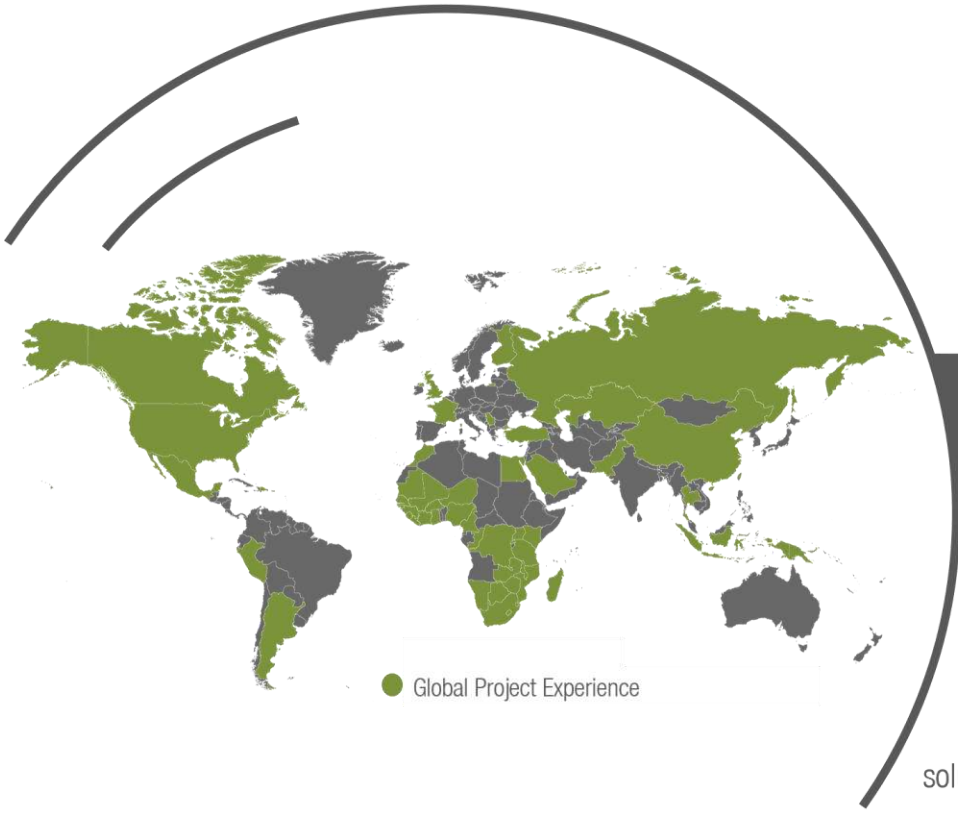

DIGBY WELLS
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Proposed Arnot South Coal Mining Project, Situated near Hendrina, Mpumalanga Province

Fauna & Flora Impact Assessment

Prepared for:
Exxaro

Project Number:
UCD6802

August 2021

Digby Wells and Associates (South Africa) (Pty) Ltd
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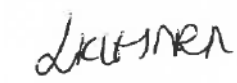
*Non-Executive

This document has been prepared by Digby Wells Environmental.

Report Type:	Fauna & Flora Impact Assessment
Project Name:	Proposed Arnot South Coal Mining Project, Situated near Hendrina, Mpumalanga Province
Project Code:	UCD6802

Name	Responsibility	Signature	Date
Julia Ndou	Report compiler		May 2021
Lisa Hester (Cand.Sci.Nat)	Field survey and report compiler		July 2021
Stephen Burton (Pri.Sci.Nat)	Technical review		August 2021

DETAILS AND DECLARATION OF THE SPECIALIST

Digby Wells and Associates (South Africa) (Pty) Ltd

Contact person: Lisa Hester

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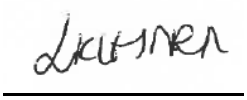
Full name:	Lisa Hester
Title/ Position:	Ecologist
Qualification(s):	BSc Hons Ecology
Experience (years):	4 years
Registration(s):	Cand. Pri. Sci

I, Lisa Hester, declare that: –

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

- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



28 August 2021

Signature of the Specialist *Date*

Findings, recommendations and conclusions provided in this report are based on the best available scientific methods and the author's professional knowledge and information at the time of compilation. Digby Wells employees involved in the compilation of this report, however, accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

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Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or make reference to this report. Whenever such recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety.

EXECUTIVE SUMMARY

Digby Wells Environmental (hereafter Digby Wells) has been requested by Universal Coal PLC (hereafter Universal Coal) to submit a terrestrial ecology and impact assessment for Arnot South's Environmental Authorisation (EA) and Water Use Licence (WUL) application to authorise the proposed underground Arnot South operation. The Prospecting Right, MP 30/5/1/1/2360 PR was issued to Exxaro Resources, and the Applicant for this process will be Exxaro Coal Mpumalanga (Pty) Ltd to mine coal on various farms covering approximately 16,000 (ha) in extent.

Based on Mucina & Rutherford (2006) classification of South Africa's vegetation, the proposed Project is located in an area dominated by the vegetation type Eastern Highveld Grassland, which according to those authors, is regarded as Endangered. According to the Mpumalanga Biodiversity Sector Plan (MBSP), moderately modified, other natural and heavily modified areas are present within the Project Area. According to the South African Protected Areas Database (SAPAD) and National Protected Area Expansion Strategy (NPAES), no protected areas occur within the Project Area however, the Amersfoort-Bethal-Carolina Important Bird Area (IBA) is located in the southern portion of the Project Area, with key species such as Botha's Lark and Secretarybirds.

A single season site survey was undertaken in April 2021 during the wet season. The following details were recorded:

- Much of the Project Area has been either transformed or degraded largely through historical crop production and other agricultural activities.
- Identified vegetation communities included Wetlands (Pan and Moist Grassland, see Wetland Report), Rocky Outcrops, Primary and Secondary Grasslands, Transformed cultivated areas and areas of Alien Invasive Plant (AIP) proliferation. The Wetland, Rocky Outcrop and Primary Grassland communities are seen as sensitive landscapes in the context of this ecological report.
- Floral Species of Conservation Concern (SCC) recorded included:
    - Watsonia gladioloides;
    - Gladiolus dalenii;
    - Gladiolus crassifolius;
    - Brunsvigia radulosa;
    - Khadia carloninses;
    - Aloe ecklonis; and
    - Crinum macowanii.

All recorded floral SCC are protected under the Mpumalanga Nature Conservation Act (MNCA, Act No. 10 of 1998) and one is Red Listed under South African National Biodiversity Institute (SANBI) as Vulnerable (*Khadia calinensis*). They were encountered within the various wetland systems and Rocky Outcrops Faunal SCC included:

- A Serval (*Leptailurus serval*) (NT), tracks recorded in the CVB Floodplain and Sandstone Outcrop (see Sensitivity Map Figure 9-1 and Figure 9-2); and
- An African Clawless Otter (*Aonyx capensis*) (NT), tracks recorded within the CVB Floodplain and Sandstone Outcrop (see Sensitivity Map Figure 9-1 and Figure 9-2).

Areas within the footprint of the infrastructure should be screened for the identified floral and faunal SCC and any other Red Data/protected species prior to construction as vegetation removal is imminent. If found, permits will be required for removal and these species should be relocated to a nearby site of similar habitat.

The Project Area represents high faunal and floral diversity with numerous SCC identified throughout. The vegetation communities associated with the highest species richness were the Rocky Outcrops and Wetland communities. However, in the context of the Project Area all the remaining natural vegetation provides habitat for numerous faunal and floral species and therefore is of conservation significance. Recommendations and mitigation measures are provided in the Impact Assessment. Important recommendations include the following:

- Management and control of AIP proliferation throughout the life of the Project;
- Keep footprint to a minimum and adhere to protective buffers recommended in the Wetland Report (DWE, 2021); and
- A thorough screening prior to construction for the locality of faunal and floral SCC should be done within the proposed infrastructure layout. Protected flora will require permits for removal or destruction.

In the construction phase, loss of vegetation and habitat will occur due to the proposed infrastructure layout. Other impacts to occur will consist of alien invasive plant sprawl, loss of sensitive habitats (such as wetlands), fragmentation and edge effects. This assessment provides mitigation measures, continuous monitoring measures, encourages concurrent rehabilitation and includes a monitoring plan.

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LIST OF ACRONYMS, ABBREVIATIONS AND DEFINITION

AIP	Alien Invasive Plant
CALLM	Chief Albert Luthuli Local Municipality
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EOO	Extent of Occurrence
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
GG	Government Gazette
GNR	General
GSDM	Gert Sibanda District Municipality
ha	Hectares
km	Kilometres
MBSP	Mpumalanga Biodiversity Sector Plan
MNCA	Mpumalanga Nature Conservation (Act No. 10 of 1998)
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MRA	Mining Rights Area

MTIS	Mineable tonnes in-situ
Mtpa	Million tonnes per annum
NDM	Nkangala District Municipality
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act, 1998 (Act No. 107 of 1998)
NPAES	National Protected Area Expansion Strategy
PCD	Pollution Control Dam
PR	Prospecting Right
QDS	Quarter Degree Square
ROM	Run of Mine
SAPAD	South African Protected Areas Database
SCC	Species of Conservation Concern
STLM	Steve Tshwete Local Municipality
TOPS	Threatened or Protected Species
UCD	Universal Coal PLC
WUL	Water Use Licence

Legal Requirement		**Section in Report**
(1)	A specialist report prepared in terms of these Regulations must contain-	
(a)	details of- (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	
cA	And indication of the quality and age of the base data used for the specialist report;	
cB	A description of existing impacts on site, cumulative impacts of the proposed development and levels of acceptable change;	
(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	

Legal Requirement		Section in Report
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of the equipment and modelling used;	
(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	
(g)	an identification of any areas to be avoided, including buffers;	
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	
(k)	any mitigation measures for inclusion in the EMPr;	
(l)	any conditions/aspects for inclusion in the environmental authorisation;	
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	
(n)	a reasoned opinion (Environmental Impact Statement) -	
	whether the proposed activity, activities or portions thereof should be authorised; and	
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
(q)	any other information requested by the competent authority.	

1. Introduction

Digby Wells Environmental (hereafter Digby Wells) has been requested by Universal Coal PLC (hereafter Universal Coal) to submit a terrestrial ecology and impact assessment for Arnot South's Environmental Authorisation (EA) and Water Use Licence (WUL) application report to authorise the proposed underground Arnot South operation. The Prospecting Right, MP 30/5/1/1/2360 PR was issued to Exxaro Resources, and the Applicant for this process will be Exxaro Coal Mpumalanga (Pty) Ltd to mine coal on various farms covering approximately 16,000 (ha) in extent.

The Prospecting Right was renewed in September 2017 and lapsed on 10 September 2020. However, a Mining Right Application (MRA) and Mine Works programme (MWP) for underground mining were submitted to the Department of Mineral Resources and Energy (DMRE) prior to the lapsing date (on 8 September 2020). The Applicant was issued reference number MP 30/5/1/2/2/10292 MR.

2. Project Description

The Arnot South Prospecting Area is approximately 10km east of Hendrina, 25 km west of Carolina, and 50 km southeast of Middelburg (see Figure 2-2). The Project is near two of Eskom's power stations, namely Hendrina (25km) and Arnot (5km). The N11 national road runs east of the proposed Project area in a north to south direction. The R38 provincial road runs across the southern part of the Project area in a west to east direction. The R33 provincial road runs to the east of the Project area in a north to south direction, and the N4 national road runs north of the Project in a west to east direction

There are five farm homesteads situated within the planned underground mining area, and a small watercourse runs in a northeast direction across the northern half of the mining area (see Figure 2-1). The land is currently mainly used for livestock farming. The boreholes drilled in the prospecting area indicate that the area of interest lies mainly on the farms Weltevreden 174 IS, Mooiplaats 165 IS, Vlakfontein 166 IS, and Schoonoord 164 IS. The farms are located within the jurisdictions of Steve Tshwete Local Municipality (STLM) and Chief Albert Luthuli Local Municipality (CALLM), situated in the Nkangala District Municipality (NDM) and Gert Sibanda District Municipality (GSDM), respectively, in the Mpumalanga Province.

The mineral reserve consists of one economically mineable underground seam (No. 2 coal seam), producing approximately 2.4 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal for approximately 17 years. Further drilling will be required to confirm a resource to the south of the MRA. The potential future resource of the remaining ROM coal is approximately 32,912,300 tonnes, allowing an additional mining period of approximately 13 years. This application considers the use of underground board-and-pillar mining with continuous miners due to the depth and thickness of the reserve.

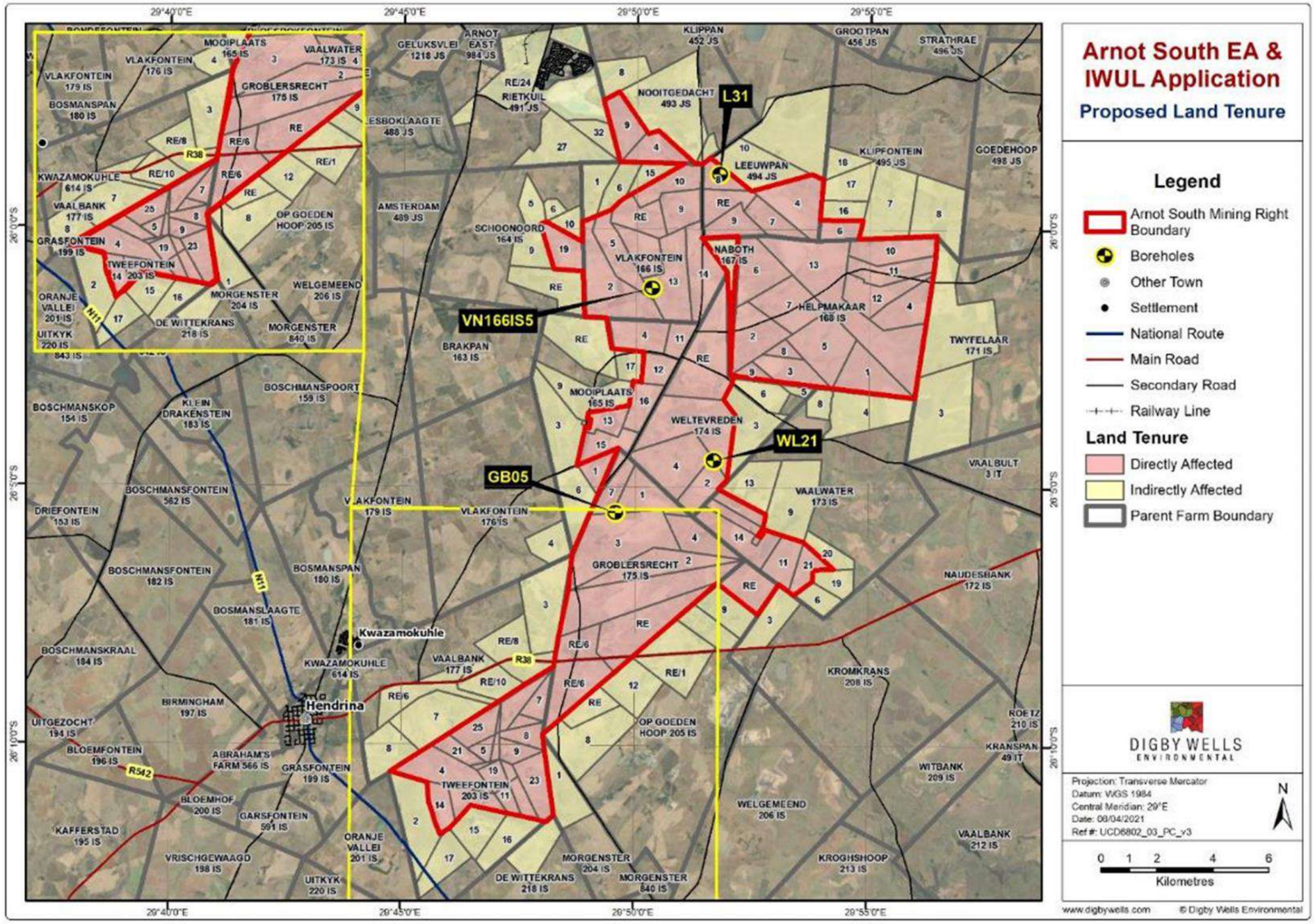

Figure 2-1: Land Tenure Map

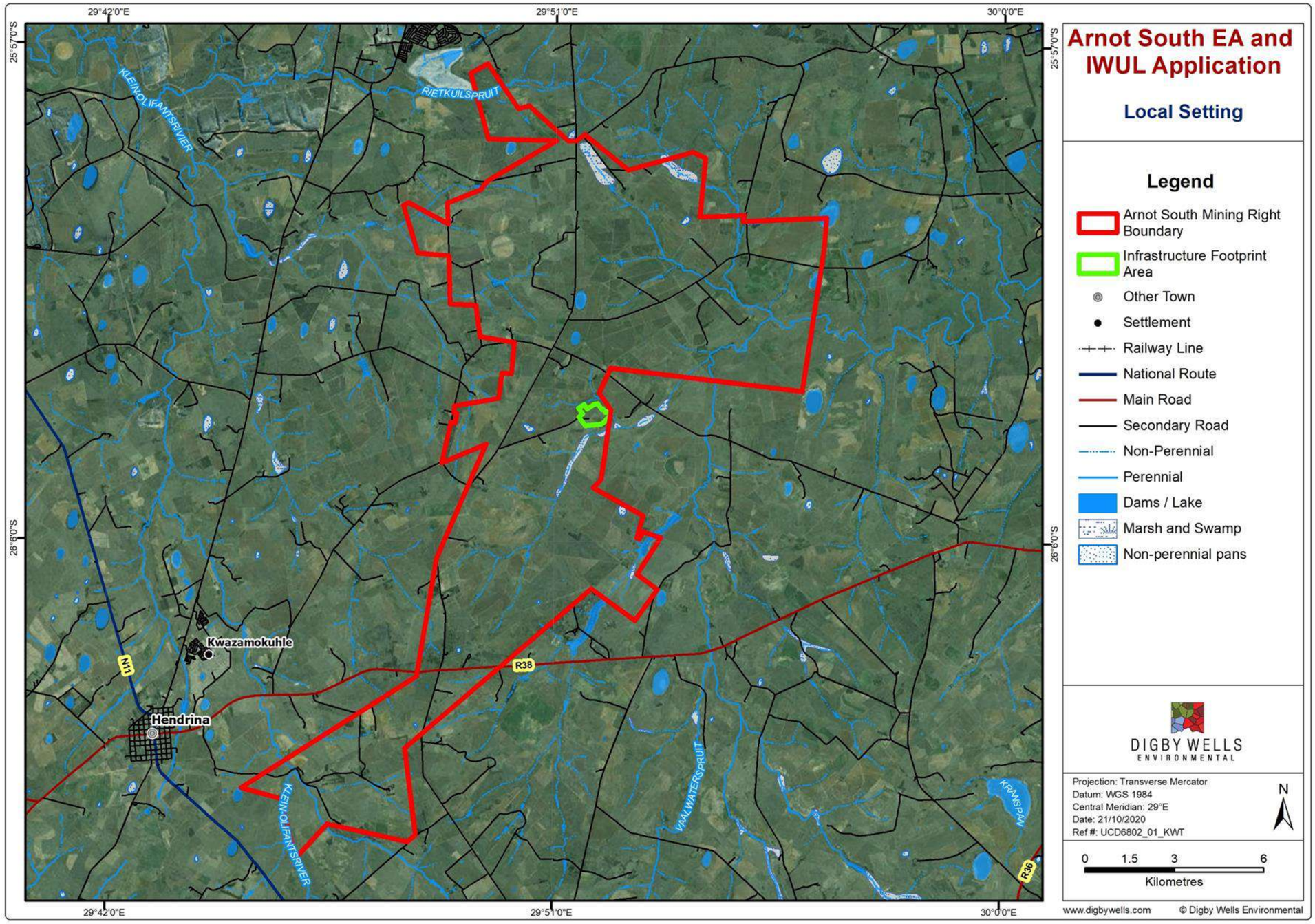

Figure 2-2: Locality Map

2.1. Alternatives Considered

Alternatives to be considered to ensure minimal impacts to the fauna and flora include:

- Reduce surface infrastructure and footprints on areas with a high density of protected flora;
- Avoid construction and movement of heavy machinery in sensitive vegetation types such as pans and wetlands;
- Reduce the amount of water and land for operations and associated infrastructure;
- Implement alien invasive plant management to ensure concurrent rehabilitation is followed;
- Reduce waste materials and waste outputs; and
- Replenish removed indigenous identified vegetation after decommissioning.

2.2. Proposed Infrastructure and Activities

Table 2-1 provides a summary of activities associated with the proposed Arnot South Project that will be further assessed in the Impact Assessment section.

Table 2-1: Project Phases and Associated Activities

Project Phase	
Construction Phase	Removal of vegetation / topsoil for establishment of mining and linear infrastructure
	Establishing the box cut
	Diesel storage and explosives magazine
	Construction of infrastructure, and ventilation Shafts.
	Construction of access road and haul roads
	Stockpiling of soils, rock dump and discard dump establishment.
Operational Phase	Ventilation fans and infrastructure area, including stockpile areas and the discard dump
	Underground blasting and operation of the underground workings
	Maintenance of haul roads, pipelines, machinery, water, effluent and stormwater management infrastructure and stockpile areas.
	Removal of rock (blasting)
	Operating washing plant
	Storage, handling, and treatment of hazardous products (including fuel, explosives and oil) and waste;
	Operating sewage treatment plant;

Project Phase	
	Stockpiling and dumping (rock dumps, soils, ROM, discard dump) establishment and operation
	Maintenance activities – throughout the operational phase, maintenance will need to be undertaken to ensure that all infrastructure in operating optimally and does not pose a threat to human or environmental health. Maintenance will include haul roads, pipelines, processing plant, machinery, water and stormwater management infrastructure, and stockpile areas.
	Continue with exploration activities
Decommissioning Phase	Demolition and removal of infrastructure
	Post-closure monitoring and rehabilitation
	Closure of the underground mine

3. Relevant Legislation, Standards and Guidelines

From an environmental and social perspective, the proposed Arnot South Project is required to comply with all the obligations in terms of the provisions of the NEMA and MPRDA. The additional legislative guidelines directing the Project and specifically related to flora and fauna, are outlined in further detail in Table 3-1 below.

Table 3-1: Applicable Legislation, Regulations, Guidelines and By-Laws

Legislation, Regulation, Guideline or By-Law	Applicability
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) The NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance: • Alien and Invasive Species Lists, 2020 (terms of GNR 1003 in GG 43726 dated 18 September 2020 – effective from 18 October 2020); • Threatened and Protected Species Regulations; and • National list of Ecosystems Threatened and in need of protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GNR 1002, 9 December 2011).	• A Fauna and Flora Impact Assessment has been undertaken; • The Project activities will be set out to abide by the guidelines set out in NEM:BA; • Areas of concern will be indicated and possible alternatives to avoid these areas; and • Required mitigation measures will be included in the Environmental

Legislation, Regulation, Guideline or By-Law	Applicability
	Management Plan (EMP) in this report.
Mpumalanga Biodiversity Sector Plan (2014) The Mpumalanga Biodiversity Sector Plan (MBSP) is a spatial tool that forms part of the national biodiversity planning tools and initiatives that are provided for national legislation and policy. The MBSP was published in 2014 by the Mpumalanga Tourism and Parks Agency (MTPA) and comprises a set of maps of biodiversity priority areas accompanied by contextual information and land-use guidelines for use in land-use and development planning, environmental assessment and regulation, and natural resource management. Strategically the MBSP enables the province to: • Implement the NEM:BA, 2004 provincially, and comply with requirements of the National Biodiversity Framework, 2009 (NBF) and certain international conventions; • Identify those areas of highest biodiversity that need to be considered in provincial planning initiatives; and • Address threat of climate change (ecosystem-based adaptation).	Provides background information about the ecology of the province and natural resource management as well as tools that can be used to guide decisions around biodiversity management.
Mpumalanga Nature Conservation Act (Act No. 10 of 1998) The Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (MNCA) is responsible for making provisions with respect to nature conservation in the Mpumalanga province. It provides for, among other things, protection of wildlife, hunting fisheries, protection of endangered fauna and flora as listed in the Convention of International Trade in Endangered Species (CITES) of wild flora and fauna, the control of harmful animals, freshwater pollution and enforcement. The objectives of the MNCA are to consolidate the laws relating to nature conservation applicable in the Mpumalanga province and to provide for matters connected therewith. The MNCA focuses on the protection of critically endangered to vulnerable fauna, and flora within the province.	Provides background information about the ecology of the province and natural resource management as well as tools that can be used to guide decisions around biodiversity management.
SANBI, National Biodiversity Assessment (NBA) 2018 The NBA is a collaborative effort to synthesise the best available science on South Africa's biodiversity to inform policy and decision making in a range of sectors and contribute to national development priorities. It is used for the following: • The NBA is used to inform policy in the biodiversity sector, such as the National Biodiversity Framework and the National Protected Area Expansion Strategy, as well as	The guideline provides practical guidance for determining the current state of the biodiversity and ecosystem identified within the area of interest as well as providing indication of threat status and protection level for

Legislation, Regulation, Guideline or By-Law	Applicability
informing policies and strategies of a range of other sectors that rely on natural resources, such as the water, agriculture and mining sectors. • The NBA provides information to help prioritise the often limited resources for managing and conserving our biodiversity – actions can focus on preventing further loss and degradation of ecosystems and ecological infrastructure, on consolidating and expanding the protected areas network; and on interventions require to restore areas in bad condition so they become functional again. • The NBA provides context and information that feeds into strategic planning processes such as strategic Environmental Assessments and bioregional planning. The NBA provides information for a range of national level reporting processes such as the South Africa Environment Outlook and ensures that the DEA has the necessary biodiversity information to meet the international reporting commitments to the Convention on Biological Diversity (CBD).	both species and ecosystems.

4. Assumptions, Limitations and Exclusions

The compilation of this Report is based on the following assumptions and limitations in Table 4-1.

Table 4-1: Limitations and Assumptions with Resultant Consequences of this Report

Assumptions and Limitations	Consequences
This fauna and flora study forms part of a larger EIA and should be read in conjunction with the EIA and other related specialist studies.	This report does not include any other specialist studies other than the fauna and flora assessment. This report cannot be used as a stand-alone report in the application for Environmental Authorisation
This Fauna and Flora Impact Assessment was conducted during April 2021 having some access restrictions to parts of the Project Area, including farm portions in the Tweefontein 203 IS and Morgenster 204 IS. Furthermore, timing and brevity of the survey was not ideal and conducted at the end of the flowering season, hence some species may have been missed. Land access delayed the timing of the survey.	Findings, recommendations, and conclusions provided in this report are based on the authors' best scientific and professional knowledge and information available at the time of compilation.

Assumptions and Limitations	Consequences
No form of this report may be amended or extended without the prior written consent of the author and/or a relevant reference to the report by the inclusion of an appropriately detailed citation. Any recommendations, statements, or conclusions drawn from or based on this report must cite or reference this report. Whenever such recommendations, statements or conclusions form part of the main report relating to the current investigation, this report must be included in its entirety.	The fauna and flora report cannot be used as a stand-alone report in the application for an Environmental Authorisation.

5. Details of Specialist

The following is a list of Digby Wells' staff who was involved in the Fauna and Flora Environmental Impact Assessment:

- **Stephen Burton** is the Ecology and Atmospheric Sciences Divisional Manager at Digby Wells. He received a Bachelor of Science in Zoology and Entomology and an Honours degree in Zoology from the University of Natal. He has also received his MSc in Zoology through the University of KwaZulu-Natal. Stephen is an ecologist with fields of interest in wetlands, fauna, and flora. In his 14-year career he has undertaken numerous wetland delineations and functional assessments, faunal assessments, wetland offset and rehabilitation assessments and audits, as well as project management of various environmental impact assessment and water use license projects. He has also worked extensively with wetland rehabilitation implementation projects for large scale developments. He has published a variety of journal articles and presented at various South African and international conferences, and is a registered Professional Natural Scientist with the South African Council for Natural Scientific Professionals (SACNASP).
- **Lisa Hester** holds the position of Ecologist at Digby Wells Environmental in South Africa. She obtained her BSc Honour's degree in Ecology and Conservation from the University of Witwatersrand in South Africa. Her dissertation topic involved an in-depth ecological survey of the Croc River Mountain Conservancy in Nelspruit. Since completion of her studies, Lisa has worked on numerous fauna and flora biomonitoring reports both locally and internationally (including Australia). Working on a multitude of surveys in various locations has allowed Lisa to engage upon a multi-faceted professional forum. Various scopes of work involving, ecological baseline assessments, ecological rehabilitation, wetland assessments, nest-box installations, environmental impact assessments, protected species surveys, bat surveys, species relocation and vegetation reports consists of her repertoire of work.

- **Julia Ndou** is an assistant ecology and atmospheric consultant at Digby Wells Environmental. She obtained her MSc in Aquatic Health from the University of Johannesburg. Her current work experience at Digby Wells Environmental includes fieldwork, the compilation of aquatics, wetlands, fauna and flora proposals, memorandums, baseline biomonitoring and impact assessment reports.

6. Methodology

This section presents the detailed methodology undertaken during the infield assessment and during the assessment of all impacts related to the project in terms of fauna and flora (Terrestrial Biodiversity).

6.1. Desktop Gap Analysis

The desktop review involved compiling relevant information for the greater study area from reliable and recognised resources, including historical studies and assessments. The aim of the desktop study is to identify the current biodiversity and ecosystem status through various databases including the following:

- Mucina and Rutherford (2012), expected vegetation type and community structure;
- South African National Botanical Institute (SANBI), Pretoria Computerised Information System) PRECIS List's, potential species in the proposed development area/site area according to the QDS;
- Potentially occurring avifaunal species through South African Bird Atlas Project (SABAP2), BirdLife South Africa Area (IBA) Directory (Barnes, 1998) and The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al., 2015);
- Potentially occurring mammal species through The Mammals of the Southern African Subregion (Skinner & Chimimba , 2005), the Animal Demography Unit Virtual Museum (http://vmus.adu.org.za/), and The 2016 Red List of Mammals of South Africa, Lesotho and Swaziland (ww.ewt.org.za) (Child, M. F., et al.,2017);
- Potentially occurring herpetofauna species list through the SARCA (sarca.adu.org); A Guide to the Reptiles of Southern Africa (Graham, 2013); Atlas and Red List of Reptiles of South Africa, Lesotho and Swaziland (Bates et al., 2014), A Complete Guide to the Frogs of Southern Africa (Du Preez & Carruthers, 2009); Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland (Minter, 2004); and
- Mpumalanga Provincial legislation, potential Red Data Listed species and their current status.

6.1.1. Species Conservation Status Repository

6.1.1.1. Red Data

Red Data Books or RDBs, are lists of threatened plants and animals specific to a certain region. They are a vital source of information in guiding conservation decisions and have guided the literature review of this study. South Africa has produced 5 RDBs dealing with each of the following: birds, land mammals, fish (freshwater and estuarine only), reptiles and amphibians, and butterflies.

The conservation status of a plant or animal species is described by the following terms:

- EXTINCT: a species for which there is a historical record, but which no longer exists in the area under review.
- ENDANGERED a species in danger of extinction, and whose survival is unlikely if the factors causing its decline to continue.
- VULNERABLE a species which it is believed will move into the endangered category if the factors causing its decline to continue.
- RARE a species with small populations, which are not yet vulnerable or endangered, but which are at risk.

The term **THREATENED** is commonly used as a collective description for species which are endangered vulnerable or rare.

Some species are **ENDEMIC,** i.e., they are restricted to one region and occur nowhere else. A threatened endemic is a conservation priority.

Of special concern were protected plant and animal species. Listed species of flora and fauna are regarded as species whose representation in the wild has declined to such an extent that drastic action is needed to ensure their survival. Under anthropogenic pressure, the number of these species has reached levels where preservation management is needed, and conservation management will no longer be effective. The listing of these species under either International Union for the Conservation of Nature (IUCN) or CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), is regarded as a valuable starting point to initiate legally sanctioned management practices to bring the numbers of these species back to within acceptable numbers.

6.1.1.2. IUCN

The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on plants and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those plants and animals that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered, and Vulnerable).

The IUCN Red List also includes information on:

- Plants and animals that are categorized as Extinct or Extinct in the Wild;
- Taxa that cannot be evaluated because of insufficient information (i.e., are Data Deficient); and
- Plants and animals that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme (i.e., are Near Threatened).

The figure below shows the Current IUCN Red List categories. These categories include Critically Endangered (CR), Endangered (EN), and Vulnerable (VU), which are collectively known as the Threatened category, Conservation Dependent (CD), Near Threatened (NT), and Least Concern (LC) which are collectively known as Lower Risk.

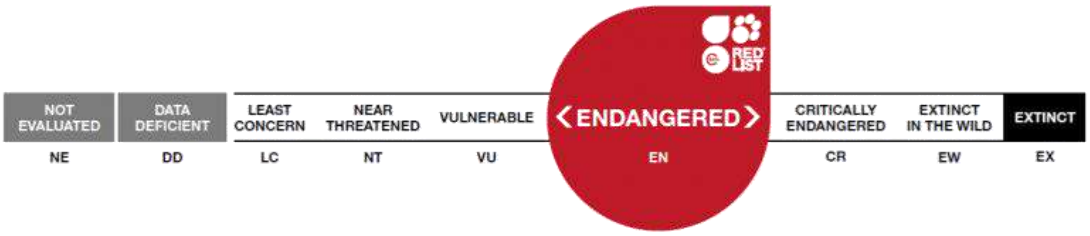

Figure 6-1: IUCN categories

Abbreviations and descriptions of each IUCN category are summarized in Table 6-1 below.

Plants and animals that have been evaluated to have a low risk of extinction are classified as Least Concern (IUCN.org).

Table 6-1: Description of IUCN Categories

IUCN Category	Abbreviation	Description
Extinct	EX	No surviving individuals of the species
Extinct In The Wild	EW	Known only to survive in captivity, or as a naturalized population outside its historic range.
Critically Endangered	CR	At a very high risk of extinction.
Endangered	EN	High risk of extinction in the wild.
Vulnerable	VU	High risk of endangerment in the wild.
Near Threatened	NT	Likely to become endangered in the near future.
Least Concern	LC	Lowest risk. Does not qualify for a more at-risk category
Data Deficient	DD	Not enough data to make an assessment of its risk of extinction.

IUCN Category	Abbreviation	Description
Not evaluated	NE	Has not yet been evaluated against the criteria.

6.1.1.3. CITES

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival (CITES.org).

CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the Convention has to be authorized through a licensing system. Each Party to the Convention must designate one or more Management Authorities in charge of administering that licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the species (CITES.org). Specimens are divided into the following appendices according to the restriction on trade.

Appendices I, II and III:

- Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
- Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.
- Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade. Changes to Appendix III follow a distinct procedure from changes to Appendices I and II, as each Party is entitled to make unilateral amendments to it.

6.1.1.4. TOPS Regulations

The Threatened or Protected Species Regulations 152 of 2007 ("TOPS Regulations") and the Lists of Critically Endangered, Endangered, Vulnerable and Protected Species (TOPS Lists) were published in 2007, in terms of the NEM:BA (South Africa, 2007(a) and (b)) and have been amended since then. These regulations through NEM:BA Chapter 4 provides for the protection and sustainable use of listed Threatened or Protected Species (TOPS) species. NEM:BA restricts activities that may be carried out in respect of Threatened or Protected Species (TOPS).

6.2. Field Investigations

Wet season infield fauna assessments took place during December 2020. Camera traps and Sherman traps were set out in locations where high faunal activity was observed and expected. During the field survey, the area was surveyed for the various fauna assemblages and floral species. The methodology of the fauna and flora assessment is described below.

6.2.1. Flora

A walkthrough of the site was undertaken to assess the vegetation. The survey searched for protected and listed plant species and declared Alien Invasive Plants (AIPs), with the overall aim to produce a full species list of all plant species present.

6.2.2. Mammals

A walkthrough of the site was done during the site survey whereby mammal species were identified by visual sightings as well as using spoor, droppings and roosting sights and available habitat. Camera traps and Sherman traps were set up in various locations where high faunal activity was observed and expected. Mammals were identified using the Smithers' Mammals of the Southern African field guide (Smithers, 2000).

6.2.3. Birds (Avifauna)

Data regarding the distribution of bird species was obtained from the Quarter Degree Square (QDS) using the information available from the South African Bird Atlas Project 2 (SABAP2). Concurrently with the mammal survey, the principal ornithological field survey technique was used to record bird species present. Opportunistic sightings were recorded during the site survey.

Because the primary purpose of this work was to establish the presence of species, no distance or time limit was set, and hence any species seen or heard anywhere within the general vicinity of the proposed project site was recorded. Visual identification was used to confirm calls of the less common species. Bird species were confirmed using the Sasol photographic field guide (Ryan, 2009)

Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN 2019), birds listed by NEMBA and the Eskom Red Data Book of Birds (Taylor MR, 2015).

6.2.4. Reptiles and Frogs

Comprehensive amphibian surveys can only be undertaken by nocturnal surveys throughout the wet season. This was beyond the current scope of the assessment and the area was surveyed diurnally for possible habitat for amphibian species. Direct / opportunistic observations were completed along trails or paths within the Project Area. Any herpetofauna species seen or heard along such paths or trails within the Project Area were identified and recorded. Another method used was to examine refuges using visual scanning of terrains to record smaller herpetofauna species which often conceal themselves under rocks and in fallen logs, rotten tree stumps, in leaf litter, rodent burrows, ponds, old termite mounds, etc. Du Preez, *et al*. (2009) was used to confirm identification where necessary. Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN 2019) and listed by NEMBA.

6.2.5. Invertebrates (Spiders, Scorpions, Beetles and Butterflies)

A list of visually identified and observed invertebrate species was compiled during the field survey. However, due to their cryptic nature and habits, varied stages of life cycles, seasonal and temporal fluctuations within the environment, it is unlikely that all invertebrate species will have been recorded during the site assessment period. Nevertheless, the data gathered during the general invertebrate assessment along with the habitat analysis provided an accurate indication of which invertebrate species are likely to occur in the study area. A sweep net was used to capture and identify invertebrates. The focus of this assessment was on protected species as this would narrow the field considerably. Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN 2019) and inverts listed by the NEMBA.

6.2.6. Species of Conservational Concern Assessment

The term Species of Conservation Concern (SCC) in the context of this report refers to all RD (Red Data) and IUCN (International Union for the Conservation of Nature) listed fauna and flora species, as well as protected species of relevance to the project.:

- Critically Endangered (CR): A taxon is Critically Endangered when it is considered to be facing an extremely high risk of extinction in the wild (IUCN, 2019).
- Endangered (EN): A taxon is Endangered when it is considered to be facing a very high risk of extinction in the wild (IUCN, 2019).
- Vulnerable (VU): A taxon is Vulnerable when the best available evidence indicates it to be facing a high risk of extinction in the wild (IUCN, 2019).
- Near Threatened (NT): A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN, 2010).

7. Findings and Discussion

The table below (Table 7-1) gives a detailed description of the baseline attributes for the Project Area. Proceeding the table are the associated maps for the conservation aspects of the Project area.

Table 7-1: Baseline Environment of the Arnot South Project Area

<table>
<tr><th colspan="2">Details of the project area in terms of Mucina & Rutherford (2006)</th><th colspan="2">Description of the vegetation type(s) relevant to the project area according to Mucina & Rutherford (2006)</th></tr>
<tr><td>BIOME</td><td>According to Mucina and Rutherford (2006), the study area falls within a Grassland Biome.</td><td>Altitude (m)</td><td>1 520–1 780, TO 1 300.</td></tr>
<tr><td>BIOREGION</td><td>The study area is located within the Mesic Highveld Grassland Bioregion.</td><td>Climate</td><td>Strongly seasonal summer rainfall, with very dry winters.
<table>
<tr><th>MAP* (mm)</th><th>MAT* (°C)</th><th>MFD* (Days)</th><th>MAPE* (mm)</th><th>MASMS* (%)</th></tr>
<tr><td>695</td><td>14.8</td><td>32</td><td>1926</td><td>73</td></tr>
</table></td></tr>
<tr><td>Vegetation Type</td><td>Eastern Highveld Grassland (Figure 7-1)</td><td>Distribution</td><td>Mpumalanga and Gauteng Provinces: Plains between Belfast in the east and the eastern side of Johannesburg in the west and extending southwards to Bethal, Ermelo and west of Piet Retief.</td></tr>
<tr><td>Conservation details pertaining to the project area (Various databases)</td><td></td><td>Geology & Soils</td><td>Red to yellow sandy soils of the Ba and Bb land types found on shales and sandstones of the Madzaringwe Formation (Karoo Supergroup). Land types of Bb (65%) and Ba (30%).</td></tr>
<tr><td>Mining and Biodiversity Guideline Category, DEA (2013)</td><td>The project area was classified as both High Biodiversity Importance – High Risk for Mining and Moderate Biodiversity Importance – Moderate Risk for Mining (Figure 7-2).</td><td rowspan="2">Conservation</td><td rowspan="2">Endangered. Target 24%. Only very small fraction conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Some 44% transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but Acacia mearnsii can become dominant in disturbed sites. Erosion is very low.</td></tr>
<tr><td>National Threatened Ecosystems (2011)</td><td>According to the National List of threatened terrestrial ecosystems, the proposed extension area falls does not fall within any original or remaining extents of a threatened ecosystem.</td></tr>
<tr><td>SAPAD & SACAD (Q4, 2018); and NPAES (2009)</td><td>According to the SAPAD, NPAES and SACAD databases (Figure 7-3), no protected areas are within the Project boundary nor are within close proxinity to it. Several Protected Areas are situated within close proximity to the Project area. The nearest and most apparent is the Nooitgedacht Dam Nature Reserve located approximately 10 km east of the Project area. The Nooitgetdacht reserve is 3,000 ha and holds host to a numerous number of game species such as Blesbuck, Springbok, Zebra, Red Hartebeest, Reedbuck, Oribi and recently introduced Buffalo. The Reserve surrounds the Nooitgedacht Dam where the Komati River originates. Other important tributaries are the Boesmanspruit, Witkloofspruit, and the Vaalwaterspruit. This Reserve is within the GSDM and is a custodian of the Mpumalanga Tourism and Parks Agency (MTPA).</td><td>Vegetation & landscape features</td><td>Slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (Aristida, Digitaria, Eragrostis, Themeda, Tristachya etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (Senegalia caffra, Celtis africana, Diospyros lycioides subsp lycioides, Parinari capensis, Protea caffra, P. welwitschii and Searsia magalismontanum).</td></tr>
</table>

Details of the project area in terms of Mucina & Rutherford (2006)		**Description of the vegetation type(s) relevant to the project area according to Mucina & Rutherford (2006)**	
IBA (2015) (Figure 7-4**).**	The Amersfoort-Bethal-Carolina IBA is located in the southern portion of the Project Area, but will not be impacted by the mining activities. This area consists of fragmented grasslands with intermittent pans and watercourses, with numerous rocky slopes, gullies and ravines that promote thickets, while secondary forests occasionally develop in the deeper, fire protected gullies. There is a probability that Botha's Lark (*Spizocorys fringillaris*) may be present due to the habitat preferability which includes, short, dense grasslands that are found within the IBA. Other key species within this IBA include Blue Crane, Southern Bald Ibis, Black Harrier, Blue Korhaan, Blacking winged Pratincole, Secretarybird, Martial Eagle, Denhams Bustard, and African Grass Owl (BirdLife, 2021). Major threats include agricultural expansion such as planting of crop.		
MPUMALANGA biodiversity Sector plan (2014)			
CBA & ESA	Moderately modified, other natural areas and heavily modified areas are present throughout within the proposed Project Area.		

CBA = Critical Biodiversity Areas; ESA = Ecological Support Area; IBA = Important Bird and Biodiversity Areas; MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MFD = Mean Frost Days; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply); NBA = National Biodiversity Assessment; NPAES = National Protected Areas Expansion Strategy; SAPAD = South African Protected Areas Database.

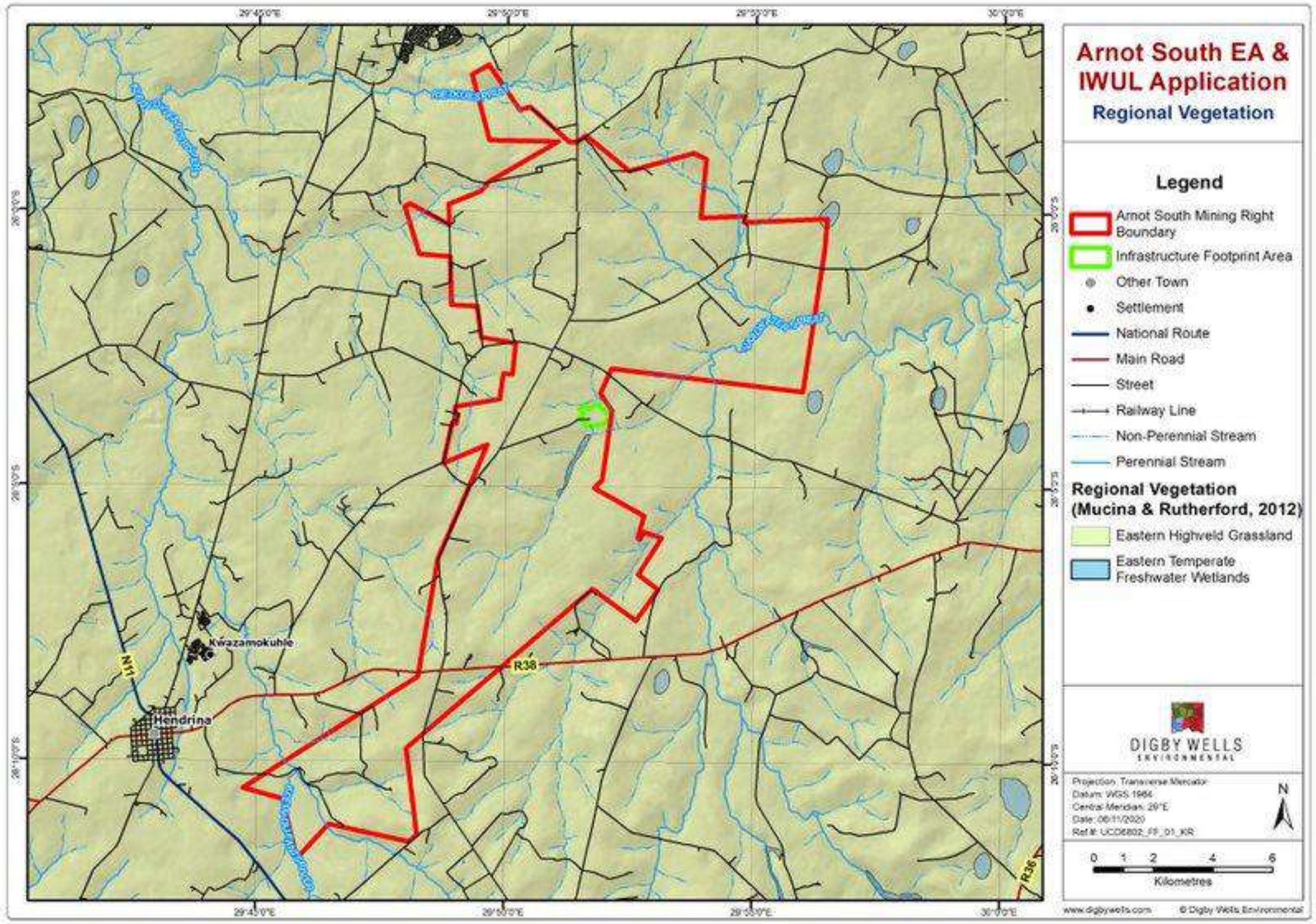

Figure 7-1: Regional vegetation

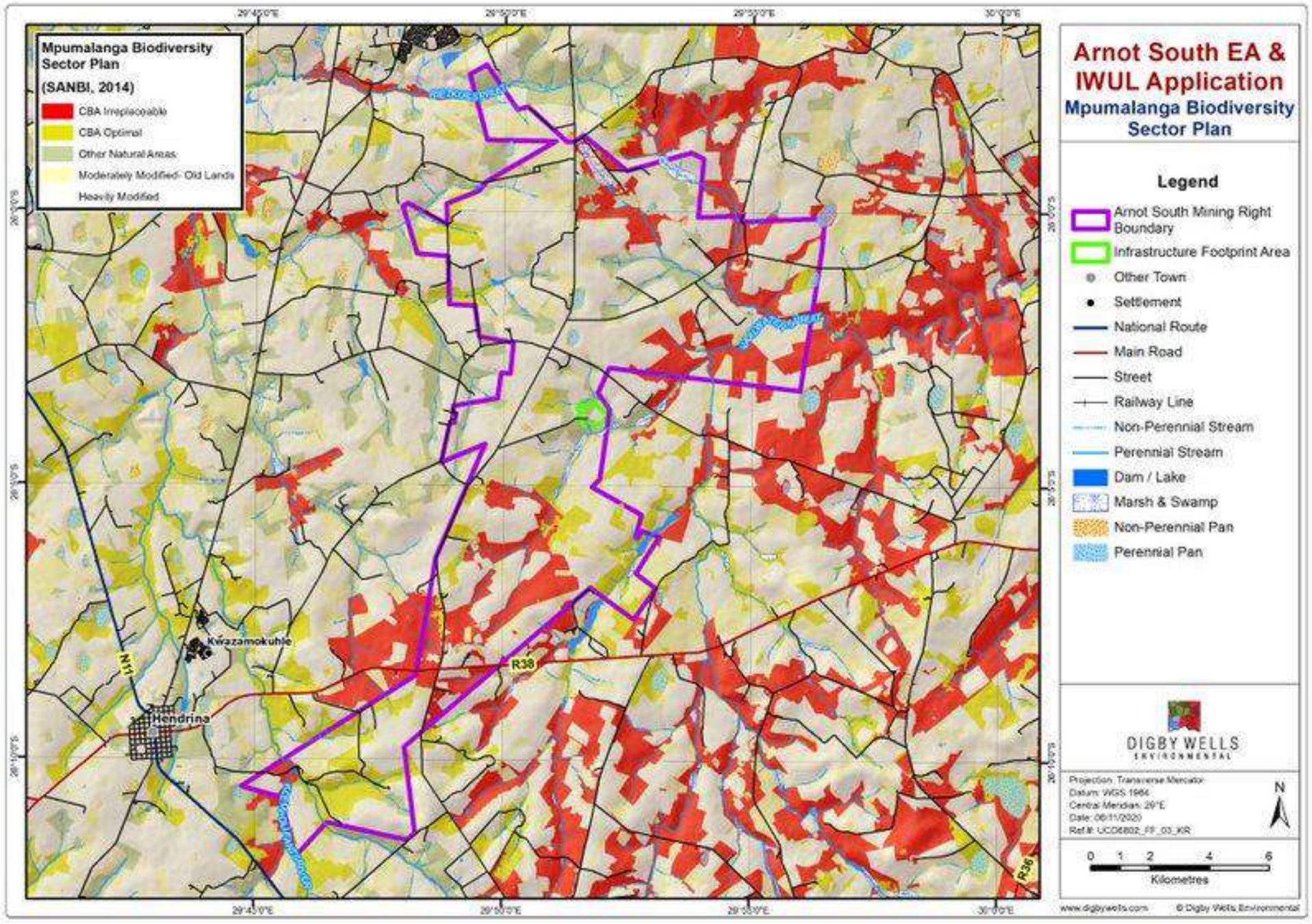

Figure 7-2: Mining Biodiversity Sector Plan

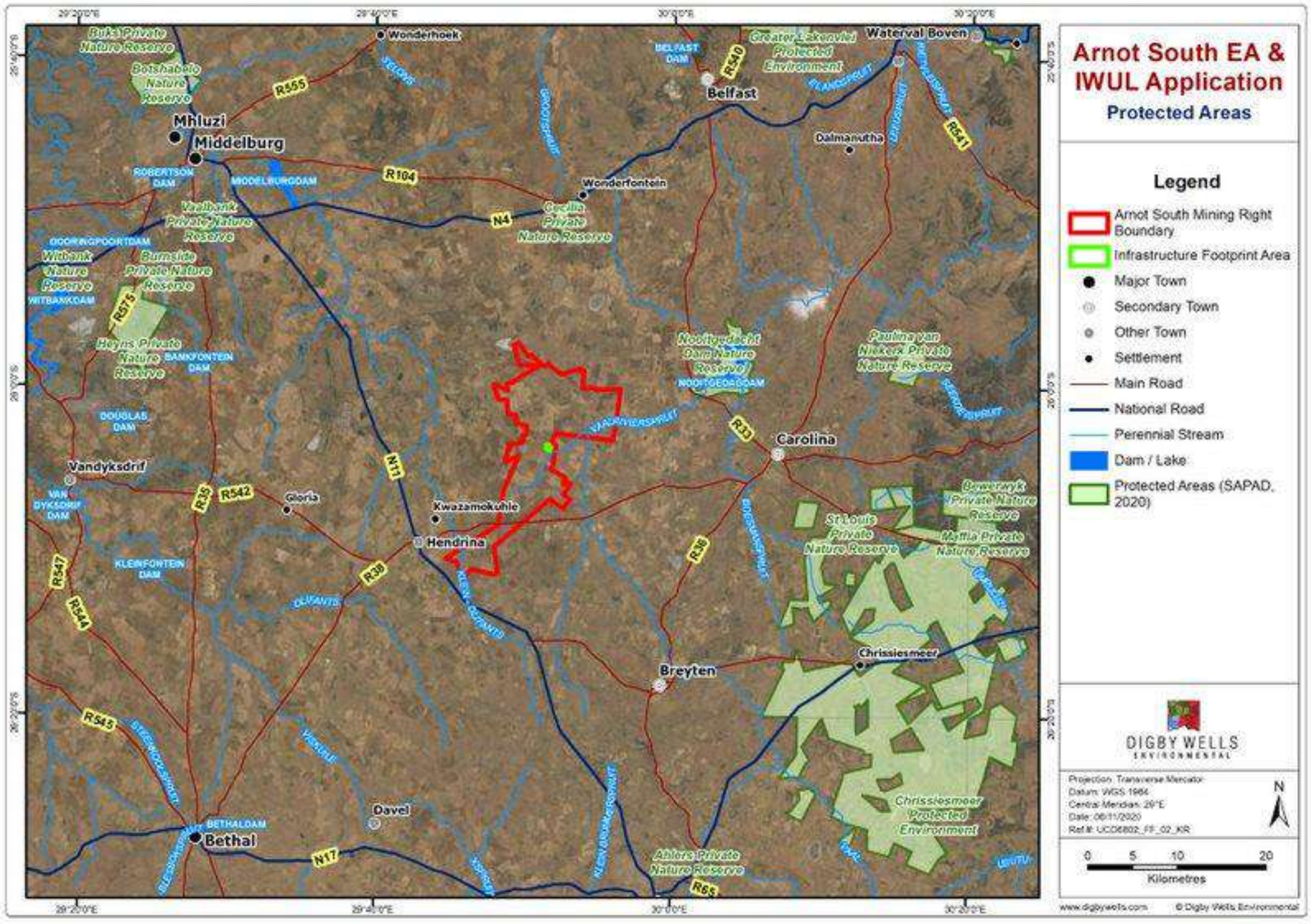

Figure 7-3: Protected Areas

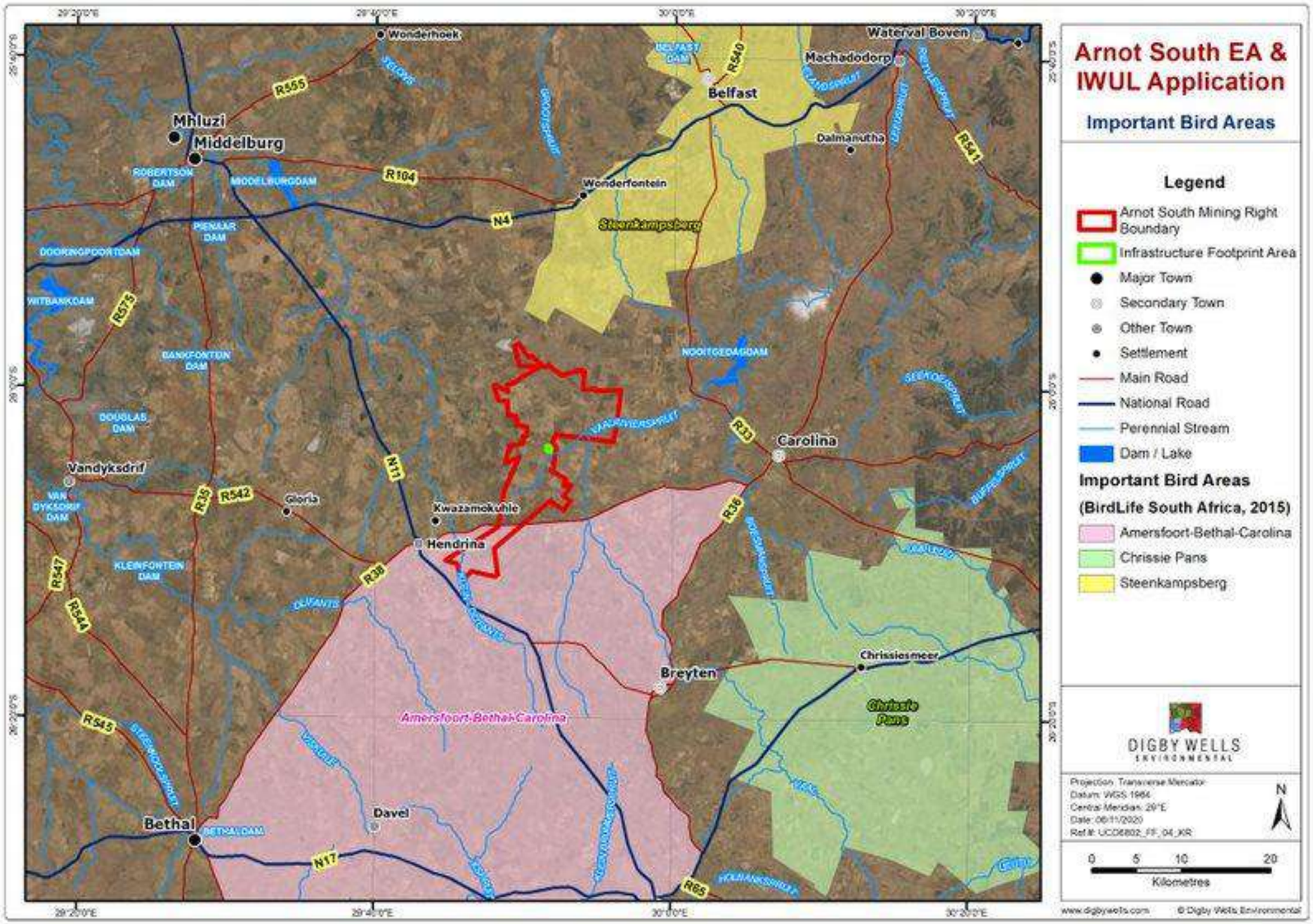

Figure 7-4: Important Bird Areas

7.1. Flora

7.1.1. Regional Vegetation

The Arnot South Project area falls within the **Eastern Highveld Grassland (Gm12)** vegetation type (Mucina & Rutherford, 2006) (Table 7-2). The Grassland Biome is one of the nine South African plant Biomes and the second most diverse biome in South Africa. The Grassland Biome is situated primarily on the central plateau of South Africa, and the inland areas of Kwa-Zulu Natal and the Eastern Cape provinces. The biome is rich in flora and fauna diversity but is under threat due to agricultural activities, expansion of mining and industrial activities.

The Eastern Highveld Grassland is characterised by slightly to moderately undulating plains, including some low hills and pan depressions. This vegetation type is considered to be "**Endangered**" on the National List of Threatened Terrestrial Ecosystems and is considered approximately 55% altered. It is considered to be "poorly protected" with only 13% of its' target percentage protected (Lötter, 2015). The primary factor responsible for this status is on-going cultivation activities within the area. The vegetation of the landscape is short dense grassland dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya* etc.) (Mucina & Rutherford, 2006). Table 7-2 lists species expected to occur within this region.

Table 7-2: Flora Species Characteristics of the Eastern Highveld Grassland

Plant Form	Species
Graminoid[1]s	*Aristida aequiglumis, A. congesta, A. junciformis* subsp. *galpinii, Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Elionurus muticus, Eragrostis chloromelas, E. capensis, E. curvula, E. gummiflua, E. patentissima, E. plana, E. racemosa, E. sclerantha, Heteropogon contortus, Loudetia simplex, Microchloa caffra, Monocymbium ceresiiforme, Setaria sphacelata, Sporobolus africanus, S. pectinatus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix, T. rehmannii, Alloteropsis semialata* subsp. *eckloniana, Andropogon appendiculatus, A. schirensis, Bewsia biflora, Ctenium concinnum, Diheteropogon amplectens, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyrium sanguineum, Setaria nigrirostris, Urelytrum agropyroides.*
Herbs	*Berkheya setifera, Haplocarpha scaposa, Justicia anagalloides, Pelargonium luridum, Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvaalensis* subsp. *setilobus, Helichrysum aureonitens, H. caespititium, H. callicomum, H. oreophilum, H. rugulosum, Ipomoea crassipes, Pentanisia prunelloides* subsp. *latifolia, Selago densiflora, Senecio coronatus, Hilliardiella oligocephala, Wahlenbergia undulata.*

[1] **Graminoids** means grasses and grass like plants, such as sedges.

Plant Form	Species
Geophytic[2] Herbs	*Gladiolus crassifolius, Haemanthus humilis* subsp. *hirsutus, Hypoxis rigidula* var. *pilosissima, Ledebouria ovatifolia.*
Succulent Herbs	*Aloe ecklonis.*
Low Shrubs	*Anthospermum rigidum* subsp. *pumilum, Seriphium plumosum.*

7.2. Species of Conservation Concern

The potential presence of Species of Conservation Concern (SCC) is necessary to highlight the fauna and floral ecological sensitivity of an area. The steps used to identify potential SCC are discussed below.

7.2.1. IUCN Red Data Species

The proposed Project area lies within two Quarter Degree Square (QDS) namely 2629BB and 2529DD. Based on the results of a search of historical records for the QDS on the Botanical Research and Herbarium Management Software (BRAHMS) New Plants of southern Africa website (NEWPOSA), a total of 362 species are indicated to potentially occur in the Project area. Of these potentially occurring species, 23 floral SCC are expected to occur and are listed in Table 7-3 below.

Table 7-3: Potential Floral SCC

Species	Red Data status	SA Endemic
Aloe cooperi subsp. cooperi	LC	No
Aloe reitzii var. reitzii	NT	Yes
Brachystelma minor	VU	Yes
Brachystelma stellatum	Rare	Yes
Crassula setulosa var. deminuta	NE	Yes
Crassula setulosa. var. setulosa	NE	Yes
Cryptocarya transvaalensis	LC	No
Dactylis glomerata	NE	No
Dianthus zeyheri subsp. natalensis	NE	Yes
Disa alticola	VU	Yes
Disa zuluensis	EN	Yes
Eucomis autumnalis subsp. clavata	NE	No

[2] **Geophytic** means a land plant that survives an unfavourable period by means of underground food-storage organs (e.g. rhizomes, tubers, and bulbs).

Species	Red Data status	SA Endemic
Eucomis vandermerwei	VU	Yes
Graderia linearifolia	VU	Yes
Habenaria barbertoni	NT	Yes
Helichrysum aureum. var. argenteum	NE	Yes
Jamesbrittenia macrantha	NT	Yes
Khadia alticola	Rare	Yes
Khadia carolinensis	VU	Yes
Lydenburgia cassinoides	NT	Yes
Merwilla natalensis	NT	No
Protea parvula	NT	No
Zantedeschia pentlandii	VU	Yes

EN = Endangered, CR = Critically Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, NYBA = Not yet been assessed

7.2.1.1. Protected Flora

Eight (8) floral SCC were encountered within the Project Area during the recent survey in April 2021. These species and their respective statutory protection status are listed in Table 7-4 below. Seven (7) species are listed under Schedule 11 Protected Plants (Section 69 (1) (a)) of the Mpumalanga Nature Conservation Act (No. 10 of 1998) (MNCA, 1998) and one is a Red Listed species under the South African National Biodiversity Institute (SANBI). The location of the floral SCC is portrayed in the Sensitivity Map below in Section 9 (Figure 9-1 and Figure 9-2).

Table 7-4: Floral SCC identified within the Project Area

Family	Species	Provincial Conservation	SANBI Red List
Asphodelaceae	Aloe ecklonis	MNCA 1998	LC
Amaryllidaceae	Brunsvigia radulosa	MNCA 1998	LC
Amaryllidaceae	Crinum macowanii	MNCA 1998	LC
Asparagaceae	Eucomis autumnalis	MNCA 1998	LC
Iridaceae	Gladiolus crassifolius	MNCA 1998	LC
Iridaceae	Gladiolus dalenii	MNCA 1998	LC
Aizoaceae	Khadia carolinensis	Not Listed	VU
Iridaceae	Watsonia gladioloides	MNCA 1998	LC

One Red Listed floral SCC was confirmed in the northern portion of the Project area, namely *Khadia carolinensis* (SANBI Red Listed as Vulnerable (VU)). It is a South African endemic found within Mpumalanga, ranging between Carolina and Belfast. It usually occurs in well-drained sandy loam soils among rocky outcrops or the edges of sandstone sheets in Highveld Grasslands. Several colonies of *Khadia carolinensis* were identified along the sandstone outcrop in the furthermost northern portion of the Project Area adjacent to the large ash dump (see location in Sensitivity Map Figure 9-1 and Figure 9-2). This genus of succulents has long been known as an additive to alcoholic fermentations, increasing the potency (Burgoyne, 2021). Major threats to the survival of this species include the coal reserves that are found beneath the sandstone outcrops. The ever-surmounting coal mining applications within the Mpumalanga province, will have severe impacts on the habitat for this species through the open cast mining activities. Should all proposed coal mining applications be approved within the province, it has been estimated that approximately 45% of the Extent of Occurrence (EOO) of this species could be destroyed within the next 10-20 years (Lötter M. B., 2021). Images of the *Khadia carolinensis* identified in the Project Area are represented in Figure 7-5 below.

Figure 7-5: Floral SCC *Khadia Carolinesis*

7.2.1.2. Protected Fauna

This section covers various groups of animals including mammals, birds, reptiles, amphibians and invertebrates.

7.2.1.2.1. Mammals

Mammals form a vital component of ecosystems. Not only are they important for nutrient cycling, habitat modification, consumers of plants and seed dispersal but they're also a considerable component of predators in healthy ecosystems.

Mammals expected to occur within the Project area are listed in Appendix B. It has been noted that 19 of these potentially occurring species have been assigned a Red Data status, either as part of the SANBI Red Data list or the IUCN (2017). The potentially occurring protected species are presented below in Table 7-5 below.

Table 7-5: Red Data mammal species

Species Name	Common Name	SA Red List (2016)	IUCN 2017	TOPS (NEMBA)
Amblysomus septentrionalis	Highveld Golden Mole	NT	NT	NYBA
Chrysospalax villosus	Rough-haired Golden Mole	VU	VU	NYBA
Neamblysomus julianae	Juliana's Golden Mole	EN	EN	NYBA
Amblysomus robustus	Robust Golden Mole	VU	VU	NYBA
Otomys laminatus	Laminate Vlei Rat	NT	LC	NYBA
Rhinolophus blasii empusa	Peak-Saddle Horseshoe Bat	NT	LC	NYBA
Cleotis percivali australis	Short-Eared Trident Bat	EN	LC	NYBA
Ourebia ourebi	Oribi	EN, Criteria 2a(ii)	LC	EN
Poecilogale albinucha	African Striped Weasel	NT	LC	NYBA
Lycaon pictus	Wild Dog	EN, Criteria D	EN	NYBA
Manis temminckii	Pangolin	VU	VU	NYBA
Panthera pardus	African Leopard	VU	VU	NYBA
Atelerixs frontalis	South African Hedgehog	NT	LC	NYBA
Dasymys incomtus	African Marsh Rat	NT	LC	NYBA
Hyaena brunnea	Brown Hyaena	NT	NT	Listed
Leptailurus serval	Serval	NT	LC	Listed
Hydrictis maculicollis	Spotted-Necked Otter	NT	NT	NYBA

Species Name	Common Name	SA Red List (2016)	IUCN 2017	TOPS (NEMBA)
Miniopterus schreibersii	Schreiber's Long-fingered Bat	NT	NT	NYBA
Dendrohyrax arboreus	Tree Hyrax	EN	LC	NYBA

EN = Endangered, CR = Critically Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, NYBA = Not yet been assessed

7.2.1.2.2. Avifauna (Birds)

Birds have been viewed as good ecological indicators, since their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological conditions are linked to land cover. As the land cover of an area changes, so do the types of birds in that area. Land cover is directly linked to habitats within the study area. The diversity of these habitats should support many different species.

According to the South African Bird Atlas Project (SABAP), approximately 131 species of birds have been identified in the area (see Appendix F); the majority of these birds are comprised of grassland species. Of these species, 31 have been assigned a Red Data status (Taylor, 2015) and are listed in Table 7-6 below.

Table 7-6: Red Data bird species

Species Name	Common Name	IUCN Status	Red Data
Spizocorys fringillaris	Botha's Lark	EN	EN
Mirafra cheniana	Melodious Lark	LC (Decreasing)	NT
Alcedo semitorquata	Half-collared Kingfisher	LC	NT
Charadrius pallidus	Chestnut-banded Plover	NT	NT
Ciconia nigra	Black Stork	LC	VU
Circus maurus	Black Harrier	EN	EN
Circus pygargus	Montagu's Harrier	LC	LC
Eupodotis caerulescens	Blue Korhaan	LC	NT
Falco biarmicus	Lanner Falcon	VU	VU
Falco peregrinus	Peregrine Falcon	LC	VU
Glareola nordmanni	Black-winged Pratincole	NT	NT
Hieraaetus ayresii	Ayres's Hawk-Eagle	LC	LC
Leptoptilos crumeniferus	Marabou Stork	LC	NT
Mirafra cheniana	Melodious Lark	LC	LC
Mycteria ibis	Yellow-billed Stork	LC	EN

Species Name	Common Name	IUCN Status	Red Data
Phoenicopterus minor	Lesser Flamingo	NT	NT
Phoenicopterus ruber	Greater Flamingo	LC	-
Rostratula benghalensis	Greater Painted snipe	LC	NT
Sagittarius serpentarius	Secretarybird	VU	VU
Sterna caspia	Caspian Tern	LC	VU
Anthropoides paradisea	Blue Crane	VU	VU
Circus ranivorus	African Marsh-Harrier	LC	Protected
Crex crex	Corn Crake	LC	LC
Falco naumanni	Lesser Kestrel	LC	VU
Geronticus calvus	Southern Bald Ibis	VU	VU
Gyps coprotheres	Cape Vulture	EN	EN
Neotis denhami	Denham's Bustard	VU	VU
Podica senegalensis	African Finfoot	VU	VU
Polemaetus bellicosus	Martial Eagle	EN	VU
Tyto capensis	African Grass-Owl	VU	VU

EN = Endangered, CR = Critically Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern

7.2.1.2.3. Reptiles

Reptiles are ectothermic (cold-blooded) meaning their internal basal temperature is influenced by their surrounding external environment, as a result, reptiles are dependent on environmental heat sources. Thus, many reptiles regulate their body temperatures by basking in the sun, or warmer surfaces (or substrates). Substrates are an important determining factor for identifying which habitats are suitable for which species of reptile. Rocky outcrops and suitable woody vegetation would increase habitat and diversity of reptiles within the Project Area. Numerous Rocky Outcrops were observed within the Project Area, providing ideal habitat for reptiles.

Of the reptile species that could potentially occur within the Project Area, 14 have been assigned a Red Data status and are presented in Table 7-7 below. Potentially occuring reptiles is presented in Appendix C.

Table 7-7: Red Data reptile species

Common Name	Species	MP Status	IUCN 2016 Status
Haacke's Flat Gecko	*Afroedura haackei*	EN	NYBA
Abel Erasmus Pass Flat Gecko	*Afroedura sp.*	EN	NYBA
Mariepskop Flat Gecko	*Afroedura sp.*	EN	NYBA
Rondavels Flat Gecko	*Afroedura sp.*	EN	NYBA
Natal Purple Glossed Snake	*Amblyodipsas concolor*	VU	LC
Lowveld Shieldnosed Snake	*Aspidelaps scutatus intermedius*	VU	NYBA
Wolkberg Dwarf Chameleon	*Bradypodion transvaalense* complex	VU	LC
Sungazer/ Giant Girdled Lizard	*Cordylus giganteus*	VU	VU
Barberton Girdled Lizard	*Cordylus warren barbertonensis*	VU	NYBA
Lebombo Girdled Lizard	*Cordylus warreni warreni*	VU	NYBA
Swazi Rock Snake	*Lamprophis swazicus*	VU	NT
Transvaal Flat Lizard	*Platysaurus orientalis orientalis*	NT	NYBA
Wilhelm's Flat Lizard	*Platysaurus wilhelmi*	VU	NYBA

EN = Endangered, CR = Critically Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, NYBA = Not yet been assessed

7.2.1.2.4. Amphibians

Amphibians are viewed to be good indicators of changes to the whole ecosystem as they are sensitive to changes in the aquatic and terrestrial environments (Waddle, 2006). Most species of amphibians are dependent on the aquatic environment for reproduction. Additionally, amphibians are sensitive to water quality and ultraviolet radiation because of their permeable skin (Gerlanc, 2005).

Wetland clusters are groups of wetlands (within a 1 km buffer) that are considered to function as a unit in the landscape, allowing for important ecological processes such as migration of frogs and insects between wetlands to take place. Numerous pans and wetlands have been identified within the Project Area and thus provide ideal habitat (among others) for the SCC Giant African Bullfrog (*Pyxicephalus adspersus*), thus this species is therefore expected to

occur. This is an SCC due to the loss of habitat from negative anthropogenic activities, the Giant African Bullfrog is listed as Near Threatened (NT) in South Africa according to the IUCN. Expected amphibians to occur in the region are listed in Appendix D

7.2.1.2.5. Invertebrates

Butterflies are a good indication of the various habitats available in a specific area (Woodhall, 2005). Although many species are eurytropes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope (specific habitat requirements with populations concentrated in a small area) species which may be very specialised (Woodhall, 2005). Butterflies are useful indicators as they are relatively easy to locate and catch, and to identify. It is for this reason that Lepidoptera (moths and butterflies) will be used as the primary focus for the invertebrate survey. One SCC that is likely to occur is the Marsh Sylph (*Metisella meninx*). This is a marsh species that requires thick clumps of grass, particularly *Leersia hexandra* (Poacea), and unpolluted environments. A marsh habitat is one of the most easily disrupted habitats and the apparent plight of this species brings it sharply into focus (Henning, 2009). Likely occurring Red Data species are listed below in Table 7-8. The specific Red Data conservation status is not always known.

Table 7-8: Red Data Lepidoptera Species

Species	Common Name	MP 2015	IUCN 2016
Aloeides rossouwi	Rossouw's Copper	EN	VU
Pseudagrion coeleste	Catshead Sprite	CR	LC
Metisella meninx	Marsh Sylph	NT	NT

EN = Endangered, CR = Critically Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, NYBA = Not yet been assessed

8. Results and Discussion

This section discusses, in detail, the findings of the flora and fauna assessment conducted by Digby Wells in April 2021. Due to access limitations and restrictions, the time of the survey was not conducted during the ideal flowering time (wet season from December to January) and various properties within the Project Area were inaccessible. Together, these limitations may have hindered species data collection as some flowering species would have been missed.

8.1. Flora

8.1.1. Vegetation Communities

The field investigation that was conducted in April 2021 concluded that the vegetation habitats within the Project Area include, grasslands, wetlands, outcrops of sandstone and ferricrete and modified areas. Four broadly defined vegetation units have been delineated and are discussed in detail below. The Project Area comprises of Wetlands, Grasslands (Primary and Secondary), Rocky Outcrops (Sandstone Sheaths and Ferricrete Outcrops) and Cultivated (transformed and/or modified) units. The vegetation units can be viewed in Figure 8-1 and Figure 8-2 below.

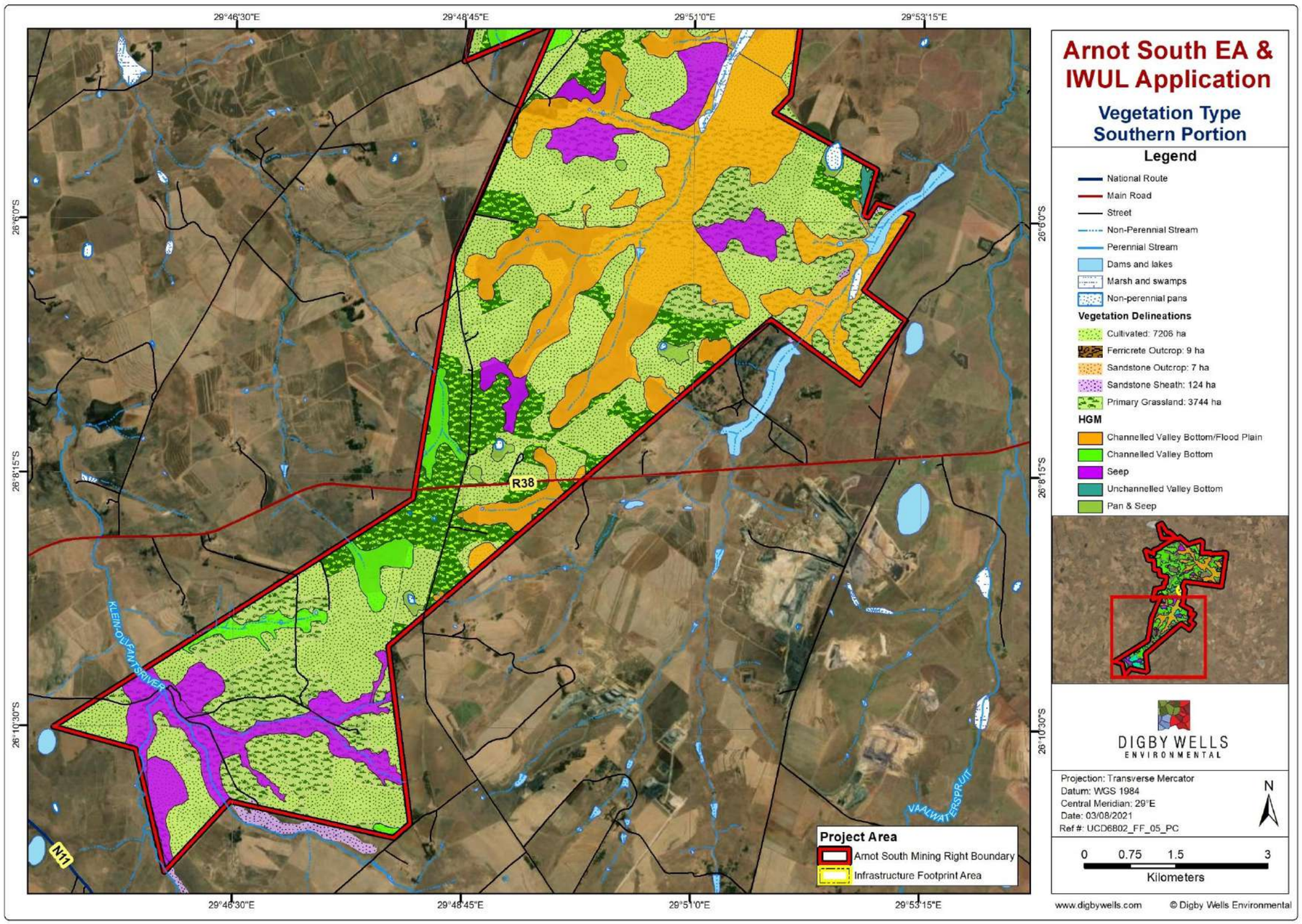

Figure 8-1: Vegetation types of the southern portion of the Project Area

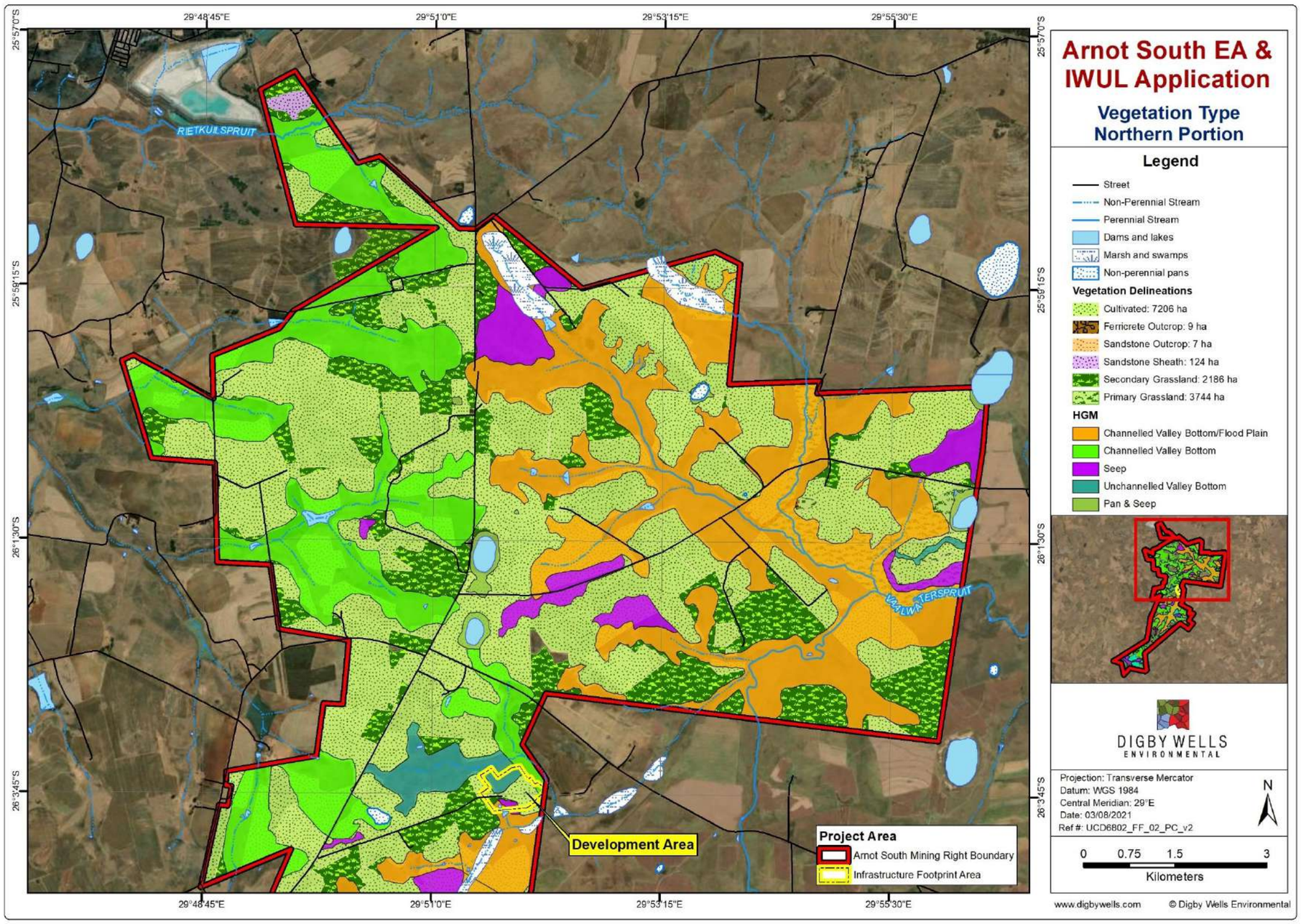

Figure 8-2: Vegetation types of the northern portion of the Project Area

8.1.1.1. Wetland Systems

A large proportion of the Project Area constitutes wetlands. The wetland systems and associated drainage lines provide basis for the trophic chain as well as essential ecological corridors for faunal movement. Continuous biomonitoring of the wetlands is recommended to identify the deterioration factors and provide mitigation measures to prevent further degradation of the systems. There are fifteen (15) Hydrogeomorphic (HGM) Units (wetlands) identified and described by the Digby Wells Wetland Report (DWE, 2021)

The location of the wetlands is depicted in Figure 8-1 and Figure 8-2. Numerous faunal and floral SCC were encountered within the delineated wetlands. The CVB Floodplain in the southeastern portion of the Project Area had evidence of high faunal activity. As the wetland is situated within the outcrop of sandstone sheaths, the undulating topography has permitted limited anthropogenic access, isolating this region from potential disturbances. Accordingly, two faunal SCC were identified within this region and are discussed in Section 8.2.1 below. The vegetation description of the wetlands saw two types of vegetation trends: namely Moist Pasture Grasslands and Pan vegetation. These vegetation trends were associated with the listed HGM units. The Moist Pasture Grasslands were associated with the CVB and CVB Floodplains, while the Pan vegetation was associated with the Seeps and Pans. A full description of the vegetation dynamics is presented in Table 8-1 below.

Wetlands are highly sensitive habitats due to their levels of biodiversity and sensitivity to disturbances.they are highly ecologically important as the host numerous faunal assemblages and habitat for floral SCC. The overlay of aquatic and terrestrial habitat results in a varied habitat which attracts a high number of species. Invertebrate and Amphibian diversity is most remarkably high with particular note of avifaunal activity, most notably the Grass Owl (*Tyto capensis*) (VU), and although not recorded during the survey, may occur in these areas. The wetland habitats are regarded as being particularly sensitive as a result of the associated faunal species that rely on them.

Table 8-1: Vegetation description of the Wetland Systems

Eragrostis plana -Agrostis lacnantha - Moist Pasture Grasslands	
Photographic representation	
Description of area	Consists of hydromorphic grasslands, inundated pans and associated marginal grassland vegetation, and vegetated pans.
Current condition	Majority of the HGM units identified within the Project area have varying degrees of disturbances such as AIP proliferation, historical cultivation, impacts from cattle and uncontrolled grazing as well as excavated lands. Most of the HGM units displayed varying degrees of species homogeneity as majority have sustained disturbances from the aforementioned impacts. Most prominent AIPs included Persicaria lapathafolia, Juncus effuses, Solanum sisymbriifolium, Verbena brasiliensis, and Cirsium vulgare.
Species of Conservation Concern	Floral SCC Crinum macowanni, Eucomis autumnalis, Gladioulus sp, Watsonia gladioloides and Brusnvigia radulosa were encountered in the various HGM units, their locatilty is depicted in the Sensitivity Map (Figure 9-1 and Figure 9-2). Two faunal SCC were encountered near the Sandstone slopes of the CVB Floodplain (Figure 8-1 and Figure 8-2), namely African Clawless Otter and Serval. Further details of their location and description are described in Section 8.2.1 below.
Common species	Common species within the wetlands are representative of moist grasslands and host numerous wetlands indicating species such as Agrostis lacnantha, Chironia palustris, Eragrostis plana, Monopsis decipiens, Typha capensis, Helichrysum pillosellum, Juncus sp., and Hemarthria altissima. Species encountered in the unit are depicted below.

Images	  Nidorella anomala and Helichrysum aureonitens
	  Limosella lineata and Mariscus congestus

Imperata cylindrica – Leersia hexandra Pan Seep Vegetation	
Photographic representation	
Description of area	Consists of hydromorphic grasslands, inundated pan and associated marginal vegetation.
Current condition	Various Pans were observed within the Project Area, they are distinguishable as they are encompassed by cultivated fields and are composed of *Imperata cylindirca* and *Leersia hexandra*. They are also encompassed by disturbed areas of road verges that have high AIP proliferation consisting of *Campuloclinium macrocephalum* (1b), *Solanum sisymbriifolium* (1b), *Pennisetum clandestium* (1b), *Conyza sumatriensis* (AIP), and *Verbena brasiliensis* (1b). the surrounding agricultural activities are negatively impacting the pan and promoting AIP proliferation due the influx of nitrification of the water table. AIPs observed in the pan, included *Lagarosiphon major, Myriophyllum aquaticum* (1b), and *Rumex crispus*.

Imperata cylindrica – Leersia hexandra Pan Seep Vegetation	
Images	 *Sebaea leiostyla* (top left), *Anthericum fasciculatum* (right) and *Cleome maculata* (bottom left).

8.1.1.2. Rocky Outcrop

Rocky Outcrops are geological features that encompass a wide variety of physical environments such as escarpments, overhangs, and cliffs (Fitzsimons, 2017). They support high levels of species diversity and endemism and provide stable micro-climates. They provide ecological refuges for colonial species such as seabirds, bats and swifts for ancient lineages. Rocky outcrops provide steppingstone habitats across landscapes and facilitate the movement of migratory bird species and other wide-ranging fauna. As rocky environments are less fertile, steep-sided and less accessible than the surrounding landscapes, they are typically less prone to human disturbances. Nonetheless, rocky outcrops are susceptible to a variety of threats including soil compaction, erosion from livestock and nutrient enrichment and weed invasion. Two variations of Rocky Outcrops were encountered within the Project Area, namely sandstone and ferricrete Outcrops. Forty-nine (49) of the 190 floral species were recorded within this unit. Detailed species composition and description of the Rocky Outcrops is elaborated in Table 8-2 below.

Table 8-2: Vegetation description of the Rocky Outcrop Unit

Sandstone Outcrop	
Photographic representation	
Description of area	The sandstone outcrops were found in scattered regions throughout the Project Area. The Vegetation Communities map for the various must be referenced for varios locations (Figure 8-1 and Figure 8-2). Sandstone is a sedimentary rock composed of minerals, rock and organic matter. It also contains cementing material that binds sand grains together and may contain a matrix of silt or clay size particles (King, 2021). The sandstone composition provides a unique habitat for floral species that thrive on shallow, well-drained soils. The outcrops range in extent, however a large escarpment up to 20 m tall was observed in the southern most portion of the Project Area and extends outside of the MRA.
Coverage of area	121.3 ha
Current condition	Due to the lack of accessibility of the outcrop areas, they are typically less prone to human disturbances. The sandstone outcrops appeared relatively undisturbed, however encroachment of AIPs such as Black Wattle (*Acacia mearnsii*) and *Eucalyptus sp.* were found fringing around the outcrops.
Species of Conservation Concern	Due to their micro-climate properties and unique mineral composition, rare and often threatened floral species are encountered within these habitats. One threatened species of succulent was identified in the sandstone outcrop, *Khadia carolinensis,* listed as Vulnerable (SANBI Red List). It was identified in the northern portion adjacent to the mine ash dumps (see Figure 9-1). Images and a description of the species is discussed in Section 7.2.1.1. Other SCC included provincially protected, *Crinum macowanii, Gladiolus delanii* and *G. crassifolius*.

Sandstone Outcrop	
Common species	The outcrops provide habitat for numerous succulents and forbs that go undetected in grasslands. Succulents include: *Khadia carolinensis, Delosperma ashtonni, Mossia, intervallaris, Crassula setulose* and *C. capitella*. Forbs included: *Helichrysum cerastioides, Oocephala staehelinoides, Lotononis listii, and Acrotome hispida*. Small trees included *Diospyrus lyciodes and Searsia magalismontana* and *S. dentata*. The large outcrop encasing a large pan and seep wetland situated on the further most eastern border, displayed abundant floral diversity. *Utricularia arenaria,* a member of the carnivorous plant family, and various ferns, *Cheilanthus viridus* and *Pallaea calomelanos*, as well as small shrubs such as *Erica woodii.*were recorded.
Images	  *Lotononis listii* and *Helichrysum cerastioides*    *Khadia carolinensis, Crassula capitella* and *Mossia intervallaris*

Sandstone Outcrop	
	  *Utricularia arenaria* and *Psammotropha myriantha*  *Cheilanthes viridus*

Ferricrete Outcrop	
Photographic representation	
Description of area	Ferricrete are ferruginous duricrusts (hardened minerals found on the Earth's surface) that are cemented by iron oxides and occur as indurated (hardened) continuous crusts and soil horizons in landscapes. The rocks are formed by cementation of soils, alluvium, or colluviums with hydrous ferris oxides (primarily geothite) derived from acidic waters(Dixon, 2013). The ferricrete outcrops are subjected to temperature variations and generally have little to no soil alluding to stark differences in the surrounding vegetation ultimately regarding them as edaphic island communities (Fernandez, 2012). These isolated communities provide ecological refuge for numerous faunal groups particularly invertebrates, reptiles and small mammals. Although not as abundant as the sandstone outcrops, the ferricrete formations were encountered in several locations and are depicted in the Vegetation Communities map in Figure 8-1 and Figure 8-2.
Coverage of area	Approximately 9.3 ha.
Current condition	Although not frequent within the Project Area, most of the ferricrete outcrops encountered were subjected to impacts from cattle grazing and encroachment of AIPs, most notably Black Wattle (*Acacia mearnsii*) and *Eucalyptus sp..*
Species of Conservation Concern	No SCC were observed within the ferricrete communities, however important invertebrate colonies were recorded such as beehives and termite colonies.

Ferricrete Outcrop	
Common species	Majority of the outcrops were associated with UVB wetlands (see Digby Wells Wetland Report (2021)) and included common wetland species such as *Lobelia flaccida, Kyllinga erecta,* and *Helichrysum* sp. Common forbs included: *Acrotome hispida, Delosperma cooperi, Hermannia transvaalensis,* and *Pallaea calomelanos. Grasses included: Sporobolus discosporus, Tristachya leucothrix, Themeda triandra* and *Alloteropsis semialata*.
Images	  *Acrotome hispida and Delosperma cooperi*  *Pallaea calomelanos and Beehive*

8.1.1.3. Transformed Habitat

For the purpose of this report, transformed land refers to areas that have been changed or disturbed to such an extent that all-natural habitats, biota and ecosystem functions have been fragmented or lost. The transformed areas within the Project Area were predominantly due to the agricultural practises and cultivation of maize/corn (*Zea mays*) and soybean (*Glycine max*) which constitutes the majority of the total Project Area (7,602 ha). The current land use practices have completely altered the landscape and has permitted AIP proliferation and loss of sensitive habitats, such as wetlands and the existing natural grassland, namely the Eastern Highveld Grassland (Endangered) (Mucina & Rutherford, 2012).

8.1.1.3.1. Exotics

Previous natural grasslands have been altered and/or transformed and have been replaced by carpets of *Pennisetum clandestinum* and pioneering AIP shrubs, trees and forbs such as *Acacia mearnsii, Populus x canescens Eucalyptus camaldulensis, Datura stramonium, Cirsium vulgare, Solanum sisymbrifolium,* and *Verbena* brasiliensis, V. officianalis can be observed throughout the transformed areas. The table below (Table 8-3) lists all AIPs recorded and their respective NEM:BA Status Category. Cattle grazing was observed throughout the entire Project Area. Vegetation considered in a “natural” state (where no evidence of transformation was observed) were identified within the margins of the wetland areas and rocky outcrops. Dense stands of *Populus x canescens* were observed within the UVB Floodplain and Seep wetlands. Eucalyptus stands were observed encroaching and fringing around the Rocky Outcrop habitats. These dense stands of AIPs accelerate due to the favourable growing conditions, they consume large amounts of water, thereby lowing the water table and thereby threatening the water supplies in the ecology of the region (Bromilow, 2010). The numerous large bodies of water, Pans, within the Project Area had a laciniate of water AIPs around their shorelines. Species included *Periscaria longiseta, Pennisetum clandestinum, Lagarosiphon major, Centella asiatica, Amaranthus viridus* and *Nymphoides thunbergia.* Photographic images of the AIPs recorded are presented in Figure 8-3 below.

South Africa has seen a rise of alien species by 15%, increasing from 1,637 to 1,880 (of which a third are declared invasive). According to the report of the Status of Biological Invasions and Management in South Africa, the current estimates suggest the ecological cost of invasive species to be more than R6.5 billion each year (Creecy, 2021). The main costs associated with losses are the decline in ecosystem services such as water, grazing potential and agricultural crop loss. Invasive trees (AIPs) induce high risks associated with the water table. It is said that invasive trees have been known to use up 3-5% of South Africa’s surface water runoff each year. Invasive trees have also known to increase the risk and intensity of veld fires, with a 15% more fuel burnt in invaded areas (Creecy, 2021). The economic impact from the loss of biodiversity is linked to the collapse of ecosystem services such as the provision of freshwater and grazing. Currently, if AIPs are not controlled, around 70% of grazing lands will be impacted. This will decline the natural rangelands for livestock production, thereby threatening rural livelihoods and food production.

Table 8-3: AIPs recorded in the Project Area

Species	Category[3]
*Acacia mearnsii**	2
Amaranthus viridus	Invasive
Bidens pilosa	Invasive
*Campuloclinium macrocephalum**	1b
Centella asiatica	Invasive
Chenopodium alba	Invasive
*Cirsium vulgare**	1b
Cosmos bipinnatus	Invasive
Conyza bonariensis	Invasive
Cuscuta campetris	1b
*Datura stramonium**	1b
*Eucalyptus camaldulensis**	1b
*Eucalyptus diversicolor**	2
Gomphrena celosioides	Invasive
Hypericum forrestii	Invasive
Lagarosiphon major	Invasive
*Myriophyllum aquaticum**	1b
Nymphoides thunbergiana	Invasive
Oenothera rosea	Invasive
Paspalum notatum	Invasive
*Pennisetum clandestinum**	1b
Persicaria longiseta	Invasive
*Populus x canescens**	2
Raphanus raphanistrum	Invasive
Richardia brasiliensis	Invasive
*Solanum sisymbrifolium**	1b
Tagetes minuta	Invasive
*Verbena brasiliensis**	1b

[3] *In accordance with the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) Alien and Invasive Species List, 2020

Species	Category[3]
Verbena officianalis	Invasive

Figure 8-3: Examples of the AIPs identified in the Project Area

8.1.1.4. Grassland

As majority of the Project Area has been subjected to anthropogenic (agriculture) activities, the remaining grasslands are broadly defined into two categories: Primary and Secondary grasslands. Primary grasslands are those that have not been significantly modified from their original state; even though they may no longer have their full complement of naturally occurring species, they have not undergone significant or irreversible modification and still retain their essential ecological characteristics. Secondary grasslands are those that have undergone extensive modification and a fundamental shift from their original state (such as cultivated areas) but have then been allowed to return to a 'grassland' state and left to fallow, allowing a few grassland species to pioneer. Although secondary grasslands may superficially look like primary grasslands, they differ markedly with respect to species composition, vegetation structure, ecological functioning, and the ecosystem services they deliver (SANBI, 2013).

Primary grassland	
Photographic representation	
Description of area	Primary grasslands species, particularly in mesic grasslands, show poor ability to re-colonise as they are outcompeted by fast-growing annual weeds that colonise when the primary vegetation is removed. When the topsoil has been transformed or removed, the process of natural regeneration is a decade-long process, and this exacerbates the degradation of the grassland. Primary grassland areas were observed in the margins of the Rocky Outcrops and various Pans located in the Project Area. They comprise of a high density of forbs and a diverse graminoid component.
Coverage of area	3,744 ha
Current condition	The primary grasslands in the Project Area have had the least exposure to cattle grazing and very little AIP composition, indicating they have not been ploughed.
Species of Conservation Concern	Several floral SCC were recorded, including provincially protected (MNCA, 1998) *Aloe ecklonis, Gladiouls delanii* and *Watsonia gladioloides*.
Common species	Dominant grasses include *Eragrostis curvula* and *Hyparrhenia hirta* with other species including *Aristida congesta, Hyparrhenia filipendula,* and *Setaria pallide-fusca* Forbs included: *Chaenostoma leve, Dimorphotheca spectabilis,*

Primary grassland	
	Haplocarpha lyrata, Ipomoea ommanneyi, Helichrysum coriaceum, H. aureonitens. and *Hilliardiella oligocephala.*
Images	  *Helichrysum coriaceum* and *Hilliardiella oligocephala*   *Aloe ecklonis* (SCC) and *Dimorphotheca spectabilis*

Secondary Grassland	
Photographic representation	 High density of *Serphium plumosum*
Description of area	The secondary grasslands are distinguishable from the primary grasslands in their notable depleted diversity. They generally miss resprouting species and do not respond in the same way as natural grasslands to fire disturbances. They also have a much lower below-ground root biomass compared to the high below-ground root biomass of natural grasslands. The impacts associated with ploughing disturbances can be observed both above and below the ground (Zaloumis, 2013).
Coverage of area	2,186 ha
Current condition	The secondary grasslands had evidence of loosened topsoil, previous ploughing and AIPs. The dominance of *Serphium plumosum* is indicative of overgrazed grasslands (see image above). Previously burnt grasslands showed signs of soil erosion as they have a lower establishment of plants to hold the soil intact when faced with high levels of water runoff. Forb species composition was very low and graminoid homogeneity was high in comparison to primary grasslands.
Species of Conservation Concern	No floral SCC were encountered in the secondary grasslands
Common species	Dominant grasses included *Eragrostis curvula, Eragrostis gummiflua,* and *Themeda triandra.* Pioneering forbs and AIPs included *Conyza bonariensis* (AIP), *Gomphocarpus fruticosus, Pseudognaphalium luteoalbum* and *Solanum pandiforme* (AIP).

Secondary Grassland	
Images	 Secondary grassland adjacent to Maize field

8.2. Fauna

This section represents the results from the field survey conducted during April 2021.

8.2.1. Mammals

A total of fifteen (15) mammals were recorded during the infield assessments. The mammal species were encountered and observed throughout the Project Area within the various habitat units. Various mammals of the Herpestidae (Mongoose) family were observed throughout the numerous wetlands. Tracks of a Water Mongoose were observed throughout the numerous CVB wetlands. Numerous sightings of Black-backed Jackal and Scrub Hare were recorded throughout the Project Area. Meerkats were observed within the Helpmakaar 168 IS farm portions (see Figure 8-4) with numerous Aardvark burrows adjacent to the large dam in the northern area of the farm portion. The CVB Floodplain associated with the sandstone outcrop in the portions of Vaalwater 173 IS, showcased high activity of crepuscular species such as Porcupine, Water Mongoose, Serval, and African Clawless Otter. The latter two, Serval and African Clawless Otter, are both listed as Near Threatened according to the Regional Red List Assessment of the IUCN. A list of all mammals recorded in the Project Area is presented in Table 8-4 below.

The Otters are inhabiting the CVB Floodplain in the above-mentioned portion as they are predominantly aquatic and are seldom found far from permanent water sources. Scats and tracks were encountered in this area (see Figure 8-5) Generally, they are found in marine habitats, but they are also associated with riverine habitats, particularly with rocks, dense vegetation, and undisturbed long grasses (Perrin, 2000). Fresh water is an essential habitat

requirement not only for drinking but for rinsing their coats. The African Clawless Otter is predominantly crepuscular, meaning they are mostly active at dawn and dusk. The major threat to the African Clawless Otter is the deterioration of freshwater ecosystems. In South Africa, 84% of the river ecosystems are threatened, while 54% are Critically Endangered (Nel, 2011). Riverside, wetland and coastal habitats must be protected to allow sufficient breeding and foraging environments necessary for them to persist and disperse between habitats (Okes N., 2016).

Evidence of Serval tracks and scats were observed within the sandstone outcrop of the above-mentioned wetland, see below in Figure 8-6. Servals are found in many protected areas within South Africa and are included on CITES Appendix II and protected under national legislation (TOPS regulations) (SANBI, 2018). It is listed as Least Concern (LC) globally and Near Threatened (NT) nationally on the IUCN Red List. Effective conservation of Serval depends on the conservation of wetlands, particularly wetlands in fragmented landscapes. Wetlands form a micro habitat in a mosaic of farmland for several wetland-dependent species; they are reservoirs of small mammal populations that are major dietary components of Servals. Consequently, if wetlands are protected in a mosaic of farmland use, the landscape may support the persistence of Serval populations.

Table 8-4: Mammals recorded in Project area

Family	Species	Common Name	Conservation status
Bovidae	*Sylvicapra grimmia*	Bush Duiker	LC
Canidae	*Canis mesomelas*	Black-backed Jackal	LC
Felidae	*Leptailurus serval*	Serval	NT
Herpestidae	Atilax paludinosus	Water Mongoose	LC
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC
Leporidae	*Lepus saxatilis*	Scrub Hare	LC
Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	LC
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	LC
Muridae	*Otomys angoniensis*	Angoni Vlei Rat	LC
Muridae	*Rhabdomys pumilio*	Four-striped Grass Mouse	LC
Mustelidae	*Aonyx capensis*	African Clawless Otter	NT
Orycteropodidae	*Orycteropus afer*	Aardvark	LC
Sciuridae	*Xerus inauris*	Ground Squirrel	LC
Herpestidae	*Suricata suricatta*	Meerkats	LC

Figure 8-4: Meerkats

Figure 8-5: Scats and tracks of African Clawless Otter

Figure 8-6: Scats and tracks of Serval

8.2.2. Birds

Birds are viewed as good ecological indicators, as their presence or absence tends to represent conditions of a functioning ecosystem. The direct link between bird diversity and land cover portrays a direct indication of the habitats in the area of interest.

According to the SABAP2 database, over 140 species of birds have been identified in the area (see Appendix F). The majority of these birds are comprised of grassland and waterbird species. Seventy-four (74) birds were recorded during the field assessment in April 2021. It should be noted that April is not an ideal bird viewing frame as many wading birds may have been missed due to the late season observation. The identified birds are listed in Table 8-5 below. Numerous pans were scattered throughout the Project Area and hosted many waterfowl including Egyptian Geese, Grey Herons, Whiskered Terns, Reed Cormorant, Yellow-billed Ducks, Red Knobbed Coots, Cormorants, Egrets, and Red-billed Teals. The pan in the farm portion Groblersrecht 175 IS (RE/6), was composed of the grass Imperata cylindrica, and efforts were undertaken to search for African Grass Owls (*Tyto capensis*), as this is their preferred nesting material. No African Grass Owls were identified; however, an active Marsh Owls (*Asio capensis*) nest, with egg, was identified within this pan (see Figure 8-7).

African Grass Owls are listed as **Vulnerable** in South Africa. The presence of this type of wetland habitat raises concern for the potential presence of African Grass Owls, within the Project Area. Grass Owls are habitat specialists and nest on the ground. They construct tunnel-like interconnected caves within the dense wetland grasses such as *Imperata cylindrica*. This breeding behaviour does put them at risk to predation and habitat loss through

burning and human encroachment. These factors contribute to the decline in the species numbers. They predominantly feed on the Angoni Vlei Rat, which was identified in the Project Area amongst the numerous wetlands. It is thus highly recommended, that a thorough screening of the *Imperata cylindrica* dense wetlands within the Project Area be screened for the potential presence of the African Grass Owl, during their breeding season in February prior to any Project activities.

Figure 8-7: Marsh Owl nest with eggs and flushed out Marsh Owl

Table 8-5: Bird species recorded in the Project area

Group	Common Name	Species Name	Conservation Status
-	Hamerkop	*Scopus umbretta*	LC
Barbet	Crested	*Trachyphonus vaillantii*	LC
Bishop	Southern Red	*Euplectes orix*	LC
Bishop	Yellow-crowned	*Euplectes afer*	LC
Buzzard	Common	*Buteo buteo*	LC
Canary	Cape	*Serinus canicollis*	LC
Cisticola	Cloud	*Cisticola textrix*	LC
Cisticola	Lazy	*Cisticola aberrans*	LC

Group	Common Name	Species Name	Conservation Status
Cisticola	Wing-snapping	*Cisticola ayresii*	LC
Cisticola	Zitting	*Cisticola juncidis*	LC
Coot	Red-knobbed	*Fulica cristata*	LC
Cormorant	Reed	*Microcarbo africanus*	LC
Cormorant	White-breasted	*Phalacrocorax lucidus*	LC
Cuckoo	Diederik	*Chrysococcyx caprius*	LC
Cuckoo	Red-chested	*Cuculus solitarius*	LC
Dove	Cape Turtle	*Streptopelia capicola*	LC
Dove	Laughing	*Spilopelia senegalensis*	LC
Dove	Red-eyed	*Streptopelia semitorquata*	LC
Duck	Yellow-billed	*Anas undulata*	LC
Egret	Intermediate	*Ardea intermedia*	LC
Egret	Western Cattle	*Bubulcus ibis*	LC
Fiscal	Southern	*Lanius collaris*	LC
Goose	Egyptian	*Alopochen aegyptiaca*	LC
Goose	Spur-winged	*Plectropterus gambensis*	LC
Grassbird	Cape	*Sphenoeacus afer*	LC
Grebe	Little	*Tachybaptus ruficollis*	LC
Guineafowl	Helmeted	*Numida meleagris*	LC
Heron	Black-headed	*Ardea melanocephala*	LC
Heron	Grey	*Ardea cinerea*	LC
Ibis	African Sacred	*Threskiornis aethiopicus*	LC
Ibis	Glossy	*Plegadis falcinellus*	LC
Ibis	Hadada	*Bostrychia hagedash*	LC
Kite	Black-winged	*Elanus caeruleus*	LC
Kite	Yellow-billed	*Milvus aegyptius*	LC
Lapwing	African Wattled	*Vanellus senegallus*	LC
Lapwing	Blacksmith	*Vanellus armatus*	LC
Lapwing	Crowned	*Vanellus coronatus*	LC
Lark	Eastern Clapper	*Mirafra fasciolata*	LC
Lark	Red-capped	*Calandrella cinerea*	LC

Group	Common Name	Species Name	Conservation Status
Longclaw	Cape	*Macronyx capensis*	LC
Martin	Banded	*Riparia cincta*	LC
Martin	Brown-throated	*Riparia paludicola*	LC
Mousebird	Speckled	*Colius striatus*	LC
Myna	Common	*Acridotheres tristis*	LC
Owl	Marsh	*Asio capensis*	LC
Pigeon	Speckled	*Columba guinea*	LC
Pipit	African	*Anthus cinnamomeus*	LC
Plover	Three-banded	*Charadrius tricollaris*	LC
Prinia	Tawny-flanked	*Prinia subflava*	LC
Quelea	Red-billed	*Quelea quelea*	LC
Robin-Chat	Cape	*Cossypha caffra*	LC
Sandpiper	Marsh	*Tringa stagnatilis*	LC
Shoveler	Cape	*Spatula smithii*	LC
Snipe	African	*Gallinago nigripennis*	LC
Sparrow	House	*Passer domesticus*	LC
Spurfowl	Swainson's	*Pternistis swainsonii*	LC
Starling	Pied	*Lamprotornis bicolor*	LC
Stilt	Black-winged	*Himantopus himantopus*	LC
Stonechat	African	*Saxicola torquatus*	LC
Swallow	Barn	*Hirundo rustica*	LC
Swallow	Greater Striped	*Cecropis cucullata*	LC
Swift	Little	*Apus affinis*	LC
Tern	Whiskered	*Chlidonias hybrida*	LC
Thick-knee	Spotted	*Burhinus capensis*	LC
Wagtail	Cape	*Motacilla capensis*	LC
Waxbill	Common	*Estrilda astrild*	LC
Weaver	Cape	*Ploceus capensis*	LC
Weaver	Southern Masked	*Ploceus velatus*	LC
Weaver	Thick-billed	*Amblyospiza albifrons*	LC
Wheatear	Capped	*Oenanthe pileata*	LC

Group	Common Name	Species Name	Conservation Status
Whydah	Pin-tailed	*Vidua macroura*	LC
Widowbird	Fan-tailed	*Euplectes axillaris*	LC
Widowbird	Long-tailed	*Euplectes progne*	LC
Widowbird	White-winged	*Euplectes albonotatus*	LC

8.2.3. Herpetofauna

Herpertofauna is defined as reptiles and amphibians inhabiting a given area. Reptiles are ectothermic (cold-blooded) meaning they are organisms that control body temperature through external means. As a result, reptiles are dependent on environmental heat sources. Due to this, many reptiles regulate their body temperature by basking in the sun, or in warmer areas. Substrate is an important factor determining which habitats are suitable for which species of reptile.

According to Carruthers (2001), a number of factors influence the distribution of amphibians, but because amphibians have porous skin they generally prosper in warm and damp habitats. The presence of suitable habitat within the Project area (wetland habitat) provides a number of different species of amphibians.

During the field assessment, three (3) amphibian species were identified within the wetland, and pans, via its call and by direct sightings. The Delalande's River Frog (*Amietia delalandii*), Bubbling Kassina (*Kassina senegalensis*) and the Boettger's Caco (*Cacosternum boettgeri*) (all Least Concern) were recorded within the wetlands.

Reptiles are notoriously difficult to comprehensively detect during short field surveys, due to many species in this group naturally occurring at low densities and being inherently illusive. Five (5) species of reptile were identified, namely Speckled Rock Skink (*Trachylepsis punctatissima*), Rinkhals (*Hemachatus haemachatus*), African Helmeted Turtle (*Pelomedusa subrufa*), Spotted Skaapsteker (*Psammophylax rhombeatus*) and the Common Brown Water Snake (*Lycodonomorphus rufulus*) (all Least Concern). The Skink was encountered basking on the outcrops of the sandstone sheaths. The snakes were unfortunately found as roadkill in the interconnecting dirt roads of the Project Area. The remaining grassland and wetland habitats provide both hunting sites and shelter for herpetofauna, primarily amphibians colonizing the wetlands which in turn attracts reptile predators.

The observed species diversity for both reptiles and amphibians was considerably low. The weather during the field survey was wet and overcast, this may have hindered the presence of herpetofauna (specifically reptile) species within the Project Area

Figure 8-8: Delandes River Frog (top left), Speckled Rock Skink (bottom left), African Helmeted Turtle (middle) and Rinkals (right)

8.2.4. Invertebrates

Invertebrates are the main components of faunal diversity in grasslands, playing substantial roles in ecosystem processes including nutrient cycling and pollination. Grassland invertebrate communities are heavily dependent on plant diversity and production within a given system (Barnett and Facey, 2016). During the field assessment in April 2021, a total of thirty-three (33) invertebrates were identified and are listed in Table 8-6 below. Various images of invertebrates were captured during the field assessment and are presented in Figure 8-9.Various species of the Nymphalidae family were recorded despite the survey being conducted during Autumn. The presence and frequency of wetlands in the Project Area provide ideal habitat for the SCC Marsh Sylph (*Metisella meninx*) (Near Threatened). *M.* meninx is an obligate wetland species and depends on the occurrence of *Leersia hexandra* (Rice Grass), of which has been recorded in majority of the wetland habitats. Henning (2009) states that this species requires unpolluted marsh habitats. The adults tend to roost low down in the wetland vegetation, above the water level – which makes the susceptible to unexpected flooding. Adults rely on nectar to replenish their energy demands, of which has been noted to be obtained from *Verbena bonariensis, V. brasililiensis,* and *Persicaria spp* (all of which were recorded within the wetland habitats).

Table 8-6: Invertebrate species recorded

Family	Species	Common name	Conservation status
Acrididae	*Locustana pardalina*	Brown Locust	LC
Carabidae	*Lophyra sp*	Tiger Beetles	LC
Cercopidae	*Locris arithmetica*	Red-spotted Spittle Bug	LC
Coccinellidae	*Henosepilachna bifasciata*	Cucurbit Ladybug	LC
Coccinellidae	*Harmonia axyridis*	Asian Lady Beetle	LC
Coenagrionidae	*Africallagma glaucum*	Swamp Bluet	LC
Coenagrionidae	*Africallagma sapphirinum*	Saphire Bluet	LC
Coleoptera	*Pedinorhina trivittata*	Yellowheart Fruit Chafer	LC
Coreidae	*Cletus sp.*	Leaffooted bug	LC
Crambidae	*Spoladea recurvalis*	Beet Webworm	LC
Erebidae	*Lacipa nobilis*	Noble Lacipa	LC
Eumenidae	*Parachilus capensis*	-	LC
Libellulidae	*Crocothemis sanguinolenta*	Small Scarlet	LC
Libellulidae	Urothemis assignata	Red Basker	LC
Libellulidae	*Trithemis strictica*	Jaunty Dropwing	LC

Family	Species	Common name	Conservation status
Lycidae	*Lycus melanurus*	Hook-winged Net-winged Beetle	LC
Lycosidae	*Hogna spenceri*	Wolf Spider	LC
Melyridae	*Astylus atromaculatus*	Spotted Maize Beetle	LC
Nymphalidae	*Junonia oenone oenone*	Blue Pansy	LC
Nymphalidae	*Byblia ilithyia*	Spotted Joker	LC
Nymphalidae	*Hypolimnas misippus*	Diadem	LC
Nymphalidae	*Acraea rahira*	Marsh Acraea	LC
Nymphalidae	*Vanessa cardui*	Painted Lady	LC
Nymphalidae	*Haminumida*	Guineafowl	LC
Pentatomidae	*Nezara viridula*	Green Vegetable Bug	LC
Pieridae	*Catopsilia florella*	African Migrant	LC
Pieridae	*Eurema brigitta*	Grass Yellow	LC
Platycnemididae	*Elattoneura glauca*	Common Threadtail	LC
Pyrgomorphidae	*Dictyophorus spumans*	Koppie Foam Grasshopper	LC
Scarabaeidae	*Tephraea dichroa*	Wild Potato Fruit Chafer	LC
Syrphidae	*Allagrapta fuscotibialis*	Hoverfly	LC
Tettigoniidae	*Conocephalu caudalis*	Meadow Katydid	LC
Tingidae	*Plerochila australis*	Olive Lace Bug	LC

Figure 8-9: Painted Lady (top left), Jaunty Dropwing (bottom left), Short Horned Grasshopper (middle) and Common Threadtail (right)

9. Sensitivity Analysis

The sensitivity analysis takes into account all of the desktop data (Mpumalanga C-Plan, Threatened Ecosystems, IBAs and the NPAES), as well as the field data gathered during the site visits. The outcome of this assessment depicts sensitivity ranging from low to high in the Project Area. High sensitivity was assigned to the Rocky Outcrops and Wetland habitats as they provide habitat for SCC and their irreplaceability as unique biodiversity features. Various habitats within the Project Area sustain a high diversity of faunal and floral SCC. The drainage and wetland systems are associated with a high ecological sensitivity as they provide refugia and habitat for numerous faunal SCC, promote movement of faunal species and act as corridors and also provide vital ecosystem services. Areas with moderate sensitivity included those that were considered in a natural state with minor anthropogenic disturbances and presence of SCC such as the intact grasslands and moderate rocky slopes. Low sensitivity was assigned to the transformed areas as they have been previously heavily degraded and are proliferated with AIPs. The maps below illustrates the areas of concern confined to the Project Area in Figure 9-1 and Figure 9-2.

It is recommended that areas of high sensitivity be actively conserved throughout the life of the proposed Project, as well as after decommissioning and closure. These areas should not be cleared or impacted in any way by construction activities. Areas of moderate sensitivity should be avoided as far as possible, and ideally conserved along with areas of high sensitivity. Mining activities and associated infrastructure should proceed with caution in these areas. Areas of low sensitivity are recommended for construction activities, however, should any SCC occur, the area is to be avoided or removal of the species from the area. If this cannot be done, the appropriate permits should be obtained for their removal.

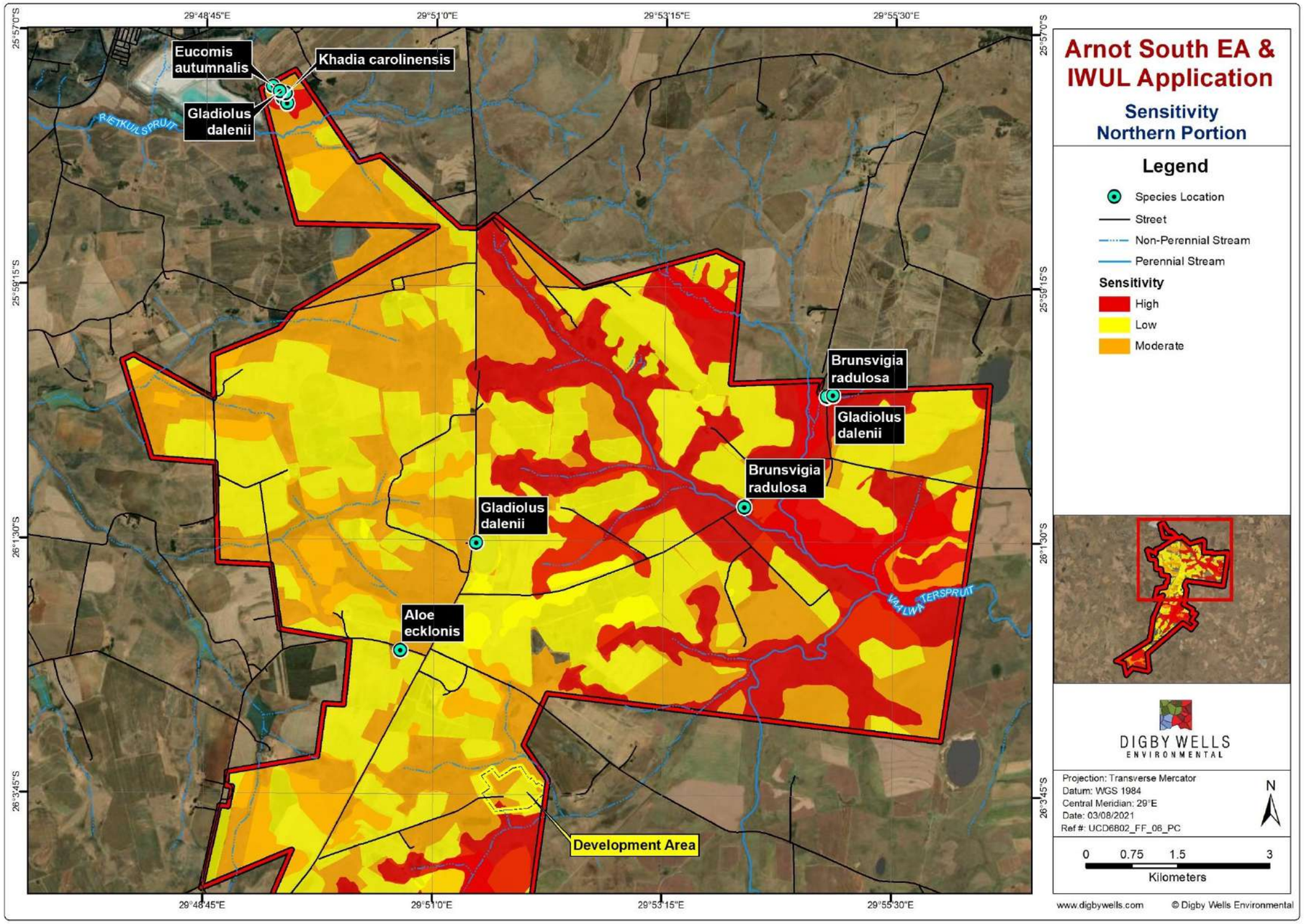

Figure 9-1: Sensitivity Map of the northern portion of the Project Area

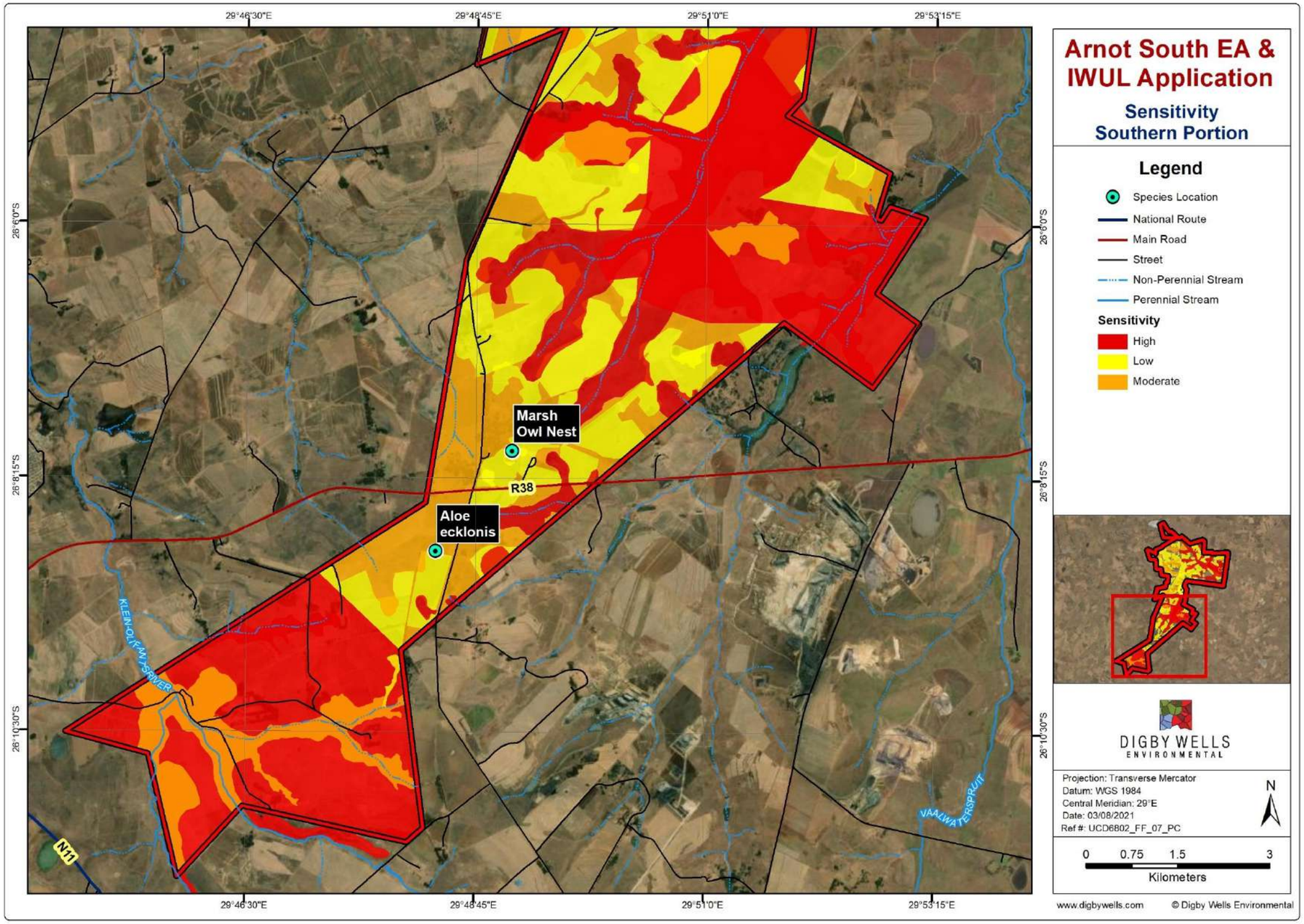

Figure 9-2: Sensitivity Map of the southern portion of the Project Area

10. Impact Assessment

The fauna and flora impacts were assessed for the three phases of the project life, including the construction, operational and decommissioning phases. The impacts were based on the impact's magnitude as well as the receiver's sensitivity, concluding an impact significance rating which identifies the most important impacts that require management.

The impacts that will potentially affect the fauna and flora of the Project Area are:

- Clearing of the vegetation within the locality of the infrastructure area. Clearing the vegetation will result in loss of the vegetation communities, biodiversity, unique habitats and identified SCC. Loss of these components will degrade the overall habitat and ecosystem services they provide. The removal of vegetation and exposure of bare soils promotes the proliferation of AIPs and edge effects;
- Sensitive areas such as the Rocky Outcrops, Primary Grasslands, and Wetlands that are within the layout of the surface infrastructure will be negatively affected. There is a risk of water contamination, loss of water quality that will affect sensitive niched fauna such as amphibians. There will also be loss of unique habitats and landscapes. Contaminated water will affect the surrounding areas, and decrease the overall functioning of the ecosystem; and
- Degradation of habitats due to post-mining subsidence. Any surface area lying above an area where coal has been mined underground, may subside at anytime in the future. Subsidence creates depressions and hollows in the surface that will over time fill with water. The water percolates down from the surface with subsequent filling of the void below and decants at the lowest point. Depending of the rocky layer below, acidic and/or sulphite rich seeps establish and decant into lower-lying surrounding areas and associated habitats (in this instance sensitive wetland systems and Rocky Outcrops).

Methodology used for the impact assessment is represented in Appendix G.

10.1. Construction Phase

Activities during the Construction Phase that may have potential impacts on the vegetation communities, biodiversity and ecosystem function are listed in Table 10-1.

Table 10-1: Interactions and Impacts of Activity

Interaction	Impact
Removal of vegetation / topsoil for establishment of mining and linear infrastructure	• Removal of vegetation within the localised infrastructure area, permits the loss of vegetation and habitat communities (including fauna and flora SCC), biodiversity and ecosystem services; • Fragmentated vegetation and the proliferation of AIPs; and • Edge effects and degradation to the ecosystem.
Establishing the box cut	• Removal of all vegetation within the localised infrastructure area, permits the loss of vegetation and habitat communities (including fauna and flora SCC), biodiversity and ecosystem services; and soil compaction, AIP proliferation and soil erosion; and • Fragmentation, edge effects and degradation to the ecosystem.
Diesel storage and explosives magazine	• Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and surrounding water; • Decline in habitat quality for biodiversity and SCC; and • Increased vehicle movement.
Construction of infrastructure, and ventilation Shafts.	• Increased faunal casualties and vegetation removal for ventilation infrastructure.
Construction of access road and haul roads	• Vegetation removal, dust pollution, soil erosion, compaction and AIP proliferation; and • Increased vehicle movement promoting potential faunal causalities;
Stockpiling of soils, rock dump and discard dump establishment.	• Compaction of soils; • Low vegetation growth. If stockpiles are unvegetated, potential erosion and spontaneous combustion may occur.

10.1.1. Impact Description

The construction of surface infrastructure will take place within the Weltevreden 174 IS farm portion of the Project Area. The vegetation types present within this area will be removed and will promote the loss of vegetation communities, species composition, and promote edge effects and fragmentation. The nature of the mine is underground, and the surface infrastructure footprint comprises of approximately 65 ha. The predominant vegetation within this footprint is cultivated areas, grasslands and wetlands. The placement of the infrastructure will include complete removal of vegetation present within the proposed layout.

Provincially protected floral species, namely *Aloe ecklonis, Crinum macowanii, Gladiolus sp* and *Khadia carolinensis* (**VU**) were recorded in various locations within the Project Area (see Figure 9-1). Removal or destruction of the protected species will necessitate an application with the relevant local authorities of the Department of Environment, Forestry and Fisheries (DEFF) to permit the removal (MNCA,1998).as these species were recorded within the Project Area, it is therefore necessary to screen the area where vegetation will be removed to ensure no SCC occur within the infrastructure footprint or alternatively flag and demarcate the SCC present for permit processing.

With the clearing of indigenous vegetation, open areas will occur where vegetation will be replaced by fast growing AIPs. This impact can be greatly reduced with the correct implementation of an AIP Eradication Plan. This plan is a multi-phased approach that is stipulated under NEM:BA; Alien and Invasive Species Regulations (2020) (GNR 1003) as published in the Government Gazette 43726 of 18 September 2020 – effective from 18 October 2020.

10.1.1.1. Management Objectives

Management objective for the site clearance activity will include informing the mine where the location of the vegetation communities are, including the location of the protected fauna and flora from the in-field assessment, and how to reduce impacts to these.

The management objectives are to prevent the loss of important landscapes, species of plants and animals (Red Data and Nationally or Provincially listed species). This is achieved by avoiding destruction of areas where these species occur. In the case of plants, if this is not possible, relocation or removal permits are required for the relocation of all protected species. A thorough screening must take place prior to construction to quantify and locate all protected species that possibly reside in the infrastructure footprint area. If relocation is not possible than replacing all removed protected species must occur after operation of the mine and during the commencement of the rehabilitation.

10.1.1.2. Management Actions

In accordance with the Red List Plant Guidelines (SANBI, Guidelines for Environmental Impact Assessments (EIAs), 2020), it is imperative to adhere to the following conservation techniques regarding Red Listed plant species:

- All populations of Near Threatened and Threatened plant taxa must be conserved *in situ* (locally);
- All populations of Threatened (see Section 7.2.1.1) plant taxa must be protected with a buffer zone in accordance with guidelines; and
- An Ecological Management Plan must be compiled in respect of all actions that affect populations of Red List Plant Species. The Ecological Management Plan must ensure long-term persistence of the SCC, include a monitoring programme for the

species, facilitate natural ecological processes, minimise artificial edge effects and include an AIP eradication and monitoring plan.

- An AIP Eradication Plan to preserve remaining natural habitat and prevent alien plant infestations. Such a strategy will entail the identification of areas where easy propagation of invasive species may occur, this generally occurs where the vegetation has been striped and the top soil has been impacted. Thereafter specific eradication measures can be prescribed for the species present.
- Destruction of natural vegetation should be limited to the areas essential for the development. Once site clearing and construction are complete, the environmental officer must ensure the construction areas are rehabilitated to an acceptable standard to accomplish the aim of the rehabilitated area. Open and steep areas are prone to erosion and these must be marked and attended to before the following wet season starts.
- Rehabilitation of disturbed areas should take place within a month of construction. All bare patches of soil should be vegetated, preferably with pioneer species which will colonise open and disturbed areas relatively quickly and prevent erosion and alien vegetation establishing.

Please refer to the Digby Wells Rehabilitation Report (2021) for the recommended seed mix ideal for soil stabilising and erosion prevention.

Illegal waste dumping, including building waste and rubble, should be prohibited. Such illegal dumping sites are prone to alien vegetation recruitment. The environmental manager must ensure that after each building site is rehabilitated, there are no rubble piles remaining.

10.1.1.3. Impact Ratings

Impacts associated with the construction phase are presented below in Table 10-2.

Table 10-2: Construction Phase Interactions, and Impacts of Activity Rating

Activity, and Interaction: Removal of vegetation / topsoil for establishment of surface infrastructure and box cutting.			
• Loss of plant communities and sensitive landscapes including, Grassland and Wetland habitats; • Loss of biodiversity and SCC; • Increased erosion; • Potential for AIP proliferation; • Loss of faunal habitat including faunal SCC.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**

Duration	6	The impact of the vegetation clearance will occur during the life of the project, although reduced during the decommissioning phase	Moderate -78
Extent	3	Vegetation removal will occur within mining and linear infrastructure areas as well as proposed roads.	
Severity	4	Moderate loss of the vegetation communities (including grassland, and wetlands) limiting ecosystem functioning and services	
Probability	6	Definite probability of vegetation clearing particularly in the infrastructure areas, and areas cleared for box cutting.	
Nature	Negative		
Mitigation measures			
• Keep site clearing to a minimal, and restrict vehicle movement to dedicated areas; • AIP Eradication strategy should be implemented; • Make use of existing roads to encourage minimal impacts/footprint; • Avoid sensitive areas such as Rocky Outcrops, Primary Grasslands and Wetlands (See Sensitivity Map, Figure 9-1 and Figure 9-2); • Environmental Practitioner and botanist to be present during vegetation clearing to prevent unnecessary clearing of extensive areas not part of the direct input area; • The footprint of the mine should be as compact as possible from a design point of view; and • Adhere to recommended protective buffers around wetlands as stipulated in the Wetland Report (DWE, 2021).			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	If mitigated the impact will cease after the operational life span	Minor -66
Extent	3	Vegetation removal will occur within mining and linear infrastructure areas as well as proposed roads.	
Intensity	3	Moderate loss, and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning.	
Probability	6	There is a definite probability that the impact will occur if mitigation measures are not implemented.	
Nature	Negative		

Activity, and Interaction: Stockpile of soils, rock dump and discard dump establishment			
• Heavy machinery utilised increasing vehicle movement in the area, increasing soil compaction, habitat disturbances and vegetation removal; • Natural vegetation will be removed, damaged and fragmented promoting edge effects and AIP proliferation; • Change in habitat and potential change in species composition; and • Increased soil compaction, runoff and erosion into surrounding sensitive landscapes.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	6	The impact of habitat fragmentation and loss of fauna and flora will occur during and after the life of the project.	Moderate -105
Extent	4	This fragmentation will only occur within the impacted area and its near surroundings.	
Severity	5	If not mitigated, once the resources have been lost from the landscape it can be difficult to recover and restore.	
Probability	7	Site clearance has to take place for construction of the discard dumps which will encourage the fragmentation and loss of fauna and flora and AIP proliferation.	
Nature	Negative		
Mitigation measures			
• Construction must be kept within the infrastructure footprint area, to reduce fragmentation as much as possible; • Bare land surfaces must be vegetated to limit soil erosion from surface runoff associated with stockpiles and dumps. Revegetate disturbed areas immediately after construction; • Monitor stockpiles to ensure no erosion, runoff, and sedimentation into surrounding areas; • No establishment of rubble piles; • AIPs should be continuously monitored and controlled throughout the life of the mine and thereafter with the establishment of an AIP Eradication Plan; and • Corridors (infrastructure and ecological) set aside within the mine area would mitigate fragmentation substantially, especially if this could be managed with the community over an extended period of time.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	4	The impact will occur during the life of the project.	Minor

Extent	3	Loss of fauna and flora and habitat degradation is extending only as far as the development area	-66
Intensity	3	Moderate loss, and/or effects to biological or physical resources or moderate sensitive environments, affecting ecosystem functioning.	
Probability	6	High probability that the impact will continue to occur.	
Nature	Negative		

Activity, and Interaction: Access and haul road construction

- Removal of vegetation and basal layer;
- Increased proliferation of AIPs;
- Increased faunal casualties; and
- Increased dust pollution.

Prior Mitigation

Dimension	Rating	Motivation	Significance
Duration	6	The impact of haul roads will extend beyond the life of the project.	Moderate -91
Extent	3	Loss of fauna and flora will only occur within the impacted area and its near surroundings	
Severity	4	If not mitigated serious loss will occur to the moderately sensitive environment.	
Probability	6	Site clearance has to take place for construction of the access and haul roads, so vegetation removal is inevitable.	
Nature	Negative		

Mitigation measures

- Keep site clearing to a minimum;
- If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals or after high rainfall events;
- Staff of the mine must adhere to policies within the operation of the mine, such as adhering to designated speed limits;
- Restoration and rehabilitation of any removed vegetation and SCC should occur during the rehab phase;
- Identify migratory crossing links between watercourses for herpetofauna, install correct signage to make all staff personnel aware and create safe underpasses for fauna at risk (discussed in further detail in Table 11-1);

• AIPs should be continuously monitored and controlled throughout the life of the mine; and thereafter, with the establishment of an AIP Eradication Plan.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impacts will occur during the life of the project.	Minor -66
Extent	3	Loss of fauna and flora is limited only to the footprint of the access and haul roads, exposed areas due to mitigation measures being implemented, such as limit vehicle movement, and restrict movement to specific sites.	
Intensity	3	Moderate loss, and/or effects to biological or physical resources or moderately sensitive environments, limiting ecosystem functioning.	
Probability	5	Likely probability that the impact will continue to occur.	
Nature	Negative		
Activity, and Interaction: Construction of infrastructure, and ventilation Shafts			
• Increased faunal casualties and vegetation removal; • Increased risk of AIP proliferation and edge effects; and • Changes to the landscape and undulating topographies.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impacts will cease after the operational life span.	Minor -44
Extent	3	Local, extending as far as the development site area.	
Severity	3	Moderate loss and/or damage to the fauna and flora of the environment.	
Probability	4	There is a <50% probability that the impacts will occur.	
Nature	Negative		
Mitigation measures			
• AIPs should be continuously monitored and controlled throughout the life of the mine; and thereafter, with the establishment of an AIP Eradication Plan; • Keep areas of infrastructure to the absolute minimum and stay within the demarcated footprint;			

• Minimise the areas that are to be stripped of vegetation; • Seal ventilation hole with a concrete plug to ensure no animals are trapped; • No harvesting of floral or poaching of faunal species may take place by the construction employees; and • No dirty water may be disposed of in the immediate environment.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	3	The impact can be reversed with minimal management.	Negligible -24
Extent	2	Limited to the site and its immediate surroundings	
Intensity	3	Moderate loss and/or damage to the fauna and flora of the environment.	
Probability	3	There is a <25% probability that the impacts will occur, therefore unlikely.	
Nature			

10.2. Operational Phase

Activities during the Operational Phase that may have potential impacts on the vegetation communities, biodiversity and ecosystem function are listed in Table 10-3.

Table 10-3: Operational Phases Interactions and Impacts

Interaction	Impact
Underground blasting and operation of the underground workings	• Potential for post-mining land subsidence; • Loss of topsoil; • Potential contamination of underground water and water table further impacting sensitive ; and • Increased risk of erosion.
Continue with exploration activities	• Continuous disturbances to the fauna and flora by vegetation removal; • Increased vehicle activity; • The sudden increase in activity may lead to the migration of sensitive species from the site to a more favourable habitat; and • Continuous anthropogenic influence stemming from staff, residents and visitors that infiltrate the unexplored natural veld areas will damage and impact on species communities within certain areas.

10.2.1. Impact Description

There may be a direct impact on animal life, as haul roads will be utilised during this phase and there will be an increase in roadkill. The operational activities involve majority of underground activities. Blasting will potentially destroy faunal habitats. Soil stability may be fabricated due to increase of erosion and loss of protective plant cover. There may be possible degradation of adjacent habitats due to potential contamination of underground water.

The nature of the mine risks the possibility of land subsidence. This has a knock-on effect on a number of other factors such as water quality, air quality and heavy metal contamination. All measures must be taken to prevent the severe environmental impacts that follow with land subsidence. At this stage, direct impacts to above biodiversity and natural habitats is minimal.

10.2.1.1. Management Objectives

. There is a potential for land-subsidence to occur, management objectives during the operational phase should be focussed on the prevention of post-mining land subsidence, please refer to the Digby Wells Hydropedology Report 2021 for mitigation measures. Prevention of this impact will prevent further degradation of the surrounding biodiversity.

10.2.1.2. Management Actions

Management actions to mitigate the impacts described can be summarised as follows:

- Monitoring of alien invasive sprawl during the operation is recommended as the surrounding vegetation is relatively intact and free from alien invasive plants;
- Ensure no loss of faunal SCC by activating anti-poaching units that will be incorporated during the mine life cycle;
- Constantly monitor boreholes as well as stream water to detect any pH changes;
- Adhere to mine regulatory protocols for commuting with the Project Area, i.e.: obeying speed limits, and install signage of faunal and floral sensitive areas; and
- Keep sight clearing to a minimal, and restrict vehicle movement outside of dedicated areas, specifically close to wetlands (pans) and Rocky Outcrops.

10.2.1.3. Impact Ratings

The operational phase impacts are rated in Table 10-4.

Table 10-4: Operational Phase Interactions, and Impacts of Activity Rating

Activity, and Interaction: Underground blasting and operation of the underground workings.

- Increased risk of post-mining land subsidence;
- Loss of topsoil;
- Impacts on the hydrological systems (water table) impacting the habitat ecology and ecosystem services;
- Potential contamination of underground water with hydrocarbons, polluting sensitive habitats for sensitive faunal and floral species..

Prior Mitigation

Dimension	Rating	Motivation	Significance
Duration	6	The impact may remain after the life of the project if not mitigated.	Minor -70
Extent	3	Underground workings can lead to extensive damage within the area.	
Severity	5	Potential for serious damage to the ecology of the area if not mitigated	
Probability	5	There is a likely probability of the impacts occurring.	
Nature	Negative		

Mitigation measures

- Adhere to all management and mitigation measures as prescribed within other specialist reports.
- To minimize potential impacts to animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the mining personal.
- Prevent impacts from reaching downstream water resources and hydrophilic environments (wetlands) by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment. This will be prudent in this development, since petroleum and other hydrocarbons associated with the trucks and vehicle-based activities are likely to be spilled in the environment if not managed well. As referenced by the Digby Wells Hydropedology Report (2021), implementation of a proposed water stormwater management plan is important to reduce sedimentation and siltation of nearby watercourses.

Post-Mitigation

Dimension	Rating	Motivation	Significance
Duration	5	The underground blasting and workings will cease after the operational phase and can be reversed with sufficient management.	Minor -60
Extent	3	The extent of the impact will remain local as far as the development site area.	
Intensity	4	Moderate loss and damage to surrounding sensitive areas if mitigation is not adhered to.	

Probability	5	The underground workings impacts are likely to occur.	
Nature	Negative		
Activity, and Interaction: Storage, handling, and treatment of hazardous products (including fuel, explosives and oil) and waste			
• Contamination of soil, water and surrounding areas / habitats (pan and wetland vegetation) from hydrocarbon waste/spills (lubricants, oil, explosives, and fuels).			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impact will occur during the life of the project, although reduced during the decommissioning phase.	Moderate -78
Extent	3	Most contamination will occur locally within the extent of the mining activities.	
Severity	5	Serious medium-term environmental effects and limiting ecosystem functioning. Damage can be irreparable if not mitigated.	
Probability	6	There is a <80% probability this impact will occur if not mitigated	
Nature	Negative		
Mitigation measures			
• All spills should be immediately cleaned up, and treated accordingly; and • Re-fuelling must take place on a sealed surface area away from sensitive habitats such as the pan vegetation to prevent the ingress of hydrocarbons into the topsoil.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impact will occur on a long-term basis, specifically during the construction, and operational phases.	Negligible -30
Extent	3	Spillage and contamination is limited only to storage areas, provided that management measures are implemented.	
Intensity	2	Minor - term environmental effects due to prevention measures and rehabilitation	
Probability	3	There is a <25% probability that the impact will occur if mitigation measures are not implemented.	

Nature	Negative		
Activity, and Interaction: Continue with exploration activities			
• Continuous disturbances to the fauna and flora by explorative activities;; • Increased vehicle activity; and • Continuous anthropogenic influence stemming from staff, residents and visitors that infiltrate the unexplored natural veld areas will damage and impact on species communities within certain areas. This could disturb unidentified SCC.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impacts will cease after the operational life span of the Project.	Minor -48
Extent	3	It will extend as far as the development site area.	
Severity	4	Serious loss and/or damage to the sensitive landscapes within the Project Area	
Probability	4	There is <50% probability that these impacts will occur.	
Nature	Negative		
Mitigation measures			

• All footprint areas should remain as small as possible;
• If any SCC are encountered within the Project Area the future, the following should be ensured:
  • If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property;
  • All rescue and relocation plans should be overseen by a suitably qualified specialist; and
  • Obtain relevant permits/consent, if applicable, for each protected or endangered floral species identified within the proposed development area that will be destroyed.
• Human and vehicle movement should be restricted from taking place in sensitive habitats.			

Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	2	Continuous exploration will be short term and intermittent.	Negligible -18
Extent	2	Areas impacted will be limited to the area of interest.	
Intensity	2	Minor loss to the biological environment	
Probability	3	The probability of impacts occurring is unlikely	

Nature	Negative		

10.3. Decommissioning Phase

Activities during the decommissioning phase that may have potential impacts on the vegetation communities, biodiversity and ecosystem function are listed in Table 10-5Table 10-5.

Table 10-5: Interactions and Impacts of Activity

Interaction	Impact
Demolition and removal of infrastructure	• Disturbance of soils, and subsequent erosion by wind, and water; • Increased vehicle movement in the area, increasing soil erosion and habitat destruction; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; • AIP proliferation; and • Changes in topography and landscape.
Post-closure monitoring and rehabilitation	• Exposure of soils, and subsequent compaction, erosion, and sedimentation; • Soil compaction, and increased runoff potential due to vehicle movement during rehabilitation programs; • Loss of organic material, and vegetation cover; and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of soil.
Closure of the underground mine	• Potential risk for land subsidence, preluding to topography changes, underground water contamination and change to faunal habitats.

10.3.1. Impact Description

The decommissioning phase will enable the rehabilitation of the removed indigenous vegetation and Red Listed species. The removal of any infrastructure or machinery may also take place, whereby these will be dismantled and trucked away.

10.3.1.1. Management Objectives

The objective for this phase will be to maximise the success of the rehabilitation that will take place after infrastructure is removed and the closure of the underground mine has commenced, and to furthermore reduce any impacts that may occur during this phase.

10.3.1.2. Management Actions

Decommissioning of the infrastructure and underground access areas will be predominantly a rehabilitation activity. These areas will be sloped and revegetated with indigenous plant species that represent the vegetation types and communities identified.

In order for the decommissioning to be a positive impact, the removal of the infrastructure and backfilling of the underground works must be completed so as to not harm or negatively impact surrounding intact vegetation. The aim will be to ensure the disturbed footprint areas are vegetated and that erosion through runoff and wind does not occur. Efforts will be maximised if rehabilitation is completed before the wet season sets in to make use of the rainfall to assist in plant growth.

10.3.1.3. Impact Ratings

The decommissioning phase impacts are listed in Table 10-6 below.

Table 10-6: Decommissioning Phase Interactions, and Impacts of Activity Rating

Activity, and Interaction: Demolition and removal of infrastructure			
• Disturbance of soils, and subsequent erosion by wind and water; • Increased vehicle movement in the area, increasing soil erosion and habitat destruction; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; • AIP proliferation; and • Unexpected changes in topography and landscape as a result of subsidence.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impact will cease after the operational life span and can be reversed with sufficient management	Minor -44
Extent	3	Local, extending as far as the development site area.	
Severity	3	Moderate effects to the surrounding environment.	
Probability	4	There is a <50% probability the impacts will occur.	
Nature	Negative		
Mitigation measures			
• Continue with concurrent Rehabilitation, begin with stockpiles, bare grounds and dumps, implement rehabilitation measures; • Address eroded and compacted areas by deep ripping to loosen the soil, and revegetate the area as soon as possible to prevent AIP sprawl; • Inventory of hazardous waste materials stored on-site should be compiled and complete removal arranged; and • Only designated access routes are to be used to reduce any unnecessary compaction.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	2	The impact will be less than a year if rehabilitation measures are implemented correctly.	Negligible -24
Extent	2	The impact will be limited to the site due to the implementation of mitigation measures.	
Intensity	2	Minor effects on the biological or physical environment. Environmental damage can be rehabilitated internally with/ without the help of external consultants.	
Probability	4	There is a <50% probability the impacts will occur.	

Nature	Negative		
Activity, and Interaction: Post-closure monitoring and rehabilitation			
• Minimal negative impacts on the environment; • Activities involve the rehabilitation processes of reprofiling the soils and re-vegetation thereafter; • Impacts include the possibility of erosion and sedimentation; • Proliferation of AIPs; and • Change in the habitat and species composition.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	4	The impacts caused during the rehabilitation activities will have a long-lasting effect if not managed.	Minor -50
Extent	1	Limited to isolated sections of the Project Area.	
Severity	5	These impacts have serious implications to the revival of the disturbed areas.	
Probability	5	Probability of <65% as these are the commonly observed impacts for the rehabilitation phase.	
Nature	Negative		
Mitigation measures			
• During the decommissioning phase, rehabilitation must start as soon as possible and preferably in the growing season (October to February) to ensure adequate plant recruitment; • Address eroded and compacted areas by deep ripping to loosen the soil, and revegetate the area as soon as possible; • Inventory of hazardous waste materials stored on-site should be compiled and complete removal arranged; and • Only designated access routes are to be used to reduce any unnecessary compaction.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	6	The impact will be less than a year if rehabilitation measures are implemented correctly	Positive Impact 66
Extent	3	The impact will be limited to the site due to the implementation of mitigation measures	

Intensity	2	Minor effects on the biological or physical environment. Environmental damage can be rehabilitated internally with/ without the help of external consultants.	
Probability	6	The impact can occur and as probability of <80%	
Nature	Positive		
Activity, and Interaction: Closure of the underground mine.			
• Potential risk for land subsidence, preluding to topography changes, underground water contamination and change to faunal habitats. • Change in the land topography and species composition.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	6	The impact will remain for some time after the life of the Project.	Minor -56
Extent	3	Local, extending only as far as the development site area	
Severity	5	Serious loss or damage to highly sensitive environments.	
Probability	4	There is a <50% probability that the impact may occur	
Nature	Negative		
Mitigation measures			
• Ensure mitigations measures to prevent subsidence are enforced and maintained throughout the decommissioning phase.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	4	Long term impact yet can be reversed with management.	Negligible -33
Extent	3	Local, extending only as far as the development site area.	
Intensity	4	Serious loss and/or damage to	
Probability	3	There is a <25% probability that the impact may occur.	
Nature	Negative		

10.4. Cumulative Impacts

It is necessary to consider the impacts that the future development will have from a wide-ranging perspective, by considering land-use and transformation of the natural habitat in surrounding areas. Cumulative impacts are assessed by considering past, present and anticipated changes to the biodiversity. Roads, other mining activity and agricultural activity in the area contribute to this regard. The proposed project is localised in extent but could affect SSC if not managed carefully.

The further removal of habitat/vegetation types to allow construction will bring about a reduction of natural areas, and the increase of the edge effect. The loss of vegetation and flora along with associated faunal habitat and ecosystem services within the proposed infrastructure layout will be minimal as majority of the area of disturbance comprises of already disturbed habitat such as cultivated areas. Albeit the Project Area resides in the Endangered Eastern Highveld Grassland vegetation type which is currently poorly protected. The cumulative loss of the vegetation type as well as the SCC within it should be considered proactively. The primary impacts will include fragmentation and edge effects, isolating pockets of vegetation decreasing movement and corridors for wildlife and threatened species.

Secondary cumulative impacts will include increased accessibility to the site and the resulting increase in development and resource dependence. Ideally, a strategic environmental plan for the area should be developed and adhered to. This should include the conservation of important areas as well as the provision of corridors for faunal movement.

10.5. Unplanned and Low Risk Events

Major unplanned risks are associated with infrastructure malfunctioning and contamination of surrounding ground and ground water. Potentially hazardous substances can contaminate the area via accidental spillage or leakage. It is imperative that the requirements of South African legislation are met for minimisation of pollution. These are described in Table 10-7 below.

Table 10-7: Unplanned Events and Associated Mitigation Measures

Unplanned Risk	Mitigation Measures
Leaking or spillage of hazardous substances from pipelines and waste storage	• If a spill occurs, it is to be cleaned up immediately (Drizit/Zupazorbtype spill kits) and consequently reported to the authorities; • All infrastructure carrying or transporting such substances is to be checked frequently and maintained; and • Ensure all staff are adequately informed and safety measures are in place for such instances.

Unplanned Risk	Mitigation Measures
Hydrocarbon spillage from vehicles	• If leak occurs from vehicle, place drip trays below the leak; • All vehicles are to be serviced on concrete areas and off site; and • Machines must be parked upon hard parking surfaces and checked daily for leaks.
Infrastructure malfunction leading towards dirty water spillage or spontaneous combustion	• All infrastructure, machinery and associated setups are to be serviced and checked throughout the project life cycle; • All staff are to be informed about potential hazards and consequently prepared for malfunctioning; • Protocols are to be induced at every phase of the project life cycle; and • If such hazards were to incur, the appropriate authorities are to be notified and the incident recorded.
Excess dust pollution	• Excess dust in construction sites is mitigated via various methods and are site specific. The recommended methods for this site would be spraying of water, mulch from the removed vegetation and tackifiers and soil stabilisers that don't harden the soils.

11. Environmental Management Plan

The objective of an Environmental Management Plan (EMP) is to present mitigations (a) to manage undue or reasonably avoidable adverse impacts associated with the development of the project and (b) to enhance potential positives.

Mitigation measures will sometimes be built into the base of a project and should be considered as part of the "pre-mitigation" scenario; additional mitigation must be recommended if the impact assessment indicates it is necessary.

The key objectives are EMPs are to give mitigation measures to:

- Identify the actual environmental, socio-economic and public health impacts of the project and check if the observed impacts are within the levels predicted in the EIA;
- Determine that mitigation measures or other conditions attached to project approval (e.g. by legislation) are properly implemented and work effectively;
- Adapt the measures and conditions attached to project approval in the light of new information or take action to manage unanticipated impacts if necessary; and
- Gauge if predicted benefits of the project are being achieved and maximized; and gain information for improving similar projects and ESIA practice in the future.

The EMP is described in Table 11-1 below.

Table 11-1: Environmental Management Plan

Activities		Potential Impacts	Mitigation Measure	Mitigation Type	The period for implementation
Construction Phase	• Site clearing, and preparation by the removal of vegetation and associated habitats and removal of soils; • Movement of vehicles, and heavy machinery; • Construction of infrastructure, including access and haul roads, diesel storage, merging bridge, and explosive magazine; and • Waste management activities, including handling of hydrocarbon chemicals, transportation of waste material, transportation of product coal, and disposal of waste material.	• Removal of vegetation, basal cover, and thus increasing the potential of loss of topsoil, organic material, and increased erosion potential; • Loss of sensitive habitat; • Removal of flora and fauna SCC and faunal habitat; • Removal of vegetation communities such as woodlands and pans (wetlands); • AIP proliferation; • Increased runoff potential and consequently sedimentation and compaction of the soil; • Potential spillage of hydrocarbons such as oils, fuels (diesel), and grease, thus contamination of the soils and surrounding grounds; • Risk of fire during the dry season; and • Increased dust pollution.	• Keep site clearing to an absolute minimum by adhering to the Project layout only, and restrict vehicle movement outside of dedicated areas, specifically close to wetlands (pans) and rocky outcrops; • Floral SCC located in areas of development should be marked prior to commencement of construction. Necessary permits for relocation of protected species must be obtained from the relevant government department (DEFF). The relocation strategy must be approved by relevant authorities prior to relocation to a safe and ideal location. Sourcing representative and indigenous flora to rehabilitate the area, local nurseries should be contracted to supply to the saplings and seed mixes; • Make use of and upgrade existing roads to encourage minimal impacts/footprint to the Project Area, this would limit the impacts proposed from the construction of the new access road; • Whilst the removal of vegetation is underway, key monitoring methods should be focussed on the prevention of AIP proliferation during the construction and operational phase. Measures must be in place to prevent the spread of AIPs; • Erosion prevention is key thus runoff must be controlled, and managed by use of proper stormwater management measures; • Management of dust may involve the spraying of water and / or covering exposed pits with mulch. Mulch can be sourced from the removed vegetation from the site; • Vehicles should regularly be surveyed and checked that oils spill and other contaminants are not exposed to the soils; • Storage and re-fuelling of vehicles must take place on bunded impervious surfaces to prevent seepage of hydrocarbons into the soil; • Fuel, grease, and oil spills should be remediated using a commercially available emergency clean up kits. However, for major spills (>5L), if soils are contaminated, they must be stripped, and disposed of at a licensed waste disposal site; and • Fire management plan is recommended in case of uncontrolled fires during the dry season.	***Modify, remedy, control, or stop*** Concurrent rehabilitation through the life of mine	Life of Construction Phase

Operational Phase	• Vehicle, and heavy machinery movement; • Underground blasting and operation of the underground workings; • Stockpiling (rock dumps, soils, ROM, discard dump) establishment, and operation. • Diesel storage, explosives magazine, and handling, and treatment of hazardous products (including fuel, explosives, and oil).	• Increased risk of AIP proliferation without adequate control measures; • Potential of post-mining land subsidence; • Increase risk of fire during dry season; • Increased erosion, runoff and compaction of soil and consequently sedimentation potential; • Changes to the landscape with subsequent removal of faunal habitats and a decrease in biodiversity and loss of SCC (faunal and floral); and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils and surrounding grounds.	• Make use of existing roads to encourage minimal impacts/footprint to the Project Area; • Monitor AIPs and ensure measures are in place to prevent spread and proliferation; • All bare patches of soil should be vegetated, preferably with pioneer species (such as *Cynodon dactylon, Eragrostis curvula* and *E. tef*) which will colonise open and disturbed patches quickly; • Avoid extensive footprint of sensitive areas as much as possible – ridges and wetlands (see Sensitivity Map Figure 9-1 and Figure 9-2); • Adhere to a recommended mitigation measures regarding the possibility of land subsidence provided in the Digby Wells Hydropedology Report, 2021); • Management of dust may involve the spraying of water and / or covering exposed pits with mulch. Mulch can be sourced from the removed vegetation from the site; • Construct underpasses (beneath roads) that will provide potential linkages and corridors between sensitive areas such as wetlands and Rocky Outcrops. This will promote wildlife movement to move safely during high flow conditions; • Natural vegetated areas should be linked as far as possible so that species can move freely. Buffer areas should be constructed around the natural areas to promote ecological corridors; • A livestock management plan should be compiled by a registered scientific professional in the field of ecological sciences, with the relevant experience to ensure that the area is managed at stocking rates which does not degrade the area further while giving the natural areas time to recover. It is imperative that livestock be excluded from wetland systems and other sensitive habitats such as Rocky Outcrops; • Monitoring must be carried out during the operational phase to ensure no unnecessary impact to the remaining vegetation and associated habitats, and if so that a remediation plan is put in place as soon as possible; • In support of the Digby Wells Wetland Report 2020, a Storm Water Management Plan (SWMP) should already be implemented. This should consider all high land capability area, high potential erosion areas, wetlands, and other watercourses associated with the new developments/infrastructure which should divert stormwater away from the surface infrastructure, and back into natural watercourses to maintain catchment yield as far as possible. The SWMP should also convey stormwater to silt traps to limit erosion and the subsequent increase of suspended solids in downstream watercourses; • Fire management plan is recommended in case of uncontrolled fires during the dry season; • Hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; and	***Modify, remedy, control, or stop*** Concurrent rehabilitation through the life of mine	Life of Operational Phase

Activities		Potential Impacts	Mitigation Measure	Mitigation Type	The period for implementation
			• Re-fuelling of vehicles and machinery must take place on a sealed surface area away from wetlands to prevent the ingress of hydrocarbons in the surrounding area.		
Decommissioning Phase	• Movement of vehicles, and heavy machinery removing infrastructure; • Rehabilitation – rehabilitation mainly consists of reprofiling the landscape via re-vegetation. • Post-closure monitoring, and rehabilitation	• Increased vehicle movement in the area, Increasing the risk of faunal casualties due to roadkill; • Increased risk of AIP proliferation without adequate control measures; • Increased erosion, runoff and compaction of soil and consequently sedimentation potential; • Changes to the landscape with subsequent removal of faunal habitats and a decrease in biodiversity and loss of SCC (faunal and floral); and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils and surrounding grounds.	• Address areas that have been impacted by erosion, compaction, sedimentation by loosening the soil, and revegetate the area as soon as possible; • Begin with the rehabilitation of the vegetation and replant with indigenous flora identified in vegetation communities, particularly pioneer species. • Ensure removal of all AIPs. This can be done manually and if necessary, with a systemic solution; • Ensure designated access routes and roads are used to reduce any unnecessary compaction and degradation; • Inventory of hazardous waste materials stored on-site should be compiled, and complete removal must be arranged; and • Rehabilitation and a Monitoring Plan should be implemented. In terms of biodiversity, a key component of the rehabilitation is the re-establishment of natural vegetation. The overall objectives for the establishment of natural vegetation are to: • Create a sustainable cover that prevents erosion and promotes ecological succession; • Avoid soil loss and reduce sedimentation into freshwater and aquatic ecosystems; • Re-establish ecosystem processes to ensure sustainable land use; and • Restore the biodiversity of the area as far as possible. • Rehabilitation of the vegetation cover will require varying species that complement the soil moisture content of the landscape. Rehabilitation of the dryland areas and rocky slopes will require good soil stabilising, easily establishing and nurse cropping grass species such as Chloris gayana, Cynodon dactylon, Eragrostis curvula and E. tef. Drainage areas, seepage zones and permanent wet areas will require species that stabilize the soils and are able to grow in permanent wet areas such as C. gayana and Typha capensis	***Modify, remedy, control, or stop*** Concurrent rehabilitation through the life of mine	Life of Decommissioning Phase

12. Monitoring Programme

A monitoring programme is essential as a management tool to detect negative impacts and variations as they arise and ensure that the necessary mitigation measures are implemented together with the effectiveness of the management measures in place. Table 12-1 describes the monitoring plan that is to be implemented from the construction phase through to monitoring after decommissioning. The program includes each element, frequency of monitoring and the person responsible thereof.

Monitoring should be done in terms of:

- Appendix 6 of the NEMA EIA Regulations, 2014, (as amended);
- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM: WA);
- National Forest Act, 1998 (Act No. 84 of 1998) (NFA); and
- Mpumalanga Biodiversity Sector Plan (MBSP, 2014).

Table 12-1: Monitoring Plan

Monitoring Element	Comment	Frequency	Responsibility
Alien Invasive Management	During the operational phase the presence if AIPs should be detected and monitored every six (6) months. An active programme of weed management, to control the presence and spread of invasive weeds, will need to be instituted so that encroaching weeds (from edge effects and fragmentation) are controlled by means appropriate to the species. This should run for the life of the mine and five years after rehabilitation.	Annually during the wet season (December to February) for the first five years after rehabilitation.	Environmental Officer
Vegetation Cover Monitoring	The natural vegetation cover established on the disturbed areas needs to be monitored annually for the first five years after rehabilitation has been carried out, to ensure that the rehabilitation work has been successful in terms of stabilising the newly formed surfaces (preventing air and water erosion from affecting those surfaces), and that the newly established vegetation cover is trending towards convergence with the original vegetation cover found on the areas prior to	Annually during the wet season for the first five years after rehabilitation.	Botanist / Flora Specialist

Monitoring Element	Comment	Frequency	Responsibility
	disturbance (and on adjacent undisturbed areas). Parameters to be followed during monitoring: • Plant species present/absent; • Weed species composition; • Species density (number of individuals); • Species frequency (number of times species is recorded); • Basal cover; and • Biomass for ground cover.		
Red Data listed fauna and flora	All protected and Red Data plant and animal species must be marked prior to any construction taking place.	Monitored every 6 months from rehabilitation	Field Specialist
Fauna monitoring	This will be closely linked to the flora monitoring to enable scientific conclusions and comparisons. To successfully monitor faunal and floral biodiversity with a Savannah biome, a solid baseline (pre-construction) will be established through the first round of monitoring. This needs to be supplemented with regular repeats to compile a reasonable comparison between the pre-construction faunal communities present and faunal communities found in the same areas during various stages of construction and operation of the proposed project. It is recommended that this monitoring be carried out through the life of the mine and concurrently during rehabilitation.	Monitored every 6 months from rehabilitation	Field Specialist

13. Stakeholder Engagement Comments Received

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EIA process. The objectives of the Public Participation Process (PPP) include the following:

- To ensure that I&APs are informed about the Project;
- To provide I&APs with an opportunity to engage and provide comment on the Project;

- To draw on local knowledge by identifying environmental and social concerns associated with the Project;
- To involve I&APs in identifying methods in which concerns can be addressed;
- To verify that stakeholder comments have been accurately recorded; and
- To comply with the legal requirements.

The PPP has been completed in part, as a process separate to the Fauna and Flora Environmental Impact Assessment. No standalone consultation was undertaken as part of this assessment. Should any I&AP comments be submitted in relevance to fauna and flora during the PPP, these will be considered in the final EIA report.

Site surveys can often present an opportunity for informal consultation with specific stakeholders (usually farm owners, managers and employees). None were encountered during the wet season survey conducted for the study during April 2021.

14. Recommendations

The following actions are recommended to reduce adverse effects on the fauna and flora of the Project area (Table 14-1).

Table 14-1: Possible Impacts and Recommendations

Possible Impacts	Recommendations	Person Responsible
Loss of Fauna SCC	• All identified faunal SCC must be located and relocated, if possible, before the construction phase.	Biodiversity specialist, and Universal Coal PM
Loss of Vegetation cover and Flora SCC	• All floral SCC must be identified and located. Protected Plant Permits from local governing authorities (DEFF) will be required for either the destruction or removal of protected flora (MNCA, 1998). • Regional relocation of protected species within development footprint must be instilled to offset the overall loss of floral SCC within the Project Area. As recommended in Table 11-1, replanting of indigenous flora during the rehabilitation phase as a means to re-vegetate the area after decommissioning the mining activities.	Field Specialist, and Universal Coal PM

Possible Impacts	Recommendations	Person Responsible
Habitat and landscape fragmentation	• Restriction of vehicle movement over sensitive areas to reduce degradation of undisturbed areas (please refer to Sensitivity Map Figure 9-1 and Figure 9-2). • Ensure a livestock management plan is enforced to prevent further degradations. • Minimise unnecessary removal of the natural vegetation cover outside the development footprint. • After rehabilitation the area must be fenced, and animals (cattle) should be kept off the area until the vegetation is self-sustaining and established.	Field Specialist, Communal Nursery and Universal Coal PM

15. Reasoned Opinion Whether Project Should Proceed

Based on the baseline information, and impact assessment significance ratings, it is the opinion of the specialist that this Project is feasible and should be considered. However, if mitigation measures are not adhered to, the Project may potentially inflict irreversible damage to sensitive habitats such as Wetlands and Rocky Outcrops. These sensitive landscapes were found to host numerous faunal and floral SCC. However, it is highly recommended that concurrent rehabilitation, management and mitigation measures are correctly implemented to minimise all potential impacts (identified in Section 10 and 11) on the fauna and flora of the site.

Managing measures to minimise potential negative impacts as set out in Section 11 should form part of the conditions throughout the development of the Project. Protected species will require permit applications for the removal of identified protected species within the development footprint, so it is strictly advised to keep development and removal within the footprint. It is also highly recommended that watercourses (wetlands and pans) be avoided and not impacted with application of the recommended mitigation measures prescribed the Digby Wells Wetland Report 2021 to any of the identified wetland systems that will be impacted by the Project. In addition to avoidance measures, other sensitive units were identified, and they include the Rocky Outcrops and Primary Grasslands. As these habitat features are not common within the Project Area, all measures must be taken to ensure their protection.

Fauna and flora management measures and monitoring requirements as set out in this report should form part of the conditions of the ongoing activities of the mine.

16. Conclusion

Based on Mucina & Rutherford (2006) classification of South Africa's vegetation, the proposed Project is located in an area dominated by the vegetation type Eastern Highveld Grassland, which according to those authors, is regarded as Endangered. According to the MBSP, moderately modified, other natural and heavily modified areas are present within the Project

Area. According to the SAPAD and NPAES, no protected areas occur within the Project Area however the Amersfoort-Bethal-Carolina IBA is located in the southern portion of the Project Area, with key species such as Botha's Lark and Secretarybirds.

A single season site survey was undertaken in April 2021 during the wet season. The following details were recorded:

- Much of the Project Area has been either transformed or degraded largely through historical crop production and other agricultural activities.
- Identified vegetation communities included Wetlands (Pan and Moist Grassland, see Wetland Report), Rocky Outcrops and Primary and Secondary Grasslands, and Transformed cultivated areas and areas of Alien Invasive Plant (AIP) proliferation. The Wetland, Rocky Outcrop and Primary Grassland communities are seen as sensitive landscapes in the context of this ecological report.
- Floral Species of Conservation Concern (SCC) recorded included:
    - Watsonia gladioloides;
    - Gladiolus dalenii;
    - Gladiolus crassifolius;
    - Brunsvigia radulosa;
    - Khadia carloninses;
    - Aloe ecklonis; and
    - Crinum macowanii.

All recorded floral SCC are protected under the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (MNCA) and one is Red Listed under SANBI as Vulnerable (*Khadia calinensis*). They were encountered within the various wetland systems and Rocky Outcrops. Faunal SCC included:

- A Serval (Leptailurus serval) (NT), tracks recorded within the CVB Floodplain and Sandstone Outcrop (see Sensitivity Map Figure 9-1 and Figure 9-2); and
- An African Clawless Otter (Aonyx capensis) (NT), tracks recorded within the CVB Floodplain and Sandstone Outcrop (see Sensitivity Map Figure 9-1 and Figure 9-2).

The mining activities in the identified vegetation communities have had direct negative ecological impacts, most notably vegetation clearing, habitat loss and fragmentation as well as AIP proliferation. Areas to be mined should be screened for the identified floral and faunal SCC and any other Red Data/protected species prior to construction. If found these species should be relocated to a nearby site of similar habitat and permits applied for the removal.

The Project Area represents high faunal and floral diversity with numerous SCC identified throughout. The vegetation communities associated with the highest species richness were

the Rocky Outcrops and Wetland communities. However, in the context of the Project Area all the remaining natural vegetation provides habitat for numerous faunal and floral species and therefore is of conservation significance. Recommendations and mitigation measures are provided in the Impact Assessment. Important recommendations include the following:

- Management and control of AIP proliferation throughout the life of the Project;
- Keep footprint to a minimum and adhere to protective buffers recommended in the Wetland Report (DWE, 2021); and
- A thorough screening prior to construction for the locality of faunal and floral SCC should be done. Protected flora will require permits for removal or destruction.

This assessment provides mitigation measures, continuous monitoring measures, encourages concurrent rehabilitation and monitoring plan.

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Appendix A: Expected Floral Species

Family	Species Name	IUCN Status
Lamiaceae	*Aeollanthus buchnerianus*	LC
Lamiaceae	*Ailanthus altissima*	LC
Orobanchaceae	*Alectra sessiliflora*	LC
Lythraceae	*Ammannia schinzii*	LC
Poaceae	*Aristida junciformis*	LC
Poaceae	*Brachiaria eruciformis*	LC
Bryaceae	*Bryum argenteum*	LC
Cyperaceae	*Bulbostylis densa subsp. afromontana*	LC
Cyperaceae	*Bulbostylis hispidula subsp. pyriformis*	LC
Poaceae	*Calamagrostis epigejos subsp. capensis*	LC
Compositae	*Cineraria parvifolia*	LC
Asteraceae	*Cirsium vulgare**	LC
Cucurbitaceae	*Citrullus lanatus*	LC
Commelinaceae	*Commelina africana var. krebsiana*	LC
Commelinaceae	*Commelina benghalensis*	LC
Commelinaceae	*Commelina subulata*	LC
Apocynaceae	*Cordylogyne argillicola*	LC
Cyperaceae	*Cyperus congestus*	LC
Cyperaceae	*Cyperus esculentus var. esculentus*	LC
Cyperaceae	*Cyperus longus subsp. longus*	LC
Cyperaceae	*Cyperus rupestris*	LC
Cyperaceae	*Cyperus squarrosus*	LC
Poaceae	*Digitaria eriantha*	LC
Poaceae	*Digitaria sanguinalis*	LC
Poaceae	*Digitaria tricholaenoides*	LC
Orchidaceae	*Disa woodii*	LC
Poaceae	*Echinochloa jubata*	LC
Poaceae	*Echinochloa pyramidalis*	LC
Poaceae	*Eleocharis dregeana*	LC
Poaceae	*Eragrostis curvula*	LC
Poaceae	*Eragrostis lappula*	LC
Poaceae	*Eragrostis lehmanniana*	LC
Poaceae	*Eragrostis virescens*	LC

Family	Species Name	IUCN Status
Ericaceae	*Erica drakensbergensis*	LC
Asteraceae	*Erigeron canadensis**	LC
Iridaceae	*Gladiolus crassifolius*	LC
Fabaceae	*Gleditsia triacanthos**	LC
Orchidaceae	*Habenaria epipactidea*	LC
Orchidaceae	*Habenaria filicornis*	LC
Orchidaceae	*Habenaria nyikana*	LC
Orchidaceae	*Habenaria schimperiana*	LC
Pedaliaceae	*Harpagophytum zeyheri subsp. zeyheri*	LC
Poaceae	*Harpochloa falx*	LC
Scrophulariaceae	*Hebenstretia angolensis*	LC
Asteraceae	*Helichrysum difficile*	LC
Asteraceae	*Helichrysum mixtum*	LC
Asteraceae	*Helichrysum rugulosum*	LC
Asteraceae	*Helichrysum stenopterum*	LC
Poaceae	*Heteropogon contortus*	LC
Poaceae	*Hyparrhenia anamesa*	LC
Asteraceae	*Hypochaeris radicata*	LC
Fabaceae	*Indigofera melanadenia*	LC
Cyperaceae	*Isolepis setacea*	LC
Juncaceae	*Juncus dregeanus subsp. dregeanus*	LC
Juncaceae	*Juncus lomatophyllus*	LC
Aiozazeae	***Khadia carolinensis***	**VU**
Asteraceae	*Lactuca inermis*	LC
Hyacinthaceae	*Ledebouria cooperi*	LC
Poaceae	*Leersia hexandra*	LC
Poaceae	*Leptochloa fusca*	LC
Hyacinthaceae	***Merwilla natalensis***	**NT**
Geraniaceae	*Monsonia angustifolia*	LC
Amaryllidaceae	*Nerine rehmannii*	LC
Nymphaeaceae	*Nymphaea nouchali*	LC
Oleaceae	*Olea europaea**	LC
Ophioglossaceae	*Ophioglossum polyphyllum*	LC

Family	Species Name	IUCN Status
Asteraceae	*Osteospermum muricatum subsp. muricatum*	LC
Geraniaceae	*Pelargonium luridum*	LC
Rubiaceae	*Pentanisia angustifolia*	LC
Caryophyllaceae	*Pollichia campestris*	LC
Polygalaceae	*Polygala africana*	LC
Polygalaceae	*Polygala hottentotta*	LC
Asteraceae	*Pseudognaphalium oligandrum*	LC
Asteraceae	*Pulicaria scabra*	LC
Ricciaceae	*Riccia stricta*	LC
Asteraceae	*Schistostephium crataegifolium*	LC
Gentianaceae	*Sebaea grandis*	LC
Scrophulariaceae	*Selago densiflora*	LC
Asteraceae	*Seriphium plumosum*	LC
Poaceae	*Setaria sphacelata var. torta*	LC
Solanaceae	*Solanum elaeagnifolium*	LC
Solanaceae	*Solanum lichtensteinii*	LC
Solanaceae	*Solanum nigrum*	LC
Solanaceae	*Solanum pseudocapsicum*	LC
Orobanchaceae	*Striga asiatica*	LC
Lamiaceae	*Syncolostemon pretoriae*	LC
Asteraceae	*Tagetes minuta**	LC
Asphodelaceae	*Trachyandra reflexipilosa*	LC
Poaceae	*Tristachya leucothrix*	LC
Fabaceae	*Vachellia tenuispina*	LC
Campanulaceae	*Wahlenbergia banksiana*	LC
Campanulaceae	*Wahlenbergia undulata*	LC
Leguminosae-Papilionoideae	*Zornia linearis*	LC

Appendix B: Expected Mammal Species

Family	Scientific Name	Common Name	Red List Category
Bovidae	*Aepyceros melampus*	Impala	LC
Bovidae	*Connochaetes gnou*	Black Wildebeest	LC
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	LC
Bovidae	*Oryx gazella*	Gemsbok	LC
Bovidae	*Ourebia ourebi*	Oribi	EN
Bovidae	*Pelea capreolus*	Vaal Rhebok	NT
Bovidae	*Redunca arundinum*	Southern Reedbuck	LC
Bovidae	*Redunca fulvorufula*	Mountain Reedbuck	LC
Bovidae	*Sylvicapra grimmia*	Bush Duiker	LC
Bovidae	*Syncerus caffer*	African Buffalo	LC
Bovidae	*Taurotragus oryx*	Common Eland	LC
Bovidae	*Tragelaphus scriptus*	Bushbuck	LC
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	LC
Canidae	*Canis sp.*	Jackals and Wolves	
Canidae	*Canis mesomelas*	Black-backed Jackal	LC
Canidae	*Vulpes chama*	Cape Fox	LC
Equidae	*Equus quagga*	Plains Zebra	LC
Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	NT
Felidae	*Caracal caracal*	Caracal	LC
Felidae	*Leptailurus serval*	Serval	NT
Felidae	*Panthera pardus*	Leopard	VU
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	LC
Hyaenidae	*Proteles cristata*	Aardwolf	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC
Leporidae	*Lepus saxatilis*	Scrub Hare	LC
Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	LC
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	LC
Muridae	*Lemniscomys rosalia*	Single-Striped Lemniscomys	LC
Muridae	*Mastomys natalensis*	Natal Mastomys	LC
Muridae	*Otomys angoniensis*	Angoni Vlei Rat	LC

Family	Scientific Name	Common Name	Red List Category
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	LC
Mustelidae	*Aonyx capensis*	African Clawless Otter	NT
Mustelidae	*Ictonyx striatus*	Striped Polecat	LC
Mustelidae	*Mellivora capensis*	Honey Badger	LC
Nesomyidae	*Dendromus mystacalis*	Chestnut African Climbing Mouse	LC
Orycteropodidae	*Orycteropus afer*	Aardvark	LC
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	LC
Soricidae	*Crocidura flavescens*	Greater Red Musk Shrew	LC
Soricidae	*Myosorex varius*	Forest Shrew	LC
Suidae	*Phacochoerus africanus*	Common Warthog	LC
Viverridae	*Genetta tigrina*	Cape Genet (Cape Large-spotted Genet)	LC

Appendix C: Expected Reptile Species

Family	Scientific Name	Common Name	Red List Category
Agamidae	*Agama atra*	Southern Rock Agama	LC
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	LC
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	LC
Cordylidae	*Pseudocordylus melanotus melanotus*	Common Crag Lizard	LC
Elapidae	*Hemachatus haemachatus*	Rinkhals	LC
Gekkonidae	*Pachydactylus affinis*	Transvaal Gecko	LC
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	LC
Lamprophiidae	*Aparallactus capensis*	Black-headed Centipede-eater	LC
Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	LC
Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	LC
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	LC
Lamprophiidae	*Pseudaspis cana*	Mole Snake	LC
Scincidae	*Acontias gracilicauda*	Thin-tailed Legless Skink	LC
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	LC
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	LC

Appendix D: Expected Amphibian Species

Family	Species	Common Name	Red List Category
Bufonidae	*Sclerophrys capensis*	Raucous Toad	LC
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	LC
Bufonidae	*Sclerophrys pusilla*	Flatbacked Toad	LC
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	LC
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	LC
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	LC
Ptychadenidae	*Ptychadena porosissima*	Striped Grass Frog	LC
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	LC
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	LC
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	LC
Pyxicephalidae	*Cacosternum nanum*	Bronze Caco	LC
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	LC
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	LC
Pyxicephalidae	*Tomopterna sp.*		LC
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	LC
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	LC
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	LC
Hyperoliidae	*Afrixalus fornasinii*	Fornasini spiny reed frog	VU
Brevicipitidae	*Breviceps sopranus*	Whistling rain frog	VU
Heleophrynidae	*Heleophryne natalensis*	Natal Ghost Frog	VU
Hemisotidae	*Hemisus guttatus*	Spotted snout-burrower	VU
Hyperoliidae	*Hyperolius semidiscus*	Yellow-striped Reed Frog	VU
Pyxicephalidae	*Pyxicephalus adspersus*	Giant African Bullfrog	NT

Appendix E: Expected Lepidoptera Species

Family	Species	Common Name	Red List Category
EREBIDAE	*Grammodes euclidioides subsp euclidioides*		Not listed
GEOMETRIDAE	*Chiasmia simplicilinea*	Oblique Peacock	LC
GEOMETRIDAE	*Rhodometra sacraria*		LC
HESPERIIDAE	*Afrogegenes sp.*		LC
HESPERIIDAE	*Borbo borbonica borbonica*	Olive-haired swift	LC
HESPERIIDAE	*Coeliades pisistratus*	Two-pip policeman	LC
HESPERIIDAE	*Metisella meninx*	Marsh sylph	LC
HESPERIIDAE	*Pelopidas mathias*	Black-branded swift	LC
LYCAENIDAE	*Chilades trochylus*	Grass jewel blue	LC
LYCAENIDAE	*Lampides boeticus*	Pea blue	LC
LYCAENIDAE	*Leptotes sp.*		LC
LYCAENIDAE	*Zizeeria knysna knysna*	African grass blue	LC
NOCTUIDAE	*Acontia caffraria*		Not listed
NYMPHALIDAE	*Acraea natalica*	Black-based acraea	LC
NYMPHALIDAE	*Danaus chrysippus orientis*	African plain tiger	LC
NYMPHALIDAE	*Hypolimnas misippus*	Common diadem	LC
NYMPHALIDAE	*Junonia hierta cebrene*	Yellow pansy	LC
NYMPHALIDAE	*Junonia oenone oenone*	Dark blue pansy	LC
NYMPHALIDAE	*Junonia orithya madagascariensis*	African blue pansy	LC
NYMPHALIDAE	*Telchinia rahira rahira*	Marsh telchinia	LC
NYMPHALIDAE	*Telchinia serena*	Dancing telchinia	LC
NYMPHALIDAE	*Vanessa cardui*	Painted lady	LC
PIERIDAE	*Belenois aurota*	Pioneer caper white	LC
PIERIDAE	*Catopsilia florella*	African migrant	LC
PIERIDAE	*Eurema brigitta brigitta*	Broad-bordered grass yellow	LC
PIERIDAE	*Pontia helice helice*	Southern meadow white	LC
SPHINGIDAE	*Cephonodes hylas virescens*		Not listed
SPHINGIDAE	*Macroglossum trochilus*		Not listed

Appendix F: Expected Bird Species

Common Group	Common Name	Scientific Name	IUCN Status
Bishop	Southern Red	*Euplectes orix*	LC
Bishop	Yellow-crowned	*Euplectes afer*	LC
Bokmakierie	Bokmakierie	*Telophorus zeylonus*	LC
Bulbul	Dark-capped	*Pycnonotus tricolor*	LC
Buzzard	Jackal	*Buteo rufofuscus*	LC
Buzzard	Steppe	*Buteo vulpinus*	LC
Canary	Black-throated	*Crithagra atrogularis*	LC
Canary	Yellow-fronted	*Crithagra mozambicus*	LC
Chat	Anteating	*Myrmecocichla formicivora*	LC
Cisticola	Cloud	*Cisticola textrix*	LC
Cisticola	Levaillant's	*Cisticola tinniens*	LC
Cisticola	Wing-snapping	*Cisticola ayresii*	LC
Cisticola	Zitting	*Cisticola juncidis*	LC
Coot	Red-knobbed	*Fulica cristata*	LC
Cormorant	Reed	*Phalacrocorax africanus*	LC
Cormorant	White-breasted	*Phalacrocorax carbo*	LC
Crow	Pied	*Corvus albus*	LC
Cuckoo	Diderick	*Chrysococcyx caprius*	LC
Darter	African	*Anhinga rufa*	LC
Dove	Laughing	*Streptopelia senegalensis*	LC
Dove	Red-eyed	*Streptopelia semitorquata*	LC
Duck	African Black	*Anas sparsa*	LC
Duck	Maccoa	*Oxyura maccoa*	LC
Duck	White-backed	*Thalassornis leuconotus*	LC
Duck	Yellow-billed	*Anas undulata*	LC
Egret	Cattle	*Bubulcus ibis*	LC
Egret	Yellow-billed	*Egretta intermedia*	LC
Falcon	Amur	*Falco amurensis*	LC
Fiscal	Common (Southern)	*Lanius collaris*	LC
Francolin	Grey-winged	*Scleroptila africanus*	LC

Common Group	Common Name	Scientific Name	IUCN Status
Goose	Egyptian	*Alopochen aegyptiacus*	LC
Goose	Spur-winged	*Plectropterus gambensis*	LC
Grassbird	Cape	*Sphenoeacus afer*	LC
Grebe	Little	*Tachybaptus rucicollis*	LC
Guineafowl	Helmeted	*Numida meleagris*	LC
Hamerkop	Hamerkop	*Scopus umbretta*	LC
Heron	Black-headed	*Ardea melanocephala*	LC
Ibis	Glossy	*Plegadis falcinellus*	LC
Ibis	Hadeda	*Bostrychia hagedash*	LC
Ibis	Southern Bald	*Geronticus calvus*	VU
Kite	Black-shouldered	*Elanus caeruleus*	LC
Lapwing	Black-winged	*Vanellus melanopterus*	LC
Lapwing	Blacksmith	*Vanellus armatus*	LC
Lapwing	Crowned	*Vanellus coronatus*	LC
Lark	Red-capped	*Calandrella cinerea*	LC
Lark	Spike-heeled	*Chersomanes albofasciata*	LC
Longclaw	Cape	*Macronyx capensis*	LC
Martin	Banded	*Riparia cincta*	LC
Martin	Brown-throated	*Riparia paludicola*	LC
Martin	Rock	*Hirundo fuligula*	LC
Masked-weaver	Southern	*Ploceus velatus*	LC
Moorhen	Common	*Gallinula chloropus*	LC
Mousebird	Speckled	*Colius striatus*	LC
Myna	Common	*Acridotheres tristis*	LC
Pigeon	Speckled	*Columba guinea*	LC
Pipit	African	*Anthus cinnamomeus*	LC
Plover	Three-banded	*Charadrius tricollaris*	LC
Pochard	Southern	*Netta erythrophthalma*	LC
Quail	Common	*Coturnix coturnix*	LC
Quailfinch	African	*Ortygospiza atricollis*	LC

Common Group	Common Name	Scientific Name	IUCN Status
Quelea	Red-billed	*Quelea quelea*	LC
Reed-warbler	Great	*arundinaceus*	LC
Robin-chat	Cape	*Cossypha caffra*	LC
Sandpiper	Wood	*Tringa glareola*	LC
Secretarybird	Secretarybird	*Sagittarius serpentarius*	VU (NT) - MBSP
Seedeater	Streaky-headed	*Crithagra gularis*	LC
Shoveler	Cape	*Anas smithii*	LC
Sparrow	Cape	*Passer melanurus*	LC
Sparrow	House	*Passer domesticus*	LC
Sparrow	Southern Grey-headed	*Passer diffusus*	LC
Spurfowl	Swainson's	*Pternistis swainsonii*	LC
Starling	Pied	*Spreo bicolor*	LC
Stonechat	African	*Saxicola torquatus*	LC
Stork	White	*Ciconia ciconia*	LC
Sunbird	Amethyst	*Chalcomitra amethystina*	LC
Swallow	Barn	*Hirundo rustica*	LC
Swallow	Greater Striped	*Hirundo cucullata*	LC
Swallow	White-throated	*Hirundo albigularis*	LC
Swift	Common	*Apus apus*	LC
Swift	Little	*Apus affinis*	LC
Swift	White-rumped	*Apus caffer*	LC
Teal	Hottentot	*Anas hottentota*	LC
Teal	Red-billed	*Anas erythrorhyncha*	LC
Tern	Whiskered	*Chlidonias hybrida*	LC
Tern	White-winged	*Chlidonias leucopterus*	LC
Thick-knee	Spotted	*Burhinus capensis*	LC
Turtle-dove	Cape	*Streptopelia capicola*	LC
Wagtail	Cape	*Motacilla capensis*	LC
Warbler	Dark-capped Yellow	*Chloropeta natalensis*	LC
Warbler	Willow	*Phylloscopus trochilus*	LC

Common Group	Common Name	Scientific Name	IUCN Status
Waxbill	Common	*Estrilda astrild*	LC
Weaver	Cape	*Ploceus capensis*	LC
Wheatear	Mountain	*Oenanthe monticola*	LC
White-eye	Cape	*Zosterops virens*	LC
Whydah	Pin-tailed	*Vidua macroura*	LC
Widowbird	Fan-tailed	*Euplectes axillaris*	LC
Widowbird	Long-tailed	*Euplectes progne*	LC
Wryneck	Red-throated	*Jynx ruficollis*	LC

Appendix G: Impact Assessment Methodology

Impact Assessment Methodology

Details of the impact assessment methodology used to determine the significance of impacts to fauna and flora is provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts.

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 17-1. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts. Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this Impact Assessment Report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 17-3, which is extracted from Table 17-2. The description of the significance ratings is discussed in Table 17-3. It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 17-1: Impact Assessment Parameter Ratings

Rating	Intensity/ Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to highly sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity/ Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to physical or biological resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity/ Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources of low to moderately sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity/ Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 17-2: Probability/Consequence Matrix

Probability \ Significance	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Consequence

Table 17-3: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a significant and usually a long-term change to the (natural and / or social) environment and result in major changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)