare and threatened flora which may be outcompeted.

Activities	Impact Group	Impact Description
		○ Resulting in a reduction in the amount of suitable habitat remaining for rare and/or threatened fauna. • Windborne dust and associated pollutants transported by this vector negatively affecting vegetation communities and threatened flora and fauna. • Continuing discharge of contaminants resulting in pollution of downslope Very High, Medium, Low and Very Low SEI vegetation communities as well as groundwater and surface water.
	D1-2b: Indirect impacts to species and threatened species conservation	• Poor implementation of rehabilitation plan which would result in: • Subsidence, slumping and flooding of previously mined areas and major erosion, flooding and or sedimentation downslope of the mine within Very High, Medium, Low and Very Low SEI vegetation communities and habitats resulting in a reduction in the amount of suitable habitat remaining for rare and/or threatened fauna and flora. • Increased levels of alien plant invasion: ○ Resulting in a decrease in the number of rare and threatened flora which may be outcompeted. ○ Resulting in a reduction in the amount of suitable habitat remaining for rare and/or threatened fauna. • Dangerous areas (e.g. open pits, etc.) leading to fauna fatalities. • Wildlife disturbance due to noise / vibration and site illumination
	D1-2c: Indirect impacts to local and regional ecological processes	• Poor implementation of rehabilitation plan which would result in: ○ Subsidence, slumping and flooding of previously mined areas and major erosion, flooding and or sedimentation downslope of the mine compromising the ability of affected areas to provide the level of ecosystem services they contributed pre-mining. ○ Increased levels of alien plant invasion: ▪ Resulting in alien plant encroachment into more intact areas outside the existing mine footprint reducing the extent of near-natural intact areas and disruption of local level ecological processes e.g. increased alien plant invasion can lead to altered fire regimes. Continuing discharge of contaminants resulting in pollution of downslope Very High, Medium, Low and Very Low SEI vegetation communities as well as groundwater and surface water reducing the resilience of affected ecosystems in the study area to cope with additional stressors and risks.

6 RECOMMENDED MITIGATION

Prior to assessing the significance of anticipated impacts for the proposed mining project, which will be assessed for a realistic "poor mitigation" scenario and a realistic "good" scenario, it is important to unpack some of the recommended mitigation measures that are anticipated to be implemented under the latter realistic "good" mitigation scenario.

The sub-sections that follow contain some of the key mitigation measures that will need to be implemented under a realistic "good" mitigation scenario. With the legislative framework for the protection of terrestrial ecosystems first briefly outlined, with ecologically sensitive terrestrial 'no-go' areas, infrastructure siting considerations, protected flora rescue and permitting requirements, pre-construction phase impact mitigation, general site management recommendations and a comment on biodiversity offsets provided thereafter.

6.1 Legislative Framework

A strong legislative framework backs up South Africa's obligations to numerous international conservation agreements and creates the necessary enabling legal framework for the protection and management of natural resources in the country.

According to the NEMA, sensitive, vulnerable, highly dynamic, or stressed ecosystems require specific attention in management and planning procedures, especially where they are subject to significant usage and development pressure. NEMA also requires that the 'precautionary principle' be applied meaning "a risk-averse and cautious approach which takes into account the limits of current knowledge about the consequences of decisions and actions". Effective measures must therefore be implemented to pro-actively prevent degradation of the region's natural resources. ***Ultimately, the risk of natural resource degradation and biodiversity reduction / loss must drive sustainability in development design.***

Of importance is the requirement of 'duty of care' with regards to environmental remediation stipulated in Section 28 of NEMA:

> **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 reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.*"

The protection of natural resources begins with the avoidance of adverse impacts and where such avoidance is not feasible; to apply appropriate mitigation in the form of reactive practical actions that minimize or reduce such impacts. The mitigation of negative impacts on natural resources 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 the 'mitigation hierarchy' (Figure 41), 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.

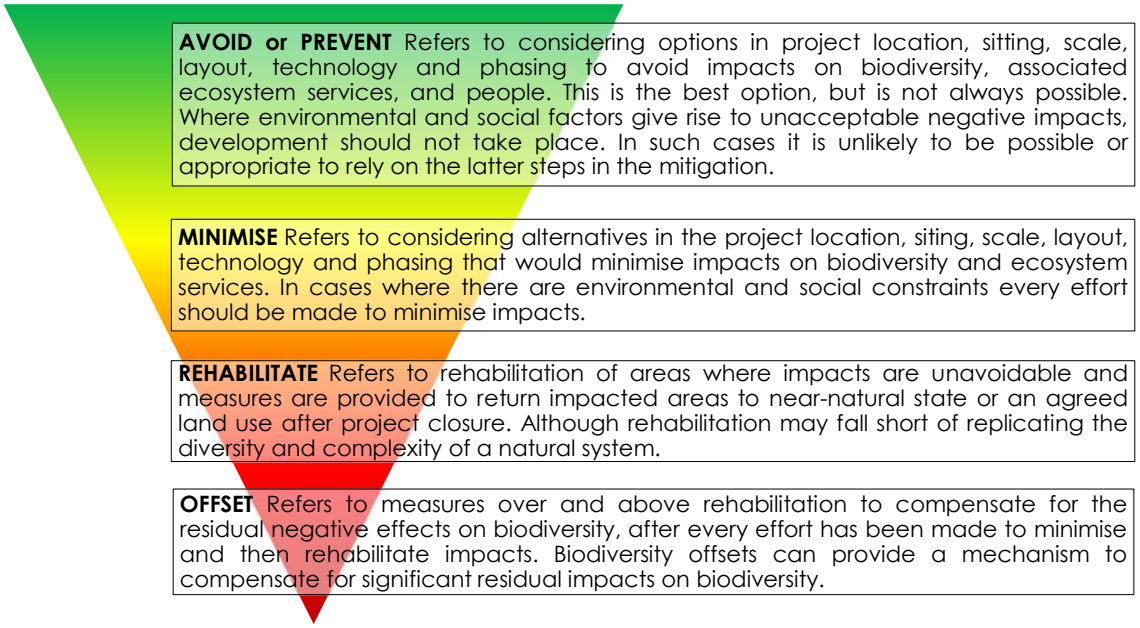

Figure 41. Diagram illustrating the 'mitigation hierarchy' (after DEA et al., 2013).

The mitigation hierarchy is 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.

The recently published Species Environmental Assessment Guideline compiled by SANBI (2020) provide broad guidance on how the mitigation hierarchy should be applied once the SEI for the receptors at a site have been assessed (refer to Table 23 below). These guidelines were used to provide design recommendations for the proposed mining development.

Table 23. Guidelines for interpreting SEI in the context of proposed development activities.

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation - No destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages. Destructive impacts for species/ecosystems where persistence target remains).
High	Avoidance mitigation wherever possible. 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.

Site Ecological Importance	Interpretation in relation to proposed development 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.

Based on the preliminary Phase 1 project layout and the nature of the surrounding environment, Eco-Pulse have identified key project elements that should be considered to avoid unnecessary impacts, namely:

- Ecologically Sensitive Terrestrial 'No-Go' Areas;
- Infrastructure Siting Considerations;
- Protected Flora & Plant Permit Requirements;
- Pre-Construction Phase Impact Mitigation;
- Construction Phase Impact Mitigation;
- Operational Phase Impact Mitigation; and
- Rehabilitation Strategy.

6.2 Mapping of theoretical 'No-Go' Areas

Given that the majority of the site is considered of very high ecological importance an ecologically sensitive no-go area for the site would ideally comprise all the vegetation communities on site that fall within the very high SEI category in accordance with **Table** 23 above. This is based on the high number of threatened and protected plant species that have been confirmed and others that are likely to occur within these vegetation communities as well as the large contiguous areas (>100ha) of moderately modified to natural threatened ecosystem types that serve as important ecological corridors at local and regional scales and which are crucial in meeting local and provincial conservation targets. Moreover, a 30m buffer should ideally be placed around these very high sensitivity vegetation communities to reduce the impact of edge effects that may be associated with development along the margins of these vegetation communities in the event that planning for the proposed development progresses further (Refer to Figure 42, Figure 43, Figure 44 *for* the preliminary recommended No-Go Area).

Whilst these areas were mapped to inform development planning, the project team and EAP indicated that certain aspects of the project, most notably the WRD and ore body had been carefully considered in terms of placement and project feasibility and there was limited scope to reduce or shift these significantly. While the overarching recommendation to avoid and minimise areas of high and very high SEI wherever practically possible remains, it is acknowledged that the implementation of avoidance of earmarked 'No-Go' areas may be limited. As a result, avoidance of these areas has not been integrated

and planned transformation of these sensitive areas has then been used to inform the impact significance assessment for this project.

Note: Mining (extraction of minerals / resources from the actual pit / shaft, not necessarily the operation of plant and processing infrastructure) is recognised as an activity with potentially high risks to natural resources and the receiving environment. A number of these risks are not addressed by the 30m buffer zone included as part of the preliminary terrestrial no-go area which focuses primarily on mitigating impacts from edge effects associated with direct clearing of indigenous vegetation and subsequent increase in invasion of invasive alien plant species etc. but does not account for other impacts associated with mining activities such as erosion, air pollution, noise pollution, point source pollution leading to surface water and groundwater contamination, alteration of hill slope hydrological processes etc. which will be important aspects to consider when finalising set-back requirements.

The preliminary recommended buffer zone widths provided in this report have therefore not attempted to provide appropriate buffer widths for the mitigation of these impacts to the terrestrial environment. These buffer widths would need to be investigated and refined at a later planning stage when more specific designs for proposed infrastructure are available for interrogation and incorporation into the buffer width determination process

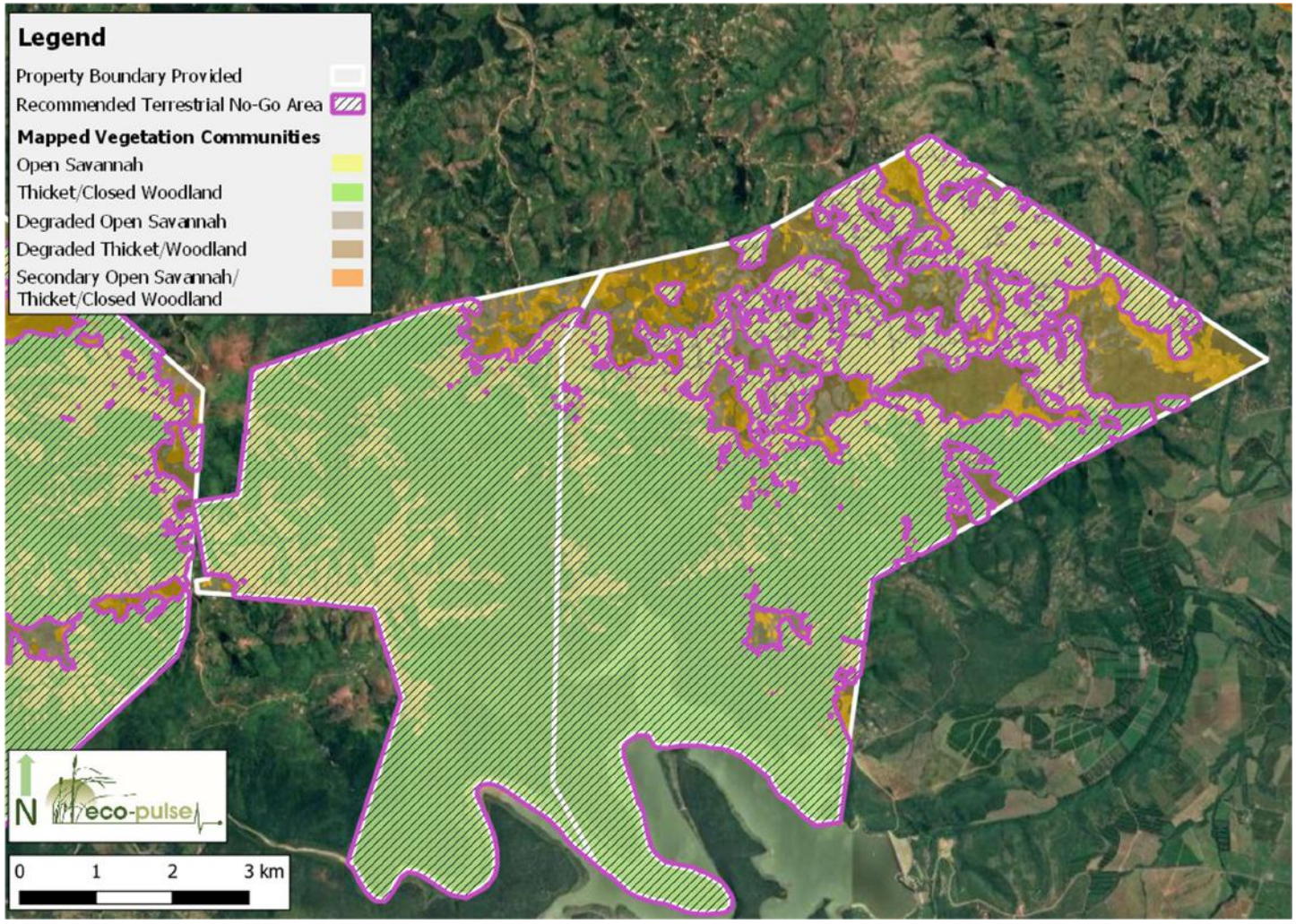

Figure 42. Recommended terrestrial 'no-go' areas for the proposed mining development in the south-eastern and south-central blocks.

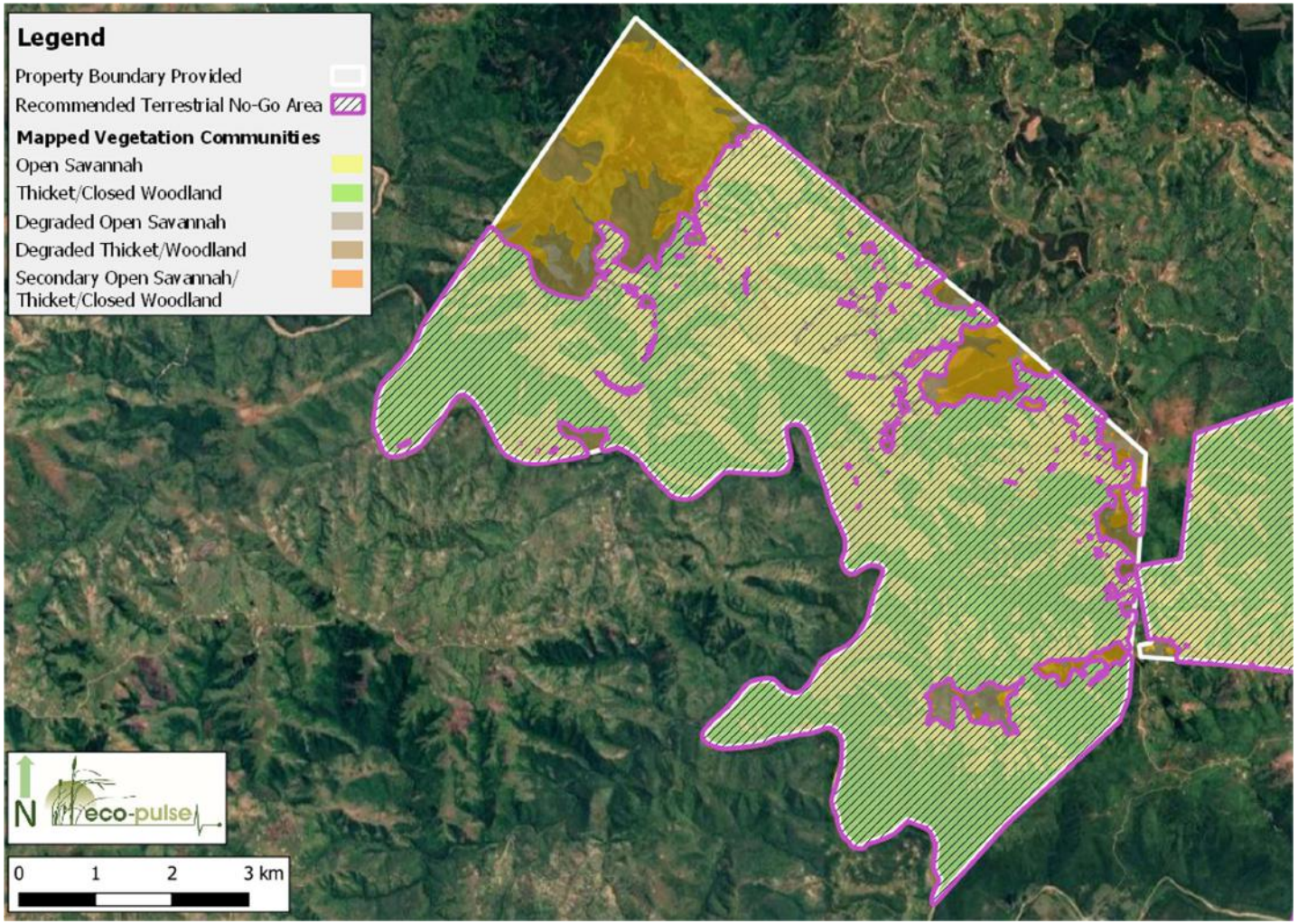

Figure 43. Recommended terrestrial 'no-go' areas for the proposed mining development in the southwestern block.

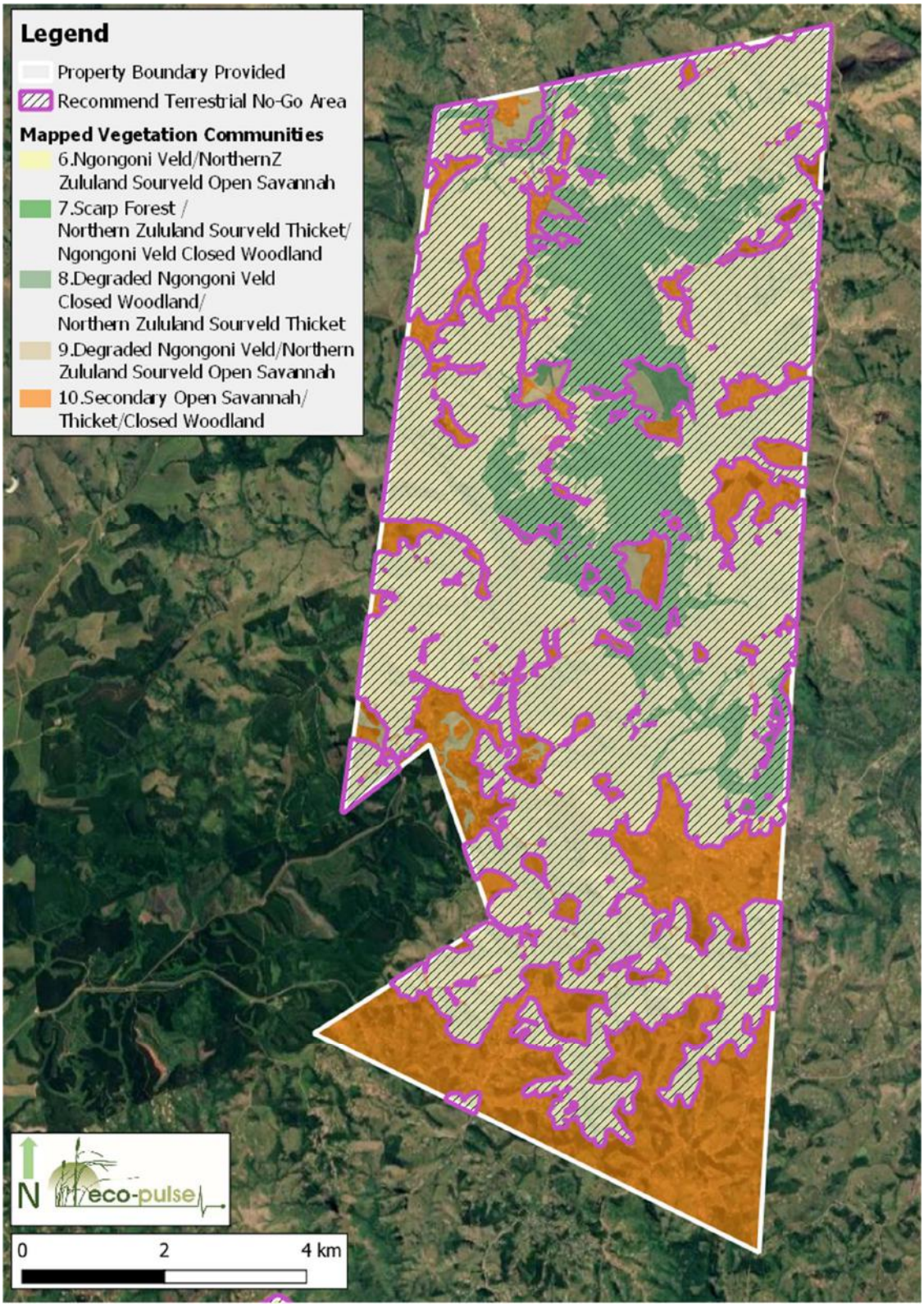

Figure 44. Recommended terrestrial 'no-go' areas for the proposed mining development in the northern block.

6.2.1 Buffer Zone Limitations

Buffer zones have their limitations and need to be considered in conjunction with other mitigation measures, which will be required to address specific impacts for which buffer zones are not well suited. From a mining perspective, it is important to note that changes in hydrology and potential toxic contaminants emanating from the mine have not been catered for when assigning preliminary buffer zones.

This is of particular importance within the study area, as large portions of the southern blocks form part of a regionally important water source area that contributes significantly to surface water supply and groundwater supply for communities and towns along the Zululand Coastal Plain. Moreover, the study site is situated in the upstream catchment of this regionally important water source area, which means that impacts on hydrology and water quality on site are likely to extend much further downstream and may have significantly high consequences for water security at a regional scale. Detailed geo-hydrological and hydro-pedological investigations are currently underway and will need to be used to inform the estimated/projected extent of impacts on downstream watercourses as part of the ESIA process. Due consideration will also need to be given to the safety of local communities when defining final buffer zones to applied around planned mining activities.

6.3 Infrastructure Siting Considerations

In planning of potential mining activities, implementing the 'impact mitigation hierarchy' (discussed above) is a critical step in attempting to avoid, reduce and mitigate potential mining-related risks and impacts to threatened ecosystems, as well as threatened floral and faunal species. For this to be achieved every attempt should be made to avoid/prevent impacts to important terrestrial ecosystems through refinements to project design and the siting of mining infrastructure, mining areas, site camps and material storage, stockpiling and dump sites. Based on the preliminary Phase 1 layout, Eco-Pulse provided basic siting recommendations for several proposed activities / infrastructures as outlined in this section of the report.

6.3.1 Waste Rock Dump (WRD)

As part of scoping phase of the project, Eco-Pulse made recommendations to avoid highly sensitive areas when siting the WRD in line with the mitigation hierarchy. Through correspondence with the project design team and EAP, it was communicated that the WRD site was largely fixed due to engineering considerations and that the size and location would unlikely change significantly. As such, Ecological considerations were not specifically considered in the siting of this dump site.

6.3.2 South-East Pit

In accordance with the mitigation hierarchy, the first step when planning the layout of a project such as

a mine should be to consider options in project location, siting, scale, layout, technology, and phasing to avoid impacts on biodiversity. In the case of the mine pit, Eco-Pulse acknowledges all the above options may not be possible to avoid unnecessarily impacting on important terrestrial habitat as a specific ore body is being targeted to make this mining project feasible. However, guidance was provided to try to avoid the permanent loss and indirect impacts to terrestrial habitat that has a very high sensitivity rating and which provides important refugia for terrestrial biota through mine pit siting and sizing considerations.

In its presently proposed location, and at its current size, the South-East pit encroaches upon vegetation community 1 (Open Savannah) and vegetation community 2 (Thicket/Closed Woodland), which are both assigned a very high sensitivity rating and form part of the recommended no-go area (Figure 45).

Based on an understanding on ecological sensitivity, Eco-Pulse suggested that the location of the pit be adjusted or resized to prevent it intersecting these two vegetation communities and rather restricting it to vegetation community 4 (Degraded Thicket/Woodland) and 5 (Secondary Vegetation) which are rated as being of medium and very low SEI respectively. This recommendation were made for the following reasons:

- Encroachment on areas rated as being of very high sensitivity according to the latest best practice guidelines should be avoided as far as possible and no development is generally recommended in these areas.
- Development activities of medium impact are acceptable followed by appropriate restoration activities in areas of medium sensitivity (community 4) and development activities of high impact which are acceptable in areas of very low ecological importance and sensitivity (community 5).

A conceptual example of a resized pit area that would achieve the impact avoidance measure described above was provided in Figure 46, for basic guidance purposes.

However, based on the current footprint, areas of very high sensitivity, medium and low and very low sensitivity stand to be lost within the south east pit footprint proposed. As such, the impact assessment ratings are based on transformation of the whole proposed pit extent, without further refinements.

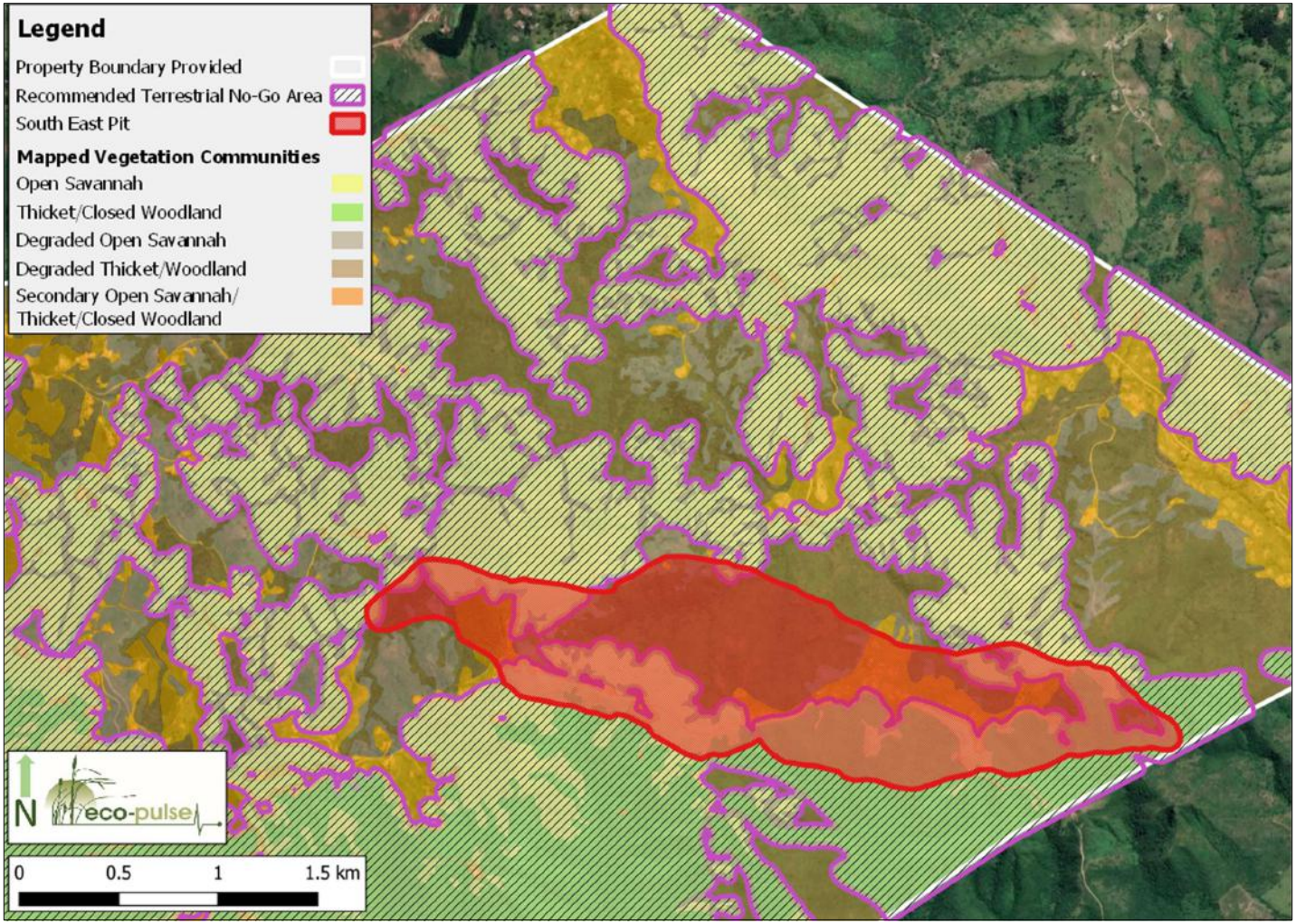

Figure 45. Location of the proposed South-East Pit in relation to recommended terrestrial no-go areas to be avoided with clear overlaps evident.

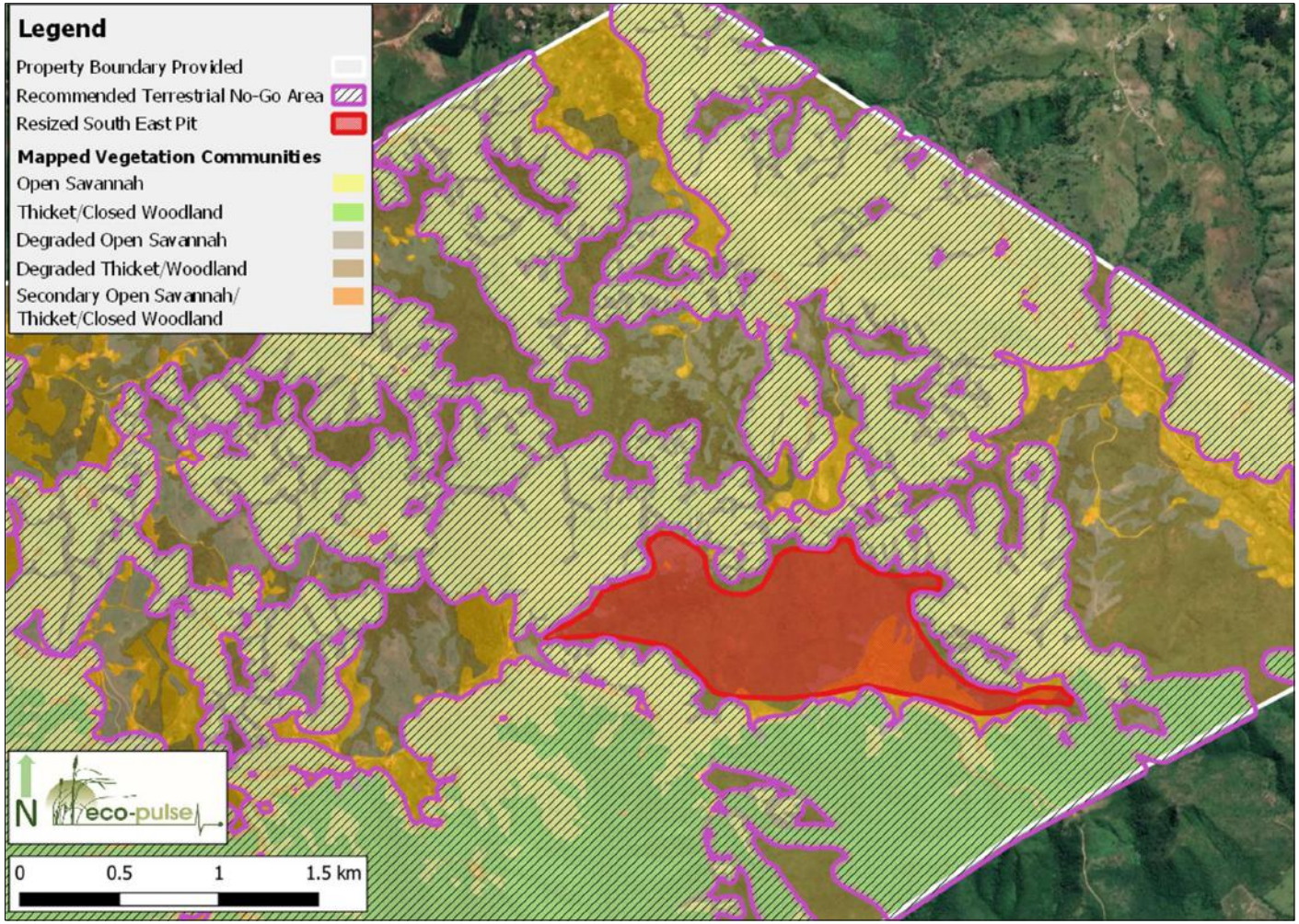

Figure 46. Conceptual resizing of the South-East pit to avoid direct impacts to terrestrial vegetation communities that have Very High SEI ratings.

6.3.3 Processing Plant, Primary Crusher and Incoming Power Yard

In their current proposed locations, the processing plant footprint and the primary crusher footprint coincide with open savannah/grassland areas (community 1) rated as being of Very High SEI (Figure 47) which forms part of the recommended Terrestrial No-Go Area. Without re-siting, the above-mentioned vegetation community stands to be directly or indirectly impacted by the proposed infrastructure. In accordance with the mitigation hierarchy, it is necessary for the design team to explore all possible siting, re-sizing, and layout adjustment options to avoid direct loss of terrestrial habitat of very high SEI and high SEI, and to effectively mitigate potential indirect impacts through the implementation of sustainable design principles. A conceptual example of the relocation of these areas that would avoid areas of very high SEI is shown in Figure 48, for basic guidance purposes.

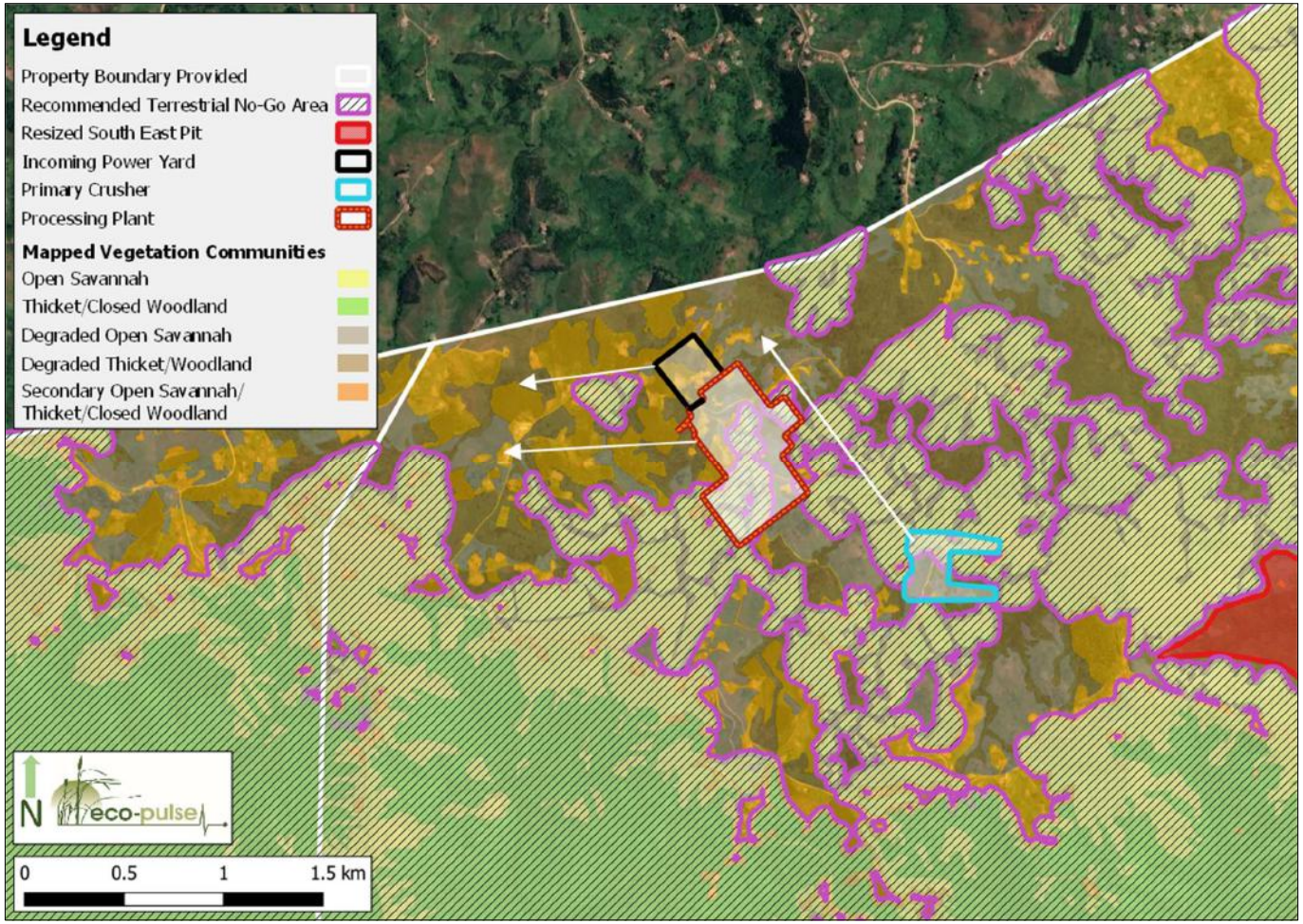

Figure 47. Processing Plant, Primary Crusher, and Incoming Power Yard footprint areas in relation to terrestrial No-Go areas and terrestrial vegetation communities mapped by Eco-Pulse with white arrows indicating suggested shift in location of this infrastructure.

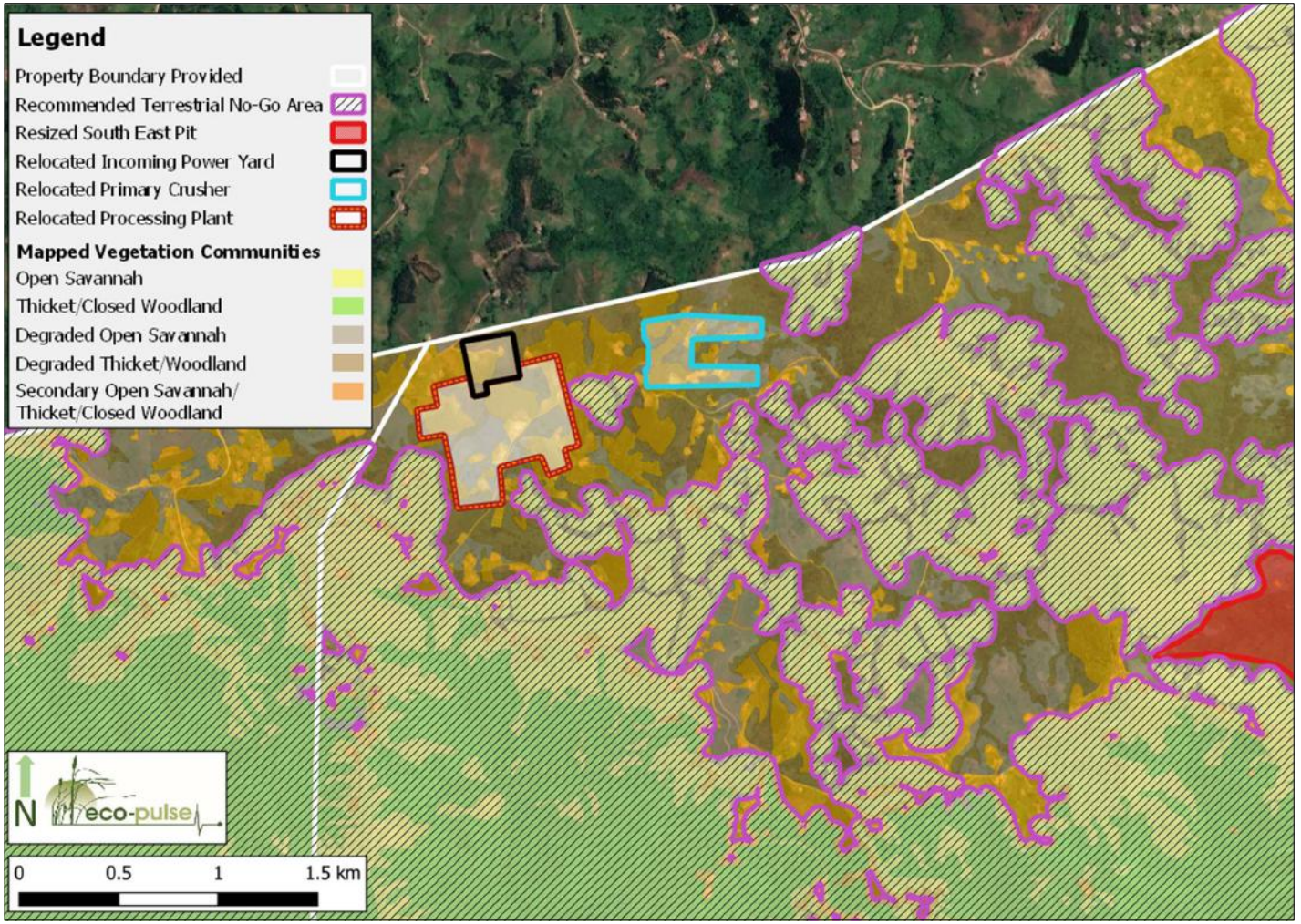

Figure 48. Conceptual relocation of Power Yard, Processing Plant and Primary Crusher to avoid direct impacts to important terrestrial habitat.

6.3.4 Access Road, 400kV Powerline and Overland Piping

It is understood by Eco-Pulse that the proposed access road, powerline and overland piping planned forms part of a preliminary alignment that may experience notable change as the project advances. During planning and alignment of linear infrastructure, in line with the principles of the mitigation hierarchy, Eco-Pulse would encourage the design team to make use of existing roads as far as practically possible, and to limit/avoid installing linear infrastructure in areas of high or very high SEI.

6.3.5 Pollution Control Dam (PCD) Design and Placement

- All PCDs retaining contaminated storm water and wastewater considered harmful to the environment must be provided with a suitable liner system to limit/prevent contaminated seepage from entering the local groundwater system and/or surface water catchments.
- A leak detection system must be installed for all PCDs retaining highly polluted wastewater.
- All PCDs should be designed with sufficient capacity and operated at a level to allow for the accommodation of storm events and hence manage the spillage frequency.
- Highly polluted water retained in the PCDs must be recycled/reused in the mining process.
- Low risk polluted water retained in the PCDs should be used for suppressing dust on roads and the iron ore stockpile areas.
- PCDs are not to be located within wetlands or rivers unless appropriate motivation for why this cannot be accomplished is provided by the design engineers, in which case the least ecologically important/sensitive watercourses must be selected first for this purpose, with input from the wetland/aquatic specialist.
- There is a need to divert and capture dirty runoff water, including runoff from discard dumps into PCDs (captured and treated as necessary).
- Moreover there is a need to ensure that PCDs are designed to contain at least a 1:50 year rainfall event, but preferably a 1:100 year rainfall event, given more high intensity rainfall events are likely to become more frequent in future.

6.3.6 Stormwater Management

- Adequate stormwater management must be incorporated into the design of the proposed development to prevent incision, erosion, and sedimentation of terrestrial ecosystems outside of the mine footprint. In this regard specific mention is made of the need to ensure that sufficient attenuation of stormwater takes place outside of remaining intact areas which should be treated as no-go areas.
- A 'Floodline and Hydrological Assessment' is underway and should be used to inform the stormwater management plan and designs.

- It is important that clean and dirty water separation systems must be in place prior to construction commencing and must be maintained and functional until site closure and rehabilitation has been completed and signed off.
- As a general principle, clean and dirty/polluted water must be kept separate. This can be achieved through designing a closed stormwater management system for dirty/polluted catchments.
- All stormwater infrastructure (including berms, stormwater channels, etc.) must be designed to withstand major flood events.

6.3.7 Raw Water Management

- Raw water should only be used for processes requiring good quality water and/or if water requirements cannot be met with recycled/polluted water retained in PCDs, for example.
- Authorised water abstraction limits must not be exceeded.

6.3.8 Wastewater Management

- In the event an onsite package wastewater treatment plant (WWTP) is designed, it must be designed to meet relevant treated effluent discharge standards through appropriate technologies and compliance monitoring of final effluent to take place.
- The design of an onsite package WWTP must allow for any large variations in flow and organic loading, both on a diurnal and seasonal basis, that are typically experienced by small treatment plants serving small groups of people (Gaydon et al., 2007). Some form of flow balancing may be necessary to deal with these variations (often accomplished by incorporating an enlarged septic tank ahead of the biological treatment stage).
- The WWTP should be fenced/secured to prevent unauthorized access by humans/wildlife which could cause damage to infrastructure and cause accidental malfunction and/or spillage of untreated wastewater.
- Reasonable measures must be taken to provide back-up for mechanical, electrical, operational or process failure and malfunction at the WWTP. At a minimum there should be an alarm system to warn of an electrical failure and sufficient standby equipment (e.g. aerator / blower / pump, etc.) to provide for reasonable assurance that the plant can be fully functional within 24 hours.
- The treatment works will need to be placed within a suitably lined, impermeable concrete bunded area with the capacity to hold untreated wastewater in an emergency and provide sufficient time for maintenance staff to address any faults/ problems. This is to limit the risk of untreated waste material (sewage or sludge) overflowing in the event of any leakage or accidental spillage at the pump station.
- If chlorine is to be used for effluent sterilization, it should preferably be in the form of solid or liquid

hypochlorite rather than chlorine gas from cylinders of liquid chlorine which constitute a potential hazard and has implications for public safety if not properly supervised, handled, maintained and secured.

6.4 Protected Flora and Plant Permit Requirements

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 NEMBA (Act No. 10 of 2004), the National Forest Act, 1998 (Act No. 84 of 1998) and the Natal Nature Conservation Ordinance, No. 15 of 1974. Table 24 provides a description of relevant sections of the abovementioned legislation that pertain to the protection of threatened plants.

Table 24. South African legislation that deals with the management of threatened or protected plant species.

Legislation	Relevant section	Description	Responsible authority
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	Section 57(1)	The following is stated: "*A person may not carry out a restricted activity*[11] *involving a specimen of a listed threatened or protected species (TOPS) without a permit*…"	EKZNW

[11] "Restricted activity", according to the Act:
a) in relation to a specimen of a listed threatened or protected species, means—
- I. hunting, catching, capturing or killing any living specimen of a listed threatened or protected species by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a missile or injuring with intent to hunt, catch, capture or kill any such specimen;
- ii. gathering, collecting or plucking any specimen of a listed threatened or protected species;
- iii. picking parts of, or cutting, chopping off, uprooting, damaging or destroying, any specimen of a listed threatened or protected species;
- iv. importing into the Republic, including introducing from the sea, any specimen of a listed threatened or protected species;
- v. exporting from the Republic, including re-exporting from the Republic, any specimen of a listed threatened or protected species;vi. having in possession or exercising physical control over any specimen of a listed threatened or protected species,
- vii. growing, breeding or in any other way propagating any specimen of a listed threatened protected species, or causing it to multiply;
- viii. conveying, moving or otherwise translocating any specimen of a listed threatened or protected species;
- ix. selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen of a listed threatened or protected species; or
- x. any other prescribed activity which involves a specimen of a listed threatened or protected species; and

b) in relation to a specimen of an alien species or listed invasive species, means—
- i. importing into the Republic, including introducing from the sea, any specimen of an alien or listed invasive species;
- ii. having in possession or exercising physical control over any specimen of an alien or listed invasive species;
- iii. growing, breeding or in any other way propagating any specimen of an alien or listed invasive species, or causing it to multiply;
- iv. conveying, moving or otherwise translocating any specimen of an alienor listed invasive species;
- v. selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen of an alien or listed invasive species; or
- vi. any other prescribed activity which involves a specimen of an alien or listed invasive species

Legislation	Relevant section	Description	Responsible authority
National Forest Act, 1998 (Act No. 84 of 1998)	Section 7(1)	The following is stated: "*No person may cut, disturb, damage or destroy any indigenous living tree in, or remove or receive any such tree from, a natural forest except in terms of (a) a licence issued…*"	DAFF
	Section 15(1)	The following is stated: "*No person may (a) cut, disturb, damage, destroy or remove any protected tree; or (b) collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister*".	DAFF
Natal Nature Conservation Ordinance, No. 15 of 1974	Schedule 12	Schedule 12 lists Specially Protected Indigenous Plants of the KwaZulu-Natal Province which require a permit to handle.	EKZNW

Seven (7) conservation important/protected plants were identified to species level (refer to Table 25 below). In accordance with Section 20, sub-section 5(1) of the Natal Nature Conservation Ordinance, No. 15 of 1974, an Ordinary Permit is required from Ezemvelo KZN Wildlife if protected species listed under this ordinance are to be handled in any manner during construction of the proposed development. Likewise, in accordance with Section 57(1) of the NEMBA, No. 10 of 2004, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species (TOPS) without a permit. Lastly, in accordance with Section 7 (1) and Section 15 (1) of the National Forest Act No. 84 of 1998, species protected by the act may not be cut, disturbed or damaged without an approved permit. Basic information on all protected plants is provided in Table 25.

Table 25. Basic information on protected plant species identified during the rapid field visit.

Family	Scientific Name	Conservation status	Applicable legislation
ZAMIACEAE	*Sensitive species*	Vulnerable	NEMBA 2004
APOCYNACEAE	*Moraea graminicola subsp. graminicola*	Near Threatened Endemic	NEMBA 2004 & Natal Nature Conservation Ordinance, No. 15 of 1974
ASPHODELACEAE	*Aloe marlothii*	Least Concern	Natal Nature Conservation Ordinance, No. 15 of 1974
DIOSCOREACEAE	*Dioscorea cotinifolia*	Least Concern	
AMARYLLIDACEAE	*Scadoxus puniceus*	Least Concern	
ORCHIDACEAE	*Stenoglottis fimbriata*	Least Concern (Endemic)	
ANACARDIACEAE	*Sclerocarya birrea subsp. caffra*	Least Concern	NFA, 1998

6.5 Monitoring and additional planning required

The following supplementary actions will need to be completed, in addition to the EMPr, if the development is approved to inform the monitoring and mitigation of biodiversity impacts related to the project:

- Protected flora rescue and translocation plan to be prepared by a terrestrial ecologist or botanist, which will need to include a monitoring programme and follow-up action plan to ensure successful rescue/translocation is achieved.
- Permits for the destruction or relocation of protected plants will need to be acquired subject to the submission of the relevant applications to Ezemvelo KZN Wildlife. This will be required prior to the implementation of the flora rescue and relocation plan.
- Undertake flora rescue and relocation in line with the approved rescue and relocation plans. The flora rescue and relocation should be undertaken by a qualified Botanist in consultation with EKZNW.
- A comprehensive monitoring programme for the mining right areas which includes detailed information collected from multiple surveys (covering seasonal variation i.e. dry and wet season) of the mining right area and its 500m buffer which includes the following minimum baseline data which should be monitored and updated on a quarterly basis:
    - Soil monitoring which focuses on picking up on any soil pollution and contamination of soils in the area with various pollutants associated with iron ore mining tested for. Crucial to the success of this monitoring programme will be a comprehensive initial baseline survey across the proposed mining area and downslope areas that stand to be affected and the incorporation of multiple control sites located above the mining area as well.
    - Fixed Vegetation plots with fixed point photography providing a representative picture of vegetation and plant species diversity within the larger study area and which will enable monitoring of any changes in vegetation condition and species diversity over time, multiple control sites which will be unaffected by planned mining should be included within each vegetation type occurring within the study area, areas immediately downslope as well as progressively further away from the mine should also be included to gauge the area affected by indirect impacts associated with mining.
    - Faunal surveys (birds, amphibians, reptiles, mammals, insects) which provide a representative picture of faunal species diversity within the larger study area and which will enable monitoring of any changes in species diversity overtime, likewise multiple control survey sites which will be unaffected by planned mining should be included within each habitat type occurring with the study area.
- A management plan for areas within the mining right area and managed by the applicant. Such a plan should be informed by:
    - A comprehensive invasive alien plant eradication programme compiled by an appropriately qualified person which accounts for alien plant clearing during the

construction, operational and de-commissioning phase of the mine and covers the entire mining right area.

- An alien plant monitoring programme or schedule must also be included and incorporated into the mines standard operating procedure from inception.
- A comprehensive grassland management programme, which accounts for an appropriate fire management regime.

- An overarching rehabilitation strategy for terrestrial ecosystems that will be affected by mining and a detailed rehabilitation plan for each phase of mine development (i.e. the construction, operational, de-commissioning and closure phases) once detailed information on site infrastructure and mining footprints becomes available.
- A rehabilitation audit programme which reviews rehabilitation success periodically and allows for amelioration and follow-up to be accounted for. An independent auditor should be appointed for rehabilitation audits conducted.
- A handover document and programme if the mine intends to pass the land holdings onto a successor in title/new land owner.
- Financial surety for the implementation of the above programmes and plans will need to be incorporated into the financial provision report and a certified bank guarantee as part of the application for environmental authorisation.

6.6 General Site-management Recommendations

A suite of general site mitigation & management recommendations has been developed to further address the potential impacts identified during the various phases of the mining project. These should be applied to all mining areas and should be included in the EMPr for the proposed mining project. These, together with guidelines for implementation of management measures and monitoring of mitigation are included below.

1 ACCESS CONTROL AND SITE CAMPS			
Project Phase:	Construction √	Operation √	Decommissioning √
• All staff involved in work within the mining area must receive basic environmental awareness training. • All relevant staff on the property are to be informed of the sensitivity of the natural ecosystems and the need to avoid damaging/polluting these sensitive natural environments. • Site supervisors must ensure that impacts are confined to designated mining areas as far as possible. • All areas outside of the formal demarcated working area must be considered no-go areas for all phases (construction, operation, decommissioning, and closure). • As far as possible, all mining-related activities and infrastructure should remain outside of the recommended no-go areas. • All no-go areas in the vicinity of any mining operations should be clearly demarcated. These demarcated areas should be considered as "out of bounds" for all vehicles and personnel.			

- When locating temporary construction camps and equipment yards, areas susceptible to soil erosion and/or water contamination must be avoided.
- Attempts must be made to situate the camp on flat ground that is at least 50m away from the edge of the nearest no-go area.
- Access to and from the development area should be either via existing roads or within the construction servitude.
- Any contractors found working inside the 'No-Go' areas (areas outside the construction/ working servitude) should be fined as per a fining schedule/system setup for the project.

2 STORM WATER MANAGEMENT & EROSION/SEDIMENT CONTROL			
Project Phase:	Construction √	Operation √	Decommissioning √

- Wherever possible, existing vegetation cover at the site should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes.
- Where possible construction roads should be aligned along contours rather than downslopes to avoid these features generating excessive sediment laden runoff.
- All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals to break the energy of surface flows.
- The use of hay-bale berms, sandbags and/or silt fences is particularly important in areas where surface runoff is concentrated (e.g.: rills, road stormwater discharge points etc.).
- Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately.
- If re-vegetation of exposed surfaces cannot be established immediately due to construction phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence.
- All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas.
- After heavy rainfall events, site checks must be conducted for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and / or silt fences until vegetation has re-colonised the rehabilitated area.
- Undertake any crossing construction or maintenance during low flows (winter season).
- Storm water infrastructure is likely to require regular on-going maintenance to ensure optimal functioning. At a minimum this should include silt and debris/litter removal from catch pits, filtration devices and attenuation ponds, and maintenance and repair of stormwater outlets to ensure the optimal functioning of such systems.
- All new planned dirty water containment facilities must remain outside of no-go areas.
- Stormwater that may be contaminated with industrial-type wastes should drain to sump collection points where this water will need to be filtered and/or treated for fuel/oil/chemical contaminants before being released into the environment. Any release must then comply with the relevant standards stipulated by the DWS.
- During the construction and operational phases of the proposed mining project, erosion berms should be

installed on all unpaved surfaces and roadways and around stockpile areas to prevent gully formation and siltation of adjacent or downstream areas as follows:
    - Where the track has a slope <2%, berms every 50m should be installed.
    - Where the track slopes between 2% - 10%, berms should be installed every 25m.
    - Where the track slopes between 10% - 15%, berms should be installed every 20m.
    - Where the track has a slope > 15%, berms should be installed every 10m.
- Undertake the construction of any road or pipeline crossings of watercourses during low flows (winter season
- Rehabilitate any erosion or vegetation clearing impacts as soon as practically possible and in accordance with the Rehabilitation Plan.
- Dewatering of any areas within the mining site needs to be done in a manner that does not cause erosion and does not result in heavily silt-laden water flowing downslope of the mining footprint. Water must be pumped out into a well vegetated and already disturbed area 100 m from any watercourse to facilitate sediment trapping and reduce the chance of sediment entering rivers/streams.
- After every major rainfall event, all erosion and sediment control structures or interventions will need to be inspected for damage immediately after the rains and repaired accordingly.
- Excavated or imported material/sediments/spoil should not be placed or stockpiled within any no-go areas.
- Soil/sand required for construction purposes must not be derived from nearby rivers/streams or other no-go areas.
- Any concentrated flow path within and around mine operating areas must be backfilled/shaped and ideally revegetated to promote more diffuse flows/sheet-wash runoff rather than concentrated flows.
- Any breached stormwater structures (e.g. eroded berms, collapsed stormwater channels, etc.) must be repaired timeously.
- Sediment barriers such as silt fences, berms, cut-off drains and sand bags must be implemented at sources of sediment. Berms, sandbags and/or silt fences employed must be maintained and monitored throughout the operational phase of mining areas.
- After every significant rainfall event, staff must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be stabilised and where possible with appropriate material with appropriate sediment barriers for additional protection until grass has re-colonised the rehabilitated area.
- Stockpiles must not be placed in areas vulnerable to excessive erosion.
- Any and all soil stockpile areas are to be located outside of no-go areas.
- Erosion/sediment control measures such as silt fences; bricks or low soil berms must be placed around soil stockpiles to limit sediment runoff from stockpiles.
- Subsoil and topsoil must be stockpiled separately.
- Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.
- The stockpiles may only be placed within demarcated stockpile areas, which must be established on flat ground and away from slopes.
- Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.
- The slope and height of stockpiles must be limited to 2m to avoid collapse and compaction.

3 POLLUTION CONTROL			
Project Phase:	Construction √	Operation √	Decommissioning √

- No dirty water runoff from mining or processing areas must be discharged into the environment during the entire life-span of mining operations.
- Clean and dirty water management systems must be put in place to prevent contaminated runoff (containing sediments, salts, pollutants/toxicants such as hydrocarbons/oils and water with low pH) from entering the receiving natural environment outside of the mine footprint.
- Contaminated stormwater must be conveyed to PCDs and not discharged into the natural environment.
- Road runoff carrying iron ore residue must be conveyed to PCDs. There must be no direct discharge of contaminated road runoff into the natural environment that forms part of the no-go area.
- All dirty water containment facilities must remain outside of the no-go areas (see section 6.2).
- The location of RoM and tailings stockpiles, and retention dams should be carefully evaluated around the likelihood of pollution of water resources because of drainage and/or seepage into downstream areas. Site-specific mitigation measures must then be put in place to reduce risks.
- Care should be taken to reduce the risks of aquifer penetration when drilling/blasting, wherever this occurs.
- All run-off from stockpiles should be captured in a suitable PCD. The base of the stockpile should be sealed to prevent infiltration of polluted water into the ground.
- No dumping of waste (liquid & solid waste) is permitted to take place within no-go areas.
- The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be administered for all mining activities.
- Drip trays should be utilised at all fuel/oil dispensing areas.
- Potentially hazardous materials (chemicals, fuel, oils) liable to spillage need to be stored in appropriate containment structures (e.g using suitable industry-standard drip-trays or within concrete bunded areas).
- Washing and cleaning of any construction and/or mining equipment should be undertaken only in clearly designated areas which are located far from no-go areas.
- Drip-trays should be used beneath any standing machinery/plant if such equipment is to be left standing for an extended period.
- Vehicles are not to be refuelled or serviced within no-go areas.
- Spillages of fuels, oils and other potentially harmful chemicals should be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the site must be removed and rehabilitated timeously and appropriately.
- Clear and completely remove from the site, all general waste, construction related plant, equipment, surplus rock and other foreign materials.
- All solid waste recorded within no-go areas must be collected and placed in bins prior to being disposed of appropriately.
- Adequate scavenger-proof rubbish bins and waste disposal facilities are to be provided on-site at strategic points at work areas and educate/encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal. The bins must be emptied on a regular basis and taken to a registered landfill for disposal only.
- A culture of "conserve, reduce, reuse & recycle" should be promoted with regards to the use and disposal of products to minimise resource consumption and reduce the amount of potential waste.
- No stockpiling of any materials should take place within any no-go areas (see section 6.2).
- Sanitation – portable toilets (1 toilet per 30 users is the norm) must be provided where mining is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Toilets should be located outside of the 1:100 yr flood line of all watercourses and outside of the recommended no-go areas. Waste from chemical toilets should be disposed of regularly and in a responsible manner by a registered waste contractor.

- Signage should be provided at a visible location at the WWTW to inform workers and locals in the area of the purpose of the treatment works. Emergency telephone contact details should also be provided on the signs so that pump station failure, leakage or electrical power outages affecting the system can be easily reported.
- A monitoring and maintenance programme should be prepared for the WWTW to ensure the on-going performance of infrastructure and prevention of foreseeable faults/problems that could result in leakage/failure. An annual report should be compiled, highlighting monitoring undertaken and main findings in terms of faults, problems, breakdowns, etc. Monitoring should consider the use of telemetry systems at pump stations and include regular inspections of the WWTW operation.
- Noise pollution should be minimized where possible 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.
- Haul trucks must operate within the recommended 430km/h speed limit when driving on all dirt roads (low speeds generally generate less dust when compared to high speeds).
- Adequate water carts and or adequate spray frequencies must be implemented particularly on dry and hot days to suppress dust pollution. Water retained in PCDs, provided the water quality is acceptable should be used for this purpose for example.
- Water trucks will be required to suppress dust by spraying water on affected areas producing dust. This may be required daily and may be subject to a water use license from the DWS.

4 TOPSOIL MANAGEMENT			
Project Phase:	Construction √	Operation √	Decommissioning √

- Subsoil and topsoil must be stockpiled separately.
- Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.
- The stockpiles may only be placed within demarcated stockpile areas, which must be established on flat ground and away from slopes.
- Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.
- Topsoil from different vegetation communities should be stripped and stockpiled separately.
- Handling of the stripped topsoil should be minimized.
- If possible, topsoil should not be stockpiled but used directly.
- Where topsoil is stocked, the piles should be lower than 2m.
- Stockpiling should be minimized to periods of 6-12 months to limit deterioration of seed, nutrients and soil biota.
- Stockpiles should be seeded with grass or legume mixtures to minimize erosion and loss of beneficial micro-organisms.

4 MANAGING FLORA & FAUNA			
Project Phase:	Construction √	Operation √	Decommissioning √

- Construction should take place in the winter months where possible in order to minimise the impacts on the breeding activities of the terrestrial faunal species.

- Vegetation removal/stripping must be limited to the approved mining footprint.
- No clearing of indigenous vegetation outside of the defined working servitudes 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 construction/mining progresses to minimise areas of bare soil left standing for prolonged periods.
- Species diversity and the health of biotic communities supported by natural ecosystems should be maintained. This includes the feeding, breeding and movement of fauna and flora. This means that the loss of habitat availability and/or condition that leads to deterioration in the current condition of terrestrial ecosystems is not acceptable.
- If any Red Data plant species are identified that may be disturbed, effective relocation of such species to suitable natural habitat outside of the mining impact zone must be arranged in consultation with EKZNW.
- Prior to mining activities taking place in natural areas, it is advised that the 'flushing out' of local wildlife be undertaken to allow species to relocate naturally before mining commences.
- No animals are to be killed on the site or surrounding areas, including species considered as dangerous/ vermin such as snakes and rats. Where these are encountered on the site, they should be removed and transferred to the nearest suitable natural habitat by a qualified handler.
- Any fauna that are found within the mining area should be moved to the closest point of natural or semi-natural vegetation outside the construction servitude. Where these are encountered on the site, they should be removed and transferred to the nearest suitable natural habitat by a qualified handler.
- Plants that are removed during construction should be maintained on site and used to re-vegetate the disturbed soil.
- Only indigenous plant species naturally occurring in the area should be used during the rehabilitation of the affected areas.
- 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 trapping of any animal must be allowed on the site and nearby/adjacent areas.
- No fishing is to take place.
- No firewood or medicinal plants may be harvested from natural areas.
- It is recommended that landscaping during the operational phase promote the use of indigenous species common to the region and that as much natural ground cover is established (naturally) on the site to help with binding soils and encouraging water infiltration, thus reducing overland flows and the pressure on stormwater management infrastructure.
- Any damage to the terrestrial ecosystems that takes place during the life of the mine outside of the designated mining footprint must be rehabilitated immediately. A site-specific rehabilitation plan would need to be developed by a qualified botanist.
- It is recommended that the developer compile and implement a long-term plan to promote the conservation of remaining primary grassland vegetation communities and habitat on the property and surrounds, in consultation with local stakeholders and local and provincial conservation authorities EKZNW in this instance and a terrestrial ecologist consulted in this regard should such disturbance occur.
- **NOTE**: An update to the baseline biodiversity information should ideally be undertaken for the project to further inform mitigation and management requirements as the original vegetation survey was undertaken outside of the recommended summer seasonal window and a number of conservation important plant species are likely to have been overlooked, in addition no faunal specialist was involved in the baseline survey which was only undertaken at a desktop level.

7 FIRE MANAGEMENT			
Project Phase:	Construction √	Operation √	Decommissioning √

- Adequate firebreaks around the mining areas must be maintained at all times.
- Illicit or informal fires must be prohibited on site and within natural areas.
- No open fires to be permitted on the site.
- Smoking must not be permitted in areas considered to be a fire hazard (i.e. in close proximity to grasslands, etc.).
- Ensure adequate fire-fighting equipment is available at the site and train workers on how to use equipment.
- Ensure that all workers on site know the proper procedure in case of a fire occurring.
- Ensure that no refuse wastes are burnt on the site or surrounding areas.

8 COMPLIANCE MONITORING			
Project Phase:	Construction √	Operation √	Decommissioning √

- 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 terrestrial ecosystem impacts include:
    - The condition of the demarcations / fence.
    - Evidence of any no-go area incursions.
    - The condition of temporary runoff, erosion and sediment control measures and evidence of any failures or sediment deposits.
    - Evidence of erosion.
    - Visual assessment of stormwater quality.
    - The condition of waste bins and the presence of litter within the working area.
    - Evidence of solid waste dumping 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.
- At the end of the construction phase a construction phase EMPr audit report will need to be compiled and submitted to the competent authorities for review, as well as a specific rehabilitation audit report for the construction phase.
- Bi-annual operational and decommissioning phase audits will need to be conducted and reports submitted to the relevant competent authorities as well as specific rehabilitation focused audit reports and should continue until closure of the mine is approved.

IMPORTANT: At the time of this impact significance assessment. The only available spatial layout information was the location of the south-east pit, primary crusher, processing plant, incoming power yard, WRD, overland piping for bulkwater (raw) supply and raw water pump to the processing plant, conceptual plant access road, and conceptual railway line (see **Figure 37**).

7 IMPACT ASSESSMENT

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 proposed construction mitigation measures, incorporation of 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.

For the purposes of this assessment, impacts are assessed for Construction (C), Operational (O) and Decommissioning / Closure (D) Phases. Impacts are also assessed only for Phase 1 of the proposed mining project and as such, impacts have been rated for C1, O1 and D1. For each phase a separate assessment has been undertaken for (1) direct and (2) indirect impacts. A further refinement to the impacts considered is made by separately evaluating impacts to (a) ecosystems, (b) species of conservation concern and (c) ecological processes. Impacts assessed are coded accordingly, with direct construction phase impacts on ecological processes captured as C1-1c as an example.

Key assumptions and limitations associated with this impact assessment are outlined below. This is then followed by a detailed rationale for the significance ratings for construction, operational and decommissioning phases of the proposed project.

7.1 Key Assumptions and Limitations

The following assumptions apply to the impact assessment:

- All direct loss in extent associated with the footprint provided was assessed as part of the construction phase only.
- The classification of vegetation communities is preliminary and has not sought to clearly define the boundary between different vegetation types. This is expected to be necessary to better inform the calculation of offset targets.
- Accidental direct loss in extent impacts outside the mining footprint provided were assessed as part of the operational phase and the decommissioning phase.
- Permanent loss calculations presented below under Impact (C1-1a) and further indicated in Section 7.7 'Terrestrial Biodiversity Offset Considerations' are based on the direct footprint for non-linear infrastructure and a 20m servitude for linear infrastructure (i.e. roads). When more detail is available regarding the width of roads planned, the permanent loss in extent

calculations will need to be revised based on this more accurate and updated information, particularly in the event this project progresses further in terms of the planning process and offset investigations are pursued. Secondary/indirect impacts and disturbances are not accounted for in the direct loss calculations.

- The realistic poor mitigation scenario assumes the following:
    - The mine will cover the layout plan provided and will impact upon vegetation communities of Medium and Very High SEI in some areas.
    - All construction, operational and decommissioning activities will be limited to the footprint provided in Figure 37 and will involve the activities listed for the various phases in Table 21 in section 5 above.
- The realistic good mitigation scenario assumes the following:
    -
    - The mine will cover the layout plan provided and will impact upon vegetation communities of Medium and Very High SEI in some areas.
    - .
    - It is assumed under a good mitigation scenario that all other mitigation measures recommended in Section 6 of this report will be adhered to.
    - If any additional mitigation measures provided in Section 6 cannot be adhered to, the impact and risk assessments will need to be revised.

The following limitations apply to this impact assessment:

- At the time of this impact assessment, no faunal baseline assessment had been undertaken for the study area, only a very rapid desktop based potential occurrence assessment.
- The vegetation assessment undertaken, was conducted at the end of the appropriate seasonal window and therefore some threatened plant species are likely to have been overlooked.
- Large portions of the study area are steep and inaccessible.
- Site Ecological Importance assessment followed the guidance prescriptively and was based largely on available desktop information and mapping.
- Based on the above limitations, impact significance ratings should be considered preliminary and may need to be revised following completion of a faunal baseline assessment and further refinements to the vegetation assessment.
- At the time of this impact assessment the geo-hydrological report for the project was still in the process of being compiled and therefore significance ratings assigned to indirect impacts should be considered preliminary until the geo-hydrological report is reviewed in order to inform the assessment of acid mine drainage and decant risks.
- Cumulative impacts were assessed at a very high level and coarse resolution and these significance ratings should be considered of low confidence.

7.2 Construction (Mine Development) Phase: Impact Significance Assessment

A summary of the impact significance assessment for the construction (mine development) phase of the proposed mining project is presented in Table 26, Table 27 and Table 28, below.

Table 26. Summary results of the impact significance assessment for construction (mine development) phase impacts to terrestrial communities and habitats.

C1-1a - Direct impacts to vegetation communities during the construction phase and implications for threatened ecosystems and biodiversity conservation	
Description of Impact	
The phase 1 conceptual mine plan will involve the construction of various infrastructure that will run through a mixture of Very High to Very Low SEI vegetation communities (Figure 40) 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 (526.02 ha of habitat loss in total), based on the footprint provided and included in the Primary Project Area of influence **under a poor and a good mitigation scenario** would include: 1. Ngongoni Veld/Eastern Valley Bushveld Open Savannah (very high SEI) – 123.59 ha. 2. Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland (very high SEI) – 71.02 ha. 3. Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah (low SEI) – 37.09 ha. 4. Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland (medium SEI) – 208.47 ha. 5. Secondary Open Savannah/Thicket/Closed Woodland (very low SEI) – 85.85 ha. In addition, large portions of the mine footprint have been flagged as part of the National Protected Area Expansion Strategy and as CBA: Optimal at the provincial level. For these reasons, the significance of the impact is rated as Very High, which means that the proposed mining development will have measurable negative impacts on biodiversity conservation and on the ability to meet provincial and national conservation targets. Very High significance impacts are potentially fatally flawed impacts and can only be compensated for through a biodiversity offset, assuming that an offset is viable. It is important to note that Very High significance impacts are typically not suitable for offsets unless there are suitable mitigating circumstances. Design recommendations to minimize impacts on terrestrial ecosystems are provided in Section 6.2 and 6.3. It is assumed that there are no options to mitigate the loss of Very High SEI, except for onsite rehabilitation which will only result in a marginal reduction in significance (from Very High to High) under a good mitigation scenario. This means that a highly significant residual impact remains that and can only be addressed through a formal biodiversity offset, if feasible.	
Type of Impact	Direct
Nature of Impact	Negative

Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Severe change (Very high)	Severe change (Very high)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Beyond site	Whole site
Consequence	Very high	High
Probability	Definite / Continuous	Definite / Continuous
Significance	Very high	High
Degree to which impact can be reversed	Irreversible	
	The impact is Irreversible. Once intact grassland ecosystems within the study area are lost through clearing of vegetation and earthworks associated with the construction phase of the proposed development it is highly unlikely that the natural ecosystem structure and levels / patterns of diversity encountered within these ecosystems will ever be recovered even with rehabilitation following mine closure.	
Degree to which impact may cause irreplaceable loss of resources	Moderately High	
	Given that the vegetation survey was conducted outside the correct seasonal window, the moderately high rating above is based largely on the precautionary principle and the assumption that a large number of the Endangered plant species flagged as part of the desktop potential occurrence assessment will occur within the study area and that good condition grassland that supports these threatened plant species populations will be lost during the construction phase.	
Degree to which impact can be mitigated	Low	
	Mitigation potential is low. Loss in extent of intact habitat will be impossible to mitigate completely as some of the floral species lost may only occupy specific ecological niches unique to the study area that are unlikely to be replicated under a rehabilitation scenario. Therefore, such species are unlikely to be successfully translocated to adjacent areas. An offset scenario would require like-for-like areas of similar size with these rare floral species confirmed to occur identified for protection. This is in reality will be difficult to achieve given the level of degradation and anthropogenic pressure existing in the remaining intact natural areas and the fact that the feasibility of an offset still needs to be investigated. Hence the original recommendation that avoidance is achieved first and foremost.	
Mitigation actions		

The following measures are recommended:	• Originally it was recommended that the project team employ design recommendations that are outlined in section 6.3 Infrastructure Siting Considerations to avoid vegetation communities of Very High to Medium SEI. • Nevertheless, all areas outside the footprint that form part of the no-go areas in Figure 42, Figure 43 and Figure 44 in section 6.2 Ecologically Sensitive No Go Areas should be considered no-go areas for all phases of the mine development (refer to section 6.6 General Site-management Recommendations – 1 Access Control and Site Camps for more information on enforcement of no-go areas). • All the baseline assessment information listed in section 7.6 will need to be compiled prior to application for environmental authorisation, all rescue and translocation plans will need to be compiled and actioned prior to the construction phase (refer to section • Refer to all measures in section 6.6 entitled General Site-management Recommendations, which are applicable to all phases of the proposed mining development.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Plans Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	The direct loss impacts outlined above in combination with direct loss impacts associated with forestry, agriculture and human settlement in the area, will result in moderate levels of cumulative direct loss impacts to vegetation communities in the area. Cumulative impacts will be more significant for remaining intact open savannah/grassland areas as these areas have a smaller remaining extent (~1000 hectares or more within the larger southern section of the mining right area) in comparison to more closed woodland thicket areas (currently in the region of ~3000 hectares or more within the larger southern section of the mining right area). Additionally future impacts associated with other land-uses in the area are more likely to occur in vegetation communities that have a more open structure (i.e. the open savannah and grassland vegetation communities) and are more accessible in comparison to closed woodland and thicket areas.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		

Nature of residual impacts	Design recommendations to minimize impacts on terrestrial ecosystems were provided in Section 6.2 and 6.3. It is however assumed that there are no options to mitigate the loss of Very High SEI, except for onsite rehabilitation which will only result in a marginal reduction in significance (from Very High to High) under a good mitigation scenario. This means that a highly significant residual impact remains that can only be addressed through a formal biodiversity offset, if feasible.
Rating of residual impacts	High

C1-2a - Indirect impacts to vegetation communities during the construction phase and implications for threatened ecosystems and biodiversity conservation

Description of Impact

During the construction phase, large exposed bare areas associated with vegetation clearing and bulk earthworks are likely to result in altered landforms, drainage and runoff flow patterns leading to major erosion and/or sedimentation downslope. This will either result in the smothering of large patches of vegetation (in the case of sediment plumes) or loss of vegetation cover (in the case of major erosion) within the vegetation communities' downslope of the mine footprint. Storm water management design guidance is outlined in the Freshwater report and should be considered by the project management team to mitigate these impacts. The dewatering of the mine may also increase flows on certain slopes if this water is discharged into the environment further exacerbating potential erosion and sedimentation impacts.

Potential pollution impacts associated with the proposed iron ore mine during the construction phase can include the mishandling of hazardous substances and/or improper maintenance of machinery during construction e.g. oil and diesel leaks and spills, contamination of local ground water by drilling muds and exposed ore, contamination of surface and ground water by seepage and effluent discharges or discharge of contaminants via mine de-watering activities. These pollution impacts may result in the die-back of vegetation and some mortalities for fauna, the extent of which will depend on the severity of the spill or the amount of contaminated water discharged into the environment. It is likely that following on from the die-back of vegetation, areas affected by soil and water pollution or point source spills will be colonised by more common indigenous weedy/pioneer species as well as alien plan species. However, the likelihood of spills and pollution can be reduced through various best practice mitigation measures which include measures listed in section 6.6 under '3 Pollution Control' of this report (note this is not an exhaustive list of measures that could be implemented but represents standard minimum best-practice measures).

Altered drainage and increased runoff, as well as de-watering activities and water use by the mine during the construction phase will result in an increase in the demand on local water resources. This will result in a lowering of the groundwater table and reduce the amount of surface water available and alter soil moisture conditions as well. Thereby resulting in drier more water stressed conditions for vegetation communities in the study area. Decreasing their resilience to withstand future stressors such as droughts, extremely high temperatures, increased grazing pressure etc.

Exposure of large bare areas will result in large amounts of dust coating vegetation within and surrounding the mine footprint. This will negatively affect the ability of plants to photosynthesise effectively and may result in increased mortalities of more sensitive plant species, reducing the level of diversity within vegetation communities located on

the edge of the mine footprint. These conditions conversely will likely favour recruitment of more weedy, pioneer and alien invasive plant species in the areas affected by this stressor/risk, that are more adaptable to a spectrum of environmental conditions and habitat types. It is recommended that various dust suppression measures are implemented during the construction phase of the mine to ensure this potential stressor/risk is minimised as much as possible.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Severe change (Very high)	Moderate change (Medium)
Duration	Medium-term (5 to 10 years)	Medium-term (5 to 10 years)
Extent	Local	Local
Consequence	High	Medium
Probability	Definite / Continuous	Definite / Continuous
Significance	High -	Medium -
Degree to which impact can be reversed	Partially Reversible	
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the construction phase, these impacts can be addressed to some degree through mitigation such as alien plant clearing, spill clean-up, silt fencing etc., however, if these impacts take place in areas that are largely intact, even with the mitigation measures above implemented , pollution, erosion and alien plant invasion could result in a reduction in the condition of the affected vegetation communities.	
Degree to which impact may cause irreplaceable loss of resources	Moderate	
	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint. However, with strict and comprehensive mitigation applied, the impact can be reduced.	
Degree to which impact can be mitigated	Moderate	
	Mitigation such as strict enforcement of no-go areas, erosion and sediment control measures, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities beyond the mine's development footprint are minimised as far as practicably possible.	
Mitigation actions		

The following measures are recommended:	Refer to section 6.6 entitled General Site-management Recommendations, sub-section 1 Access Control and Site Camps, sub-section 2 Storm Water Management & Erosion/Sediment Control, and sub-section 3 Pollution control for key mitigation aimed at reducing indirect impacts.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Plans Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	The indirect impacts outlined above in combination with indirect impacts associated with forestry, agriculture and human settlement in the area, will result in moderate levels of cumulative indirect impacts to vegetation communities in the area.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate levels.	
Rating of residual impacts	Medium -	

Table 27 Summary results of the impact significance assessment for construction (mine development) phase impacts to terrestrial biota / species (flora and fauna).

C1-1b - Direct impacts to species and threatened species conservation during the construction phase		
Description of Impact		
Vegetation communities rated as being of Low or Very Low SEI are unlikely to host conservation important species, however, based on the current layout, the location of certain mine infrastructure as well as the WRD and the south-east pit coincide with areas of Medium to Very High SEI could eliminate or reduce the size of threatened plant populations on-site. Therefore, impacts to populations of threatened plant species are anticipated (two threatened plant species are confirmed to occur within the larger mining right area, namely, *Moraea graminicola subsp graminicola* – Near threatened and *a sensitive plant species* – Vulnerable; in addition what appeared to be *Helichrysum pannosum* – Endangered was, noted by D. Styles on site, however no available flowering specimens were present to confirm this). A plant rescue, relocation and protection plan, which would include a detailed search of the footprint for any threatened and/or protected plant species will need to be compiled and actioned (refer to section 6.5 Monitoring and Additional Planning Required). An additional floral survey is still required within the appropriate flowering window to confirm the presence of threatened flora within the mining footprint to better improve the confidence of this impact assessment. Faunal impacts associated with infrastructure construction may also be high. A faunal survey is still required to confirm the presence of threatened fauna within the mining footprint to better improve the confidence of this impact assessment. Although, large portions of the study area have already been transformed or degraded, with any fauna persisting in these areas likely habituated to the existing disturbance regime (subsistence cultivation, livestock grazing, domestic animals and working dirt roads), there are certain invertebrate species flagged as potentially occurring as part of the POC. These invertebrate species have specific habitat requirements and occur in areas of Medium to Very High SEI that stand to be lost. Moreover, 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 also a concern and anticipated impact. Loss of existing ecological corridors for faunal species such as leopard etc., are anticipated as well as loss of the exchange of genetic material between threatened plant populations.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Prominent change (High)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Beyond site	Whole site
Consequence	High	High
Probability	Definite / Continuous	Definite / Continuous
Significance	High	High
Degree to which impact can be reversed	Irreversible	

	This depends on the floral species affected and whether they survive rescue and translocation prior to construction. Some species of conservation concern may be translocated successfully. However, even if successfully translocated, the loss in extent of viable habitat is nevertheless still likely to reduce resilience of remaining populations to future risks and stressors.	
Degree to which impact may cause irreplaceable loss of resources	Moderately-High	
	If a population of a range restricted rare floral species is not successfully translocated into suitable habitat this could negatively affect the continued persistence of the species and result in a significant reduction in their known range and available habitat.	
Degree to which impact can be mitigated	Moderate	
	Impact can be mitigated through rescue and translocation where possible, however, this is not always guaranteed to be successful with certain sensitive species.	
Mitigation actions		
The following measures are recommended:	Mitigation measures of particular relevance to species of conservation concern are included under the heading '4 Managing Flora & Fauna' in section 6.6. All the outstanding baseline information listed in section 7.6 will need to be compiled prior to application for environmental authorisation, in particular a comprehensive faunal baseline assessment.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	The direct loss impacts outlined above in combination with direct loss impacts associated with forestry, agriculture and human settlement in the area, will result in moderate levels of cumulative direct loss impacts to species of conservation concern in the area.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Residual impacts will be high, as the loss of genetic diversity and populations of threatened plant species within the study area will have a negative effect on the remaining gene pool potentially	

	compromising the ability of rare and threatened plant species to persist in the long term.	
Rating of residual impacts	High	
C1-2b - Indirect impacts to species and threatened species conservation during the construction phase		
Description of Impact		
During construction, increased rates of sedimentation and erosion associated with bulk earthworks could result in vegetation being smothered downslope. Windborne dust can smother plants compromising their ability to photosynthesise as effectively. Disturbed areas can become colonised with weedy, pioneer and alien plant species quickly. Any spills or pollution associated with construction can contaminate natural areas downslope or downstream. All these indirect impacts can result in increased mortalities of threatened flora and fauna.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Moderate change (Medium)
Duration	Medium-term (5 to 10 years)	Medium-term (5 to 10 years)
Extent	Beyond site	Whole site
Consequence	Medium	Medium
Probability	Definite / Continuous	Definite / Continuous
Significance	Medium -	Medium -
Degree to which impact can be reversed	Partially Reversible	
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the construction phase, these impacts can be addressed to some degree through strict adherence to mitigation such as alien plant clearing, storm water management, pollution control, etc., however, even with the mitigation measures above implemented, loss of certain individuals of threatened plant species may occur along with the loss of some level of genetic diversity.	
Degree to which impact may cause irreplaceable loss of resources	Moderate	
	Erosion and pollution impacts could, lead to higher levels of mortality within threatened plant species populations. In addition, alien plant invasion could result in indigenous plant species being outcompeted. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate.	
Degree to which impact can be mitigated	Moderate	

	Mitigation such as strict erosion and sediment control measures, well designed and maintained storm water management systems, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities beyond the mine's development footprint are minimised as far as practicably possible.	
Mitigation actions		
The following measures are recommended:	Refer to section 6.6 entitled General Site-management Recommendations, sub-section 1 Access Control And Site Camps, sub-section 2 Storm Water Management & Erosion/Sediment Control, and sub-section 3 Pollution control for key mitigation aimed at reducing indirect impacts	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	The indirect impacts outlined above in combination with indirect impacts associated with forestry, agriculture and human settlement in the area, will result in moderate levels of cumulative indirect impacts to species of conservation concern in the area.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Residual impacts associated with indirect impacts are moderate, as although indirect impacts can result in the loss of genetic diversity and populations of threatened plant species within the study area, strict adherence to mitigation measures can reduce the intensity of this impact under a good mitigation scenario.	
Rating of residual impacts	Medium -	

Table 28 Summary results of the impact significance assessment for construction (mine development) phase impacts to local and regional landscape ecological processes.

C1-1c - Direct impacts to local and regional ecological processes during the construction phase		
Description of Impact		
Large portions of the study area including the current footprint of the Incoming Power Yard, Processing Plant and Primary Crusher, WRD and ~ half of the South East Pit are considered CBA: Optimal at the provincial scale, and at the national scale, portions of the study area have been flagged as part of the National Protected Area Expansion Strategy (this includes the entire WRD, Incoming Power Yard, Processing Plant and Primary Crusher) and portions of the footprint also form part of a Surface Water Strategic Water Source Area at the national scale as well. Therefore, the project area is considered an important intact ecological corridor at the national and provincial scale that plays a critical role for biodiversity maintenance and for ecosystem services related to water supply. Direct loss of more than 500ha of vegetation will result in significant habitat fragmentation, a reduction in the extent of available ecological corridors and remaining intact areas that are capable of contributing meaningfully to biodiversity maintenance and various ecosystem services. Fragmentation of large contiguous areas of intact grassland habitat will take place. Large contiguous areas of intact grassland are becoming increasingly rare, with the result being that fires that would have historically spread across larger areas and been more intense, will become more localised and less intense in nature. This will likely result in shifts in landscape scale ecosystem processes over time, thereby irreversibly altering these grassland ecosystems.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Prominent change (High)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Beyond site	Beyond site
Consequence	High	High
Probability	Definite / Continuous	Definite / Continuous
Significance	High -	High -
Degree to which impact can be reversed	Irreversible	
	Rehabilitation post closure may restore some ecological corridors for some more common faunal species that are habituated to disturbed/degraded environments, however, sensitive threatened floral species are unlikely to re-colonise these degraded areas in the medium to long term, moreover the hydrological and geomorphological processes and ecosystem services provided by	

	intact areas vs. the degraded areas post closure and rehabilitation are unlikely to ever be comparative.
Degree to which impact may cause irreplaceable loss of resources	Moderately High
	Other ecological corridors will still exist for faunal species frequenting or passing through the area along major rivers and valley drainage lines adjoining the project area, however, connectivity between intact primary grassland areas will be greatly reduced and may represent a loss in terms of seed dispersal across contiguous intact areas for certain plant species that are wind dispersed.
Degree to which impact can be mitigated	Low
	Mitigation potential is low. Loss in extent of intact habitat will be impossible to mitigate completely and given that the design recommendations provided for avoidance of Medium and Very High SEI have not ben incorporated, key ecological corridors as well as the ecosystems services they provide will be lost.
Mitigation actions	
The following measures are recommended:	• Originally it was recommended that the project team employ design recommendations that are outlined in section 6.3 Infrastructure Siting Considerations to avoid vegetation communities of Very High to Medium SEI, feedback has been that this would make the project financially unviable. • Nevertheless, all areas outside the footprint that form part of the no-go areas in Figure 42, Figure 43 and Figure 44 in section 6.2 'Ecologically Sensitive No Go Areas' should be considered no-go areas for all phases of the mine development (refer to section 6.6 General Site-management Recommendations – 1 Access Control and Site Camps for more information on enforcement of no-go areas). • All the baseline assessment information listed in section 7.6 will need to be compiled prior to application for environmental authorisation, all rescue and translocation plans will need to be compiled and actioned prior to the construction phase refer to section 6.4. • Refer to all measures in section 6.6 entitled General Site-management Recommendations, which are applicable to all phases of the proposed mining development.
Monitoring	
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.6 Monitoring and Additional Planning Required, for monitoring recommendations.

Cumulative impacts		
Nature of cumulative impacts	The direct loss impacts outlined above in combination with direct loss impacts associated with forestry, agriculture and human settlement in the area, will result in moderate levels of cumulative direct loss impacts to ecological processes in the area.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Residual impacts will be high based on the assumption that direct loss associated with the mine footprint will result in habitat fragmentation, reduced biodiversity maintenance and therefore reduced resilience for threatened ecosystems and species to withstand additional/future stressors and risks.	
Rating of residual impacts	High -	
C1-2c – Indirect impacts to local and regional ecological processes during the construction phase		
Description of Impact		
During construction of infrastructure, increased rates of sedimentation and erosion associated with bulk earthworks could result in vegetation being smothered downslope. Disturbed areas can become colonised with weedy, pioneer and alien plant species quickly. Any spills or pollution associated with construction can contaminate natural areas downslope or downstream thereby compromising the integrity and functioning of terrestrial ecosystems on site and indirectly affecting the ecosystem goods and services they provide.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Intensity	Moderate change (Medium)	Moderate change (Medium)
Duration	Medium-term (5 to 10 years)	Medium-term (5 to 10 years)
Extent	Local	Local
Consequence	Medium	Medium
Probability	Definite / Continuous	Definite / Continuous
Significance	Medium -	Medium -
Degree to which impact can be reversed	Partially Reversible	
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the construction phase, these impacts can be addressed to some degree through mitigation such as alien plant clearing, spill clean-up, silt fencing etc. However, if these impacts take place in areas	

	that are largely intact, even with the mitigation measures above implemented, pollution, erosion and alien plant invasion could result in a reduction in the condition of the affected vegetation communities.	
Degree to which impact may cause irreplaceable loss of resources	Moderate	
	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate.	
Degree to which impact can be mitigated	Moderate	
	Mitigation such as strict enforcement of no-go areas, erosion and sediment control measures, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities beyond the mine's development footprint are minimised as far as practicably possible.	
Mitigation actions		
The following measures are recommended:	Refer to section 6.6 entitled General Site-management Recommendations, sub-section 1 Access Control And Site Camps, sub-section 2 Storm Water Management & Erosion/Sediment Control, and sub-section 3 Pollution control for key mitigation aimed at reducing indirect impacts.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	The indirect impacts outlined above in combination with indirect impacts associated with forestry, agriculture and human settlement in the area, will result in moderate levels of cumulative indirect impacts to ecological processes in the area.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint and therefore lead to reduced	

	resilience to withstand future stressors and risks and affect the ability of these communities to contribute to local and regional scale ecological processes. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate levels.
Rating of residual impacts	Medium -

7.3 Operation Phase (Active Mining): Impact Significance Assessment

A summary of the impact significance assessment for the operation (active mining) phase of the proposed mining project is presented in Table 29, Table 30 and Table 31, below.

Table 29. Summary results of the impact significance assessment for operational phase impacts to terrestrial communities and habitats.

O1-1a - Direct impacts to vegetation communities during the operational (mining) phase and implications for threatened ecosystems and biodiversity conservation		
Description of Impact		
It is important to state upfront that the direct operational impacts only consider accidental impacts to ecosystems and habitat near the mining footprint that are likely to be modified and transformed by operational activities. The direct impacts of all ecosystem and habitat loss under the development footprint has been assessed as part of Impact C1-1a. During the mine operation phase terrestrial habitat could 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 outside the mine footprint, must therefore be appropriately safeguarded as no-go areas.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operational	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Moderate change (Medium)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Beyond site	Whole site
Consequence	High	Medium
Probability	Definite / Continuous	Probable
Significance	High -	Medium
Degree to which impact can be reversed	Irreversible	

	The impact is irreversible if accidental vegetation clearing takes place outside of the mine footprint in intact areas that play host to high levels of plant diversity. However, the likelihood of this impact occurring can be reduced through strict adherence to best-practice mitigation measures such as clear demarcation of no-go areas and limiting operational activities to the mine footprint already cleared during the construction phase.
Degree to which impact may cause irreplaceable loss of resources	Moderately High
	Given that the vegetation survey was conducted outside the correct seasonal window, the moderately high rating above is based largely on the precautionary principle and the assumption that a large number of the Endangered plant species flagged as part of the desktop potential occurrence assessment will occur within the study area and that smaller portions of good condition grassland that support these threatened plant species populations will be lost during the operational phase due to accidental incursion and vegetation clearing under a poor mitigation scenario. .
Degree to which impact can be mitigated	Moderate
	Additional accidental incursion into intact vegetation communities during the operational phase can be avoided through appropriate demarcation and enforcement of sensitive no-go areas and a clear working servitude limited to within the existing mine footprint.
Mitigation actions	
The following measures are recommended:	• Originally it was recommended that the project team employ design recommendations that are outlined in section 6.3 Infrastructure Siting Considerations to avoid vegetation communities of Very High to Medium SEI, feedback has been that this would make the project financially unviable. • Nevertheless, all areas outside the footprint that form part of the no-go areas in Figure 42, Figure 43 and Figure 44 in section 6.2 Ecologically Sensitive No Go Areas should be considered no-go areas for all phases of the mine development (refer to section 6.6 General Site-management Recommendations – 1 Access Control and Site Camps for more information on enforcement of no-go areas). • All the baseline assessment information listed in section 7.6 will need to be compiled prior to application for environmental authorisation, all rescue and translocation plans will need to be compiled and actioned prior to the construction phase (refer to section 6.4).

	• Refer to all measures in section 6.6 entitled General Site-management Recommendations, which are applicable to all phases of the proposed mining development.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	Cumulative impacts will be more significant for remaining intact open savannah/grassland areas as these areas have a smaller remaining extent (~1000 plus hectares within the larger southern section of the mining right area) in comparison to more closed woodland thicket areas (currently in the region of ~3000 plus hectares within the larger southern section of the mining right area) and are anticipated to be moderate. .	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Residual impacts will be moderate, provided natural habitat outside the mine footprint is appropriately safeguarded under a good mitigation scenario with strict adherence to no-go areas achieved during the operational phase of the proposed mine development.	
Rating of residual impacts	Medium -	
O1-2a - Indirect impacts to vegetation communities during the operational (mining) phase and implications for threatened ecosystems and biodiversity conservation		
Description of Impact		
During the operational phase, hardened surfaces associated with the power yard, processing plant, primary crusher, WRD, South East Pit and other infrastructure are likely to reduce infiltration rates which could lead to increased runoff downslope and loss of soil and vegetation. Storm water management design guidance is outlined in the Freshwater report and should be considered by the project management team to mitigate these impacts. The dewatering of the mine may also increase flows on certain slopes if this water is discharged into the environment. Additionally, as with the construction phase, during the operational phase of the mine large bare areas of earth and bedrock will be exposed to surface weather elements. As exposed bedrock has very little infiltration capacity it is expected that runoff volumes from the mine pit will increase as mining advances. If this storm water is not effectively managed it can cause erosion, which has implications for the ecological condition of terrestrial ecosystems downslope of the planned mine pit area. Bare and exposed soil associated with the mine pit may also wash into downslope areas during rainfall events. The rock dump area will also likely hold or distribute runoff in an altered fashion, with this likely having knock on effects downslope of this area.		

In addition to sedimentation and erosion risks highlighted above, impacts to vegetation of Medium to Very High 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 ecosystems, reducing overall biodiversity.

Another impact to consider is dust generated from operational activities which will coat vegetation within and on the margins of the operational footprint, associated with haul roads, the expanding mine pit, WRD and other infrastructure planned. This will affect the ability of plants to photosynthesise as effectively and decrease their ability to survive other environmental stresses they encounter as a consequence. These conditions conversely will likely favour recruitment of more weedy, pioneer and alien invasive plant species in the areas affected by this stressor/risk, that are more adaptable to a spectrum of environmental conditions and habitat types.

It is recommended that various dust suppression measures are implemented during the operational phase of the mine to ensure this potential stressor/risk is minimised as much as possible.

Accumulation of unnatural concentrations of heavy metals in the soil may also have a long term cumulative negative effect on certain plant species (Singh et al 2016), thereby reducing their resilience, increasing mortality rates in affected species and potentially resulting in less diverse plant species assemblages and ultimately impacting upon terrestrial biodiversity levels in areas downstream of the mine.

Correct storm water management will be critical in minimising sediment runoff and heavy metal accumulation downstream although this stressor/risk unfortunately cannot be eliminated but may be reduced in extent and in intensity.

At a smaller point source scale, accidental fuel spills and wastewater infrastructure failure (e.g. sewer pipeline leaks or waste water treatment work malfunction) may result in spills to adjacent intact ecosystems during the operational phase of the mine which could result in die-back of vegetation and some mortalities for fauna. However, the likelihood of spills can be reduced through various best practice mitigation measures which include measures listed in section 6.6 under '3 Pollution Control' of this report (note this is not an exhaustive list of measures that could be implemented but represents standard minimum best-practice measures).

Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Moderate change (Medium)
Duration	Long-term (10 and 20 years	Long-term (10 and 20 years
Extent	Local	Whole site
Consequence	High	Medium
Probability	Definite / Continuous	Definite / Continuous
Significance	High -	Medium -

Degree to which impact can be reversed	Partially Reversible
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the operational phase, these impacts can be addressed to some degree through mitigation such as alien plant clearing, appropriate storm water management, pollution control measures etc. which would decrease the extent and intensity of these impacts. However, if these impacts take place in areas that are largely intact, even with the mitigation measures above implemented, pollution, erosion and alien plant invasion could result in a reduction in the condition of the affected vegetation communities.
Degree to which impact may cause irreplaceable loss of resources	Moderate
	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate.
Degree to which impact can be mitigated	Moderate
	Mitigation such as strict erosion and sediment control measures, storm water management, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities beyond the mine's development footprint are minimised as far as practicably possible.
Mitigation actions	
The following measures are recommended:	Refer to section 6.6 entitled General Site-management Recommendations, sub-section 1 Access Control And Site Camps, sub-section 2 Storm Water Management & Erosion/Sediment Control, and sub-section 3 Pollution control for key mitigation aimed at reducing indirect impacts.
Monitoring	
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.
Cumulative impacts	
Nature of cumulative impacts	The indirect impacts outlined above in combination with indirect impacts associated with forestry, agriculture and human settlement in the area, will result in moderate levels of cumulative indirect impacts to vegetation communities in the area.

Rating of cumulative impacts	Without Mitigation	With Mitigation
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate levels.	
Rating of residual impacts	Medium -	

Table 30 Summary results of the impact significance assessment for operational phase impacts to terrestrial biota / species (flora and fauna).

O1-1b - Direct impacts to species and threatened species conservation during the operational (mining) phase	
Description of Impact	
It is important to state upfront that the direct operational impacts only consider planned and/or accidental impacts to ecosystems and habitat near the mining footprint that are likely to be modified and transformed by operational activities. The direct impacts to threatened biota under the development footprint has been assessed as part of Impact C1-1b. Vegetation communities rated as being of Low or Very Low SEI are unlikely to host conservation important species, however, based on the current layout areas of Medium to Very High SEI vegetation communities which play host to species of conservation concern, occur on the margins of the mine footprint. Additional portions of these vegetation communities may be lost due to accidental incursion outside the proposed footprint during the operational phase. Therefore, impacts to populations of threatened plant species are anticipated under a poor mitigation scenario (two threatened plant species are confirmed to occur within the large mining right area, namely, *Moraea graminicola subsp graminicola* – Near Threatened and *a sensitive plant species* – Vulnerable; in addition what appeared to be *Helichrysum pannosum* – Endangered was, noted by D. Styles on site, however no available flowering specimens were present to confirm this). Direct loss could eliminate or reduce the size of threatened plant populations on-site. Strict enforcement of no-go areas during the operational phase will need to be undertaken by an ECO to avoid accidental incursion and reduce the likelihood of this impact occurring under a good mitigation scenario. Faunal impacts associated with accidental incursion under a poor mitigation scenario are also likely to be high, given that invertebrate species flagged as potentially occurring as part of the POC may have specific habitat requirements and occur in areas of Medium to Very High SEI. Moreover, at the local scale the potential additional loss in extent of important ecological corridors for faunal species movement as well as the loss of seed sources for certain plant species is a concern and anticipated impact. A reduction in extent of existing ecological corridors for faunal species such as leopard etc., are anticipated as well as loss of the exchange of genetic material between threatened plant populations.	
Type of Impact	Direct

Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Moderate change (Medium)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Beyond site	Whole site
Consequence	High	Medium
Probability	Definite / Continuous	Probable
Significance	High	Medium
Degree to which impact can be reversed	Irreversible	
	The impact is irreversible if accidental vegetation clearing takes place outside of the mine footprint in intact areas that play host to high levels of plant diversity. However, the likelihood of this impact occurring can be reduced through strict adherence to best-practice mitigation measures such as clear demarcation of no-go areas and limiting operational activities to the mine footprint already cleared during the construction phase.	
Degree to which impact may cause irreplaceable loss of resources	Moderately High	
	Given that the vegetation survey was conducted outside the correct seasonal window, the moderately high rating above is based largely on the precautionary principle and the assumption that a large number of the Endangered plant species flagged as part of the desktop potential occurrence assessment will occur within the study area and that smaller portions of good condition grassland that support these threatened plant species populations will be lost during the operational phase due to accidental incursion and vegetation clearing under a poor mitigation scenario. .	
Degree to which impact can be mitigated	Moderate	
	Additional accidental incursion into intact vegetation communities during the operational phase can be avoided through appropriate demarcation and enforcement of sensitive no-go areas and a clear working servitude within the existing mine footprint.	
Mitigation actions		
The following measures are recommended:	Mitigation measures of particular relevance to species of conservation concern are included under the heading '4 Managing Flora & Fauna' in section 6.6.	
Monitoring		

The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	In the event populations of threatened plant species are lost, this could potentially have a negative effect on the remaining gene pool and genetic diversity of the species. Also less suitable habitat will be left available for species to occupy in future given the anticipated increase in other anthropogenic disturbances in the area (in addition to proposed mining) which includes forestry, agriculture and human settlement, reducing their resilience to other ecological or anthropogenic disturbances and ability to persist long term. The same applies for threatened faunal species that may use habitat that is lost as ecological corridors or for foraging and breeding habitat.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Residual impacts will be moderate, as the loss of genetic diversity and populations of threatened plant species within the study area will have a negative effect on the remaining gene pool potentially compromising the ability of rare and threatened plant species to persist in the long term.	
Rating of residual impacts	Medium	
O1-2b - Indirect impacts to species and threatened species conservation during the operational (mining) phase		
Description of Impact		
During mining operations, increased rates of sedimentation and erosion associated with bulk earthworks could result in vegetation being smothered downslope. Windborne dust can smother plants compromising their ability to photosynthesise as effectively. Disturbed areas can become colonised with weedy, pioneer and alien plant species quickly. Any spills or pollution associated with mining operations can contaminate natural areas downslope or downstream. All these indirect impacts can result in increased mortalities of threatened flora and fauna.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Moderate change (Medium)	Moderate change (Medium)

Duration	Long-term (10 and 20 years	Long-term (10 and 20 years
Extent	Beyond site	Beyond site
Consequence	Medium	Medium
Probability	Definite / Continuous	Probable
Significance	Medium -	Medium -
Degree to which impact can be reversed	Partially Reversible	
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the operational phase, these impacts can be addressed to some degree through strict adherence to mitigation such as alien plant clearing, storm water management pollution control, silt fencing etc., however, even with the mitigation measures above implemented, loss of certain individuals of threatened plant species may occur along with the loss of some level of genetic diversity.	
Degree to which impact may cause irreplaceable loss of resources	Moderate	
	Erosion and pollution impacts could, lead to higher levels of mortality within threatened plant species populations. In addition, alien plant invasion could result in indigenous plant species being outcompeted. However, with strict and comprehensive mitigation applied, the impact can be reduced.	
Degree to which impact can be mitigated	Moderate	
	Mitigation such as strict enforcement of no-go areas, erosion and sediment control measures, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities and species of conservation concern beyond the mine's development footprint are minimised as far as practicably possible.	
Mitigation actions		
The following measures are recommended:	Refer to section 6.6 entitled General Site-management Recommendations, sub-section 1 Access Control And Site Camps, sub-section 2 Storm Water Management & Erosion/Sediment Control, and sub-section 3 Pollution control for key mitigation aimed at reducing indirect impacts.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	In the event populations of threatened plant species are lost, this could potentially have a negative effect on the remaining gene	

	pool and genetic diversity of the species. Also less suitable habitat will be left available for species to occupy in future given the anticipated increase in other anthropogenic disturbances in the area (in addition to proposed mining) which include forestry, agriculture and human settlement, reducing their resilience to other ecological or anthropogenic disturbances and ability to persist long term. The same applies for threatened faunal species that may use habitat that is lost as ecological corridors or for foraging and breeding habitat.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Residual impacts will be moderate, as the loss of genetic diversity and populations of threatened plant species within the study area will have a negative effect on the remaining gene pool potentially compromising the ability of rare and threatened plant species to persist in the long term.	
Rating of residual impacts	Medium -	

Table 31 Summary results of the impact significance assessment for operational phase impacts to local and regional landscape ecological processes.

O1-1c - Direct impacts to local and regional ecological processes during the operational (mining) phase
Description of Impact
It is important to state upfront that the direct operational impacts only consider accidental impacts to ecosystems and habitat near the mining footprint that are likely to be modified and transformed by operational activities. The direct impacts to local and landscape ecological processes and macro ecological corridors under the development footprint has been assessed as part of Impact C1-1c. Large portions of the study area are considered CBA: Optimal at the provincial scale, and at the national scale, portions of the study area have been flagged as part of the National Protected Area Expansion Strategy and portions of the larger study area also form part of a Surface Water Strategic Water Source Area at the national scale as well. Therefore the study area (which includes the secondary and tertiary project area of influence beyond the direct footprint) is considered an important intact ecological corridor at the national and provincial scale that plays a critical role for biodiversity maintenance and for ecosystem services related to water supply. Additional direct loss of vegetation beyond the mine footprint due to accidental incursion during the operational phase will result in additional habitat fragmentation impacts, a reduction in the extent of available ecological corridors and remaining intact areas that are capable of contributing meaningfully to biodiversity maintenance and various ecosystem services.

Further fragmentation of areas of intact grassland habitat will likely take place under a poor mitigation scenario, further reducing the extent of remaining contiguous areas of grassland which are becoming increasingly rare, with the result being that fires that would have historically spread across larger areas and been more intense, will become more localised and less intense in nature.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Moderate change (Medium)	Moderate change (Medium)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Whole site	Whole site
Consequence	Medium	Medium
Probability	Definite / Continuous	Probable
Significance	Medium -	Medium -
Degree to which impact can be reversed	Irreversible	
	The impact is irreversible if accidental vegetation clearing takes place outside of the mine footprint in intact areas that play host to high levels of plant diversity. However, the likelihood of this impact occurring can be reduced through strict adherence to best-practice mitigation measures such as clear demarcation of no-go areas and limiting operational activities to the mine footprint already cleared during the construction phase.	
Degree to which impact may cause irreplaceable loss of resources	Moderately High	
	Other ecological corridors will still exist for faunal species frequenting or passing through the area along major rivers and valley drainage lines adjoining the project area, however, connectivity between intact primary grassland areas will be reduced and may represent a loss in terms of seed dispersal across contiguous intact areas for certain plant species that are wind dispersed.	
Degree to which impact can be mitigated	Moderate	
	Additional accidental incursion into intact vegetation communities during the operational phase can be avoided through appropriate demarcation and enforcement of sensitive no-go areas and a clear working servitude within the existing mine footprint.	
Mitigation actions		
The following measures are recommended:	• Originally it was recommended that the project team employ design recommendations that are outlined in section 6.3 Infrastructure Siting Considerations to avoid vegetation	

	communities of Very High to Medium SEI, feedback has been that this would make the project financially unviable. • Nevertheless, all areas outside the footprint that form part of the no-go areas in Figure 42, Figure 43 and Figure 44 in section 6.2 'Ecologically Sensitive No Go Areas' should be considered no-go areas for all phases of the mine development (refer to section 6.6 General Site-management Recommendations – 1 Access Control and Site Camps for more information on enforcement of no-go areas). • Refer to all measures in section 6.6 entitled General Site-management Recommendations, which are applicable to all phases of the proposed mining development.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	Habitat fragmentation, reduced biodiversity and therefore reduced resilience for threatened ecosystems and species to withstand additional/future stressors and risks.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Residual impacts to ecological processes will be moderate due to increased habitat fragmentation, reduced biodiversity and therefore reduced resilience for threatened ecosystems and species to withstand additional/future stressors and risks.	
Rating of residual impacts	Medium	
O1-2c - Indirect impacts to local and regional ecological processes during the operational (mining) phase		
Description of Impact		
During the operational phase of the mine, increased rates of sedimentation and erosion associated with bulk earthworks could result in vegetation being smothered downslope. Disturbed areas can become colonised with weedy, pioneer and alien plant species quickly. Any spills or pollution associated with mining can contaminate natural areas downslope or downstream thereby compromising the integrity and functioning of terrestrial ecosystems on site and indirectly affecting the ecosystem goods and services they provide.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	

Criteria	Without Mitigation	With Mitigation
Intensity	Prominent change (High)	Prominent change (High)
Duration	Long-term (10 and 20 years	Long-term (10 and 20 years
Extent	Whole site	Whole site
Consequence	Medium	Medium
Probability	Definite / Continuous	Probable
Significance	Medium -	Medium -
Degree to which impact can be reversed	Partially Reversible	
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the operational phase, these impacts can be addressed to some degree through strict adherence to mitigation such as alien plant clearing, storm water management pollution control, silt fencing etc., however, even with the mitigation measures above implemented, loss of certain individuals of threatened plant species may occur along with the loss of some level of genetic diversity.	
Degree to which impact may cause irreplaceable loss of resources	Moderate	
	Erosion and pollution impacts could, lead to higher levels of alien plant invasion, deterioration of ecological condition of intact vegetation communities, and compromise ecological processes. However, with strict and comprehensive mitigation applied, the impact can be reduced.	
Degree to which impact can be mitigated	Moderate	
	Mitigation such as strict enforcement of no-go areas, erosion and sediment control measures, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities and species of conservation concern beyond the mine's development footprint are minimised as far as practicably possible.	
Mitigation actions		
The following measures are recommended:	Refer to section 6.6 entitled General Site-management Recommendations, sub-section 1 Access Control And Site Camps, sub-section 2 Storm Water Management & Erosion/Sediment Control, and sub-section 3 Pollution control for key mitigation aimed at reducing indirect impacts.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed	

	in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	Reduced connectivity and ecological corridors as well as reduced capacity to deal with additional stressors could result in a higher level of sensitivity to any additional impacts and pressures such as the impacts associated with forestry as well as commercial and subsistence agriculture, grazing and human settlement.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Medium -
Residual impacts		
Nature of residual impacts	Residual impacts will be moderate resulting in reduced biodiversity due to the proliferation of alien plants, increased erosion, higher levels of pollutants and therefore reduced resilience for ecosystems to withstand additional/future stressors and risks and reduced levels of ecosystem functioning.	
Rating of residual impacts	Medium -	

7.4 Decommissioning, Closure & Rehabilitation Phase: Impact Significance Assessment

A summary of the impact significance assessment for the decommissioning (closure and rehabilitation) phase of the proposed mining project is presented in Table 32, Table 33 and Table 34, below.

Table 32. Summary results of the impact significance assessment for decommissioning phase impacts to terrestrial communities and habitats.

D1-1a - Direct impacts to vegetation communities during the decommissioning phase and implications for threatened ecosystems and biodiversity conservation		
Description of Impact		
Direct impacts in the decommissioning phase are limited to accidental incursion into sensitive no-go areas by heavy vehicles/machinery during the removal of infrastructure and decommissioning of access roads. Additional intact areas may be impacted by accidental incursion if they are not clearly demarcated as no-go areas and an ECO is not on site to enforce the relevant mitigation measures. This could result in additional loss in extent of Very High, Medium, Low and Very Low SEI vegetation communities on the margins of the mining footprint.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Decommissioning	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Moderate change (Medium)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Beyond site	Whole site
Consequence	High	Medium
Probability	Possible / frequent	Conceivable
Significance	Medium	Low
Degree to which impact can be reversed	Irreversible	
	The impact is irreversible if accidental vegetation clearing takes place outside of the mine footprint in intact areas that play host to high levels of plant diversity. However, the likelihood of this impact occurring can be reduced through strict adherence to best-practice mitigation measures such as clear demarcation of no-go areas and limiting decommissioning activities to the mine footprint already cleared during the construction phase.	
Degree to which impact may cause irreplaceable loss of resources	Moderately High	
	Given that the vegetation survey was conducted outside the correct seasonal window, the moderately high rating above is based largely	

	on the precautionary principle and the assumption that a large number of the Endangered plant species flagged as part of the desktop potential occurrence assessment will occur within the study area and that smaller portions of good condition grassland that support these threatened plant species populations will be lost during the decommissioning phase due to accidental incursion and vegetation clearing under a poor mitigation scenario. .	
Degree to which impact can be mitigated	High	
	Additional accidental incursion into intact vegetation communities during the operational phase can be avoided through appropriate demarcation and enforcement of sensitive no-go areas and a clear working servitude within the existing mine footprint.	
Mitigation actions		
The following measures are recommended:	Areas depicted in Figure 42, Figure 43 and Figure 44 in section 6.2 Ecologically Sensitive No Go Areas should be considered no-go areas for all phases of the mine development (refer to section 6.6 General Site-management Recommendations – 1 Access Control and Site Camps for more information on enforcement of no-go areas).	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	Cumulative impacts could include Increased habitat fragmentation at the local scale, lower levels of ecosystem resilience and ecological connectivity in the vegetation communities affected by accidental incursion and other existing land-use impacts in the study area (i.e. forestry, agriculture and residential development), decreased recruitment of rare and threatened indigenous species, lower levels of diversity, increased edge effects and associated IAP invasion in remaining intact areas of grassland, savannah and valley bushveld/thicket vegetation.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium	Low
Residual impacts		
Nature of residual impacts	Residual impacts to vegetation communities would be low under a good mitigation scenario, which assumes that enforcement of	

	sensitive no-go areas by an ECO is achieved and accidental incursion into intact vegetation communities is avoided.	
Rating of residual impacts	Low	
D1-2a - Indirect impacts to vegetation communities during the decommissioning phase and implications for threatened ecosystems and biodiversity conservation		
Description of Impact		
During the decommissioning phase under a poor mitigation scenario there is a risk that open pits erode and lead to slumping and loss of intact habitat outside the mining footprint, leading to additional loss of intact habitat of potentially Very High SEI. This is the most significant impact that could affect vegetation structure and plant species composition. Indirect impacts associated with poor implementation of mitigation measures could also include an increase in IAPs and bush encroachment in former grassland areas, and pollution from the mine pits could cause further shifts in plant species composition and structure towards a more exotic and woody assemblage.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Decommissioning	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Moderate change (Medium)	Moderate change (Medium)
Duration	Long-term (10 and 20 years	Long-term (10 and 20 years
Extent	Beyond site	Whole site
Consequence	Medium	Medium
Probability	Definite / Continuous	Possible / frequent
Significance	**Medium -**	**Low -**
Degree to which impact can be reversed	Partially Reversible	
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the decommissioning phase, these impacts can be addressed through mitigation such as alien plant clearing, appropriate storm water management, pollution control measures etc. which would decrease the extent and intensity of these impacts. However, if these impacts take place in areas that are largely intact, even with the mitigation measures above, pollution, erosion and alien plant invasion could result in a reduction in the condition of the affected vegetation communities.	
Degree to which impact may cause irreplaceable loss of resources	Moderate	
	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate.	

Degree to which impact can be mitigated	Moderate	
	Mitigation such as strict enforcement of no-go areas, erosion and sediment control measures, storm water management, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities beyond the mine's development footprint are minimised as far as practicably possible.	
Mitigation actions		
The following measures are recommended:	Refer to all measures in section 6.6 entitled General Site-management Recommendations which are applicable to all phases of the proposed mining development.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	Increased edge effects and associated IAP invasion in remaining intact areas of grassland, savannah and valley bushveld/thicket vegetation associated with mining development and other land uses in the study area (forestry, agriculture, grazing, human settlement)	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -
Residual impacts		
Nature of residual impacts	Under a good mitigation scenario, additional edge effects and associated IAP invasion in remaining intact areas of grassland, savannah and valley bushveld/thicket vegetation were rated as low.	
Rating of residual impacts	Low -	

Table 33 Summary results of the impact significance assessment for decommissioning phase impacts to terrestrial biota / species (flora and fauna).

D1-1b - Direct impacts to species and threatened species conservation during the decommissioning phase		
Description of Impact		
Direct impacts in the decommissioning phase are limited to accidental incursion into sensitive no-go areas by heavy vehicles/machinery during the removal of infrastructure and decommissioning of access roads. Additional intact areas may be impacted by accidental incursion if they are not clearly demarcated as no-go areas and an ECO is not on site to enforce the relevant mitigation measures. This could result in additional loss in extent of Very High, Medium, Low and Very Low SEI vegetation communities on the margins of the mining footprint, reducing the suitable habitat available for fauna and flora of conservation concern or resulting in direct mortalities for threatened plant species.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Decommissioning	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Moderate change (Medium)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Beyond site	Whole site
Consequence	High	Medium
Probability	Possible / frequent	Conceivable
Significance	Medium	Low
Degree to which impact can be reversed	Irreversible	
	The impact is irreversible if accidental vegetation clearing takes place outside of the mine footprint in intact areas that play host to high levels of plant diversity. However, the likelihood of this impact occurring can be reduced through strict adherence to best-practice mitigation measures such as clear demarcation of no-go areas and limiting decommissioning phase activities to the mine footprint already cleared during the construction phase.	
Degree to which impact may cause irreplaceable loss of resources	Moderately High	
	Given that the vegetation survey was conducted outside the correct seasonal window, the moderately high rating above is based largely on the precautionary principle and the assumption that a large number of the Endangered plant species flagged as part of the desktop potential occurrence assessment will occur within the study area and that smaller portions of good condition grassland that support these threatened plant species populations will be lost	

	during the decommissioning phase due to accidental incursion and vegetation clearing under a poor mitigation scenario. .	
Degree to which impact can be mitigated	High	
	Additional accidental incursion into intact vegetation communities during the operational phase can be avoided through appropriate demarcation and enforcement of sensitive no-go areas and a clear working servitude within the existing mine footprint.	
Mitigation actions		
The following measures are recommended:	Areas depicted in Figure 42, Figure 43 and Figure 44 in section 6.2 Ecologically Sensitive No Go Areas should be considered no-go areas for all phases of the mine development (refer to section 6.6 General Site-management Recommendations – 1 Access Control and Site Camps for more information on enforcement of no-go areas).	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	In the event populations of threatened plant species are lost, this could potentially have a negative effect on the remaining gene pool and genetic diversity of the species. Also, less suitable habitat will be left available for threatened and sensitive plant species to occupy, reducing their resilience to other ecological or anthropogenic disturbances and their ability to persist long term. The same applies for threatened faunal species that may use habitat that is lost as ecological corridors or for foraging and breeding habitat.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -
Residual impacts		
Nature of residual impacts	Residual impacts to species of conservation concern would be low under a good mitigation scenario, which assumes that enforcement of sensitive no-go areas by an ECO is achieved and accidental incursion into intact vegetation communities during the decommissioning phase is avoided/highly unlikely to occur.	
Rating of residual impacts	Low -	
D1-2b - Indirect impacts to species and threatened species conservation during the decommissioning phase		

Description of Impact		
During the decommissioning the most significant indirect impacts on species of conservation concern would be associated with an increase in alien plant cover and an accumulation of pollutants in the soil. Both would result in invasive alien plants potentially outcompeting indigenous species, thereby decreasing the number of individuals remaining in populations of plant species of conservation concern. Consequently, reducing the resilience of the remaining populations of the affected plant species of conservation concern to persist. Impacts on populations of animal species of conservation concern would likely be a reduction in suitable habitat, movement corridors, as well as potentially increased mortalities associated with a bioaccumulation of heavy metals and toxicants.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Decommissioning	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Moderate change (Medium)	Moderate change (Medium)
Duration	Long-term (10 and 20 years	Long-term (10 and 20 years
Extent	Beyond site	Whole site
Consequence	Medium	Medium
Probability	Definite / Continuous	Possible / frequent
Significance	Medium -	Low -
Degree to which impact can be reversed	Partially Reversible	
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the decommissioning phase, these impacts can be addressed to some degree through mitigation such as alien plant clearing, appropriate storm water management, pollution control measures etc. which would decrease the extent and intensity of these impacts. However, if these impacts take place in areas that are largely intact, even with the mitigation measures above, pollution, erosion and alien plant invasion could result in a reduction in the condition of the affected vegetation communities.	
Degree to which impact may cause irreplaceable loss of resources	Moderate	
	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate.	
Degree to which impact can be mitigated	Moderate	

	Mitigation such as strict enforcement of no-go areas, erosion and sediment control measures, storm water management, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities beyond the mine's development footprint are minimised as far as practicably possible.	
Mitigation actions		
The following measures are recommended:	Refer to all measures in section 6.6 entitled General Site-management Recommendations which are applicable to all phases of the proposed mining development.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	Increased pollution, increased edge effects and associated IAP invasion in remaining intact areas of grassland, savannah and valley bushveld/thicket vegetation at the local scale will result in a reduction in the extent of viable habitat available for threatened and/or flora and fauna.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -
Residual impacts		
Nature of residual impacts	Residual impacts associated with increased edge effects and associated IAP invasion in remaining intact areas of grassland, savannah and valley bushveld/thicket vegetation which would reduce the extent of viable habitat available for threatened and/or sensitive flora and fauna were assessed as being of low significance due to the application of mitigation measures decreasing the likelihood of this impact occurring as well as the intensity of the impact.	
Rating of residual impacts	Low -	

Table 34 Summary results of the impact significance assessment for decommissioning phase impacts to local and regional landscape ecological processes.

D1-1c - Direct impacts to local and regional ecological processes during the decommissioning phase		
Description of Impact		
Direct impacts in the decommissioning phase are limited to accidental incursion into sensitive no-go areas by heavy vehicles/machinery during the removal of infrastructure and decommissioning of access roads. Additional intact areas may be impacted by accidental incursion if they are not clearly demarcated as no-go areas and an ECO is not on site to enforce the relevant mitigation measures. This could result in additional loss in extent of Very High, Medium, Low and Very Low SEI vegetation communities on the margins of the mining footprint, reducing the extent of intact ecosystems and compromising their functioning further as well as the ecosystem services they provide.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Decommissioning	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Prominent change (High)	Moderate change (Medium)
Duration	Very long term/ Permanent (> 20 years)	Very long term/ Permanent (> 20 years)
Extent	Beyond site	Whole site
Consequence	High	Medium
Probability	Possible / frequent	Conceivable
Significance	Medium	Low
Degree to which impact can be reversed	Irreversible	
	The impact is irreversible if accidental vegetation clearing takes place outside of the mine footprint in intact areas that play host to high levels of plant diversity. However, the likelihood of this impact occurring can be reduced through strict adherence to best-practice mitigation measures such as clear demarcation of no-go areas and limiting decommissioning phase activities to the mine footprint already cleared during the construction phase.	
Degree to which impact may cause irreplaceable loss of resources	Moderately High	
	Given that the vegetation survey was conducted outside the correct seasonal window, the moderately high rating above is based largely on the precautionary principle and the assumption that a large number of the Endangered plant species flagged as part of the desktop potential occurrence assessment will occur within the study area and that smaller portions of good condition grassland that support these threatened plant species populations will be lost	

	during the decommissioning phase due to accidental incursion and vegetation clearing under a poor mitigation scenario. .	
Degree to which impact can be mitigated	High	
	Additional accidental incursion into intact vegetation communities during the operational phase can be avoided through appropriate demarcation and enforcement of sensitive no-go areas and a clear working servitude within the existing mine footprint.	
Mitigation actions		
The following measures are recommended:	Areas depicted in Figure 42, Figure 43 and Figure 44 in section 6.2 Ecologically Sensitive No Go Areas should be considered no-go areas for all phases of the mine development (refer to section 6.6 General Site-management Recommendations – 1 Access Control and Site Camps for more information on enforcement of no-go areas).	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	Accidental incursion and additional loss of intact vegetation/habitat would result in reduced ecological connectivity and reduced ecosystem functioning.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium	Low
Residual impacts		
Nature of residual impacts	Residual impacts to local regional ecological processes would be low under a good mitigation scenario, which assumes that enforcement of sensitive no-go areas by an ECO is achieved and accidental incursion into intact vegetation communities during the decommissioning phase is avoided/highly unlikely to occur.	
Rating of residual impacts	Low -	
D1-2c - Indirect impacts to local and regional ecological processes during the decommissioning phase		
Description of Impact		
During active mining, groundwater entering the open pits will be continually pumped to the surface to create a suitable mining environment. Should pumping of groundwater cease after the mining has stopped, this groundwater could potentially rise to the surface and may discharge into adjacent downslope areas. This could alter long-term hydrological and geomorphological processes in the area.		

Should roads, buildings, parking lots, and other infrastructure associated with hardened surfaces not be removed, these areas will continue to be associated with reduced infiltration rates and increased storm water runoff and potentially additional erosion and siltation. If roads are not appropriately decommissioned and mining pits left open, erosion and other sediment related impacts could ensue which has implications for the ecological condition of terrestrial ecosystems downslope of the mine pit area. Bare and exposed soil associated with the mine pit may also wash into downslope areas during rainfall events. The WRD area will also likely hold or distribute runoff in an altered fashion, with this likely having knock on effects downslope of this area.

Any areas that are not successfully re-vegetated would also lead to dust pollution being an issue in the decommissioning phase as well. Dust will coat vegetation within and on the margins of the mine footprint, associated with haul roads, the mine pit, WRD and other infrastructure. This will affect the ability of plants to photosynthesise as effectively and decrease their ability to survive other environmental stresses they encounter as a consequence, potentially leading to lower resilience and higher mortality rates of more specialised, rare indigenous plants adapted to very specific ecological niches that are more sensitive to slight changes in their environmental conditions. These conditions conversely will likely favour recruitment of more weedy, pioneer and alien invasive plant species in the areas affected by this stressor/risk, that are more adaptable to a spectrum of environmental conditions and habitat types.

There is also the risk that water and soil becomes more contaminated during the decommissioning phase of the mine through long-term mine drainage associated with rising groundwater and runoff from the WRD area, where not closed and rehabilitated appropriately. Mine drainage would likely contain metal rich water which can be toxic to fauna and flora. Ongoing mine drainage associated with decommissioned mines is a common concern associated with the mining industry, and is often unavoidable and can completely desolate the ecological integrity of an area if it is not adequately managed.

Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Decommissioning	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Moderate change (Medium)	Moderate change (Medium)
Duration	Long-term (10 and 20 years	Long-term (10 and 20 years
Extent	Beyond site	Whole site
Consequence	Medium	Medium
Probability	Definite / Continuous	Possible / frequent
Significance	Medium -	Low -
Degree to which impact can be reversed	Partially Reversible	
	In terms of indirect impacts such as sedimentation, point source pollution and alien plant invasion which would take place during the decommissioning phase, these impacts can be addressed to some degree through mitigation such as alien plant clearing, appropriate storm water management, pollution control measures etc. which	

	would decrease the extent and intensity of these impacts. However, if these impacts take place in areas that are largely intact, even with the mitigation measures above, pollution, erosion and alien plant invasion could result in a reduction in the condition of the affected vegetation communities.	
Degree to which impact may cause irreplaceable loss of resources	Moderate	
	Erosion and pollution impacts as well as alien plant invasion could reduce the ecological condition of vegetation communities surrounding the mine footprint. However, with strict and comprehensive mitigation applied, the impact can be reduced to moderate.	
Degree to which impact can be mitigated	Moderate	
	Mitigation such as strict enforcement of no-go areas, erosion and sediment control measures, storm water management, pollution control and alien plant eradication can contribute to ensuring additional indirect impacts to vegetation communities beyond the mine's development footprint are minimised as far as practicably possible.	
Mitigation actions		
The following measures are recommended:	Refer to all measures in section 6.6 entitled General Site-management Recommendations which are applicable to all phases of the proposed mining development.	
Monitoring		
The following monitoring is recommended:	Refer to section 6.6 General Site-management Recommendations, sub-section 8 Compliance Monitoring and the monitoring plans listed in Section 6.5 Monitoring and Additional Planning Required, for monitoring recommendations.	
Cumulative impacts		
Nature of cumulative impacts	Cumulative impacts associated with the decommissioning phase include water, air, and soil pollution, increased runoff, erosion and siltation which could all be compounded by other anthropogenic activities All these disturbances will lead to higher levels of invasive alien plant cover and a reduction in floral and potentially faunal diversity.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	Medium -	Low -
Residual impacts		
Nature of residual impacts	Residual impacts associated with the decommissioning phase could include water, air, and soil pollution, increased runoff, erosion and	

	siltation which could all be compounded by other anthropogenic activities in the area (i.e. forestry, agriculture, residential and infrastructure development). All these disturbances will lead to higher levels of invasive alien plant cover and a reduction in floral and potentially faunal diversity. Under a good mitigation scenario alien plant control and monitoring of rehabilitation and potential impacts and addressing issues through adaptive management during the decommissioning phase can reduce the intensity of these impacts and the likelihood of these impacts occurring.
Rating of residual impacts	Low -

7.5 Impact Significance Assessment Summary Table

A summary table containing the impact significance assessment ratings (for a 'poor' and 'good' mitigation scenario) and for each mining phase is included below. All impacts were rated to have a very high, high or medium level of significance under a poor mitigation scenario given the large scale of the proposed project and the far-ranging impacts it will have on the surrounding region. Under a good mitigation scenario, impact significance ranges between medium and high during the constructional phase, with impact significance reduced to medium ratings for the operational phase and to low ratings for the decommissioning phase. The most significant impacts are associated with the initial development of mine infrastructure during the construction phase leading to direct loss of habitat, species of conservation concern and notable impacts to ecological processes. The risk of erosion and slumping and continued and increasing levels of pollution and alien plant invasion during the decommissioning phase are the most prominent risks during this phase.

Table 35. Terrestrial impact significance assessment summary table for the mining project phases.

Impact Type	Impact Significance Rating	
	'poor' (pre-) mitigation scenario	'good' (post-) mitigation scenario
CONSTRUCTION (MINE DEVELOPMENT) PHASE		
C1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**Very high**	**High**
C1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**High**	**Medium**
C1-1b: Direct impacts to species and threatened species conservation	**High**	**High**
C1-2b: Indirect impacts to species and threatened species conservation	**Medium**	**Medium**
C1-1c: Direct impacts to local and regional ecological processes	**High**	**High**
C1-2c: Indirect impacts to local and regional ecological processes	**Medium**	**Medium**
OPERATIONAL (MINING) PHASE		
O1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	**High**	**Medium**

Impact Type	Impact Significance Rating	
	'poor' (pre-) mitigation scenario	'good' (post-) mitigation scenario
O1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	High	Medium
O1-1b: Direct impacts to species and threatened species conservation	High	Medium
O1-2b: Indirect impacts to species and threatened species conservation	Medium	Medium
O1-1c: Direct impacts to local and regional ecological processes	Medium	Medium
O1-2c: Indirect impacts to local and regional ecological processes	Medium	Medium
DECOMMISSIONING/CLOSURE (REHABILITATION) PHASE		
D1-1a: Direct impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	Medium	Low
D1-2a: Indirect impacts to communities and ecosystems and threatened ecosystem and biodiversity conservation	Medium	Low
D1-1b: Direct impacts to species and threatened species conservation	Medium	Low
D1-2b: Indirect impacts to species and threatened species conservation	Medium	Low
D1-1c: Direct impacts to local and regional ecological processes	Medium	Low
D1-2c: Indirect impacts to local and regional ecological processes	Medium	Low

7.6 Further Biodiversity Studies Required

This report provides a clear overview of the site and articulates key risks and anticipated impacts to terrestrial biodiversity. There are however several gaps in existing knowledge which should be addressed to ensure that recommended mitigation and compensation actions are strengthened based on a more in-depth understanding of the site. As such, the following additional assessments are recommended to further inform mitigation and offset actions:

- A supplementary vegetation baseline assessment that focuses on (i) further refining the habitat type and condition of habitats within the final footprint/layout, (ii) gaining a better understanding on the location of SCC and potential relocation opportunities and (iii) advising on any critical "No-go" areas. This assessment must be undertaken within the appropriate seasonal window (October – December) to optimise the detection of plant SCC.
- A detailed faunal surveys by the relevant taxon-specific specialists to verify and refine the importance of the site for fauna SCC. This assessment should include and recommended refinements to impact ratings, mitigation measures and provide specific guidance for integrating SCC into offset planning. The appropriate seasonal windows for undertaking such work will need to be informed by taxon specialists.

7.7 Terrestrial Biodiversity Offset Considerations

Once all reasonable mitigation has been considered, significant residual impacts to ecosystems will need to be offset in line with Provincial and National policy. Indeed, in the case of impacts of high significance, the draft national biodiversity offset guidelines suggest that "Biodiversity offsets are likely to be required, unless there are compelling reasons why a biodiversity offset should not be required."

While it was not in the scope of work for this assessment to investigate offset requirements, a preliminary summary of habitat losses associated with the projects PAOI has been included below in Table 36. This indicates significant areas of transformation but does not provide the level of clarity on vegetation types and associated condition to inform offset targets.

Table 36. Summary of preliminary habitat losses from the primary project area and associated activities.

Vegetation Community	SEI	Area (Ha)
1.Ngongoni Veld/Eastern Valley Bushveld Open Savannah	Very High	123.59
2.Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Very High	71.02
3.Degraded Ngongoni Veld/Eastern Valley Bushveld Open Savannah	Low	37.09
4.Degraded Eastern Valley Bushveld Thicket/Ngongoni Veld Closed Woodland	Medium	208.47
5.Secondary Open Savannah/Thicket/Closed Woodland	Very Low	85.85
	Grand Total	**526.02**

For the project to progress towards formal authorisation by the regulating authorities, a formal offset investigation will therefore need to be undertaken. This assessment will need to draw on the findings of supplementary vegetation and faunal surveys to better quantify impacts and to identify the key ecosystems and associated species that would need to be catered for through the offset process. The assessment would then need to apply appropriate offset ratios and calculate offset targets in line with National and Provincial guidelines and in consultation with the relevant regulating authorities. Thereafter, the investigation would need to identify potential offset receiving areas and outline potential mechanisms and institutional agreements required to implement a biodiversity offset for the project. Following the offset investigation, a formal offset plan will need to be developed for the project that sets out a framework for the implementation of the offset, including all financial and institutional requirements.

It is strongly recommended that offset investigations be initiated as soon as practically possible as both are important considerations for long-term project feasibility/ viability. In addition, based on Eco-Pulses experience, Ezemvelo KZN Wildlife typically requires an offset plan to be developed as part of the ESIA process prior to granting Environmental Authorisation.

8 CONCLUSION

This report outlines the conservation context assessments for the North and South Block study areas and contains the baseline terrestrial ecosystem assessment findings. Based on the findings of this assessment, ten broad vegetation communities were described on-site, four of which are considered to be in fair to natural condition and have a Very High SEI rating. The remaining six vegetation communities on site range in SEI from Medium to Very Low. In addition to being in good to fair ecological condition the four largely intact vegetation communities are highly likely to support a number of floral SCC that are either red-listed, rare, or endemic, however, this would need to be verified through additional in-field sampling during the appropriate seasonal window. Following the initial site inspection, two floral SCC were confirmed to occur within open savannah/grassland vegetation on-site, a sensitive plant species (Vulnerable) and *Moraea graminicola* subsp. *graminicola* (Near Threatened, South African Endemic).

In addition to the two threatened plant species occurring on site, which are protected under the National Environmental Management: Biodiversity Act, there are several plant species that are protected under the Natal Conservation Ordinance and National Forest Act that will also require relevant plant permits from the relevant competent authorities (i.e., DAFF and EKZNW).

Several faunal SCC have been flagged as potentially occurring within the study area and therefore faunal surveys by appropriately qualified specialists for avifauna, mammal, frog, reptile, and invertebrate species will need to be conducted to refine an understanding of potential impacts associated with the Animal Species Theme (which falls outside the scope of this report).

The impact assessment focussed on some of the infrastructure planned as part of phase 1 of the mining development. All impacts were rated to have a very high, high or medium level of significance under a poor mitigation scenario given the large scale of the proposed project and the far-ranging impacts it will have on biodiversity in the surrounding region. Under a good mitigation scenario, impact significance ranges between medium and high during the construction phase, with impact significance reduced to medium for the operational phase and reduced to low ratings for the decommissioning phase, provided all mitigation measures recommended in this report are adhered to.

Recommended Terrestrial No-Go areas and siting infrastructure recommendations were provided to try and avoid and minimise potential impacts in accordance with the first two steps of the mitigation hierarchy. Despite these recommendations, impacts have been assessed based on the assumption that the proposed mining layout would be implemented without further refinements. Under this scenario, options to mitigate the loss of Very High SEI are limited and even with onsite rehabilitation will result in **impacts of high significance to terrestrial biodiversity**. **Based on best-practice guidelines, a biodiversity offset would therefore be required**. As such, the preparation of a biodiversity offset report is

recommended to clarify residual impacts, set offset targets and to define reasonable offset actions necessary to compensate for these impacts should the application be approved. Protected plant permits will also need to be obtained from the relevant competent authorities.

Several gaps in current knowledge and recommendations for supplementary assessments have been made to strengthen the confidence of this assessment and to inform further development planning. This includes (i) a baseline assessment for faunal SCC flagged at a desktop level; (ii) a more detailed vegetation survey in the appropriate seasonal window; and (iii) the preparation of a biodiversity offset plan to compensate for significant residual impacts.

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10 ANNEXURES

ANNEXURE A: Plant Species List

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
1	FABACEAE	Black wattle	*Acacia mearnsii*	Tree	N/A	-
2	EUPHORBIACEAE		*Acalypha peduncularis*	Herb	LC	
3	ASTERACEAE	Creeping star bur	*Acanthospermum australe*	Herb	N/A	-
4	AMARANTHACEAE	Devil's horsewhip	*Achyranthes aspera*	Herb	N/A	-
5	APOCYNACEAE	Common Poison Bush	*Acokanthera oppositifolia*	Shrub	LC	
6	ASTERACEAE		*Afroaster hispida*	Herb	LC	
7	AGAPANTHACEAE		*Agapanthus sp.*	Herb	LC	
8	ASTERACEAE	-	*Ageratum conyzoides*	Herb	N/A	-
9	FABACEAE	Large-leaved False-thorn	*Albizia versicolor*	Tree	LC	-
10	APIACEAE	-	*Alepidea peduncularis*	Herb	DDT (Endemic)	-
11	SAPINDACEAE	False Currant	*Allophylus dregeanus*	Tree	LC (Endemic)	-
12	ASPHODELACEAE	Mountain Aloe	*Aloe marlothii*	Herb	LC	KZN
13	FABACEAE	Red Moneywort	*Alysicarpus rugosus*	Herb	LC	-
14	STILBACEAE	Pambati-Tree	*Anastrabe integerrima*	Tree	LC (Endemic)	-
15	ANNONACEAE	African Custard-Apple	*Annona senegalensis*	Tree	LC	-
16	RUBIACEAE	-	*Anthospermum herbaceum*	Herb	LC	-
17	RUBIACEAE		*Anthospermum rigidum*	Herb	LC	
18	FABACEAE	-	*Argyrolobium rotundifolium*	Herb	LC	-
19	POACEAE	Ngongoni Three-Awn Grass	*Aristida junciformis*	Grass	LC	-
20	APOCYNACEAE	Cartwheels	*Asclepias albens*	Herb	LC	
21	ACANTHACEAE	-	*Asystasia gangetica*	Herb	LC	-

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
22	ASTERACEAE		*Athrixia phylicoides*	Herb	LC	
23	SALVADORACEAE	Bee-sting Bush	*Azima tetracantha*	Shrub	LC	
24	ASTERACEAE	-	*Baccharoides adoensis*	Herb	LC	-
25	POACEAE	Common Bamboo	*Bambusa vulgaris*	Grass	N/A	-
26	ACANTHACEAE	White Bushveld Barleria	*Barleria elegans*	Shrub	LC	-
27	ACANTHACEAE	Bush Violet	*Barleria obtusa*	Shrub	LC	-
28	PASSIFLORACEAE	-	*Basananthe sandersonii*	Herb	LC	-
29	ASTERACEAE	Wild Thistle	*Berkheya insignis*	Herb	LC	-
30	ASTERACEAE	Buffalo-tongue Thistle	*Berkheya setifera*	Herb	LC	
31	ASTERACEAE		*Berkheya speciosa*	Herb		-
32	ASTERACEAE		*Berkheya umbellata*	Herb	LC	
33	ASTERACEAE	Black-jack	*Bidens pilosa*	Herb	N/A	-
34	ASTERACEAE	Bitter-Leaved Silver Oak	*Brachylaena elliptica*	Shrub/Tree	LC (Endemic)	-
35	PHYLLANTHACEAE	Mitzeeri	*Bridelia micrantha*	Tree	LC	-
36	SCROPHULARIACEAE	False Olive	*Buddleja saligna*	Tree	LC	-
37	FABACEAE		*Caesalpinia decapetala*			-
38	FABACEAE	Cape Laburnum	*Calpurnia aurea*	Tree	LC	-
39	CARICACEAE	Papaya	*Carica papaya*	Tree	N/A	-
40	APOCYNACEAE	Large Num-num	*Carissa bispinosa*	Shrub	LC	-
41	CASUARINACEAE	Horsetail Tree	*Casuarina equisetifolia*	Tree	N/A	-
42	RUBIACEAE	Coastal Bone-apple	*Catunaregam obovata*	Shrub/Tree	LC	-
43	APOCYNACEAE	Pink Periwinkle	*Catharanthus roseus*	Herb	N/A	
44	ULMACEAE	White Stinkwood	*Celtis africana*	Tree	LC	
45	APIACEAE		*Centella asiatica*	Herb	LC	
46	PEDALIACEAE	African Foxglove	*Ceratotheca triloba*	Herb	LC	-
47	SOLANACEAE	Inkberry	*Cestrum laevigatum*	Tree	N/A	-

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
48	POACEAE	Rhodes Grass	*Chloris gayana*	Grass	LC	-
49	AGAVACEAE		*Chlorophytum krookianum*	Herb	LC	-
50	ASTERACEAE		*Chromolaena odorata*	Shrub	N/A	-
51	VITACEAE	Forest Grape Vine	*Cissus fragilis*	Herbaceous Climber	LC (Endemic)	-
52	RUTACEAE	Horsewood	*Clausena anisata*	Tree	LC	
53	LAMIACEAE	Tinderwood	*Clerodendrum glabrum*	Tree	LC	-
54	EUPHORBIACEAE		*Clutia monticola*		LC	-
55	RUBIACEAE	Small Bone-apple	*Coddia rudis*	Shrub	LC	
56	COMBRETACEAE	Velvet Bushwillow	*Combretum molle*	Tree	LC	-
57	COMBRETACEAE	Large-leaved Forest Bushwillow	*Combretum woodii*	Tree	LC	-
58	BURSERACEAE	Copper-stem Corkwood	*Commiphora harveyi*	Tree	LC	-
59	BORAGINACEAE	Septee Tree	*Cordia caffra*	Tree	LC	-
60	CRASSULACEAE		*Crassula alba*	Herb	LC	-
61	CRASSULACEAE		*Crassula alba*	Herb	LC	
62	CRASSULACEAE	White Stonecrop	*Crassula vaginata*	Herb	LC	
63	ACANTHACEAE		*Crossandra sp.*	Herb	LC	-
64	ARALIACEAE	Cabbage Tree	*Cussonia spicata*	Tree	LC	-
65	THELYPTERIDACEAE		*Cyclosorus interruptus*	Fern	LC	-
66	POACEAE	Giant Turpentine Grass	*Cymbopogon nardus*	Grass	LC	-
67	POACEAE		*Cymbopogon sp.*	Grass	LC	-
68	POACEAE	Bermuda Grass	*Cynodon dactylon*	Grass	LC	-
69	CYPERACEAE	Ingawane Ephakathi	*Cyperus albostriatus*	Herb	LC	
70	POACEAE	Natal Crowfoot	*Dactyloctenium australe*	Grass	LC	-
71	FABACEAE	Climbing Flat-bean	*Dalbergia obovata*	Woody Climber	LC	-
72	EUPHORBIACEAE	Wild Hop	*Dalechampia capensis*	Herb	LC	

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
73	FABACEAE	Orange Tick-Clover	*Desmodium repandum*	Herbaceous Climber	LC	-
74	FABACEAE		*Desmodium setigerum*	Herb	LC	
75	FABACEAE	Sickle Bush	*Dichrostachys cinerea*	Tree	LC	-
76	POACEAE	Common Finger Grass	*Digitaria eriantha*	Grass	LC	-
77	DIOSCOREACEAE	Wild Yam	*Dioscorea cotinifolia*	Herb	LC	KZN
78	EBENACEAE	Bluebush	*Diospyros lycioides*	Shrub	LC	
79	EBENACEAE	Climbing Star-apple	*Diospyros simii*	Tree	LC (Endemic)	-
80	MELASTOMATACEAE	Pink Wild Tibouchina	*Dissotis canescens*	Herb	LC	-
81	MALVACEAE	Hairless Dombeya	*Dombeya cymosa*	Tree	LC	-
82	MALVACEAE	Wild Pear	*Dombeya rotundifolia*	Tree	LC	-
83	BORAGINACEAE	Puzzle Bush	*Ehretia rigida*	Tree	LC	
84	MELIACEAE	Cape Ash	*Ekebergia capensis*	Tree	LC	-
85	POACEAE	Cape Love Grass	*Eragrostis capensis*	Grass	LC	-
86	POACEAE	Weeping Love Grass	*Eragrostis curvula*	Grass	LC	-
87	FABACEAE		*Eriosema cordatum*	Herb	LC	
88	FABACEAE	Brown Bonnets	*Eriosema salignum*	Shrub	LC	-
89	FABACEAE	Broad-leaved Coral Tree	*Erythrina latissima*	Tree	LC	-
90	FABACEAE	Coral Tree	*Erythrina lysistemon*	Tree	LC	-
91	MYRTACEAE	Gum Tree	*Eucalyptus grandis*	Tree	N/A	
92	MYRTACEAE		*Eucalyptus sp.*	Tree	N/A	-
93	EBENACEAE	White-stem Guarri	*Euclea daphnoides*	Tree	LC	-
94	EUPHORBIACEAE	Candelabra Euphorbia	*Euphorbia ingens*	Tree	LC	-
95	EUPHORBIACEAE	Hedge Euphorbia	*Euphorbia tirucalli*	Tree	LC	-
96	EUPHORBIACEAE	River Euphorbia	*Euphorbia triangularis*	Tree	LC	-
97	EUPHORBIACEAE	River Euphorbia	*Euphorbia triangularis*	Tree	LC	-
98	ASTERACEAE	Loose Resin Bush	*Euryops laxus*	Herb	LC	

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
99	MORACEAE	Strangler Fig	*Ficus burkei*	Tree	LC	-
100	MORACEAE	African Rock-Fig	*Ficus glumosa*	Tree	LC	-
101	MORACEAE	Cape Wild Fig	*Ficus sur*	Tree	LC	-
102	RUBIACEAE	Tonga Gardenia	*Gardenia cornuta*	Tree	LC	-
103	RUBIACEAE	Bushveld Gardenia	*Gardenia volkensii*	Tree	LC	-
104	ASTERACEAE	Butter Flower	*Gazania krebsiana*	Herb	LC	
105	ASTERACEAE	Botterblom	*Gerbera ambigua*	Herb	LC	-
106	TILIACEAE	Cross-berry	*Grewia occidentalis*	Shrub/Tree	LC	
107	ASTERACEAE	Mountain Bitter-tea	*Gymnanthemum corymbosum*	Herb	LC	
108	CELASTRACEAE	Common Spike-Thorn	*Gymnosporia buxifolia*	Shrub/Tree	LC	-
109	CELASTRACEAE	Tropical Spike-Thorn	*Gymnosporia maranguensis*	Shrub/Tree	LC	-
110	CELASTRACEAE	Confetti Spike-Thorn	*Gymnosporia senegalensis*	Shrub/Tree	LC	-
111	ANACARDIACEAE	Sour Plum	*Harpephyllum caffrum*	Tree	LC	-
112	ASTERACEAE	Fairy Everlasting	*Helichrysum adenocarpum*	Herb	LC	-
113	ASTERACEAE	Monkey-Tail Everlasting	*Helichrysum herbaceum*	Herb	LC	-
114	ASTERACEAE		*Helichrysum krebsianum*	Herb	LC	-
115	ASTERACEAE		*Helichrysum nudifolium var. pilosellum*	Herb	LC	
116	APIACEAE	Parsley Tree	*Heteromorpha arborescens*	Tree	LC	-
117	HETEROPYXIDACEAE	Lavender-Tree	*Heteropyxis natalensis*	Tree	LC	-
118	SAPINDACEAE	False Horsewood	*Hippobromus pauciflorus*	Tree	LC	
119	ACANTHACEAE	Ribbon-Bush	*Hypoestes aristata*	Shrub	LC	-
120	HYPOXIDACEAE	Grass Star-flower	*Hypoxis filiformis*	Herb	LC	-
121	HYPOXIDACEAE	Star-flower	*Hypoxis hemerocallidea*	Herb	LC	
122	POACEAE	Cotton-Wool Grass	*Imperata cylindrica*	Grass	LC	-
123	FABACEAE		*Indigofera williamsonii*	Herb/Shrub	LC	-
124	BIGNONIACEAE	Blue Jacaranda	*Jacaranda mimosifolia*	Tree	N/A	-

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
125	ACANTHACEAE		*Justicia protracta*	Herb	LC	
126	CRASSULACEAE		*Kalanchoe rotundifolia*	Herb	LC	-
127	VERBENACEAE	Lantana	*Lantana camara*	Shrub	N/A	-
128	THYMELAEACEAE	Shrubby White Pincushion	*Lasiosiphon calocephalus*	Shrub	LC	-
129	THYMELAEACEAE	Inhlashane	*Lasiosiphon kraussianus*	Herb	LC	
130	THYMELAEACEAE	Natal Silver Yellow-Head	*Lasiosiphon splendens*	Shrub	LC	-
131	LAMIACEAE	Minaret-Flower	*Leonotis intermedia*	Shrub	LC	-
132	LAMIACEAE	Lion's Ear	*Leonotis leonurus*	Shrub	LC	-
133	VERBENACEAE	Lemon Bush	*Lippia javanica*	Shrub	LC	-
134	LOBELIACEAE		*Lobelia flaccida*	Herb	LC	-
135	EUPHORBIACEAE	Wild Poplar	*Macaranga capensis*	Tree	LC	-
136	MAESACEAE	False Assegai	*Maesa lanceolata*	Shrub/Tree	LC	-
137	ANACARDIACEAE	Mango Tree	*Mangifera indica*	Tree	N/A	-
138	TILIACEAE		*Melhania didyma*	Herb	LC	
139	MELIACEAE	Syringa	*Melia azedarach*	Tree	N/A	-
140	POACEAE	Natal Red-Top Grass	*Melinis repens*	Grass	LC	-
141	POACEAE		*Monocymbium ceresiiforme*	Grass	LC	-
142	IRIDACEAE		*Moraea graminicola subsp. graminicola*	Herb	NT	KZN
143	MORACEAE	White Mulberry	*Morus alba*	Tree	N/A	-
144	MUSACEAE	Banana Tree	*Musa acuminata*	Tree	N/A	-
145	LAMIACEAE	Cat's Whiskers	*Ocimum obovatum subsp. obovatum*	Herb	LC	
146	OLEACEAE	African Olive	*Olea europaea subsp. africana*	Tree	LC	-
147	CACTACEAE	Prickly-Pear	*Opuntia ficus-indica*	Shrub/Tree	N/A	-
148	APOCYNACEAE		*Pachycarpus sp.*			-
149	POACEAE	Guinea Grass	*Panicum maximum*	Grass	LC	-
150	SAPINDACEAE	Jacket Plum	*Pappea capensis*	Tree	LC	-

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
151	POACEAE	Vasey Grass	*Paspalum urvilli*	Grass	N/A	-
152	LAMIACEAE		*Plectranthus fruticosus*	Herb	LC	
153	LAMIACEAE		*Plectranthus hadiensis*	Herb	LC	-
154	LAMIACEAE		*Plectranthus laxiflorus*	Herb	LC	-
155	POLYGALACEAE	Small Purple Broom	*Polygala hottentotta*	Herb	LC	-
156	MYRTACEAE	Guava Tree	*Psidium guajava*	Tree	N/A	-
157	FABACEAE	Fountain Bush	*Psoralea glabra*	Shrub	LC	-
158	BIGNONIACEAE		*Pyrostegia sp*		N/A	-
159	RUBIACEAE	Porcupine Bush	*Pyrostria hystrix*	Shrub	LC	-
160	LAMIACEAE		*Rabdosiella calycina*	Herb	LC	
161	RUBIACEAE	Tropical Mexican Clover	*Richardia brasiliensis*	Herb	N/A	-
162	EUPHORBIACEAE	Castor Oil Plant	*Ricinus communis*	Shrub	N/A	-
163	ROSACEAE	American Bramble	*Rubus cuneifolius*	Shrub	N/A	-
164	ROSACEAE	Rose-Leaf Bramble	*Rubus rosifolius*	Shrub	N/A	-
165	ACANTHACEAE		*Ruellia cordata*	Herb	LC	
166	AMARYLLIDACEAE	Snake Lily	*Scadoxus puniceus*	Herb	LC	KZN
167	FABACEAE	Weeping Boer-Bean	*Schotia brachypetala*	Tree	LC	-
168	ANACARDIACEAE	Marula Tree	*Sclerocarya birrea*	Tree	LC	DAFF
169	SALICACEAE	Thorn Pear	*Scolopia zeyheri*	Tree	LC	-
170	RHAMNACEAE	Cat-Thorn	*Scutia myrtina*	Tree	LC	-
171	RHAMNACEAE	Cat-thorn	*Scutia myrtina*	Shrub/Tree	LC	-
172	ANACARDIACEAE	Ribbed Kuni-Bush	*Searsia pallens*	Shrub/Tree	LC	-
173	ANACARDIACEAE	Crow-Berry	*Searsia pentheri*	Shrub/Tree	LC	-
174	ASTERACEAE	Ragwort	*Senecio latifolius*	Herb	LC	-
175	ASTERACEAE		*Senecio panduriformis*	Herb	LC	-
176	ASTERACEAE		*Senecio sp.*	Herb	?	-

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
177	ASTERACEAE		*Senecio variabilis*	Herb	LC (Endemic)	-
178	FABACEAE	Flame Thorn	*Senegalia ataxacantha*	Tree	LC	-
179	FABACEAE	Common Hook Thorn	*Senegalia caffra*	Tree	LC	-
180	FABACEAE	Peanut Cassia	*Senna didymobotrya*	Tree	N/A	-
181	POACEAE	Golden Bristle Grass	*Setaria sphacelata*	Grass	LC	-
182	SMILACACEAE	Leg-Ripper	*Smilax anceps*	Creeper	LC	-
183	SOLANACEAE	Bitter Apple	*Solanum aculeastrum*	Shrub	LC	-
184	SOLANACEAE	Bug Weed	*Solanum mauritianum*	Shrub/Tree	N/A	-
185	EUPHORBIACEAE	Tamboti	*Spirostachys africana*	Tree	LC	-
186	POACEAE	Common Rat's Tail Dropseed Grass	*Sporobolus africanus*	Grass	LC	-
187	POACEAE	Cat's Tail Dropseed Grass	*Sporobolus pyramidalis*	Grass	LC	-
188	ZAMIACEAE	-	*Sensitive species*	-	VU	NEMBA
189	APOCYNACEAE	Giant Carrion Flower	*Stapelia gigantea*	Herb	LC	-
190	ORCHIDACEAE		*Stenoglottis fimbriata*	Herb	LC (Endemic)	
191	LOGANIACEAE		*Strychnos sp.*		?	-
192	LAMIACEAE		*Syncolostemon argenteus*	Herb	LC (Endemic)	-
193	LAMIACEAE	Pink Plume	*Syncolostemon densiflorus*	Herb	LC (Endemic)	-
194	LAMIACEAE		*Syncolostemon sp.*	Herb	?	-
195	MYRTACEAE	Mdoni	*Syzigium cordatum*	Tree	LC	-
196	ASTERACEAE	Khaki Weed	*Tagetes minuta*	Herb/Shrub	N/A	-
197	ASTERACEAE	Small-Headed Camphor Bush	*Tarchonanthus parvicapitulatus*	Herb/Shrub	LC	-
198	BIGNONIACEAE	Yellow-Bells	*Tecoma stans*	Shrub/Tree	N/A	-
199	BIGNONIACEAE	Cape Honeysuckle	*Tecomaria capensis*	Shrub	LC	
200	ASTERACEAE		*Tenrhynea phylicifolia*	Herb	LC	-
201	FABACEAE	Pink Bush Pea	*Tephrosia grandiflora*	Shrub	LC (Endemic)	-
202	LAMIACEAE	River Ginger-Bush	*Tetradenia riparia*	Shrub	LC	-

No	Family	Common Name	Scientific Name	Growth Form	Status	Protected
203	POACEAE	Red Grass	*Themeda triandra*	Grass	LC	-
204	ACANTHACEAE	Natal Primrose	*Thunbergia atriplicifolia*	Herb	LC	-
205	ACANTHACEAE		*Thunbergia neglecta*	Herb	LC	-
206	ULMACEAE	Pigeon wood	*Trema orientalis*	Tree	LC	-
207	MELIACEAE	Natal Mahogany	*Trichilia emetica*	Tree	LC	-
208	MALVACEAE		*Triumfetta pilosa*	Shrub	LC	-
209	ALLIACEAE		*Tulbaghia cernua*	Herb	LC	-
210	FABACEAE	Pale-bark Sweet Thorn	*Vachellia natalitia*	Tree	LC	-
211	FABACEAE	Scented Thorn	*Vachellia nilotica*	Tree	LC	-
212	FABACEAE		*Vachellia robusta*	Tree	LC	
213	FABACEAE	Paper-bark Thorn	*Vachellia sieberiana*	Tree	LC	-
214	FABACEAE	Curly-pod Acacia	*Vachellia tortilis*	Tree	LC	-
215	FABACEAE	Umbrella Thorn	*Vachellia tortilis*	Tree	LC	
216	RUBIACEAE	Velvet Wild-Medlar	*Vangueria infausta*	Tree	LC	-
217	RUTACEAE	White Ironwood	*Vepris lanceolata*	Tree	LC	-
218	VERBENACEAE		*Verbena bonariensis*	Herb	N/A	-
220	ASTERACEAE	Rough Cocklebur	*Xanthium strumarium*	Shrub	N/A	-
221	OLACACEAE	Large Sourplum	*Ximenia caffra*	Tree	LC	-
222	POACEAE	Maize	*Zea mays*	Grass	N/A	-
223	ASTERACEAE	Peruvian zinnia	*Zinnia peruviana*	Herb	N/A	-
224	RHAMNACEAE	Buffalo Thorn	*Ziziphus mucronata*	Tree	LC	

ANNEXURE B: Desktop SCC Likelihood of Occurrence Assessment

The determination of ecological importance requires the consideration of whether the vegetation communities 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 twenty-six (26) species which are considered Endangered, Vulnerable, Near Threatened, Data Deficient, Rare and/or Endemic out of a possible 32 species flagged by online databases. Details of the assessment results are provided in Table 37. Field verification by David Styles during the current assessment (2021) confirmed the presence of two of the potential species flagged by the online tools on-site, however, there are likely to be a large number of additional red-listed species likely to occur as sampling was limited to the southern blocks of the property and did not fall within the appropriate seasonal window while the northern block has not been visited during this rapid baseline assessment.

Table 37. Potential occurrence of floral SCC within the study area.

Scientific Name	Threat Status[12]	Habitat Preference	Rationale	POC	Source
Acalypha entumenica	EN (En)	Qudeni and Entumeni, central KwaZulu-Natal in Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland on dolerite 850 – 1600m.	Only known from two locations, and the study area is reasonably close to the areas in which this species occurs. Habitat Requirements largely met and on edge of distribution range	Medium: possible	David Styles

[12] 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[12]	Habitat Preference	Rationale	POC	Source
Aloe kraussii	EN	This species is endemic to KwaZulu-Natal province, South Africa, where it occurs between Richmond and Greytown, and eastwards to Durban. It occurs on grassy slopes in KwaZulu-Natal Sandstone Sourveld, Midlands Mistbelt Grassland, KwaZulu-Natal Highland Thornveld, Moist Coast Hinterland Grassland and Dry Coast Hinterland Grassland.	Although habitat requirements are fully met in some portions of the study area, the site falls outside of this species known geographic distribution range and therefore although it is still possible that it occurs on site, it is unlikely.	Medium: unlikely	Screening Tool
Sensitive species	EN	This species has a limited distribution in central KwaZulu-Natal, where it occurs from Melmoth to Greytown and Wartburg. KwaZulu-Natal Sandstone Sourveld, Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland. It occurs in crevices and small pockets on cool, semi-shaded rocky slopes in mistbelt and moist grassland.	If there is moist coast hinterland grassland on site in near-natural condition then rating should be high: probable if only in fair condition the medium: possible, as the study area falls within the distribution range and meets the habitat requirements.	Medium: possible	Screening Tool
Sensitive species	EN (En)	Deeply shaded sites on south-facing slopes in forests, rocky sites, 20-900 m in Northern Coastal Forest, Southern Coastal Forest, Scarp Forest, Southern Mistbelt Forest.	Within distribution range, and habitat requirements met by what appears to be intact scarp forest on steep south facing slopes within the northern block.	High: probable	EIA Screening Tool
Brachystelma chlorozonum	NT (En)	Grassland. A wide range of habitats and altitudes, from sea level in northern Zululand to above 1000 m in Songimvelo Game Reserve	Within known distribution range. Habitat requirements met.	High: probable	David Styles
Brachystelma gerrardii	EN	Open grassland, 400-1800 m in Ngongoni Veld and other vegetation types.	Within known distribution range, Habitat requirements met.	High: probable	David Styles
Cassipourea gummiflua var. verticillata	VU	Evergreen forest, riverine and swamp forest. Moist scarp forest and coastal lowland forest.	Within distribution range, and habitat requirements met by what appears to be intact scarp forest on steep south facing slopes within the northern block.	High: probable	EIA Screening Tool

Scientific Name	Threat Status[12]	Habitat Preference	Rationale	POC	Source
Sensitive species	VU (En)	Ngome Forest to KwaZulu-Natal Midland within forest undergrowth found in Northern Coastal Forest, Scarp Forest or Southern Mistbelt Forest.	Within distribution range, and habitat requirements met by what appears to be intact scarp forest on steep south facing slopes within the northern block.	High: probable	EIA Screening Tool
Sensitive species	VU	Scarp, mistbelt and coastal riverine forests, in loose rocky habitats in light or partial shade, 100-1400 m.	Within distribution range, and habitat requirements met by what appears to be intact scarp forest on steep south facing slopes within the northern block.	High: probable	EIA Screening Tool
Sensitive species	VU (En)	Coastal and riverine forests, scarp forest, in damp or marshy places along watercourses, never in grassland.	Within distribution range, and habitat requirements met by what appears to be intact scarp forest on steep south facing slopes within the northern block.	High: probable	EIA Screening Tool
Sensitive species	VU (En)	Evergreen, mistbelt and scarp forests, on steep slopes and valley bottoms, close to waterfalls and streams.	Within distribution range, and habitat requirements met by what appears to be intact scarp forest on steep south facing slopes within the northern block.	High: probable	EIA Screening Tool
Dahlgrenodendron natalense	EN	Pondoland, from Mkambati to Umtamvuna, with isolated occurrences at Umdoni Park, Pinetown and Ozwatini. Possibly extinct at Ngoye. Occurs in Northern Coastal Forest, Scarp Forest, Scarp Forest, most typically on Natal group and Msikaba Formation sandstones, but also on granite. Usually near streams.	Unlikely distribution appears to be primarily coastal site is too inland for this this species to occur?	Medium: unlikely	EKZNW, 2011
Dierama dubium	VU	Mahlabatini to Mapumulo. Midlands Mistbelt Grassland, Moist Coast Hinterland Grassland. Grassland, 1200-1500 m.	If there is moist coast hinterland grassland (between 1200 -1500m) on site in near-natural condition then rating should be high: probable if only in fair condition the medium: possible, as the study area falls within the distribution range and meets the habitat requirements.	High: probable	EIA Screening Tool
Sensitive species	VU	Western Cape, Eastern Cape, KwaZulu-Natal, Free State, Gauteng, Mpumalanga, Limpopo Province, Swaziland, Zimbabwe and Zambia. Wooded and	One of the major habitat types is Eastern Valley Bushveld and there is near-natural/primary examples of this vegetation	High: probable	EIA Screening Tool

Scientific Name	Threat Status[12]	Habitat Preference	Rationale	POC	Source
		relatively mesic places, such as the moister bushveld areas, coastal bush and wooded mountain kloofs.	types on site and therefore it is highly probable that this species occurs.		
Disperis woodii	VU	It occurs in damp grassland, usually in open places with sandy soils, sometimes within grass tussocks, from sea level to 800 m.	Within distribution range just need to check altitudinal range, habitat requirements fully met medium possible or high probable	High: probable	EIA Screening Tool
Emplectanthus cordatus	VU (En)	Scarp forest. Eshowe to Mtubatuba. EOO 2263 km², AOO <10 km², plants at three of four known locations are potentially threatened by habitat degradation.	Within distribution range, and habitat requirements met by what appears to be intact scarp forest on steep south facing slopes within the northern block.	High: probable	EIA Screening Tool
Encephalartos woodii	EW (En)	Ngoye Forest.	Unlikely	Low	EKZNW, 2012
Sensitive species	VU	Savanna and coastal grassland, 100-800 m.	Habitat requirements are met (natural to fair condition) and the study area falls within this species distribution range.	High: probable	EIA Screening Tool
Gerbera aurantiaca	EN (En)	Mistbelt grassland, well-drained doleritic areas.	Within distribution range and habitat requirements fully met in natural/near natural grassland areas on site. Northern Zululand Sourveld (Near-natural grassland)	High: probable	EIA Screening Tool
Faurea macnaughtonii	Rare	Occurs deep inside mature Scarp Forest, Northern Mistbelt Forest, Northern Afrotemperate Forest, Southern Afrotemperate Forest from near sea level up to 2000 m.	Within distribution range, and habitat requirements may be met by what appears to be intact mature scarp forest on steep south facing slopes within the northern block.	Medium: possible	EIA Screening Tool
Sensitive species	Rare	Rare in KwaZulu-Natal, extending inland to Swaziland, Mpumalanga and North-West. Deep shade in subtropical forest, 150-1000 m.	Within altitudinal range may occur in scarp forest within the northern block.	Medium: possible	David Styles
Helichrysum pannosum	EN (En)	Grassland, often on hill slopes near forest patches.	Outside distribution range, however, noted by D Styles on site, no available flowering specimens present to confirm but highly likely to occur.	High: probable	David Styles

Scientific Name	Threat Status[12]	Habitat Preference	Rationale	POC	Source
Helichrysum woodii	Rare (En)	Pinetown, Camperdown and New Hanover to Oribi Gorge. South aspect faces of Natal Group sandstone cliffs. 600-900m. Indian Ocean Coastal Belt, Savanna	Appears to be outside distribution range therefore unlikely never been recorded north of Durban (D Styles)	Low	EKZNW, 2013
Moraea graminicola subsp. graminicola	NT	KwaZulu-Natal Midlands and Ngome. Moist slopes and flats in open mistbelt grasslands, 900-1500 m.	Confirmed on site.	Confirmed	David Styles
Mystacidium aliceae	VU (En)	Occurs in thick scrub in hilly regions as a low-level epiphyte in shady conditions in Northern Coastal Forest, Southern Coastal Forest and Scarp Forest	Within distribution range, and habitat requirements met by what appears to be intact scarp forest on steep south facing slopes within the northern block.	High: probable	EIA Screening Tool
Plectranthus esculentus	DDD	Natural habitat is not well known, possibly sandstone grasslands and the edges of dry woodland.	According to D Styles may occur in the study area.	Medium: possible	David Styles
Prunus africana	VU	Evergreen forests near the coast, inland mistbelt forests and afromontane forests up to 2100 m.	Within distribution range and habitat requirements largely to fully met by dense Eastern Valley Bushveld vegetation	High: probable	Screening Tool
Salpinctium natalense	Rare (En)	Hluhluwe-Umfolozi Park. Savanna, in partially shaded sites on the margins of acacia scrub.	Habitat requirements fully met but outside known species distribution range, unlikely but still possible.	Medium: possible	Screening Tool
Selago zuluensis	EN	Zululand, between Melmoth, Eshowe and Ngoye. Moist Coast Hinterland Grassland, KwaZulu-Natal Coastal Belt Grassland. Moist grasslands.	If there is moist coast hinterland grassland on site in near-natural condition then rating should be high: probable if only in fair condition the medium: possible, as the study area falls within the distribution range and meets the habitat requirements.	High: probable	Screening Tool
Sensitive species	VU	Scarp and coastal forest, Ngongoni and coastal grassland.	Confirmed on site.	Confirmed	Screening Tool
Struthiola anomala	VU	Midlands Mistbelt Grassland, Drakensberg Foothill Moist Grassland on rocky slopes, 1100-1400 m.	Study area is completely outside its distribution range therefore highly unlikely.	Low	EKZNW, 2015

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 15 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 and transformed habitats in the study area given the lack of suitable habitat, although nine mammal species may potentially utilise the more intact thicket, closed woodland, open savannah/grassland and scarp forest habitat on site (see Table 38 below for details).

Table 38. Potential occurrence of mammal species within the study area.

Species Name	Status[13]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Sensitive species	VU	Thrives in a variety of forested and wooded habitats including primary and secondary forests, gallery forests, dry forest patches, coastal scrub farmland and regenerating forest. Can also survive in degraded or modified thicket.	Within distribution range and thicket vegetation in fair to near natural condition may provide suitable habitat.	Medium: possible	EWT Regional Red List status (2016)
Maquassie Musk Shrew (*Crocidura maquassiensis)*	VU	It's found in rocky, mountain habitats. It may tolerate a wider range of habitats and individuals have been collected in Kwa-Zulu Natal from a garden, and in mixed bracken and grassland alongside a river.	Grassland/ Savannah on site could provide suitable habitat and within distribution range.	Medium: possible	EWT Regional Red List status (2016)

[13] 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[13]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Serval *Leptailurus serval*	NT	Servals are found in well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types and along the edge of forests.	The presence of human activity, grazing and the decreases the likelihood that they occur on large portions of the site although may occur along steep intact drainage lines and open grassland areas that are further removed from human settlement in near natural condition.	Medium: possible	EWT Regional Red List status (2016)
Water Rat *Dasymys imcomtus*	NT	Wetlands, dams and drainage lines in grasslands.	Very few wetlands that occur on site and most of these have been transformed for cultivation or settlement. Although there may be some drainage lines with intact grassland available for this species in the southwestern block of the study area.	Medium: possible	EWT Regional Red List status (2016)
African Striped Weasel *Poecilogale albinucha*	NT	Mainly found in savannah and grassland habitats, although this species is likely to have a wide habitat tolerance range and has been recorded previously from lowland forest. Semi-desert grassland, fynbos and pine plantations.	Within distribution range and habitat preferences largely met within portions of the study area.	Medium: possible	EWT Regional Red List status (2016)
Cape Clawless Otter *Aonyx capensis*	NT	Found along rivers, in marshes, dams and lakes; also occurs in dry stream beds in most terrain if pools of water exist. It may wander several kilometres away from water.	Within known distribution range and habitat requirements largely met on portions of the site by perennial rivers.	Medium: possible	EWT Regional Red List status (2016)
Southern Tree Hyrax *Dendrohyrax arboreus*	EN	In Afromontane, scarp and coastal forests of the KwaZulu-Natal and Eastern Cape provinces.	On edge of distribution range. Habitat preferences may be met in any remaining intact scarp forest patches within the northern block which still needs	Medium: unlikely	EWT Regional Red List status (2016)

Species Name	Status[13]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
			to be ground-truthed and habitat condition verified.		
Mountain Reedbuck (*Redunca fulvorufula fulvorufula*)	EN	The Southern Mountain Reedbuck (R. f. fulvorufula) occurs extensively in South Africa, being present in all provinces, although only marginally in the Western Cape and the eastern Northern Cape provinces. They still occur throughout much of their former range, largely on private land but also in many formally protected areas throughout their range (Skinner & Chimimba 2005). Mountain Reedbuck live on grass-covered ridges and hillsides in broken rocky country and high-altitude grasslands often with some tree or bush cover (Avenant 2013).	Within distribution range, however given they largely occur on private land formally protected areas and the fact that large portions of the study area have been transformed by cultivation forestry or human settlement it is highly unlikely this species occurs.	Low	EWT Regional Red List status (2016)
Leopard (*Panthera pardus*)	VU	The species has become locally extinct in areas of high human density or extensive habitat transformation (Hunter et al. 2013). Within the assessment region, they range extensively across all provinces (except the Free State Province and the greater Karoo basin in the Northern and Western Cape provinces), including Swaziland but not Lesotho; and they occur in all biomes of South Africa, with a marginal occurrence in the Nama Karoo and Succulent Karoo biomes. Suitable Leopard habitat in South Africa has been further fragmented into four core areas, based on MaxEnt models using true positive data (Swanepoel et al. 2013), namely 1) the west coast and southeast coast of the Western and Eastern Cape Provinces; 2) the interior of KwaZulu-Natal Province; 3) the Kruger	The study area appears to be within this species distribution range or close to the edge of its distribution range. Large portions of the study area have been affected by human settlement with perhaps only steep inaccessible thicket habitat in fair to near-natural condition along the Mhlatuze River providing an ecological corridor to this species to pass through the area.	Medium: possible	EWT Regional Red List status (2016)

Species Name	Status[13]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
		National Park and the interior of Limpopo, Mpumalanga and North West Provinces; and 4) the northern region, containing the Kgalagadi Transfrontier Park (KTP) and adjacent areas of the Northern Cape and North West Provinces. T			
Swinny's Horseshoe Bat (*Rhinolophus swinnyi*)	VU	This species is found in temperate Afromontane forests in the southern part of its distribution range (Monadjem et al 2010). For example, Roberts (1951) recorded it in the Pirie Forest, Eastern Cape Province and Bronner (1990) recorded it in Podocarpus mist forests in the Ngome Forest Reserve, KwaZulu-Natal Province. Further north, it is found in moist montane rainforest, and dry and moist savanna woodlands (Cotterill 1996, 2002). It is probably more dependent on the availability of suitable shelter in which to roost during the day than on specific vegetation types (Skinner & Chimimba 2005).	Within distribution range, however habitat preferences not met.	Low	EWT Regional Red List status (2016)
Swamp Musk Shrew (*Crocidura mariquensis*)	NT	Within the assessment region, it occurs in wetlands and waterlogged grasslands predominantly (both post-1999 and pre-2000 records) in KwaZulu-Natal, Mpumalanga, Limpopo, Gauteng and eastern North West provinces.	Within distribution range and habitat preferences largely met.	Medium: possible	EWT Regional Red List status (2016)

Species Name	Status[13]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Sclater's Forest Shrew (*Myosorex sclateri*)	VU	Sclater's Forest Shrew is endemic to northern KwaZulu-Natal Province, South Africa. It is restricted to moist lowland subtropical, scarp and coastal forests on the Maputaland coastal plain. Further field surveys are necessary to delimit its precise northern and eastern range limits.	Within distribution range/on edge of distribution range and habitat preferences not met.	Low	EWT Regional Red List status (2016)
Samango Monkey (*Cercopithecus albogularis labiatus*)	EN	Cercopithecus a. labiatus is endemic to South Africa and has been separated from populations further north in the assessment region for ~1.7 million years (Dalton et al. 2015). The southern limit of C. a. labiatus is the Pirie Forest in the Eastern Cape, it is not found in the evergreen Knysna and Tsitsikamma forests further south (Lawes 1990), and it extends northeastwards to the midlands of the KwaZulu-Natal Province. Its present distribution is closely correlated with the distribution of Afromontane forests within the assessment region (Lawes 1990). It seems to occur in Scarp and Indian Ocean Coastal belt forests, as well as Pondoland forests (Hayward et al. 2005). However, identification of the subspecies there is unknown, and needs to be done via genetic analyses. The boundary between C. a. labiatus and C. a. erythrarchus is currently suspected to be the St. Lucia and Umfolozi River systems (Lawes 1990; Dalton et al. 2015), where apparently neither subspecies are found in the dune forest south of the St. Lucia estuary (Lawes1992).	On northern edge of distribution range, habitat preferences may be met in any remaining intact scarp forest patches within the northern block which still needs to be ground truthed and habitat condition verified.	Medium: possible	EWT Regional Red List status (2016)

Species Name	Status[13]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Vlei Rat (Grassland type) (*Otomys auratus*)	NT	The species is widely distributed throughout the Highveld grasslands and Drakensberg Escarpment of South Africa, Lesotho and Swaziland, with isolated populations in the Soutpansberg Mountains of northern Limpopo and the Eastern Highlands of Zimbabwe (Monadjem et al. 2015). This species is associated with mesic grasslands and wetlands within alpine, montane and sub-montane regions (Monadjem et al. 2015), typically occurring in dense vegetation in close proximity to water (for example, Wandrag et al. 2002; Watson 2006).In the Drakensberg range, O. angoniensis occurs on the lower slopes in savannah habitats, O. auratus and O. laminatus occur at mid-elevation in grasslands and O. sloggetti at the highest elevations in alpine heath habitats (Monadjem et al. 2015). Where O. auratus and O. angoniensis co-occur at the same site, the former is associated with sedges and grasses adapted to densely vegetated wetlands with wet soils, while the latter is associated with plant species that typically grow in the drier margins of wetlands (Davis 1973).	Just outside distribution range occurs further inland to the west.	Low	EWT Regional Red List status (2016)

Species Name	Status[13]	Habitat Requirements/Preferences (after Stuart & Stuart, 2007; IUCN,2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Laminate Vlei Rat (*Otomys laminatus*)	NT	Endemic to South Africa with a patchy distribution in the Western Cape (Paarl and Cape Town areas) and Eastern Cape, as well as the eastern foothills of the central and northern Drakensberg in KwaZulu-Natal and Mpumalanga provinces (Monadjem et al. 2015). It occurs in the Afromontane-Afroalpine, Highveld and occasionally in the Coastal Forest Mosaic biotic zones (Taylor 2013).This species occurs on mid-level grasslands from sea level up to at least 2,000 m asl.It occurs in mesic sub-montane grasslands along the Drakensberg foothills and has also been recorded from coastal forests as well as Restio-dominated coastal and mountain fynbos (de Graaff 1981; Taylor et al. 1994; Taylor 1998). Specifically, it inhabits moist habitats such as wetlands and marshes. It may also occur in pine plantations (Taylor 2013), but more research is necessary to determine the extent of this habitat use. It is not known whether it occurs in agricultural landscapes.	Very few wetlands that occur on site and most of these have been transformed for cultivation or settlement. Although there may be some drainage lines and seeps with intact grassland available for this species in the southwestern block of the study area, highly unlikely this species occurs on site.	Low	EWT Regional Red List status (2016)

B. Avifauna (birds)

Birds of conservation concern were identified through use of the South African Bird Atlas Project (SABAP2) database (available online at http://sabap2.adu.org.za/). Information for the pentads: 2830_3125, 2830_3130, 2835_3125, 2835_3130, 2840_3120, 2845_3120, 2840_3130, 2840_3125, 2845_3125, 2840_3115, 2840_3120, 2845_3120 and 2840_3115 were used. Whilst the majority of species recorded by the SABAP2 are considered locally common birds, there are 12 bird species that are considered to be of conservation concern based on their threat status (**Table 39** below). Of these species, eight may frequent the more intact vegetation communities on the property include the **Tawny Eagle** (Endangered), **African marsh-harrier** (Endangered), **European Roller** (Near Threatened), **Lanner Falcon** (Vulnerable), **Southern Bald Ibis** (Vulnerable), **Martial Eagle** (Endangered), **Secretary bird** (Vulnerable) and **Crowned Eagle** (Vulnerable).

Table 39. Potential occurrence of avifauna within the study area.

Species Name	Status[14]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Half-collared Kingfisher (*Alcedo semitorquata*)	NT	Within the region, the Half-collared Kingfisher is widespread but generally sparsely distributed throughout high-rainfall areas of the east and extreme south (Fry et al. 1988, Allan 2000). A strictly water-associated kingfisher, restricted to the immediate vicinity of fast-flowing, clear, perennial streams and rivers offering secluded conditions and dense marginal vegetation (Turpie 2005). It also frequents well-vegetated banks of lakes, dams, estuaries and coastal lagoons (Fry et al. 1988), and occasionally fishes in salt water in Eastern Cape Province (Maclean 1993).	Within distribution range and habitat requirements partially met.	Medium: unlikely	SABAP2
Tawny Eagle (*Aquila rapax*)	EN	Tawny Eagles are found in lightly wooded savannah and thornveld, as well as semi-desert (Simmons 1997), but avoid dense forest and highlands. Adults maintain a year-round territory of approximately 70 km2 (Tarboton and Allan 1984). Scavenging and piracy aretwo of their most important foraging strategies (Watson et al. 1984). Breeding occurs in winter (Hustler and Howells 1989). The Tawny Eagle in southern Africa, is largely concentrated in protected areas in the north-east and central parts of the region (Simmons 1997). Outside of protected areas, the Tawny Eagle has disappeared from large parts of its former range.	Within distribution range and foraging habitat may be available in areas that are still considered natural or near-natural in certain steeper portions of the study area.	Medium: possible	SABAP2

[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

Species Name	Status[14]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Sensitive species	EN	The EoO in South Africa has declined by approximately 66% in 115 years, or less than 3 generations (Kemp and Webster 2008), with about half of the regional population found in large protected areas, primarily Kruger National Park and Adjacent Private Nature Reserves. Groups outside this stronghold are patchily distributed in areas unaffected by expansion of rural communities, afforestation, bush encroachment, livestock diseases and cultivation (Morrison et al. 2005, Jordan 2011).Throughout the species' range, it occurs in habitats broadly classified as grassland and savannah, but it is absent from arid semi-deserts and extensive forests (Kemp 1995, Jordan 2011).	Within distribution range, however given the presence of rural communities, afforestation, bush encroachment, livestock and cultivated areas across large portions of the study area it is unlikely that this species frequents the study area.	Medium: unlikely	SABAP2
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.	Medium: possible	SABAP2
European Roller (*Coracias garrulus*)	NT	The European Roller is a non-breeding migrant. Birds arrive in the austral spring between October/November and depart again in March/April (Kovács et al. 2008). Within the region, the species is concentrated in the upper-middle Limpopo River drainage, the Lowveld region of Mpumalanga and Limpopo, and coastal KwaZulu-Natal (Herremans 1997). Occurs in woodland, bushveld and even grassland where it perches on powerlines.	Within distribution range, and habitat requirements largely met.	Medium: 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.	High: probable	SABAP2

Species Name	Status[14]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
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, 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.	May visit open grassland and there is suitable breeding habitat present.	High: probable	SABAP2
White-backed Night Heron (*Gorsachius leuconotus*)	VU	A secretive and easily overlooked species that is widespread but generally sparse throughout its range. Within the region, the species occurs very sparsely in low-lying, high-rainfall areas of northern and eastern South Africa and Swaziland, extending westwards along the south coast to about Knysna, Western Cape (Martin 1997). Mostly along clear, swift- or slow-flowing perennial rivers and streams with forested banks and overhanging vegetation, chiefly in Woodland and Savannah biomes but also in more open country (Allan 2005), below 1 500 m (Parker and Barnes 2000). Occurs on both large rivers (especially where dissected by islands, or near rapids) and smaller streams (Tarboton et al. 1987). May also be encountered in mangrove swamps, along coastal lagoons with thick fringing cover, and along wooded margins of lakes. Has bred on small dams and crocodile farms (Randall 1994).	On edge of species distribution range and habitat preferences may only be partially met.	Medium: unlikely	SABAP2

Species Name	Status[14]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
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 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).	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.	Medium: unlikely	SABAP2
Martial Eagle (*Polemaetus bellicosus*)	EN	Martial Eagles occur in a variety of habitats but seem to prefer arid and mesic savannah but are also commonly found at forest edges and in open shrubland (Simmons 2005). Birds will occupy most habitats provided there are adequate tall trees or pylons for nesting and perching (Machange et al. 2005). It rarely occurs in mountainous areas. It is known to nest on human-made structures, such as pylons and wind-pumps, and in alien trees (Tarboton and Allan 1984).	Within distribution range and habitat requirements partially to largely met.	Medium: possible	SABAP2
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 (acacias); where indigenous thorny trees are not available, alien pines or wattles may also be used (Tarboton 2011).	Within distribution range and habitat largely met.	Medium: possible	SABAP2

Species Name	Status[14]	Habitat Requirements/Preferences (after Roberts, 2015; Chittenden, 2009; Newman, 2002; IUCN, 2017)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
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.	Medium: possible	SABAP2

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 1. Potential occurrence of reptile species within the study area.

Table 40. Potential occurrence of reptile species within the study area.

Species Name	Status[15]	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	Medium: possible	Atlas and Red List of Reptiles of South Africa, Lesothos and Swaziland
Dhlinza Dwarf Chameleon (Bradypodion caeruleogula)	EN	Found in three forest patches (Ntumeni, Dlinza and Ongoya) in KwaZulu-Natal, South Africa (Tilbury and Tolley 2009, Bates et al. 2014), where it prefers the high canopy, or high perches in smaller trees.	Outside known distribution range.	Low	Atlas and Red List of Reptiles of South Africa, Lesothos and Swaziland
Zululand Dwarf Chameleon (*Bradypodion nemorale*)	NT	This species is endemic to Qudeni and Nkandla Forests, two patches of indigenous forest in KwaZulu-Natal, South Africa (Tolley and Burger 2007, Bates et al. 2014), with an EOO of 184 km2 .Confined to isolated patches of Afromontane and scarp forest. Usually found high in the canopy, although smaller individuals have been observed in the understorey (Tolley and Burger 2007).	Outside known distribution range.	Low	Atlas and Red List of Reptiles of South Africa, Lesothos and Swaziland
Nile Crocodile (*Crocodylus niloticus*)	VU	Widespread throughout southern, eastern and northern Africa. In South Africa and Eswatini (Swaziland) it is distributed from the Zinkwazi River south of the Tugela River in KwaZulu-Natal (Combrink et al. 2011) northwards into Eswatini (Swaziland), Mpumalanga, Limpopo, northern Gauteng and adjacent parts of North-West Province (Bates et al. 2014). Inhabits swamps, lakes, rivers and river mouths across most of its range as well as	Within distribution range, however unlikely to occur.	Medium: unlikely	Atlas and Red List of Reptiles of South Africa, Lesothos and Swaziland

[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 (SANBI, 2021)	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
		coastal estuaries in KwaZulu-Natal Province, South Africa (Branch 1998, Bates et al. 2014).			

D. Amphibians

Three frog SCC may occur within specific freshwater habitats on site, they include **Bilbo's Rain Frog** (Vulnerable), the **Natal Cascade Frog** (Not red listed by threatened by introduced trout and habitat destruction), and the **Shovel Nosed Frog** (Vulnerable).

Table 41. Potential occurrence of amphibian species within the study area.

Species Name	Status[16]	Habitat Requirements/Preferences (IUCN, 2017)	Distribution/Range	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Bilbo's Rain Frog (*Breviceps bagginsi*)	VU	Restricted tp KZN midlands and northern Eastern Cape. Known from grassy verges in or along exotic plantatoins in Boston Greytown, Ixopo, iMpendle, Melmoth-Babanango and Umgeni vlei districts and in grasslands at Mkambati Nature Reserve in the Eastern Cape.	KZN midlands and northern Eastern Cape	Site occurs on the edge of known species geographic range (i.e. Melmoth-Babanango) and Moist Coast Hinterland Grassland within the study area largely meets the habitat requirements for the species.	Medium: possible	du Preez and Carruthers, 2017
Natal Cascade Frog (*Hadromorphryne natalensis*)	Not red listed but threatened by introduced trout and habitat destruction	At low and high altitudes in cold, clear swiftly flowing densely vegetated mountain streams, in kloofs, forest and grassland. Sometimes found quite far from water, under vegetation or rocks.	KZN, Swaziland, Lesotho, Free State Gauteng	Within known distribution range and habitat requirements largely met on portions of the site.	Medium: possible	du Preez and Carruthers, 2017

[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 (IUCN, 2017)	Distribution/Range	Onsite Habitat Requirements Met?	Potential Occurrence on Site	Source
Shovel Nosed Frog (*Hemisus guttatus)*	VU	Inhabits grassland and savannah. It breeds in seasonal pans, swampy areas, and in pools near rivers where there are sandy soils/alluvial deposits. Spend most of their time underground in areas of flat, sandy soil that tend to flood during the rains. Breeds in burrows and is seldom encountered above ground.	Central and northern KwaZulu-Natal	Habitat requirements partially met along the few wetlands that occur and the Mhlatuze River where alluvial deposits present. Also, within distribution range.	Medium: possible	du Preez and Carruthers, 2017

E. Invertebrates

Very few formal surveys of invertebrates have been carried out in the study area. A review of the KZN Terrestrial Systematic Conservation Plan, the EIA Screening Tool Report for the site, LepiMap, SpiderMap, ScorpionMap, OdonataMap accessed from http://vmus.adu.org.za/; highlighted seventeen (17) species that could potentially occur in vegetation communities that are in good ecological condition on site.

Table 42. Potential occurrence of invertebrate species within the study area.

Scientific & Common Name	Type	Status[17]	Habitat	Relevant Onsite Habitat	POC	Source
Maritzburg slender-spined millipede (*Spinotarsus maritzburgensis*)	Millipede	EN	Under rocks, in leaf litter or top 30cm of soil	Could occur in thicket vegetation occurring on site in the leaf litter perhaps.	Medium: possible	KZN SCA
Two-toothed slender spined millipede (*Patinatius bidentatus simulator*)	Millipede	Unknown	Leaf litter, often at base of trees, may also be in top 30cm of soil	Could occur in thicket vegetation occurring on site in the leaf litter perhaps.	Medium: possible	KZN SCA
Gulella euthymia	Mollusc	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Gulella separata	Mollusc	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Spinotarsus destructus	Millipede	EN	Under rocks and cattle dung	Unknown	Medium: possible	KZN SCA
Sickle-shaped Black Millipede (*Doratogonus falcatus)*	Millipede	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Odontomelus eshowe	Grasshopper	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Complex keeled millipede (*Allawrencius complex*)	Millipede	Unknown	Information not available	Unknown	Medium: possible	KZN SCA

[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

Scientific & Common Name	Type	Status[17]	Habitat	Relevant Onsite Habitat	POC	Source
Wandering black millipede (*Doratogonus peregrinus*)	Millipede	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Natal black millipede (*Doratogonus natalensis*)	Millipede	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Wrinkled red millipede (*Centrolobus rugulosus*)	Millipede	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Dlinza Forest pinwheel (*Trachycystis clifdeni*)	Mollusc	CR	The Dlinza Forest pinwheel (Trachycystis clifdeni) is a species of very small, air-breathing, land snail. This species is endemic to South Africa. Its natural habitat is subtropical or tropical dry forests. The common name is a reference to the Dlinza Forest Nature Reserve.	Could occur in thicket vegetation occurring on site in the leaf litter perhaps.	Medium: possible	KZN SCA
Bifid red millipede (*Centrolobus bifidus*)	Millipede	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Gulella aliciae	Mollusc	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Gulella barbarae	Mollusc	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Eunonyma lymnaeformis	Mollusc	Unknown	Information not available	Unknown	Medium: possible	KZN SCA
Edouardia conulus	Mollusc	Unknown	Information not available	Unknown	Medium: possible	KZN SCA