APPENDIX C -
SPECIALIST IMPACT ASSESSMENTS

APPENDIX C1 –
RIVER AND WETLAND ECOSYSTEM ASSESSMENT

PROPOSED DEVELOPMENT OF THE ESKOM MESONG 400KV LOOP IN LOOP OUT POWERLINE PROJECT, GAUTENG PROVINCE

RIVER AND WETLAND ASSESSMENT REPORT

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REVISIONS TRACKING TABLE

CES Report Revision and Tracking Schedule

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Client Name & Address:	Eskom Holdings Soc Ltd Megawatt Park, Maxwell Drive, Sandton, 2000			
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Aidan obtained his MSc in Environmental Science (*Cum laude*) from Rhodes University, having conducted research on the spatio-temporal dynamics of *Acacia dealbata* invasions and broader land-use and cover changes in the northern Eastern Cape, funded through a study bursary awarded by the Agricultural Research Council (ARC). Prior to this, he obtained his BSc Honours in Geographical and Environmental Sciences (*Cum laude*) from the University of Pretoria, studying plant ecology and EIA methodology amongst others. Since joining CES in 2018, Aidan has been involved in several projects, including Basic Assessments, Full Scoping and Environmental Impact Assessments, Environmental Amendment Applications, Environmental Audits and Terrestrial Biodiversity Assessments. He is registered with the South African Council for Natural Scientific Professions (SACNASP) as a Candidate Natural Scientist and with the International Association for Impact Assessments (IAIA). Aidan received his certificate of competence in wetland assessments after completing the Tools for Wetland Assessment (TWA) Course in 2020, hosted by Rhodes University in association with GroundTruth, The Water Research Commission and Verdant Environmental. He has since been involved in a number of wetland assessments under the mentorship of Mr Ryan Edwards of Verdant Environmental.

Declaration of Independence

This is to certify that the following report has been prepared as per the requirements of:

- Section 32 (3) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental Impact Assessment Regulations 2017 as per Government Notice No. 40772 Government Gazette, 4 December 2014 (as amended); and
- The Department of Human Settlements, Water & Sanitation for Water Use Licensing and wetland/aquatic assessment, as outlined in the 'Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals' contained in the Government Gazette No. 40713 of 24 March 2017.

I, **Aidan Gouws**, hereby declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Forestry, Fisheries and the Environment (DFFE) and Department of Human Settlements, Water and Sanitation (DHSWS).

Signed: 

Date: 13th January 2022

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SACNASP Field of Practice	Environmental Science
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Ryan is a wetland ecosystem specialist and environmental scientist with thirteen (13) years of experience in the natural scientific and environmental management consulting sector. His core field of focus, specialisation and passion is wetland and riparian ecosystem ecology and has conducted over 100 specialist assessments for a wide variety of clients and sectors in South Africa. Ryan also has over ten (10) years of experience in wetland rehabilitation and management, wetland offset planning and implementation and vegetation assessments. Ryan is one of the leading wetland ecologists in the field of wetland offset planning and implementation in SA and has been involved in several high-profile offset projects and the development of novel offset solutions. Ryan's highest qualification is a Master of Science (MSc) in Environmental Science (Research Masters) and his Masters dissertation was on wetland geomorphology. Ryan is currently accredited as a professional natural scientist by the South African Council for Natural Scientific Professions (SACNASP) under the field of practice – 'environmental science'.

Declaration of Independence

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I, **Ryan Edwards**, hereby declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Forestry, Fisheries and the Environment (DFFE) and Department of Human Settlements, Water and Sanitation (DHSWS).

Signed:

Date: 13th January 2022

Please refer to the Curricula vitae in Appendix A for more information.

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GLOSSARY OF TERMS

TERM	DEFINITION
Alien vegetation	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome -usually international in origin.
Alluvial soil	A deposit of sand, mud, etc. formed by flowing water, or the sedimentary matter deposited thus within recent times, especially in the valleys of large rivers.
Biodiversity	The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Buffer	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment	The area contributing to runoff at a particular point in a river system.
Chroma	The relative purity of the spectral colour which decreases with increasing greyness.
Delineation (of a wetland)	To determine the boundary of a wetland based on soil vegetation and/or hydrological indicators.
Ecoregion	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Facultative species	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas.
Groundwater	Subsurface water in the saturated zone below the water table.
Hydromorphic soil	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobic soils).
Hydrology	The study of the occurrence, distribution and movement of water over, on and under the land surface.
Hydromorphy	A process of gleying and mottling resulting from the intermittent or permanent presence of excess water in the soil profile.
Indigenous vegetation	Vegetation occurring naturally within a defined area.
Obligate species	Species almost always found in wetlands (>99% of occurrences).
Perennial	Flows all year round.
Ramsar	The Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilisation of wetlands, i.e., to stem the progressive encroachment on and loss of wetlands now and in the future, recognising the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. It is named after the city of Ramsar in Iran, where the Convention was signed in 1971.

LIST OF ACRONYMS

ACRONYM	TERM
CBA	Critical Biodiversity Area
CES	CES Environmental and Social Advisory Services
ECO	Environmental Control Officer
EI	Ecological Importance
ES	Ecological Sensitivity
ESA	Ecological Support Area
GIS	Geographical Information System
IAP	Invasive Alien Plant
IUCN	International Union for Conservation of Nature
NEMBA	National Environmental Management Biodiversity Act
NWBMA	North West Biodiversity Management Act
NWBSP	North West Biodiversity Sector Plan
PES	Present Ecological State
QDS	Quarter Degree Square
SA	South Africa
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SQR	Sub Quaternary Reach
TOPS	Threatened or Protected Species

1 INTRODUCTION

1.1 PROJECT LOCATION AND DESCRIPTION

Eskom Holdings SOC Ltd is proposing the development of 2 x 1 km 400 kV loop-in and loop-out overhead transmission lines (LILO). The proposed 400 kV lines are located within a Strategic Transmission Corridor (STC). The proposed LILO is located near Kempton Park West on the boarder of Johannesburg and Ekurhuleni municipalities. Locality details are provided in Table 1.1 below. Figure 1.1 illustrates the project location.

Table 1.1. Locality details of the proposed project.

GEOGRAPHICAL ENTITY	LOCATION	
Province	Gauteng	
Metropolitan Municipality	City of Johannesburg and City of Ekurhuleni	
Nearest Towns	Kempton Park (5 km east), Tembisa (8 km north) Sandton (13 km west)	
Ward Number(s)	32 (CoJ), 13 and 17 (CoE)	
Farm portions	• Zuurfontein 33 IR, Portions 16, 26, 125, 129, 141, 143, 152, 331, 425, 427, 429, RE/218, RE/24, RE/391 • Klipfontein 12 IR, Portions RE/2, 96 • Modderfontein 34 IR, Portion RE	
CO-ORDINATES	**LATITUDE**	**LONGITUDE**
EXISTING APO-CRO 106	26°5’21.3”S	28°11’10.8”E
EXISTING APO-CRO 107	26°5’23.0”S	28°11’5.2”E
EXISTING APO-CRO 108	26°5’29.3”S	28°11’2.2”E
EXISTING APO-CRO 109	26°5’32.9”S	28°10’58.3”E
Existing Ese-Jup 70	26°5’33.3”S	28°10’58.9”E
Existing Ese-Jup 71	26°5’29.6”S	28°11’2.9”E
Existing Ese-Jup 72	26°5’23.6”S	28°11’5.8”E
Existing Ese-Jup 73	26°5’22.1”S	28°11’10.9”E
GANTRY 1	26°5’2.5”S	28°10’51.6”E
GANTRY 2	26°5’3.6”S	28°10’50.6”E
SEB 1	26°6’54.3”S	28°11’27.0”E
SEB 2	26°6’55.5”S	28°11’27.4”E
SEB 3	26°6’51.0”S	28°11’28.3”E
SEB 4	26°6’43.5”S	28°11’24.7”E
SEB 5	26°6’35.5”S	28°11’20.8”E
SEB 6	26°6’30.2”S	28°11’22.3”E
SEB 7	26°6’27.2”S	28°11’33.5”E
SEB 8	26°6’20.3”S	28°11’39.0”E
SEB 9	26°6’13.1”S	28°11’44.8”E
SEB 10	26°6’6.7”S	28°11’43.3”E
SEB 11	26°5’57.5”S	28°11’39.7”E
SEB 12	26°5’48.3”S	28°11’36.0”E
SEB 13	26°5’40.8”S	28°11’31.8”E
SEB 14	26°5’35.9”S	28°11’22.8”E
SEB 15	26°5’30.7”S	28°11’13.2”E
SEB 16	26°5’27.0”S	28°11’6.5”E
SEB 17	26°5’25.5”S	28°11’4.9”E
SEB 18	26°5’27.0”S	28°11’4.3”E
TOWER 1	26°5’4.8”S	28°10’54.7”E
TOWER 2	26°5’5.1”S	28°10’51.8”E

TOWER 3	26°5’7.9”S	28°10’53.6”E
TOWER 4	26°5’13.2”S	28°10’53.9”E
TOWER 5	26°5’19.5”S	28°10’58.4”E
TOWER 6	26°5’25.1”S	28°11’2.4”E
TOWER 7	26°5’25.0”S	28°11’4.0”E
TOWER 8	26°5’26.3”S	28°11’3.6”E

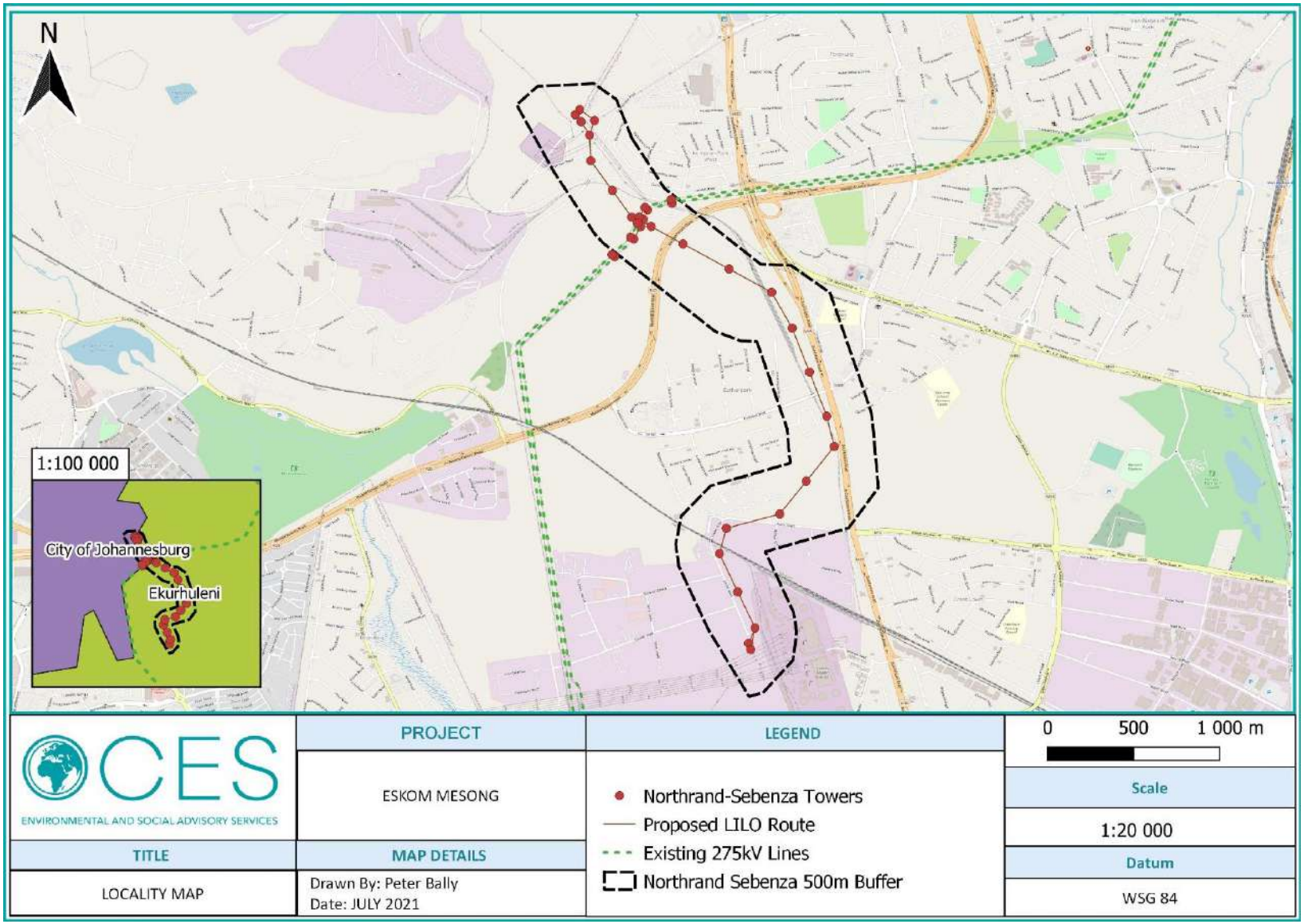

Figure 1.1: Location Map of the proposed Mesong 400kV LILO, Gauteng

1.2 PURPOSE OF THIS REPORT

In accordance with the National Environmental Management Act, 1998 (Act No. 107 0f 1998) (NEMA) and the NEMA Environmental Impact Assessment (EIA) Regulations (2017), the issuing of an Environmental Authorisation (EA) requires the undertaking of a Basic Assessment (BA) process, with associated Public Participation Process (PPP) and specialist studies. The need for a particular specialist study is determined based on the environmental sensitivities of the site, identified using the Department of Forestry, Fisheries and the Environment's (DFFE's) national web-based environmental screening tool.

The screening tool identified the site footprint as falling within an area of "Low" for Aquatic Biodiversity. This triggered the need for an Aquatic Biodiversity Compliance Statement Assessment, as per the Biodiversity Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity (hereafter referred to as the "Aquatic Biodiversity Protocol"), published in Government Notice No. 320 on 20 March 2020.

Additionally, in accordance with the Section 21 of the National Water Act (NWA), 1998 (Act 36 of 1998) and the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals 2017, a Wetland Delineation Report will be required in support of the General Authorisation (GA) application for water uses associated with development within 100 m of a watercourse or 500 m of a wetland.

1.3 SCOPE OF ASSESSMENT AND CONTENTS OF THE SPECIALIST REPORT

The specialist assessment sought to identify and delineate all watercourses within 100 m and wetlands within 500 m of the project site and assess these in terms of their health / functionality and functional / ecological importance. The terms of reference for the assessment were therefore specified as follows:

- Undertake a desktop assessment of the freshwater ecosystem (watercourse and wetland) context using available national and regional spatial datasets, assessments, and classifications;
- Undertake a desktop screening of all wetlands, rivers and other watercourses within 500m of the project site that are likely to be negatively impacted by the project and confirmation of the study area for infield investigation. The remaining watercourses within 500m were mapped and classified at a desktop level only;
- Delineate the wetlands and riparian zones according to the national wetland and riparian zone delineation guidelines (DWAF, 2005);
- Classify the wetlands and rivers according to the national aquatic ecosystem classification system (Ollis et al., 2013);
- Assess the importance of the ecosystem services provided by the delineated wetland and riparian zones;
- Assess of the Ecological Importance and Sensitivity (EIS) of the delineated wetlands and rivers using published assessment tools;

- Identify, describe and assess the potential and likely direct and indirect impacts of the project on local wetlands and rivers, including cumulative impacts;
- Provide the project design, construction phase and operational phase mitigation measures to avoid, minimize and/or rehabilitate the potential impacts;
- Assess the significance of the potential impacts of the project on wetland and river ecosystems using a structured assessment method;
- Assess the qualitative risk of the proposed development activities on wetlands and rivers using the DWS risk matrix for Section 21(c) and 21(i) water uses; and
- Determine any outright fatal flaws associated with the project.

The Aquatic Biodiversity Compliance Statement was conducted in accordance with the Aquatic Biodiversity Protocol (2020). This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on aquatic biodiversity for activities requiring EA. This protocol replaces the requirements of Appendix 6 of the EIA Regulations 2014, GN R. 982 (as amended), published under NEMA. Table 1.2 below indicates how the assessment complied with the requirements of the Aquatic Biodiversity Protocol, with reference to specific sections in this report.

Table 1.2: Requirements of an Aquatic Biodiversity Compliance Statement

AQUATIC BIODIVERSITY COMPLIANCE STATEMENT REPORT REQUIREMENTS		SECTION IN REPORT
3.3.	The compliance statement must contain, as a minimum, the following information:	
3.3.1.	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Page vi and Appendix A
3.3.2.	A signed statement of independence by the specialist;	Page vii-viii
3.3.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 3.2
3.3.4.	A baseline profile description of biodiversity and ecosystems of the site;	Chapter 3
3.3.5.	The methodology used to verify the sensitivities of the aquatic biodiversity features on the site including the equipment and modelling used where relevant;	Chapter 2
3.3.6.	In the case of a linear activity, confirmation from the aquatic biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;	Chapter 6
3.3.7.	Where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;	Chapter 6
3.3.8.	A description of the assumptions made as well as any uncertainties or gaps in knowledge or data; and	Section 2.6
3.3.9.	Any conditions to which this statement is subjected.	Chapter 6

This report was also compiled in accordance with the requirements of a Wetland Delineation Report, as outlined in the, published under the National Water Act, 1998 (Act 36 of 1998) (Table 1.3).

Table 1.3: Requirements of a Wetland Delineation Report

REQUIREMENTS OF A WETLAND DELINEATION REPORT		SECTION IN REPORT
1.	Introduction	Chapter 1
2.	Terms of reference	Section 1.3
3.	Knowledge gaps	Section 2.6
4.	Study area	Chapter 3
5.	Expertise of the specialist	Page vi
6.	Aims and objectives	Section 1.3
7.	Methodology	Chapter 0
7.1.	Wetland identification and mapping	Section 2.2
7.2.	Wetland delineation	Section 2.2.1
7.3.	Wetland functional assessment	Section 0
7.4.	Determining the ecological integrity of the wetlands	Section 2.3
7.5.	Determining the Present Ecological State of wetlands	Section 2.3
7.6.	Determining the Ecological Importance and Sensitivity of wetlands	Section 0
7.7.	Ecological classification and description	Section 2.2.2
8.	Results	Chapter 3
8.1.	Wetland delineation	Section 3.2.1
8.2.	Wetland unit identification	Section 3.2.1
8.3.	Wetland unit setting	Section 3.2.1
8.4.	Wetland soils	Section 3.2.1
8.5.	Description of wetland type	Section 3.2.1
8.6.	General functional description of wetland types	Section 0
8.7.	Wetland ecological functional assessment	Section 3.2.2
8.8.	The ecological health assessment of the affected area	Section 3.2.2
8.9.	The PES assessment of the remaining wetland areas	Section 3.2.2
8.10.	The EIS assessment of the remaining wetland areas	Chapter 4
9.	Impact assessment discussions	Section 6.1
10.	Conclusions and recommendations	Chapter 6
11.	References	Chapter 7

1.4 RELEVANT LEGISLATION

This specialist assessment was conducted in alignment with the regulatory and legislative requirements for environmental management in South Africa. The environmental legislation relevant to the proposed development is summarised in Table 1.4 below.

Table 1.4: Environmental legislation considered in the preparation of this report

LEGISLATION	DESCRIPTION	RELEVANCE
National Environmental Management Act (NEMA), 1998 (Act No. 108 of 1998)	The objective of NEMA is: *"To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith."* This report has been guided by the NEMA Principles detailed in Section 2 of the Act. NEMA introduces the "duty of care" concept, which is based on the policy of strict liability. This duty of care extends to the prevention, control and rehabilitation of significant	The undertaking of a specialist study, in this case, the aquatic and wetland study, in order to identify potential impacts on the aquatic environment and to recommend mitigation measures to minimise these impacts, complies with Section 28 of NEMA. The developer must apply the NEMA principles, the fair decision-making and conflict management procedures that are provided for in NEMA.

LEGISLATION	DESCRIPTION	RELEVANCE
	pollution and environmental degradation. It also dictates a duty of care to address emergency incidents of pollution. A failure to perform this duty of care may lead to criminal prosecution, and may lead to the prosecution of responsible persons, including companies, for the conduct of the legal persons.	
NEMA EIA Regulations (2014, as amended)	The NEMA EIA Regulations (2014, as amended) aim to avoid detrimental environmental impacts through the regulation of specific activities that cannot commence without prior environmental authorisation. Authorisation either requires a Basic Assessment or a Full Scoping and Environmental Impact Assessment, depending on the type of activity. These assessments specify mitigation and management guidelines to minimise negative environmental impacts and optimise positive impacts. Should any portion of an area be proposed for development (after proclamation) these Regulations should be consulted.	An application for Environmental Authorisation (as triggered by the EIA 2014 Regulations, as amended) is required to be submitted to the Competent Authority.
Aquatic Biodiversity Protocol (2020)	This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on aquatic biodiversity for activities requiring EA. This protocol replaces the requirements of Appendix 6 of the EIA Regulations 2014, GN R. 982 (as amended), published under NEMA.	The screening tool identified the site footprint as falling within an area of "Low" for Aquatic Biodiversity. This triggered the need for an Aquatic Biodiversity Compliance Statement. This assessment and report, complies with Aquatic Biodiversity Protocol.
National Water Act (36 of 1998)	Provides details of measures intended to ensure the comprehensive protection of all water resources, including the water reserve and water quality.	All necessary Water Use Licence Applications must be submitted to the Department of Human Settlements, Water and Sanitation for approval.
Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (2017)	In accordance with the Section 21 of the National Water Act (NWA), 1998 (Act 36 of 1998) and the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals 2017, a Wetland Delineation Report will be required in support of any GA application for water uses associated with development within 500m of a wetland.	This report was compiled in accordance with the requirements of a Wetland Delineation Report, as outlined in the Water Use Regulations.

2 ASSESSMENT METHODOLOGY

The aim of the study was to identify and delineate all watercourses within 100 m and wetlands within 500 m of the project site that are going to be measurably impacted by the project activities, evaluate these in terms of their present functionality and health, and assess the potential impacts and risks associated with the proposed development.

2.1 DATA COLLECTION AND ASSESSMENT APPROACH

2.1.1 DESKTOP ASSESSMENT

A desktop assessment of the project area was conducted in terms of current surface water classifications and biodiversity programmes and plans. This included the consideration of the following base data:

- Northern Cape Critical Biodiversity Areas (CBAs) (2016);
- North West Biodiversity Sector Plan (2015);
- The National Freshwater Ecosystem Priority Areas (NFEPA) project (2011 - 2014); and
- National Biodiversity Assessment (NBA) – South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (2018).

2.1.2 SITE ASSESSMENT

Upon the completion of the desktop assessment a site visit was undertaken to determine the actual condition of the watercourses within the study area. The site assessment was conducted concurrently with the Terrestrial Ecological Assessment on 20 August 2021, during the late winter season. The season during which the assessment was conducted heavily influenced the conditions on site at the time. The site falls within a summer rainfall area, with only 7 mm of precipitation typically falling in the month of August (Meteoblue, 2021). Additionally, the site assessment fell outside of the flowering season of most species, reducing the ease of identifying plant species.

Transects were conducted across the desktop-identified assessment units. The GPS coordinates were captured and a soil auger was used to extract soil to a depth of up to 50 cm. The soil and vegetation indicators were then used to determine the wetness zones and boundary of the wetlands, as described in Section 2.2.1 below.

2.2 DEFINING AND DESCRIBING AQUATIC ECOSYSTEMS

"*Wetland*" is a name given to a variety of ecosystems ranging from rivers, springs, seeps and mires in upper catchments, to midland marshes, pans and floodplains, coastal lakes, mangrove swamps and estuaries at the bottom of a catchment. These ecosystems all share the common primary driver of water and its prolonged presence is a fundamental determinant of soil characteristics, vegetation and animal life (DWAF, 2005). The National Water Act (Act No. 36, 1998 as amended in 2013) defines wetlands as:

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

Thus, wetlands must have one or more of the following characteristics:

- **Hydromorphic soils**: characteristic soils of prolonged saturation;
- **Hydrophytes**, at least occasionally: plants that are adapted to waterlogged and anaerobic soil conditions; and
- **High or perched water table,** at least occasionally: a high or perched water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

Wetland formation is controlled by geological, hydrological and topographical factors that encourage prolonged near surface flooding and soil saturation. These landforms form in parts of a catchment where the movement of water is slowed down or obstructed, causing soil to become temporarily, seasonally or permanently waterlogged.

Wetlands within the proposed development site and surrounding areas were defined and described using the Department of Water Affairs and Forestry (DWAF) Wetland Delineation Guidelines (2005), the National Wetland Classification System (NWCS, 2013), the National Biodiversity Assessment (NBA, 2018) and the National Freshwater Ecosystem Priority Areas (NFEPA, 2014).

2.2.1 RIPARIAN AND WETLAND DELINEATION

The DWAF (2005) guidelines for "a practical field procedure for delineation of wetlands and riparian areas" are recommended in Gazette No. 19182, Notice No. 1091 of the National Water Act, 1998. This guideline explains the field indicators and methods for determining whether an area is a wetland or a riparian area, and how to find its boundaries.

Riparian delineation refers to the determination and demarcation of the boundary of the riparian area/zone, defined as the outer edge of the macro-channel bank and associated vegetation (DWAF, 2005). Three indicators are used to delineate riparian areas, namely topography, vegetation, and alluvial soils and deposited material (DWAF, 2005). Topographically, the outer edge of the macro-channel bank provides a rough indication of the riparian area, with vegetation providing a more exact delineation of the riparian boundary (DWAF, 2005). The boundary of the riparian area is marked by a distinct transition in the structure and composition of vegetation from riparian to terrestrial (DWAF, 2005). Although less reliable without the support of topographical and vegetation indicators, the presence of alluvial soils and recently-deposited materials, such as sand, mud and vegetation debris, can also often be used to confirm the boundary of riparian areas (DWAF, 2005).

Wetland delineation refers to the determination and demarcation of the boundary of the wetland, defined as the outer edge of the temporary wetness zone. In wetland delineation there are three zones which are distinguished according to a changing frequency of saturation. These are the permanent, seasonal and temporary zone. Although the primary driver of a wetland is water, due to its dynamic nature water is not a very useful parameter for identifying the outer boundary of a wetland. What is needed is a method of identifying the indirect indicators of prolonged saturation by water. This includes wetland plants (hydrophytes) and wetland (hydromorphic) soils. Their presence or absence implies the frequency and duration of saturation and is a satisfactory indicator to classify the area as a wetland (DWAF, 2005). There are four important indicators that are used to define the boundaries of a wetland. The most important one is the soil wetness indicator with the terrain unit,

soil form and vegetation indicators acting as confirmation. Once a wetland is confirmed, the point where wetland indicators disappear is regarded as the edge of the wetland.

During the site visit, transects were conducted across the watercourses and wetlands within the proposed development site and surrounding areas, starting from the suspected centre of the wetland (i.e. lowest lying and wettest area) and moving outwards. Terrain, soil and vegetation characteristics were noted at each sample point.

2.2.1.1 WETLAND SOILS

Prolonged anaerobic soil conditions result in diagnostic soil features that are characteristic of hydric or hydromorphic soils that are used as the primary indicator of wetland occurrence and delineation in South Africa. The permanently wet zone is characterised by either near black, organic rich or medium to light grey ('gleyed') soil where prolonged saturation and anaerobic conditions result in the reduced rate of organic matter decomposition and organic matter accumulation, and in the reduction of iron and manganese that coats soil particles, which results in a loss of soil colour referred to as 'gleying'. The seasonally wet zone is characterised by dark to light grey soils as a result of mineral reduction but with an abundance of orange and black mottles formed by the repeated wetting (reduction of minerals) and drying (oxidisation of minerals) of the soils. Due to the period of saturation being shorter than seasonal zones, temporary zones are characterised by less soil gleying (i.e. less mineral reduction) and lower abundances of mottles.

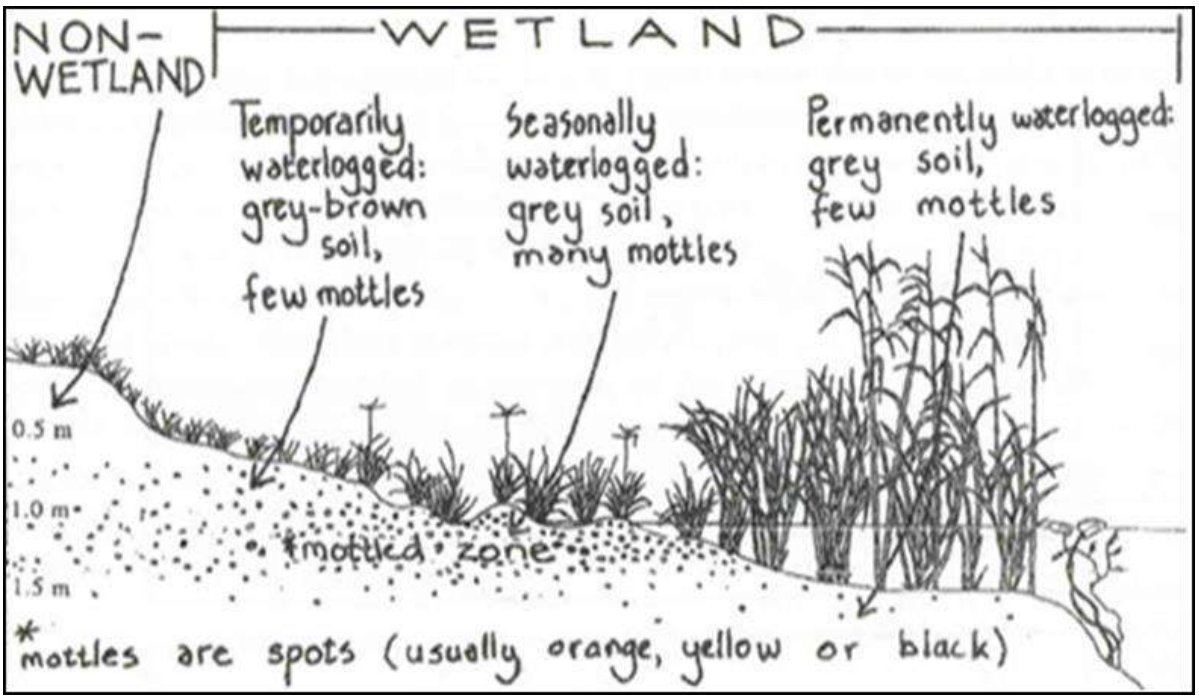

Figure 2.1: A cross-section through a wetland, indicating how the soil wetness and vegetation indicators change as one moves along a gradient of decreasing wetness, from the middle to the edge of the wetland (DWAF, 2005).

During the site visit, soils were examined in 10 cm horizon intervals to a maximum depth of 50 cm at each sample point along the transects. The abovementioned indicators were then used to determine the permanently, seasonally and temporarily wet zones of the wetland, and to distinguish these from

the surrounding terrestrial area. The sample points were then designated a wetness zone based on the soil (and vegetation) and the edge of the wetland was determined as the midpoint between the temporary wet zone and the surrounding terrestrial area.

2.2.1.2 WETLAND VEGETATION

Plant species which have adapted to purely terrestrial environments become stressed under periods of prolonged flooding and anaerobic conditions, whereas those adapted to purely aquatic environments may become stressed during periods of drying. Since tolerance to flooding is species-specific, one can distinguish between the following types of species under natural conditions:

- **Obligate** wetland species, which occur in wetlands >99% of the time;
- **Facultative positive** wetland species, which occur in wetlands 67-99% of the time;
- **Facultative** wetland species, which occur in wetlands 34-66% of the time;
- **Facultative negative** wetland species, which occur in wetlands 1-33% of the time; and
- **Terrestrial** species, which occur in occur in wetlands <1% of the time.

Species composition and the relative cover of obligate and facultative wetland plants are therefore used to confirm hydric or hydromorphic conditions. Hydric conditions are present if more than half the vegetation cover is comprised of obligate and/or facultative wetland plants, possibly present if the vegetation includes some wetland plants but the coverage is less than half, and absent if the vegetation includes no wetland plants.

During the site visit, the composition of species and the relative cover of obligate and facultative wetland plants were assessed at each sample point along the transects. The sample points were then designated a wetness zone based on the vegetation (and soil) indicators and the edge of the wetland was determined as the midpoint between the temporary wet zone and the surrounding terrestrial area.

2.2.2 WETLAND CLASSIFICATION

The National Wetland Classification System (NWCS) and NBA (2018) use hydrological and geomorphological traits to distinguish the direct factors that influence wetland function. This is presented as a 6-tiered structure with four spatially nested primary levels that are applied in a hierarchical manner between different wetland types on the basis of these direct factors (SANBI, 2009). These include:

- **Level 1:** Distinguishes between marine, estuarine and inland ecosystems based on the degree of connectivity the systems have with the ocean.
- **Level 2:** Categorises the regional wetland setting using a combination of biophysical attributes at the landscape level.
- **Level 3:** Assesses the topographical position of inland wetlands.
- **Level 4:** Concerns the hydrogeomorphic (HGM) units as defined as follows:
  - *Landform* - considering the shape and localised setting of the wetland;
  - *Hydrological characteristics* - nature of water movement into, through and out of the wetland; and
  - *Hydrodynamics* - the direction and strength of flow through the wetland.

The HGM unit is considered the focal point for NWCS as the upper levels mean to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, whilst the lower levels provide more descriptive detail. As wetlands are formed under the influence of geology, hydrology and topography it is necessary to note these features when delineating a wetland as follows:

- **Geology:** Geology influences the formation of a wetland by geological obstructions such as erosion resistant rock or impervious material close to the surface forcing groundwater to move close to or onto the soil surface.
- **Hydrology*:*** The water transfer mechanisms such as source, movement and exit are important features of a wetland.
- **Topography:** The topography of the landscape influences the likelihood of whether a wetland will form. For instance, under the right conditions, wetlands may form in floodplains, valley bottoms, hillslopes, depressions and coastal flats.

A range of 'hydro-geomorphic' types can be defined by considering the above features. Six HGM units are defined for South African inland wetlands (Ollis, et al., 2013):

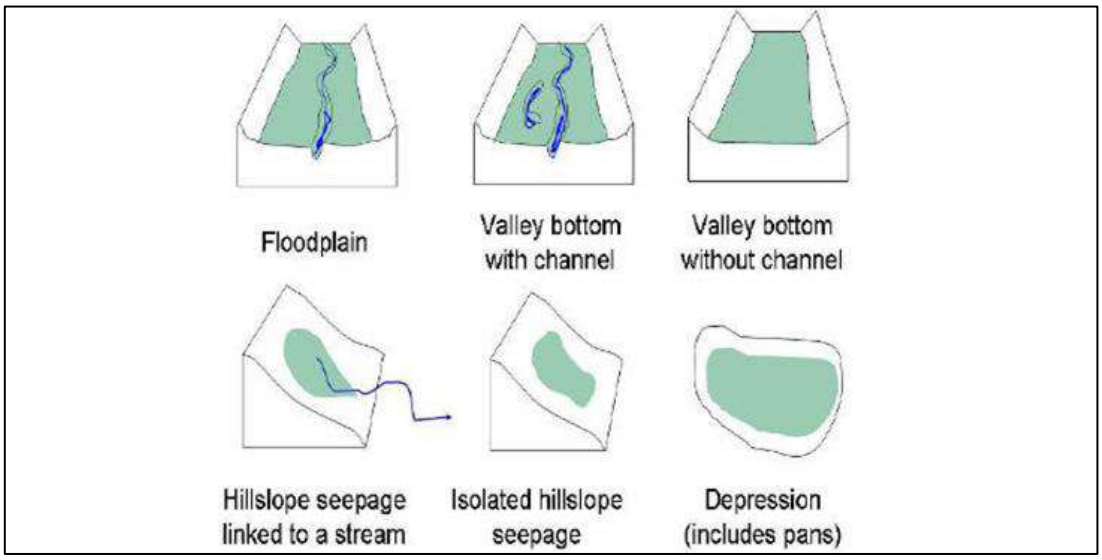

Figure 2.2: The HGM types for South African Inland wetlands (Ollis, et al., 2013).

The wetlands assessed during this study were classified according to their NWCS HGM types. Initially, this was done at the desktop-level, using the NBA (2018) and NFEPA (2011) spatial datasets for all natural and artificial wetlands occurring within 500 m of the assessment footprint. Based on the site assessment, only those wetlands which would likely be affected by the proposed development were further assessed. The classification of these wetlands was based on the existing NWCS HGM types (where available), as well as the consideration of their landforms, hydrological characteristics and hydrodynamics. The likely origins of these wetlands were also determined using historical aerial imagery.

2.3 PRESENT ECOLOGICAL STATE (PES) AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) ASSESSMENTS

The baseline PES / health and EIS of the wetlands were assessed using the WET-Health and WET-Ecoservices tools, respectively. These tools form part of the WET-Management Series, a suite of

"integrated tools that can be used to guide well-informed and effective wetland management and rehabilitation" (Dada, et al., 2007, p. 4), developed under the auspices of the Water Research Commission (WRC) of South Africa.

2.3.1 WET-HEALTH AND PRESENT ECOLOGICAL STATE ASSESSMENT

For all wetlands assessed, wetland PES was assessed using the Level 1 WET-Health tool (Version 2) (Macfarlane, et al., 2020). This assessment tool defines wetland health as the "*perceived deviation from a theoretical reference condition, where the reference condition is defined as the un-impacted condition in which ecosystems show little or no influence of human actions*" (Macfarlane, et al., 2020, p. i). A Level 1 Rapid Assessment involves evaluating specific indicators pertaining to four drivers of wetland health, namely hydrology, geomorphology, water quality and vegetation (Figure 2.3). The purposes of WET-Health are to aid users in understanding the ecological condition of the wetland and to identify the causes of degradation. The assessment criteria and information are specific to South Africa. The four drivers are assessed by taking into account the extent, intensity and magnitude of an impact which then produces a health score. Evaluation scores within each driver are then combined to produce an overall impact of activities on the wetland system which corresponds to a Present State health category that provides an impact score scale of 0-10 and associated health category (ecological state) from A-F (Table 2.1). Such categories represent natural, largely natural, moderately modified, largely modified, extensively modified, and critically modified.

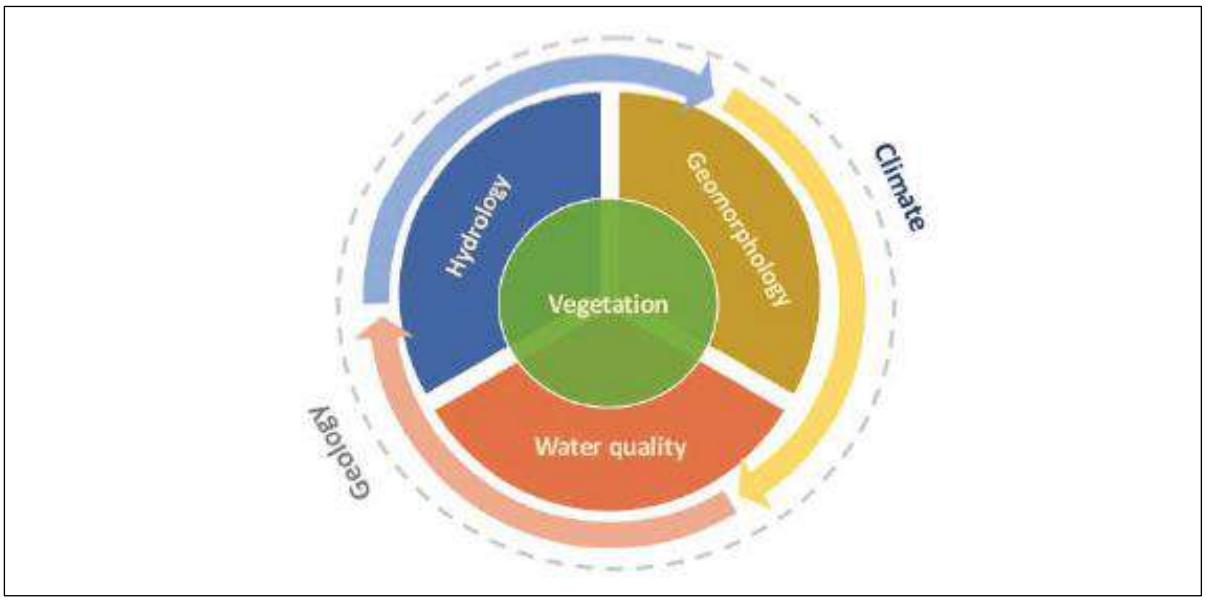

Figure 2.3: Four key drivers of Wetland PES considered in WET-Health v2 (Macfarlane, et al., 2020)

Table 2.1: Description of A-F ecological categories (Macfarlane, et al., 2020)

PES DESCRIPTION	COMBINED IMPACT SCORE	PES CATEGORY	LEVEL OF DISTURBANCE
Unmodified, natural.	0-0.9	**A**	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed
Largely natural with few modifications. A slight change in ecosystem processes is discernable and a small loss of natural habitats and biota may have taken place.	1-1.9	**B**	Some human-related disturbance, but mostly of low impact potential

PES DESCRIPTION	COMBINED IMPACT SCORE	PES CATEGORY	LEVEL OF DISTURBANCE
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2-3.9	**C**	Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	**D**	
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	**E**	Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	**F**	

The WET-Health Assessment also considers the likely trajectory of change based on the threats to or vulnerability of a wetland. Five categories of the Trajectory of Change include: large improvement, slight improvement, remains the same, slight decline and rapid decline. Overall health of the wetland is then presented by the calculated Present Ecological State scores and the most likely Trajectory of Change.

2.3.2 WET-ECOSERVICES (FUNCTIONAL ASSESSMENT)

Wetland Ecosystem Services were assessed for all wetlands using the Level 2 WET-EcoServices tool (Kotze, et al., 2020). The tool provides guidelines for scoring the importance of a wetland in delivering each of 15 different ecosystem services. The first step is to characterise wetlands according to their hydrogeomorphic setting. Ecosystem service delivery is then assessed either at Level 1, based on existing knowledge or at Level 2, based on a field assessment of key descriptors. Where there are characteristics relating to effectiveness and opportunity WET-Ecoservices calculates an average for each of the groups and an overall score is calculated from these averages. The overall score is then rated according to the table below. The Ecoservices that are assessed are illustrated in Table 2.2.

Table 2.2: Relative importance of ecosystem services

SCORE	0-0.79	0.8-1.29	1.3-1.69	1.7-2.29	2.3-2.69	2.7-3.19	3.2-4.0
Relative importance	Very low	Low	Moderately low	Moderate	Moderately high	High	Very high

Table 2.3: Ecosystem services included in, and assessed by, WET-Ecoservices (Kotze, et al., 2020).

Ecosystem services supplied by wetlands	Indirect benefits	Regulating and supporting benefits	Flood attenuation	The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream
			Streamflow regulation	Sustaining streamflow during low flow periods
			Water quality enhancement benefits: Sediment trapping	The trapping and retention in the wetland of sediment carried by runoff waters
			Water quality enhancement benefits: Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters
			Water quality enhancement benefits: Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters
			Water quality enhancement benefits: Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts) carried by runoff waters
			Water quality enhancement benefits: Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation.
			Carbon storage	The trapping of carbon by the wetland, principally as soil organic matter
	Direct benefits	Biodiversity maintenance[2]		Through the provision of habitat and maintenance of natural process by the wetland, a contribution is made to maintaining biodiversity
		Provisioning benefits	Provision of water for human use	The provision of water extracted directly from the wetland for domestic, agriculture or other purposes
			Provision of harvestable resources	The provision of natural resources from the wetland, including livestock grazing, craft plants, fish, etc.
			Provision of cultivated foods	The provision of areas in the wetland favourable for the cultivation of foods
		Cultural benefits	Cultural heritage	Places of special cultural significance in the wetland, e.g. for baptisms or gathering of culturally significant plants
			Tourism and recreation	Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife
			Education and research	Sites of value in the wetland for education or research

2.3.3 ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) ASSESSMENT

The Ecological Importance and Sensitivity (EIS) assessment is comprised of two metrics, namely:

- **Ecological Importance (EI)**, which is the expression of the importance of wetlands and rivers in terms of the maintenance of biological diversity and ecological functioning at a local and landscape level (Kotze, et al., 2020); and
- **Ecological Sensitivity (S)**, which refers to ecosystem fragility or the ability to resist or recover from disturbance (Kotze, et al., 2020).

The Wetland EIS tool was used to assess the ecological importance and sensitivity of the delineated wetlands. The EIS scores for the wetlands within 500 m of the proposed site was determined as the highest score amongst their EI scores, i.e. biodiversity maintenance, regulating services, and provisioning and cultural services importance scores (calculated using the WET-Ecoservices Tool), and their ES score (Kotze, et al., 2020). EIS scores were interpreted using the categories and descriptions provided in Table 2.4 below.

Table 2.4. Wetland EIS rating categories

IMPORTANCE CATEGORY	
Very Low	0-0.79
Low	0.8 – 1.29
Moderately-Low	1.3 – 1.69
Moderate	1.7 – 2.29
Moderately-High	2.3 – 2.69
High	2.7 – 3.19
Very High	3.2 - 4.0

2.4 RECOMMENDED ECOLOGICAL CATEGORY (REC)

The recommended ecological category (REC) is the target or desired state of freshwater ecosystems required to meet water resource management objectives and quality targets. It is determined through the consideration of the PES, EIS and realistic opportunities to improve the PES that is driven by the context / setting.

The modus operandi followed by DWAF's Directorate: Resource Directed Measures (RDM) is that if the EIS is high or very high, the ecological management objective should be to improve the condition of the watercourse (Kleynhans & Louw, 2007). However, the causes related to a PES should also be considered to determine if improvement is realistic and attainable (Kleynhans & Louw, 2007). This relates to whether the problems in the catchment can be addressed and mitigated (Kleynhans & Louw, 2007). If the EIS is evaluated as moderate or low, the ecological aim should be to maintain the river in its PES (Kleynhans & Louw, 2007). Within the Ecological Reserve context, Ecological Categories A to D can be recommended as future states depending on the EIS and PES (Kleynhans & Louw, 2007). Ecological Categories E and F PES are regarded as ecologically unacceptable, and remediation is needed if possible (Kleynhans & Louw, 2007). A generic matrix for the determination of RECs for water resources is shown in Table 2.5 below.

Table 2.5: Generic matrix for the determination of REC for water resources

CATEGORY			EIS			
			Very high	High	Moderate	Low
PES	A	Pristine/Natural	A Maintain	A Maintain	A Maintain	A Maintain
	B	Largely Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good - Fair	B Improve	B/C Improve	C Maintain	C Maintain
	D	Poor	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Very Poor	D Improve	E/F Improve	E/F Maintain	E/F Maintain

2.5 IMPACT AND RISK ASSESSMENT

The impacts and risks associated with the proposed development were assessed in accordance with the NEMA's Aquatic Biodiversity Protocol and the NWA Section 21 Risk Assessment Matrix, respectively. These were broadly characterised into one of the four impact types described in Section 2.5.1, then assessed using the impact assessment criteria described in Section 2.5.2 and risk assessment criteria in Section 2.5.3.

2.5.1 IMPACT CHARACTERISATION

River and wetland ecosystem impacts can be grouped into the following broad impact types:

- **Direct ecosystem modification or destruction / loss impacts** – This impact refers to the direct physical destruction and/or modification of river or wetland vegetation communities, habitat and associated biota. Such impacts may be attributed to a range of activities including vegetation / habitat clearing (stripping / grubbing), earthworks (i.e. excavation and infilling)

and deep flooding by impoundments.

- **Alteration of hydrological and geomorphological processes** – This impact refers to all the indirect impacts resulting from human activities within the watercourse or catchment that alter hydrological and geomorphological processes i.e. rates of erosion and sedimentation. This includes activities that:
  (i) Modify landcover characteristics that alter the quantity and pattern of catchment runoff and sediment inputs e.g. earthworks, surface hardening, plantations, etc.; and
  (ii) Activities that regulate, reduce or increase flows e.g. impoundment / dams, abstraction, return flows and decant flows; and activities alter wetland flow hydraulics e.g. establishment of drains, flow canalisation, flow constrictions and flow diversions.
- **Water pollution impacts** – This impact refers to the alteration of the chemical and biological characteristics of soil and water within watercourses and the associated ecological impacts. In the context of this impact assessment, water quality is assessed in relation to changes to its fitness for use (e.g. for domestic, recreational or agricultural purposes) and ability to maintain the health of aquatic ecosystems. This impact includes a full spectrum of activities ranging from direct inputs (e.g. spillages / point source discharges) through to diffuse source inputs from land use activities that affects the quality of water entering watercourses (e.g. hazardous substances handling, storage and transport; urban stormwater management; irrigation return flows and acid mine drainage).
- **Ecological connectivity and edge disturbance impacts** – This impact refers to the alteration of local and regional ecological processes resulting from the transformation of land and disturbance within and/or surrounding a watercourse. Key ecological processes of relevance in this regard include ecological connectivity and edge effects edge effects that are impacted by habitat fragmentation, patch size reduction, increased alien invasive plant invasion, noise pollution, vibrations, light pollution, and the occurrence of barriers to propagule and animal movement.

2.5.2 IMPACT ASSESSMENT

CES has developed the following impact rating methodology which has been developed in line with the Aquatic Biodiversity Protocol, as well as the content requirements of Appendix 6 and the impact ratings required in Appendix 1 and 3 of the EIA Regulations (2014, as amended). This scale takes into consideration the following variables:

- **Nature**: negative or positive impact on the environment.
- **Type**: direct, indirect and/or cumulative effect of impact on the environment.
- **Significance**: The criteria in Table 2.6 are used to determine the overall significance of an activity. The impact effect (which includes duration; extent; consequence and probability) and the reversibility/mitigation of the impact are then read off the significance matrix in order to determine the overall significance of the issue. The overall significance is either negative or positive and will be classified as low, moderate or high (Table 2.6).
- **Consequence:** the consequence scale is used in order to objectively evaluate how severe a number of negative impacts might be on the issue under consideration, or how beneficial a number of positive impacts might be on the issue under consideration.
- **Extent:** the spatial scale defines the physical extent of the impact.

- **Duration:** the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
- **Probability:** the likelihood of impacts taking place as a result of project actions arising from the various alternatives. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development and alternatives. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.
- **Reversibility:** The degree to which an environment can be returned to its original/partially original state.
- **Irreplaceable loss:** The degree of irreplaceable loss which an impact may cause, e.g. loss of non-regenerative vegetation or removal of rocky habitat or destruction of wetland.
- **Mitigation potential:** The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 2.6 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Table 2.6: Impact rating criteria

CRITERIA	CATEGORIES	DESCRIPTION
Overall nature	**Negative**	Beneficial/positive impact.
	Positive	Detrimental/negative impact.
Type	**Direct**	Direct interaction of an activity with the environment.
	Indirect	Impacts on the environment that are not a direct result of the project or activity.
	Cumulative	Impacts which may result from a combination of impacts of this project and similar related projects.
Duration	**Short term**	Less than 5 years.
	Medium term	Between 5-20 years.
	Long term	More than 20 years.
	Permanent	Over 40 years or resulting in a permanent and lasting change that will always be there.
Extent	**Localised**	Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
	Study area	The proposed site and its immediate environments.
	Municipal	Impacts affect the municipality, or any towns within the municipality.
	Regional	Impacts affect the wider district municipality or the Eastern Cape Province as a whole.
	National	Impacts affect the entire country.
Consequence	**Slight**	Slight impacts or benefits on the affected system(s) or party(ies).
	Moderate	Moderate impacts or benefits on the affected system(s) or party(ies).
	Severe/Beneficial	Severe impacts or benefits on the affected system(s) or party(ies).
Probability	**Definite**	More than 90% sure of a particular fact. Should have substantial supportive data.
	Probable	Over 70% sure of a particular fact, or of the likelihood of that impact occurring.

CRITERIA	CATEGORIES		DESCRIPTION
	Possible		Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
	Unsure		Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.
Reversibility	**Reversible**		The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.
	Irreversible		The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.
Irreplaceable Loss	**Resource will not be lost**		The resource will not be lost/destroyed provided mitigation measures are implemented.
	Resource may be partly lost		The resource will be partially destroyed even though mitigation measures are implemented.
	Resource will be lost		The resource will be lost despite the implementation of mitigation measures.
Mitigation Potential	**Easily achievable**		The impact can be easily, effectively and cost effectively mitigated/reversed.
	Achievable		The impact can be effectively mitigated/reversed without much difficulty or cost.
	Difficult		The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.
	Very Difficult		The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.
Impact Significance	**Low negative**	**Low positive**	Largely of HIGH mitigation potential, after considering the other criteria.
	Moderate negative	**Moderate positive**	Largely of MODERATE or partial mitigation potential after considering the other criteria.
	High negative	**High positive**	Largely of LOW mitigation potential after considering the other criteria.

2.5.3 RISK ASSESSMENT MATRIX

Wetlands have been confirmed within 500m of the proposed development activities / site. Therefore, the project activities are likely to constitute Section 21(c) and 21(i) water uses in terms of the NWA, as described as follows:

- 21(c) impeding or diverting the flow of water in a watercourse (relevant to the construction occurring in close proximity to drainage lines); and
- 21(i) altering the bed, banks, course or characteristics of a watercourse.

Low risk projects qualify for a General Authorisation (GA) in terms of Government Notice 509 for Section 21(c) and 21(i) water uses. The Department of Water and Sanitation (DWS) have developed a Risk Assessment Matrix to assess water risks associated with development activities. The tool uses the following approach to calculating risk:

RISK = CONSEQUENCE X LIKELIHOOD

whereby:

CONSEQUENCE = SEVERITY + SPATIAL SCALE + DURATION

and

LIKELIHOOD = FREQUENCY OF ACTIVITY + FREQUENCY OF IMPACT + LEGAL ISSUES + DETECTION

The risk rating is used to determine the risk class, which in turn is used to determine the permitting and management requirements (Table 2.7).

Table 2.7: Risk Assessment Rating Classes

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
170 – 300	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

The key risk stressors associated with each of the four (4) impact groups / types considered were:

1. Direct ecosystem modification or destruction / loss impacts – **Physical disturbance**
2. Alteration of hydrological and geomorphological processes – **Erosive surface runoff, sediment and increased and/or reduced water inputs**
3. Water pollution impacts – **Chemical, organic and biological pollutants**
4. Alteration of ecological connectivity and edge effect processes – **Alien invasive plants, noise pollution, dust pollution**

For each of the above stressors, risk was assessed qualitatively using the DWS risk matrix tool. It is important to note that the risk matrix also makes provision for the downgrading of risk to low in borderline moderate/low cases subject to independent specialist motivation granted that (i) the initial risk score is within twenty-five (25) risk points of the 'Low' class and that mitigation measures are provided to support the reduction of risk. The tool was applied to the project for the highest risk activities and watercourses was used to inform WUL requirements for the proposed development.

2.6 ASSUMPTIONS, LIMITATIONS AND GAPS IN KNOWLEDGE

This report is based on current available information and, as a result, the following limitations and assumptions are implicit:

- The report is based on a project description received from the client;
- Species of Conservation Concern (SCC) are difficult to find and difficult to identify, thus species described in this report do not comprise an exhaustive list. It is almost certain that additional SCCs will be found during construction and operation of the development;
- Sampling could only be carried out at one stage in the annual or seasonal cycle. The survey was conducted in late winter, outside of the flowering season of plant species. Seasonality influences the species of flora encountered at the site, with the flowering time of many species often posing a challenge in species identification. Since the wetland vegetation in the study area was largely monotypical and somewhat degraded, with low native plant diversity, seasonality would not be as significant a limitation when compared with a vegetation community that is largely natural or high in native plant diversity.

- Although every effort was made to correctly identify the plant species encountered onsite, wetland plants, particularly the Cyperaceae (sedge) family, are notoriously difficult to identify to species level. Every effort as made to accurately identify plants species but where identification to species level could not be determined, such species were only identified to genus level.
- The site survey for the River and Wetland Ecosystem Assessment (this report) was undertaken concurrently with that of the Terrestrial Ecological Assessment (CES, 2022). The delineation and characterisation of the on-site wetlands therefore relies largely on topographical and vegetation indicators, with a limited number of soil samples.

3 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

This chapter provides a description of the affected environment within the vicinity of the proposed development. This information is provided to assist the reader in understanding the possible effects of the project on the environment within which it is proposed to be developed. This information has been sourced from existing information available for the area. This chapter aims to provide the context within which this assessment is being conducted.

3.1 DESKTOP ASSESSMENT

3.1.1 CLIMATE

The information provided herewith is based on the climate data for Johannesburg – the nearest urban area in proximity to the project area. According to the Koppen Climate Classification, the climate for Johannesburg is classified as 'Bsk' (Mid-Latitude Steppe and semi-arid cool climate). The average annual temperature is 16°C, with the warmest average temperatures recorded in December and January (26°C) and coldest average temperatures recorded in June and July (4°C). Precipitation typically occurs in the summer months. Approximately 543 mm of rain is received per year, with January receiving the highest average precipitation (125 mm) and July receiving the lowest (4 mm) (ClimaTemps, 2021). A summary of the climate at Johannesburg is provided in Figure 3.1 below.

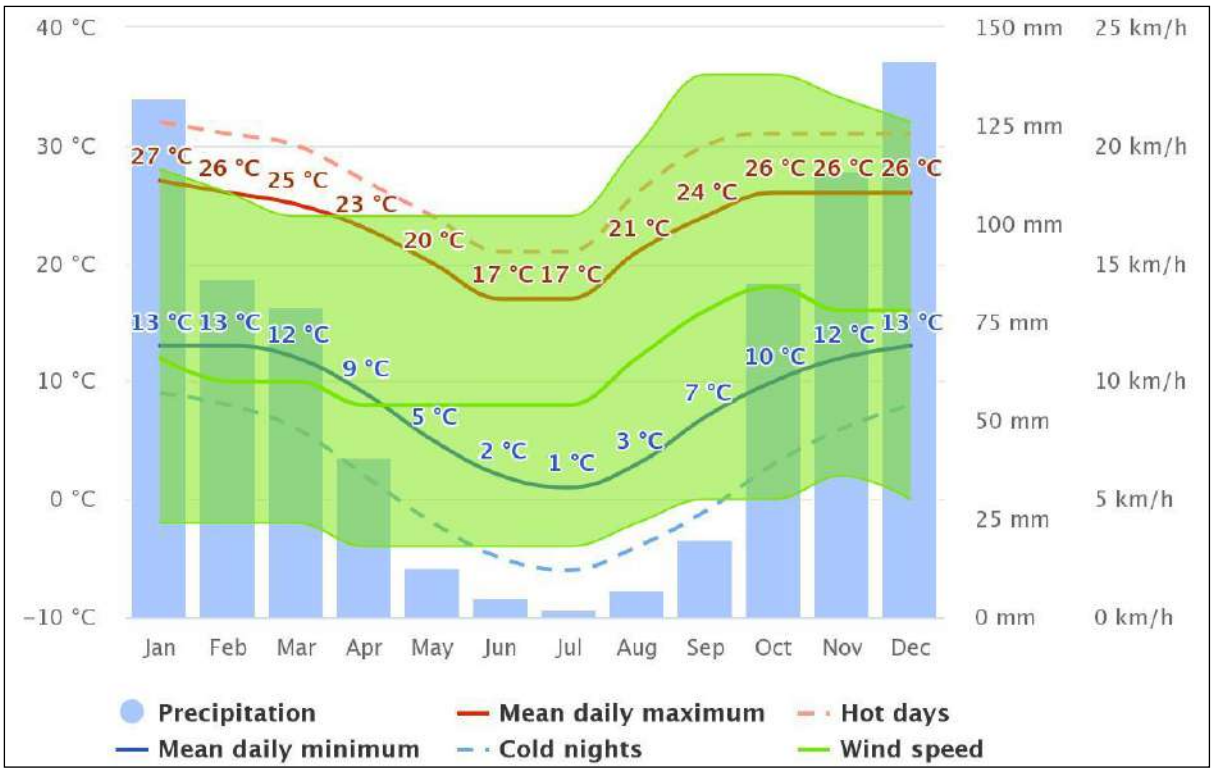

Figure 3.1: Climatic data for Johannesburg, Gauteng (Meteoblue, 2021) .

3.1.2 TOPOGRAPHY

Vegetation types are influenced by a range of biotic and/or abiotic factors at different spatial and temporal scales, which together influence the distribution, composition, structure, and diversity of

plant communities (Rodrigues et al., 2018). Among the abiotic factors influencing vegetation types, topography (landform), geology, and soils are considered three of the major factors determining habitat heterogeneity and species diversity. The topography of the eastern area is relatively flat, increasing in elevation towards the west of the project area in Figure 3.2.

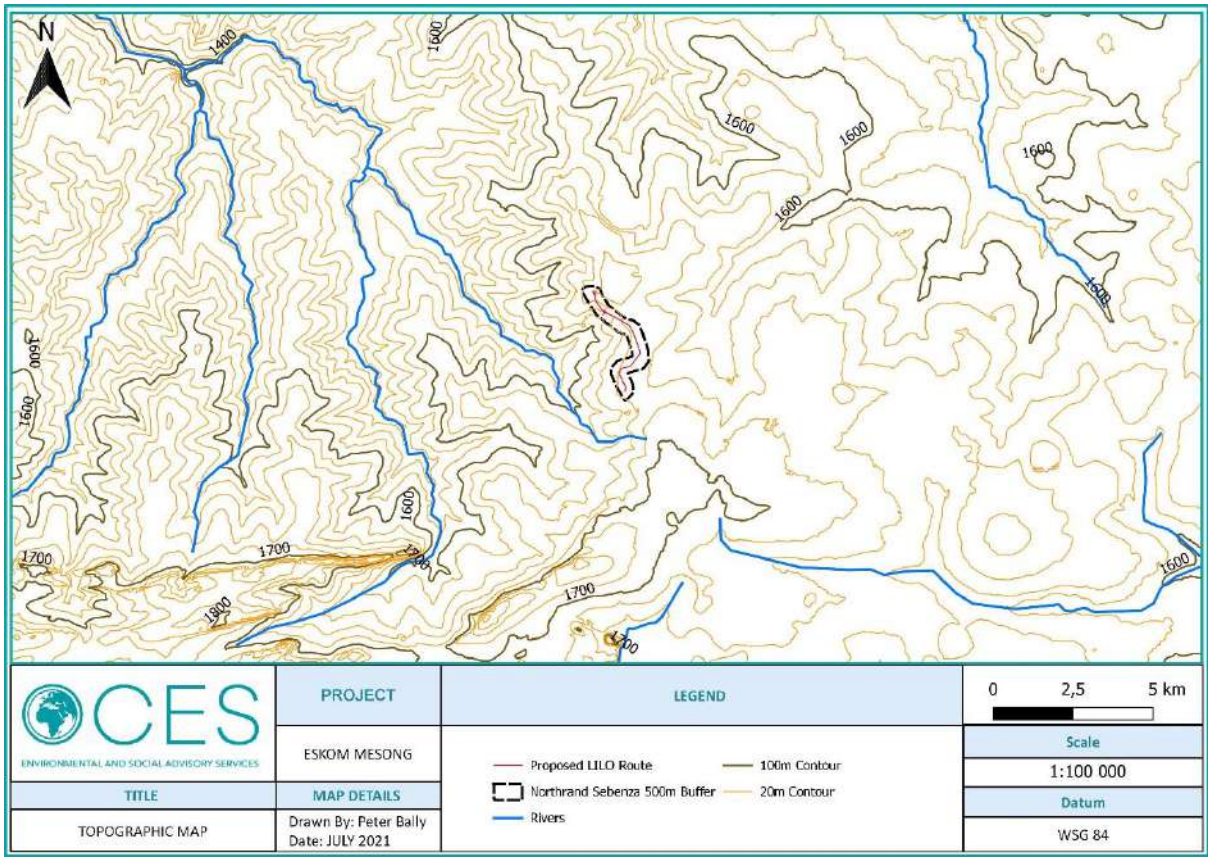

Figure 3.2: Contour Map of the study area

3.1.3 GEOLOGY AND SOILS

The geology underlying the project area is characterised by two main geological features, namely Halfway House Granite and Basement Complex, with the surrounding area including Dwyka, Black Reef, Klipriver, Vryheid and Hospital Hill geologies (Figure 3.3).

The soils within the study site are classified as Haplic Lixisols (Figure 3.4). Lixisols are defined by the presence of a subsurface layer of accumulated kaolinitic clays, where at least half of the readily displaceable ions are calcium, magnesium, sodium, or potassium, but they are also identified by the absence of an extensively leached layer below the surface horizon (uppermost layer).

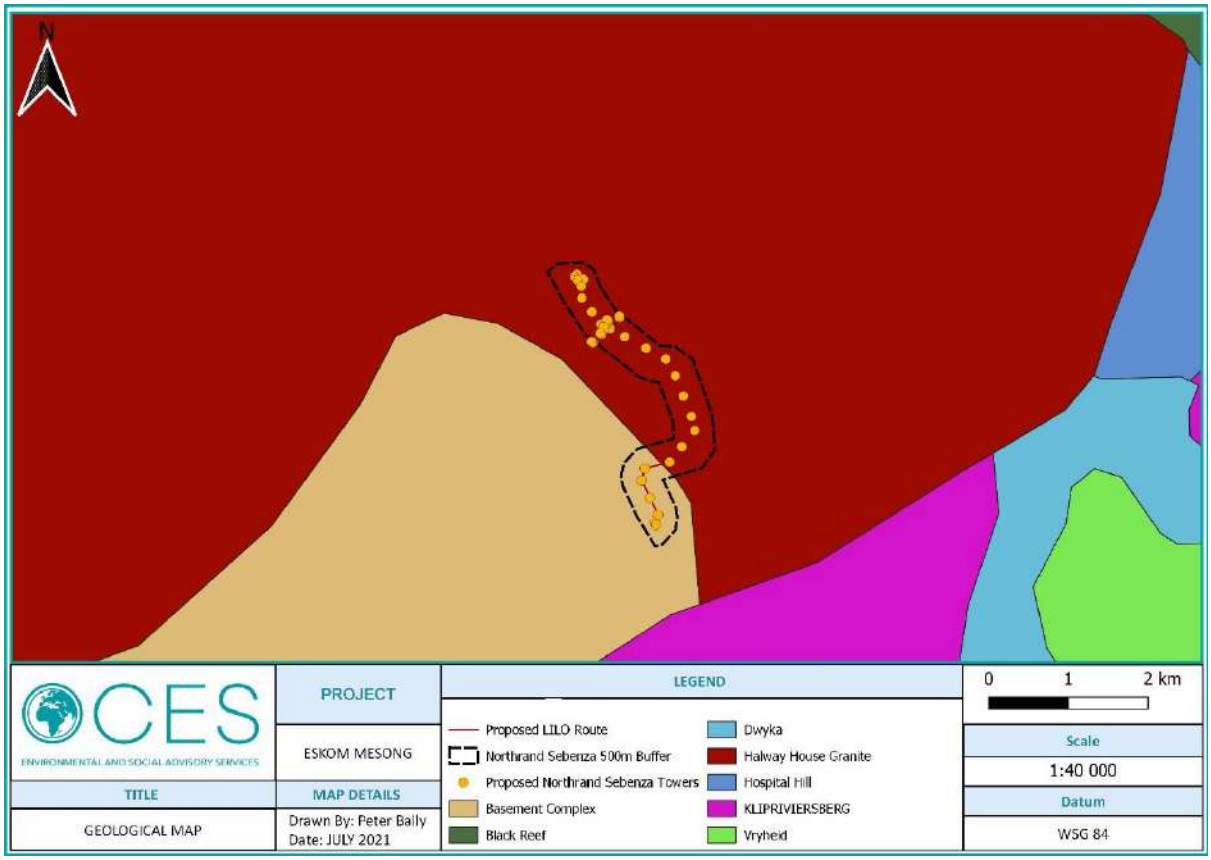

Figure 3.3: Geology map of the study site

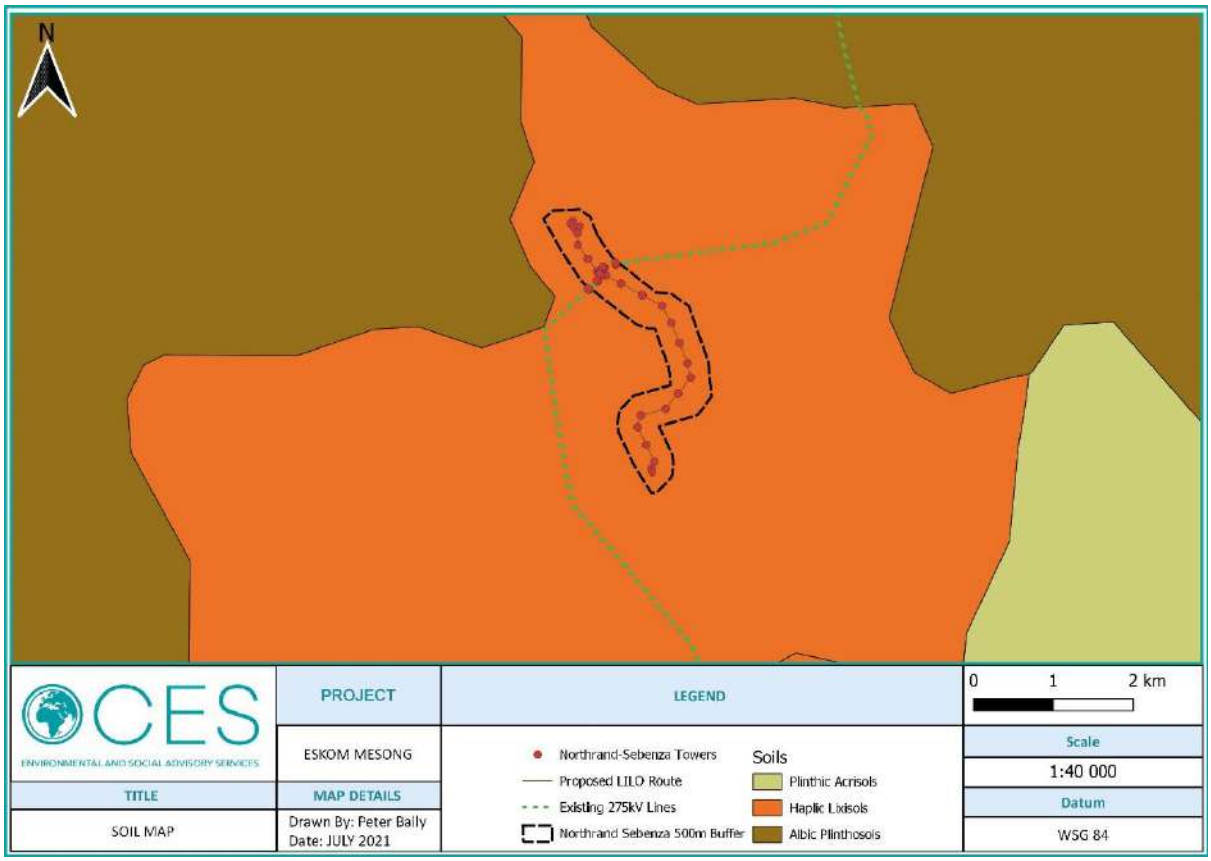

Figure 3.4: SOTER SAF Soil Map of the project area

3.1.4 LAND USE AND COVER

According to the South African National Land-Cover (2020) spatial dataset, the majority of the project area occurs within *Natural Grassland*, with the northern portion of the proposed LILO occurring within *Contiguous & Dense Planted Forest*. Portions of *Open Woodland* occur within the *Natural Grassland* portion of the project area. The proposed 400 kV LILO also passes through *Residential Formal* and *Industrial* areas (Figure 3.5).

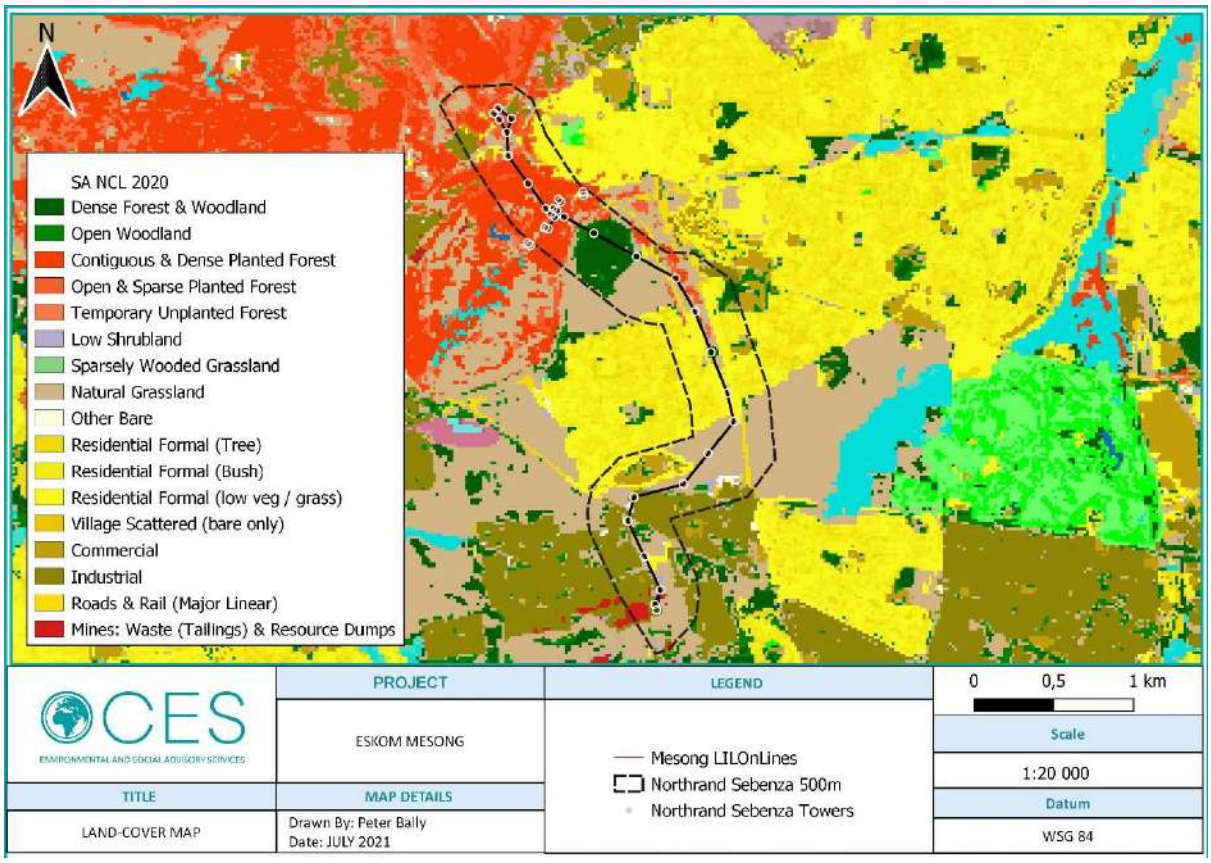

Figure 3.5: South African National Land-Cover (SANLC, 2018) Map of the project area

3.1.5 TERRESTRIAL VEGETATION AND BIODIVERSITY INDICATORS

According to the SA VEGMAP (2018), the project area occurs within one (1) vegetation type – Carletonville Dolomite Grassland (Figure 3.6). This is a species-rich mosaic of plant community types occurring on undulating plains dissected by rocky chert ridges. It is a vegetation type that is characterized by the presence of the species: *Aristida congesta, Brachiaria serrata, Cynodon dactylon, Digitaria tricholaenoides, Diheteropogon amplectens, Eragrostis chloromelas, Eragrostis racemosa, Heteropogon contortus, Loudetia simplex, Schizachyrium sanguineum, Setaria sphacelata, Themeda triandra*, and a wide variety of herbaceous forbs and other grasses.

This vegetation type is considered to be **Vulnerable** (Driver et al., 2005 and Mucina et al., 2006), and whilst the conservation target is 24%, only a small extent is currently protected and 23% is considered to be transformed, mostly by cultivation (17%), urbanization (4%), forestry (1%) and mining (1%) (Mucina et al. 2006).

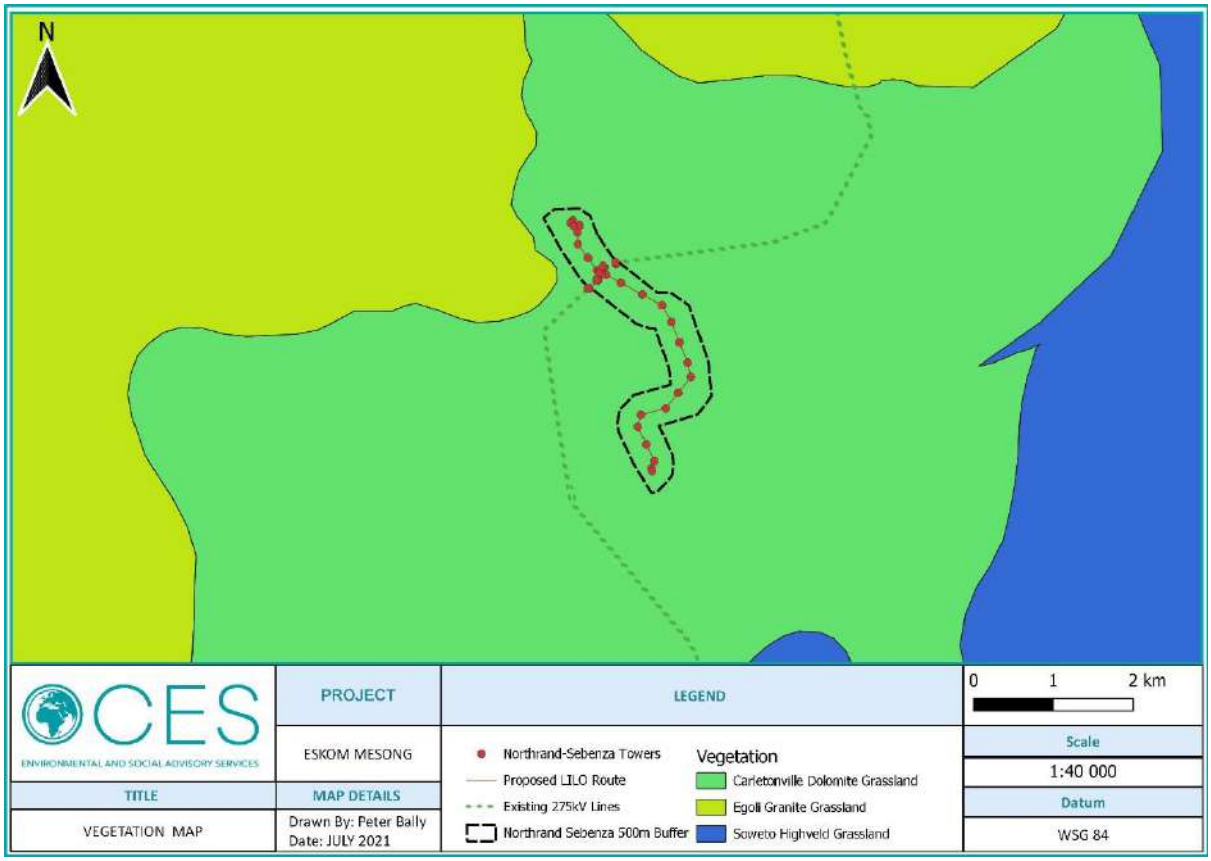

Figure 3.6: National Vegetation Map of the project site.

The Gauteng Conservation Plan (C-Plan) is based on the systematic conservation protocols based on principles developed by Margules & Pressey (2000). This plan must be treated as a living document with periodic review and updates as the knowledge of the distribution of biodiversity, the status of species, approaches for dealing with aspects such as climate change, methods of data analysis, and the nature of threats to biodiversity within a planning region are constantly changing, especially in the Gauteng Province, which is developing at an extremely rapid rate. The main aim of the C-Plan is:

- To serve as the primary decision support tool for the biodiversity component of the Environmental Impact Assessment (EIA) process;
- To inform protected area expansion and biodiversity stewardship programmes in the Province;
- To serve as a basis for development of Bioregional Plans in municipalities within the Province.

The Gauteng C-Plan forms part of the environmental authorization process in that if the proposed project is located within a Critical Biodiversity Area (CBA) or an Ecological Support Area (ESA), Listing Notice 3 (GN No. R. 985, as amended) activities are triggered. The Gauteng C-Plan was utilised to indicate any sensitive surrounding environments and the level of protection of these. According to the Gauteng Conservation Plan the proposed development occurs within a CBA and an Ecological Support Area (ESA) (Figure 3.7).

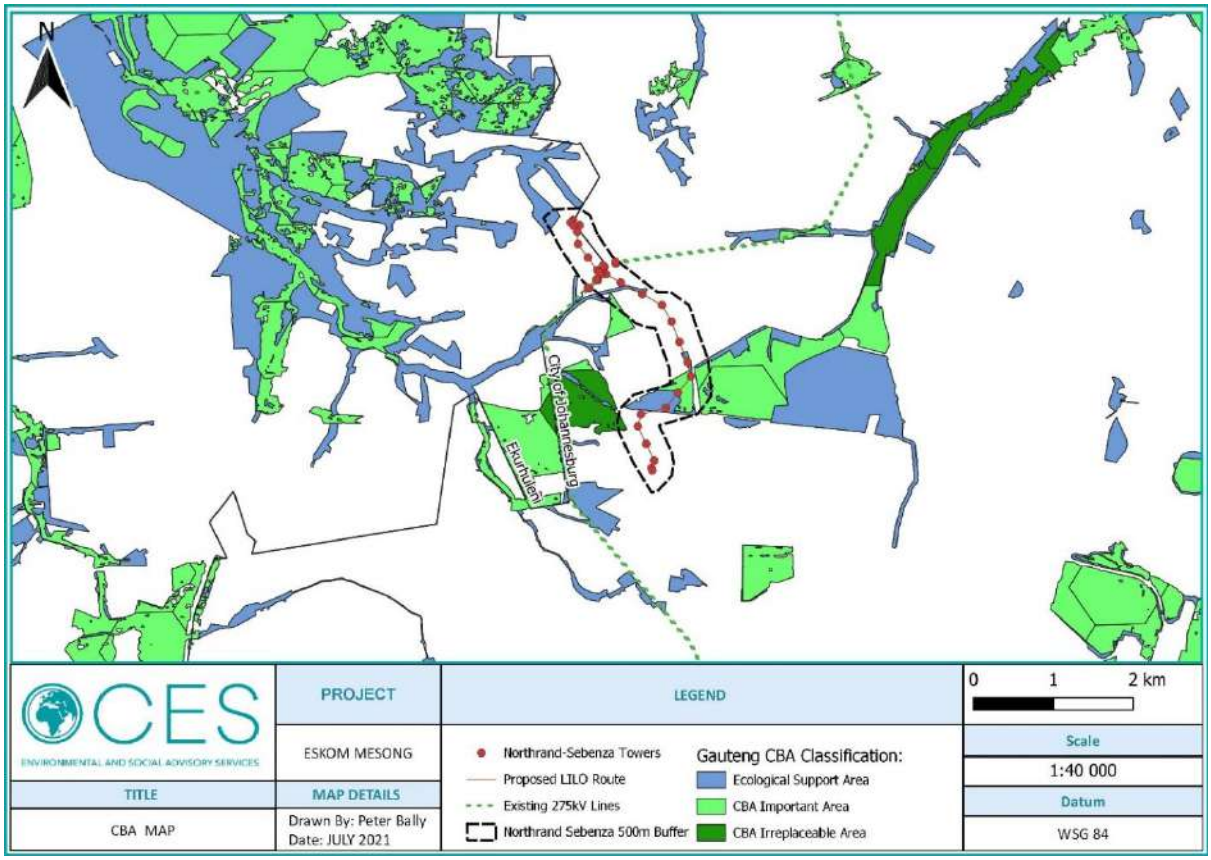

Figure 3.7: Gauteng CPlan map of the project area

3.1.6 DRAINAGE AND RIVER ECOSYSTEM CONTEXT

The proposed development falls primarily within Quaternary Catchment A21C, which drains the Modderfontein River, a tributary of the Jukskei River, and falls entirely within the Limpopo Water Management Area (WMA) (Figure 3.8). The Modderfontein main channel flows in a north-westerly direction, falling approximately 2.3 km to the south-west of the proposed LILO line (Figure 3.8). Several non-perennial rivers and smaller drainage lines drain into the Modderfontein River, some of which intersect the proposed LILO line.

Most of the Modderfontein River has been assigned a 'Critically-Endangered' ecosystem threat status in terms of the National Biodiversity Assessment (NBA, 2018). Critically Endangered ecosystems are ecosystem types that have very little of their original extent (measured as area, length or volume) left in natural or near-natural condition. Most of the ecosystem type has been heavily, severely or critically modified from its natural state. Any further loss of natural habitat or deterioration in condition of the remaining healthy examples of these ecosystem types must be avoided, and the remaining healthy examples should be the focus of urgent conservation action. According to the NBA (2018), the Present Ecological State (PES) of the Modderfontein from E to F ("Critically modified"), i.e. a critical change in ecosystem processes and loss of natural habitat and biota and has occurred.

The Modderfontein is categorised as an Upstream Management Area in terms of the National Freshwater Ecosystem Priority Areas (NFEPA) project (2014). These are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas.

3.1.7 WETLAND ECOSYSTEM CONTEXT

Wetlands in South Africa have been mapped on a broad-scale by various stakeholders and have been included in the NFEPA (2011-2014) and NBA (2018). Due to the broad-scale nature of the NFEPA map it is not spatially accurate and, therefore, some error is expected. The location of NFEPA wetlands was derived from the National Land Cover 2000 (Van Den Berg et al., 2008) and inland water features from the Department of Land Affairs' Chief Directorate: Surveys and Mapping (DLA-CDSM). All wetlands are classified as either 'natural' or 'artificial' water bodies. The NFEPA and NBA wetland maps identify important or sensitive wetlands and wetland clusters. A wetland cluster is a group of wetlands all within 1 km of each other and which are surrounded by relatively natural vegetation. Wetland clusters allow for important ecological processes such as the migration of insects and frogs between the wetlands.

According to the National Wetland Map Version 5 (2018), no natural wetlands occur within 500 m of the proposed powerlines (Figure 3.8). Only one artificial wetland falls within 500 m of the proposed powerlines (Figure 3.8). Numerous other natural and artificial wetlands occur within the broader area. No NFEPA wetland clusters fall within 500 m of the proposed development site (Figure 3.8).

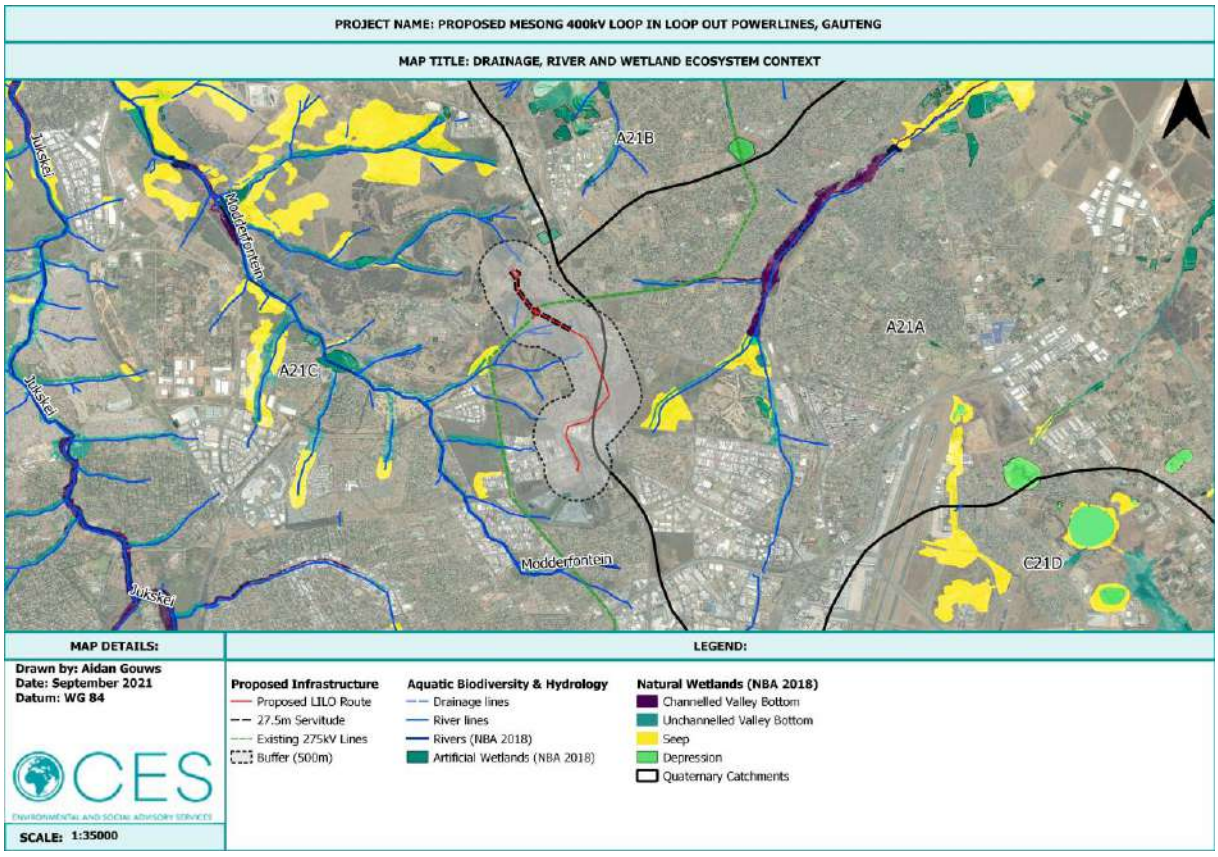

Figure 3.8: Surface water features affected by the proposed development.

3.2 SITE ASSESSMENT

The site assessment was conducted on 20 August 2021. Although not recorded in the NFEPA (2014) and NBA (2018) spatial datasets, three wetland units were identified on site within 500 m of the proposed powerline, including one channelled valley bottom and two seeps. The delineation map of the wetland units is provided in Figure 3.9 below.

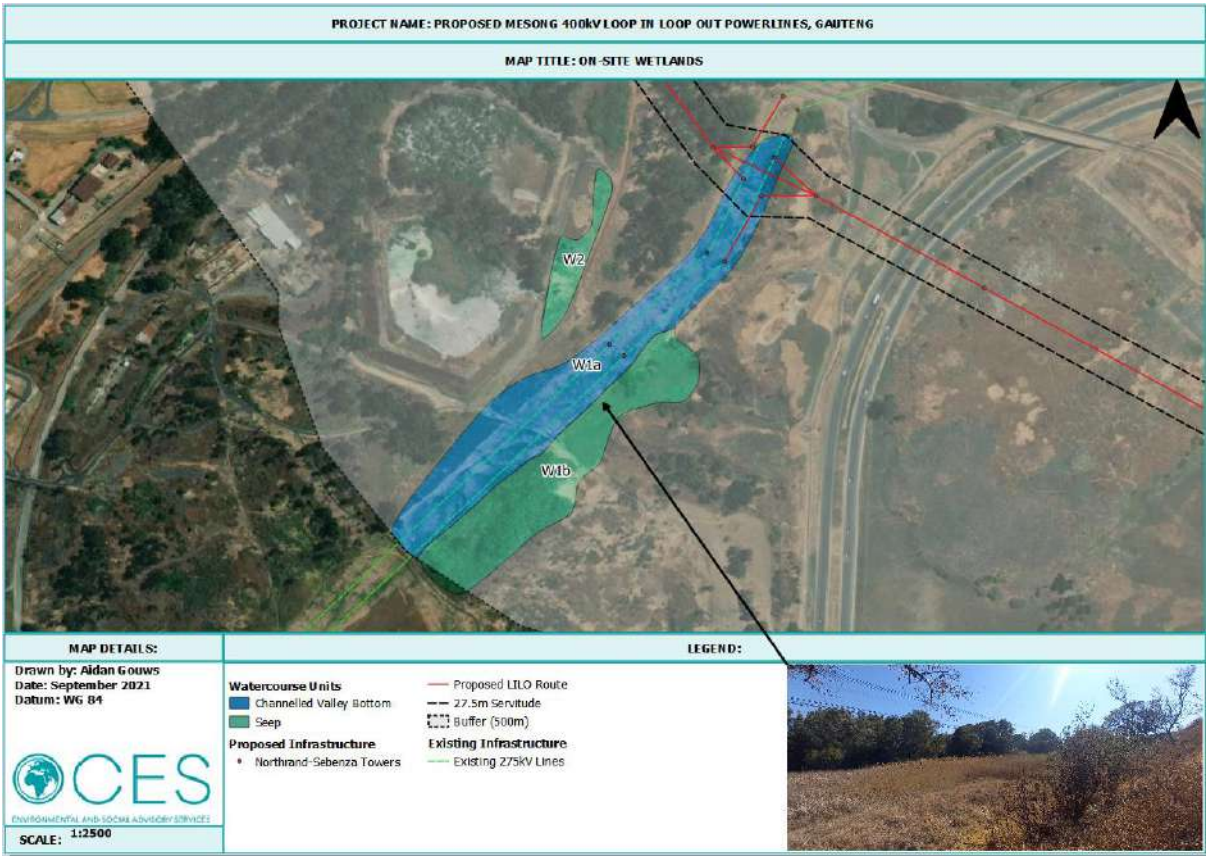

Figure 3.9: Assessment units potentially affected by the proposed development.

3.2.1 WETLAND CLASSIFICATION, DELINEATION AND HABITAT CHARACTERISTICS

Wetland unit W1a is a channelled-valley bottom wetland, sustained by a shallow, narrow active channel (10 cm deep by 50 cm across), feeding in from the adjacent woodland area (Plate 3.1) situated at the eastern upstream edge of the unit. The stream crosses an existing onsite access road via a box culvert further downstream (Plate 3.2). The unit is characterised by uniform dark grey, near-black, wet loamy soils (without mottles) to a depth of 50 cm (Plate 3.3) and dominated by *Phragmites australis* reedland vegetation (Plate 3.3), with a moderate abundance of *Hyparrhenia hirta* and low abundance of *Verbena bonariensis*. An existing powerline runs through the reedland and adjacent grassland (Plate 3.3).

The woodland, falling along the foot of a steep embankment slope, is comprised of several exotic and invasive species (Plate 3.4), including *Acacia dealbata, Acacia mearnsii, Araujia sericifera, Eucalyptus camaldulensis, Hedera helix, Lantana camara, Melia azedarach, Sisymbrium capense, Solanum mauritianum, Tipuana tipu* and *Tecoma stans,* with a few indigenous species, such as *Ficus salicifolia* and *Zantedeschia aethiopica*.

Down valley from the woodland, the eastern slope of the valley transitions to a more gently-sloped, *Hyparrhenia hirta*-dominated grassland, with a patch of *Arundo donax* (Plate 3.4). This then transitions to the *P. australis*-dominated seep (W1b), which bowls outwards up and along the hillslope in parallel with W1a. The section of unit W1b downstream of the access road crossing is dominated by invasive *Populus alba*.

Along much of its western edge, unit W1a is fringed by a narrow (10-30 m wide) terrestrial *Hyparrhenia hirta*-dominated secondary grassland (Plate 3.5), characterised by dark grey brown loams (0-10 cm), brown loamy sands (20-40 cm) and red brown sands (40-50 cm) (Plate 3.5). The upstream section of this edge transitions to a *Eucalyptus camaldulensis* exotic woodland (Plate). The reedland bowls out along the gradual western slope further downstream as fewer *E. camaldulensis* are encountered and it approaches and crosses the existing access road.

Wetland unit W2 is a mixed *P. australis / A. donax* reedland seep, pocketed between the *E. camaldulensis* exotic woodland and adjacent old mine dump to the west of the W1 units. Similar uniform dark grey, near-black, wet loamy soils (without mottles) were observed in W2.

Table 3.1: Select photographs from the site assessment

Plate 3.1: Active channel within the woodland and downstream of the access road crossing.

Plate 3.2: Existing access road and associated box culvert crossing.

Plate 3.3: Soils and reedland wetland vegetation observed within wetland unit W1a.


Plate 3.4: Woodland and grassland vegetation observed along the eastern edge of wetland unit W1a.




Plate 3.5: Soils and terrestrial grassland vegetation observed along the western edge of unit W1a.

3.2.2 PRESENT ECOLOGICAL STATE

The results of the WET-Health assessment are summarised in below (Table 3.2). Of the three wetland units, two are in a critically-modified condition (PES Classes E/F) and one is in a largely-modified condition (PES Class D) (Table 3.2). The catchments of all units have been impacted by residential urban development, industry and mining operations. Within wetland impacts include scattered alien vegetation (such as *Acacia dealbata*, *Arundo donax* and *Solanum mauritianum*) and *Eucalyptus camaldulensis* tree plantations, as well as erosion and infilling in surrounding the existing powerline pylons. Unit W1a is the least impacted, with a greater proportion of semi-natural vegetation occurring within the unit and surrounding catchment, as compared to the other two units.

Table 3.2: Present Ecological State (PES) of the wetlands

UNIT	HYDROLOGY IMPACT RATING	GEOMORPHOLOGY IMPACT SCORE	WATER QUALITY IMPACT SCORE	VEGETATION IMPACT SCORE	OVERALL PES SCORE & RATING
W1a	6.6	5.7	1.4	6.9	**5.6 (D)**
W1b	7.1	5.7	1.4	8.3	**6.1 (E)**
W2	7.0	7.0	1.7	7.3	**6.1 (E)**

3.2.3 ECOSYSTEM SERVICES

Ecosystem services were assessed for all units using the WET-Ecoservices Tool. The overall importance scores for the goods and services provided by the units are illustrated below (Table 3.3). The rating of the extent to which a benefit is being supplied for each ecosystem service is also listed. The majority of the ecosystem services were rated as very low to low in terms of their overall importance. Ecosystem services scoring moderately-low to moderate include sediment, nitrate and toxicant trapping, as well as harvestable resources and food for livestock services.

The supply of sediment, nitrate and toxicant trapping services is attributed to the abundance of reedland vegetation across much of the assessment units, providing a relatively high resistance to water flow, contributing the dispersion of low flow patterns. Unit W1b obtained a moderate score for sediment trapping because the unit falls on a more gradual slope, with a greater dispersion of low flows across the unit, compared to W1a and W2, both of which scored moderately-low for sediment

trapping. The supply of harvestable resources and food for livestock services is similarly attributed to the abundance of reedland, with some grassland, vegetation across much of the assessment units. The moderately low demand for these services is attributed the dominance of urban residential, commercial and industrial land use in the broader catchment. Biodiversity maintenance services were scored very low for all units (Table 3.3). This is attributed to the following:

- No noteworthy biodiversity features present within the units;
- Low species and habitat diversity; and
- Species present indicate disturbance and early successional stages.

Table 3.3: Ecosystem Services provided by wetland units

	ECOSYSTEM SERVICE	W1a	W1b	W2
Regulating and supporting services	Flood attenuation	0.0 (VL)	0.0 (VL)	0.0 (VL)
	Stream flow regulation	0.0 (VL)	0.0 (VL)	0.0 (VL)
	Sediment trapping	**1.5 (ML)**	**1.8 (M)**	**1.5 (ML)**
	Erosion control	0.4 (VL)	0.2 (VL)	0.3 (VL)
	Phosphate assimilation	1.3 (L)	**1.5 (ML)**	1.3 (L)
	Nitrate assimilation	**1.4 (ML)**	**1.6 (ML)**	**1.4 (ML)**
	Toxicant assimilation	**1.4 (ML)**	**1.7 (ML)**	**1.4 (ML)**
	Carbon storage	**1.4 (ML)**	1.3 (L)	1.3 (L)
	Biodiversity maintenance	0.5 (VL)	0.3 (VL)	0.0 (VL)
Provisioning services	Water for human use	0.1 (VL)	0.0 (VL)	0.0 (VL)
	Harvestable resources	**1.5 (ML)**	**1.5 (ML)**	**1.5 (ML)**
	Food for livestock	**1.5 (ML)**	**1.5 (ML)**	**1.5 (ML)**
	Cultivated foods	0.3 (VL)	0.8 (L)	0.6 (VL)
Cultural services	Tourism and Recreation	0.0 (VL)	0.0 (VL)	0.0 (VL)
	Education and Research	0.0 (VL)	0.0 (VL)	0.0 (VL)
	Cultural and Spiritual	0.0 (VL)	0.0 (VL)	0.0 (VL)

4 SITE SENSITIVITY

4.1 ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) ASSESSMENT

This section discusses the results of the Ecological Importance and Sensitivity (EIS) assessments. The wetlands were assessed using the Wetland EIS tool. Units W1a and W2 scored moderately-low, whereas W1b scoring marginally higher with a moderate EIS score. This is attributed to regulating services (sediment and nutrient trapping) and provisioning (harvestable resources and food for livestock) services provided by these units. The EIS assessment results are summarised in Table 4.1 below. A sensitivity map (Figure 4.1 below) was developed based on the above EIS ratings.

Table 4.1: Summary of EIS scores and ratings

UNIT	ECOLOGICAL IMPORTANCE SCORE			ECOLOGICAL SENSITIVITY	INTEGRATED EIS SCORE	INTEGRATED EIS RATING
	BIODIVERSITY MAINTENANCE	REGULATING SERVICES	PROVISIONING AND CULTURAL SERVICES			
W1a	0.5	1.5	1.5	1.5	1.5	Moderately-low
W1b	0.3	1.8	1.5	0.8	1.8	Moderate
W2	0.0	1.5	1.5	1.0	1.5	Moderately-low

4.2 RECOMMENDED ECOLOGICAL CATEGORY (REC)

The recommended ecological category (REC) is the target or desired state of freshwater ecosystems required to meet water resource management objectives and quality targets. It is determined through the consideration of the PES, EIS and realistic opportunities to improve the PES that is driven by the context / setting. All units obtained REC scores on par with their PES, as highlighted in Table 4.2. Thus, the regional water resource management objective is to maintain the PES of these local wetlands. The management objective of the project should be to ensure that all impacts are minimised such that there is no change in PES for all units assessed.

Table 4.2 Summary of REC for assessed watercourses

UNIT	PES	EIS	REC
W1a	D: Poor	Moderately-low	D: Maintain
W1b	E: Very Poor	Moderate	E/F: Maintain
W2	E: Very Poor	Moderately-low	E/F: Maintain

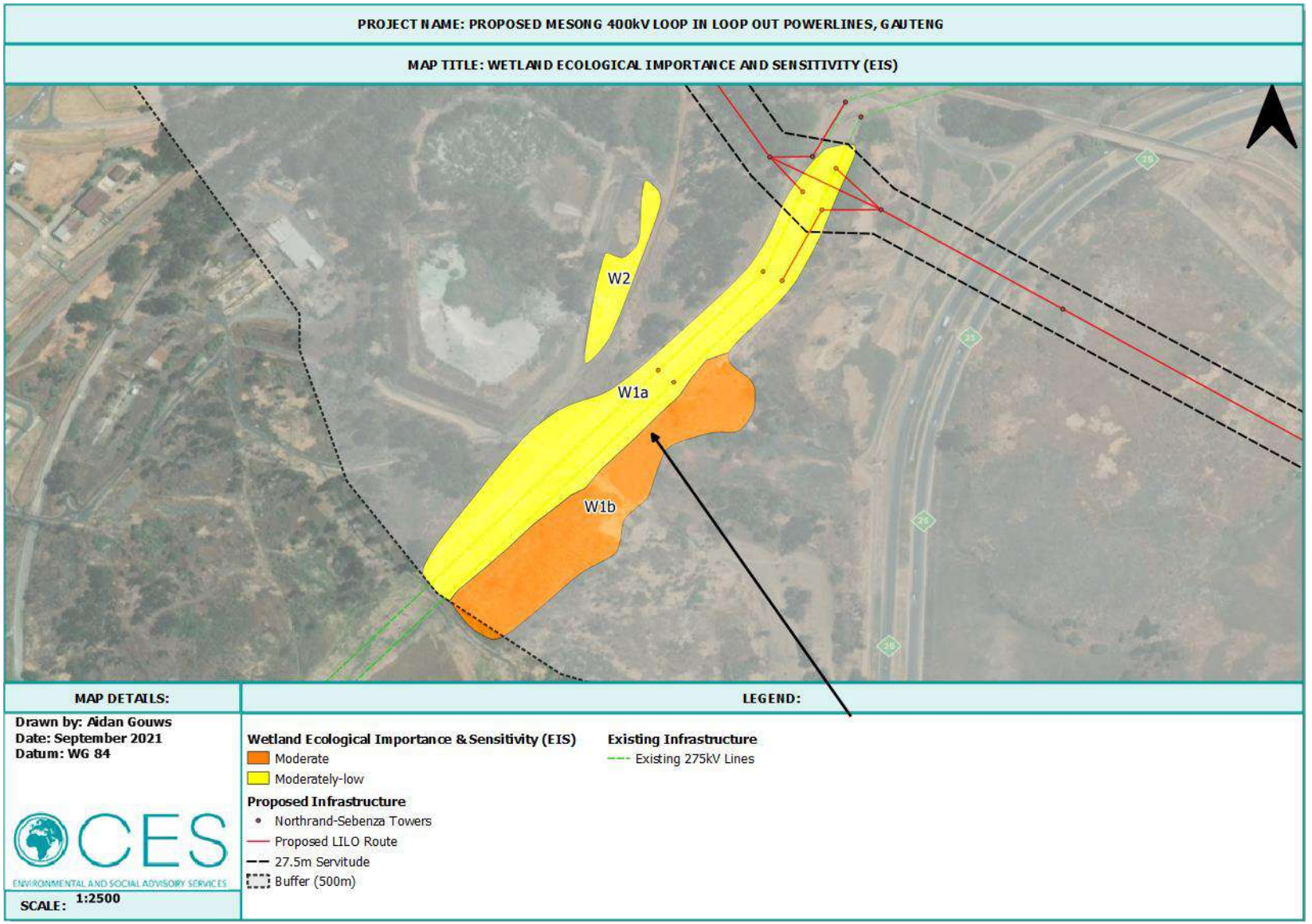

Figure 4.1: Ecological Importance and Sensitivity (EIS) map of the proposed development site.

5 IMPACT AND RISK ASSESSMENT

Impacts that could be a direct or indirect result of the proposed activity were identified for the Construction and Operational Phases. These included the consideration of direct, indirect and cumulative impacts that may occur, and also considers the no-go or existing impacts.

An impact assessment was conducted, using the methodology outlined in Section 2.5.2 and the data collected during the desktop and site assessments, for the planning, construction and operation phases of the proposed development, as well as for the no-go alternative. A breakdown of the assessment and mitigation measures is presented in Table 5.1.

Similarly, the risk assessment was conducted, using the methodology outlined in Section 2.5.3, for all phases of the proposed development. A breakdown of the risk assessment is provided in Table 5.2.

Table 5.1: Impacts and mitigation measures for all phases of the proposed development.

POTENTIAL ISSUE	SOURCE OF ISSUE	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
CONSTRUCTION PHASE													
Direct ecosystem modification or destruction / loss impacts	During the construction phase, vegetation clearance, construction vehicle traffic and earthworks may result in the temporary disturbance of units W1a and W2.	Negative	Direct	Slight	Localised	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**LOW -**	Avoid/prevent impact: • Powerlines should span the extent of watercourses where possible. • Pylons should not be placed within 32 m of watercourses. • All construction phase access and haulage roads must avoid the delineated watercourses and buffer zones. As far as practically possible, existing roads and dirt tracks should be used to access the construction sites if such access routes avoid watercourses. Minimize/reduce impact: • Construction activities should be undertaken during the driest part of the year to minimize erosion and downstream sedimentation due to excavation, etc. • Appropriate stormwater management must be implemented during construction to control run-off, minimize erosion and trap sediment. Such measures include the installation of sediment fences, earthen / sand bag barriers at regular intervals. • Vegetation clearing must be kept a minimum and only to the site footprint.	**VERY LOW -**
	During the construction phase, vegetation clearance, construction vehicle traffic and earthworks may result in the temporary disturbance of units W1b.	Negative	Direct	Moderate	Localised	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**MODERATE -**		**LOW -**
Alteration of hydrological and geo-morphological processes	During the construction phase, the clearance of vegetation and compaction of soil may result in increased run-off and erosion, altering hydrological and geomorphological processes.	Negative	Indirect	Slight	Study area	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**LOW -**		**VERY LOW -**

POTENTIAL ISSUE	SOURCE OF ISSUE	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Ecological connectivity and edge disturbance impacts	During the construction phase, vegetation clearance, construction vehicle traffic and earthworks may reduce ecological connectivity and disturb the watercourse/terrestrial edge.	Negative	Direct, indirect	Slight	Study area	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**LOW -**	• Stockpiles must be monitored for erosion and mobilisation of materials towards watercourses. • Stockpiles must not exceed 1.5m in height. Stockpiles must be covered during windy periods. Remediate/rehabilitate impact: • Disturbed areas must be monitored for erosion and these must be rehabilitated. • All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated, where applicable.	**VERY LOW -**

POTENTIAL ISSUE	SOURCE OF ISSUE	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Water pollution impacts	During the construction phase, accidental spillages of wet concrete and chemical / hazardous substances may result in soil and groundwater contamination, adversely affecting the aquatic ecosystems in the broader area.	Negative	Direct, indirect	Slight	Study area	Long-term	May occur	Reversible	Resource will not be lost	Achievable	**LOW -**	Avoid/prevent impact: • No concrete mixing must take place within of any watercourse. • No machinery must be parked overnight within 50 m of the rivers/wetlands. • All stationary machinery must be equipped with a drip tray to retain any oil leaks. • Chemicals used for construction must be stored safely on bunded surfaces in the construction site camp. • No ablution facilities must be located within 50 m of any river or wetland system. • Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution. • Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it. • All general waste and refuse must be removed from site and disposed and windproof temporary storage area before being disposed of at a registered landfill site. Remediate/rehabilitate impact: • Emergency plans must be in place in case of spillages onto bare soil or within water courses.	**VERY LOW -**

POTENTIAL ISSUE	SOURCE OF ISSUE	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
OPERATIONAL PHASE													
Alteration of hydrological and geo-morphological processes	During the operational phase, localised altered flow patterns may occur around the powerline pylons. This may indirectly result in increased run-off, erosion and sedimentation.	Negative	Indirect	Slight	Localised	Permanent	May occur	Reversible	Resource will not be lost	Achievable	**LOW -**	Minimize/reduce impact: • All operational phase service roads must avoid the delineated watercourses and buffer zones. As far as practically possible, existing roads and dirt tracks should be used as maintenance roads if such access routes avoid watercourses. • Stormwater measures must be installed at pylon sites. • Stormwater infrastructure must be maintained and monitored for effectiveness with respect to controlling and minimising erosion and sedimentation of watercourses. Remediate/rehabilitate impact: • The site must be monitored for erosion and should be rehabilitated where applicable.	**VERY LOW -**
Ecological connectivity and edge disturbance impacts	During the operational phase, inadequate rehabilitation of disturbed areas may lead to the reduction of ecological connectivity and degradation of the surrounding environment.	Negative	Indirect	Slight	Study area	Long-term	May occur	Reversible	Resource will not be lost	Achievable	**LOW -**	Remediate/rehabilitate impact: • Disturbed areas should be rehabilitated and re-vegetated.	**VERY LOW -**

POTENTIAL ISSUE	SOURCE OF ISSUE	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Water pollution impacts	During the operational phase, routine maintenance may lead to the introduction of chemical / hazardous substances into the watercourse, soil and/or groundwater, adversely affecting the aquatic ecosystems in the broader area.	Negative	Indirect	Slight	Localised	Long term	May occur	Reversible	Resource may be partially lost	Achievable	**LOW -**	Avoid/prevent impact: • No machinery must be parked overnight within 50m of the rivers/wetlands. • All stationary machinery must be equipped with a drip tray to retain any oil leaks. • Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it. • All general waste and refuse must be removed from site and disposed and windproof temporary storage area before being disposed of at a registered landfill site. Remediate/rehabilitate impact: • Emergency plans must be in place in case of spillages onto bare soil or within water courses.	**VERY LOW -**
NO-GO ALTERNATIVE													
Status-quo maintained	Should the project not proceed then the current land use will remain the same. The site is highly degraded and current impacts are likely to persist.	Negative	Indirect	Slight	Study area	Long term	Definite	Reversible	Resource may be partially lost	Difficult	**LOW -**	• No mitigation measures are proposed for the no-go alternative.	**LOW -**

Table 5.2: Risk scores and ratings for construction and operational phases of the proposed development.

NO.	PHASES	ACTIVITY	ASPECT	IMPACT	SEVERITY				SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	FREQUENCY OF ACTIVITY	FREQUENCY OF IMPACT	LEGAL ISSUES	DETECTION	LIKELIHOOD	SIGNIFICANCE	RISK RATING	CONFIDENCE LEVEL	CONTROL MEASURES	BORDERLINE LOW MODERATE RATING CLASSES	PES AND EIS OF WATERCOURSE
					FLOW REGIME	PHYSICO & CHEMICAL (WATER QUALITY)	HABITAT (GEOMORPH + VEGETATION)	BIOTA															
1	CONSTRUCTION PHASE	Vegetation clearance and earthworks, including excavation and infilling	Clearance of vegetation during site preparation. Excavation, infilling and shaping of landscape.	During the construction phase, vegetation clearance, construction vehicle traffic and earthworks may result in the temporary disturbance of units W1a and W2.	2	1.5	2.5	2	2	1	2	5	1	3	5	1	10	50	LOW RISK	90-100	Avoid/prevent impact: • Powerlines should span the extent of watercourses where possible. • Pylons should not be placed within 32 m of watercourses. • All construction phase access and haulage roads must avoid the delineated watercourses and buffer zones. As far as practically possible, existing roads and dirt tracks should be used to access the construction sites if such access routes avoid watercourses. Minimize/reduce impact: • Construction activities should be undertaken during the driest part of the year to minimize erosion and downstream sedimentation due to excavation, etc. • Appropriate stormwater management must be implemented during construction to control run-off, minimize erosion and trap sediment. Such measures include the installation of sediment fences, earthen / sand bag barriers at regular intervals. • Vegetation clearing must be kept a minimum and only to the site footprint. • Stockpiles must be monitored for erosion and mobilisation of materials towards watercourses. • Stockpiles must not exceed 1.5m in height. Stockpiles must be covered during windy periods. Remediate/rehabilitate impact: • Disturbed areas must be monitored for erosion and these must be rehabilitated. • All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated, where applicable.	LOW RISK	EIS = 1.5 (Mod-Low)
2		Vegetation clearance and earthworks, including excavation and infilling	Clearance of vegetation during site preparation. Excavation, infilling and shaping of landscape.	During the construction phase, vegetation clearance, construction vehicle traffic and earthworks may result in the temporary disturbance of units W1b.	2.5	1.5	2.5	2	2.125	1.5	2	5.625	1	3	5	1	10	56.25	MODERATE RISK	90-100		LOW RISK	EIS = 1.8 (Moderate)
3		Vegetation clearance, construction vehicle traffic and earthworks	Clearance of vegetation during site preparation. Excavation, infilling and shaping of landscape. Disturbance of vegetation by construction vehicle traffic.	During the construction phase, the clearance of vegetation and compaction of soil may result in increased run-off and erosion, altering hydrological and geomorphological processes.	1.5	1	1.5	1.5	1.375	2	2	5.375	1	3	5	1	10	53.75	LOW RISK	90-100		LOW RISK	EIS = 1.5-1.8 (Mod-Low to Moderate)
4		Clearance of vegetation and compaction of soil	Clearance of vegetation during site preparation. Excavation, infilling and shaping of landscape. Disturbance of vegetation and soil by construction vehicle traffic.	During the construction phase, vegetation clearance, construction vehicle traffic and earthworks may reduce ecological connectivity and disturb the watercourse/terrestrial edge.	1.5	1	1.5	1	1.25	2	2	5.25	1	3	5	1	10	52.5	LOW RISK	90-100		LOW RISK	EIS = 1.5-1.8 (Mod-Low to Moderate)

NO.	PHASES	ACTIVITY	ASPECT	IMPACT	SEVERITY				SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	FREQUENCY OF ACTIVITY	FREQUENCY OF IMPACT	LEGAL ISSUES	DETECTION	LIKELIHOOD	SIGNIFICANCE	RISK RATING	CONFIDENCE LEVEL	CONTROL MEASURES	BORDERLINE LOW MODERATE RATING CLASSES	PES AND EIS OF WATERCOURSE
					FLOW REGIME	PHYSICO & CHEMICAL (WATER QUALITY)	HABITAT (GEOMORPH + VEGETATION)	BIOTA															
5		Preparation, storage and transportation of construction materials. Potential oil leaks from construction vehicles and equipment	Accidental spillages of wet concrete and chemical / hazardous substances	During the construction phase, accidental spillages of wet concrete and chemical / hazardous substances may result in soil and groundwater contamination, adversely affecting the aquatic ecosystems in the broader area.	1	2	1	1.5	1.375	1.5	2.5	5.375	1	2	5	2	10	53.75	LOW RISK	90-100	Avoid/prevent impact: • No concrete mixing must take place within of any watercourse. • No machinery must be parked overnight within 50 m of the rivers/wetlands. • All stationary machinery must be equipped with a drip tray to retain any oil leaks. • Chemicals used for construction must be stored safely on bunded surfaces in the construction site camp. • No ablution facilities must be located within 50 m of any river or wetland system. • Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution. • Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it. • All general waste and refuse must be removed from site and disposed and windproof temporary storage area before being disposed of at a registered landfill site. Remediate/rehabilitate impact: • Emergency plans must be in place in case of spillages onto bare soil or within water courses.	LOW RISK	EIS = 1.5-1.8 (Mod-Low to Moderate)
6	OPERATIONAL PHASE	Operation of the powerline.	Removal of vegetation and soil, and introduction of hardened concrete surfaces	During the operational phase, localised altered flow patterns may occur around the powerline pylons. This may indirectly result in increased run-off, erosion and sedimentation.	1.5	0.5	0.5	0.5	0.75	1	4	5.75	1	1	5	1	8	46	LOW RISK	90-100	Minimize/reduce impact: • All operational phase service roads must avoid the delineated watercourses and buffer zones. As far as practically possible, existing roads and dirt tracks should be used as maintenance roads if such access routes avoid watercourses. • Stormwater measures must be installed at pylon sites. • Stormwater infrastructure must be maintained and monitored for effectiveness with respect to controlling and minimising erosion and sedimentation of watercourses. Remediate/rehabilitate impact: • The site must be monitored for erosion and should be rehabilitated where applicable.	LOW RISK	EIS = 1.5-1.8 (Mod-Low to Moderate)
7		Inadequate rehabilitation	Inadequate rehabilitation of disturbed areas may lead to the reduction of ecological connectivity and degradation of the surrounding environment.	During the operational phase, inadequate rehabilitation of disturbed areas may lead to the reduction of ecological connectivity and degradation of the surrounding environment.	1	0.5	1	1	0.875	2	3	5.875	1	1	5	1	8	47	LOW RISK	90-100	Remediate/rehabilitate impact: • Disturbed areas should be rehabilitated and re-vegetated.	LOW RISK	EIS = 1.5-1.8 (Mod-Low to Moderate)

NO.	PHASES	ACTIVITY	ASPECT	IMPACT	SEVERITY				SEVERITY	SPATIAL SCALE	DURATION	CONSEQUENCE	FREQUENCY OF ACTIVITY	FREQUENCY OF IMPACT	LEGAL ISSUES	DETECTION	LIKELIHOOD	SIGNIFICANCE	RISK RATING	CONFIDENCE LEVEL	CONTROL MEASURES	BORDERLINE LOW MODERATE RATING CLASSES	PES AND EIS OF WATERCOURSE
					FLOW REGIME	PHYSICO & CHEMICAL (WATER QUALITY)	HABITAT (GEOMORPH + VEGETATION)	BIOTA															
8		Routine maintenance. Potential oil leaks from vehicles and equipment	Accidental spillages of chemical / hazardous substances	During the operational phase, routine maintenance may lead to the introduction of chemical / hazardous substances into the watercourse, soil and/or groundwater, adversely affecting the aquatic ecosystems in the broader area.	1	1.5	1	1.5	1.25	1.5	2	4.75	1	1	5	2	9	42.75	LOW RISK	90-100	Avoid/prevent impact: • No machinery must be parked overnight within 50m of the rivers/wetlands. • All stationary machinery must be equipped with a drip tray to retain any oil leaks. • Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it. • All general waste and refuse must be removed from site and disposed and windproof temporary storage area before being disposed of at a registered landfill site. Remediate/rehabilitate impact: • Emergency plans must be in place in case of spillages onto bare soil or within water courses.	LOW RISK	EIS = 1.5-1.8 (Mod-Low to Moderate)

6 IMPACT STATEMENT, CONCLUSION AND RECOMMENDATIONS

6.1 SUMMARY OF IMPACT SIGNIFICANCE

Table 6.1 provides a summary of the negative impacts of the proposed development on the watercourse and wetlands along the project route, pre- and post-mitigation, during the construction and operational phases. Prior to mitigation, the proposed development is anticipated to have one impact of MODERATE significance and six impacts of LOW significance. Generally, the most significant impacts of powerlines on freshwater ecosystems involve direct disturbance during construction and operation (e.g. service roads). In this case, the moderately-low importance and sensitivity of W1b triggers a potential moderately significant impact for the unit. Units W1a and W2, with low EIS scores, are anticipated to carry low significance impacts. All impacts will be reduced to a very low to low significance post-mitigation, provided that the proposed mitigation measures are implemented and adhered to.

Table 6.1: Assessment of pre- and post-mitigation impact significance.

PHASE	PRE-MITIGATION			POST-MITIGATION		
	LOW	MOD	HIGH	VERY LOW	LOW	MOD
Construction	4	1	0	4	1	0
Operation	2	0	0	2	0	0
TOTAL	6	1	0	6	1	0

6.2 WATER USE LICENCING

The proposed development site falls within 100 m of watercourses and within 500 m of artificial wetlands, and will therefore require a WUA under Section 21(c) and 21(i) of the NWA. Under Section 21 of the NWA, the proposed development would require either a General Authorisation (GA) or full Water Use Licence (WULA) (depending on the level of risk) for any development occurring within 500m of a wetland, due to the triggering of the following water uses:

- 21(c) impeding or diverting the flow of water in a watercourse (relevant to the construction occurring in close proximity to drainage lines); and
- 21(i) altering the bed, banks, course or characteristics of a watercourse (relevant to the construction occurring in close proximity to drainage lines).

The level of risk associated with the water use activities has been assessed using the DWS Risk Assessment Matrix. Since the proposed development was found to carry a low risk, a GA will be required for these water uses.

6.3 RECOMMENDATIONS FOR THE PROPOSED ACTIVITY

All the mitigation measures provided below are to be implemented in the Planning and Design, Construction and Operation Phases of the proposed activity.

6.3.1 PLANNING AND DESIGN

- All legal matters pertaining to permitting must be completed prior to any construction activity.

- In particular, all necessary Water Use Authorisations must be in order for the abstraction and storage of water, as well as any construction activities within 500 m of a wetland.
- An Erosion and Stormwater Management Plan should be developed during the planning and design phase and implemented during the construction and operational phases.
- Appropriate stormwater structures must be designed to control run-off and minimize erosion.
- Wherever possible, construction activities should be undertaken during the driest part of the year to minimize downstream sedimentation due to excavation, etc.
- All construction phase access and haulage roads must avoid the delineated watercourses and buffer zones. As far as practically possible, existing roads and dirt tracks should be used to access the construction sites if such access routes avoid watercourses.
- All operational phase service roads must avoid the delineated watercourses and buffer zones. As far as practically possible, existing roads and dirt tracks should be used as maintenance roads if such access routes avoid watercourses.

6.3.2 CONSTRUCTION

- Construction materials must not be stored within the moderate sensitivity areas.
- Stockpiles must not be stored within the moderate sensitivity areas.
- No concrete mixing must take place within any watercourse.
- No machinery must be parked overnight within 50 m of the rivers/wetlands.
- All stationary machinery must be equipped with a drip tray to retain any oil leaks.
- Chemicals used for construction must be stored safely on bunded surfaces in the construction site camp.
- No ablution facilities must be located within 50 m of any river or wetland system.
- Chemical toilets must be regularly maintained/ serviced to prevent ground or surface water pollution.
- Any hazardous substances/waste must be stored in impermeable bunded areas or secondary containers 110% the volume of the contents within it.
- All general waste and refuse must be removed from site and disposed and windproof temporary storage area before being disposed of at a registered landfill site.
- Construction activities should be undertaken during the driest part of the year to minimize erosion and downstream sedimentation due to excavation, etc.
- Appropriate stormwater structures must be implemented during construction to control run-off and minimize erosion.
- Vegetation clearing must be kept a minimum and only to the site footprint.
- Erosion controls and sediment trapping measures must be put in place.
- Stockpiles must be monitored for erosion and mobilisation of materials towards watercourses.
- Stockpiles must not exceed 1.5m in height. Stockpiles must be covered during windy periods.
- Disturbed areas must be monitored for erosion channels and these must be rehabilitated.
- All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated, where applicable.
- Emergency plans must be in place in case of spillages onto bare soil or within water courses.

- All construction phase access and haulage roads must avoid the delineated watercourses and buffer zones. As far as practically possible, existing roads and dirt tracks should be used to access the construction sites if such access routes avoid watercourses.

6.3.3 OPERATION

- Stormwater infrastructure must be maintained and monitored for effectiveness with respect to controlling and minimising erosion and sedimentation of watercourses.
- The site must be monitored for erosion and should be rehabilitated where applicable.
- Disturbed areas should be rehabilitated and re-vegetated.
- All operational phase service roads must avoid the delineated watercourses and buffer zones. As far as practically possible, existing roads and dirt tracks should be used as maintenance roads if such access routes avoid watercourses.

6.4 FATAL FLAWS

It is the opinion of the specialist that **NO FATAL FLAWS** exist with the proposed development.

6.5 ENVIRONMENTAL STATEMENT AND OPINION OF THE SPECIALIST

The aquatic impacts of all aspects for the development were assessed and considered to be acceptable, provided that the mitigation measures provided in this report are implemented. All impacts are rated as LOW to MODERATE pre-mitigation. Therefore, implementation of recommended mitigation measures coupled with rehabilitation and monitoring in terms of re-vegetation and restoration is an important element of the mitigation strategy. Given the currently high level of degradation on site and the nature of the proposed development as a linear activity, implementing the recommended mitigations measures will reduce impacts to VERY LOW to LOW significance and the site will likely be returned to its current state within two years of completion of the construction phase.

7 REFERENCES

Dada, R., Kotze, D., Ellery, W. & Uys, M., 2007. *WET-RoadMap: A Guide to the Wetland Management Series (No. WRC Report No TT 321/07), Wetland Management Series,* Pretoria, South Africa: Water Research Commission (WRC).

Department of Economic Development, Environment, Conservation and Tourism (DEDECT), 2015. *North West Biodiversity Sector Plan 2015.* [Online]
Available at:
http://www.nwpg.gov.za/Agriculture/documents/2016/Environmental%20Policy%20Planning%20and%20Coordination/New%20Documents/North%20West%20Biodiversity%20Sector%20Plan%202015.pdf
[Accessed 16 January 2019].

Kotze, D. C., Macfarlane, D. M. & Edwards, R. J., 2020. *WET-EcoServices (Version 2): A technique for rapidly assessing ecosystem services supplied by wetlands and riparian areas. Final Report. WRC Project K5/2737. ,* Pretoria, South Africa: Water Research Commission.

Macfarlane, D. M., Ollis, D. J. & Kotze, D. C., 2020. *WET-Heath (Version 2): A Refined Suite of Tools for Assessing the Present Ecological State of Wetland Ecosystems. WRC Report No. TT 820/20,* Pretoria: Water Research Commission.

Meteoblue, 2021. *Meteoblue Climate Johannesburg.* [Online]
Available at:
https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/johannesburg_republic-of-south-africa_993800
[Accessed 30 April 2021].

Meteoblue, 2021. *Meteoblue Climate Pampierstad.* [Online]
Available at:
https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/pampierstad_republic-of-south-africa_966380
[Accessed 30 April 2021].

Ollis, D., Snaddon, K., Job, N. & Mbona, N., 2013. *Classification system for wetlands and other aquatic ecosystems in South Africa,* Pretoria: South African National Biodiversity Institute.

South African National Biodiversity Institute, 2006-2018. *The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Version 2018.* [Online]
Available at: http://bgis.sanbi.org/Projects/Detail/186
[Accessed 18 December 2019].

8 APPENDIX A – CURRICULUM VITAE

AIDAN JOHN GOUWS
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

CONTACT DETAILS

Name of Company	**CES – Environmental and Social Advisory Services**
Designation	Centurion Branch
Profession	Senior Environmental Consultant
Years with firm	3 Years
E-mail	a.gouws@cesnet.co.za
Office number	+27 (0)10 045 1372
Nationality	South African
Professional Affiliations	• South African Council for Natural Scientific Professions (SACNASP) (*Cand.Sci.Nat* 121901) • International Association of Impact Assessment (IAIAsa)
Key areas of expertise	• Environmental Authorisations • Geographical Information Systems (GIS) • Terrestrial Ecology • Wetland Ecology • Database Management

PROFILE

Mr Aidan Gouws

Aidan obtained his MSc in Environmental Science (*Cum laude*) from Rhodes University, having conducted research on the spatio-temporal dynamics of *Acacia dealbata* invasions and broader land-use and cover changes in the northern Eastern Cape, funded through a study bursary awarded by the Agricultural Research Council (ARC). Prior to this, he obtained his BSc Honours in Geographical and Environmental Sciences (*Cum laude*) from the University of Pretoria, studying plant ecology and EIA methodology amongst others. Since joining CES in 2018, he has been involved in several projects, including Basic Assessments (BA), Full Scoping and Environmental Impact Assessments (S&EIA), Environmental Amendment Applications, Environmental Audits and Resettlement Action Plan (RAP) Audits. He works from the Centurion office as a Senior Environmental Consultant. His interests include the general Environmental Impact Assessment (EIA) process, terrestrial and wetland ecology, and database management. Aidan is registered with the South African Council for Natural Scientific Professions (SACNASP) as a Candidate Natural Scientist (*Cand.Sci.Nat.* 121901) and with the International Association for Impact Assessments (IAIA).

AIDAN JOHN GOUWS
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

EMPLOYMENT EXPERIENCE	**Senior Environmental Consultant – Coastal and Environmental Services (Centurion)** *August 2020 – Current* • Consulting, project management and conducting assessments in the broad field of Environmental Management, including Basic Assessments, full Scoping and Environmental Impact Assessments, Environmental Management Programmes and Environmental Auditing. • Ecological Impact Assessments • Wetland Impact Assessments • GIS Mapping • Database Management **Environmental Consultant – Coastal and Environmental Services (Centurion)** *July 2018 – July 2020* • Consulting, project management and conducting assessments in the broad field of Environmental Management, including Basic Assessments, full Scoping and Environmental Impact Assessments, Environmental Management Programmes and Environmental Auditing. • Ecological Impact Assessments • GIS Mapping • Database Management **Volunteer – Khulisa Social Solutions (Johannesburg)** *May 2018 – July 2018* **Departmental tutor - Department of Environmental Science, Rhodes University (Grahamstown)** *January 2016 – December 2017* **Demonstrator - Department of Plant Science, University of Pretoria (Pretoria)** *July 2015 – December 2015*
ACADEMIC QUALIFICATIONS	• 2014 - BSc Environmental Science (University of Pretoria) • 2015 - BSc (Hons) Geographical and Environmental Science (University of Pretoria) • 2018 - MSc Environmental Science (Rhodes University)
COURSES	• 2020 - Tools for Wetland Assessment (Rhodes University, in association with GroundTruth, The Water Research Commission and Verdant Environmental) *August 2020*
PUBLICATIONS	• Gouws, A. J., & Shackleton, C. M. (2019). A spatio-temporal, landscape perspective on *Acacia dealbata* invasions and broader land use and cover changes in the northern Eastern Cape, South Africa. Environmental Monitoring and Assessment, 191(2), 74. • Gouws, A. J., & Shackleton, C. M. (2019). Abundance and correlates of the *Acacia dealbata* invasion in the northern Eastern Cape, South Africa. Forest Ecology and Management, 432, 455-466.

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PROFESSIONAL EXPERIENCE

BASIC ASSESSMENTS

SANRAL R573 Section 1 Phase 2A and 3A Road Upgrade from Baviaanspoort Road to PWV2 the Interchange, Pretoria, Gauteng Province, 2022–
Basic Assessment for the upgrade of the R573 Section 1 Road Upgrade from Baviaanspoort Road to PWV2 the Interchange in Pretoria, Gauteng Province. Assigned the role of project manager.

SANRAL Masekwaspoort N1 Road Upgrade BAR Authorisation, Musina, Limpopo Province, 2018–2019, 2022–
Basic Assessment for the upgrade of the N1 between Louis Trichardt and Musina. Assigned the role of project manager and co-author of the Basic Assessment Report.

Eskom Mesong 400Kv Loop in Loop-out Powerline, Gauteng Province, 2021–
Basic Assessment for the development of the 400 kV LILO Powerline in the Modderfontein area, Gauteng Province. Assigned the role of Terrestrial Ecologist, Wetland Ecologist and co-author of the Basic Assessment Report.

Eskom 132 kV Ganspan Pering powerline in the Pampierstad area, in the Northern Cape and North West Provinces, 2021–
Basic Assessment for the development of the 132 kV Powerline in the Pampierstad area, in the Northern Cape and North West Provinces. Assigned the role of Wetland Ecologist and co-author of the Basic Assessment Report.

Sturdee Energy Solar PV Plants at PPC Cement Facilities, South Africa, 2020–
Two Basic Assessments for the proposed solar PV plants at the PPC Dwaalboom and PPC Slurry Facilities, located in the Limpopo and North West Provinces, respectively. Assigned the roles of co-project manager, Terrestrial Ecologist and Wetland Ecologist.

SANRAL R516 Section 1 Road Upgrade (R511-Tooyspruit and Tooyspruit-Bela Bela), Limpopo Province, 2021–
Two Basic Assessments for the upgrade of two sections of the R516-01 (namely from R511 to Tooyspruit and from Tooyspruit to Bela Bela), as well as a Basic Assessment for the associated mining of a quarry. Assigned the role of project manager.

Ramotshere Moiloa Local Municipality Residential Extensions, Zeerust, North West Province, 2019–2020
Two Basic Assessments for the proposed extension of two residential extensions in Zeerust, North West. Assigned the roles of project manager, PPP manager, Terrestrial Ecologist and lead author of the Basic Assessment Report.

SANRAL Koster R52 Road Upgrade, Koster, North West Province, 2018–2021
Basic Assessment for the road upgrade of the R52 route between Koster and the N4 Rustenburg. Assigned the roles of project manager, PPP manager, Terrestrial Ecologist, Wetland Ecologist and lead author of the Basic Assessment Report.

Transnet Freight Rail Installation of Telecommunications Masts and Associated Infrastructure at Various Locations in South Africa, 2019–2020
Three Basic Assessments for the installation of telecommunications masts in Gauteng, Mpumalanga and KwaZulu-Natal. Assigned the roles of project manager, PPP manager and lead author of the Basic Assessment Report.

PRASA CRES Establishment of Township Leralla Extension 1, Tembisa, Gauteng Province, 2019–2020
Basic Assessment for the proposed township establishment at Leralla Station in Tembisa, Gauteng Province. Assigned the roles of project manager, PPP manager and lead author of the Draft Basic Assessment Report.

FULL SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENTS

SANRAL Zandkraal-Winburg N1 Road Upgrade Quarry S&EIR Authorisation, Winburg, Free State Province, 2018–2022
Full Scoping and Environmental Impact Assessment for the mining of borrow pits and quarries associated with the upgrade of the N1 between Zandkraal and Winburg South. Assigned the roles of project manager, PPP manager and lead author of the Scoping Report and Environmental Impact Assessment Report.

SANRAL Masekwaspoort N1 Road Quarry S&EIAR Authorisation, Musina, Limpopo Province, 2018–2019, 2022–
Full Scoping and Environmental Impact Assessment for the mining of borrow pits and quarries associated with the upgrade of the N1 between Louis Trichardt and Musina, Limpopo Province. Assigned the role of project manager and co-author of the Scoping Report.

ENVIRONMENTAL SCREENING

Eskom Lesokwana Substation and Associated Powerlines, Gauteng Province, 2021–
Detailed environmental screening process for the development of the Lesokwana substation and associated powerlines in the Gauteng Province. Assigned the roles of project manager, Terrestrial Ecologist, Wetland Ecologist and lead author of the detailed screening report.

ENVIRONMENTAL AMENDMENT APPLICATIONS

SANSA Space Operations Installation of Satellite Antennae on Farm Hartebeesthoek 502JQ, Gauteng Province, 2019–2021
Amendment of Environmental Authorisation for the installation of satellite antennae at the South African National Space Agency (SANSA) Space Operations facility. Assigned the roles of client liaison, Terrestrial Ecologist, Assistant Wetland Ecologist and lead author of the Amendment Report.

WATER USE AUTHORISATON (WUA) APPLICATIONS

Door of Hope Village Estate for Abandoned and Orphaned Children on Farm Hartsenbergfontein 332, De Deur, Gauteng, 2020–
Integrated Water Use Licence Application (WULA) under Section 21(a)(c)(e)(f)(g) of the National Water Act, 1998 (Act 36 of 1998) for the development of a village estate for abandoned and orphaned children. Assigned the role of WULA manager.

SANRAL Koster R52 Road Upgrade, Koster, North West Province, 2021–
Section 21(c)(i) General Authorisation Application for the road upgrade of the R52 route between Koster and the N4 Rustenburg. Assigned the roles of project manager, Wetland Ecologist and WUA manager.

Sturdee Energy Solar PV Plants at PPC Slurry Cement Facility, North West Province, 2021–
Section 21(c)(i) General Authorisation Application for the proposed solar PV plants at the PPC Slurry Facility, located near Mahikeng in the North West Province. Assigned the roles of co-project manager, WUA manager and Wetland Ecologist.

ENVIRONMENTAL AUDITING

SANRAL R510 Section 2 Thabazimbi-Bierspruit, Limpopo Province, 2021–
Environmental Auditing for the upgrade of the R510-02 road between Thabazimbi and Bierspruit. Assigned the roles of project manager and reviewer of audit reports.

SANRAL R33 Section 14 Vaalwater-Lephalale Road Upgrade ECO Audits, Limpopo Province, 2021–
Environmental Auditing for the upgrade of the R33-14 road and associated bridges and culverts between Vaalwater and Lephalale. Assigned the roles of project manager and assistant ECO.

SANRAL Hendrina N11 Road Upgrade ECO Audits, Hendrina, Mpumalanga Province, 2018–2019
Environmental Auditing for the construction of the road and mining of borrow pits associated with the upgrade of the N11 route between Hendrina and Hendrina Power Station. Assigned the roles of ECO, author of ECO audit reports and author of the borrow pit closure report

South African National Biodiversity Institute (SANBI) Office Complex Development, Pretoria, Gauteng Province, 2018
Environmental Auditing for the construction of the Office Complex at the Pretoria National Botanical Gardens. Assigned the roles of interim ECO and co-author of ECO audit reports.

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RISK ASSESSMENTS

PRASA CRES Inhlanzane Risk Assessment, Jabulani (Soweto), Gauteng, 2019
Social and Environmental Risk Assessment of the Illegal Occupation of the Rail Reserve near Inhlanzane Station - Jabulani (Soweto), Gauteng. Assigned the roles of project manager and lead author of the Risk Assessment Report.

RESETTLEMENT ACTION PLAN (RAP) AUDITING

Millennium Challenge Account Malawi (MCA-M) RAP Audits, 2018–2019
Completion audits for six Resettlement Action Plans (RAPs) conducted for the Infrastructure Development Project in Malawi. These RAPs documented the physical and economic displacement impacts and compensation for assets of people affected by wayleave corridors along 400kV, 132kV, 66kV and 33kV OHLs, as well as for substations and permanent access roads. Assigned the roles of database support, auditor, training assistant and assistant author. Later assigned the role of database manager.

DATABASE MANAGEMENT

Eswatini Electricity Company (EEC) 132kV Powerline ESIA and RAP, 2020–
Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the proposed 132kV powerline in the Shiselweni Region of Swaziland. Assigned the roles of data analyst and database co-manager.

SPECIALIST ASSESSMENTS

Terrestrial biodiversity and ecological impact assessments:

- Anglo American Borwa Vent Shaft Construction, Limpopo, 2021–
- Eskom Mesong 400Kv Loop in Loop-out Powerline, Gauteng, 2021–2022
- Eskom Lesokwana Substation and Associated Powerlines, Gauteng Province, 2021
- Sturdee Energy Solar PV Plants at PPC Cement Facilities, South Africa, 2021
- SANRAL Koster R52 Road Upgrade, Koster, North West Province, 2020
- SANSA Space Operations Installation of Satellite Antennae on Farm Hartebeesthoek 502JQ, Gauteng Province, 2020
- Ramotshere Moiloa Local Municipality Residential Extensions, Zeerust, North West Province, 2019

River and wetland impact assessments:

- Anglo American Borwa Vent Shaft Construction, Limpopo, 2021–
- Diamcor Diamond Mine Mining Expansion Project, Limpopo, 2021–
- Bosch Projects Jan Kleynhans Water Treatment Works Subsoil Drain, Grahamstown, Eastern Cape, 2021–
- Eskom 132 kV Ganspan Pering powerline in the Pampierstad area, in the Northern Cape and North West Provinces, 2021
- Eskom Lesokwana Substation and Associated Powerlines, Gauteng Province, 2021
- De Beers Venetia Mine Stormwater Management Project, Limpopo, 2021

AIDAN JOHN GOUWS
Curriculum Vitae

- Sturdee Energy Solar PV Plant at PPC Slurry, North West, 2021
- T4 Mining Project in the Dr Pixley Ka Isaka Seme Local Municipality, Mpumalanga, 2021
- Birmingham Mining Project in the Steve Tshwete Local Municipality, Mpumalanga, 2020-2021
- SANSA Space Operations Installation of Satellite Antennae on Farm Hartebeesthoek 502JQ, Gauteng, 2020
- SANRAL Koster R52 Road Upgrade, Koster, North West, 2020

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Aidan John Gouws Date: January 2022

Ryan Edwards | Wetland Ecologist & Environmental Scientist

M.Sc., B.Sc. (Hons), B.Sc. UKZN
SACNASP Reg. No.: 400089/13

96 Edmonds Road, Glenwood, 4001
Cell no.: +27 73 121 3392
Email: ryan@verdantenv.co.za

PROFILE

- I am a highly motivated wetland ecosystem specialist and environmental scientist with twelve (12) years experience in the natural scientific and environmental management consulting sector.
- My core field of focus, specialisation and passion is wetland and freshwater ecosystem ecology.
- I regularly conduct wetland and river ecosystem assessments and develop wetland rehabilitation and management plans and wetland offset plans for private, commercial and industrial clients as well as for provincial and national government departments and municipalities.
- My highest qualification is a Master of Science (MSc) in Environmental Science (Research Masters). My Masters dissertation was on wetland geomorphology and as such I have expertise in the methods of data collection and analysis in the discipline of fluvial geomorphology.
- I have developed a wide range of skills and knowledge over my career. I am competent in data collection and analysis methods related to wetland and river ecosystem assessments that include soil and vegetation sampling, description and analysis; ecosystem services assessments; biodiversity / ecological importance assessments; ecological health / condition assessments; and freshwater ecosystem impact assessment.
- I have notable experience in wetland rehabilitation and management (±10yrs), wetland and biodiversity offset planning (±5yrs), and vegetation / biodiversity assessments (±8yrs).
- I have some experience in the compilation of constructed wetland feasibility assessments.
- I have considerable project management experience (±10yrs) having successfully led, managed and completed a diverse range of specialist freshwater ecosystem and environmental management related projects.
- I am one of the leading wetland ecologists in the field of wetland offset planning in SA and have been involved in a number of high profile offset projects, two of which I have lead and managed.
- I have completed over 100 specialist wetland assessments.
- I am competent in the basic use of Geographical Information Systems (GIS) for the purpose of mapping wetlands, rivers (riparian zones) and vegetation communities as well as environmental impacts.

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- As a senior scientist in my current post, my role involves the mentorship, management and oversight of junior scientists, a managerial role that I fulfilled over the last five years.
- I am currently accredited as a professional natural scientist by the South African Council for Natural Scientific Professions (SACNASP) under the field of practice – 'environmental science'.
- My professional interests are wetland ecosystems, ecosystem restoration and rehabilitation, ecosystems services, sustainability, climate resilience, market internalisation of negative environmental externalities, and the mainstreaming of environmental management and sustainability into strategic development planning and governance.

SKILLS PROFILE

A. Technical Scientific Skills:

Proficient in the following ecological / biophysical specialist assessments and plans:

- Wetland and River / Riparian Ecosystem Delineation and Classification
- Wetland and River / Riparian Ecosystem Service/Functional Assessments
- Wetland and River / Riparian Ecosystem Health/Ecological State Assessments
- Wetland and River / Riparian Ecosystem Vegetation Assessments
- Wetland and River / Riparian Ecosystem Geomorphology Assessments
- Wetland and River / Riparian Ecosystem Rehabilitation Plans
- Wetland and River / Riparian Ecosystem Management and Conservation Plans
- Wetland and Biodiversity Offset Plans
- Freshwater ecosystem (wetland and river) impact assessments
- Strategic freshwater ecosystem / wetland management planning
- Terrestrial ecosystem impact assessments (typically in collaboration with botanists and zoologists)
- Alien Plant Eradication and Control Programmes
- Wetland training presentations and courses

Proficient in the following scientific sampling methods and analysis:

- Soil sampling for hydric (wetland / alluvial) soil identification
- Vegetation sampling (plots / quadrats) and wetland / riparian plant identification
- Wetland surface cross-sectional and longitudinal surveys using a dumpy level and a staff
- Wetland sedimentary fill sampling and interpretation

Proficient in the following specialist ecological assessment tools and techniques:

- WET-Health (Macfarlane et al., 2008) – co-author of the current revision of the tool (in preparation)
- WET-EcoServices (Kotze et al., 2007) – co-author of the current revision of the tool (in preparation)
- Wetland Ecological Importance and Sensitivity Assessment (DWAF, 1999)

- Riverine Index of Habitat Integrity Assessment (Kleyhans & Louw, 2008)
- Riverine Ecological Importance and Sensitivity Assessment (DWAF, 1999)

Have experience with the following river ecosystem assessment techniques:

- Riparian Vegetation Response Assessment Index (VEGRAI) (Kleynhans et al., 2007)
- SASS 5 (not an accredited practitioner but have undertaken the course)
- Mini-SASS

Proficient in the following environmental management activities:

- Leading, managing and compiling Environmental Impact Assessments (EIAs) and Basic Environmental Assessments (BAs)
- Leading, managing and compiling Water Use License Applications (WULAs)
- Environmental Prefeasibility Assessments
- Environmental Auditing/Compliance Monitoring

Proficient in the use of Geographical Information Systems (GIS) for mapping and basic analysis purposes.

B. Project Management and Managerial Skills:

Proficient in the following project management tasks:

- Leading, coordinating and managing specialist ecological assessments.
- Leading and managing the development of wetland rehabilitation and offset plans that often require multi-stakeholder engagement.
- Leading, facilitating and managing Environmental Impact Assessments and Water Use License Applications.

Proficient in the following managerial tasks:

- Managing and mentoring a small team of scientists.
- Consulting business strategic planning.

CV: Ryan Edwards

EDUCATION

1. MSc Environmental Science

University of KwaZulu-Natal, Durban | **2006 – 2009**

Thesis / Dissertation Title: The Origin and Evolution of Dartmoor Vlei in the KwaZulu-Natal Midlands.

Supervisor: Prof. Fred Ellery

2. BSc (Hons) Geography and Environmental Management

University of KwaZulu-Natal, Durban | **2005 - 2006**

3. BSc Geography and Environmental Management

University of KwaZulu-Natal, Durban | **2001 - 2004**

4. Senior Certificate

Northwood Boys High School, Durban-North, Durban | **1996 - 2000**

CAREER HISTORY

Verdant Environmental (Pty) Ltd March 2020 – Present ***Owner and Director*** ***Principal Environmental Scientist and Wetland Ecologist***	Duties and Responsibilities: • Directing and managing a small environmental consulting business. • Data collection and analysis for specialist ecological assessments, plans and programmes. • Project management and compilation of specialist freshwater ecological assessments (wetlands and rivers). • Project management and compilation of specialist ecological plans and programmes including wetland and river rehabilitation plans, wetland and biodiversity offset plans, wetland and river management plans, ecological monitoring programmes, alien invasive plant control plans. • Project management and compilation of Basic Assessments (BAs), Environmental Impact Assessments (EIAs), Water Use License Applications (WULAs), Strategic Environmental Assessments (SEAs), Environmental Management Frameworks (EMFs) and Integrated Environmental Management Plans (IEMPs). • Undertaking ecological monitoring. • Undertaking environmental compliance monitoring.
Eco-Pulse Consulting Services cc Aug 2014 – Feb 2020	Duties and Responsibilities: • Data collection and analysis for specialist ecological assessments, plans and

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CV: Ryan Edwards

Senior Environmental Scientist and Wetland Ecologist	programmes. • Project management and compilation of specialist freshwater and terrestrial ecological assessments and plans. • Project management and compilation of specialist ecological plans and programmes including wetland and river rehabilitation plans, wetland and biodiversity offset plans, wetland and river management plans, ecological monitoring programmes, alien invasive plant control plans. • Sign-off on specialist freshwater and terrestrial ecological assessments and plans, and WULA reports. • Project management and compilation of Water Use License Applications (WULAs). • Management and mentorship of junior ecological / scientist staff.
GCS (Pty) Ltd Nov 2012 – August 2014 ***Wetland Specialist and Environmental Scientist***	Duties and Responsibilities: • Data collection and analysis for specialist ecological assessments, plans and programmes. • Project management and compilation of specialist freshwater and terrestrial ecological assessments and plans. • Project management and compilation of specialist ecological plans and programmes including wetland and river rehabilitation plans, wetland and biodiversity offset plans, wetland and river management plans, ecological monitoring programmes, alien invasive plant control plans. • Project management and compilation of Basic Assessments (BAs), Environmental Impact Assessments (EIAs), Water Use License Applications (WULAs).
School of Environmental Science, University of KwaZulu-Natal Sept – Nov 2012 ***First Year Atmospheric Science Module Lecturer***	Duties and Responsibilities: • Lectured atmospheric science module as part of the first year environmental systems course (ENVS102). • Facilitated module practicals. • Marked atmospheric section of final course exam.
SiVEST SA (Pty) Ltd March 2008 – Nov 2012 ***Wetland Specialist and Environmental Scientist***	Duties and Responsibilities: • Project management of specialist wetland ecological assessments and Basic Assessments / Environmental Impact Assessments. • Data collection and analysis for specialist wetland ecological assessments and plans • Reporting for Basic Assessments (BAs) and Environmental Impact Assessments (EIAs).
SiVEST SA (Pty) Ltd May 2007 – March 2008	Duties and Responsibilities: Assisted in the review of backlogged EIA's and in the compilation of a number of draft Record of Decisions (ROD's) for large residential

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Internship - DEAT Review Mentorship Program (Part Time)	developments in KwaZulu-Natal.
Private Wetland Consulting April 2007 – May 2007 ***Wetland Specialist***	Duties and Responsibilities: Undertook private wetland assessments for small development projects supervised by Professor Fred Ellery of the School of Environmental Sciences at the University of KwaZulu-Natal.

SELECTED PROJECT EXPERIENCE

1. **Wetland & River (Freshwater Ecosystem) Impact Assessments:**
   - Freshwater Habitat Impact Assessment for the Proposed Luhlanga Open Cast Pit Expansion at Somkheke Mine in the Hlabisa Local Municipality, Kwazulu-Natal (2018-2019) | Role: Lead author and project manager | Client: Black Rock Consulting
   - Freshwater Habitat Impact Assessment for the Proposed Disposal of Mine Residue Deposits to the KwaQubuka and Luhlanga Open Cast Pits at Somkheke Mine in the Hlabisa Local Municipality, Kwazulu-Natal (2018-2019) | Role: Lead author and project manager | Client: Black Rock Consulting
   - Wetland & River Impact Assessment for the Cato Ridge Intermodal Development in KwaZulu-Natal, South Africa (2018) | Role: Lead author and project manager | Client: SiVEST SA (Pty) Ltd
   - Freshwater Habitat Impact Assessment for the proposed TradeZone2 Development in La Mercy, KwaZulu-Natal, South Africa (2017) | Role: Lead author and project manager | Client: Dube Tradeport Corporation
   - Freshwater Habitat Impact Assessment for the proposed AgriZone2 Development in La Mercy, KwaZulu-Natal, South Africa (2017) | Role: Lead author and project manager | Client: Dube Tradeport Corporation
   - Freshwater Habitat Impact Assessment Report for the proposed White iMfolozi Bridge and Link Road in the Ulundi Local Municipality, KwaZulu-Natal, South Africa (2017) | Role: Project manager, senior report review, co-author and report sign-off | Client: Royal HaskoningDHV
   - Freshwater Habitat Impact Assessment and Conceptual Rehabilitation plan for the proposed Avoca South Business Estate in the eThekwini Municipality, KwaZulu-Natal, South Africa (2015) | Role: Lead author and project manager | Client: GCS (Pty) Ltd
   - Wetland Impact Assessment Report & Conceptual Rehabilitation Plan for the commencement of unauthorised activities within the Balamhlanga wetland associated with bulrush eradication, Jozini, KwaZulu-Natal, South Africa (2015) | Role: Lead author and project manager | Client: Nzingwe Consultancy
   - Wetland Impact Assessment Report for the Longridge Mine Closure in the eDumbe Local Municipality, KwaZulu-Natal (2013) | Role: Lead author and project manager | Client: Kangra Coal (Pty) Ltd

CV: Ryan Edwards

2. **Wetland Rehabilitation Plans, Management Plans, Monitoring Plans & Offset Plans:**
   - Wetland and riparian zone rehabilitation plan for the Dube TradePort Automotive Supply Park Development in Illovo, Durban, KwaZulu-Natal, South Africa (2019) | Role: Lead author and project manager | Client: Dube Tradeport Corporation
   - Wetland management and monitoring plan for high conservation value wetlands at World Hardwood Rockvale Plantation near Ixopo, KZN (2019) | Role: Project management, senior report review, co-author and report sign-off | Client: World Hardwood (Pty) Ltd
   - River and Buffer Zone Revegetation Plan for the Kudumane Manganese Resources Mine in Hotazel, Northern Cape (2019) | Role: Project manager, senior report review, co-author and report sign-off | Client: Kudumane Manganese Resources (Pty) Ltd
   - Baseline Wetland Habitat Monitoring Assessments for four priority wetlands in the eThekwini Municipality hosting the endangered *Hyperolius pickersgillii* (Pickersgill's Reed frog) (2015-2016 & 2018-2019) | Project manager, lead author and assessor | Endangered Wildlife Trust
   - Wetland and riparian zone rehabilitation plan for the Dube TradePort TradeZone 2 Development Offset Site in La Mercy, KwaZulu-Natal, South Africa (2017) | Role: Lead author and project manager | Dube TradePort Corporation
   - Piseang River floodplain wetland rehabilitation plan, offset strategy and funding plan for the Bridge City-KwaMashu Open Space Project, KwaZulu-Natal, South Africa (2015-2017) | Role: Project manager and lead author | Client: eThekwini Municipality Architects Department
   - Wetland offset plan for the proposed Clairwood Racecourse Logistics Development in South Durban, KZN (2015-2017) | Role: Project manager and lead author | Client: Capital Property Fund
   - Strategic Wetland Offset Plan for the eThekwini Municipality Northern Region, KwaZulu-Natal, South Africa (2016) | Role: Co-author | Client: Dube TradePort Corporation and Tongaat Hulett Developments
   - Baseline (Tier 2) Monitoring Assessment for the Ivanhoe Wetland (T32B-05) in KwaZulu-Natal, South Africa (as part of the Monitoring and Evaluation Programme for Working for Wetlands) (2015) | Role: Lead author | Client: Working for Wetlands
   - Interim Wetland Rehabilitation Plan for the commencement of unauthorised activities within the Balamhlanga wetland associated with bulrush eradication, Jozini, KwaZulu-Natal, South Africa (2015) | Role: Lead author and project manager | Client: Nzingwe Consultancy
   - Foskor Rock Phosphate Storage Facility Wetland Offset Mitigation Study and Wetland Rehabilitation and Management Plan (2013) | Role: Lead author and project manager | Client: GIBB
   - Cornubia Mixed Use Development Phase 1 Wetland Rehabilitation Plan in Verulam/Umhlanga, KZN (2011-2012) | Role: Co-author | Tongaat Hulett Developments

3. **Constructed Wetland Feasibility Assessments:**
   - Constructed Wetland Feasibility Assessment for the proposed Kangra Longridge Mine Closure in KwaZulu-Natal (2014) | Role: Lead author and project manager | Client: Kangra Coal (Pty) Ltd

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4. **Development of Wetland Assessment Tools & Management Guidelines:**
   - Revision of the WET-EcoServices and Ecological Importance and Sensitivity (EIS) assessment tools for South African wetlands (2017-2019) | Role: Contributing author and developer | Client: Water Research Commission
   - Development of wetland management guidelines for South African municipalities (2017-2018) | Role: Lead author, technical content development, sub-consultant coordination | Client: ICLEI: Africa

5. **Terrestrial Ecological / Vegetation Assessments:**
   - Terrestrial ecosystem impact assessment for the Proposed Umlass Gates Light Industrial Development in Umlaas Road, KwaZulu-Natal (2018-2019) | Project manager, senior report review, co-author and report sign-off | Client: Super Digger Holdings (Pty) Ltd
   - Vegetation Assessment for the Proposed Apron Stands and Bravo Taxiway at King Shaka International Airport (KSIA) (2018) | Role: Co-author and project manager | Client: BMK Consulting Engineers
   - Terrestrial Habitat Impact Assessment Report for the proposed White iMfolozi Bridge and Link Road in the Ulundi Local Municipality, KwaZulu-Natal, South Africa (2017) | Role: Project manager, senior report review, co-author and report sign-off | Client: Royal HaskoningDHV

6. **Alien Invasive Plant Eradication and Control Plans / Programmes:**
   - Alien Invasive Plant Eradication and Control Programme for the Kudumane Manganese Resources (KMR) Mine near Hotazel, Northern Cape (2019) | Role: Project manager, senior report review, co-author and report sign-off | Client: Kudumane Manganese Resources (Pty) Ltd
   - Alien Plant Eradication and Control Programme Implementation Plan for the King Shaka International Airport (KSIA) (2014) | Role: Lead author and project manager | Client: Airports Company of South Africa (ACSA)

Selected Environmental Assessment Practitioner (EAP) Experience:

1. **Basic Assessments and Environmental Impact Assessments:**
   - Environmental Impact Assessment for the Proposed Magdalena Colliery Discard Dump Extension (2013-2014) | Role: Project manager and lead author | Client: Forbes Coal (Pty) Ltd
   - Environmental Impact Assessment for the Proposed Kingthorpe Equestrian Estate in Lynfield Park, KZN (2011-2012) | Role: Lead author and project assistant | Client: Stars Away Investments (Pty) Ltd
   - Basic Assessment for the Proposed Lungisisa Indlela Village (LIV) Development in Hazelmere, KwaZulu-Natal (2011-2012) | Role: Project manager and co-author | Client: LIV
   - Environmental Impact Assessment for the Proposed Madimeni Low Cost Housing Project in Molweni, KwaZulu-Natal (2009-2011) | Role: Lead author and project assistant | Client: eThekwini Municipality
   - Environmental Impact Assessment for the Proposed Lower Langefontein 5 Low Cost Housing Project in Molweni, KwaZulu-Natal (2009-2011) | Role: Lead author and project assistant | Client: eThekwini Municipality

- Environmental Impact Assessment for the Proposed Umzinto Slums Clearance Low Income Housing Project, KwaZulu-Natal (2009-2011) | Role: Lead author and project assistant | Client: Umdoni Municipality
- Environmental Impact Assessment for the Proposed Motala Farm Affordable Housing Project in Tongaat, KZwaZulu-Natal (2009-2010) | Role: Lead author and project assistant | Client: Shield Homes

2. **Water Use License Applications:**
   - R61 Road Upgrade WULA (2018-2019) | Role: Project manager, senior review and report sign-off | Client: SANRAL

3. **Desktop Environmental Feasibility Investigations:**
   - Desktop Environmental Feasibility Assessment for the eThekwini Wards 99 & 100 Rural Housing Project, KwaZulu-Natal (2011) | Role: Lead author and assessor | Client: MGM Holdings (Pty) Ltd
   - Desktop Environmental Feasibility Assessment for the Umzumbe Wards 8 & 9 Rural Housing Project, KwaZulu-Natal (2011) | Role: Lead author and assessor | Client: MGM Holdings (Pty) Ltd
   - Desktop Environmental Feasibility Assessment for the KwaYanguye Rural Housing Project, KweaZulu-Natal (2011) | Role: Lead author and assessor | Client: Ilima Rural Housing

4. **Environmental Compliance Monitoring / Auditing:**
   - Zimbali Lakes Estate Golf Course in Ballito, KwaZulu-Natal (2011-2012) | Role: Environmental Control Officer | Client: IFA Hotels & Resorts
   - Rocky Park Integrated Housing Project in Stanger, KwaZulu-Natal (2011) | Role: Environmental Control Officer | Client: KwaDukuza Municipality
   - Philani Valley Redevelopment Phases 17-25 in Umlazi, KwaZulu-Natal (2008-2009) | Role: Environmental Control Officer | Client: eThekwini Municipality

PROFESSIONAL MEMBERSHIPS

- Professional Natural Scientist (Reg. No. 400089/13) under the South African Council for Natural Scientific Professions (SACNASP)
- South African Wetland Society (SAWS)

PUBLICATIONS

- Edwards, R. J., Ellery, W. N. and Dunlevey, J. 2014. The role of the insitu weathering of dolerite in the formation of a peatland: the origin and evolution of Dartmoor Vlei in the KwaZulu-Natal Midlands, South Africa. *Catena* 143: 232-243.

- Lead author for: ICLEI Africa[1]. 2018. Wetland Management Guidelines: Building Capacity and Supporting Effective Management of Wetlands within South African Municipalities.

CONFERENCE AND SYMPOSIA PRESENTATIONS

- Implementing a wetland offset: application of the Draft Wetland Offset Guidelines and lessons learnt: The case of the Clairwood Logistics Park Development – National Wetlands Indaba 2017 (Port Edward)
- Understanding the Origin and Evolution of Dartmoor Vlei in KwaZulu-Natal Midlands – National Wetlands Indaba 2006 (Johannesburg)
- Social and environmental justice in environmental decision making: The case of Wolraad Park in Wentworth, KwaZulu-Natal, South Africa – National IAIA Conference 2005 (Free State)

AWARDS

- International Association for Impact Assessment South Africa (IAIASA) 'Young Person' Award for: Best Paper and Presentation at the 2005 IAIAsa Conference.

INTERESTS

Personal fields of interest:

- Wetland ecology and conservation
- Wetland origin and evolution (geomorphology)
- Restoration ecology
- Botany
- Environmental / ecological sustainability and sustainable development
- Ecosystem services and their value
- Climate resilience
- Ecological economics
- Addressing market failures related to the environment (e.g. internalisation of negative environmental externalities)
- Social and environmental justice

[1] (ICLEI) Local Governments for Sustainability – Africa Secretariat

REFERENCES

Prof. Fred Ellery	Head of Geography Department
Company/Institution:	Rhodes University
Relationship:	Master of Science (MSc) Supervisor (2006 – 2009)
Tel:	046 603 7453
Email:	f.ellery@ru.ac.za
Greg Mullins	Senior Environmental Scientist
Company/Institution:	eThekwini Municipality Environmental Planning Department
Relationship:	Colleague (2008 – 2012)
Tel:	031 322 4560
Email:	greg.mullins@durban.gov.za
Adam Teixeira-Leite	Principal Wetland Ecologist & Environmental Scientist
Company/Institution:	Eco-Pulse Environmental Consulting Services
Relationship:	Colleague (2014 – Present)
Tel:	082 310 6769
Email:	ateixeira@eco-pulse.co.za

APPENDIX C2 –
TERRESTRIAL BIODIVERSITY AND ECOLOGY ASSESSMENT

PROPOSED DEVELOPMENT OF THE ESKOM MESONG 400KV LOOP IN LOOP OUT POWERLINE PROJECT, GAUTENG PROVINCE

DRAFT TERRESTRIAL BIODIVERSITY SPECIALIST REPORT

Prepared for:

Eskom Holdings SOC Ltd
Megawatt Park
Maxwell Drive
Sandton, 2000

Prepared by:

CENTURION
Route 21 Business Park
72 Regency Drive
Centurion, 0178
010 045 1372
Also in Cape Town, East London, Grahamstown, Port Elizabeth and Maputo (Mozambique)
www.cesnet.co.za

JANUARY 2022

REVISIONS TRACKING TABLE

CES Report Revision and Tracking Schedule

Document Title:	Terrestrial Biodiversity and Ecology Asssessment for the Proposed Development of the Eskom Mesong 400kv Loop In Loop Out Powerline Project, Gauteng Province			
Client Name & Address:	Eskom Holdings SOC LTD Megawatt Park, Maxwell Drive, Sunninghill, Sandton, 2146			
Status:	Draft			
Issue Date:	January 2022			
Lead Author:	Mr Aidan Gouws	Ecologist (CES)		
Reviewer:	Dr Alan Carter	Executive (CES)		
Report Distribution	***Circulated to***		***No. of hard copies***	***No. electronic copies***
	Eskom			1
Report Version	***Date***			
	January 2022			

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES
Info@cesnet.co.za
www.cesnet.co.za

PROJECT TEAM EXPERTISE AND DECLARATIONS

In terms of the Terrestrial Biodiversity Protocol (2020):

2.1. The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.

3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:

3.1.1. Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;

3.1.2. A signed statement of independence by the specialist.

Name of Specialist	Aidan Gouws
Position	Senior Environmental Consultant & Terrestrial Ecologist (CES)
Contact Details	Email: a.gouws@cesnet.co.za | Tel: +27 10 045 1372
Role on Project	Terrestrial Ecologist Report Author
Highest Qualification	MSc. Environmental Science (Dissertation Topic: Invasion Ecology)
SACNASP Registration No.	*Cand.Sci.Nat.* 121901
SACNASP Field of Practice	Environmental Science
Experience (no. of years)	3 years in environmental consulting and terrestrial biodiversity assessments

Aidan obtained his MSc in Environmental Science (*Cum laude*) from Rhodes University, having conducted research on the spatio-temporal dynamics of *Acacia dealbata* invasions and broader land-use and cover changes in the northern Eastern Cape, funded through a study bursary awarded by the Agricultural Research Council (ARC). Prior to this, he obtained his BSc Honours in Geographical and Environmental Sciences (*Cum laude*) from the University of Pretoria, studying plant ecology and EIA methodology amongst others. Since joining CES in 2018, Aidan has been involved in several projects, including Basic Assessments, Full Scoping and Environmental Impact Assessments, Environmental Amendment Applications, Environmental Audits and Terrestrial Biodiversity Assessments. He is registered with the South African Council for Natural Scientific Professions as a Candidate Natural Scientist and with the International Association for Impact Assessments.

Declaration of Independence

- I, **Aidan Gouws**, declare that, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amended Environmental Impact Assessment Regulations, 2017;
- 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 report 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.

Signed:

Date:

Name of Specialist	Alan Carter
Position	Executive and Principal Environmental Consultant (CES)
Contact Details	Email: a.carter@cesnet.co.za
Role on Project	Quality Control
Highest Qualification	Ph.D. Plant Science (Marine)
SACNASP Registration No.	*Pr.Sci.Nat* 400332/04
SACNASP Field of Practice	Environmental Science
EAPASA Registration No.	2019/1807
Experience (no. of years)	30 years

Alan is the Executive Director of the CES East London Office. He holds a PhD in Marine Biology and is a certified Public Accountant, with extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He has over 30 years of experience in environmental management and has specialist skills in sanitation, coastal environments and industrial waste. Dr Carter is registered as a Professional Natural Scientist under the South African Council for Natural Scientific Professions (SACNASP). He is also registered as an EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA).

Declaration of Independence

- I, **Alan Carter**, declare that, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amended Environmental Impact Assessment Regulations, 2017;
- 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 report 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.

Signed:

Date:

Please refer to the Curricula vitae in Appendix A for more information.

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GLOSSARY OF TERMS

TERM	DEFFINITION
Alien Invasive Species	An exotic species that can spread rapidly and displace native species causing damage to the environment
Biodiversity	Term used to describe the variety of life on Earth and is defined as "*the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems*" (Secretariat of the Convention on Biological Diversity, 2005).
Habitat Fragmentation	Occurs when large expanses of habitat are transformed into smaller patches of discontinuous habitat units isolated from each other by transformed habitats such as farmland.
Key Biodiversity Area	A globally recognised site that contains significant concentrations of biodiversity.
Natural Habitat	Refers to habitats composed of viable assemblages of plant and/or animal species of largely native origin and/or where human activity has not essentially modified an area's primary ecological function and species composition.
Pentad	A 5 minute x 5 minute coordinate grid super-imposed over the continent for spatial reference.
Protected Area	A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values**.** *(IUCN Definition 2008)***.**

LIST OF ACRONYMS

ACRONYM	TERM
AOO	Area of Occupancy
CBA	Critical Biodiversity Area
CES	Coastal and Environmental Services
CR	Critically Endangered
ECO	Environmental Control Officer
EDGE	Evolutionarily Distinct and Globally Endangered
EN	Endangered
ESIA	Environmental and Social Impact Assessment
EOO	Extent of Occupancy
GBIF	Global Biodiversity Information Facility
GIS	Geographical Information System
IBA	Important Birding Areas
IUCN	International Union for Conservation of Nature
KBA	Key Birding Areas
LC	Least Concern
NBSAP	National Biodiversity and Strategy Action Plan
NEMBA	National Environmental Management Biodiversity Act
NGO	Non-Government Organisation
PNCO	Provincial Nature Conservation Ordinance
SCC	Species of Conservation Concern
QDS	Quarter Degree Square
SA	South Africa
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
TOPS	Threatened and Protected Species

1 INTRODUCTION

In terms of Section 1 of the Terrestrial Biodiversity Protocol (2020):
1.1. An applicant intending to undertake an activity identified in the Scope of this Protocol, on a site identified as being of "very high sensitivity" for terrestrial biodiversity on the national web based environmental screening tool must submit a Terrestrial Biodiversity Impact Assessment.

1.1 PROJECT LOCATION AND DESCRIPTION

Eskom Holdings SOC Ltd is proposing the development of 2 x 1 km 400 kV loop-in and loop-out overhead transmission lines (LILO). The proposed 400 kV lines are located within a Strategic Transmission Corridor (STC). The proposed LILO is located near Kempton Park West on the boarder of Johannesburg and Ekurhuleni municipalities. Locality details are provided in Table 1.1 below. Figure 1.1 illustrates the project location.

Table 1.1. Locality details of the proposed project.

GEOGRAPHICAL ENTITY	LOCATION	
Province	Gauteng	
Metropolitan Municipality	City of Johannesburg and City of Ekurhuleni	
Nearest Towns	Kempton Park (5 km east), Tembisa (8 km north) Sandton (13 km west)	
Ward Number(s)	32 (CoJ), 13 and 17 (CoE)	
Farm portions	• Zuurfontein 33 IR, Portions 16, 26, 125, 129, 141, 143, 152, 331, 425, 427, 429, RE/218, RE/24, RE/391 • Klipfontein 12 IR, Portions RE/2, 96 • Modderfontein 34 IR, Portion RE	
CO-ORDINATES	**LATITUDE**	**LONGITUDE**
EXISTING APO-CRO 106	26°5'21.3"S	28°11'10.8"E
EXISTING APO-CRO 107	26°5'23.0"S	28°11'5.2"E
EXISTING APO-CRO 108	26°5'29.3"S	28°11'2.2"E
EXISTING APO-CRO 109	26°5'32.9"S	28°10'58.3"E
Existing Ese-Jup 70	26°5'33.3"S	28°10'58.9"E
Existing Ese-Jup 71	26°5'29.6"S	28°11'2.9"E
Existing Ese-Jup 72	26°5'23.6"S	28°11'5.8"E
Existing Ese-Jup 73	26°5'22.1"S	28°11'10.9"E
GANTRY 1	26°5'2.5"S	28°10'51.6"E
GANTRY 2	26°5'3.6"S	28°10'50.6"E
SEB 1	26°6'54.3"S	28°11'27.0"E
SEB 2	26°6'55.5"S	28°11'27.4"E
SEB 3	26°6'51.0"S	28°11'28.3"E
SEB 4	26°6'43.5"S	28°11'24.7"E
SEB 5	26°6'35.5"S	28°11'20.8"E
SEB 6	26°6'30.2"S	28°11'22.3"E
SEB 7	26°6'27.2"S	28°11'33.5"E
SEB 8	26°6'20.3"S	28°11'39.0"E
SEB 9	26°6'13.1"S	28°11'44.8"E
SEB 10	26°6'6.7"S	28°11'43.3"E
SEB 11	26°5'57.5"S	28°11'39.7"E
SEB 12	26°5'48.3"S	28°11'36.0"E
SEB 13	26°5'40.8"S	28°11'31.8"E
SEB 14	26°5'35.9"S	28°11'22.8"E
SEB 15	26°5'30.7"S	28°11'13.2"E
SEB 16	26°5'27.0"S	28°11'6.5"E

SEB 17	26°5’25.5”S	28°11’4.9”E
SEB 18	26°5’27.0”S	28°11’4.3”E
TOWER 1	26°5’4.8”S	28°10’54.7”E
TOWER 2	26°5’5.1”S	28°10’51.8”E
TOWER 3	26°5’7.9”S	28°10’53.6”E
TOWER 4	26°5’13.2”S	28°10’53.9”E
TOWER 5	26°5’19.5”S	28°10’58.4”E
TOWER 6	26°5’25.1”S	28°11’2.4”E
TOWER 7	26°5’25.0”S	28°11’4.0”E
TOWER 8	26°5’26.3”S	28°11’3.6”E

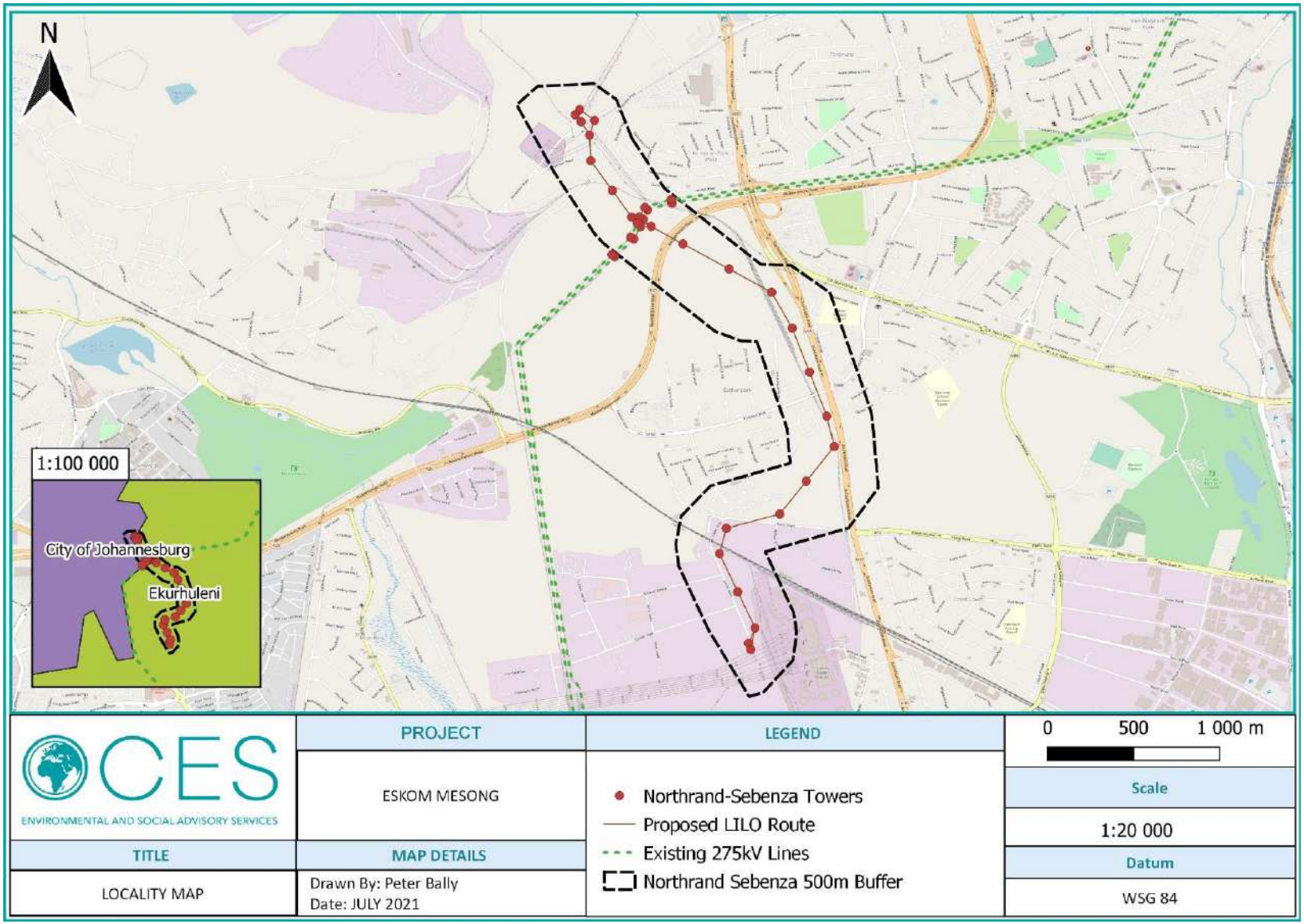


Figure 1.1: Location Map of the proposed Mesong 400kV LILO, Gauteng

1.2 PURPOSE OF THIS REPORT

In terms of the Protocol for the Specialist Assessment and Minimum Reporting Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN R. 320 of 2020), prior to the commencement of a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration as identified by the screening tool, must be confirmed by undertaking a site sensitivity verification. The results of the screening tool, together with the site sensitivity verification, ultimately determines the minimum report content requirements.

According to the results of the Screening Report generated for the development, the relative terrestrial biodiversity theme sensitivity is classified as VERY HIGH due to site falling within a critically-endangered ecosystem, namely the Rietvleiriver Highveld Grassland. According to Section 3 (1) of GN R. 320, '*an applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being of "very high sensitivity" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment*'.

Due to the VERY HIGH sensitivity rating of the site, a full **Terrestrial Biodiversity Specialist Assessment** (this report) has been undertaken as part of the Detailed Screening Process for the proposed development.

The Screening Report also indicates that the site falls within MEDIUM to HIGH sensitivity areas in terms of terrestrial plant and animal species sensitivity, respectively. According to the Species Environmental Assessment Guideline (SANBI, 2020):
"Where the sensitivity indicated in the screening tool is 'medium' for the proposed development footprint . . . the presence or likely presence of the SCC identified by the screening tool must be investigated through a site inspection . . . Where SCC are found on site or have been confirmed as likely to be present, an assessment must be submitted in accordance with the requirements specified for 'very high' and 'high' sensitivity in the protocol. However, if the ISSV [initial site sensitivity verification] *step indicates that the proposed development footprint/PAOI* [project areas of influence] *consists of a 'low' sensitivity and that the screening tool incorrectly classified the area as 'very high', 'high' or 'medium', then taxon-specific specialists are not required to perform an assessment and the EAP/specialist must submit a Terrestrial Animal/Plant Species Compliance Statement . . . However, if the ISSV step indicates that the proposed development footprint/PAOI consists of a 'low' sensitivity then taxon-specific specialists are not required to perform an assessment and the EAP/specialist must submit a Terrestrial Animal/Plant Species Compliance Statement"* (SANBI, 2020, p. 11).

In accordance with the Species Environmental Assessment Guidelines, a Terrestrial Animal and Plant Species Compliance Statement is required for the proposed development. It is recommended that a separate Avifaunal Specialist Assessment be completed for the HIGH sensitivity bird species.

1.3 AIMS, OBJECTIVES AND TERMS OF REFERENCE

The specialist assessment sought to assess the ecological state and current land-use of the proposed site, identify potential sensitive ecosystems, animal and plant species, and identify potential impacts of the proposed development. The objectives for the ecological assessment are as follows:

- Describe and map the vegetation types in the study area.
- Describe the biodiversity and ecological state of each vegetation unit.
- Establish and map sensitive vegetation areas showing the suitability for development and no-go areas.
- Identify plant and animal species of conservation concern (Red Data List, PNCO and TOPS lists). In the case of the fauna, this was done at a desktop level.
- Identify alien plant species, assess the invasive potential and recommend management procedures.
- Identify and assess the impacts of development on the site's natural vegetation and faunal species in terms of habitat loss, fragmentation and degradation of key ecosystems and, where feasible, provide mitigation measures to reduce these impacts.

1.4 RELEVANT LEGISLATION

This specialist assessment was conducted in alignment with the regulatory and legislative requirements for environmental management in South Africa. The environmental legislation relevant to the proposed development is summarised in Table 1.2 below.

Table 1.2: Environmental legislation considered in the preparation of this report

LEGISLATION	DESCRIPTION	RELEVANCE
The Constitution, 1996 (Act No. 108 of 1996).	The Constitution of the Republic of South Africa is the supreme law of the land. As a result, all laws, including those pertaining to this Management Plan, must conform to the Constitution. The Bill of Rights - Chapter 2 of the Constitution, includes an environmental right (Section 24) according to which, everyone has the right: *a) To an environment that is not harmful to their health or well-being; and* *b) To have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that:* *i. Prevent pollution and ecological degradation;* *ii. Promote conservation; and* *iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*	The proponent has an obligation to ensure that the proposed activity will not result in pollution and ecological degradation, as well as an obligation to ensure that the proposed development is ecologically sustainable, while demonstrating economic and social development.
National Environmental Management Act (NEMA), 1998 (Act No. 108 of 1998)	The objective of NEMA is: *"To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith."* This report has been guided by the NEMA Principles detailed in Section 2 of the Act. NEMA introduces the "duty of care" concept, which is based on the policy of strict liability. This duty of care extends to the prevention, control and rehabilitation of significant pollution and environmental degradation. It also dictates a duty of care to address emergency incidents of pollution. A failure to perform this duty of care may lead to criminal	The undertaking of a specialist study, in this case, the terrestrial biodiversity study, in order to identify potential impacts on the terrestrial environment and to recommend mitigation measures to minimise these impacts, complies with Section 28 of NEMA. The developer must apply the NEMA principles, the fair decision-making and conflict management

LEGISLATION	DESCRIPTION	RELEVANCE
	prosecution, and may lead to the prosecution of responsible persons, including companies, for the conduct of the legal persons.	procedures that are provided for in NEMA.
NEMA EIA Regulations (2014, as amended)	The NEMA EIA Regulations (2014, as amended) aim to avoid detrimental environmental impacts through the regulation of specific activities that cannot commence without prior environmental authorisation. Authorisation either requires a Basic Assessment or a Full Scoping and Environmental Impact Assessment, depending on the type of activity. These assessments specify mitigation and management guidelines to minimise negative environmental impacts and optimise positive impacts. Should any portion of an area be proposed for development (after proclamation) these Regulations must be consulted.	An application for Environmental Authorisation (as triggered by the EIA 2014 Regulations, as amended) is required to be submitted to the Competent Authority.
Terrestrial Biodiversity Protocol (2020)	This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on terrestrial biodiversity for activities requiring EA. This protocol replaces the requirements of Appendix 6 of the EIA Regulations 2014, GN R. 982 (as amended), published under NEMA.	The screening tool identified the site footprint as falling within an area of "Very High Sensitivity" for Terrestrial Biodiversity. This triggered the need for a full Terrestrial Biodiversity Assessment. This assessment and report complies with Terrestrial Biodiversity Protocol.
Plant and Animal Species Protocols (GN R. 1150 2020), and the associated Species Environmental Assessment Guideline (SANBI, 2020)	These protocols and the associated guideline provides the criteria for the specialist assessment and minimum report content requirements for impacts on plant and animal species diversity for activities requiring EA. These protocol replaces the requirements of Appendix 6 of the EIA Regulations 2014, GN R. 982 (as amended), published under NEMA.	The screening tool indicates that the site falls within MEDIUM sensitivity areas in terms of terrestrial plant and animal species sensitivity. This assessment and report complies the Plant and Animal Species Protocols, as well as the Species Environmental Assessment Guideline.
National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act No. 10 of 2004)	The National Environmental Management: Biodiversity Act (NEMBA), No. 10 of 2004, aims to assist with the management and conservation of South Africa's biological diversity through the use of legislated planning tools. These planning tools include the declaration of bioregions and the associated bioregional plans as well as other mechanisms for managing and conserving biodiversity. The objectives of the Act include *inter alia*: • The management and conservation of biological diversity within the Republic and of the components of such biological diversity; • The use of indigenous biological resources in a suitable manner;	Activities may not be carried out in threatened or protected ecosystems without first gaining authorisation for such activities. No protected species may be removed or damaged without a permit.

LEGISLATION	DESCRIPTION	RELEVANCE
	• The fair and equitable sharing of benefits arising from bio-prospecting of genetic material derived from indigenous biological resources; and • To give effect to ratified international agreements relating to biodiversity which are binding on the Republic. • To provide for co-operative governance in biodiversity management and conservation; and • To provide for a South African National Biodiversity Institute to assist in achieving the objectives of the Act. • In addition to this, Sections 50-62 of the Act provide details relating to the protection of threatened or protected ecosystems and species, while Sections 63-77 of the Act provide details relating to alien and invasive species with the purpose of preventing their introduction and spread, managing, controlling and eradicating of alien and invasive species.	
NEMBA National List of Threatened Ecosystems (GNR 1002 of 2011)	The National List of Ecosystems is in place for the ecosystems that are threatened and in need of protection. The NEMBA provides for listing of threatened or protected ecosystems in one of the following categories: • Critically endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation; • Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems; • Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; • Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.	
NEMBA: Alien Invasive Species Regulations (2014)	The Alien and Invasive Species Regulations (2014) categorises the different types of alien and invasive plant and animal species and how they should be managed: • Category 1a Listed Invasive Species – species which must be combatted or eradicated.	An invasive species management, control and eradication plan for land/activities under their control should be developed, as part of their

LEGISLATION	DESCRIPTION	RELEVANCE
	• Category 1b Listed Invasive Species – species which must be controlled. • Category 2 Listed Invasive Species – species which require a permit and must not be allowed to spread outside of the designated area. • Category 3 Listed Invasive Species – species which are subject to exemptions in terms of section requiring a permit, but where such a species occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.	environmental plans in accordance with Section 11 of NEMA.

1.5 SCOPE OF ASSESSMENT AND CONTENTS OF THE SPECIALIST REPORT

The Terrestrial Biodiversity Specialist Assessment was conducted in accordance with the Terrestrial Biodiversity Protocol (2020). This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on Terrestrial biodiversity for activities requiring EA. This protocol replaces the requirements of Appendix 6 of the EIA Regulations 2014, GN R. 982 (as amended), published under NEMA.

The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by DFFE's national web-based environmental screening tool screening tool. The screening tool identified the site footprint as falling within an area of "Very High Sensitivity" for Terrestrial biodiversity. This triggered the need for a full Terrestrial Biodiversity Assessment. Table 1.3 below indicates how the assessment complied with the requirements of the Terrestrial Biodiversity Protocol, with reference to specific sections in this report.

Table 1.3: Requirements of a Terrestrial Biodiversity Specialist Assessment Report

SPECIALIST REPORT REQUIREMENTS ACCORDING TO GN R. 320			SECTION OF REPORT
3.1	The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:		
	3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Page ii-iv and Appendix A
	3.1.2	A signed statement of independence by the specialist;	Page ii-iv
	3.1.3	A statement of the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 2.1.2
	3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Chapter 2
	3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Section 2.5
	3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Chapter 4
	3.1.7	Additional environmental impacts expected from the proposed development;	Chapter 5
	3.1.8	Any direct, indirect and cumulative impacts of the proposed development;	Chapter 5

SPECIALIST REPORT REQUIREMENTS ACCORDING TO GN R. 320			SECTION OF REPORT
	3.1.9	The degree to which the impacts and risks can be mitigated;	Chapter 5
	3.1.10	The degree to which the impacts and risks can be reversed;	
	3.1.11	The degree to which the impacts and risks can cause loss of irreplaceable resources;	
	3.1.12	Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Chapter 5 and Section 6.2
	3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	N/A
	3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Chapter 6
	3.1.15	Any conditions to which this statement is subjected.	Section 6.2
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.		.
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.		

The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by DFFE's national web-based environmental screening tool screening tool. The screening tool identified the site footprint as falling within an area of predominantly "MEDIUM" sensitivity for terrestrial animal and plant species diversity, with the exception of a "HIGH" avifaunal sensitivity. As such a botanical field survey was undertaken while the faunal assessment was done at a desktop level. It is recommended that a separate Avifaunal Specialist Assessment be completed for the HIGH sensitivity bird species.

2 ASSESSMENT METHODOLOGY

3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:
3.1.3. A statement of the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
3.1.4. A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;
3.1.5. A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;

The aim of the study was to assess the ecological state and current land-use of the proposed site, identify potential sensitive ecosystems and plant species, and identify potential impacts of the proposed development.

2.1 DATA COLLECTION AND ASSESSMENT APPROACH

2.1.1 DESKTOP ASSESSMENT

A desktop assessment of the site was conducted in terms of current vegetation classifications and biodiversity programmes and plans. For the terrestrial flora, the consideration of the following has been included:

- The South African Vegetation Map (Mucina and Rutherford, 2018);
- The Gauteng Conservation Plan (C-Plan) (2014);
- Gauteng Ridge Guidelines;
- Council for Geoscience (2013) South African Geology;
- Soil and Terrain (SOTER) Database of South Africa (2008);
- Review of the SANBI Red Data List; and
- Available literature on the regional vegetation.

Data on the known distribution and conservation status for each potential plant SCC were obtained in order to develop a list of SCC. These plant species are those that are subject to significant impacts from the proposed activity. In general, these will be species that are already known to be threatened or at risk. Efforts to provide the conservation status (SA 'red list' status) of individual species may provide additional valuable information on SCC (see http://redlist.sanbi.org). SCC have been identified by means of a combination of applicable legislation, guidelines and conservation status lists. The following lists were utilised to cross reference conservation and protection statuses of various species:

- National Environmental Management: Biodiversity Act (No. 10 of 2004) – Chapter 4, Part 2;
- 1976 List of Protected Trees (Government Gazette No. 9542 Schedule A) in the 1998 National Forest Act (NFA) as amended in November 2014;
- SA Red Data List;
- Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES);
- IUCN Red Data List; and
- C-Plan Red and Orange Data lists for the Gauteng Province.

The South African Red Data List of plants use the internationally recognised IUCN Red List Categories and Criteria to measure a species risk of extinction. Since the Red List of South African plants are used widely for conservation practices throughout South Africa, this list has been modified to identify species that are at low risk of extinction but of high conservation importance. Species that are afforded special protection, which are protected by the Threatened or Protected Species (TOPS) list are also regarded as SCC. Species that are afforded special protection, which are protected by CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna) are also regarded as SCC (see http://www.cites.org/).

A detailed faunal survey was not conducted. Although a site visit was undertaken, the faunal survey was mainly a desktop study, using information from previous ecological surveys conducted in the area. This data was supplemented by recording animal species that were observed during the site survey. Faunal distribution data were primarily sourced from the following web-based databases:

- The IUCN Red List of Threatened Species Website;
- The Animal Demography Unit (ADU) Virtual Museum's Frog, Reptile and Mammal Maps; and
- The iNaturalist Website.

2.1.2 SITE ASSESSMENT

Upon the completion of the desktop assessment a site visit was undertaken to determine the actual condition of the terrestrial ecology within the study area. The site assessment was conducted concurrently with the River and Wetland Ecosystem Assessment on 20 August 2021, during the late winter season. The season during which the assessment was conducted heavily influenced the conditions on site at the time. The site falls within a summer rainfall area, with only 7 mm of precipitation typically falling in the month of August (Meteoblue, 2021). Additionally, the site assessment fell outside of the flowering season of most species, reducing the ease of identifying plant species.

A sampling protocol was developed that would enable us to evaluate the existing desktop interpretations of the vegetation of the study area, to improve on them if necessary, and to add detailed information on the plant communities present. The protocol considered the amount of time available for the study, the accessibility of different parts of the area, and limitations such as the seasonality of the vegetation. A stratified random sampling approach was adopted, whereby initial assumptions were made about the diversity of vegetation, based on Google Earth, spatial planning tools and available literature and the area stratified into these basic types. In this way the time available was used much more efficiently than in random sampling, but there is a risk of bias and the eventual results may simply 'prove' the assumptions.

In general, the stratification of the site was influenced by obvious features of the vegetation, such as the presence of conspicuous species or vegetation structure. These factors may be largely independent of the floristic make-up of the vegetation, and by definition the biological communities present. Sample plots were analysed by determining the dominant species in each plot, as well as any alien invasive species and potential SCC occurring within the plots. Each sample plot was sampled until no new species were recorded. Vegetation communities were then described according to the dominant species recorded from each type, and these were mapped and assigned a sensitivity score.

2.2 VEGETATION MAPPING

The revised SA VEGMAP (2018) maps "*floristically-based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before*." The map was developed using a wealth of data provided by a network of ecologists, biologists and conservation planners that make periodic contributions to the project. These contributions have allowed for the best national vegetation map to date, the last being that of Acocks developed over 50 years ago. The SA VEGMAP informs finer scale bioregional plans and includes an additional 47 new vegetation units since its refinement in 2012. The SA VEGMAP is compared to actual conditions of vegetation observed onsite during the site assessment through mapping from satellite images, literature descriptions and related data gathered on the ground.

2.3 SENSITIVITY ASSESSMENT

The Species Environmental Assessment guideline (SANBI, 2020) was applied to assess the Site Ecological Importance (SEI) of the project area. The habitats and the species of conservation concern in the project area were assessed based on their conservation importance, functional integrity and receptor resilience (Table 2.1). The combination of these resulted in a rating of SEI and interpretation of mitigation requirements based on the ratings (Table 2.2). The sensitivity map was developed using available spatial planning tools as well as by applying the SEI sensitivity based on the field survey.

Table 2.1: Criteria for establishing Site Ecological importance and description of criteria

CRITERIA	DESCRIPTION
Conservation Importance (CI)	The importance of a site for supporting biodiversity features of conservation concern present e.g. populations of IUCN Threatened and Near-Threatened species (CR, EN, VU & NT), Rare, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes.
Functional Integrity (FI)	A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts.
Biodiversity Importance (BI) is a function of Conservation Importance (CI) and the Functional Integrity (FI) of a receptor.	
Receptor Resilience (RR)	The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention.
Site Ecological Importance (SEI) is a function of Biodiversity Importance (BI) and Receptor Resilience (RR)	

Table 2.2: Interpretation of Site Ecological importance (SEI) categories

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

2.4 IMPACT ASSESSMENT

CES has developed the following impact rating methodology which has been developed in line with the Terrestrial Biodiversity Protocol, as well as the content requirements of Appendix 6 and the impact ratings required in Appendix 1 and 3 of the EIA Regulations (2014, as amended). This scale takes into consideration the following variables:

- **Nature**: negative or positive impact on the environment.
- **Type**: direct, indirect and/or cumulative effect of impact on the environment.
- **Significance**: The criteria in Table 2.3 are used to determine the overall significance of an activity. The impact effect (which includes duration; extent; consequence and probability) and the reversibility/mitigation of the impact are then read off the significance matrix in order to determine the overall significance of the issue. The overall significance is either negative or positive and will be classified as low, moderate or high (Table 2.3).
- **Consequence:** the consequence scale is used in order to objectively evaluate how severe a number of negative impacts might be on the issue under consideration, or how beneficial a number of positive impacts might be on the issue under consideration.
- **Extent:** the spatial scale defines the physical extent of the impact.
- **Duration:** the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
- **Probability:** the likelihood of impacts taking place as a result of project actions arising from the various alternatives. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development and alternatives. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.
- **Reversibility:** The degree to which an environment can be returned to its original/partially original state.
- **Irreplaceable loss:** The degree of irreplaceable loss which an impact may cause, e.g. loss of non-regenerative vegetation or removal of rocky habitat or destruction of wetland.
- **Mitigation potential:** The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 2.3 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Table 2.3: Impact rating criteria

CRITERIA	CATEGORIES	DESCRIPTION
Overall nature	**Negative**	Beneficial/positive impact.
	Positive	Detrimental/negative impact.
Type	**Direct**	Direct interaction of an activity with the environment.
	Indirect	Impacts on the environment that are not a direct result of the project or activity.
	Cumulative	Impacts which may result from a combination of impacts of this project and similar related projects.
Duration	**Short term**	Less than 5 years.
	Medium term	Between 5-20 years.
	Long term	More than 20 years.

CRITERIA	CATEGORIES		DESCRIPTION
	Permanent		Over 40 years or resulting in a permanent and lasting change that will always be there.
Extent	**Localised**		Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
	Study area		The proposed site and its immediate environments.
	Municipal		Impacts affect the municipality, or any towns within the municipality.
	Regional		Impacts affect the wider district municipality or the Eastern Cape Province as a whole.
	National		Impacts affect the entire country.
Consequence	**Slight**		Slight impacts or benefits on the affected system(s) or party(ies).
	Moderate		Moderate impacts or benefits on the affected system(s) or party(ies).
	Severe/Beneficial		Severe impacts or benefits on the affected system(s) or party(ies).
Probability	**Definite**		More than 90% sure of a particular fact. Should have substantial supportive data.
	Probable		Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
	Possible		Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.
	Unsure		Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.
Reversibility	**Reversible**		The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.
	Irreversible		The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.
Irreplaceable Loss	**Resource will not be lost**		The resource will not be lost/destroyed provided mitigation measures are implemented.
	Resource may be partly lost		The resource will be partially destroyed even though mitigation measures are implemented.
	Resource will be lost		The resource will be lost despite the implementation of mitigation measures.
Mitigation Potential	**Easily achievable**		The impact can be easily, effectively and cost effectively mitigated/reversed.
	Achievable		The impact can be effectively mitigated/reversed without much difficulty or cost.
	Difficult		The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.
	Very Difficult		The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.
Impact Significance	**Low negative**	**Low positive**	Largely of HIGH mitigation potential, after considering the other criteria.
	Moderate negative	**Moderate positive**	Largely of MODERATE or partial mitigation potential after considering the other criteria.
	High negative	**High positive**	Largely of LOW mitigation potential after considering the other criteria.

2.5 ASSUMPTIONS, LIMITATIONS AND GAPS IN KNOWLEDGE

This report is based on current available information and, as a result, the following limitations and assumptions are implicit:

- The report is based on a project description received from the client.
- A detailed faunal survey was not conducted. Although a site visit was undertaken, the faunal survey was mainly a desktop study, using information from previous ecological surveys conducted in the area. This data was supplemented by recording animal species that were observed during the site survey.
- A separate avifaunal survey was undertaken by a specialist and birds are therefore not included in this report.
- Species of Conservation Concern (SCC) are difficult to find and difficult to identify, thus species described in this report do not comprise an exhaustive list. It is almost certain that additional SCCs will be found during construction and operation of the development.
- Sampling could only be carried out at one stage in the annual or seasonal cycle. The survey was conducted in late winter, outside of the flowering season of plant species. However, the time available in the field, and information gathered during the survey was sufficient to provide enough information to determine the status of the affected area.

3 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

In terms of Section 2 of the Terrestrial Biodiversity Protocol (2020):

2.2. The assessment must be undertaken on the preferred site and within the proposed development footprint

2.3. Description of the preferred site - the following aspects, as a minimum, must be considered in the baseline description:

2.3.1. A description of the ecological drivers/processes of the system and how the proposed development will impact these;

2.3.2. Ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the proposed development site;

2.3.3. The ecological corridors that the development would impede including migration and movement of flora and fauna;

2.3.4. The description of any significant landscape features (including rare or important flora/faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Areas (FEPA) sub catchments;

2.3.5. A description of terrestrial biodiversity and ecosystems on the proposed development site, including

(a) Main vegetation types;

(b) Threatened ecosystems, including Listed Ecosystems as well as locally important habitat types identified;

(c) Ecological connectivity, habitat fragmentation, ecological processes and fine-scale habitats; and

(d) Species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified.

2.3.7. The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:

2.3.7.1. Terrestrial critical biodiversity areas (CBAs);

2.3.7.2. Terrestrial ecological support areas (ESAs);

2.3.7.3. Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004;

2.3.7.4. Priority areas for protected area expansion;

2.3.7.5. SWSAs;

2.3.7.6. FEPA sub catchments, and

2.3.7.7. Indigenous forests.

This chapter provides a description of the affected environment within the vicinity of the proposed infrastructure. This information is provided to assist the reader in understanding the possible effects of the project on the environment within which it is proposed to be developed. This information has been sourced from existing information available for the area. This chapter aims to provide the context within which this assessment is being conducted.

3.1 DESKTOP ASSESSMENT

3.1.1 CLIMATE

The information provided herewith is based on the climate data for Johannesburg – the nearest urban area in proximity to the project area. According to the Koppen Climate Classification, the climate for Johannesburg is classified as 'Bsk' (Mid-Latitude Steppe and semi-arid cool climate). The average annual temperature is 16°C, with the warmest average temperatures recorded in December and January (26°C) and coldest average temperatures recorded in June and July (4°C). Precipitation typically occurs in the summer months. Approximately 543 mm of rain is received per year, with January receiving the highest average precipitation (125 mm) and July receiving the lowest (4 mm) (ClimaTemps, 2021). A summary of the climate at Johannesburg is provided in Figure 3.1 below.

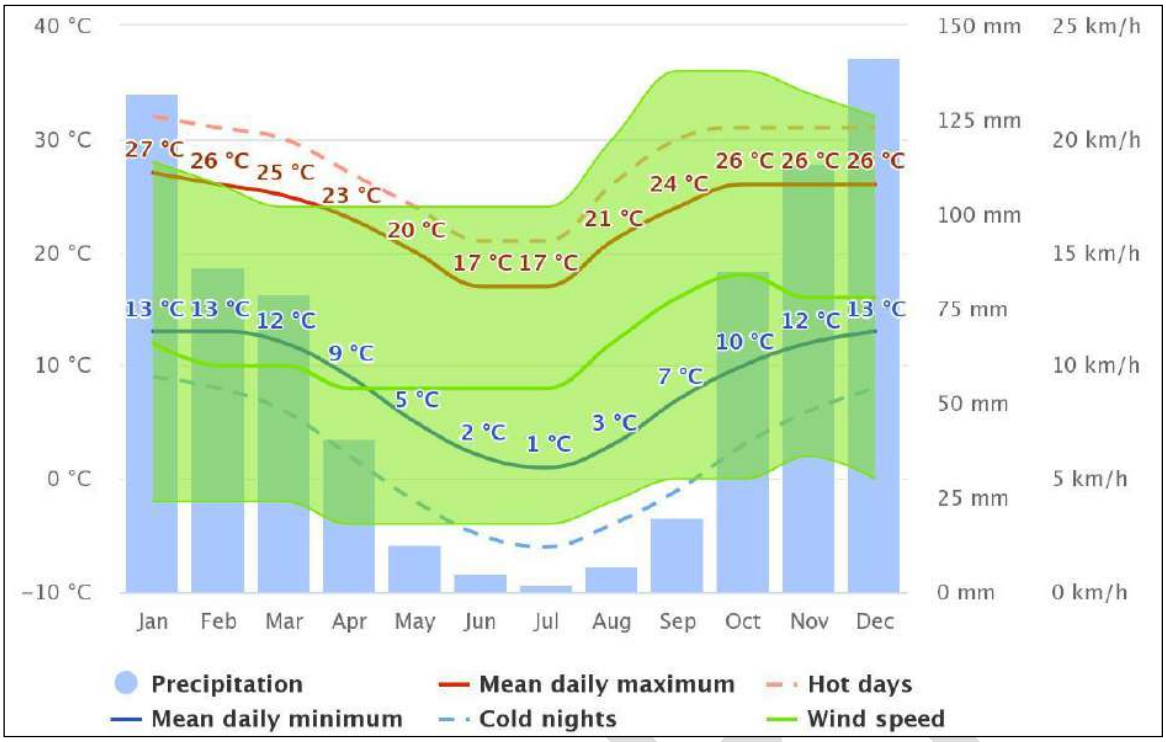


Figure 3.1: Climatic data for Johannesburg, Gauteng (Meteoblue, 2021).

3.1.2 TOPOGRAPHY

Vegetation types are influenced by a range of biotic and/or abiotic factors at different spatial and temporal scales, which together influence the distribution, composition, structure, and diversity of plant communities (Rodrigues et al., 2018). Among the abiotic factors influencing vegetation types, topography (landform), geology, and soils are considered three of the major factors determining habitat heterogeneity and species diversity. The topography of the eastern area is relatively flat, increasing in elevation towards the west of the project area in Figure 3.2.

3.1.3 GEOLOGY AND SOILS

The geology underlying the project area is characterised by two main geological features, of Halfway House Granite and Basement Complex, the surrounding area includes Dwyka, Black Reef, Klipriver, Vryheid and Hospital Hill geologies (Figure 3.3). The soils within the study site are classified as Haplic Lixisols (Figure 3.4). Lixisols are defined by the presence of a subsurface layer of accumulated kaolinitic clays, where at least half of the readily displaceable ions are calcium, magnesium, sodium, or potassium, but they are also identified by the absence of an extensively leached layer below the surface horizon (uppermost layer).

3.1.4 LAND USE AND COVER

According to the South African National Land-Cover (2020) spatial dataset, the majority of the project area occurs within *Natural Grassland*, with the northern portion of the proposed LILO occurring within *Contiguous & Dense Planted Forest*. Portions of *Open Woodland* occur within the *Natural Grassland* portion of the project area. The proposed 400 kV LILO also passes through *Residential Formal* and *Industrial* areas (Figure 3.5).

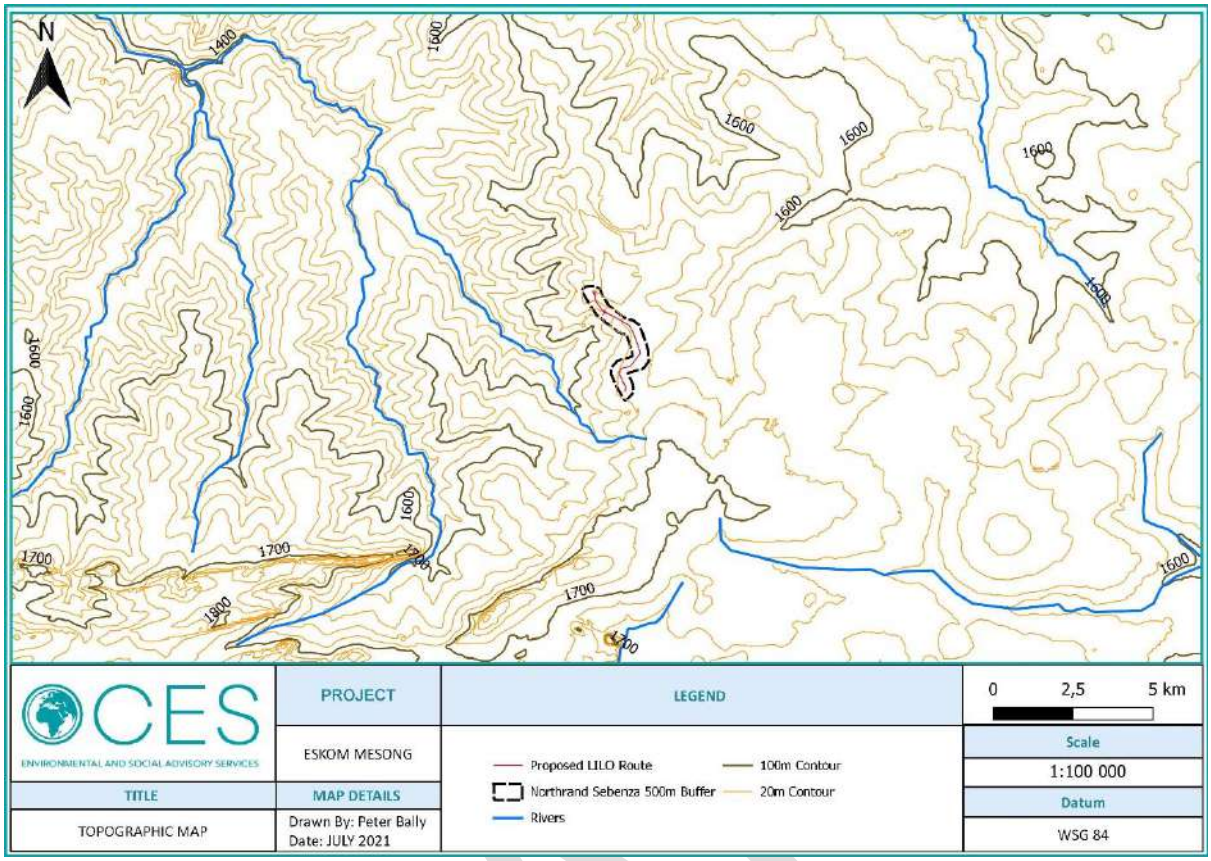


Figure 3.2: Contour Map of the study area

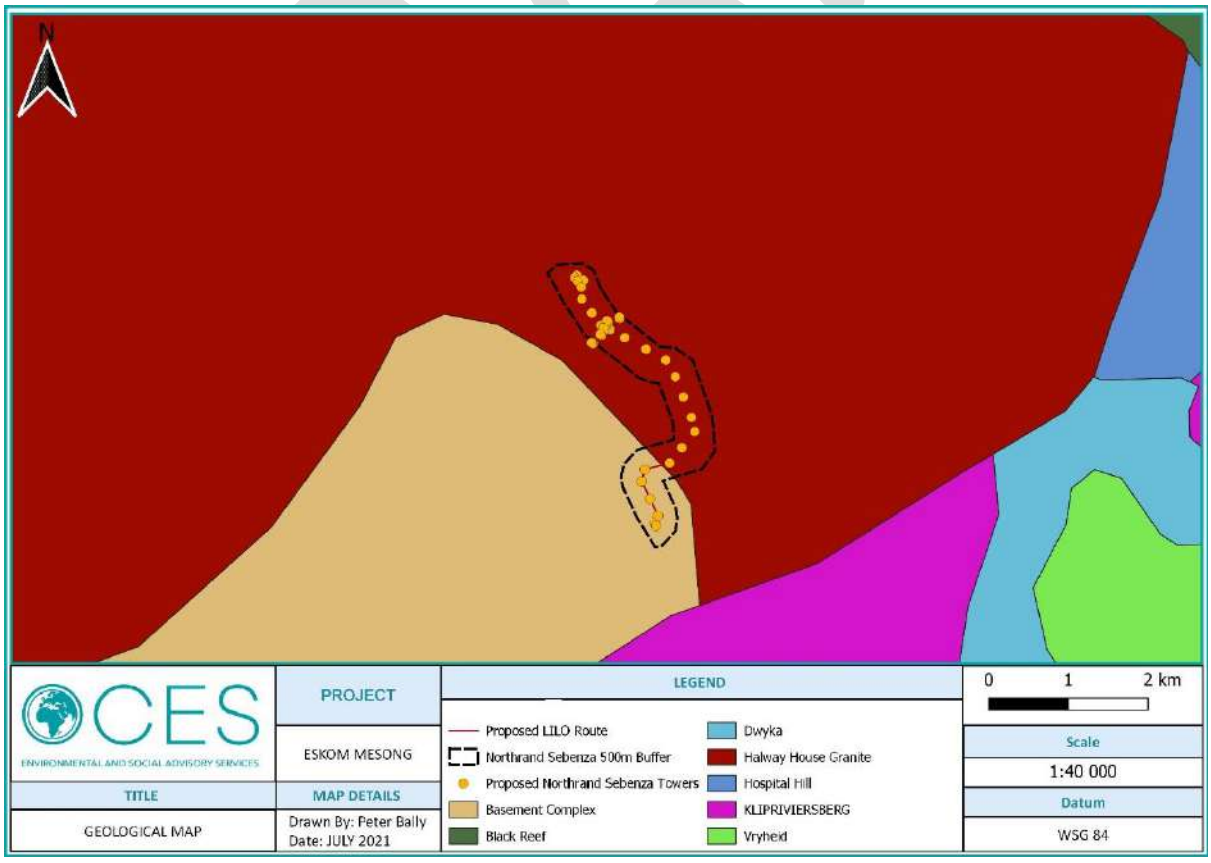


Figure 3.3: Geology map of the study site

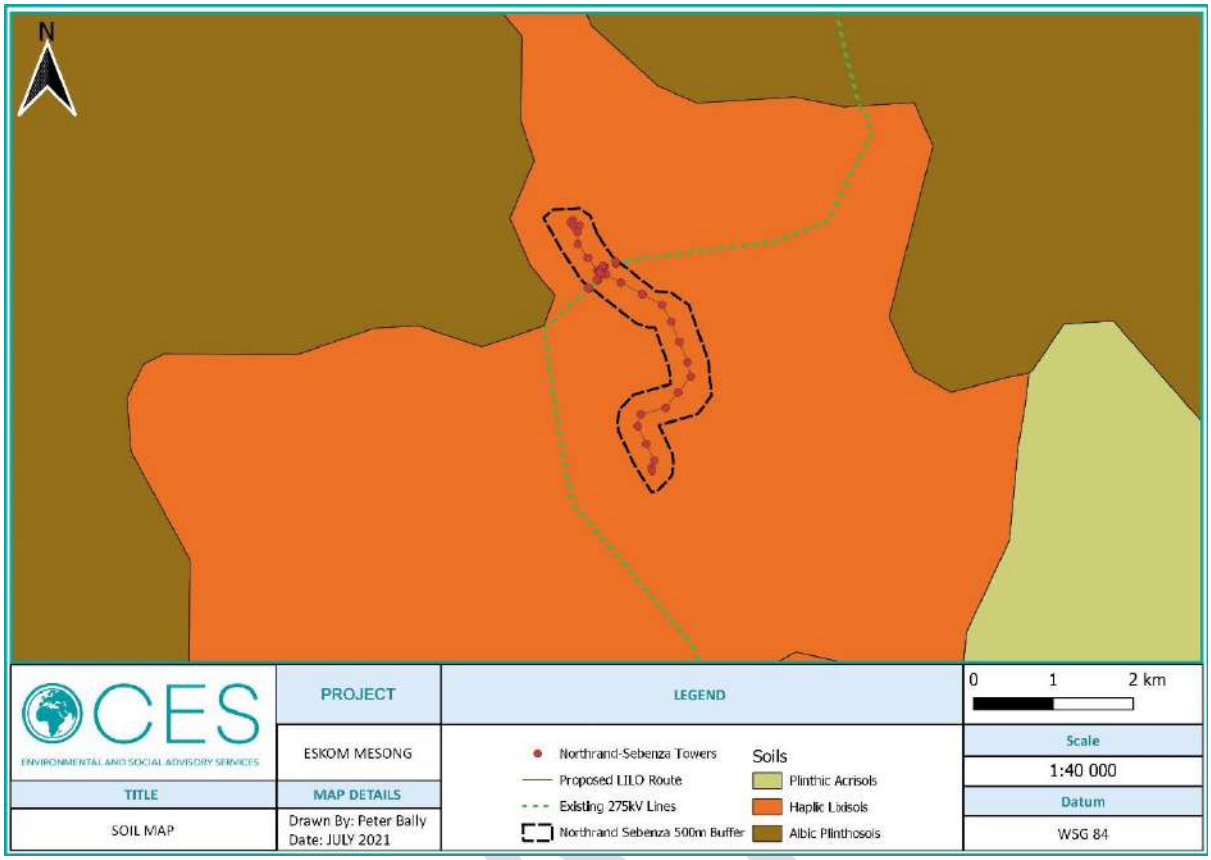


Figure 3.4: SOTER SAF Soil Map of the project area

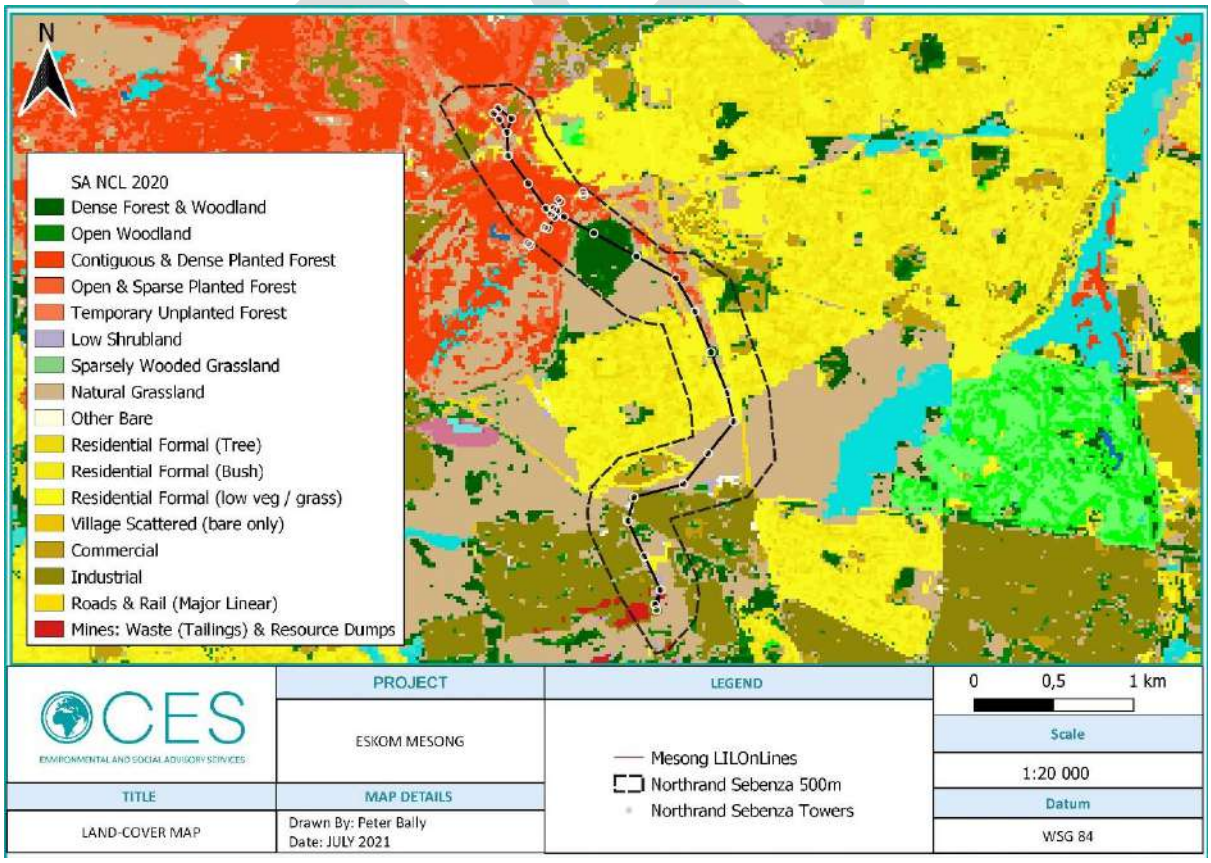


Figure 3.5: South African National Land-Cover (SANLC, 2018) Map of the project area

3.1.5 DRAINAGE AND RIVER ECOSYSTEM CONTEXT

The proposed development falls primarily within Quaternary Catchment A21C, which drains the Modderfontein River, a tributary of the Jukskei River, and falls entirely within the Limpopo Water Management Area (WMA) (Figure 3.6). The Modderfontein main channel flows in a north-westerly direction, falling approximately 2.3 km to the south-west of the proposed LILO line (Figure 3.6). Several non-perennial rivers and smaller drainage lines drain into the Modderfontein River, some of which intersect the proposed LILO line.

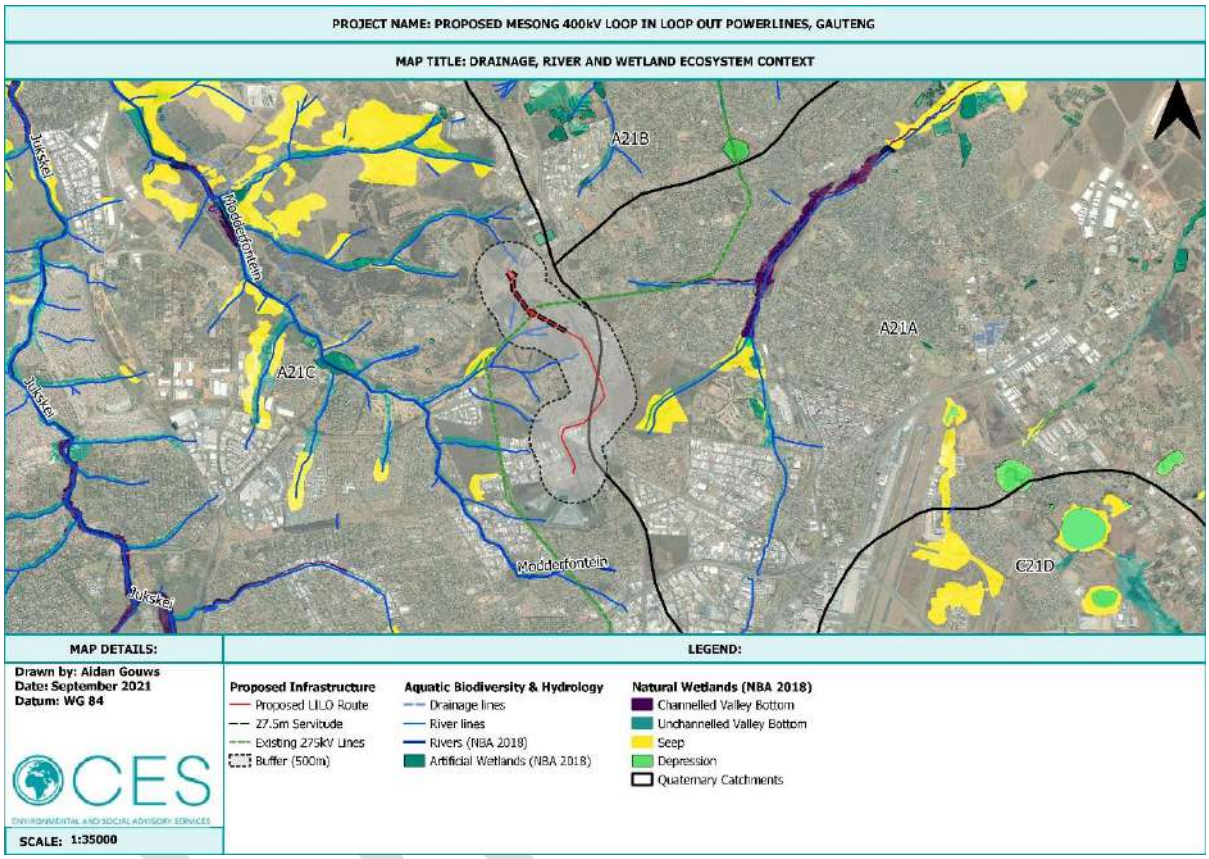


Figure 3.6: Surface water features affected by the proposed development.

Most of the Modderfontein has been assigned a 'Critically-Endangered' ecosystem threat status in terms of the National Biodiversity Assessment (NBA, 2018). Critically Endangered ecosystems are ecosystem types that have very little of their original extent (measured as area, length or volume) left in natural or near-natural condition. Most of the ecosystem type has been heavily, severely or critically modified from its natural state. Any further loss of natural habitat or deterioration in condition of the remaining healthy examples of these ecosystem types must be avoided, and the remaining healthy examples should be the focus of urgent conservation action (Nel & Driver, 2012). According to the NBA (2018), the Present Ecological State (PES) of the **Modderfontein** from E to F ("Critically modified"), i.e. a critical change in ecosystem processes and loss of natural habitat and biota and has occurred. The Modderfontein is categorised as an Upstream Management Area in terms of the National Freshwater Ecosystem Priority Areas (NFEPA) project (2014). These are subquaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs and Fish Support Areas.

3.1.6 WETLAND ECOSYSTEM CONTEXT

Wetlands in South Africa have been mapped on a broad-scale by various stakeholders and have been included in the NFEPA (2011-2014) and NBA (2018). Due to the broad-scale nature of the NFEPA map it is not spatially accurate and, therefore, some error is expected. The location of NFEPA wetlands was derived from the National Land Cover 2000 (Van Den Berg et al., 2008) and inland water features from the Department of Land Affairs' Chief Directorate: Surveys and Mapping (DLA-CDSM). All wetlands are classified as either 'natural' or 'artificial' water bodies. The NFEPA and NBA wetland maps identify important or sensitive wetlands and wetland clusters. A wetland cluster is a group of wetlands all within 1 km of each other and which are surrounded by relatively natural vegetation. Wetland clusters allow for important ecological processes such as the migration of insects and frogs between the wetlands. According to the National Wetland Map Version 5 (2018), no natural wetlands occur within 500 m of the proposed powerlines (Figure 3.6). Only one artificial wetland falls within 500 m of the proposed powerlines (Figure 3.6). Numerous other natural and artificial wetlands occur within the broader area. No NFEPA wetland clusters fall within 500 m of the proposed development site (Figure 3.6). Please refer to the River and Wetland Ecosystem Assessment Report (CES, 2022) for further detail.

3.1.7 SCREENING TOOL: SENSITIVE TERRESTRIAL BIODIVERSITY AND SPECIES

According to the results of the DFFE Screening Report generated for the development, the relative terrestrial biodiversity theme sensitivity is classified as VERY HIGH due to portions of the project areas occurring within a critically-endangered ecosystem (Figure 3.7 and Table 3.1). This triggers the need for a Terrestrial Biodiversity Specialist Assessment, as detailed in this report.

Table 3.1: Summary of sensitive environments within the project area

THEME	FEATURE(S)	SENSITIVITY
Terrestrial Biodiversity	Critically Endangered Ecosystems	VERY HIGH
Plant Species	*Brachycorythis conica* subsp. *transvaalensis*	MEDIUM
	Sensitive species A[1]	
Animal Species	Aves – *Tyto capensis*	HIGH
	Invertebrate – *Clonia uvarovi*	MEDIUM
	Mammalia – *Chrysospalax villosus*	
	Mammalia – *Ourebia ourebi ourebi*	

Additionally, the screening reports illustrate that in terms of plant species sensitivity, the sites fall within MEDIUM sensitivity areas (Figure 3.8), with two MEDIUM-sensitivity plant species noted in the project area (Table 3.1). This triggers the need for a Plant Species Compliance Statement, as included in this report. The screening reports also illustrate that the proposed project areas include areas of MEDIUM to HIGH sensitivity in terms of animal species sensitivity (Figure 3.9), with one HIGH sensitive bird species and a number of MEDIUM sensitivity invertebrates and mammals (Table 3.1). This triggers the need for an Avifaunal Specialist Assessment and an Animal Species Compliance Statement. It is recommended that a separate Avifaunal Specialist Assessment be completed for the HIGH sensitivity bird species.

[1] The names of some species have been withheld as these species may be prone to illegal harvesting and must be protected.

Figure 3.7: Terrestrial biodiversity sensitivity for portions of project within VERY HIGH sensitivity areas (DFFE, 2021).

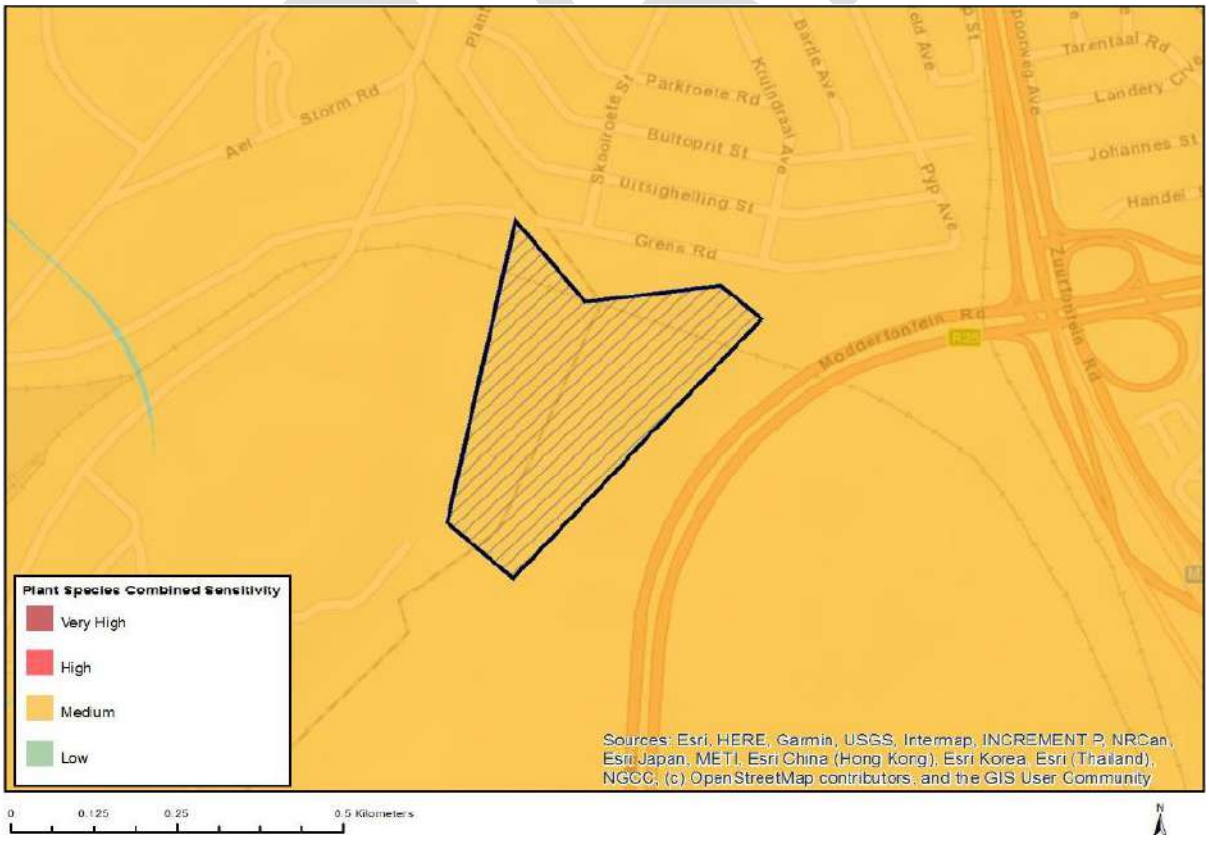


Figure 3.8: Plant species sensitivity for the proposed project (DFFE, 2021).

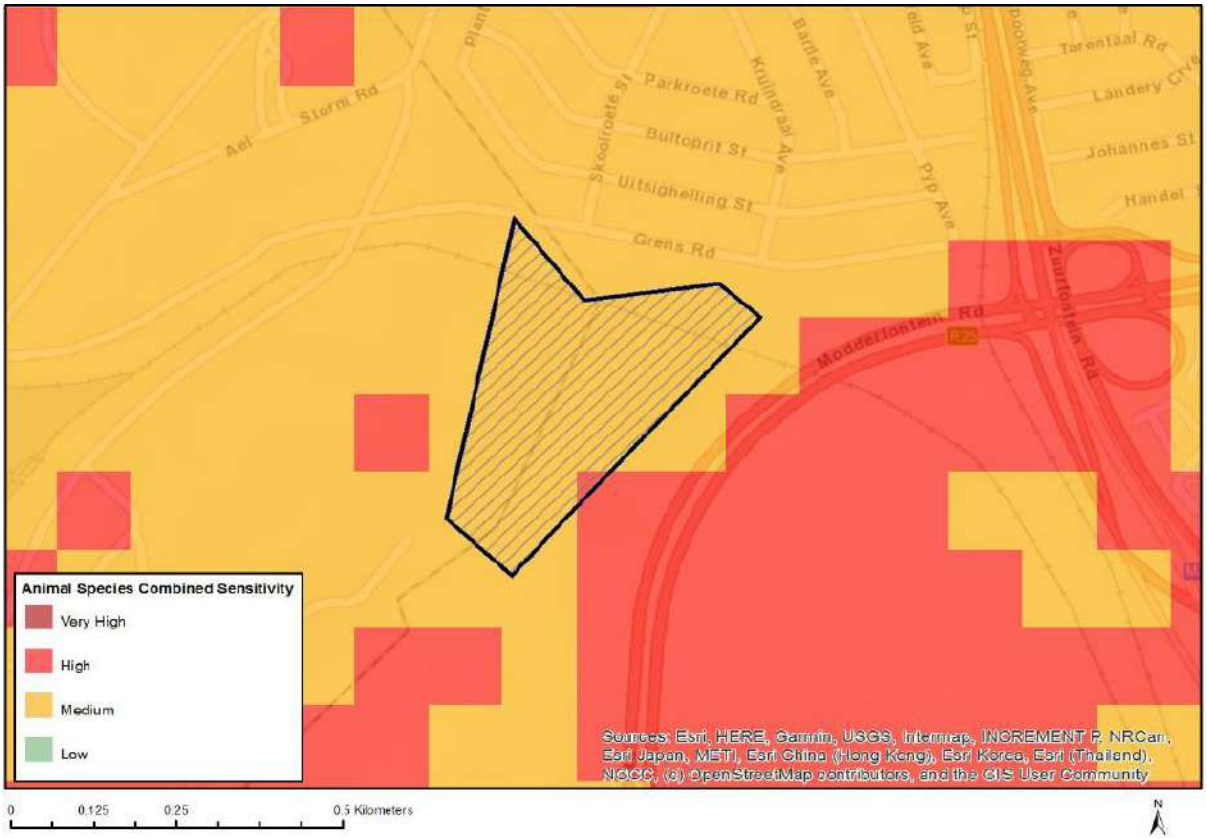


Figure 3.9: Animal species sensitivity for the proposed project (DFFE, 2021).

3.1.8 DESCRIPTION OF VEGETATION AND FLORA

3.1.8.1 NATIONAL VEGETATION MAP

According to the SA VEGMAP (2018), the project area occurs within one (1) vegetation type – Carletonville Dolomite Grassland (Figure 3.10). This is a species-rich mosaic of plant community types occurring on undulating plains dissected by rocky chert ridges. It is a vegetation type that is characterized by the presence of the species: *Aristida congesta, Brachiaria serrata, Cynodon dactylon, Digitaria tricholaenoides, Diheteropogon amplectens, Eragrostis chloromelas, Eragrostis racemosa, Heteropogon contortus, Loudetia simplex, Schizachyrium sanguineum, Setaria sphacelata, Themeda triandra*, and a wide variety of herbaceous forbs and other grasses.

This vegetation type is considered to be **Vulnerable** (Driver et al., 2005 and Mucina et al., 2006), and whilst the conservation target is 24%, only a small extent is currently protected and 23% is considered to be transformed, mostly by cultivation (17%), urbanization (4%), forestry (1%) and mining (1%) (Mucina et al. 2006).

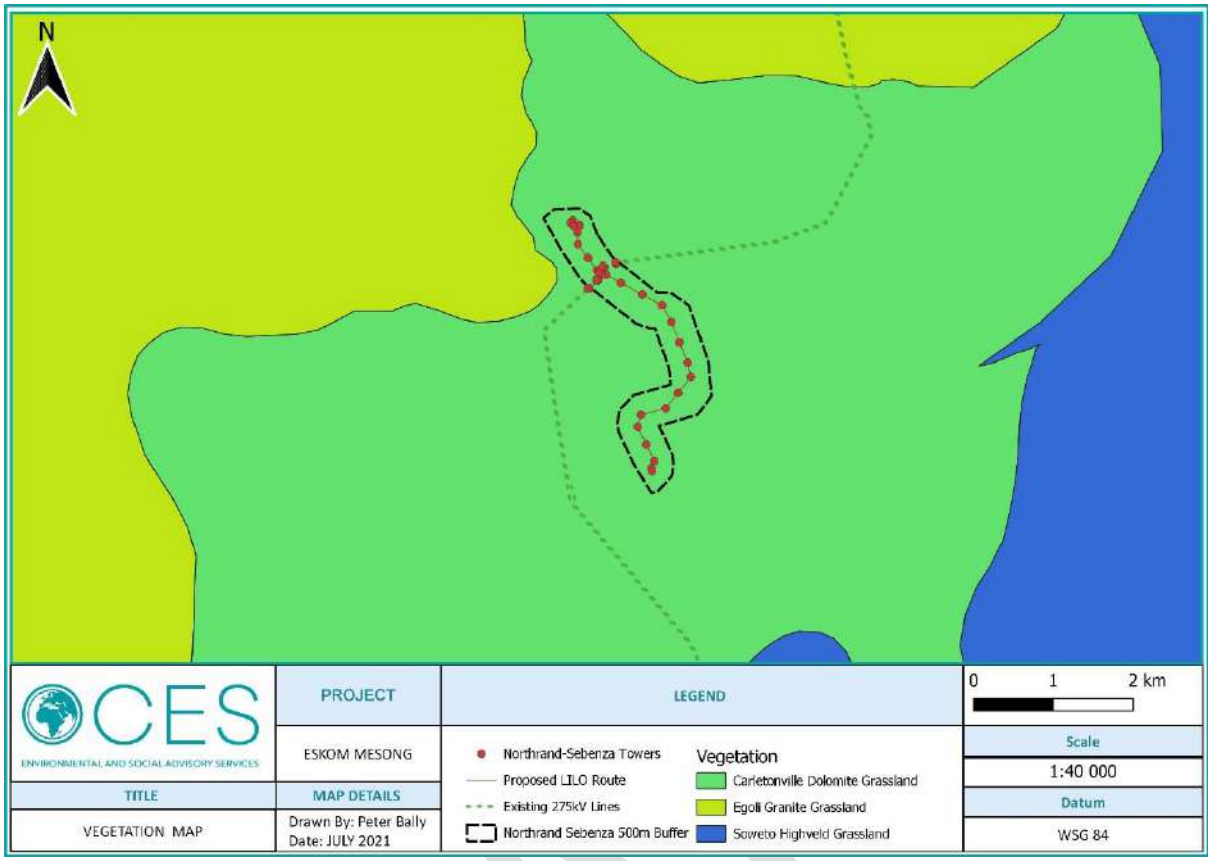


Figure 3.10: National Vegetation Map of the project site.

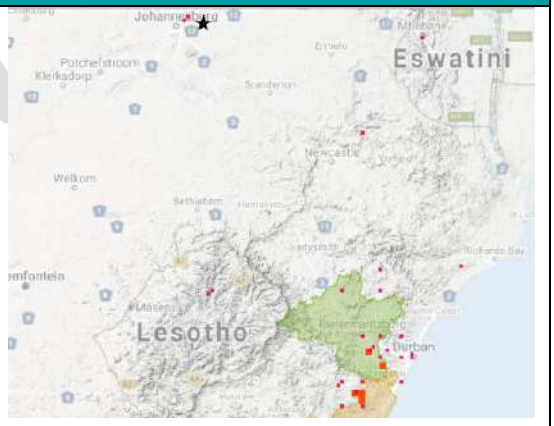
3.1.8.2 SPECIES OF CONSERVATION CONCERN

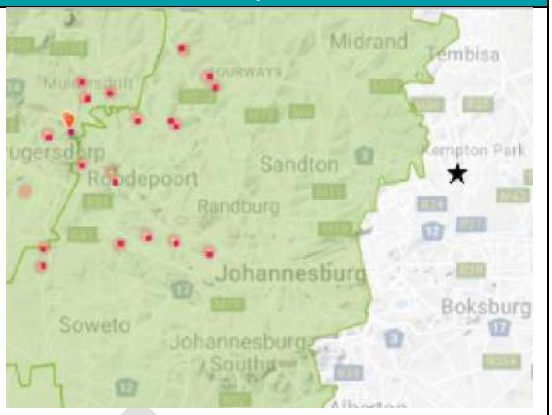
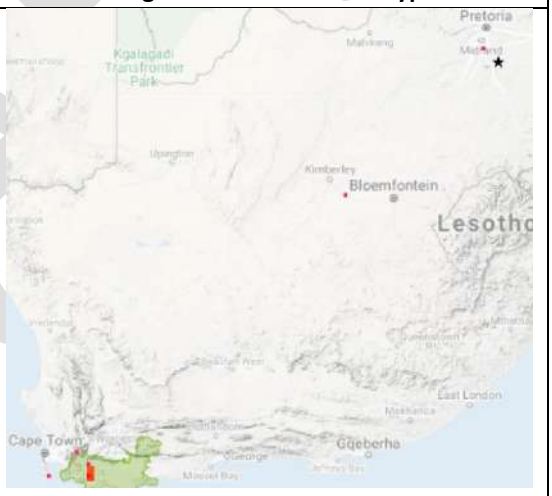
Plant species of conservation concern (SCC) comprise those species that are either threatened (Critically Endangered, Endangered, Vulnerable), rare or declining. The South African National Biodiversity Institute (SANBI) Plants of Southern Africa (POSA) plant database (http://posa.sanbi.org) was consulted (Figure 3.11), along with the categories indicated in the SANBI Threatened Species Programme website (http://redlist.sanbi.org/index.php) to identify potential SCCs within the proposed study area. In addition to SANBI, the international IUCN Red Data list, the Threatened or Protected Species (TOPS) list and Convention on International Trade in Endangered Species (CITES), was consulted to compile a list of plant SCCs that may potentially be found within the study area. According to POSA, seven potential plant SCC have been recorded in close proximity to the proposed development footprint, including three critically endangered, one endangered and one vulnerable in terms of the SANBI Red List. In addition, one species (*Podocarpus henkelii*) is internationally endangered according to the IUCN and is regarded as a Protected Tree Species in South Africa (Table 3.2). A full list of the potential species found within the study area is included in Table 9.1.

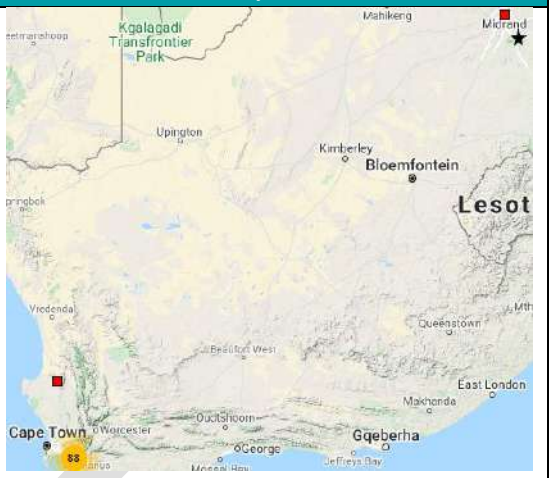
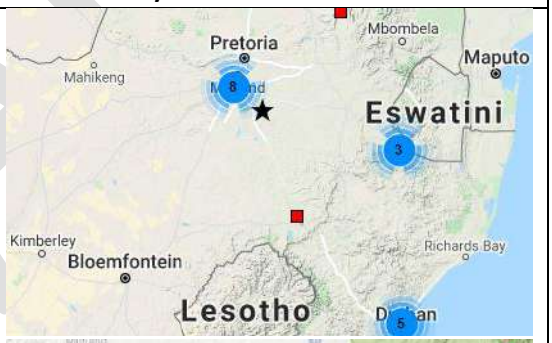
It is noted that, although POSA or other sources report observations of these species within proximity to the site, some of these species are unlikely to occur on site given their known distributions and habitat preferences, as well as the possibility of some individuals being misidentified by the observers or some occurring within estates, gardens and/or herbariums.

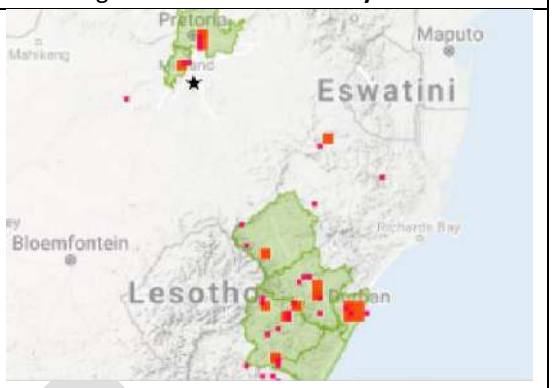
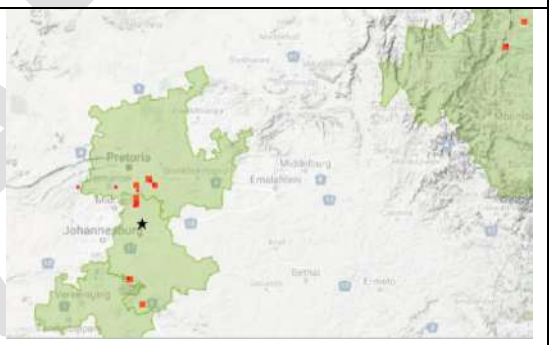
Figure 3.11: POSA search area highlighting botanical records (red).

Table 3.2: Plant SCCs observations (orange squares – iNaturalist 2021, pink squares – GBIF 2021, red squares – POSA) in relation to the project area (black star)

SPECIES	STATUS	HABITAT	DISTRIBUTION / OBSERVATIONS
Argyrolobium longifolium	VU	Ngongoni and sandstone grasslands within the KwaZulu-Natal Sandstone Sourveld, Moist Coast Hinterland Grassland, Dry Coast Hinterland Grassland vegetation types (Edwards, et al., 2014).	 *Argyrolobium longifolium* is currently known from a number of records from a limited area of sandstone grasslands between Pinetown, Pietermaritzburg and Richmond (Edwards, et al., 2014). Although two GBIF records are noted in the Gauteng Province, it is assumed that these are either misidentifications or specimens kept in an estate, garden or herbarium because this species is more likely to occur in suitable sandstone grasslands within KwaZulu-Natal (Edwards, et al., 2014). The likelihood of the species occurring on site is therefore **very low**.

SPECIES	STATUS	HABITAT	DISTRIBUTION / OBSERVATIONS
Brachycorythis conica transvaalensis	CR	Short, open grassland and wooded grassland, on sandy gravel overlying dolomite, sometimes also on quartzite, 1 000–1 705 m (Von Staden, et al., 2015).	 *Brachycorythis conica transvaalensis* has an extent of occurrence (EOO) of 26.75 km² (SANBI, 2020). Although the proposed site is > 20 km from the closest recorded sites for this species, parts of the study area (e.g. CDG vegetation) provide a suitable habitat for the species. The likelihood of this species occuiring on site is therefore considered **moderate within the CDG and wetland vegetation types** and **low within the other vegetation and land use types** on site.
Erica jasminiflora	CR	Fynbos, in loamy, gravely, ferricrete soils on lowland hill slopes of the Elim Ferricrete Fynbos in the Western Cape (Turner, et al., 2011).	 *Erica jasminiflora*is has an EOO of less than 10 km² and it is known from only two, severely fragmented subpopulations in the Western Cape, one of which is declining (Turner, et al., 2011). Although one GBIF record is noted in the Gauteng Province, it is assumed that this either a misidentification or it is a specimen kept in an estate, garden or herbarium because this species only occurs naturally in the Fynbos region (Turner, et al., 2011). The likelihood of the species occurring on site is therefore **very low**.

SPECIES	STATUS	HABITAT	DISTRIBUTION / OBSERVATIONS
Erica viscaria	CR	Fynbos vegetation in the Western Cape.	 *Erica viscaria* is only know to occur within the Western Cape Fynbos region. Although one POSA record (dated 2002) is noted in the Gauteng Province, it is assumed that this either a misidentification or it is a specimen kept in an estate, garden or herbarium because this species only occurs naturally in the Fynbos region. The likelihood of the species occurring on site is therefore **very low**.
Indigofera hybrida	VU	KaNgwane Montane Grassland, Eastern Highveld Grassland in the Mpumalanga Province (Burrows, et al., 2006).	  *Indigofera hybrida* is known from three locations, with a range from Ermelo to Wakkerstroom in the Mpumalanga Province. Although eight POSA records are reported in the Gauteng Province, Burrows, et. al (2006) note that this is a very poorly known, commonly misidentified species, with similarities to the widespread *I. hilaris.* It is assumed that Gauteng specimens were either misidentified or they are possibly specimens kept in estates, gardens and/or herbariums because this species generally occurs naturally in the KaNgwane Montane and Eastern Highveld Grasslands of

SPECIES	STATUS	HABITAT	DISTRIBUTION / OBSERVATIONS
			Mpumalanga. The likelihood of the species occurring on site is therefore **very low**.
Podocarpus henkelii	Protected, EN (IUCN), LC (RSA)	Forest habitats (Foden & Potter, 2009).	 The distribution of *Podocarpus henkelii* ranges from the Southern Drakensberg to Gauteng (Foden & Potter, 2009). Although the distribution range includes the site and observations of the species have been reported within 20 km of the site, the likelihood of the species occuring on site is considered **low** because the site lacks forest habitat.
Sensitive Species A[2]	EN	Open grassland on dolomite or in black, sandy soil in the Andesite Mountain Bushveld and Carletonville Dolomite Grassland vegetation types (Pfab & Victor, 2005)	 Surveys of remaining habitat within Gauteng Province revealed that there are only about 230 mature individuals. These occur as six scattered subpopulations, the largest of which only has 70-80 mature individuals, but there are generally fewer than 40 mature individuals per subpopulation (Pfab & Victor, 2005). The likelihood of this species occuring on site is therefore considered **moderate to high within the CDG and wetland vegetation type** and **low within the other vegetation and land use types** on site.

3.1.8.3 ALIEN INVASIVE SPECIES

The SANBI POSA plant database (http://posa.sanbi.org) was consulted (Figure 3.11), along with the categories indicated in NEMBA's Alien Invasive Species (AIS) Regulations (2014) to identify potential non-indigenous and invasive species within the proposed study area. Of the 134 non-indigenous species, 133 are considered naturalised and 73 are considered invasive. Thirty-eight of these species

[2] The names of some species have been withheld as these species may be prone to illegal harvesting and must be protected.

are classified in terms of NEMBA's AIS Regulations (2014), including three Category 1a species, 30 Category 1b species, two Category 2 species and three Categorty 3 species (Table 3.3).

Table 3.3: Potential plant AIS likely to occur within the study area.

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Amaranthaceae	*Salsola*	*kali*	Not indigenous; Naturalised; Invasive	Cat 1b
Apocynaceae	*Araujia*	*sericifera*	Not indigenous; Naturalised; Invasive	Cat 1b
Asteraceae	*Campuloclinium*	*macrocephalum*	Not indigenous; Naturalised; Invasive	Cat 1b
Asteraceae	*Cirsium*	*vulgare*	Not indigenous; Naturalised; Invasive	Cat 1b
Asteraceae	*Coreopsis*	*lanceolata*	Not indigenous; Cultivated; Naturalised; Invasive	Cat 1a
Asteraceae	*Montanoa*	*hibiscifolia*	Not indigenous; Naturalised; Invasive	Cat 1b
Asteraceae	*Xanthium*	*spinosum*	Not indigenous; Naturalised; Invasive	Cat 1b
Boraginaceae	*Echium*	*plantagineum*	Not indigenous; Naturalised; Invasive	Cat 1b
Brassicaceae	*Nasturtium*	*officinale*	Not indigenous; Naturalised; Invasive	Cat 2
Convolvulaceae	*Cuscuta*	*campestris*	Not indigenous; Naturalised; Invasive	Cat 1b
Convolvulaceae	*Cuscuta*	*suaveolens*	Not indigenous; Naturalised; Invasive	Cat 1b
Convolvulaceae	*Ipomoea*	*purpurea*	Not indigenous; Naturalised; Invasive	Cat 1b
Fabaceae	*Acacia*	*elata*	Not indigenous; Naturalised; Invasive	Cat 1b
Fabaceae	*Robinia*	*pseudoacacia*	Not indigenous; Naturalised; Invasive	Cat 1b
Fabaceae	*Spartium*	*junceum*	Not indigenous; Cultivated; Naturalised; Invasive	Cat 3
Iridaceae	*Iris*	*pseudacorus*	Not indigenous; Cultivated; Naturalised; Invasive	Cat 1a
Malvaceae	*Malva*	*verticillata*	Not indigenous; Naturalised	Cat 1b
Myrtaceae	*Eucalyptus*	*camaldulensis*	Not indigenous; Cultivated; Naturalised; Invasive	Cat 1b
Myrtaceae	*Kunzea*	*ericoides*	Not indigenous; Naturalised	Cat 1a
Nyctaginaceae	*Mirabilis*	*jalapa*	Not indigenous; Naturalised; Invasive	Cat 1b
Oleaceae	*Ligustrum*	*lucidum*	Not indigenous; Cultivated; Naturalised; Invasive	Cat 3
Papaveraceae	*Argemone*	*ochroleuca*	Not indigenous; Naturalised; Invasive	Cat 1b
Phytolaccaceae	*Phytolacca*	*dioica*	Not indigenous; Naturalised; Invasive	Cat 3
Phytolaccaceae	*Phytolacca*	*octandra*	Not indigenous; Naturalised; Invasive	Cat 1b
Poaceae	*Pennisetum*	*clandestinum*	Not indigenous; Naturalised; Invasive	Cat 1b
Poaceae	*Pennisetum*	*villosum*	Not indigenous; Naturalised; Invasive	Cat 1b
Poaceae	*Sorghum*	*halepense*	Not indigenous; Naturalised; Invasive	Cat 2
Pontederiaceae	*Pontederia*	*cordata*	Not indigenous; Naturalised	Cat 1b
Rosaceae	*Agrimonia*	*procera*	Not indigenous; Naturalised; Invasive	Cat 1b
Salviniaceae	*Azolla*	*filiculoides*	Not indigenous; Naturalised; Invasive	Cat 1b
Solanaceae	*Cestrum*	*aurantiacum*	Not indigenous; Naturalised; Invasive	Cat 1b
Solanaceae	*Cestrum*	*laevigatum*	Not indigenous; Naturalised; Invasive	Cat 1b
Solanaceae	*Datura*	*stramonium*	Not indigenous; Naturalised; Invasive	Cat 1b
Solanaceae	*Solanum*	*mauritianum*	Not indigenous; Naturalised; Invasive	Cat 1b

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Solanaceae	*Solanum*	*pseudocapsicum*	Not indigenous; Naturalised; Invasive	Cat 1b
Solanaceae	*Solanum*	*sisymbriifolium*	Not indigenous; Naturalised; Invasive	Cat 1b
Verbenaceae	*Verbena*	*bonariensis*	Not indigenous; Naturalised; Invasive	Cat 1b
Verbenaceae	*Verbena*	*rigida*	Not indigenous; Naturalised; Invasive	Cat 1b

3.1.9 DESCRIPTION OF FAUNA

South Africa is a faunally diverse country, with approximately 1,663 terrestrial vertebrate faunal species of which 343 species are mammals, 350 species are reptiles and 120 species are amphibians spread across seven biomes and 122 million km². The Gauteng Province is home to approximately over 30 amphibian species, 100 reptile species and 200 mammal species (ADU, 2021; IUCN, 2021).

3.1.9.1 AMPHIBIANS

Of the more than 30 amphibian species in Gauteng Province, 24 species have a distribution range which includes the proposed development site (ADU, 2021; iNaturalist, 2021; IUCN, 2021). Thirteen of these species have been recorded within a 30 km radius of the site (ADU, 2021). All amphibian species likely to occur on site are listed as of Least Concern. A full list of amphibian species with a distribution range which includes the development area is provided in Table 10.1.

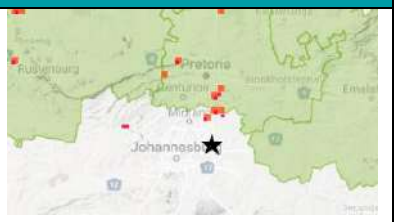
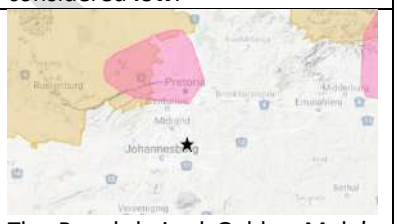
3.1.9.2 REPTILES

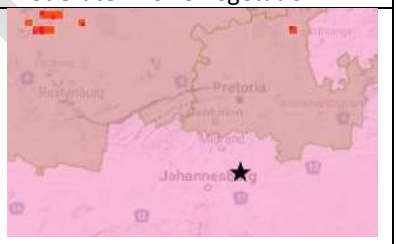
The Gauteng Province is home to over 100 reptile species (ADU, 2021), 92 of which have a distribution which includes the proposed development site (ADU, 2021; iNaturalist, 2021; IUCN, 2021). Approximately 50 reptile species have been recorded within a 30 km radius of the site (ADU, 2021). All reptile species likely to occur on site are listed as of least concern. A full list of reptile species with a distribution range which includes the development area is provided in Table 10.2.

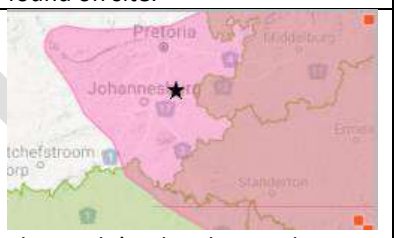
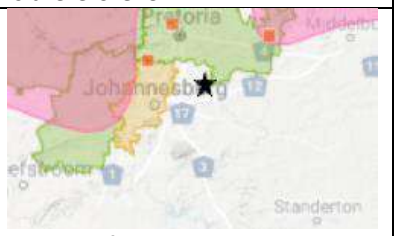
3.1.9.3 MAMMALS

Of the 200+ mammal species which occur in the Gauteng Province, 138 have a distribution which includes the proposed development site (ADU, 2021; iNaturalist, 2021; IUCN, 2021) and approximately 65 of these have been recorded within a 30 km radius of the site (ADU, 2021). Ten of the 138 species with distribution ranges which include the site are considered SCCs, including one critically-endangered, three endangered and six vulnerable species (Table 3.4). A full list of mammal species with a distribution range which includes the development area is provided in Table 10.3.

Table 3.4: Mammalian SCC distributional ranges (pink area) and observations (orange squares – iNaturalist 2021, pink squares – GBIF 2021) in relation to the project area (black star).

SPECIES	THREAT STATUS	HABITAT	DISTRIBUTION / OBSERVATIONS
Acinonyx jubatus (Cheetah)	VU	Cheetahs are found in a wide range of habitats and ecoregions, ranging from dry forest and thick scrub through to grassland and hyper-arid deserts. They are only absent from tropical and montane forest. Cheetah appear to show relatively low habitat selectivity compared with other carnivores (Durant, et al., 2015).	 Cheetah are typically limited to fenced-off reserves. Additionally, the site falls adjacent to current and historical land use activities and lacks sufficient prey to support large carnivores, such as the Cheetah. The likelihood of the species occuring on site is considered **low**.
Chrysospalax villosus (Rough-haired Golden Mole)	VU	The Rough-haired Golden Mole is found on sandy soils in grasslands, meadows and along edges of marshes in Savanna and Grassland biomes of South Africa. It has also been found in gardens, parklands, dense stands of kikuyu grass and marginally on golf courses adjoining natural grasslands (Bronner, 2015).	 The Rough-haired Golden Mole's range occurs further to the north around Pretoria. However, portions of the site, namely CDG vegetation, provide suitable habitat for this species. The likelihood of the species occuring on site is considered **moderate** within in CDG vegetation.
Cloeotis percivali (Percival's Short-eared Trident Bat)	EN	Percival's Trident Bat occurs in savanna areas where there is sufficient cover in the form of caves and mine tunnels for day roosting. It feeds exclusively on moths, and appears to be very sensitive to disturbance (Monadjem, et al., 2017).	 Percival's Trident Bats' distribution range generally falls north of Midrand. Despite the lack of suitable habitats on site with sufficient cover for roosting (such as caves and mine tunnels), the site is possibly used as a feeding ground. The likelihood of the species occurring within the project area is therefore **moderate** in CDG vegetation.

SPECIES	THREAT STATUS	HABITAT	DISTRIBUTION / OBSERVATIONS
Crocidura maquassiensis (Makwassie musk shrew)	VU	The Makwassie musk shrew is generally found in rocky, mountain habitats, but may tolerate a wider range of habitats, with some individuals found in gardens and mixed bracken/grassland riversides in KwaZulu-Natal (Cassola, 2016).	 The Makwassie musk shrew's distribution range includes the site and portions of the site, namely CDG vegetation, may provide suitable habitat for this species. The likelihood of the species occurring within the project area is therefore **moderate** in CDG vegetation.
Diceros bicornis (Black Rhino)	CR	The Black Rhino occurs in a wide variety of habitats from desert areas in Namibia to wetter wooded areas. The highest densities of rhinos are found in savannas on nutrient-rich soils and in succulent Valley Bushveld areas. Black Rhino are browsers and favour small acacia's and other palatable woody species (Grewia's, Euphorbiaceae species, etc.) as well as palatable herbs and succulents. Apart from plant species composition and size structure, Black Rhino carrying capacity is related to rainfall, soil nutrient status, fire histories, levels of grass interference, extent of frost and densities of other large browsers (Emslie, 2020).	 Due to its critically endangered status, the Black Rhino is primarily confined to fenced-off reserves in South Africa. The likelihood of the species occurring within the project area is therefore **low**.
Felis nigripes (Black-footed Cat)	VU	The Black-footed Cat can be found in dry savannas, subtropical grasslands and the Karoo semi-desert with sparse shrub and tree cover. Predominantly ground-dwellers and during the day use dens in termite mounds or made by other animals (Sliwa, et al., 2016).	 The Black-footed Cat's distribution range includes the site and portions of the site, namely semi-natural CDG vegetation, may provide suitable habitat for this species. The likelihood of the species occurring within the project area is therefore **moderate** in CDG vegetation. It is recommended that a search and rescue team be sent ahead of vegetation clearance and construction teams to ensure that no individuals are found on site. This team should focus on checking termite

SPECIES	THREAT STATUS	HABITAT	DISTRIBUTION / OBSERVATIONS
			mounds, burrows and dens in particular.
Mystromys albicaudatus (White-tailed rat)	VU	The White-tailed rat is thought to occur within Carletonville Dolomite Grasslands, on sloped clay soils and are often associated with calcrete soils within grasslands. They are never found on soft, sandy substrate, rocks, wetlands or riverbanks (Avenant, et al., 2019).	 The White-tailed rat's distributional range includes the site and the species displays a preference for CDG vegetation. The likelihood of the species occurring within the project area is therefore **moderate** in CDG vegetation. It is recommended that a search and rescue team be sent ahead of vegetation clearance and construction teams to ensure that no individuals are found on site.
Ourebia ourebi and *Ourebia ourebi ourebi* (Oribi)	EN	Oribi inhabit savanna woodlands, floodplains and other open grasslands, reaching their highest density on floodplains and moist tropical grasslands, especially in association with large grazers (IUCN SSC Antelope Specialist Group, 2016).	 The Oribi's distributional range includes the site. However, there is insuffient intact habitat available to support the species on site. The likelihood of the species occurring within the project area is therefore **low**.
Panthera pardus (Leopard)	VU	Leopards have a wide habitat tolerance and highly varied diet. Their habitats include woodland, grassland savanna and mountain habitats but they also occur widely in coastal scrub, shrubland and semi-desert (Swanepoel, et al., 2016).	 The site falls adjacent to current and historical land use activities and lacks sufficient prey to support large carnivores, such as the Leopard. The likelihood of the species occurring within the project area is therefore **low**.

3.1.10 TERRESTRIAL BIODIVERSITY INDICATORS

3.1.10.1 CRITICAL BIODIVERSITY AREAS AND ECOLOGICAL SUPPORT AREAS

The Gauteng Conservation Plan (C-Plan) is based on the systematic conservation protocols based on principles developed by Margules & Pressey (2000). This plan must be treated as a living document with periodic review and updates as the knowledge of the distribution of biodiversity, the status of species, approaches for dealing with aspects such as climate change, methods of data analysis, and the nature of threats to biodiversity within a planning region are constantly changing, especially in the Gauteng Province, which is developing at an extremely rapid rate. The main aim of the C-Plan is:

- To serve as the primary decision support tool for the biodiversity component of the Environmental Impact Assessment (EIA) process;
- To inform protected area expansion and biodiversity stewardship programmes in the Province;
- To serve as a basis for development of Bioregional Plans in municipalities within the Province.

The Gauteng C-Plan forms part of the environmental authorization process in that if the proposed project is located within a Critical Biodiversity Area (CBA) or an Ecological Support Area (ESA), Listing Notice 3 (GN No. R. 985, as amended) activities are triggered. The Gauteng C-Plan was utilised to indicate any sensitive surrounding environments and the level of protection of these. According to the Gauteng Conservation Plan the proposed development occurs within a CBA and an Ecological Support Area (ESA) (Figure 3.12).

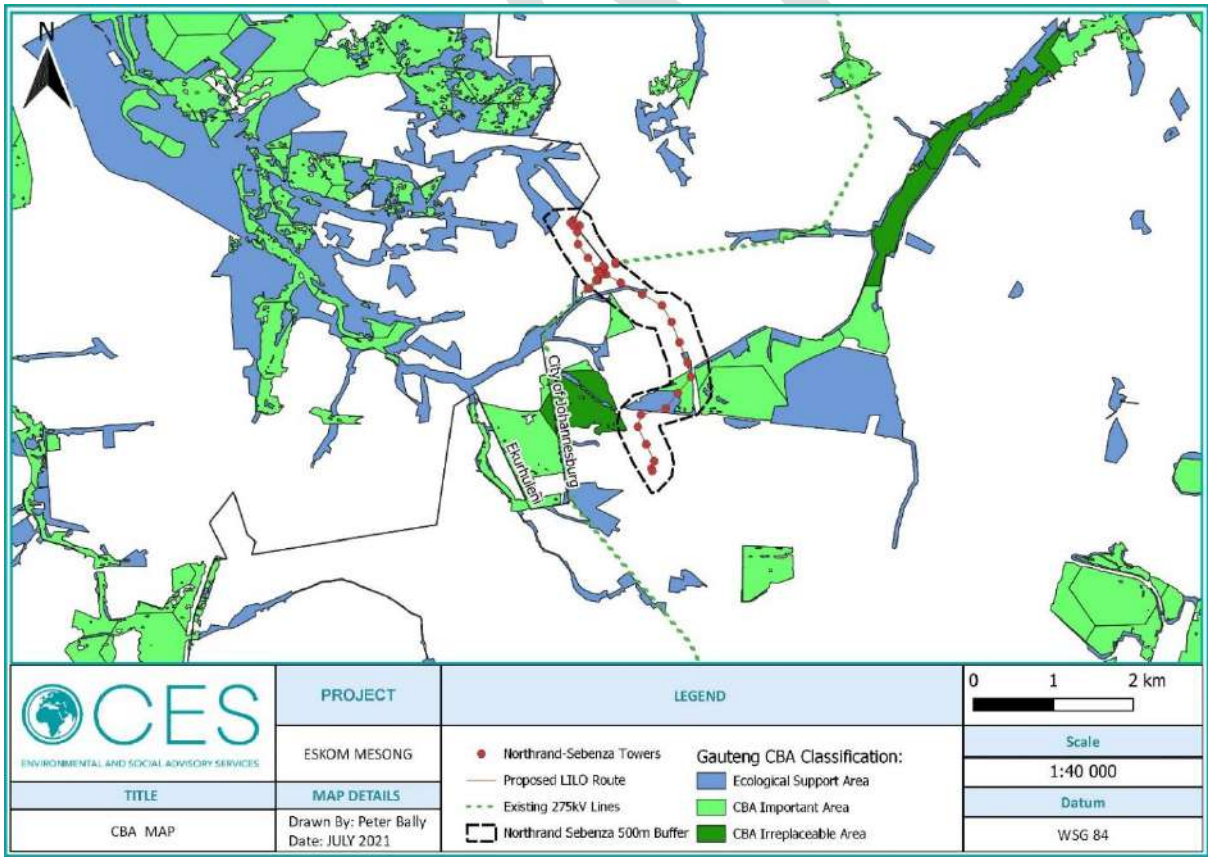


Figure 3.12: Gauteng CPlan map of the project area

3.1.10.2 ECOSYSTEM THREAT STATUS

The National Environmental Management: Biodiversity Act, (Act No. 10 OF 2004) (NEM:BA) provides a National List of Ecosystems that are threatened and in need of protection – GN 1002 of 2011. According to the NEMBA List of Threatened Ecosystems, the project does not occur within or near to a threatened ecosystem. These findings are supported by the NBA (2018) *Terrestrial ecosystem threat status assessment* (Skowno *et al*., 2019) which confirmed that the ecosystems within and surrounding the project area are classified as Least Concern.

3.1.10.3 GAUTENG RIDGE GUIDELINES

A section of the project area falls within a Class 3 Ridge (Figure 3.13). As per the Gauteng Ridge Guidelines, "Class 3 ridges include ridges of which 35% or more, but less than 65%, of their surface area has been converted to urban development, quarries and/or alien vegetation. Approximately 9% of ridges currently fall within Class 3, including the ridge that traverses the Northcliff, Roodepoort and Krugersdorp areas". The following guidelines apply to Class 3 Ridges:

- *The consolidation of properties on Class 3 ridges is supported.*
- *The guidelines for Class 2 ridges will be applied to areas of the ridge that have not been significantly impacted on by human activity, i.e.:*
    - *The consolidation of properties on Class 2 ridges is supported;*
    - *The subdivision of property on Class 2 ridges will not be permitted;*
    - *Development activities and uses that have a high environmental impact on a Class 2 ridge will not be permitted;*
    - *Low impact development activities, such as tourism facilities, which comprise of an ecological footprint of 5% or less of the property may be permitted. (The ecological footprint includes all areas directly impacted on by a development activity, including all paved surfaces, landscaping, property access and service provision); and*
    - *Low impact development activities on a ridge will not be supported where it is feasible to undertake the development on a portion of the property abutting the ridge.*
- *The guidelines for Class 4 ridges will be applied to areas of the ridge that have been significantly impacted on by human activity, i.e.:*
    - *The consolidation of properties on Class 4 ridges is supported;*
    - *The subdivision of property on Class 4 ridges will not be permitted in areas of the ridge where the remaining contiguous extent of natural habitat is 4 ha or more; and*
    - *Further development activities will not be permitted in areas of the ridge where the remaining contiguous extent of natural habitat is 4 ha or more.*

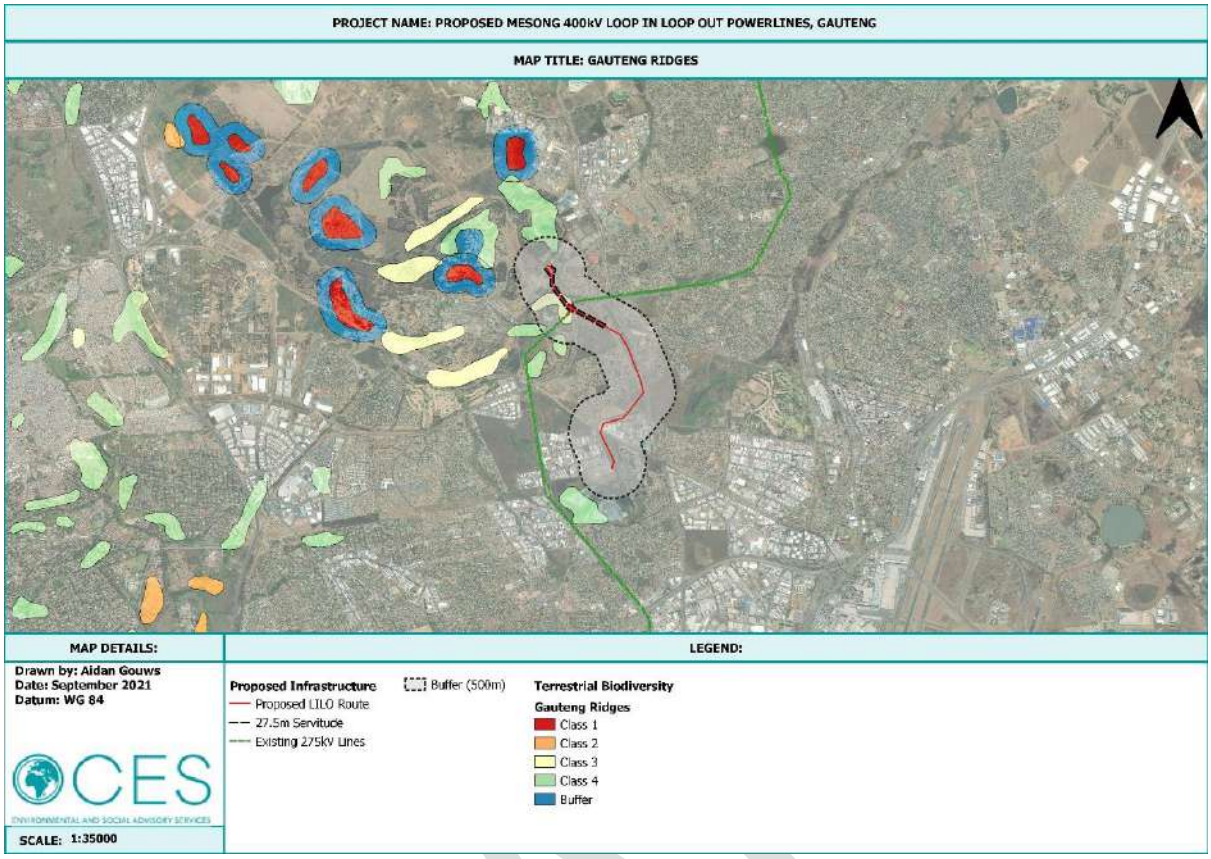


Figure 3.13: Gauteng Ridge Classification map of the project area

3.1.10.4 PROTECTED AND PRIORITY AREAS

The National Environmental Management: Protected Areas Act (NEMPAA), 2003 (Act 57 of 2003) aims to protect natural landscapes and to keep the aesthetic values of these areas intact. The objectives of NEMPAA are to:

- Provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes;
- Establish a national register of all national, provincial and local protected areas;
- Manage these areas in accordance with national norms and standards;
- Foster intergovernmental co-operation and public consultation in matters concerning protected areas; and
- Deal with all matters in connection therewith.

The National Protected Areas Expansion Strategy (NPAES, 2008) was developed to "*achieve cost-effective protected area expansion for ecological sustainability and increased resilience to climate change*." The NPAES originated as Government recognised the importance of protected areas in maintaining biodiversity and critical ecological process. The NPAES sets targets for expanding South Africa's protected area network, placing emphasis on those ecosystems that are least protected. Similarly, the Gauteng Protected Areas Expansion Strategy (GPAES, 2013) provides a strategic framework for the coordination of protected area expansion efforts at the provincial level over the next 20 years.

The proposed site does not fall within any protected or priority areas, with the closest Protected Area (Pamula Park Private Nature Reserve) falling approximately 7.5 km to the south-east of the site, the closest GPAES areas falling 12-14 km to the north (Glen Austin Bullfrog Pan) and south-east (Korsman Westdene Pan Bird Sanctuary) of the site, and the closest NPAES area (Vaal Grasslands) falling 28 km to the north-west of the site (Figure 3.14).

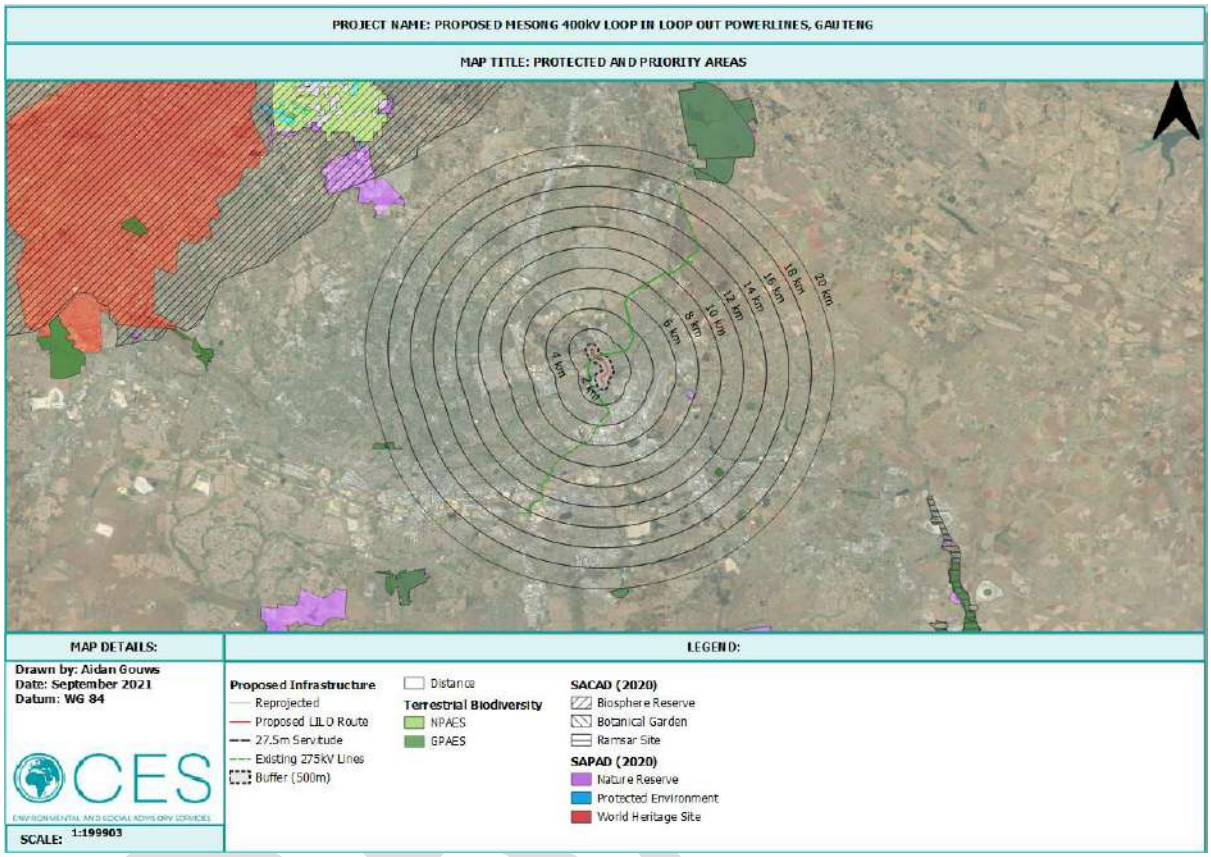


Figure 3.14: Protected and priority areas map of the project area

3.2 SITE ASSESSMENT

The vegetation and habitat composition were assessed along 12 transect lines, with an additional 19 point localities sampled across the development footprint. Field data was further supplemented by data collected concurrently during the wetland site survey (20 August 2021). The vegetation types, land uses and species composition observed on site are presented below.

3.2.1 VEGETATION AND LAND USES MAPPING

The vegetation and land use types within the assessment footprint (500 m buffer) were then mapped using a combination of data from the field assessment, the Mucina and Rutherford (2018) vegetation map, the National Land Cover (NLC, 2018) map and aerial imagery from Google Earth (Figure 3.15). The vegetation and land use types recorded within the assessment footprint are described in Table 3.6 below, along with photographic examples of the site conditions and species for each category.

3.2.2 PLANT SPECIES IDENTIFIED ON SITE

A total of 24 plants were identified during the site visit, none of which were Species of Conservation Concern (SCC), with all categorised as "**Least Concern**" (Table 3.5). Fourteen species were categorised as non-indigenous species, of which nine are Category 1b invaders, three are Category 2 invaders and two are Category 2 invaders in terms of the NEMBA AIS List (2016) (Table 3.5).

Table 3.5: Plant species found occurring within the project footprint.

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Adoxaceace	*Sambucus*	*nigra*	Not indigenous; Naturalised; Invasive	- Cat 1b
Apocynaceae	*Araujia*	*sericifera*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Araceace	*Zantedeschia*	*aethiopica*	Indigenous	- LC
Araliaceae	*Hedera*	*helix*	Not indigenous; Naturalised; Invasive	- Cat 3
Asteraceae	*Bidens*	*pilosa*	Not indigenous; Naturalised	- Not Evaluated
Asteraceae	*Senecio*	sp.	Indigenous	
Asteraceae	*Tagetes*	*minuta*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Bignoniaceace	*Tecoma*	*stans*	Not indigenous; Cultivated; Naturalised; Invasive	- Not Evaluated - Cat 1b
Brassicaceae	*Sisymbrium*	*capense*	Indigenous	- LC
Fabaceae	*Acacia*	*dealbata*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 2
Fabaceae	*Acacia*	*mearnsii*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 2
Fabaceae	*Tipuana*	*tipu*	Not indigenous; Naturalised; Invasive	- Cat 3
Fabaceae	*Vachellia*	*karroo*	Indigenous	- LC
Lamiaceae	*Leonotis*	*leonurus*	Indigenous	- LC
Meliaceace	*Melia*	*azedarach*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Moraceae	*Ficus*	*salicifolia*	Indigenous	- LC
Myrtaceae	*Eucalyptus*	*camaldulensis*	Not indigenous; Cultivated; Naturalised; Invasive	- Not Evaluated - Cat 1b
Poaceae	*Arundo*	*donax*	Not indigenous; Naturalised; Invasive	- Not Evaluated

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
				- Cat 1b
Poaceae	*Hyparrhenia*	*hirta*	Indigenous	- LC
Poaceae	*Phragmites*	*australis*	Indigenous	- LC
Saliaceace	*Populus*	*alba*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 2
Solanaceae	*Solanum*	*mauritianum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Verbenaceae	*Lantana*	*camara*	Not indigenous; Cultivated; Naturalised; Invasive	- Not Evaluated - Cat 1b
Verbenaceae	*Verbena*	*bonariensis*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b

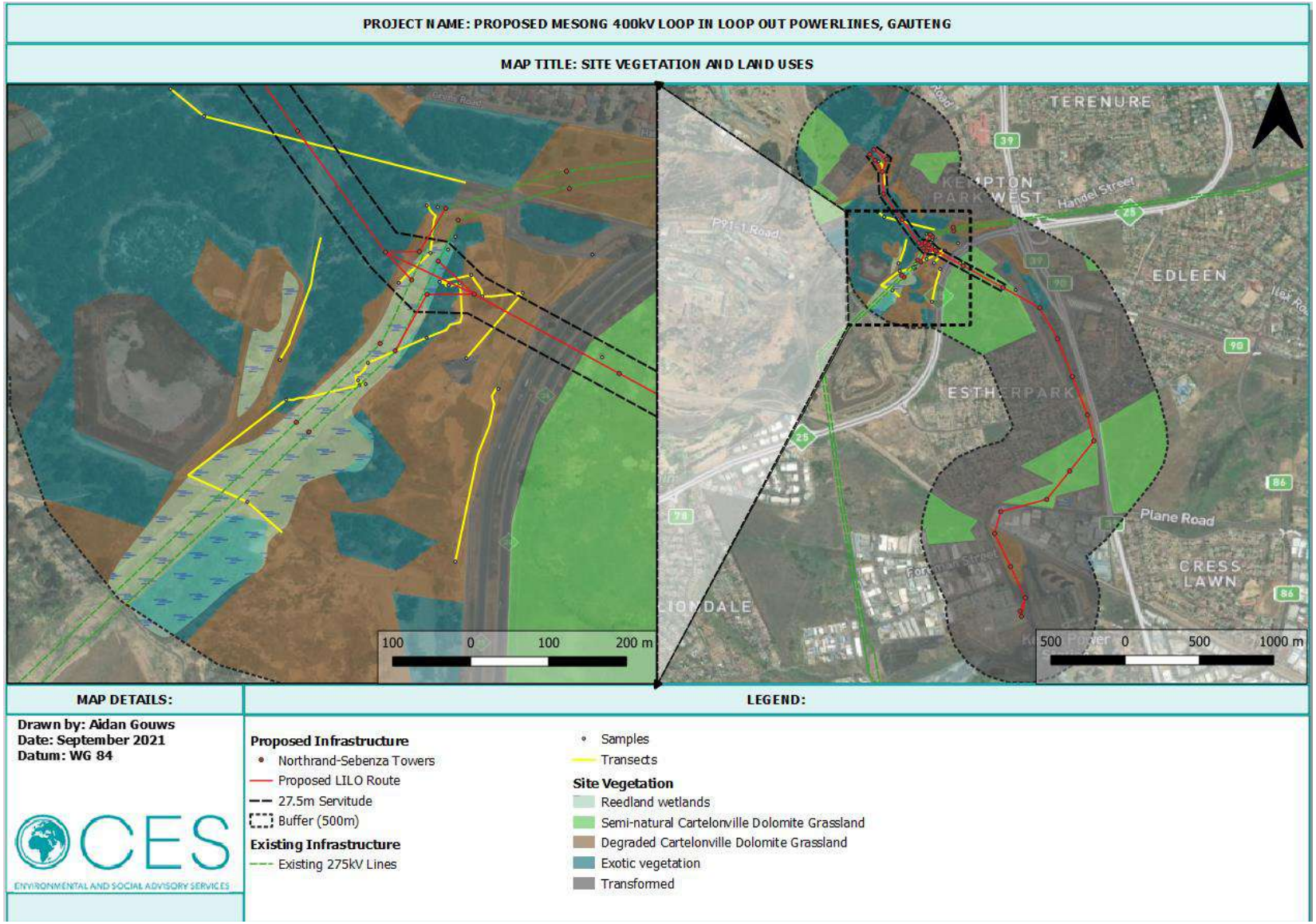


Figure 3.15: Site vegetation and land use map of the proposed development sites.

Table 3.6: Vegetation and land use survey within the assessment footprint.

NAME	DESCRIPTION	PHOTOGRAPHS
Reedland wetlands	Unchannelled-valley bottom and seep wetlands, dominated by *Phragmites australis* reedland. A few other plant species were encountered within this vegetation type, including *Arundo donax, Hyparrhenia hirta, Populus alba* and *Verbena bonariensis.* Please refer to the River and Wetland Ecosystem Assessment Report (CES, 2022) for further detail.	 **Plate 3.1: Reedland wetland vegetation observed within the assessment footprint.**

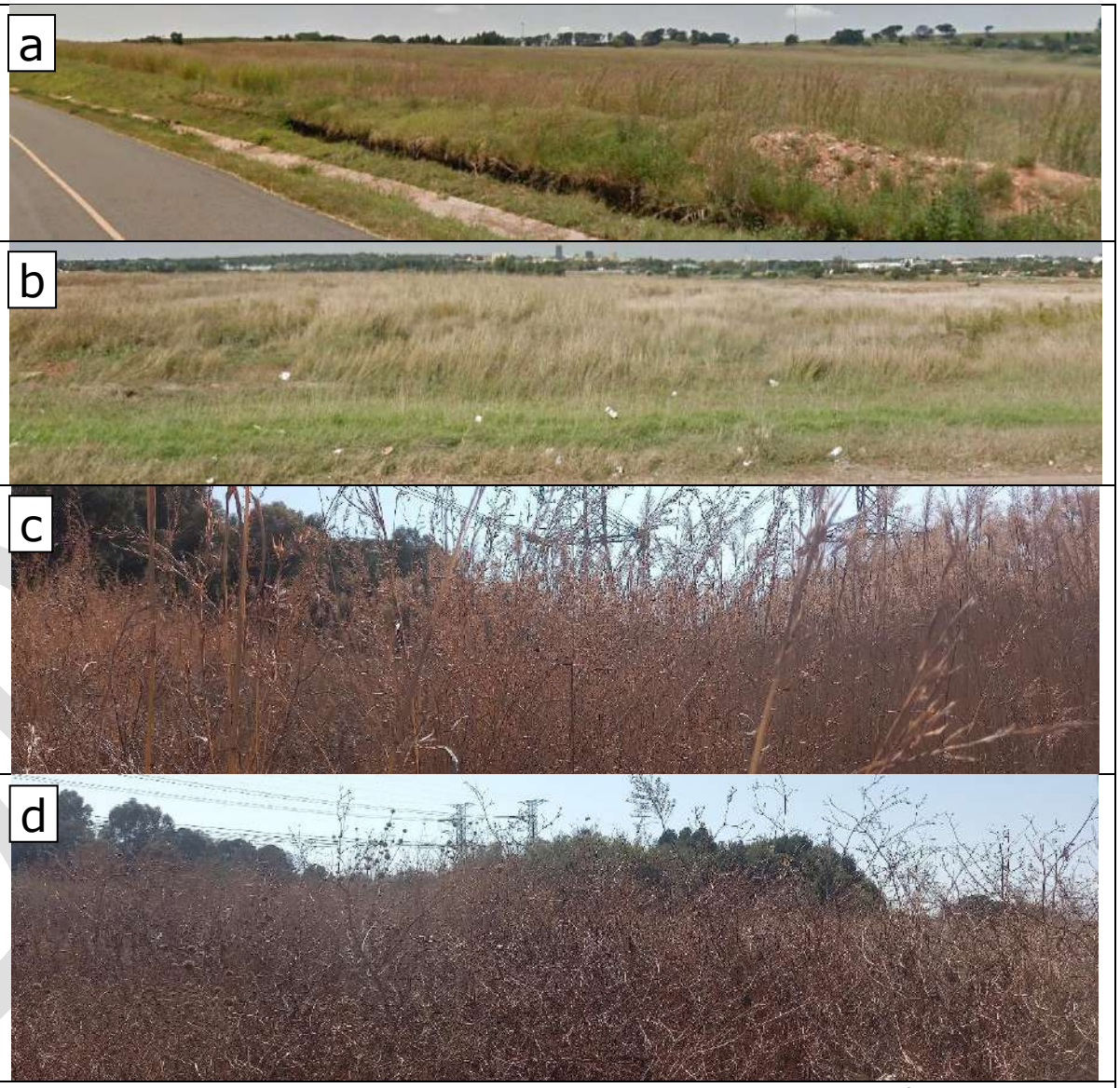
Semi-Natural to Degraded Carletonville Dolomite Grassland (CDG)	Semi-natural (a & b) to degraded (c & d) Carletonville Dolomite Grassland (CDG), generally dominated by *Hypharrhenia hirta*. The semi-natural subtype is characterised by a mostly-continuous secondary grassland, with evidence of historical impacts yet limited current impacts and few (if any) alien invasive and/or encroaching indigenous species present. The degraded subtype is characterised by patchy to mostly-continuous secondary grassland, with clear evidence of historical and ongoing impacts, with many scattered alien invasive species, such as: • *Acacia dealbata,* • *Acacia mearnsii,* • *Eucalyptus camaldulensis,* • *Melia azedarach,* • *Solanum mauritianum,* and • *Verbena bonariensis;* and/or a high abundance of encroaching indigenous species, such as: • *Bidens pilosa,* • *Leonotis leonurus,* • *Senecio sp.,* • *Sisymbrium capense,* • *Tagetes minuta,* and • *Vachellia karroo.*	

Plate 3.2: Semi-natural and degraded CDG vegetation observed within the assessment footprint.

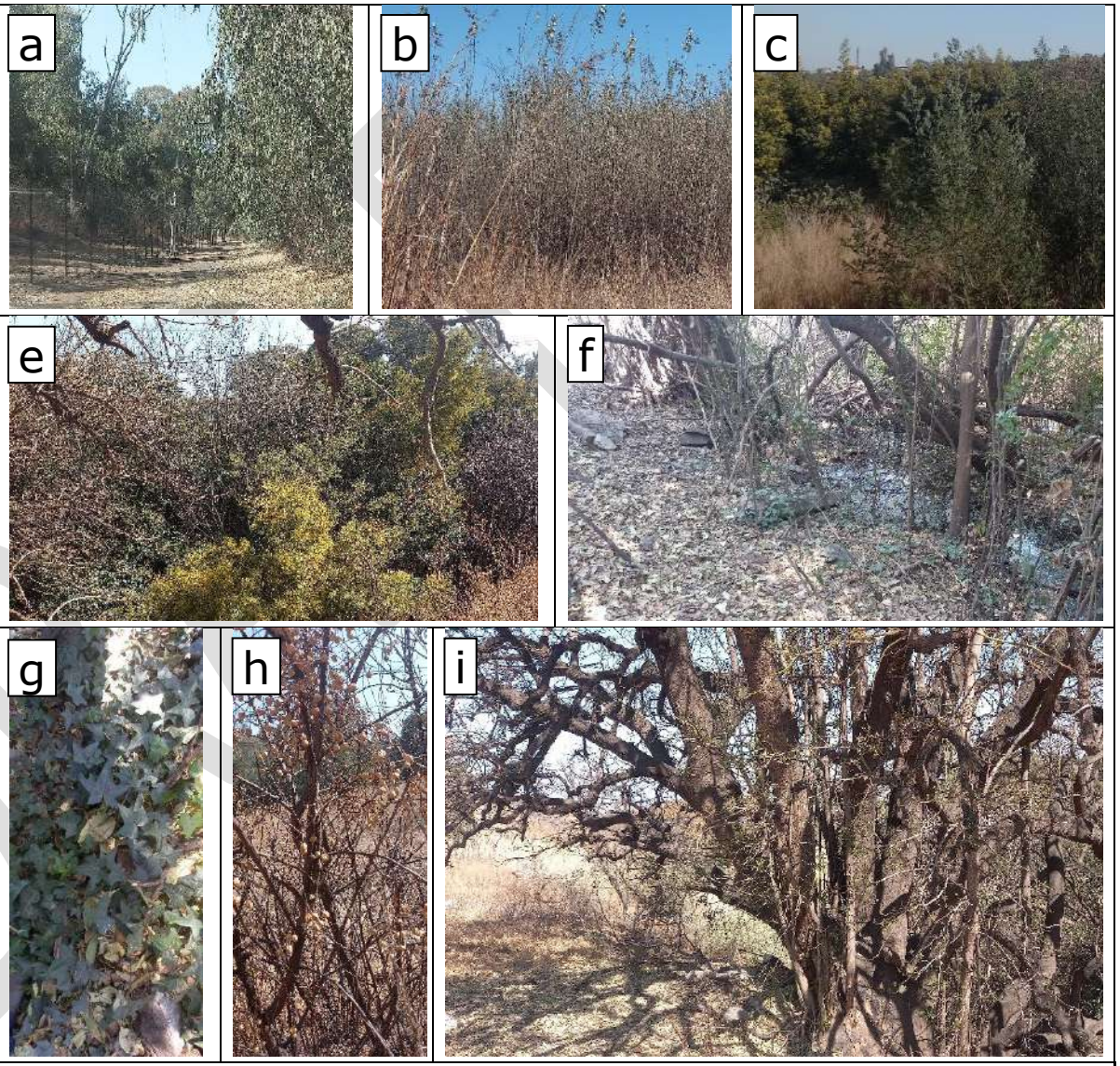
Exotic vegetation	Several dense, monotypical *Eucalyptus camaldulensis* (a), *Populus alba* (b) and *Acacia* spp. (*A. dealbata* and *A. mearnsii*) (c) stands scattered around the assessment footprint, as well a mixed exotic woodland (e & f), pocketed along the steep, west-facing slope of the valley bottom reedland. Mixed woodland comprised of several exotic species, including *A. dealbata, A. mearnsii, Araujia sericifera, E. camaldulensis, Hedera helix* (g), *Lantana camara, Melia azedarach* (h), *Sisymbrium capense, Solanum mauritianum, Tipuana tipu* and *Tecoma stans*, with a few indigenous species, such as *Ficus salicifolia* (i) and *Zantedeschia aethiopica*.	

Plate 3.3: Exotic vegetation observed within the assessment footprint.

Transformed areas	Large areas of the assessment footprint have been significantly transformed from their natural state. Consequently, little to no remaining discernible natural vegetation remains in these areas. The following generalised land uses were noted during the site assessment: • Current and/or historical mining areas and associated land uses, as depicted in Google Earth aerial imagery (a); • Urban land uses, including residential, commercials and industrial areas, such as the AECI Facility (b); and • Linear infrastructure, such as the R25 and M39 major roads (c).	   **Plate 3.4: Transformed areas observed within the assessment footprint.**

4 SITE SENSITIVITY

3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:

3.1.6. A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant); and

3.1.13. A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate.

The method used to assess site sensitivity has been described in Section 2.3 above. Table 4.1 provides a summary of how each vegetation type was assessed. Based on their Site Ecological Importance (SEI) ratings, wetland vegetation was assigned MEDIUM sensitivity, the semi-natural CDG vegetation was assigned Low sensitivity, and the degraded CDG vegetation, exotic vegetation and transformed areas were assigned Very Low sensitivities.

The wetland and CDG vegetation types received MEDIUM Conservation Importance (CI) scores, attributed to the moderate to high likelihood of one or more Species of Conservation Concern (SCC) occurring within these areas. The exotic vegetation and transformed areas scored low and very low in terms of CI, due to the highly unlikely occurrence of SCCs and the limited to no remaining natural habitat in these areas.

The Functional Integrity (FI) of the ecosystems varied amongst vegetation types, with a MEDIUM rating obtained by wetlands and semi-natural CDG, and a low rating by degraded CDG, exotic vegetation and transformed areas. These scores were attributed to the generally limited connectivity and intactness of the ecosystems within the vegetation types.

The CDG and exotic vegetation both received high receptor resilience (RR) scores. According to Cadman, *et al.* (2013, p. 38), "*changes in species composition and structure resulting from poor rangeland management are generally reversible in the short to mid-term (5-20 years), especially if the primary grassland species (forbs and grasses) are still scattered across the grassland, even in low numbers . . . Dry Highveld ecosystems* [such as the CDG] *will generally recover more quickly than mesic ones as they are dominated by plants that recruit more often from seeds stored in the seed bank, depending on rainfall."* The wetland vegetation and transformed areas were assigned a MEDIUM RR scores.

Table 4.1: Evaluation of Site Ecological Importance (SEI) of habitat and SCC

HABITAT/ SPECIES	CONSERVATION IMPORTANCE (CI)	FUNCTIONAL INTEGRITY (FI)	RECEPTOR RESILIENCE (RR)	SEI
Reedland Wetlands	**MEDIUM** Moderate likelihood of one CR plant species (*Brachycorythis conica transvaalensis*), with an EOO > 10 km^2 (26.75 km^2) but fewer than 10 000 mature individuals remaining. Moderate to high likelihood of one EN plant species (Sensitive Species A), with an EOO > 10 km^2 (152.23 km^2) but fewer than 10 000 mature individuals remaining (~230) and a distribution range which includes the project area.	**MEDIUM** Medium (~6.6 ha) partially-intact area of semi-natural to degraded ecosystem. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity. Mostly moderate current negative impacts and a few signs of minor to moderate past disturbance. Moderate rehabilitation potential.	**MEDIUM** These areas will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	**MEDIUM**
Semi-natural CDG	**MEDIUM** Moderate likelihood of one CR plant species (*Brachycorythis conica transvaalensis*), with an EOO > 10 km^2 (26.75 km^2) but fewer than 10 000 mature individuals remaining. Moderate to high likelihood of one EN plant species (Sensitive Species A), with an EOO > 10 km^2 (152.23 km^2) but fewer than 10 000 mature individuals remaining (~230) and a distribution range which includes the project area. Moderate likelihood of five VU aniumal species (*Chrysospalax villosus, Cloeotis percivali, Crocidura maquassiensis, Felis nigripes* and *Mystromys albicaudatus*) occurring within the vegetation type.	**MEDIUM** Very large (~107.3 ha) partially-intact area of semi-natural LC ecosystem type. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity. Mostly minor to moderate current negative impacts and a few signs of minor to moderate past disturbance. Moderate rehabilitation potential.	**HIGH** The CDG habitats are Dry Highveld ecosystems, dominated by grasses and are therefore likely to recover relatively quickly and retain a high degree of the original species composition and functionality.	**LOW**
Degraded CDG		**LOW** Large (~41.8 ha) area of degraded LC ecosystem type. Limited habitat connectivity but migrations still possible across some modified or degraded natural habitat. Low to moderate rehabilitation potential. Several moderate and major current negative ecological impacts.		**VERY LOW**

Exotic vegetation	**LOW**	**LOW**	**HIGH**	**VERY LOW**
	No confirmed and highly unlikely populations of SCC and/or range-restricted species. Less than 50 % of receptor contains natural habitat with limited potential to support SCC.	Large (~53.1 ha) area of invaded LC ecosystem type. Limited habitat connectivity but migrations still possible across some modified or degraded natural habitat. Low to moderate rehabilitation potential. Several moderate and major current negative ecological impacts.	The exotic vegetation patched on site fall within the broader DCG vegetation type. The CDG habitats are Dry Highveld ecosystems, dominated by grasses and are therefore likely to recover relatively quickly and retain a high degree of the original species composition and functionality.	
Transformed areas	**VERY LOW**	**LOW**	**MEDIUM**	**VERY LOW**
	No confirmed and highly unlikely populations of SCC and/or range-restricted species. Little to no natural habitat remaining.	Very large (~327.3 ha) transformed areas with almost no habitat connectivity, but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low to moderate rehabilitation potential. Several minor and major current negative ecological impacts.	Given the high degree of transformation, these areas will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	

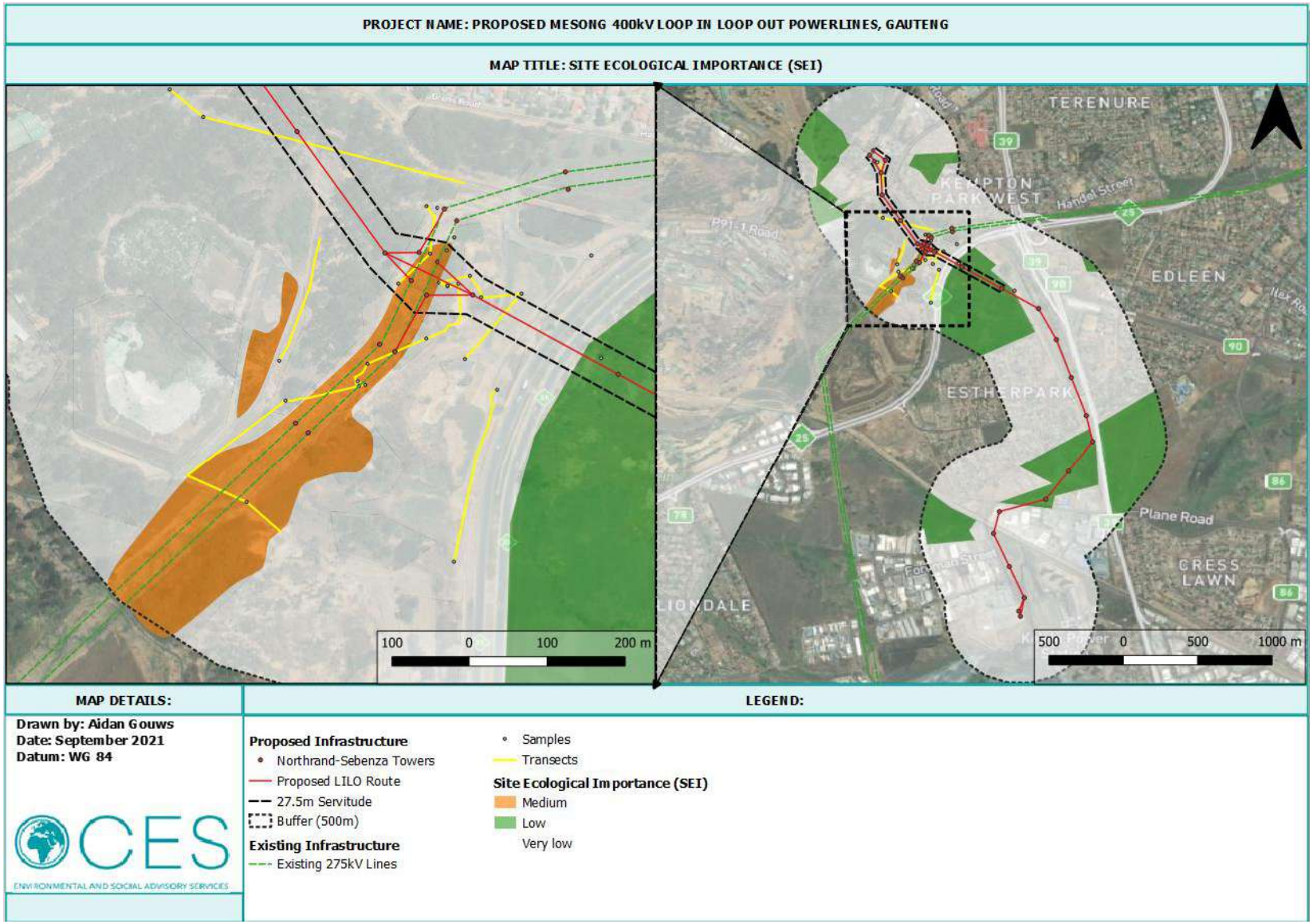


Figure 4.1: Terrestrial Biodiversity Site Ecological Importance (SEI) map of the proposed development area.

5 IMPACT ASSESSMENT

3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:

3.1.7. Additional environmental impacts expected from the proposed development;
3.1.8. Any direct, indirect and cumulative impacts of the proposed development;
3.1.9. The degree to which the impacts and risks can be mitigated;
3.1.10. The degree to which the impacts and risks can be reversed;
3.1.11. The degree to which the impacts and risks can cause loss of irreplaceable resources;
3.1.12. Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr).

Impacts that could be a direct or indirect result of the proposed activity were identified for the Planning and Design, Construction, Operational and Decommissioning Phases. These included the consideration of direct, indirect and cumulative impacts that may occur, and also considers the no-go or existing impacts. Table 5.1 below provides a technical scope and summary of the potential issues identified and their applicability to each phase of the proposed development.

An impact assessment was conducted, using the methodology outlined in Section 2.4 and the data collected during the desktop and site assessments, for the planning, construction and operation phases of the proposed development, as well as for the no-go alternative. A breakdown of the assessment and mitigation measures is presented in Table 5.1.

Table 5.1: Technical scope of the impacts on the terrestrial biodiversity and ecology for all phases of the proposed development.

THEME	POTENTIAL ISSUES	SOURCE OF ISSUE	RECEPTORS	PHASE			
				PLANNING AND DESIGN	CONSTRUCTION	OPERATION	DECOMMISSIONING
Terrestrial biodiversity and ecology	Loss of vegetation	• Loss to substation. • Loss to towers and pylons. • Vegetation disturbance and clearance, including construction vehicle traffic, earthworks, excavation and infilling. • Poor rehabilitation, management and monitoring.	• Abundance, diversity and composition of flora and fauna in development footprint. • Ecological connectivity. • Plant and animal SCCs.	X	X		X
	Loss of Plant Species of Conservation Concern	• Vegetation disturbance and clearance.	• Floral diversity. • CI, FI, RR and SEI.	X	X		
	Impact on faunal species of conservation concern	• Vegetation disturbance and clearance. • Disturbance, fragmentation and loss of habitats.	• Faunal diversity. • CI, FI, RR and SEI.		X		X
	Reduced Faunal Habitat	• Vegetation disturbance and clearance. • Loss of ecological connectivity and edge effects.	• Faunal diversity. • CI, FI, RR and SEI.		X		
	Disruption of Ecosystem Function and Processes	• Vegetation disturbance and clearance. • Loss of ecological connectivity and edge effects. • Disturbance, fragmentation and loss of habitats.	• Ecological connectivity. • Plant and animal SCCs. • Floral and faunal diversity.	X	X	X	X

THEME	POTENTIAL ISSUES	SOURCE OF ISSUE	RECEPTORS	PHASE			
				PLANNING AND DESIGN	CONSTRUCTION	OPERATION	DECOMMISSIONING
			• CI, FI, RR and SEI.				
	Disturbance to faunal species and potential reduction in abundance and mortality of faunal species	• Vegetation disturbance and clearance. • Noise and vibrations of earthworks. • Encounters with construction machinery. • Disturbance, fragmentation and loss of habitats.	• Faunal diversity. • CI, FI, RR and SEI.		X		X
	Establishment and/or spread of Alien Plant Species	• Vegetation disturbance and clearance. • Poor rehabilitation, management and monitoring.	• Plant and animal SCCs. • Floral and faunal diversity. • CI, FI, RR and SEI.	X	X	X	X

Table 5.2: Impacts and mitigation measures for all phases of the proposed development.

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT		NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
PLANNING AND DESIGN PHASE															
Loss of vegetation to pylons / towers	Preferred	The planned layout and siting of construction activities and infrastructure will directly result in the destruction and permanent loss of vegetation. The consequence and significance of this impact depends on the pre-construction SEI of the vegetation.	Loss of medium SEI vegetation (wetland)	Negative	Direct, indirect	Moderate	Localised	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**MODERATE -**	Minimize/reduce impact: • During the planning and design phase, the development footprint must be designed to minimize the loss of near- to semi-natural indigenous vegetation as far as possible. • The development footprint must be clearly demarcated and only vegetation within the approved footprint may be removed. Vegetation outside of these areas may not be cleared. Remediate/rehabilitate impact: • A rehabilitation plan must be developed by the project manager or contractor as part of the method statement and implemented during construction and operation phases. This method statement must be approved by the appointed ECO.	**LOW -**
			Loss of low SEI vegetation (semi-natural CDG)	Negative	Direct, indirect	Slight	Localised	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**LOW -**		**VERY LOW -**
			Loss of very low SEI vegetation (degraded CDG, exotic vegetation and transformed areas)	Negative	Direct, indirect	Very slight	Localised	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**VERY LOW -**		**VERY LOW -**
Non-compliance with permitting requirements	Preferred	During the planning and design phase, the inadequate planning for search and rescue operations and permitting for the removal of any SCC may result in non-compliances being issued and the unintended loss of SCC.		Negative	Direct, indirect	Moderate	Study Area	Long-term	May occur	Irreversible	Resource could be partially lost	Achievable	**MODERATE -**	Avoid/prevent impact: • Planning for any search and rescue operations must be conducted prior to the commencement of construction activities. • All necessary permits must be obtained for the removal of any identified SCC prior to the commencement of construction activities.	**VERY LOW -**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Disruption of Ecosystem Function and Processes	Preferred	The planned layout and siting of construction activities and infrastructure will result in the disruption of ecosystem functions and processes, including the loss of ecological connectivity and edge disturbance impacts.	Negative	Direct, indirect	Moderate	Study Area	Medium-term	Probable	Reversible	Resource could be partially lost	Achievable	**MODERATE -**	Minimize/reduce impact: • During the planning and design phase, the development footprint must be designed to minimize edge disturbance impacts. Remediate/rehabilitate impact: • A rehabilitation plan must be developed by the project manager or contractor as part of the method statement and implemented during construction and operation phases. This method statement must be approved by the appointed ECO.	**LOW -**
Establishment and/or spread of Alien Plant Species	Preferred	During the planning and design phase, the failure to plan for the removal and management of alien vegetation could result in the invasion of alien vegetation in sensitive areas during the construction and operational phases.	Negative	Indirect	Moderate	Study area	Long-term	Probable	Reversible	Resource will not be lost	Easily Achievable	**MODERATE -**	Minimize/reduce impact: • An Alien Vegetation Management Plan must be developed by the Contractor prior to construction to mitigate the establishment and spread of undesirable alien plant species during all phases of the project. • The Alien Vegetation Management Plan must be approved by the appointed ECO prior to implementation. Remediate/rehabilitate impact: • A rehabilitation plan must be developed by the project manager or contractor as part of the method statement and implemented during construction and operation phases. This method statement must be approved by the appointed ECO.	**LOW -**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT		NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
CONSTRUCTION PHASE															
Loss of vegetation to pylons / towers	Preferred	The clearing of land for the construction of the powerline pylons / towers will result in the loss of vegetation. The consequence and significance of this impact depends on the pre-construction SEI of the vegetation.	Loss of medium SEI vegetation (wetland)	Negative	Direct, indirect	Slight	Localised	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**MODERATE -**	Avoid/prevent impact: • Implement mitigation measures during planning and design phase. • Areas of VERY HIGH sensitivity must be avoided. Minimize/reduce impact: • Construction activities must remain within the approved demarcated development footprint, and no vegetation clearance is to be permitted outside of the approved development footprint. • Construction vehicles and machinery must not encroach into identified highly-sensitive, 'no-go' areas or areas outside the project footprint. • Activities within 500 m of a wetland must obtain the necessary Water Use Authorisation prior to the commencement of such activities. • Lay down areas must not be located within any watercourses or drainage lines. Remediate/rehabilitate impact: • Topsoil (20 cm, where possible) must be collected and stored in an area of low sensitivity and used to rehabilitate impacted areas that are no longer required during the operational phase (e.g. laydown areas). • Only indigenous species must be used for rehabilitation. • The alien invasive management plan for the site must be implemented.	**LOW -**
			Loss of low SEI vegetation (semi-natural CDG)	Negative	Direct,	Slight	Localised	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**LOW -**		**VERY LOW -**
			Loss of very low SEI vegetation (degraded CDG, exotic vegetation and transformed areas)	Negative	Direct, indirect	Very slight	Localised	Medium-term	Probable	Reversible	Resource will not be lost	Achievable	**VERY LOW -**		**VERY LOW -**
	No-go	Should the project not proceed then the current land use will remain the same. Vegetation will likely continue to degrade under current land uses.		Negative	Indirect	Slight	Study area	Long-term	Possible	N/A	N/A	N/A	**LOW -**		**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Loss of Plant Species of Conservation Concern	Preferred	The permanent loss of plant SCCs may occur. The following SCCs have a moderate to high likelihood of occurring within the project area: • *Brachycorythis conica transvaalensis* • Sensitive species A It is possible that these species may be lost should the development proceed.	Negative	Direct, indirect	Moderate	Regional	Permanent	Possible	Irreversible	Resource may be partially lost	Achievable	**MODERATE -**	Avoid/prevent impact: • A botanical walkthrough of the development area, by an experienced botanist with knowledge of the SCC identified as possibly occurring within the site, must be undertaken during the flowering season. • If restricted range SCC populations are found, the development must be shifted to avoid these populations. • The ECO must monitor for potential additional plant SCCs not found during search and rescue activities. • Plant SCCs must not be removed from the development footprint unless the relevant permits have been obtained.	**LOW -**
		If populations of SCC with restricted ranges are present within the site and are impacted by the placement of infrastructure, the cumulative impact will be moderate as some SCC have already been lost as a consequence of historical and current land uses in the region. This impact can be reduced if a thorough botanical walkthrough of the site is undertaken during the optimum flowering season.	Negative	Cumulative	Moderate	Study area	Permanent	May occur	Irreversible	Resource will be lost	Achievable	**MODERATE -**		**LOW -**
	No-go	Disturbance from the existing land uses will probably continue should the proposed project not go ahead. This will have a low negative impact on the site, with the vegetation continuing to degrade.	Negative	Direct	Slight	Study area	Long term	Probable	N/A	N/A	N/A	**LOW -**		**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Impact on faunal species of conservation concern	Preferred	The loss of animal species of conservation concern may occur during the construction phase. The following SCCs have a moderate likelihood of occurring within the project area: • *Chrysospalax villosus* ((Rough-haired Golden Mole), • *Cloeotis percivali* (Percival's Short-eared Trident Bat, • *Crocidura maquassiensis* (Makwassie musk shrew), • *Felis nigripes* (Black-footed Cat) *and* • *Mystromys albicaudatus* (White-tailed rat).	Negative	Direct, indirect	Moderate	Localised	Permanent	May occur	Irreversible	Resource may be partially lost	Achievable	**MODERATE -**	Avoid/prevent impact: • All clearing activities must deploy search and rescue teams in-front of clearing machinery to assist in relocating slower moving faunal species e.g. tortoises. • This team should focus on checking termite mounds, burrows and dens in particular for small mammals, such as the Black-footed Cat, shrews and rats.	**LOW -**
		If populations of SCC with restricted ranges are present within the site and are impacted by the placement of infrastructure, the cumulative impact will be moderate as some SCC have already been lost as a consequence of historical and current land uses in the region.	Negative	Cumulative	Moderate	Study area	Permanent	May occur	Irreversible	Resource will be lost	Achievable	**MODERATE -**		**LOW -**
	No-go	Disturbance from the existing land uses will probably continue should the proposed project not go ahead. This will have a low negative impact on the site, with habitats continuing to degrade.	Negative	Direct	Slight	Study area	Long term	Probable	N/A	N/A	N/A	**LOW -**		**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Reduced Faunal Habitat	Preferred	During the construction phase, the construction related activities will result in the loss and/or degradation of natural habitats for fauna.	Negative	Indirect, Cumulative	Moderate	Study area	Long-term	Definite	Reversible	Resource will be partially lost	Achievable	**MODERATE -**	Minimize/reduce impact: • The contractor must ensure that vegetation clearance of near-natural, semi-natural and wetland vegetation is restricted to the approved development footprint only. • Construction vehicles and machinery must not be permitted outside of the development footprint, as much as practically possible. • Clearing of trees should take place in winter months, to prevent birds and bats establishing nesting grounds and starting to breed and rear young in the spring and summer months. • Employees must be prohibited from making open fires during the construction phase. • The ECO must monitor that all construction activities are conducted within the development footprint. Remediate/rehabilitate impact: • All impacted areas must be rehabilitated as per the Rehabilitation Plan, as soon as construction has been completed within each area.	**LOW -**
		Portions of habitat have already been lost due to historical and current land uses. The additional loss of habitats will have a low cumulative impact.	Negative	Cumulative	Slight	Study area	Permanent	Definite	Irreversible	Resource will not be lost	Achievable	**LOW -**		**LOW -**
	No-go	Disturbance from the existing land uses will probably continue should the proposed project not go ahead. This will have a low negative impact on the site, with habitats continuing to degrade.	Negative	Direct	Slight	Study area	Medium term	Probable	N/A	N/A	N/A	**LOW -**		**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Disruption of Ecosystem Function and Processes	Preferred	Construction activities will result in the disruption of ecosystem functions and processes, including the loss of ecological connectivity and edge disturbance impacts. Fragmentation is one of the most important impacts on vegetation as it creates breaks in previously continuous vegetation, causing a reduction in the gene pool and a decrease in species richness and diversity. It also impacts on fauna as it separates habitats and necessitates fauna having to move across exposed areas like roads to get to another section of their habitat or territory. This impact occurs when more and more areas are cleared, resulting in the isolation of functional ecosystems, which results in reduced biodiversity and reduced movement due to the absence of ecological corridors. Given the small footprint of individual powerline pylons and the degraded nature of the proposed substation site, a low significance impact on ecosystem functions and processes is anticipated.	Negative	Direct, indirect	Slight	Localised	Medium-term	Possible	Reversible	Resource could be partially lost	Achievable	**LOW -**	Avoid/prevent impact: • Implement mitigation measures during planning and design and construction phases. Minimize/reduce impact: • The contractor must ensure that vegetation clearance of near-natural and wetland vegetation is restricted to the approved development footprint only. • Construction vehicles and machinery must not be permitted outside of the development footprint, as much as practically possible. • Employees must be prohibited from making open fires during the construction phase. Remediate/rehabilitate impact: • A rehabilitation plan must be implemented during construction and operation phases. • All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated, where applicable.	**LOW -**
		Given the relatively high degree of fragmentation across the project area as the result of historical and current land uses, the cumulative impact of the proposed pylons and substation will carry a moderate significance.	Negative	Cumulative	Moderate	Study area	Long-term	Possible	Reversible	Resource will not be lost	Achievable	**MODERATE -**		**LOW -**
	No-go	Under the no go alternative, habitat fragmentation has already occurred and will continue to do so.	Negative	Direct	Moderate	Study Area	Permanent	Definite	N/A	N/A	N/A	**MODERATE -**		**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Disturbance to faunal species and potential reduction in abundance and mortality of faunal species	Preferred	Faunal species will be disturbed during construction due to noise and vibrations of construction machinery. Faunal species that vacate the immediate area may return following completion of construction or new individuals or species may inhabit the area. Construction machinery may cause unintentional mortalities of faunal species. Even with the mitigations applied, the construction will still have an impact on faunal species.	Negative	Direct	Moderate	Study Area	Permanent	Definite	Irreversible	Resource could be partially lost	Difficult	**MODERATE -**	Minimize/reduce impact: • Vehicles and machinery must meet best practice standards in terms of noise and vibration. • Staff and contractors' vehicles must comply with speed limits of 40 km/hr • Project must start and be completed within the minimum timeframe, i.e. may not be started and left incomplete. • ECO must walk ahead of clearing construction machinery and move slow moving species e.g. tortoises out of harm's way and into suitable neighbouring habitat. • Any faunal species that may die as a result of construction must be recorded (photographed, GPS coordinate captured) and if somewhat intact preserved and donated to SANBI. • Any faunal species observed onsite must be recorded (photographed, GPS coordinate captured) and loaded onto iNaturalist. • Staff and contractors must not be permitted to capture, collect or eat any faunal species onsite.	**MODERATE -**
		Portions of habitat have already been lost due to historical and current land uses. The additional loss of habitats will have a low cumulative impact.	Negative	Cumulative	Slight	Study area	Long-term	Definite	Irreversible	Resource will not be lost	Achievable	**LOW -**		**LOW -**
	No-go	Disturbance from the existing land uses will probably continue should the proposed project not go ahead. This will have a low negative impact on the site, with habitats continuing to degrade.	Negative	Direct	Slight	Study area	Long-term	Probable	N/A	N/A	N/A	**LOW -**		**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Establishment and/or spread of Alien Plant Species	Preferred	During the construction phase, the removal of natural vegetation creates open habitats that favour the establishment of undesirable alien plant species. The infestation of alien plant species will result in the displacement of indigenous vegetation and possible local extinctions of species. This pre-mitigation impact is of moderate significance but can easily be managed through the implementation of an alien invasive management plan.	Negative	Indirect	Moderate	Study area	Long-term	Probable	Reversible	Resource will not be lost	Easily Achievable	**MODERATE -**	Minimize/reduce impact: • The Contractor must implement the Alien Vegetation Management Plan. The ECO must monitor for the adequate implementation of this plan. • The ECO must monitor the site for the presence of alien invasive plant species and take immediate action when these are recorded. • It is recommended that the ECO prepare a photo guide of all invasive plant species likely to occur on site. This will aid in the identification of undesirable species. Remediate/rehabilitate impact: • All previously infested areas must be rehabilitated as per the Rehabilitation Plan, to the satisfaction of the appointed ECO, as soon as construction has been completed within each area.	**LOW -**
		Disturbance from the existing land uses will likely be exacerbated by the additional impacts of the construction of the proposed substation and associated powerlines. This will be of moderate significance.	Negative	Cumulative	Moderate	Study area	Long-term	Probable	Irreversible	Resource will not be lost	Achievable	**MODERATE -**		**LOW -**
	No-go	Disturbance from the existing alien invasive species on site will probably continue should the proposed project not go ahead. This will have a moderate negative impact on the site.	Negative	Direct	Moderate	Study area	Long term	Probable	N/A	N/A	N/A	**MODERATE -**		**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
OPERATIONAL PHASE														
Disruption of Ecosystem Function and Processes	Preferred	Operational activities, such as routine maintenance, may result in the disruption of ecosystem functions and processes, including the disturbance of vegetation and faunal habitats, as well as edge disturbance impacts. Assuming the appropriate mitigation measures are adopted during the planning and design and construction phases, the severity of the operational phase impacts will be relatively low.	Negative	Direct, indirect	Slight	Localised	Medium-term	May occur	Reversible	Resource could be partially lost	Easily achievable	**LOW -**	Avoid/prevent impact: • Mitigation measures must be implemented during planning and design and construction phases. Minimize/reduce impact: • Monitoring and maintenance vehicles must not be permitted outside of the development footprint, as much as practically possible. Remediate/rehabilitate impact: • The rehabilitation plan must be implemented during operation phases.	**VERY LOW -**
		Portions of habitat have already been lost due to historical and current land uses occurring on site. The additional loss of habitats will have a low cumulative impact.	Negative	Cumulative	Slight	Study area	Permanent	Definite	Irreversible	Resource will not be	Achievable	**LOW -**		**LOW -**
	No-go	Disturbance from the existing land uses will probably continue should the proposed project not go ahead. This will have a low negative impact on the site, with habitats continuing to degrade.	Negative	Direct	Slight	Study area	Medium term	Probable	N/A	N/A	N/A	**LOW -**		**N/A**
Establishment and/or spread of Alien Plant Species	Preferred	During the operation phase, the failure to manage alien vegetation could result in the widespread invasion of alien vegetation.	Negative	Direct,	Moderate	Study Area	Long-Term	May occur	Reversible	Resource could be	Easily achievable	**MODERATE -**	Avoid/prevent impact: • Mitigation measures must be implemented during planning and design and construction phases. Minimize/reduce impact: • The Alien Vegetation Management Plan must continue to be implemented. • The site must be monitored on a regular basis to ensure that no alien vegetation establishes on site.	**VERY LOW -**
		Disturbance from the existing land uses will likely be exacerbated by the additional impacts of the operation of the proposed substation and powerlines. This will be of low significance.	Negative	Cumulative	Moderate	Study area	Long-term	Probable	Irreversible	Resource will not be lost	Achievable	**LOW -**		**VERY LOW -**
	No-go	Disturbance from the existing alien invasive species on site will probably continue should the proposed project not go ahead. This will have a moderate negative impact on the site.	Negative	Direct	Moderate	Study area	Long term	Probable	N/A	N/A	N/A	**MODERATE -**	Remediate/rehabilitate impact: • Any alien vegetation found during monitoring must be removed as per the Alien Vegetation Management Plan and the area must be appropriately rehabilitated in alignment with the Rehabilitation Plan.	**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
DECOMMISSIONING PHASE														
Loss of Indigenous Vegetation	Preferred	The decommissioning of the infrastructure and removal of materials will require laydown areas and will disrupt vegetation that has re-established around the areas that were disturbed during the construction phase. The loss of vegetation will be similar to the construction phase impacts.	Negative	Direct	Moderate	Localised	Permanent	Probable	Irreversible	Resource will be lost	Achievable	**MODERATE -**	Avoid/prevent impact: • Mitigation measures must be implemented during planning and design phase. Minimize/reduce impact: • Decommissioning activities must remain within the approved demarcated development footprint, and no vegetation clearance is to be permitted outside of the approved development footprint. • Vehicles and machinery must not encroach into identified highly-sensitive, 'no-go' areas or areas outside the project footprint. • Lay down areas must not be located within any watercourses or drainage lines.	**LOW -**
	No-go	Should the project not proceed then the current land use will remain the same. Vegetation will likely continue to degrade under current land uses.	Negative	Indirect	Slight	Study area	Long-term	Possible	N/A	N/A	N/A	**LOW -**	Remediate/rehabilitate impact: • Topsoil (20 cm, where possible) must be collected and stored in an area of low sensitivity and used to rehabilitate impacted areas that are no longer required during the operational phase (e.g. laydown areas). • Only indigenous species must be used for rehabilitation. • The alien invasive management plan for the site must be implemented.	**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Disturbance to faunal species and potential reduction in abundance and mortality of faunal species	Preferred	Faunal species will be disturbed during decommissioning due to noise and vibrations of machinery. Faunal Species that vacate the immediate area may return following completion of construction or new individuals or species may inhabit the area. Machinery may cause unintentional mortalities of faunal species.	Negative	Direct	Moderate	Study Area	Permanent	Definite	Reversible	Resource will not be lost	Achievable	**LOW -**	Minimize/reduce impact: • Vehicles and machinery must meet best practice standards in terms of noise and vibration. • Staff and contractors' vehicles must comply with speed limits of 40 km/hr • Project must start and be completed within the minimum timeframe, i.e. may not be started and left incomplete. • ECO must walk ahead of machinery and move slow moving species e.g. tortoises out of harm's way and into suitable neighbouring habitat. • Any faunal species that may die as a result of decommissioning must be recorded (photographed, GPS coordinate captured) and if somewhat intact preserved and donated to SANBI. • Any faunal species observed onsite must be recorded (photographed, GPS coordinate captured) and loaded onto iNaturalist. • Staff and contractors must not permitted to capture, collect or eat any faunal species onsite.	**LOW -**
		Portions of habitat have already been lost due to historical and current land uses. The additional loss of habitats will have a low cumulative impact.	Negative	Cumulative	Slight	Study area	Short term	Definite	Reversible	Resource will not be lost	Achievable	**LOW -**		**LOW -**
	No-go	Disturbance from the existing land uses will probably continue should the proposed project not go ahead. This will have a low negative impact on the site, with habitats continuing to degrade.	Negative	Direct	Slight	Study area	Medium term	Probable	N/A	N/A	N/A	**LOW -**		**N/A**

POTENTIAL ISSUE	ALT	DESCRIPTION / SOURCE OF IMPACT	NATURE	TYPE	CONSEQUENCE	EXTENT	DURATION	PROBABILITY	REVERSIBILITY	IRREPLACEABLE LOSS	MITIGATION POTENTIAL	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION MEASURES	SIGNIFICANCE WITH MITIGATION
Establishment and/or spread of Alien Plant Species	Preferred	During the decommissioning phase, the disturbance of natural vegetation creates open habitats that favour the establishment of undesirable alien plant species. The infestation of alien plant species will result in the displacement of indigenous vegetation and possible local extinctions of species. This pre-mitigation impact is of moderate significance but can easily be managed through the implementation of an alien invasive management plan.	Negative	Indirect	Moderate	Study area	Long-term	Probable	Reversible	Resource will not be lost	Easily Achievable	**MODERATE -**	Remediate/rehabilitate impact: • All areas previously infested by alien plant species must be rehabilitated as per the Rehabilitation Plan, to the satisfaction of the appointed ECO, as soon as construction has been completed within each area.	**LOW -**
		Disturbance from the existing land uses will likely be exacerbated by the additional impacts of the decommissioning of the proposed substation and associated powerlines. This will be of moderate significance.	Negative	Cumulative	Moderate	Study area	Long-term	Probable	Reversible	Resource will not be lost	Achievable	**MODERATE -**		**LOW -**
	No-go	Disturbance from the existing alien invasive species on site will probably continue should the proposed project not go ahead. This will have a moderate negative impact on the site.	Negative	Direct	Moderate	Study area	Long term	Probable	N/A	N/A	N/A	**MODERATE -**		**N/A**

6 IMPACT STATEMENT, CONCLUSION AND RECOMMENDATIONS

3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:

3.1.14. *A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and*

3.1.15. *Any conditions to which this statement is subjected.*

6.1 SUMMARY OF IMPACT SIGNIFICANCE

Table 6.1 provides a summary of the negative impacts of the proposed development on the terrestrial biodiversity and ecology of the area, pre- and post-mitigation, during the planning and design, construction, operational and decommissioning phases. Prior to mitigation, the proposed development is anticipated to have 18 impacts of MODERATE significance, with 10 of low and one of very low significance, respectively. All impacts would be reduced to a VERY LOW to LOW significance post-mitigation, provided that the proposed mitigation measures are implemented and adhered to.

Table 6.1: Assessment of pre- and post-mitigation impact significance.

PHASE	PRE-MITIGATION			POST-MITIGATION		
	V. LOW	LOW	MOD	V. LOW	LOW	MOD
Planning and Design	-1	-1	-4	-3	-3	
Construction		-4	-10	-2	-12	
Operational		-3	-1	-3	-1	
Decommissioning		-2	-3		-5	
TOTAL	-1	-10	-18	-8	-21	0

6.2 RECOMMENDATIONS FOR THE PROPOSED ACTIVITY AND CONDITIONS OF EA & EMPR

As per Section 3.2 of the Terrestrial Biodiversity Protocol (2020), *"the findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant."* All mitigation measures should therefore be incorporated in the Basic Assessment Report and EMPr once the applicant proceeds to apply for Environmental Authorisation.

It should be noted that if the impacts are suitably planned for and mitigated (i.e. avoided or minimized) during the planning and design phase, the impacts of these will be reduced during the construction phase, even in the absence of active mitigation during construction. Similarly, if the impacts are suitably planned for during the planning and design phase, and mitigated and rehabilitated during the construction phase, the operational phase impacts will also be significantly reduced, even in the absence of active mitigation during the operational phase. That said, it is recommended that all mitigation measures are implemented during all phases.

It is recommended that a separate Avifaunal Specialist Assessment be completed for the HIGH sensitivity bird species.

All the mitigation measures provided below are to be implemented in the Planning and Design, Construction, Operational and Decommissioning Phases of the proposed activity.

6.2.1 PLANNING AND DESIGN

- Avoid/prevent impact:
  - Planning for any search and rescue operations must be conducted prior to the commencement of construction activities.
  - All necessary permits must be obtained for the removal of any identified SCC prior to the commencement of construction activities.

- Minimize/reduce impact:
  - During the planning and design phase, the development footprint must be designed to minimize the loss of near- to semi-natural indigenous vegetation as far as possible.
  - The development footprint must be clearly demarcated and only vegetation within the approved footprint may be removed. Vegetation outside of these areas may not be cleared.
  - During the planning and design phase, the development footprint must be designed to minimize edge disturbance impacts.

- Remediate/rehabilitate impact:
  - A rehabilitation plan must be developed by the project manager or contractor as part of the method statement and implemented during construction and operation phases. This method statement must be approved by the appointed ECO.
  - An Alien Vegetation Management Plan must be developed by the Contractor prior to construction to mitigate the establishment and spread of undesirable alien plant species during all phases of the project.
  - The Alien Vegetation Management Plan must be approved by the appointed ECO prior to implementation.

6.2.2 CONSTRUCTION

- Avoid/prevent impact:
  - Mitigation measures must be implemented during planning and design phase.
  - Areas of VERY HIGH sensitivity must be avoided.
  - A botanical walkthrough of the development area, by an experienced botanist with knowledge of the SCC identified as possibly occurring within the site, must be undertaken during the flowering season.
  - If restricted range SCC populations are found, the development must be shifted to avoid these populations.
  - The ECO must monitor for potential additional plant SCCs not found during search and rescue activities.
  - Plant SCCs must not be removed from the development footprint unless the relevant permits have been obtained.

- All clearing activities must deploy search and rescue teams in-front of clearing machinery to assist in relocating slower moving faunal species e.g. tortoises.
- This team should focus on checking termite mounds, burrows and dens in particular for small mammals, such as the Black-footed Cat, Southern African Hedgehog, shrews and rats.

- Minimize/reduce impact:
  - Construction activities must remain within the approved demarcated development footprint, and no vegetation clearance is to be permitted outside of the approved development footprint.
  - Construction vehicles and machinery must not encroach into identified highly-sensitive, 'no-go' areas or areas outside the project footprint.
  - Activities within 500 m of a wetland must obtain the necessary Water Use Authorisation prior to the commencement of such activities.
  - Lay down areas must not be located within any watercourses or drainage lines.
  - The contractor must ensure that vegetation clearance of near-natural, semi-natural and wetland vegetation is restricted to the approved development footprint only.
  - Construction vehicles and machinery must not be permitted outside of the development footprint, as much as practically possible.
  - Clearing of trees should take place in winter months, to prevent birds and bats establishing nesting grounds and starting to breed and rear young in the spring and summer months.
  - Employees must be prohibited from making open fires during the construction phase.
  - The ECO must monitor that all construction activities are conducted within the development footprint.
  - Vehicles and machinery must meet best practice standards in terms of noise and vibration.
  - Staff and contractors' vehicles must comply with speed limits of 40 km/hr
  - Project must start and be completed within the minimum timeframe, i.e. may not be started and left incomplete.
  - ECO must walk ahead of clearing construction machinery and move slow moving species e.g. tortoises out of harm's way and into suitable neighbouring habitat.
  - Any faunal species that may die as a result of construction must be recorded (photographed, GPS coordinate captured) and if somewhat intact preserved and donated to SANBI.
  - Any faunal species observed onsite must be recorded (photographed, GPS coordinate captured) and loaded onto iNaturalist.
  - Staff and contractors must not be permitted to capture, collect or eat any faunal species onsite.
  - The Contractor must implement the Alien Vegetation Management Plan. The ECO must monitor for the adequate implementation of this plan.
  - The ECO must monitor the site for the presence of alien invasive plant species and take immediate action when these are recorded.
  - It is recommended that the ECO prepare a photo guide of all invasive plant species likely to occur on site. This will aid in the identification of undesirable species.

- Remediate/rehabilitate impact:
  - Topsoil (20 cm, where possible) must be collected and stored in an area of low sensitivity and used to rehabilitate impacted areas that are no longer required during the operational phase

(e.g. laydown areas).
- Only indigenous species must be used for rehabilitation.
- The alien invasive management plan for the site must be implemented.
- All impacted areas must be rehabilitated as per the Rehabilitation Plan, as soon as construction has been completed within each area.
- All trenches/excavations must be backfilled and all disturbed areas backfilled, compacted and revegetated, where applicable.
- All previously infested areas must be rehabilitated as per the Rehabilitation Plan, to the satisfaction of the appointed ECO, as soon as construction has been completed within each area.

6.2.3 OPERATIONAL

- Minimize/reduce impact:
  - Monitoring and maintenance vehicles must not be permitted outside of the development footprint.
  - The Alien Vegetation Management Plan must continue to be implemented.
  - The site must be monitored on a regular basis post-construction to ensure that no alien vegetation establishes on site.

- Remediate/rehabilitate impact:
  - The rehabilitation plan must be implemented during operation phases.
  - Any alien vegetation found during monitoring must be removed as per the Alien Vegetation Management Plan and the area must be appropriately rehabilitated in alignment with the Rehabilitation Plan.

6.2.4 DECOMMISSIONING

- Minimize/reduce impact:
  - Decommissioning activities must remain within the approved demarcated development footprint, and no vegetation clearance is to be permitted outside of the approved development footprint.
  - Vehicles and machinery must not encroach into identified highly-sensitive, 'no-go' areas or areas outside the project footprint.
  - Lay down areas must not be located within any watercourses or drainage lines.
  - Vehicles and machinery must meet best practice standards in terms of noise and vibration.
  - Staff and contractors' vehicles must comply with speed limits of 40 km/hr
  - Project must start and be completed within the minimum timeframe, i.e. may not be started and left incomplete.
  - ECO must walk ahead of machinery and move slow moving species e.g. tortoises out of harm's way and into suitable neighbouring habitat.
  - Any faunal species that may die as a result of decommissioning must be recorded (photographed, GPS coordinate captured) and if somewhat intact preserved and donated to SANBI.

- Any faunal species observed onsite must be recorded (photographed, GPS coordinate captured) and loaded onto iNaturalist.
- Staff and contractors must not be permitted to capture, collect or eat any faunal species onsite.

- Remediate/rehabilitate impact:
  - Topsoil (20 cm, where possible) must be collected and stored in an area of low sensitivity and used to rehabilitate impacted areas that are no longer required during the operational phase (e.g. laydown areas).
  - Only indigenous species must be used for rehabilitation.
  - The alien invasive management plan for the site must be implemented.
  - All areas previously infested by alien plant species must be rehabilitated as per the Rehabilitation Plan, to the satisfaction of the appointed ECO, as soon as construction has been completed within each area.

6.3 FATAL FLAWS

It is the opinion of the specialist that **NO FATAL FLAWS** exist with the proposed development.

6.4 ENVIRONMENTAL STATEMENT AND OPINION OF THE SPECIALIST

The terrestrial biodiversity and ecological impacts of all aspects for the development were assessed and considered to be acceptable, provided that the mitigation measures provided in this report are implemented. All impacts are rated as VERY LOW to MODERATE pre-mitigation. Therefore, implementation of recommended mitigation measures coupled with comprehensive rehabilitation and monitoring in terms of re-vegetation and restoration is an important element of the mitigation strategy. Implementing the recommended mitigations measures will reduce impacts to VERY LOW to LOW significance.

It is recommended that the proposed development be authorised provided that all mitigation measures in this report are implemented.

7 REFERENCES

ADU, 2021. *Virtual Museum - Mammal Atlas of Southern Africa.* [Online]
Available at: http://vmus.adu.org.za/vm_sp_list.php
[Accessed 30 March 2021].

ADU, 2022. *Virtual Museum - Frog Atlas of Southern Africa.* [Online]
Available at: http://vmus.adu.org.za/vm_sp_list.php
[Accessed 4 January 2022].

ADU, 2022. *Virtual Museum - Reptile Atlas of Southern Africa.* [Online]
Available at: http://vmus.adu.org.za/vm_sp_list.php
[Accessed 4 January 2022].

Avenant, N. et al., 2019. *Mystromys albicaudatus. The IUCN Red List of Threatened Species 2019.* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T14262A22237378.en
[Accessed 20 May 2021].

Bronner, G., 2015. *Chrysospalax villosus. The IUCN Red List of Threatened Species 2015: e.T4829A21290416.* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T4829A21290416.en
[Accessed 3 December 2021].

Burrows, J. E., Lötter, M. & von Staden, L., 2006. *Indigofera hybrida N.E.Br. National Assessment: Red List of South African Plants version 2020.1.* [Online]
Available at: http://redlist.sanbi.org/species.php?species=357-230
[Accessed 13 January 2022].

Cadman, M., de Villiers, C., Lechmere-Oertel, R. & McCulloch, D., 2013. *Grasslands Ecosystem Guidelines: landscape interpretation for planners and managers,* Pretoria: South African National Biodiversity Institute.

Cassola, F., 2016. *Crocidura maquassiensis (errata version published in 2017). The IUCN Red List of Threatened Species 2016: e.T5576A115075148.* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T5576A22303779.en
[Accessed 3 December 2021].

Cassola, F., 2016. *Crocidura mariquensis (errata version published in 2017). The IUCN Red List of Threatened Species 2016: e.T41334A115179070..* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T41334A22306233.en
[Accessed 3 December 2021].

CES, 2022. *Eskom Mesong LILO: River and Wetland Ecosystem Specialist Assessment,* Pretoria: CES.

Durant, S., Mitchell, N., Ipavec, A. & Groom, R., 2015. *Acinonyx jubatus. The IUCN Red List of Threatened Species 2015: e.T219A50649567.* [Online]

Available at: https://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T219A50649567.en
[Accessed 20 May 2021].

Edwards, T. J., Raimondo, D. & von Staden, L., 2014. *Argyrolobium longifolium (Meisn.) Walp. National Assessment: Red List of South African Plants version 2020.1..* [Online]
Available at: http://redlist.sanbi.org/species.php?species=283-24
[Accessed 13 January 2022].

Emslie, R., 2020. *Diceros bicornis. The IUCN Red List of Threatened Species 2020: e.T6557A152728945.* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T6557A152728945.en
[Accessed 20 May 2021].

Emslie, R., 2020. *eratotherium simum. The IUCN Red List of Threatened Species 2020: e.T4185A45813880..* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T4185A45813880.en.
[Accessed 3 Decem ber 2021].

Foden, W. & Potter, L., 2009. *Podocarpus henkelii Stapf ex Dallim. & A.B.Jacks. National Assessment: Red List of South African Plants version 2020.1..* [Online]
Available at: http://redlist.sanbi.org/species.php?species=3778-4
[Accessed 13 January 2022].

iNaturalist, 2021. *iNaturalist.* [Online]
Available at: inaturalist.org/observations?iconic_taxa=Amphibia&nelat=-26.16621969044481&nelng=28.515599514563988&place_id=any&subview=map&swlat=-26.50467797583531&swlng=28.18394973429055
[Accessed 26 October 2021].

iNaturalist, 2021. *iNaturalist.* [Online]
Available at:
https://www.inaturalist.org/observations?iconic_taxa=Reptilia&nelat=-26.16621969044481&nelng=28.515599514563988&place_id=any&subview=map&swlat=-26.50467797583531&swlng=28.18394973429055
[Accessed 26 October 2021].

iNaturalist, 2021. *iNaturalist.* [Online]
Available at:
https://www.inaturalist.org/observations?iconic_taxa=Mammalia&nelat=-26.16621969044481&nelng=28.515599514563988&place_id=any&subview=map&swlat=-26.50467797583531&swlng=28.18394973429055
[Accessed 26 October 2021].

IUCN SSC Antelope Specialist Group, 2016. *Ourebia ourebi. The IUCN Red List of Threatened Species 2016: e.T15730A50192202.* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T15730A50192202.en
[Accessed 3 December 2021].

IUCN SSC Antelope Specialist Group, 2019. *Syncerus caffer. The IUCN Red List of Threatened Species 2019: e.T21251A50195031..* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2019-1.RLTS.T21251A50195031.en
[Accessed 3 December 2021].

IUCN, 2022. *IUCN Red List.* [Online]
Available at: https://www.iucnredlist.org/search/list
[Accessed 4 January 2022].

Jacques, H., Reed-Smith, J. & Somers, M. J., 2015. *Aonyx capensis. The IUCN Red List of Threatened Species 2015: e.T1793A21938767..* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T1793A21938767.en.
[Accessed 3 December 2021].

Meteoblue, 2021. *Meteoblue Climate Johannesburg.* [Online]
Available at: https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/johannesburg_republic-of-south-africa_993800
[Accessed 30 April 2021].

Monadjem, A. et al., 2017. *Cloeotis percivali. The IUCN Red List of Threatened Species 2017: e.T4983A22028899..* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2017-2.RLTS.T4983A22028899.en
[Accessed 24 May 2021].

Mucina, L. & Rutherford, M. C., 2018. *The Vegetation of South Africa, Lesotho and Swaziland.* Pretoria: South African National Biodiversity Institute (SANBI).

Nel, J. L. & Driver, A., 2012. *National Biodiversity Assessment 2011: Technical Report. Volume 2: Freshwater Component. Council for Scientific & Industrial Research (CSIR) Report No. CSIR/NRE/ECO/IR/2012/0022/A.,* Stellenbosch: CSIR.

Pfab, M. F. & Victor, J. E., 2005. *Sensitive Species A. National Assessment: Red List of South African Plants version 2020.1..* [Online]
Available at: http://redlist.sanbi.org
[Accessed 13 January 2022].

Sliwa, A., Wilson, B., K. M. & Tordiffe, A., 2016. *Felis nigripes (errata version published in 2020). The IUCN Red List of Threatened Species 2016: e.T8542A177944648.* [Online]
Available at: https://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T8542A177944648.en
[Accessed 20 May 2021].

South African National Biodiversity Institute (SANBI), 2020. *Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental*

impact assessments in South Africa, Pretoria: South African National Biodiversity Institute (SANBI).

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

South African National Biodiversity Institute, 2006-2018. *The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Version 2018.* [Online]
Available at: http://bgis.sanbi.org/Projects/Detail/186
[Accessed 18 December 2019].

Swanepoel, L. H. et al., 2016. A conservation assessment of Panthera pardus. In: M. F. Child, et al. eds. *The Red List of Mammals of South Africa, Swaziland and Lesotho.* Pretoria: The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wild Trust.

Turner, R. C., Ebrahim, I. & Raimondo, D., 2011. *Erica jasminiflora Salisb. National Assessment: Red List of South African Plants version 2020.1..* [Online]
Available at: http://redlist.sanbi.org/species.php?species=1820-472
[Accessed 13 January 2022].

Von Staden, L., Hankey, A. J. M. L. & Raimondo, D., 2015. *Brachycorythis conica (Summerh.) Summerh. subsp. transvaalensis Summerh. National Assessment: Red List of South African Plants version 2020.1.* [Online]
Available at: http://redlist.sanbi.org/species.php?species=2785-1
[Accessed 6 December 2021].

8 APPENDIX A: CURRICULUM VITAE

AIDAN JOHN GOUWS
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

CONTACT DETAILS

Name of Company	**CES – Environmental and Social Advisory Services**
Designation	Centurion Branch
Profession	Senior Environmental Consultant
Years with firm	3 Years
E-mail	a.gouws@cesnet.co.za
Office number	+27 (0)10 045 1372
Nationality	South African
Professional Affiliations	• South African Council for Natural Scientific Professions (SACNASP) (*Cand.Sci.Nat* 121901) • International Association of Impact Assessment (IAIAsa)
Key areas of expertise	• Environmental Authorisations • Geographical Information Systems (GIS) • Terrestrial Ecology • Wetland Ecology • Database Management

PROFILE

Mr Aidan Gouws

Aidan obtained his MSc in Environmental Science (*Cum laude*) from Rhodes University, having conducted research on the spatio-temporal dynamics of *Acacia dealbata* invasions and broader land-use and cover changes in the northern Eastern Cape, funded through a study bursary awarded by the Agricultural Research Council (ARC). Prior to this, he obtained his BSc Honours in Geographical and Environmental Sciences (*Cum laude*) from the University of Pretoria, studying plant ecology and EIA methodology amongst others. Since joining CES in 2018, he has been involved in several projects, including Basic Assessments (BA), Full Scoping and Environmental Impact Assessments (S&EIA), Environmental Amendment Applications, Environmental Audits and Resettlement Action Plan (RAP) Audits. He works from the Centurion office as a Senior Environmental Consultant. His interests include the general Environmental Impact Assessment (EIA) process, terrestrial and wetland ecology, and database management. Aidan is registered with the South African Council for Natural Scientific Professions (SACNASP) as a Candidate Natural Scientist (*Cand.Sci.Nat.* 121901) and with the International Association for Impact Assessments (IAIA).

AIDAN JOHN GOUWS
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

EMPLOYMENT EXPERIENCE	**Senior Environmental Consultant – Coastal and Environmental Services (Centurion)** *August 2020 – Current* • Consulting, project management and conducting assessments in the broad field of Environmental Management, including Basic Assessments, full Scoping and Environmental Impact Assessments, Environmental Management Programmes and Environmental Auditing. • Ecological Impact Assessments • Wetland Impact Assessments • GIS Mapping • Database Management **Environmental Consultant – Coastal and Environmental Services (Centurion)** *July 2018 – July 2020* • Consulting, project management and conducting assessments in the broad field of Environmental Management, including Basic Assessments, full Scoping and Environmental Impact Assessments, Environmental Management Programmes and Environmental Auditing. • Ecological Impact Assessments • GIS Mapping • Database Management **Volunteer – Khulisa Social Solutions (Johannesburg)** *May 2018 – July 2018* **Departmental tutor - Department of Environmental Science, Rhodes University (Grahamstown)** *January 2016 – December 2017* **Demonstrator - Department of Plant Science, University of Pretoria (Pretoria)** *July 2015 – December 2015*
ACADEMIC QUALIFICATIONS	• 2014 - BSc Environmental Science (University of Pretoria) • 2015 - BSc (Hons) Geographical and Environmental Science (University of Pretoria) • 2018 - MSc Environmental Science (Rhodes University)
COURSES	• 2020 - Tools for Wetland Assessment (Rhodes University, in association with GroundTruth, The Water Research Commission and Verdant Environmental) *August 2020*
PUBLICATIONS	• Gouws, A. J., & Shackleton, C. M. (2019). A spatio-temporal, landscape perspective on *Acacia dealbata* invasions and broader land use and cover changes in the northern Eastern Cape, South Africa. Environmental Monitoring and Assessment, 191(2), 74. • Gouws, A. J., & Shackleton, C. M. (2019). Abundance and correlates of the *Acacia dealbata* invasion in the northern Eastern Cape, South Africa. Forest Ecology and Management, 432, 455-466.

AIDAN JOHN GOUWS
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

PROFESSIONAL EXPERIENCE

BASIC ASSESSMENTS

Ramotshere Moiloa Local Municipality Residential Extensions, Zeerust, North West Province, 2019–2020
Two Basic Assessments for the proposed extension of two residential extensions in Zeerust, North West. Assigned the role of project manager, PPP manager, Terrestrial Ecologist and lead author of the Basic Assessment Report.

SANRAL Koster R52 Road Upgrade, Koster, North West Province, 2018–2021
Basic Assessment for the road upgrade of the R52 route between Koster and the N4 Rustenburg. Assigned the role of project manager, PPP manager, Terrestrial Ecologist, Wetland Ecologist, WULA manager and lead author of the Basic Assessment Report.

Transnet Freight Rail Installation of Telecommunications Masts and Associated Infrastructure at Various Locations in South Africa, 2019–2020
Three Basic Assessments for the installation of telecommunications masts in Gauteng, Mpumalanga and KwaZulu-Natal. Assigned the role of project manager, PPP manager and lead author of the Basic Assessment Report.

PRASA CRES Establishment of Township Leralla Extension 1, Tembisa, Gauteng Province, 2019–2020
Basic Assessment for the proposed township establishment at Leralla Station in Tembisa, Gauteng. Assigned the role of project manager, PPP manager and lead author of the Draft Basic Assessment Report.

FULL SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENTS

SANRAL Zandkraal-Winburg N1 Road Upgrade Quarry S&EIR Authorisation, Winburg, Free State Province, 2018–2021
Full Scoping and Environmental Impact Assessment for the mining of borrow pits and quarries associated with the upgrade of the N1 between Zandkraal and Winburg South. Assigned the role of project manager, PPP manager and lead author of the Scoping Report and Environmental Impact Assessment Report.

SANRAL Masekwaspoort N1 Road Quarry S&EIAR Authorisation, Musina, Limpopo Province, 2018–On hold, to resume 2021
Full Scoping and Environmental Impact Assessment for the mining of borrow pits and quarries associated with the upgrade of the N1 between Louis Trichardt and Musina. Assigned the role of co-author of the Scoping Report. Project on hold due to pending design changes.

ENVIRONMENTAL AMENDMENT APPLICATIONS

SANSA Space Operations Installation of Satellite Antennae on Farm Hartebeesthoek 502JQ, Gauteng Province, 2019–2021
Amendment of Environmental Authorisation for the installation of satellite antennae at the South African National Space Agency (SANSA) Space Operations facility. Assigned the role client liaison, Terrestrial Ecologist, Assistant Wetland Ecologist and lead author of the Amendment Report.

AIDAN JOHN GOUWS
Curriculum Vitae

CES
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

ENVIRONMENTAL AUDITING

SANRAL Hendrina N11 Road Upgrade ECO Audits, Hendrina, Mpumalanga Province, 2018–2019
Environmental Auditing for the construction of the road and mining of borrow pits associated with the upgrade of the N11 route between Hendrina and Hendrina Power Station. Assigned the role of Environmental Control Officer (ECO), author of ECO audit reports and author of the borrow pit closure report.

South African National Biodiversity Institute (SANBI) Office Complex Development, Pretoria, Gauteng Province, 2018
Environmental Auditing for the construction of the Office Complex at the Pretoria National Botanical Gardens. Assigned the role of interim ECO and co-author of ECO audit reports.

RISK ASSESSMENTS

PRASA CRES Inhlanzane Risk Assessment, Jabulani (Soweto), Gauteng, 2019
Social and Environmental Risk Assessment of the Illegal Occupation of the Rail Reserve near Inhlanzane Station - Jabulani (Soweto), Gauteng. Assigned the role of project manager and lead author of the Risk Assessment Report.

RESETTLEMENT ACTION PLAN (RAP) AUDITING

Millennium Challenge Account Malawi (MCA-M) RAP Audits, 2018–2019
Completion audits for six Resettlement Action Plans (RAPs) conducted for the Infrastructure Development Project in Malawi. These RAPs documented the physical and economic displacement impacts and compensation for assets of people affected by wayleave corridors along 400kV, 132kV, 66kV and 33kV OHLs, as well as for substations and permanent access roads. Assigned the role of database support, auditor, training assistant and assistant author. Later assigned the role of database manager.

DATABASE MANAGEMENT

Eswatini Electricity Company (EEC) 132kV Powerline ESIA and RAP, 2020-
Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the proposed 132kV powerline in the Shiselweni Region of Swaziland. Assigned the role of data analyst and database co-manager.

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

Aidan John Gouws Date: February 2021

9 APPENDIX B: LIST OF PLANT SPECIES

9.1 LIST OF PLANT SPECIES THAT MAY OCCUR WITHIN THE STUDY AREA

The following list of plant species may occur within the study area of the proposed development (Source: http://posa.sanbi.org/searchspp.php).

Table 9.1 List of plant species that may occur within the proposed development area.

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Acanthaceae	*Barleria*	*obtusa*	Indigenous	- LC
Acanthaceae	*Blepharis*	*innocua*	Indigenous; Endemic	- LC
Acanthaceae	*Blepharis*	*stainbankiae*	Indigenous; Endemic	- LC
Acanthaceae	*Crabbea*	*acaulis*	Indigenous	- LC
Acanthaceae	*Crabbea*	*angustifolia*	Indigenous; Endemic	- LC
Acanthaceae	*Dyschoriste*	*costata*	Indigenous; Endemic	- LC
Acanthaceae	*Hypoestes*	*forskaolii*	Indigenous	- LC
Acanthaceae	*Justicia*	*anagalloides*	Indigenous	- LC
Achariaceae	*Kiggelaria*	*africana*	Indigenous	- LC
Agapanthaceae	*Agapanthus*	*inapertus*	Indigenous	- LC
Agavaceae	*Chlorophytum*	*bowkeri*	Indigenous	- LC
Agavaceae	*Chlorophytum*	*cooperi*	Indigenous	- LC
Agavaceae	*Chlorophytum*	*fasciculatum*	Indigenous	- LC
Agavaceae	*Chlorophytum*	sp.		
Agavaceae	*Chlorophytum*	*trichophlebium*	Indigenous; Endemic	- LC
Aizoaceae	*Delosperma*	*herbeum*	Indigenous	- LC
Aizoaceae	*Delosperma*	sp.		
Aizoaceae	*Khadia*	*acutipetala*	Indigenous; Endemic	- LC
Aizoaceae	*Mesembryanthemum*	*cordifolium*	Indigenous; Endemic	
Aizoaceae	*Mesembryanthemum*	*lancifolium*	Indigenous; Endemic	
Aizoaceae	*Mossia*	*intervallaris*	Indigenous	- LC
Alliaceae	*Tulbaghia*	*acutiloba*	Indigenous	- LC
Alliaceae	*Tulbaghia*	*leucantha*	Indigenous	- LC
Amaranthaceae	*Achyranthes*	*aspera*	Indigenous	- Not Evaluated
Amaranthaceae	*Achyranthes*	*aspera*	Not indigenous; Naturalised	- Not Evaluated
Amaranthaceae	*Amaranthus*	*deflexus*	Not indigenous; Naturalised	- Not Evaluated
Amaranthaceae	*Amaranthus*	*hybridus*	Not indigenous; Naturalised	- Not Evaluated
Amaranthaceae	*Amaranthus*	*thunbergii*	Indigenous	- LC
Amaranthaceae	*Atriplex*	*suberecta*	Not indigenous; Naturalised; Invasive	- LC
Amaranthaceae	*Chenopodium*	*album*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Amaranthaceae	*Chenopodium*	sp.		
Amaranthaceae	*Cyathula*	*cylindrica*	Indigenous	- LC
Amaranthaceae	*Cyathula*	*uncinulata*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Amaranthaceae	*Dysphania*	*ambrosioides*	Not indigenous; Naturalised; Invasive	
Amaranthaceae	*Dysphania*	*multifida*	Not indigenous; Naturalised; Invasive	
Amaranthaceae	*Dysphania*	*pumilio*	Not indigenous; Naturalised; Invasive	
Amaranthaceae	*Einadia*	*nutans*	Not indigenous; Naturalised	- Not Evaluated
Amaranthaceae	*Gomphrena*	*celosioides*	Not indigenous; Naturalised	- Not Evaluated
Amaranthaceae	*Guilleminea*	*densa*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Amaranthaceae	*Salsola*	*kali*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Amaryllidaceae	*Apodolirion*	*buchananii*	Indigenous	- LC
Amaryllidaceae	*Cyrtanthus*	*breviflorus*	Indigenous	- LC
Amaryllidaceae	*Haemanthus*	*humilis*	Indigenous	- LC
Amaryllidaceae	*Haemanthus*	*montanus*	Indigenous	- LC
Amaryllidaceae	*Nerine*	*angustifolia*	Indigenous	- LC
Amaryllidaceae	*Nerine*	*bowdenii*	Indigenous; Endemic	- Rare
Amaryllidaceae	*Nerine*	*krigei*	Indigenous; Endemic	- LC
Amaryllidaceae	*Nerine*	*rehmannii*	Indigenous	- LC
Amaryllidaceae	*Nerine*	sp.		
Anacampserotaceae	***Anacampseros***	***subnuda***	**Indigenous**	- **VU**
Anacardiaceae	*Lannea*	*edulis*	Indigenous	- LC
Anacardiaceae	*Searsia*	*dentata*	Indigenous	- LC
Anacardiaceae	*Searsia*	*discolor*	Indigenous	- LC
Anacardiaceae	*Searsia*	*lancea*	Indigenous	- LC
Anacardiaceae	*Searsia*	*leptodictya*	Indigenous	- Not Evaluated
Anacardiaceae	*Searsia*	*magalismontana*	Indigenous	- LC
Anacardiaceae	*Searsia*	*pallens*	Indigenous	- LC
Anacardiaceae	*Searsia*	*pyroides*	Indigenous	- LC
Anacardiaceae	*Searsia*	*pyroides*	Indigenous	- LC
Anacardiaceae	*Searsia*	*rigida*	Indigenous; Endemic	- LC
Anacardiaceae	*Searsia*	*rigida*	Indigenous; Endemic	- LC
Anacardiaceae	*Searsia*	*undulata*	Indigenous	- LC
Anemiaceae	*Anemia*	*dregeana*	Indigenous	- LC
Anemiaceae	*Mohria*	*vestita*	Indigenous	- LC
Anthocerotaceae	*Anthoceros*	*natalensis*	Indigenous	
Apiaceae	*Afrosciadium*	*magalismontanum*	Indigenous	- LC
Apiaceae	*Alepidea*	*peduncularis*	Indigenous	- DDT
Apiaceae	*Berula*	*repanda*	Indigenous	- LC
Apiaceae	*Centella*	*asiatica*	Indigenous	- LC
Apiaceae	*Cyclospermum*	*leptophyllum*	Not indigenous; Naturalised	

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Apiaceae	*Heteromorpha*	*arborescens*	Indigenous	- LC
Apiaceae	*Heteromorpha*	*arborescens*	Indigenous	- LC
Apiaceae	*Pimpinella*	*transvaalensis*	Indigenous	- LC
Apocynaceae	*Acokanthera*	*oppositifolia*	Indigenous	- LC
Apocynaceae	*Ancylobothrys*	*capensis*	Indigenous	
Apocynaceae	*Araujia*	*sericifera*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Apocynaceae	*Asclepias*	*adscendens*	Indigenous	- LC
Apocynaceae	*Asclepias*	*albens*	Indigenous	- LC
Apocynaceae	*Asclepias*	*aurea*	Indigenous	- LC
Apocynaceae	*Asclepias*	*brevipes*	Indigenous; Endemic	- LC
Apocynaceae	*Asclepias*	*crispa*	Indigenous; Endemic	- LC
Apocynaceae	*Asclepias*	*eminens*	Indigenous	- LC
Apocynaceae	*Asclepias*	*fallax*	Indigenous; Endemic	- LC
Apocynaceae	*Asclepias*	*fulva*	Indigenous	- LC
Apocynaceae	*Asclepias*	*gibba*	Indigenous	- LC
Apocynaceae	*Asclepias*	*meyeriana*	Indigenous	- LC
Apocynaceae	*Asclepias*	*stellifera*	Indigenous	- LC
Apocynaceae	*Aspidoglossum*	*biflorum*	Indigenous	- LC
Apocynaceae	*Aspidoglossum*	*glabrescens*	Indigenous; Endemic	- LC
Apocynaceae	*Aspidoglossum*	*interruptum*	Indigenous	- LC
Apocynaceae	*Aspidoglossum*	*lamellatum*	Indigenous	- LC
Apocynaceae	*Aspidoglossum*	*ovalifolium*	Indigenous	- LC
Apocynaceae	*Aspidoglossum*	*restioides*	Indigenous; Endemic	- LC
Apocynaceae	*Brachystelma*	*chloranthum*	Indigenous	- LC
Apocynaceae	*Brachystelma*	*circinatum*	Indigenous	- LC
Apocynaceae	*Brachystelma*	*ramosissimum*	Indigenous	- LC
Apocynaceae	*Carissa*	*bispinosa*	Indigenous	- LC
Apocynaceae	*Ceropegia*	*rendallii*	Indigenous	- LC
Apocynaceae	*Cryptolepis*	*oblongifolia*	Indigenous	- LC
Apocynaceae	*Gomphocarpus*	*fruticosus*	Indigenous	- LC
Apocynaceae	*Gomphocarpus*	*fruticosus*	Indigenous	- LC
Apocynaceae	*Gomphocarpus*	sp.		
Apocynaceae	*Pachycarpus*	*schinzianus*	Indigenous	- LC
Apocynaceae	*Parapodium*	*costatum*	Indigenous	- LC
Apocynaceae	*Raphionacme*	*galpinii*	Indigenous	- LC
Apocynaceae	*Raphionacme*	*hirsuta*	Indigenous	- LC
Apocynaceae	*Schizoglossum*	*nitidum*	Indigenous	- LC
Apocynaceae	*Sisyranthus*	*randii*	Indigenous	- LC
Apocynaceae	*Stapelia*	*gigantea*	Indigenous	- LC
Apocynaceae	*Stapelia*	*leendertziae*	Indigenous	- LC
Apocynaceae	*Stenostelma*	*periglossoides*	Indigenous; Endemic	
Apocynaceae	***Stenostelma***	***umbelluliferum***	**Indigenous; Endemic**	- **NT**

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
				- **Near Threatened (CITES)**
Apocynaceae	*Xysmalobium*	*brownianum*	Indigenous	- LC
Apocynaceae	*Xysmalobium*	*undulatum*	Indigenous	- LC
Araceae	*Lemna*	*minor*	Indigenous	- LC
Araceae	*Spirodela*	*punctata*	Indigenous	- LC
Araceae	*Zantedeschia*	*albomaculata*	Indigenous	- LC
Araliaceae	*Cussonia*	*paniculata*	Indigenous	- LC
Asparagaceae	*Asparagus*	*africanus*	Indigenous	- LC
Asparagaceae	*Asparagus*	*angusticladus*	Indigenous	- LC
Asparagaceae	*Asparagus*	*asparagoides*	Indigenous	- LC
Asparagaceae	*Asparagus*	*cooperi*	Indigenous	- LC
Asparagaceae	*Asparagus*	*flavicaulis*	Indigenous	- LC
Asparagaceae	*Asparagus*	*laricinus*	Indigenous	- LC
Asparagaceae	*Asparagus*	*suaveolens*	Indigenous	- LC
Asphodelaceae	*Aloe*	*bergeriana*	Indigenous	- DDD
Asphodelaceae	*Aloe*	*davyana*	Indigenous; Endemic	
Asphodelaceae	*Aloe*	*jeppeae*	Indigenous	- LC
Asphodelaceae	*Aloe*	*marlothii*	Indigenous	- LC
Asphodelaceae	*Aloe*	*subspicata*	Indigenous	
Asphodelaceae	*Aloe*	*transvaalensis*	Indigenous	
Asphodelaceae	*Aloe*	*verecunda*	Indigenous; Endemic	- LC
Asphodelaceae	*Bulbine*	*abyssinica*	Indigenous	- LC
Asphodelaceae	*Bulbine*	*capitata*	Indigenous	- LC
Asphodelaceae	*Bulbine*	*favosa*	Indigenous	- LC
Asphodelaceae	*Kniphofia*	*ensifolia*	Indigenous	- LC
Asphodelaceae	*Trachyandra*	*asperata*	Indigenous	- LC
Asphodelaceae	*Trachyandra*	*asperata*	Indigenous	- LC
Asphodelaceae	*Trachyandra*	*erythrorrhiza*	Indigenous; Endemic	- LC - Near Threatened (CITES)
Asphodelaceae	*Trachyandra*	*saltii*	Indigenous	- LC
Asphodelaceae	*Trachyandra*	sp.		
Aspleniaceae	*Asplenium*	*adiantum-nigrum*	Indigenous	- LC
Asteraceae	*Afroaster*	*peglerae*	Indigenous; Endemic	- LC
Asteraceae	*Afroaster*	*serrulatus*	Indigenous	- LC
Asteraceae	*Ambrosia*	*psilostachya*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Asteraceae	*Artemisia*	*afra*	Indigenous	- LC
Asteraceae	*Athrixia*	*elata*	Indigenous	- LC
Asteraceae	*Berkheya*	*insignis*	Indigenous	- LC
Asteraceae	*Berkheya*	*pinnatifida*	Indigenous; Endemic	- LC
Asteraceae	*Berkheya*	*radula*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Asteraceae	*Berkheya*	*seminivea*	Indigenous; Endemic	- LC
Asteraceae	*Berkheya*	*setifera*	Indigenous	- LC
Asteraceae	*Berkheya*	*speciosa*	Indigenous	- LC
Asteraceae	*Berkheya*	*subulata*	Indigenous	- Not Evaluated
Asteraceae	*Berkheya*	*zeyheri*	Indigenous	- Not Evaluated
Asteraceae	*Bidens*	*pilosa*	Not indigenous; Naturalised	- Not Evaluated
Asteraceae	*Brachylaena*	*rotundata*	Indigenous	- LC
Asteraceae	*Brachylaena*	sp.		
Asteraceae	*Callilepis*	*leptophylla*	Indigenous	- Declining
Asteraceae	*Campuloclinium*	*macrocephalum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Asteraceae	*Chrysanthellum*	sp.		
Asteraceae	*Cineraria*	*albicans*	Indigenous	- LC
Asteraceae	*Cineraria*	*aspera*	Indigenous	- LC
Asteraceae	***Cineraria***	***austrotransvaalensis***	**Indigenous; Endemic**	- **NT**
Asteraceae	*Cineraria*	*saxifraga*	Indigenous; Endemic	- LC
Asteraceae	*Cirsium*	*vulgare*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Asteraceae	*Conyza*	*aegyptiaca*	Indigenous	
Asteraceae	*Conyza*	*pinnata*	Indigenous	
Asteraceae	*Conyza*	*podocephala*	Indigenous	
Asteraceae	*Conyza*	*ulmifolia*	Indigenous	
Asteraceae	*Coreopsis*	*lanceolata*	Not indigenous; Cultivated; Naturalised; Invasive	- Not Evaluated - Cat 1a;
Asteraceae	*Cosmos*	*bipinnatus*	Not indigenous; Naturalised	- Not Evaluated
Asteraceae	*Cotula*	*anthemoides*	Indigenous	- LC
Asteraceae	*Cotula*	sp.		
Asteraceae	*Crepis*	*hypochaeridea*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Asteraceae	*Curio*	*cicatricosus*	Indigenous	- DDT
Asteraceae	*Denekia*	*capensis*	Indigenous	- LC
Asteraceae	*Dicoma*	*anomala*	Indigenous	- LC
Asteraceae	*Dicoma*	sp.		
Asteraceae	*Dimorphotheca*	*spectabilis*	Indigenous; Endemic	- LC
Asteraceae	*Emilia*	sp.		
Asteraceae	*Erigeron*	*bonariensis*	Not indigenous; Naturalised; Invasive	
Asteraceae	*Erigeron*	*canadensis*	Not indigenous; Naturalised; Invasive	
Asteraceae	*Erigeron*	*karvinskianus*	Not indigenous; Naturalised; Invasive	- Not Evaluated

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Asteraceae	*Euryops*	*laxus*	Indigenous	- LC
Asteraceae	*Euryops*	*oligoglossus*	Indigenous	- LC
Asteraceae	*Euryops*	*transvaalensis*	Indigenous	- LC
Asteraceae	*Felicia*	*filifolia*	Indigenous	- LC
Asteraceae	*Felicia*	*fruticosa*	Indigenous; Endemic	- LC
Asteraceae	*Felicia*	*muricata*	Indigenous	- LC
Asteraceae	*Felicia*	*muricata*	Indigenous; Endemic	- LC
Asteraceae	*Galinsoga*	*parviflora*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Asteraceae	*Gazania*	*krebsiana*	Indigenous	- LC
Asteraceae	*Gazania*	sp.		
Asteraceae	*Geigeria*	*aspera*	Indigenous	- LC
Asteraceae	*Geigeria*	*burkei*	Indigenous; Endemic	- Not Evaluated
Asteraceae	*Gerbera*	*ambigua*	Indigenous	- LC
Asteraceae	*Gerbera*	*piloselloides*	Indigenous	- LC
Asteraceae	*Gnaphalium*	*filagopsis*	Indigenous	- LC
Asteraceae	*Haplocarpha*	*scaposa*	Indigenous	- LC
Asteraceae	*Helichrysum*	*acutatum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*argyrosphaerum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*aureonitens*	Indigenous	- LC
Asteraceae	*Helichrysum*	*aureum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*caespititium*	Indigenous	- LC
Asteraceae	*Helichrysum*	*callicomum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*cephaloideum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*cerastioides*	Indigenous	- LC
Asteraceae	*Helichrysum*	*chionosphaerum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*difficile*	Indigenous	- LC
Asteraceae	*Helichrysum*	*dregeanum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*kraussii*	Indigenous	- LC
Asteraceae	*Helichrysum*	*lepidissimum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*miconiifolium*	Indigenous	- LC
Asteraceae	*Helichrysum*	*mundtii*	Indigenous	- LC
Asteraceae	*Helichrysum*	*nudifolium*	Indigenous	- LC
Asteraceae	*Helichrysum*	*oreophilum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*polycladum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*rugulosum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*setosum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*stenopterum*	Indigenous	- LC
Asteraceae	*Helichrysum*	*uninervium*	Indigenous; Endemic	- LC
Asteraceae	*Hertia*	sp.		
Asteraceae	*Hilliardiella*	*aristata*	Indigenous	- LC
Asteraceae	*Hilliardiella*	*elaeagnoides*	Indigenous	
Asteraceae	*Hilliardiella*	*hirsuta*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Asteraceae	*Hilliardiella*	*sutherlandii*	Indigenous	
Asteraceae	*Hypochaeris*	*radicata*	Not indigenous; Naturalised	- Not Evaluated
Asteraceae	*Kleinia*	*longiflora*	Indigenous	- LC
Asteraceae	*Lactuca*	*inermis*	Indigenous	- LC
Asteraceae	*Launaea*	*rarifolia*	Indigenous	- LC
Asteraceae	*Lopholaena*	*coriifolia*	Indigenous	- LC
Asteraceae	*Macledium*	*zeyheri*	Indigenous	- LC
Asteraceae	*Montanoa*	*hibiscifolia*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Asteraceae	*Nidorella*	*anomala*	Indigenous	- LC
Asteraceae	*Nidorella*	*auriculata*	Indigenous	- LC
Asteraceae	*Nidorella*	*hottentotica*	Indigenous	- LC
Asteraceae	*Nolletia*	*rarifolia*	Indigenous; Endemic	- LC
Asteraceae	*Osteospermum*	*muricatum*	Indigenous	- LC
Asteraceae	*Othonna*	*natalensis*	Indigenous	- LC
Asteraceae	*Phymaspermum*	*athanasioides*	Indigenous	- LC
Asteraceae	*Polydora*	*angustifolia*	Indigenous	- LC
Asteraceae	*Pseudoconyza*	*viscosa*	Indigenous	- LC
Asteraceae	*Pseudognaphalium*	*luteoalbum*	Not indigenous; Cryptogenic	
Asteraceae	*Pseudognaphalium*	*oligandrum*	Indigenous	- LC
Asteraceae	*Pseudopegolettia*	*tenella*	Indigenous	
Asteraceae	*Pulicaria*	*scabra*	Indigenous	- LC
Asteraceae	*Schistostephium*	*crataegifolium*	Indigenous	- LC
Asteraceae	*Schkuhria*	*pinnata*	Not indigenous; Naturalised	- Not Evaluated
Asteraceae	*Senecio*	*achilleifolius*	Indigenous	- LC
Asteraceae	*Senecio*	*affinis*	Indigenous	- LC
Asteraceae	*Senecio*	*albanensis*	Indigenous	- LC
Asteraceae	*Senecio*	*barbertonicus*	Indigenous	- LC
Asteraceae	*Senecio*	*burchellii*	Indigenous; Endemic	- LC
Asteraceae	*Senecio*	*consanguineus*	Indigenous	- LC
Asteraceae	*Senecio*	*coronatus*	Indigenous	- LC
Asteraceae	*Senecio*	*erubescens*	Indigenous; Endemic	- LC
Asteraceae	*Senecio*	*erubescens*	Indigenous	- LC
Asteraceae	*Senecio*	*glaberrimus*	Indigenous	- LC
Asteraceae	*Senecio*	*glanduloso-pilosus*	Indigenous; Endemic	- LC
Asteraceae	*Senecio*	*infirmus*	Indigenous; Endemic	- DDT
Asteraceae	*Senecio*	*inornatus*	Indigenous	- LC
Asteraceae	*Senecio*	*isatideus*	Indigenous	- LC
Asteraceae	*Senecio*	*laevigatus*	Indigenous; Endemic	- LC
Asteraceae	*Senecio*	*lydenburgensis*	Indigenous	- LC
Asteraceae	*Senecio*	*othonniflorus*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Asteraceae	*Senecio*	*oxyriifolius*	Indigenous	- LC
Asteraceae	*Senecio*	*oxyriifolius*	Indigenous	- LC
Asteraceae	*Senecio*	*pentactinus*	Indigenous	- LC
Asteraceae	*Senecio*	*scitus*	Indigenous	- LC
Asteraceae	*Senecio*	*serratuloides*	Indigenous	- LC
Asteraceae	*Senecio*	sp.		
Asteraceae	*Senecio*	*subcoriaceus*	Indigenous	- LC
Asteraceae	*Senecio*	*venosus*	Indigenous	- LC
Asteraceae	*Seriphium*	*plumosum*	Indigenous	
Asteraceae	*Sonchus*	*dregeanus*	Indigenous	- LC
Asteraceae	*Sonchus*	*integrifolius*	Indigenous	- LC
Asteraceae	*Sonchus*	*nanus*	Indigenous	- LC
Asteraceae	*Sonchus*	*oleraceus*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Asteraceae	*Symphyotrichum*	*squamatum*	Not indigenous; Naturalised	
Asteraceae	*Tagetes*	*minuta*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Asteraceae	*Taraxacum*	*breviscapum*	Not indigenous; Naturalised	- Not Evaluated
Asteraceae	*Taraxacum*	*officinale*	Not indigenous; Naturalised	- Not Evaluated
Asteraceae	*Tolpis*	*capensis*	Indigenous	- LC
Asteraceae	*Tragopogon*	*dubius*	Not indigenous; Naturalised	- Not Evaluated
Asteraceae	*Ursinia*	*montana*	Indigenous	- LC
Asteraceae	*Ursinia*	*nana*	Indigenous	- LC
Asteraceae	*Vernonia*	sp.		
Asteraceae	*Xanthium*	*spinosum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Bartramiaceae	*Philonotis*	*africana*	Indigenous	
Bartramiaceae	*Philonotis*	*dregeana*	Indigenous	
Bartramiaceae	*Philonotis*	*hastata*	Indigenous	
Bartramiaceae	*Philonotis*	sp.		
Blechnaceae	*Blechnum*	*australe*	Indigenous	- LC
Boraginaceae	*Anchusa*	*azurea*	Not indigenous; Naturalised	- Not Evaluated
Boraginaceae	*Cynoglossum*	*lanceolatum*	Indigenous	- LC
Boraginaceae	*Echium*	*plantagineum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Boraginaceae	*Ehretia*	*rigida*	Indigenous	- LC
Boraginaceae	*Lappula*	*heteracantha*	Not indigenous; Naturalised	- Not Evaluated
Boraginaceae	*Lithospermum*	*cinereum*	Indigenous	- LC
Boraginaceae	*Trichodesma*	*physaloides*	Indigenous	- LC
Brachytheciaceae	*Brachythecium*	*ruderale*	Indigenous	

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Brassicaceae	*Capsella*	*bursa-pastoris*	Not indigenous; Naturalised	- Not Evaluated
Brassicaceae	*Cardamine*	*hirsuta*	Not indigenous; Naturalised	- Not Evaluated
Brassicaceae	*Erucastrum*	*austroafricanum*	Indigenous	- LC
Brassicaceae	*Heliophila*	*carnosa*	Indigenous	- LC
Brassicaceae	*Heliophila*	*rigidiuscula*	Indigenous	- LC
Brassicaceae	*Lepidium*	*africanum*	Indigenous	- LC
Brassicaceae	*Lepidium*	*schinzii*	Indigenous	- LC
Brassicaceae	*Lepidium*	*transvaalense*	Indigenous	- LC
Brassicaceae	*Lobularia*	*maritima*	Not indigenous; Naturalised	- Not Evaluated
Brassicaceae	*Nasturtium*	*officinale*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 2
Brassicaceae	*Sisymbrium*	*capense*	Indigenous	- LC
Bruchiaceae	*Trematodon*	*longicollis*	Indigenous	
Bryaceae	*Anomobryum*	*julaceum*	Indigenous	
Bryaceae	*Bryum*	*alpinum*	Indigenous	
Bryaceae	*Bryum*	*apiculatum*	Indigenous	
Bryaceae	*Bryum*	*argenteum*	Indigenous	
Bryaceae	*Bryum*	*dichotomum*	Indigenous	
Bryaceae	*Bryum*	*pycnophyllum*	Indigenous	
Bryaceae	*Bryum*	sp.		
Campanulaceae	*Wahlenbergia*	*androsacea*	Indigenous	- LC
Campanulaceae	*Wahlenbergia*	*dieterlenii*	Indigenous	- LC
Campanulaceae	*Wahlenbergia*	*lycopodioides*	Indigenous	- LC
Campanulaceae	*Wahlenbergia*	*prostrata*	Indigenous	- LC
Campanulaceae	*Wahlenbergia*	sp.		
Campanulaceae	*Wahlenbergia*	*undulata*	Indigenous	- LC
Campanulaceae	*Wahlenbergia*	*virgata*	Indigenous	- LC
Cannabaceae	*Celtis*	*africana*	Indigenous	- LC
Capparaceae	*Maerua*	*cafra*	Indigenous	- LC
Caryophyllaceae	*Cerastium*	*arabidis*	Indigenous	- LC
Caryophyllaceae	*Cerastium*	*capense*	Indigenous	- LC
Caryophyllaceae	*Corrigiola*	*litoralis*	Indigenous	- Not Evaluated
Caryophyllaceae	*Dianthus*	*mooiensis*	Indigenous; Endemic	- Not Evaluated
Caryophyllaceae	*Dianthus*	*mooiensis*	Indigenous	- Not Evaluated
Caryophyllaceae	*Herniaria*	*erckertii*	Indigenous	- LC
Caryophyllaceae	*Paronychia*	*brasiliana*	Not indigenous; Naturalised	- Not Evaluated
Caryophyllaceae	*Pollichia*	*campestris*	Indigenous	- LC
Caryophyllaceae	*Silene*	*burchellii*	Indigenous	- Not Evaluated

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Caryophyllaceae	*Silene*	*burchellii*	Indigenous	- Not Evaluated
Caryophyllaceae	*Silene*	*undulata*	Indigenous	- LC
Celastraceae	*Gymnosporia*	*buxifolia*	Indigenous	- LC
Celastraceae	*Gymnosporia*	*polyacantha*	Indigenous; Endemic	- LC
Celastraceae	*Mystroxylon*	*aethiopicum*	Indigenous; Endemic	- LC
Celastraceae	*Pterocelastrus*	*echinatus*	Indigenous	- LC
Chenopodiaceae	*Chenopodiastrum*	*murale*	Not indigenous; Naturalised; Invasive	
Chrysobalanaceae	*Parinari*	*capensis*	Indigenous	- LC
Cleomaceae	*Cleome*	*gynandra*	Indigenous	- LC
Cleomaceae	*Cleome*	*maculata*	Indigenous	- LC
Cleomaceae	*Cleome*	*monophylla*	Indigenous	- LC
Cleomaceae	*Cleome*	*oxyphylla*	Indigenous	- LC
Cleomaceae	*Tarenaya*	*hassleriana*	Not indigenous; Naturalised; Invasive	
Colchicaceae	*Colchicum*	*melanthioides*	Indigenous	
Combretaceae	*Combretum*	*erythrophyllum*	Indigenous	- LC
Combretaceae	*Combretum*	*molle*	Indigenous	- LC
Commelinaceae	*Commelina*	*africana*	Indigenous	- LC
Commelinaceae	*Commelina*	*africana*	Indigenous	- LC
Commelinaceae	*Commelina*	*africana*	Indigenous	- LC
Commelinaceae	*Commelina*	*benghalensis*	Indigenous	- LC
Commelinaceae	*Commelina*	*eckloniana*	Indigenous	- LC
Commelinaceae	*Commelina*	*modesta*	Indigenous	- LC
Commelinaceae	*Cyanotis*	*speciosa*	Indigenous	- LC
Convolvulaceae	*Convolvulus*	*dregeanus*	Indigenous; Endemic	- LC
Convolvulaceae	*Convolvulus*	*sagittatus*	Indigenous	- LC
Convolvulaceae	*Convolvulus*	*thunbergii*	Indigenous	- LC
Convolvulaceae	*Cuscuta*	*campestris*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Convolvulaceae	*Cuscuta*	*suaveolens*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Convolvulaceae	*Ipomoea*	*bathycolpos*	Indigenous; Endemic	- LC
Convolvulaceae	*Ipomoea*	*crassipes*	Indigenous	- LC
Convolvulaceae	*Ipomoea*	*oblongata*	Indigenous	- LC
Convolvulaceae	*Ipomoea*	*obscura*	Indigenous	- LC
Convolvulaceae	*Ipomoea*	*ommanneyi*	Indigenous	- LC
Convolvulaceae	*Ipomoea*	*purpurea*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Convolvulaceae	*Ipomoea*	*simplex*	Indigenous	- LC
Convolvulaceae	*Xenostegia*	*tridentata*	Indigenous	- LC
Crassulaceae	*Adromischus*	*umbraticola*	Indigenous; Endemic	- DDT

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Crassulaceae	***Cotyledon***	***orbiculata***	**Indigenous**	- **NT**
Crassulaceae	*Crassula*	*alba*	Indigenous	- Not Evaluated
Crassulaceae	*Crassula*	*campestris*	Indigenous	- LC
Crassulaceae	*Crassula*	*capitella*	Indigenous	- LC
Crassulaceae	*Crassula*	*capitella*	Indigenous	- LC
Crassulaceae	***Crassula***	***decumbens***	**Indigenous; Endemic**	- **NT**
Crassulaceae	*Crassula*	*lanceolata*	Indigenous	- LC
Crassulaceae	*Crassula*	*lanceolata*	Indigenous	- LC
Crassulaceae	*Crassula*	*setulosa*	Indigenous	- Not Evaluated
Crassulaceae	*Crassula*	*setulosa*	Indigenous	- Not Evaluated
Crassulaceae	*Crassula*	*swaziensis*	Indigenous	- LC
Crassulaceae	*Kalanchoe*	*paniculata*	Indigenous	- LC
Crassulaceae	*Kalanchoe*	*rotundifolia*	Indigenous	- LC
Crassulaceae	*Kalanchoe*	*thyrsiflora*	Indigenous	- LC
Cucurbitaceae	*Coccinia*	*adoensis*	Indigenous	- LC
Cucurbitaceae	*Cucumis*	*africanus*	Indigenous	- LC
Cucurbitaceae	*Cucumis*	*hirsutus*	Indigenous	- LC
Cucurbitaceae	*Cucumis*	*zeyheri*	Indigenous	- LC
Cucurbitaceae	*Peponium*	*caledonicum*	Indigenous	- LC
Cucurbitaceae	*Peponium*	*mackenii*	Indigenous; Endemic	- LC
Cyperaceae	*Bolboschoenus*	sp.		
Cyperaceae	*Bulbostylis*	*burchellii*	Indigenous	- LC
Cyperaceae	*Bulbostylis*	*densa*	Indigenous	- LC
Cyperaceae	*Bulbostylis*	*humilis*	Indigenous	- LC
Cyperaceae	*Bulbostylis*	*oritrephes*	Indigenous	- LC
Cyperaceae	*Bulbostylis*	*scleropus*	Indigenous	- LC
Cyperaceae	*Carex*	*acutiformis*	Not indigenous; Naturalised	- Not Evaluated
Cyperaceae	*Carex*	*glomerabilis*	Indigenous	- LC
Cyperaceae	*Coleochloa*	*setifera*	Indigenous	- LC
Cyperaceae	*Cyperus*	*capensis*	Indigenous; Endemic	- LC
Cyperaceae	*Cyperus*	*congestus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*denudatus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*difformis*	Indigenous	- LC
Cyperaceae	*Cyperus*	*esculentus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*fastigiatus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*latifolius*	Indigenous	- LC
Cyperaceae	*Cyperus*	*longus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*margaritaceus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*obtusiflorus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*obtusiflorus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*rupestris*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Cyperaceae	*Cyperus*	*semitrifidus*	Indigenous	- LC
Cyperaceae	*Cyperus*	sp.		
Cyperaceae	*Cyperus*	*sphaerospermus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*squarrosus*	Indigenous	- LC
Cyperaceae	*Cyperus*	*uitenhagensis*	Indigenous	- LC
Cyperaceae	*Cyperus*	*usitatus*	Indigenous	- LC
Cyperaceae	*Eleocharis*	*atropurpurea*	Indigenous	- LC
Cyperaceae	*Eleocharis*	*dregeana*	Indigenous	- LC
Cyperaceae	*Ficinia*	*stolonifera*	Indigenous	- LC
Cyperaceae	*Fimbristylis*	*complanata*	Indigenous	- LC
Cyperaceae	*Fuirena*	*coerulescens*	Indigenous	- LC
Cyperaceae	*Fuirena*	*leptostachya*	Indigenous	- Not Evaluated
Cyperaceae	*Fuirena*	*pubescens*	Indigenous	- LC
Cyperaceae	*Isolepis*	*costata*	Indigenous	- LC
Cyperaceae	*Isolepis*	*setacea*	Indigenous	- LC
Cyperaceae	*Kyllinga*	*alata*	Indigenous	- LC
Cyperaceae	*Kyllinga*	*alba*	Indigenous	- LC
Cyperaceae	*Kyllinga*	*erecta*	Indigenous	- LC
Cyperaceae	*Kyllinga*	*melanosperma*	Indigenous	- LC
Cyperaceae	*Kyllinga*	*pulchella*	Indigenous	- LC
Cyperaceae	*Lipocarpha*	*nana*	Indigenous	- LC
Cyperaceae	*Lipocarpha*	*rehmannii*	Indigenous	- LC
Cyperaceae	*Pycreus*	*macranthus*	Indigenous	- LC
Cyperaceae	*Pycreus*	*mundii*	Indigenous	- LC
Cyperaceae	*Pycreus*	*nitidus*	Indigenous	- LC
Cyperaceae	*Pycreus*	*pumilus*	Indigenous	- LC
Cyperaceae	*Schoenoplectus*	*brachyceras*	Indigenous	- LC
Cyperaceae	*Schoenoplectus*	*muriculatus*	Indigenous	- LC
Cyperaceae	*Schoenoplectus*	*tabernaemontani*	Not indigenous; Naturalised	- Not Evaluated
Cyperaceae	*Scirpoides*	*burkei*	Indigenous	- LC
Cyperaceae	*Scleria*	*dregeana*	Indigenous	- LC
Cyperaceae	*Scleria*	*woodii*	Indigenous	- LC
Dicranaceae	*Leptotrichella*	*minuta*	Indigenous	
Dioscoreaceae	*Dioscorea*	*retusa*	Indigenous	- LC
Dipsacaceae	*Cephalaria*	*zeyheriana*	Indigenous	- LC
Dipsacaceae	*Scabiosa*	*columbaria*	Indigenous	- LC
Ditrichaceae	*Ceratodon*	*purpureus*	Indigenous	
Droseraceae	*Drosera*	*madagascariensis*	Indigenous	- LC
Dryopteridaceae	*Dryopteris*	*athamantica*	Indigenous	- LC
Ebenaceae	*Diospyros*	*austroafricana*	Indigenous	
Ebenaceae	*Diospyros*	*lycioides*	Indigenous	- LC
Ebenaceae	*Euclea*	*crispa*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Elatinaceae	*Elatine*	*triandra*	Indigenous	- LC
Ericaceae	***Erica***	***jasminiflora***	**Indigenous; Endemic**	- **CR**
Ericaceae	*Erica*	*pinea*	Indigenous; Endemic	- LC
Ericaceae	*Erica*	*taxifolia*	Indigenous; Endemic	- LC
Ericaceae	***Erica***	***viscaria***	**Indigenous; Endemic**	- **CR**
Eriocaulaceae	*Eriocaulon*	*abyssinicum*	Indigenous	- LC
Eriocaulaceae	*Eriocaulon*	*sonderianum*	Indigenous	- LC
Euphorbiaceae	*Acalypha*	*angustata*	Indigenous	- LC
Euphorbiaceae	*Acalypha*	*caperonioides*	Indigenous	- DDT
Euphorbiaceae	*Acalypha*	*peduncularis*	Indigenous	- LC
Euphorbiaceae	*Acalypha*	sp.		
Euphorbiaceae	*Croton*	*gratissimus*	Indigenous	- LC
Euphorbiaceae	*Euphorbia*	*clavarioides*	Indigenous	- LC
Euphorbiaceae	*Euphorbia*	*hirsuta*	Not indigenous; Naturalised; Invasive	
Euphorbiaceae	*Euphorbia*	*inaequilatera*	Indigenous	- Not Evaluated
Euphorbiaceae	*Euphorbia*	*indica*	Not indigenous; Naturalised	- Not Evaluated
Euphorbiaceae	*Euphorbia*	*prostrata*	Not indigenous; Naturalised	- Not Evaluated
Euphorbiaceae	*Euphorbia*	*striata*	Indigenous	- Not Evaluated
Fabaceae	*Acacia*	*elata*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Fabaceae	***Argyrolobium***	***longifolium***	**Indigenous; Endemic**	- **VU**
Fabaceae	*Argyrolobium*	*speciosum*	Indigenous	- LC
Fabaceae	*Argyrolobium*	*tuberosum*	Indigenous	- LC
Fabaceae	*Chamaecrista*	*biensis*	Indigenous	- LC
Fabaceae	*Chamaecrista*	*comosa*	Indigenous	- LC
Fabaceae	*Chamaecrista*	*mimosoides*	Indigenous	- LC
Fabaceae	*Crotalaria*	*distans*	Indigenous	- LC
Fabaceae	*Crotalaria*	*magaliesbergensis*	Indigenous; Endemic	- LC
Fabaceae	*Dichilus*	*lebeckioides*	Indigenous	- LC
Fabaceae	*Dichilus*	*pilosus*	Indigenous; Endemic	- LC
Fabaceae	*Dichilus*	*strictus*	Indigenous	- LC
Fabaceae	*Dolichos*	*angustifolius*	Indigenous	- LC
Fabaceae	*Dolichos*	*falciformis*	Indigenous	- LC
Fabaceae	*Elephantorrhiza*	*elephantina*	Indigenous	- LC
Fabaceae	*Eriosema*	*burkei*	Indigenous	- LC
Fabaceae	*Eriosema*	*cordatum*	Indigenous	- LC
Fabaceae	*Eriosema*	*nutans*	Indigenous	- LC
Fabaceae	*Eriosema*	*salignum*	Indigenous	- LC
Fabaceae	*Eriosema*	*squarrosum*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Fabaceae	*Erythrina*	*zeyheri*	Indigenous	- LC
Fabaceae	*Indigastrum*	*burkeanum*	Indigenous	- LC
Fabaceae	*Indigofera*	*alternans*	Indigenous	- LC
Fabaceae	*Indigofera*	*confusa*	Indigenous	- LC
Fabaceae	*Indigofera*	*cryptantha*	Indigenous	- LC
Fabaceae	*Indigofera*	*daleoides*	Indigenous	- Not Evaluated
Fabaceae	*Indigofera*	*dimidiata*	Indigenous	- LC
Fabaceae	*Indigofera*	*hedyantha*	Indigenous	- LC
Fabaceae	*Indigofera*	*hilaris*	Indigenous	- LC
Fabaceae	*Indigofera*	*hirsuta*	Indigenous	- LC
Fabaceae	***Indigofera***	***hybrida***	**Indigenous; Endemic**	- **VU**
Fabaceae	*Indigofera*	*jucunda*	Indigenous; Endemic	- LC
Fabaceae	*Indigofera*	*melanadenia*	Indigenous	- LC
Fabaceae	*Indigofera*	*oxalidea*	Indigenous	- LC
Fabaceae	*Indigofera*	*oxytropis*	Indigenous	- LC
Fabaceae	*Indigofera*	*rostrata*	Indigenous	- LC
Fabaceae	*Indigofera*	*setiflora*	Indigenous	- LC
Fabaceae	*Indigofera*	*zeyheri*	Indigenous	- LC
Fabaceae	*Leobordea*	*arida*	Indigenous; Endemic	- LC
Fabaceae	*Leobordea*	*divaricata*	Indigenous	- LC
Fabaceae	*Leobordea*	*eriantha*	Indigenous	- LC
Fabaceae	*Leobordea*	*foliosa*	Indigenous	- LC
Fabaceae	*Leobordea*	*mucronata*	Indigenous	
Fabaceae	*Lessertia*	*frutescens*	Indigenous	- LC
Fabaceae	*Lessertia*	*frutescens*	Indigenous	- LC
Fabaceae	*Lessertia*	*perennans*	Indigenous	- Not Evaluated
Fabaceae	*Lessertia*	*stricta*	Indigenous	- LC
Fabaceae	*Listia*	*bainesii*	Indigenous	- LC
Fabaceae	*Listia*	*heterophylla*	Indigenous	- LC
Fabaceae	*Lotus*	*corniculatus*	Not indigenous; Naturalised	- Not Evaluated
Fabaceae	*Lotus*	*discolor*	Indigenous	- LC
Fabaceae	*Macrotyloma*	*axillare*	Indigenous	- LC
Fabaceae	*Medicago*	*falcata*	Not indigenous; Naturalised	- Not Evaluated
Fabaceae	*Medicago*	*sativa*	Not indigenous; Cultivated; Naturalised; Invasive	- Not Evaluated
Fabaceae	*Mundulea*	*sericea*	Indigenous	- LC
Fabaceae	*Neonotonia*	*wightii*	Indigenous	- LC
Fabaceae	*Neorautanenia*	*ficifolia*	Indigenous	- LC
Fabaceae	*Otholobium*	*polystictum*	Indigenous	- LC
Fabaceae	***Pearsonia***	***bracteata***	**Indigenous; Endemic**	- **NT**
Fabaceae	*Pearsonia*	*cajanifolia*	Indigenous; Endemic	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Fabaceae	*Pearsonia*	*sessilifolia*	Indigenous	- LC
Fabaceae	*Rhynchosia*	*adenodes*	Indigenous	- LC
Fabaceae	*Rhynchosia*	*cooperi*	Indigenous	- LC
Fabaceae	*Rhynchosia*	*pedunculata*	Indigenous; Endemic	
Fabaceae	*Rhynchosia*	*pentheri*	Indigenous	- LC
Fabaceae	*Rhynchosia*	*pentheri*	Indigenous	- LC
Fabaceae	*Rhynchosia*	*sordida*	Indigenous	- LC
Fabaceae	*Rhynchosia*	sp.		
Fabaceae	*Rhynchosia*	*totta*	Indigenous	- LC
Fabaceae	*Rhynchosia*	*totta*	Indigenous	- LC
Fabaceae	*Robinia*	*pseudoacacia*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Fabaceae	*Spartium*	*junceum*	Not indigenous; Cultivated; Naturalised; Invasive	- Cat 3
Fabaceae	*Sphenostylis*	*angustifolia*	Indigenous	- LC
Fabaceae	*Tephrosia*	*capensis*	Indigenous	- LC
Fabaceae	*Tephrosia*	*elongata*	Indigenous	- LC
Fabaceae	*Tephrosia*	*elongata*	Indigenous	- LC
Fabaceae	*Tephrosia*	*marginella*	Indigenous; Endemic	- LC
Fabaceae	*Tephrosia*	*multijuga*	Indigenous	- LC
Fabaceae	*Tephrosia*	*semiglabra*	Indigenous	- LC
Fabaceae	*Tephrosia*	sp.		
Fabaceae	*Trifolium*	*africanum*	Indigenous	- LC
Fabaceae	*Trifolium*	*africanum*	Indigenous	- LC
Fabaceae	*Trifolium*	*medium*	Not indigenous; Naturalised	- Not Evaluated
Fabaceae	*Trifolium*	*pratense*	Not indigenous; Naturalised	- Not Evaluated
Fabaceae	*Trifolium*	*repens*	Not indigenous; Naturalised	- Not Evaluated
Fabaceae	*Vachellia*	*karroo*	Indigenous	- LC
Fabaceae	*Vachellia*	*nilotica*	Indigenous	- LC
Fabaceae	*Vachellia*	*robusta*	Indigenous	- LC
Fabaceae	*Vigna*	*unguiculata*	Indigenous	- Not Evaluated
Fabaceae	*Vigna*	*vexillata*	Indigenous	- LC
Fabaceae	*Zornia*	*linearis*	Indigenous	- LC
Fabaceae	*Zornia*	*milneana*	Indigenous	- LC
Fabroniaceae	*Fabronia*	*pilifera*	Indigenous	
Fissidentaceae	*Fissidens*	*bryoides*	Indigenous	
Fissidentaceae	*Fissidens*	*fasciculatus*	Indigenous; Endemic	
Fissidentaceae	*Fissidens*	*submarginatus*	Indigenous	
Fossombroniaceae	*Fossombronia*	sp.		
Frullaniaceae	*Frullania*	*ericoides*	Indigenous	

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Frullaniaceae	*Frullania*	sp.		
Fumariaceae	*Fumaria*	*muralis*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Funariaceae	*Funaria*	*hygrometrica*	Indigenous	
Funariaceae	*Funaria*	*limbata*	Indigenous	
Funariaceae	*Physcomitrium*	*spathulatum*	Indigenous	
Gentianaceae	*Chironia*	*palustris*	Indigenous	- LC
Gentianaceae	*Chironia*	*palustris*	Indigenous	- LC
Gentianaceae	*Chironia*	*purpurascens*	Indigenous	- LC
Gentianaceae	*Exochaenium*	*grande*	Indigenous	- LC
Gentianaceae	*Sebaea*	*exigua*	Indigenous	- LC
Gentianaceae	*Sebaea*	*filiformis*	Indigenous	- LC
Gentianaceae	*Sebaea*	*leiostyla*	Indigenous	- LC
Geraniaceae	*Erodium*	*cicutarium*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Geraniaceae	*Monsonia*	*angustifolia*	Indigenous	- LC
Geraniaceae	*Monsonia*	*attenuata*	Indigenous	- LC
Geraniaceae	*Pelargonium*	*luridum*	Indigenous	- LC
Gisekiaceae	*Gisekia*	*pharnaceoides*	Indigenous	
Hyacinthaceae	*Albuca*	*glauca*	Indigenous; Endemic	- LC
Hyacinthaceae	*Albuca*	*setosa*	Indigenous	- LC
Hyacinthaceae	*Albuca*	*shawii*	Indigenous	- LC
Hyacinthaceae	*Albuca*	sp.		
Hyacinthaceae	*Albuca*	*virens*	Indigenous	- LC
Hyacinthaceae	*Dipcadi*	*gracillimum*	Indigenous	- LC
Hyacinthaceae	*Dipcadi*	*marlothii*	Indigenous	- LC
Hyacinthaceae	*Dipcadi*	*papillatum*	Indigenous	- LC
Hyacinthaceae	*Dipcadi*	sp.		
Hyacinthaceae	*Dipcadi*	*viride*	Indigenous	- LC
Hyacinthaceae	*Drimia*	*calcarata*	Indigenous	- LC
Hyacinthaceae	*Drimia*	*depressa*	Indigenous	- LC
Hyacinthaceae	*Drimia*	*elata*	Indigenous	- DDT
Hyacinthaceae	*Drimia*	*intricata*	Indigenous	- LC
Hyacinthaceae	*Drimia*	*multisetosa*	Indigenous	- LC
Hyacinthaceae	*Drimia*	*uniflora*	Indigenous	- LC
Hyacinthaceae	*Eucomis*	*autumnalis*	Indigenous	- Not Evaluated
Hyacinthaceae	*Ledebouria*	*burkei*	Indigenous	- LC
Hyacinthaceae	*Ledebouria*	*cooperi*	Indigenous	- LC
Hyacinthaceae	*Ledebouria*	*leptophylla*	Indigenous	- LC
Hyacinthaceae	*Ledebouria*	*luteola*	Indigenous	- LC
Hyacinthaceae	*Ledebouria*	*marginata*	Indigenous	- LC
Hyacinthaceae	*Ledebouria*	*ovatifolia*	Indigenous	- LC
Hyacinthaceae	*Ledebouria*	*revoluta*	Indigenous	- LC
Hyacinthaceae	*Ledebouria*	sp.		

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Hyacinthaceae	*Schizocarphus*	*nervosus*	Indigenous	- LC
Hydrocharitaceae	*Lagarosiphon*	*major*	Indigenous	- LC
Hydrocharitaceae	*Lagarosiphon*	*muscoides*	Indigenous	- LC
Hypericaceae	*Hypericum*	*aethiopicum*	Indigenous	- LC
Hypericaceae	*Hypericum*	*lalandii*	Indigenous	- LC
Hypodontiaceae	*Hypodontium*	*dregei*	Indigenous	
Hypoxidaceae	*Hypoxis*	*argentea*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	*argentea*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	*filiformis*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	*galpinii*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	*hemerocallidea*	Indigenous	- Declining
Hypoxidaceae	*Hypoxis*	*interjecta*	Indigenous; Endemic	- LC
Hypoxidaceae	*Hypoxis*	*iridifolia*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	*multiceps*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	*neliana*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	*rigidula*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	*rigidula*	Indigenous	- LC
Hypoxidaceae	*Hypoxis*	sp.		
Iridaceae	*Aristea*	*torulosa*	Indigenous	- LC
Iridaceae	*Babiana*	*bainesii*	Indigenous	- LC
Iridaceae	*Dierama*	*pulcherrimum*	Indigenous; Endemic	- LC
Iridaceae	*Gladiolus*	*crassifolius*	Indigenous	- LC
Iridaceae	*Gladiolus*	*dalenii*	Indigenous	- LC
Iridaceae	*Gladiolus*	*papilio*	Indigenous	- LC
Iridaceae	*Gladiolus*	*permeabilis*	Indigenous	- LC
Iridaceae	*Gladiolus*	*woodii*	Indigenous	- LC
Iridaceae	*Hesperantha*	*coccinea*	Indigenous	- LC
Iridaceae	*Hesperantha*	*leucantha*	Indigenous	- LC
Iridaceae	*Hesperantha*	*longicollis*	Indigenous	- LC
Iridaceae	*Iris*	*pseudacorus*	Not indigenous; Cultivated; Naturalised; Invasive	- Cat 1a
Iridaceae	*Moraea*	*pallida*	Indigenous	- LC
Iridaceae	*Moraea*	*stricta*	Indigenous	- LC
Iridaceae	*Tritonia*	*nelsonii*	Indigenous	- LC
Iridaceae	*Watsonia*	sp.		
Iridaceae	*Watsonia*	*watsonioides*	Indigenous	- LC
Juncaceae	*Juncus*	*dregeanus*	Indigenous	- LC
Juncaceae	*Juncus*	*effusus*	Indigenous	- LC
Juncaceae	*Juncus*	*lomatophyllus*	Indigenous	- LC
Juncaceae	*Juncus*	*oxycarpus*	Indigenous	- LC
Juncaceae	*Juncus*	*rigidus*	Indigenous	- LC
Lamiaceae	*Acrotome*	*inflata*	Indigenous	- LC
Lamiaceae	*Aeollanthus*	*buchnerianus*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Lamiaceae	*Ajuga*	*ophrydis*	Indigenous	- LC
Lamiaceae	*Leonotis*	*martinicensis*	Indigenous	- LC
Lamiaceae	*Leonotis*	*randii*	Indigenous	- LC
Lamiaceae	*Leonotis*	*schinzii*	Indigenous	- LC
Lamiaceae	*Ocimum*	*angustifolium*	Indigenous	- LC
Lamiaceae	*Ocimum*	*labiatum*	Indigenous	- LC
Lamiaceae	*Ocimum*	*obovatum*	Indigenous	- Not Evaluated
Lamiaceae	*Plectranthus*	*ambiguus*	Indigenous	- LC
Lamiaceae	*Plectranthus*	*ciliatus*	Indigenous	- LC
Lamiaceae	*Plectranthus*	*elegantulus*	Indigenous; Endemic	- LC
Lamiaceae	*Plectranthus*	*hereroensis*	Indigenous	- LC
Lamiaceae	*Plectranthus*	*ornatus*	Not indigenous; Naturalised	
Lamiaceae	*Plectranthus*	*ramosior*	Indigenous; Endemic	- LC
Lamiaceae	*Plectranthus*	*rubropunctatus*	Indigenous	- LC
Lamiaceae	*Plectranthus*	*verticillatus*	Indigenous	- LC
Lamiaceae	*Pycnostachys*	*reticulata*	Indigenous	- LC
Lamiaceae	*Pycnostachys*	*urticifolia*	Indigenous	- LC
Lamiaceae	*Rotheca*	*hirsuta*	Indigenous	- LC
Lamiaceae	*Salvia*	*reflexa*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Lamiaceae	*Salvia*	*repens*	Indigenous	- DDD
Lamiaceae	*Salvia*	*runcinata*	Indigenous	- LC
Lamiaceae	*Salvia*	*schlechteri*	Indigenous; Endemic	- DDD
Lamiaceae	*Salvia*	*stenophylla*	Indigenous	
Lamiaceae	*Stachys*	*hyssopoides*	Indigenous	- LC
Lamiaceae	*Syncolostemon*	*pretoriae*	Indigenous	- LC
Lamiaceae	*Syncolostemon*	*subvelutinus*	Indigenous; Endemic	- LC
Lamiaceae	*Tetradenia*	*riparia*	Indigenous	- LC
Lamiaceae	*Teucrium*	*trifidum*	Indigenous	- LC
Lamiaceae	*Vitex*	*zeyheri*	Indigenous	- LC
Lentibulariaceae	*Utricularia*	*bisquamata*	Indigenous	- LC
Lentibulariaceae	*Utricularia*	*livida*	Indigenous	- LC
Lepidoziaceae	*Telaranea*	sp.		
Leskeaceae	*Pseudoleskeopsis*	*claviramea*	Indigenous	
Leucobryaceae	*Campylopus*	*atroluteus*	Indigenous	
Leucobryaceae	*Campylopus*	*flaccidus*	Indigenous	
Leucobryaceae	*Campylopus*	*pilifer*	Indigenous	
Leucobryaceae	*Campylopus*	*pyriformis*	Indigenous	
Leucobryaceae	*Campylopus*	*robillardei*	Indigenous	
Limeaceae	*Limeum*	*argute-carinatum*	Indigenous	- LC
Limeaceae	*Limeum*	*pauciflorum*	Indigenous; Endemic	- LC
Limeaceae	*Limeum*	*viscosum*	Indigenous	- LC
Linaceae	*Linum*	*thunbergii*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Linderniaceae	*Craterostigma*	*wilmsii*	Indigenous; Endemic	- LC
Lobeliaceae	*Cyphia*	*stenopetala*	Indigenous	- LC
Lobeliaceae	*Lobelia*	*dregeana*	Indigenous	- LC
Lobeliaceae	*Lobelia*	*erinus*	Indigenous	- LC
Lobeliaceae	*Lobelia*	*laxa*	Indigenous	- LC
Lobeliaceae	*Monopsis*	*decipiens*	Indigenous	- LC
Loganiaceae	*Strychnos*	*pungens*	Indigenous	- LC
Lophocoleaceae	*Lophocolea*	*difformis*	Indigenous	
Lunulariaceae	*Lunularia*	*cruciata*	Indigenous	
Lycopodiaceae	*Palhinhaea*	*cernua*	Indigenous	
Lythraceae	*Nesaea*	*sagittifolia*	Indigenous	- Not Evaluated
Lythraceae	*Nesaea*	*schinzii*	Indigenous	- LC
Malpighiaceae	*Sphedamnocarpus*	*pruriens*	Indigenous	- LC
Malpighiaceae	*Sphedamnocarpus*	*pruriens*	Indigenous	- LC
Malvaceae	*Abutilon*	*sonneratianum*	Indigenous	- LC
Malvaceae	*Dombeya*	*rotundifolia*	Indigenous	- LC
Malvaceae	*Dombeya*	sp.		
Malvaceae	*Dombeya*	*tiliacea*	Indigenous; Endemic	- LC
Malvaceae	*Grewia*	*occidentalis*	Indigenous	- LC
Malvaceae	*Hermannia*	*depressa*	Indigenous	- LC
Malvaceae	*Hermannia*	*floribunda*	Indigenous	- LC
Malvaceae	*Hermannia*	*geniculata*	Indigenous	- LC
Malvaceae	*Hermannia*	*grandistipula*	Indigenous	- LC
Malvaceae	*Hermannia*	*lancifolia*	Indigenous; Endemic	- LC
Malvaceae	*Hermannia*	sp.		
Malvaceae	*Hibiscus*	*aethiopicus*	Indigenous	- LC
Malvaceae	*Hibiscus*	*lunariifolius*	Indigenous	
Malvaceae	*Hibiscus*	*microcarpus*	Indigenous	- LC
Malvaceae	*Hibiscus*	*mutabilis*	Not indigenous; Naturalised	- Not Evaluated
Malvaceae	*Hibiscus*	sp.		
Malvaceae	*Hibiscus*	*trionum*	Not indigenous; Naturalised	
Malvaceae	*Malva*	*verticillata*	Not indigenous; Naturalised	- Not Evaluated - Cat 1b
Malvaceae	*Pavonia*	*burchellii*	Indigenous	- LC
Malvaceae	*Pavonia*	*columella*	Indigenous	- LC
Malvaceae	*Sida*	*chrysantha*	Indigenous	- LC
Malvaceae	*Sida*	*dregei*	Indigenous	- LC
Malvaceae	*Sida*	*rhombifolia*	Indigenous	- LC
Malvaceae	*Sparrmannia*	*africana*	Indigenous; Endemic	- LC
Malvaceae	*Sphaeralcea*	*bonariensis*	Not indigenous; Naturalised	- Not Evaluated

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Malvaceae	*Triumfetta*	*annua*	Indigenous	- Not Evaluated
Malvaceae	*Triumfetta*	*pilosa*	Indigenous	- Not Evaluated
Malvaceae	*Triumfetta*	*sonderi*	Indigenous; Endemic	- LC
Marchantiaceae	*Marchantia*	*debilis*	Indigenous	
Marchantiaceae	*Marchantia*	*polymorpha*	Not indigenous; Naturalised	
Marsileaceae	*Marsilea*	*macrocarpa*	Indigenous	- LC
Melianthaceae	*Melianthus*	*major*	Indigenous; Endemic	- LC
Menyanthaceae	*Nymphoides*	*thunbergiana*	Indigenous	- LC
Mniaceae	*Pohlia*	*baronii*	Indigenous	
Molluginaceae	*Pharnaceum*	*dichotomum*	Indigenous	- LC
Molluginaceae	*Psammotropha*	*myriantha*	Indigenous	- LC
Moraceae	*Ficus*	*abutilifolia*	Indigenous	- LC
Moraceae	*Ficus*	*ingens*	Indigenous	- LC
Moraceae	*Ficus*	*salicifolia*	Indigenous	- LC
Myrothamnaceae	*Myrothamnus*	*flabellifolius*	Indigenous	- DDT
Myrsinaceae	*Lysimachia*	*ovalis*	Not indigenous; Naturalised	
Myrtaceae	*Eucalyptus*	*camaldulensis*	Not indigenous; Cultivated; Naturalised; Invasive	- Not Evaluated - Cat 1b
Myrtaceae	*Eucalyptus*	*regnans*	Not indigenous; Naturalised	- Not Evaluated
Myrtaceae	*Eucalyptus*	sp.		
Myrtaceae	*Kunzea*	*ericoides*	Not indigenous; Naturalised	- Cat 1a
Nyctaginaceae	*Mirabilis*	*jalapa*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Oleaceae	*Ligustrum*	*lucidum*	Not indigenous; Cultivated; Naturalised; Invasive	- Cat 3
Oleaceae	*Olea*	*europaea*	Indigenous	- LC
Oliniaceae	*Olinia*	*emarginata*	Indigenous	- LC
Onagraceae	*Epilobium*	*capense*	Indigenous	- LC
Onagraceae	*Epilobium*	*hirsutum*	Indigenous	- LC
Onagraceae	*Oenothera*	*rosea*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Onagraceae	*Oenothera*	*stricta*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Orchidaceae	*Bonatea*	*antennifera*	Indigenous	- LC
Orchidaceae	*Bonatea*	*boltonii*	Indigenous; Endemic	- LC
Orchidaceae	*Bonatea*	*porrecta*	Indigenous	- LC
Orchidaceae	*Disperis*	*micrantha*	Indigenous	- LC
Orchidaceae	*Eulophia*	*hereroensis*	Indigenous	- LC
Orchidaceae	*Eulophia*	*hians*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Orchidaceae	*Eulophia*	*hians*	Indigenous	- LC
Orchidaceae	*Eulophia*	*ovalis*	Indigenous	- LC
Orchidaceae	*Eulophia*	*ovalis*	Indigenous	- LC
Orchidaceae	*Habenaria*	*falcicornis*	Indigenous	- LC
Orchidaceae	*Habenaria*	*filicornis*	Indigenous	- LC
Orchidaceae	*Habenaria*	*galpinii*	Indigenous	- LC
Orchidaceae	***Holothrix***	***randii***	**Indigenous**	- **NT** - **Near Threatened (CITES)**
Orchidaceae	*Holothrix*	*villosa*	Indigenous; Endemic	- LC
Orchidaceae	*Orthochilus*	*foliosus*	Indigenous	- LC
Orchidaceae	*Orthochilus*	*leontoglossus*	Indigenous	- LC
Orchidaceae	*Orthochilus*	*welwitschii*	Indigenous	- LC
Orchidaceae	*Satyrium*	*cristatum*	Indigenous	- LC
Orchidaceae	*Satyrium*	*hallackii* ssp. *ocellatum*	Indigenous	- LC
Orchidaceae	*Satyrium*	*trinerve*	Indigenous	- LC
Orchidaceae	*Schizochilus*	*zeyheri*	Indigenous	- LC
Orobanchaceae	*Alectra*	*orobanchoides*	Indigenous	- LC
Orobanchaceae	*Cycnium*	*tubulosum*	Indigenous	- LC
Orobanchaceae	*Graderia*	*subintegra*	Indigenous	- LC
Orobanchaceae	*Harveya*	*pumila*	Indigenous	- LC
Orobanchaceae	*Harveya*	sp.		-
Orobanchaceae	*Sopubia*	*cana*	Indigenous	- LC
Orobanchaceae	*Sopubia*	*cana*	Indigenous	- LC
Orobanchaceae	*Striga*	*asiatica*	Indigenous	- LC
Orobanchaceae	*Striga*	*bilabiata*	Indigenous	- LC
Orobanchaceae	*Striga*	*elegans*	Indigenous	- LC
Orobanchaceae	*Striga*	*gesnerioides*	Indigenous	- LC
Orobanchaceae	*Striga*	sp.		
Oxalidaceae	*Oxalis*	*corniculata*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Oxalidaceae	*Oxalis*	*obliquifolia*	Indigenous	- LC
Pallaviciniaceae	*Symphyogyna*	*brasiliensis*	Indigenous	
Papaveraceae	*Argemone*	*ochroleuca*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Papaveraceae	*Papaver*	*aculeatum*	Indigenous	- LC
Peraceae	*Clutia*	*hirsuta*	Indigenous	- LC
Peraceae	*Clutia*	*natalensis*	Indigenous	- LC
Peraceae	*Clutia*	*pulchella*	Indigenous	- LC
Phrymaceae	*Mimulus*	*gracilis*	Indigenous	- LC
Phyllanthaceae	*Phyllanthus*	sp.		
Phytolaccaceae	*Phytolacca*	*dioica*	Not indigenous; Naturalised; Invasive	- Not Evaluated

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
				- Cat 3
Phytolaccaceae	*Phytolacca*	*heptandra*	Indigenous	- LC
Phytolaccaceae	*Phytolacca*	*octandra*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Pittosporaceae	*Pittosporum*	*viridiflorum*	Indigenous	- LC
Plantaginaceae	*Plantago*	*lanceolata*	Indigenous	- LC
Plantaginaceae	*Plantago*	*myosuros*	Not indigenous; Naturalised	- Not Evaluated
Plantaginaceae	*Veronica*	*anagallis-aquatica*	Indigenous	- LC
Poaceae	*Acroceras*	*macrum*	Indigenous	- LC
Poaceae	*Agrostis*	*eriantha*	Indigenous	- LC
Poaceae	*Agrostis*	*eriantha*	Indigenous	- LC
Poaceae	*Agrostis*	*lachnantha*	Indigenous	- LC
Poaceae	*Alloteropsis*	*semialata*	Indigenous	- LC
Poaceae	*Alloteropsis*	*semialata*	Indigenous	- LC
Poaceae	*Andropogon*	*appendiculatus*	Indigenous	- LC
Poaceae	*Andropogon*	*eucomus*	Indigenous	- LC
Poaceae	*Andropogon*	*huillensis*	Indigenous	- LC
Poaceae	*Andropogon*	*schirensis*	Indigenous	- LC
Poaceae	*Aristida*	*adscensionis*	Indigenous	- LC
Poaceae	*Aristida*	*aequiglumis*	Indigenous	- LC
Poaceae	*Aristida*	*congesta*	Indigenous	- LC
Poaceae	*Aristida*	*congesta*	Indigenous	- LC
Poaceae	*Aristida*	*diffusa*	Indigenous	- LC
Poaceae	*Aristida*	*junciformis*	Indigenous	- LC
Poaceae	*Aristida*	sp.		
Poaceae	*Aristida*	*stipitata*	Indigenous	- LC
Poaceae	*Aristida*	*transvaalensis*	Indigenous	- LC
Poaceae	*Arundinella*	*nepalensis*	Indigenous	- LC
Poaceae	*Avena*	*fatua*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Poaceae	*Bewsia*	*biflora*	Indigenous	- LC
Poaceae	*Brachiaria*	*advena*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Brachiaria*	*serrata*	Indigenous	- LC
Poaceae	*Briza*	*maxima*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Poaceae	*Briza*	*minor*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Poaceae	*Bromus*	*catharticus*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Poaceae	*Bromus*	sp.		
Poaceae	*Chloris*	*pycnothrix*	Indigenous	- LC
Poaceae	*Chloris*	*virgata*	Indigenous	- LC
Poaceae	*Cymbopogon*	*caesius*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Poaceae	*Cymbopogon*	*nardus*	Indigenous	- LC
Poaceae	*Cymbopogon*	*pospischilii*	Indigenous	- Not Evaluated
Poaceae	*Cymbopogon*	*prolixus*	Indigenous	- LC
Poaceae	*Cynodon*	*bradleyi*	Indigenous; Endemic	- LC
Poaceae	*Cynodon*	*dactylon*	Indigenous	- LC
Poaceae	*Cynodon*	*hirsutus*	Indigenous	- Not Evaluated
Poaceae	*Cynodon*	*transvaalensis*	Indigenous	- LC
Poaceae	*Dactyloctenium*	*giganteum*	Indigenous	- LC
Poaceae	*Digitaria*	*brazzae*	Indigenous	- LC
Poaceae	*Digitaria*	*eriantha*	Indigenous	- LC
Poaceae	*Digitaria*	*monodactyla*	Indigenous	- LC
Poaceae	*Digitaria*	*natalensis*	Indigenous	- LC
Poaceae	*Digitaria*	*sanguinalis*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Digitaria*	sp.		
Poaceae	*Digitaria*	*ternata*	Indigenous	- LC
Poaceae	*Digitaria*	*tricholaenoides*	Indigenous	- LC
Poaceae	*Diheteropogon*	*amplectens*	Indigenous	- LC
Poaceae	*Echinochloa*	*crus-galli*	Indigenous	- LC
Poaceae	*Echinochloa*	*jubata*	Indigenous	- LC
Poaceae	*Ehrharta*	*erecta*	Indigenous	- LC
Poaceae	*Eleusine*	*coracana*	Indigenous	- LC
Poaceae	*Eleusine*	*indica*	Indigenous	- LC
Poaceae	*Eleusine*	*multiflora*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Eleusine*	*tristachya*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Elionurus*	*muticus*	Indigenous	- LC
Poaceae	*Enneapogon*	*scoparius*	Indigenous	- LC
Poaceae	*Eragrostis*	*capensis*	Indigenous	- LC
Poaceae	*Eragrostis*	*chloromelas*	Indigenous	- LC
Poaceae	*Eragrostis*	*cilianensis*	Indigenous	- LC
Poaceae	*Eragrostis*	*curvula*	Indigenous	- LC
Poaceae	*Eragrostis*	*gummiflua*	Indigenous	- LC
Poaceae	*Eragrostis*	*lappula*	Indigenous	- LC
Poaceae	*Eragrostis*	*mexicana*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Eragrostis*	*micrantha*	Indigenous	- LC
Poaceae	*Eragrostis*	*nindensis*	Indigenous	- LC
Poaceae	*Eragrostis*	*patens*	Indigenous	- LC
Poaceae	*Eragrostis*	*patentipilosa*	Indigenous	- LC
Poaceae	*Eragrostis*	*plana*	Indigenous	- LC
Poaceae	*Eragrostis*	*planiculmis*	Indigenous	- LC
Poaceae	*Eragrostis*	*racemosa*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Poaceae	*Eragrostis*	*sclerantha*	Indigenous	- LC
Poaceae	*Eragrostis*	sp.		
Poaceae	*Eragrostis*	*tef*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Fingerhuthia*	*sesleriiformis*	Indigenous	- LC
Poaceae	*Harpochloa*	*falx*	Indigenous	- LC
Poaceae	*Heteropogon*	*contortus*	Indigenous	- LC
Poaceae	*Hordeum*	sp.		
Poaceae	*Hyparrhenia*	*dregeana*	Indigenous	- LC
Poaceae	*Hyparrhenia*	*hirta*	Indigenous	- LC
Poaceae	*Hyparrhenia*	sp.		
Poaceae	*Imperata*	*cylindrica*	Indigenous	- LC
Poaceae	*Koeleria*	*capensis*	Indigenous	- LC
Poaceae	*Lolium*	*temulentum*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Poaceae	*Lophacme*	*digitata*	Indigenous	- LC
Poaceae	*Loudetia*	*flavida*	Indigenous	- LC
Poaceae	*Loudetia*	*simplex*	Indigenous	- LC
Poaceae	*Melinis*	*nerviglumis*	Indigenous	- LC
Poaceae	*Melinis*	*repens*	Indigenous	- LC
Poaceae	*Melinis*	sp.		
Poaceae	*Microchloa*	*caffra*	Indigenous	- LC
Poaceae	*Microchloa*	*kunthii*	Indigenous	- LC
Poaceae	*Monocymbium*	*ceresiiforme*	Indigenous	- LC
Poaceae	*Oropetium*	*capense*	Indigenous	- LC
Poaceae	*Panicum*	*maximum*	Indigenous	- LC
Poaceae	*Panicum*	*natalense*	Indigenous	- LC
Poaceae	*Panicum*	*repens*	Indigenous	- LC
Poaceae	*Panicum*	*schinzii*	Indigenous	- LC
Poaceae	*Panicum*	sp.		
Poaceae	*Paspalum*	*dilatatum*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Poaceae	*Paspalum*	*distichum*	Not indigenous; Naturalised; Invasive	- LC
Poaceae	*Paspalum*	*scrobiculatum*	Indigenous	- LC
Poaceae	*Paspalum*	sp.		
Poaceae	*Paspalum*	*urvillei*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Poaceae	*Pennisetum*	*clandestinum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Poaceae	*Pennisetum*	*thunbergii*	Indigenous	- LC
Poaceae	*Pennisetum*	*villosum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Poaceae	*Phalaris*	*aquatica*	Not indigenous; Naturalised	- Not Evaluated

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Poaceae	*Phalaris*	*canariensis*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Phalaris*	*minor*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Poa*	*annua*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Poa*	sp.		
Poaceae	*Poa*	*trivialis*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Pogonarthria*	*squarrosa*	Indigenous	- LC
Poaceae	*Polypogon*	*monspeliensis*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Rendlia*	*altera*	Indigenous	- LC
Poaceae	*Sacciolepis*	*chevalieri*	Indigenous	- LC
Poaceae	*Schizachyrium*	*sanguineum*	Indigenous	- LC
Poaceae	*Setaria*	*incrassata*	Indigenous	- LC
Poaceae	*Setaria*	*italica*	Not indigenous; Naturalised	- Not Evaluated
Poaceae	*Setaria*	*lindenbergiana*	Indigenous	- LC
Poaceae	*Setaria*	*nigrirostris*	Indigenous	- Not Evaluated
Poaceae	*Setaria*	*pumila*	Indigenous	- LC
Poaceae	*Setaria*	sp.		
Poaceae	*Setaria*	*sphacelata*	Indigenous	- Not Evaluated
Poaceae	*Setaria*	*sphacelata*	Indigenous	- Not Evaluated
Poaceae	*Sorghum*	*bicolor*	Indigenous	- LC
Poaceae	*Sorghum*	*halepense*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 2
Poaceae	*Sorghum*	sp.		
Poaceae	*Sporobolus*	*africanus*	Indigenous	- LC
Poaceae	*Sporobolus*	*conrathii*	Indigenous	- LC
Poaceae	*Sporobolus*	*discosporus*	Indigenous	- LC
Poaceae	*Sporobolus*	*pectinatus*	Indigenous; Endemic	- LC
Poaceae	*Sporobolus*	sp.		
Poaceae	*Sporobolus*	*stapfianus*	Indigenous	- LC
Poaceae	*Stiburus*	*conrathii*	Indigenous	- LC
Poaceae	*Stiburus*	sp.		
Poaceae	*Themeda*	*triandra*	Indigenous	- LC
Poaceae	*Trachypogon*	sp.		
Poaceae	*Trachypogon*	*spicatus*	Indigenous	- LC
Poaceae	*Tragus*	*koelerioides*	Indigenous	- LC
Poaceae	*Tripogon*	*minimus*	Indigenous	- LC
Poaceae	*Trisetopsis*	*imberbis*	Indigenous	
Poaceae	*Tristachya*	*leucothrix*	Indigenous	- LC
Poaceae	*Tristachya*	*rehmannii*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Poaceae	*Urelytrum*	*agropyroides*	Indigenous	- LC
Poaceae	*Urochloa*	*brachyura*	Indigenous	- LC
Poaceae	*Urochloa*	*panicoides*	Indigenous	
Podocarpaceae	***Podocarpus***	***henkelii***	**Indigenous; Endemic**	- **LC** - **Protected**
Polygalaceae	*Polygala*	*gerrardii*	Indigenous; Endemic	- LC
Polygalaceae	*Polygala*	*gracilenta*	Indigenous	- LC
Polygalaceae	*Polygala*	*hottentotta*	Indigenous	- LC
Polygalaceae	*Polygala*	*leendertziae*	Indigenous	- LC
Polygalaceae	*Polygala*	*rehmannii*	Indigenous	- LC
Polygalaceae	*Polygala*	*transvaalensis*	Indigenous	- LC
Polygonaceae	*Fallopia*	*convolvulus*	Not indigenous; Naturalised	- Not Evaluated
Polygonaceae	*Oxygonum*	*dregeanum*	Indigenous	- Not Evaluated
Polygonaceae	*Oxygonum*	*dregeanum*	Indigenous; Endemic	- Not Evaluated
Polygonaceae	*Persicaria*	*decipiens*	Indigenous	- LC
Polygonaceae	*Persicaria*	*lapathifolia*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Polygonaceae	*Persicaria*	*madagascariensis*	Indigenous	
Polygonaceae	*Polygonum*	*aviculare*	Not indigenous; Naturalised	- Not Evaluated
Polygonaceae	*Rumex*	*acetosella*	Not indigenous; Naturalised	
Polygonaceae	*Rumex*	*crispus*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Polygonaceae	*Rumex*	*lanceolatus*	Indigenous	- LC
Polygonaceae	*Rumex*	*sagittatus*	Indigenous	- LC
Polypodiaceae	*Pleopeltis*	*macrocarpa*	Indigenous	- LC
Polytrichaceae	*Pogonatum*	*capense*	Indigenous	
Pontederiaceae	*Pontederia*	*cordata*	Not indigenous; Naturalised	- Not Evaluated - Cat 1b
Portulacaceae	*Portulaca*	*quadrifida*	Indigenous	- LC
Potamogetonaceae	*Potamogeton*	*nodosus*	Indigenous	- LC
Potamogetonaceae	*Potamogeton*	*octandrus*	Indigenous	- LC
Potamogetonaceae	*Potamogeton*	*pectinatus*	Indigenous	- LC
Potamogetonaceae	*Potamogeton*	*pusillus*	Indigenous	- LC
Potamogetonaceae	*Potamogeton*	*trichoides*	Indigenous	- LC
Pottiaceae	*Gymnostomum*	sp.		
Pottiaceae	*Leptophascum*	*leptophyllum*	Indigenous	
Pottiaceae	*Trichostomum*	*brachydontium*	Indigenous	
Pottiaceae	*Weissia*	*controversa*	Indigenous	
Proteaceae	*Faurea*	*rochetiana*	Indigenous	- LC
Proteaceae	*Leucadendron*	sp.		
Proteaceae	*Protea*	*caffra*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Proteaceae	*Protea*	*caffra*	Indigenous	- LC
Proteaceae	*Protea*	*roupelliae ssp. roupelliae*	Indigenous	- LC
Proteaceae	*Protea*	sp.		
Proteaceae	*Protea*	*welwitschii*	Indigenous	- LC
Pteridaceae	*Cheilanthes*	*hirta*	Indigenous	- LC
Pteridaceae	*Cheilanthes*	*involuta*	Indigenous	- LC
Pteridaceae	*Cheilanthes*	*quadripinnata*	Indigenous	- LC
Pteridaceae	*Cheilanthes*	*viridis*	Indigenous	- LC
Pteridaceae	*Cheilanthes*	*viridis*	Indigenous	- LC
Pteridaceae	*Pellaea*	*calomelanos*	Indigenous	- LC
Ranunculaceae	*Clematis*	*brachiata*	Indigenous	- LC
Ranunculaceae	*Clematis*	*oweniae*	Indigenous	
Ranunculaceae	*Clematis*	sp.		
Ranunculaceae	*Ranunculus*	*dregei*	Indigenous	- LC
Ranunculaceae	*Ranunculus*	*multifidus*	Indigenous	- LC
Rhabdoweisiaceae	*Oreoweisia*	*erosa*	Indigenous	
Rhamnaceae	*Helinus*	*integrifolius*	Indigenous	- LC
Rhamnaceae	*Phylica*	*karroica*	Indigenous; Endemic	- LC
Rhamnaceae	*Rhamnus*	*prinoides*	Indigenous	- LC
Rhamnaceae	*Ziziphus*	*mucronata*	Indigenous	- LC
Rhamnaceae	*Ziziphus*	*zeyheriana*	Indigenous	- LC
Ricciaceae	*Riccia*	*okahandjana*	Indigenous	
Ricciaceae	*Riccia*	sp.		
Ricciaceae	*Riccia*	*stricta*	Indigenous	
Ricciaceae	*Riccia*	*volkii*	Indigenous	
Rosaceae	*Agrimonia*	*procera*	Not indigenous; Naturalised; Invasive	- LC - Cat 1b
Rosaceae	*Prunus*	sp.		
Rubiaceae	*Afrocanthium*	*gilfillanii*	Indigenous	- LC
Rubiaceae	*Afrocanthium*	*mundianum*	Indigenous	- LC
Rubiaceae	*Anthospermum*	*hispidulum*	Indigenous	- LC
Rubiaceae	*Anthospermum*	*rigidum*	Indigenous	- LC
Rubiaceae	*Anthospermum*	*rigidum*	Indigenous	- LC
Rubiaceae	*Bridsonia*	*chamaedendrum*	Indigenous	
Rubiaceae	*Canthium*	*inerme*	Indigenous	- LC
Rubiaceae	*Canthium*	*suberosum*	Indigenous	- LC
Rubiaceae	*Cordylostigma*	*virgatum*	Indigenous	- LC
Rubiaceae	*Galium*	*capense*	Indigenous	- LC
Rubiaceae	*Kohautia*	*amatymbica*	Indigenous	- LC
Rubiaceae	*Kohautia*	*caespitosa*	Indigenous	- LC
Rubiaceae	*Oldenlandia*	*herbacea*	Indigenous	- LC
Rubiaceae	*Pavetta*	*gardeniifolia*	Indigenous	- LC
Rubiaceae	*Pentanisia*	*angustifolia*	Indigenous	- LC

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Rubiaceae	*Pentanisia*	*prunelloides*	Indigenous	- LC
Rubiaceae	*Pentodon*	*pentandrus*	Indigenous	- LC
Rubiaceae	*Pygmaeothamnus*	*zeyheri*	Indigenous	- LC
Rubiaceae	*Richardia*	*brasiliensis*	Not indigenous; Naturalised	- Not Evaluated
Rubiaceae	*Richardia*	*scabra*	Not indigenous; Naturalised	- Not Evaluated
Rubiaceae	*Rothmannia*	*capensis*	Indigenous	- LC
Rubiaceae	*Vangueria*	*infausta*	Indigenous	- LC
Rubiaceae	*Vangueria*	*parvifolia*	Indigenous	- LC
Rubiaceae	*Vangueria*	*pygmaea*	Indigenous	
Ruscaceae	*Sansevieria*	*aethiopica*	Indigenous	- LC
Rutaceae	*Calodendrum*	*capense*	Indigenous	- LC
Rutaceae	*Zanthoxylum*	*capense*	Indigenous	- LC
Salicaceae	*Scolopia*	*zeyheri*	Indigenous	- LC
Salviniaceae	*Azolla*	*filiculoides*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Santalaceae	*Osyris*	*lanceolata*	Indigenous	- LC
Santalaceae	*Thesium*	*costatum*	Indigenous	- LC
Santalaceae	*Thesium*	*ericaefolium*	Indigenous; Endemic	- LC
Santalaceae	*Thesium*	*goetzeanum*	Indigenous	- LC
Santalaceae	*Thesium*	*rasum*	Indigenous	- LC
Santalaceae	*Thesium*	sp.		
Santalaceae	*Thesium*	*spartioides*	Indigenous	- LC
Santalaceae	*Thesium*	*transvaalense*	Indigenous; Endemic	- LC
Santalaceae	*Thesium*	*utile*	Indigenous	- LC
Santalaceae	*Viscum*	*combreticola*	Indigenous	- LC
Santalaceae	*Viscum*	*rotundifolium*	Indigenous	- LC
Sapindaceae	*Pappea*	*capensis*	Indigenous	- LC
Sapotaceae	*Englerophytum*	*magalismontanum*	Indigenous	- LC
Sapotaceae	*Mimusops*	*zeyheri*	Indigenous	- LC
Sapotaceae	*Sideroxylon*	sp.		
Scrophulariaceae	*Aptosimum*	*elongatum*	Indigenous	- LC
Scrophulariaceae	*Buddleja*	*saligna*	Indigenous	- LC
Scrophulariaceae	*Buddleja*	*salviifolia*	Indigenous	- LC
Scrophulariaceae	*Chaenostoma*	*leve*	Indigenous	- LC
Scrophulariaceae	*Diclis*	*rotundifolia*	Indigenous	- LC
Scrophulariaceae	*Gomphostigma*	*virgatum*	Indigenous	- LC
Scrophulariaceae	*Hebenstretia*	*comosa*	Indigenous	- LC
Scrophulariaceae	*Hebenstretia*	sp.		
Scrophulariaceae	*Jamesbrittenia*	*aurantiaca*	Indigenous	- LC
Scrophulariaceae	*Jamesbrittenia*	*burkeana*	Indigenous	- LC
Scrophulariaceae	*Jamesbrittenia*	sp.		

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Scrophulariaceae	*Limosella*	*longiflora*	Indigenous	- LC
Scrophulariaceae	*Limosella*	*maior*	Indigenous	- LC
Scrophulariaceae	*Limosella*	sp.		
Scrophulariaceae	*Manulea*	*bellidifolia*	Indigenous; Endemic	- LC
Scrophulariaceae	*Manulea*	*paniculata*	Indigenous	- LC
Scrophulariaceae	*Manulea*	*parviflora*	Indigenous	- LC
Scrophulariaceae	*Manulea*	*parviflora*	Indigenous; Endemic	- LC
Scrophulariaceae	*Melanospermum*	*foliosum*	Indigenous	- LC
Scrophulariaceae	*Nemesia*	*fruticans*	Indigenous	- LC
Scrophulariaceae	*Nemesia*	*rupicola*	Indigenous	- LC
Scrophulariaceae	*Nemesia*	sp.		
Scrophulariaceae	*Nemesia*	*umbonata*	Indigenous	- LC
Scrophulariaceae	*Phygelius*	*aequalis*	Indigenous	- LC
Scrophulariaceae	*Selago*	*canescens*	Indigenous; Endemic	- LC
Scrophulariaceae	*Selago*	*capitellata*	Indigenous; Endemic	- LC
Scrophulariaceae	*Selago*	*densiflora*	Indigenous	- LC
Scrophulariaceae	*Selago*	sp.		
Scrophulariaceae	*Zaluzianskya*	*elongata*	Indigenous	- LC
Scrophulariaceae	*Zaluzianskya*	*katharinae*	Indigenous; Endemic	- LC
Scrophulariaceae	*Zaluzianskya*	*ovata*	Indigenous	- LC
Scrophulariaceae	*Zaluzianskya*	sp.		
Selaginellaceae	*Selaginella*	*dregei*	Indigenous	- LC
Sematophyllaceae	*Sematophyllum*	*sphaeropyxis*	Indigenous	
Solanaceae	*Cestrum*	*aurantiacum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Solanaceae	*Cestrum*	*laevigatum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Solanaceae	*Datura*	*stramonium*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Solanaceae	*Physalis*	*angulata*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Solanaceae	*Physalis*	*viscosa*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Solanaceae	*Solanum*	*campylacanthum*	Indigenous	- LC
Solanaceae	*Solanum*	*capense*	Indigenous	- LC
Solanaceae	*Solanum*	*chenopodioides*	Not indigenous; Naturalised; Invasive	- Not Evaluated
Solanaceae	*Solanum*	*humile*	Indigenous	
Solanaceae	*Solanum*	*lichtensteinii*	Indigenous	- LC
Solanaceae	*Solanum*	*mauritianum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Solanaceae	*Solanum*	*nigrum*	Not indigenous; Naturalised	- Not Evaluated

FAMILY	GENUS	SPECIES	ECOLOGY	STATUS
Solanaceae	*Solanum*	*pseudocapsicum*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Solanaceae	*Solanum*	*retroflexum*	Indigenous	- LC
Solanaceae	*Solanum*	*rubetorum*	Indigenous; Endemic	- LC
Solanaceae	*Solanum*	*sisymbriifolium*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Solanaceae	*Solanum*	*tomentosum*	Indigenous	- LC
Solanaceae	*Solanum*	*tuberosum*	Not indigenous; Naturalised	- Not Evaluated
Solanaceae	*Withania*	*somnifera*	Indigenous	- LC
Stilbaceae	*Halleria*	*lucida*	Indigenous	- LC
Stilbaceae	*Nuxia*	*congesta*	Indigenous	- LC
Talinaceae	*Talinum*	*caffrum*	Indigenous	- LC
Thymelaeaceae	*Gnidia*	*gymnostachya*	Indigenous	- LC
Thymelaeaceae	*Lasiosiphon*	*caffer*	Indigenous	- LC
Thymelaeaceae	*Lasiosiphon*	*canoargenteus*	Indigenous; Endemic	- LC
Thymelaeaceae	*Lasiosiphon*	*capitatus*	Indigenous	- LC
Thymelaeaceae	*Lasiosiphon*	*kraussianus*	Indigenous	- LC
Thymelaeaceae	*Lasiosiphon*	*microcephalus*	Indigenous	
Urticaceae	*Obetia*	*tenax*	Indigenous	- LC
Urticaceae	*Pouzolzia*	*mixta*	Indigenous	- LC
Valerianaceae	*Valeriana*	*capensis*	Indigenous	- LC
Verbenaceae	*Chascanum*	*hederaceum*	Indigenous	- LC
Verbenaceae	*Chascanum*	*incisum*	Indigenous	- LC
Verbenaceae	*Glandularia*	*aristigera*	Not indigenous; Naturalised; Invasive	
Verbenaceae	*Lantana*	*rugosa*	Indigenous	- LC
Verbenaceae	*Lippia*	*javanica*	Indigenous	- LC
Verbenaceae	*Lippia*	*scaberrima*	Indigenous	- LC
Verbenaceae	*Verbena*	*bonariensis*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Verbenaceae	*Verbena*	*rigida*	Not indigenous; Naturalised; Invasive	- Not Evaluated - Cat 1b
Vitaceae	*Cissus*	*cactiformis*	Indigenous	- LC
Vitaceae	*Cyphostemma*	*sandersonii*	Indigenous	- LC
Vitaceae	*Rhoicissus*	*tridentata*	Indigenous	- LC
Vitaceae	*Rhoicissus*	*tridentata*	Indigenous; Endemic	- LC
Zygophyllaceae	*Tribulus*	*terrestris*	Indigenous	- LC

10 APPENDIX C: LIST OF FAUNAL SPECIES

10.1 LIST OF AMPHIBIAN SPECIES

The following list of amphibian species have distribution ranges which include the study area of the proposed development, based on the following sources:

1. Amphibian Taxon Search for coordinate 26° 5'25.65"S, 28°11'5.34"E (IUCN, 2022);
2. The Frog Map, species list search for Quarter Degree Square (QDS) 2628AA (ADU, 2022); and
3. Amphibian Taxon Search (iNaturalist, 2021).

Table 10.1 List of amphibian species with a distribution range which includes the proposed development area.

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	SOURCE
Brevicipitidae	*Breviceps adspersus*	Common Rain Frog	LC	1
Bufonidae	*Poyntonophrynus fenoulheti*	Fenoulhet's Toad	LC	1
	Schismaderma carens	Red Toad	LC	1, 2, 3
	Sclerophrys capensis	Raucous Toad	LC	1, 2, 3
	Sclerophrys garmani	Garman's Toad	LC	1
	Sclerophrys gutturalis	Guttural Toad	LC	1, 2
	Sclerophrys poweri	Power's Toad	LC	1
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	LC	1, 2, 3
	Semnodactylus wealii	Weale's Running Frog	LC	1
Microhylidae	*Phrynomantis bifasciatus*	Red-Banded Rubber Frog	LC	1
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	LC	1, 2
Pipidae	*Xenopus laevis*	Common Platanna	LC	1, 2
Ptychadenidae	*Ptychadena anchietae*	Anchieta's Ridged Frog	LC	1
	Ptychadena porosissima	Grassland Ridged Frog	LC	1
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	LC	1, 2, 3
	Amietia fuscigula	Cape River Frog	LC	1, 2
	Amietia poyntoni	Poynton's River Frog	LC	1
	Cacosternum boettgeri	Common Caco	LC	1, 2
	Pyxicephalus adspersus	Giant Bull Frog	LC	1, 2
	Pyxicephalus edulis	Edible Bullfrog	LC	1
	Strongylopus fasciatus	Striped Stream Frog	LC	1, 2
	Tomopterna cryptotis	Tremelo Sand Frog	LC	1, 2
	Tomopterna natalensis	Natal Sand Frog	LC	1, 2
	Tomopterna tandyi	Tandy's Sand Frog	LC	1

10.2 LIST OF REPTILE SPECIES

The following list of reptile species have distribution ranges which include the study area of the proposed development, based on the following sources:

1. Reptile Taxon Search for coordinate 26° 5'25.65"S, 28°11'5.34"E (IUCN, 2022);
2. The Reptile Map, species list search for QDS 2628AA (ADU, 2022); and
3. Reptile Taxon Search (iNaturalist, 2021).

Table 10.2 List of reptile species with a distribution range which includes the proposed development area.

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	SOURCE
LIZARDS				
Agamidae	*Agama aculeata*	Ground Agama	LC	1
	Agama aculeata distanti	Distant's Ground Agama	LC	2
	Agama atra	Southern Rock Agama	LC	1, 2
Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	LC	1, 2
Cordylidae	*Chamaesaura aenea*	Coppery Grass Lizard	LC	1, 2
	Chamaesaura anguina	Cape Snake Lizard	LC	1
	Cordylus jonesii	Jones' Girdled Lizard	LC	1
	Cordylus vittifer	Common Girdled Lizard	LC	1, 2
	Pseudocordylus melanotus	Highveld Crag Lizard	LC	1
Gekkonidae	*Chondrodactylus turneri*	Turner's Gecko	LC	1
	Hemidactylus mabouia	Common Tropical House Gecko	LC	1, 2, 3
	Lygodactylus capensis	Common Dwarf Gecko	LC	1, 2, 3
	Lygodactylus ocellatus	Spotted Dwarf Gecko	LC	1
	Pachydactylus affinis	Transvaal Gecko	LC	1, 2
	Pachydactylus capensis	Cape Gecko	LC	1, 2
	Pachydactylus sp.		LC	2
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	LC	1, 2
Lacertidae	*Meroles squamulosus*	Common Desert Lizard	LC	1
	Nucras holubi	Holub's Sandveld Lizard	LC	1
	Nucras intertexta	Spotted Sandveld Lizard	LC	1
	Nucras lalandii	Delalande's Sandveld Lizard	LC	1, 2
	Nucras ornata	Ornate Sandveld Lizard	LC	1
	Pedioplanis lineoocellata	Spotted Sand Lizard	LC	1
Scincidae	*Acontias gracilicauda*	Thin-tailed Legless Skink	LC	1, 2
	Acontias occidentalis	Western Legless Skink	LC	1
	Mochlus sundevallii	Sundevall's Writhing Skink	LC	1
	Panaspis wahlbergii	Wahlberg's Snake-eyed Skink	LC	1, 2
	Trachylepis capensis	Cape Skink	LC	1, 2
	Trachylepis damarana	Damara Variable Skink	LC	1
	Trachylepis punctatissima	Speckled Rock Skink	LC	1, 2, 3
	Trachylepis varia	Eastern Variable Skink	LC	1
	Trachylepis varia sensu lato	Common Variable Skink Complex	LC	2
Varanidae	*Varanus albigularis*	White-throated Monitor	LC	1
	Varanus niloticus	Nile Monitor	LC	1, 2, 3

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	SOURCE
SNAKES				
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	LC	1, 2
	Dasypeltis scabra	Rhombic Egg-eater	LC	1, 2
	Dispholidus typus	Boomslang	LC	1
	Philothamnus hoplogaster	South Eastern Green Snake	LC	1, 2
	Philothamnus natalensis	Eastern Natal Green Snake	LC	1
	Philothamnus semivariegatus	Spotted Bush Snake	LC	1
	Telescopus semiannulatus	Common Tiger Snake	LC	1
	Thelotornis capensis	Southern Twig Snake	LC	1
Elapidae	*Elapsoidea sundevallii*	Sundevall's Garter Snake	LC	1
	Elapsoidea sundevallii media	Highveld Garter Snake	LC	2
	Hemachatus haemachatus	Rinkhals	LC	1, 2
	Naja annulifera	Snouted Cobra	LC	1, 3
	Naja mossambica	Mozambique Spitting Cobra	LC	1, 2
Lamprophiidae	*Amblyodipsas polylepis*	Common Purple-glossed Snake	LC	1
	Amblyodipsas polylepis polylepis	Common Purple-glossed Snake	LC	2
	Aparallactus capensis	Black-headed Centipede-eater	LC	1, 2
	Aspidelaps scutatus	Speckled Shield Cobra	LC	1
	Atractaspis bibronii	Bibron's Stiletto Snake	LC	1, 2
	Atractaspis duerdeni	Duerden's Burrowing Asp	LC	1
	Boaedon capensis	Brown House Snake	LC	1, 2
	Duberria lutrix	Common Slug Eater	LC	1
	Duberria lutrix lutrix	South African Slug-eater	LC	2
	Homoroselaps dorsalis	Striped Harlequin Snake	LC	1, 2
	Homoroselaps lacteus	Spotted Harlequin Snake	LC	1, 2
	Lamprophis aurora	Aurora House Snake	LC	1, 2
	Limaformosa capensis	Common File Snake	LC	1, 2
	Lycodonomorphus inornatus	Olive House Snake	LC	1, 2
	Lycodonomorphus rufulus	Brown Water Snake	LC	1, 2
	Lycophidion capense	Cape Wolf Snake	LC	1
	Lycophidion capense capense	Cape Wolf Snake	LC	2
	Prosymna bivittata	Two-striped Shovel-snout	LC	1
	Prosymna sundevallii	Sundevall's Shovel-snout	LC	1, 2
	Psammophis angolensis	Dwarf Sand Snake	LC	1
	Psammophis brevirostris	Short-snouted Grass Snake	LC	1, 2
	Psammophis crucifer	Cross-marked Grass Snake	LC	1, 2
	Psammophis jallae	Jalla's Sand Snake	LC	1
	Psammophis leightoni	Cape Sand Snake	LC	1
	Psammophis subtaeniatus	Western Yellow-bellied Sand Snake	LC	1, 2
	Psammophylax rhombeatus	Spotted Grass Snake	LC	1, 2
	Psammophylax tritaeniatus	Striped Grass Snake	LC	1, 2
	Pseudaspis cana	Mole Snake	LC	1, 2

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	SOURCE
Leptotyphlopidae	*Leptotyphlops conjunctus*	Cape Thread Snake	LC	1
	Leptotyphlops distanti	Distant's Thread Snake	LC	1
	Leptotyphlops incognitus	Incognito Thread Snake	LC	1
	Leptotyphlops scutifrons	Peter's Thread Snake	LC	1
	Leptotyphlops scutifrons conjunctus	Eastern Thread Snake	LC	2
	Leptotyphlops scutifrons scutifrons	Peters' Thread Snake	LC	2
Pythonidae	*Python natalensis*	Southern African Rock Python	LC	1
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	LC	1, 2
	Indotyphlops braminus	Brahminy Blindsnake	LC	1
	Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	1
Viperidae	*Bitis arietans*	Puff Adder	LC	1
	Bitis arietans arietans	Puff Adder	LC	2
	Bitis caudalis	Horned Adder	LC	1
	Causus rhombeatus	Rhombic Night Adder	LC	1, 2
TERRAPINS, TORTOISES AND TURTLES				
Pelomedusidae	*Pelomedusa galeata*	South African Marsh Terrapin	LC	1, 2
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	LC	2
WORM LIZARDS				
Amphisbaenia	*Monopeltis infuscata*	Dusky Worm Lizard	LC	1

10.3 LIST OF MAMMAL SPECIES

The following list of mammal species have distribution ranges which include the study area of the proposed development, based on the following sources:

1. Mammal Taxon Search for coordinate 26° 5'25.65"S, 28°11'5.34"E (IUCN, 2022);
2. The Mammal Map, species list search for QDS 2628AA (ADU, 2022);
3. Mammal Taxon Search (iNaturalist, 2021); and
4. The DFFE Screening Reports (2021).

Table 10.3 List of mammal species with a distribution range which includes the proposed development area.

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	SOURCE
Bathyergidae	*Cryptomys hottentotus*	Southern African Mole-rat	LC	2
	Cryptomys hottentotus pretoriae	Common Molerat	LC	2
	Cryptomys pretoriae	Highveld Mole-rat	LC	1
Bovidae	*Aepyceros melampus*	Impala	LC	1
	Alcelaphus buselaphus	Hartebeest	LC	1, 3
	Antidorcas marsupialis	Springbok	LC	1, 3
	Connochaetes gnou	Black Wildebeest	LC	1
	Connochaetes taurinus	Blue Wildebeest	LC	1
	Damaliscus pygargus	Bontebok	LC	1
	Damaliscus pygargus phillipsi	Blesbok	LC	2
	Oreotragus oreotragus	Klipspringer	LC	2
	Ourebia ourebi	**Oribi**	**EN**	**1**
	Ourebia ourebi ourebi	**Southern Oribi**	**EN**	**4**
	Pelea capreolus	**Vaal Rhebok**	**NT**	**1**
	Raphicerus campestris	Steenbok	LC	1, 2
	Redunca fulvorufula	Mountain Reedbuck	LC	1
	Sylvicapra grimmia	Bush Duiker	LC	1, 2
	Syncerus caffer	African Buffalo	LC	1, 2
	Tragelaphus oryx	Common Eland	LC	1
	Tragelaphus scriptus	Bushbuck	LC	1
	Tragelaphus strepsiceros	Greater Kudu	LC	1
Canidae	*Canis mesomelas*	Black-backed Jackal	LC	1, 2
	Lupulella mesomelas	Black-backed Jackal	LC	3
	Vulpes chama	Cape Fox	LC	1
Cercopithecidae	*Cercopithecus sp.*	Guenons		2
	Papio ursinus	Chacma Baboon	LC	1
Chrysochloridae	***Chrysospalax villosus***	**Rough-haired Golden Mole**	**VU**	**4**
Emballonuridae	*Taphozous mauritianus*	Mauritian Tomb Bat	LC	1
Equidae	*Equus quagga*	Plains Zebra	LC	1
Erinaceidae	***Atelerix frontalis***	**Southern African Hedgehog**	**NT**	**1, 2, 3**
Felidae	***Acinonyx jubatus***	**Cheetah**	**VU**	**2**
	Caracal caracal	Caracal	LC	1
	Felis nigripes	**Black-footed Cat**	**VU**	**1**

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	SOURCE
	Felis silvestris	Wildcat	LC	1
	Leptailurus serval	Serval	LC	1
	Panthera leo	Lion	LC	2
	Panthera pardus	**Leopard**	**VU**	**1**
Galagidae	*Galago moholi*	Mohol Bushbaby	LC	1
	Galago senegalensis	Senegal Bushbaby	LC	2
Gliridae	*Graphiurus platyops*	Flat-headed African Dormouse	DD	1, 2
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	LC	1, 2
	Cynictis penicillata	Yellow Mongoose	LC	1, 2
	Herpestes sanguineus	Slender Mongoose	LC	1, 2, 3
	Ichneumia albicauda	White-tailed Mongoose	LC	1
	Mungos mungo	Banded Mongoose	LC	1
	Suricata suricatta	Meerkat	LC	1
Hippopotamidae	*Hippopotamus amphibius*	Common Hippopotamus	LC	1, 2
	Cloeotis percivali	**Percival's Short-eared Trident Bat**	**EN**	**1**
	Hipposideros caffer	Sundevall's Leaf-nosed Bat	LC	1
Hyaenidae	*Crocuta crocuta*	Spotted Hyaena	LC	2
	Parahyaena brunnea	**Brown Hyaena**	**NT**	**1**
	Proteles cristata	Aardwolf	LC	1
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC	1, 2
Leporidae	*Lepus saxatilis*	Scrub Hare	LC	2
	Lepus victoriae	African Savanna Hare	LC	1
	Pronolagus randensis	Jameson's Red Rock Hare	LC	1, 2
Macroscelididae	*Elephantulus brachyrhynchus*	Short-snouted Elephant Shrew	LC	1
	Elephantulus myurus	Eastern Rock Elephant Shrew	LC	1, 2
Molossidae	*Sauromys petrophilus*	Roberts's Flat-headed Bat	LC	1
	Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	1, 2
Muridae	*Acomys selousi*	Selous's Spiny Mouse	LC	1
	Aethomys ineptus	Tete Veld Aethomys	LC	1, 2
	Aethomys namaquensis	Namaqua Rock Mouse	LC	2
	Aethomys sp.	Veld rats		2
	Dasymys incomtus	**Common Dasymys**	**NT**	**1**
	Desmodillus auricularis	Cape Short-tailed Gerbil	LC	1
	Gerbilliscus brantsii	Highveld Gerbil	LC	1, 2
	Gerbilliscus leucogaster	Bushveld Gerbil	LC	1
	Gerbillurus sp.	Hairy-footed Gerbils		2
	Lemniscomys rosalia	Single-Striped Lemniscomys	LC	2
	Mastomys coucha	Southern African Mastomys	LC	1, 2
	Mastomys natalensis	Natal Mastomys	LC	1, 2
	Micaelamys namaquensis	Namaqua Rock Rat	LC	1
	Mus (Nannomys) minutoides	Southern African Pygmy Mouse	LC	2
	Mus minutoides	Tiny Pygmy Mouse	LC	3
	Mus musculus	House Mouse	LC	1

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	SOURCE
	Mus musculus musculus	Eastern European House Mouse	LC	2
	Mus sp.	Old World Mice and Pygmy Mice		2
	Myomyscus verreauxii	Verreaux's White-footed Rat	LC	2
	Otomys angoniensis	Angoni Vlei Rat	LC	1
	Otomys auratus	**Southern African Vlei Rat (Grassland type)**	**NT**	**1, 2, 3**
	Otomys sp.	Vlei Rats		2
	Rattus norvegicus	Brown Rat	LC	2
	Rattus rattus	Roof Rat	LC	1, 2
	Rattus tanezumi	Oriental House Rat	LC	2
	Rhabdomys dilectus	Mesic Four-striped Grass Rat	LC	1
	Rhabdomys pumilio	Xeric Four-striped Grass Rat	LC	2
	Thallomys paedulcus	Acacia Thallomys	LC	1
Mustelidae	***Aonyx capensis***	**African Clawless Otter**	**NT**	**1, 2**
	Hydrictis maculicollis	Spotted-necked Otter	LC	1, 2
	Ictonyx striatus	Striped Polecat	LC	1, 2
	Mellivora capensis	Honey Badger	LC	1
	Poecilogale albinucha	African Striped Weasel	LC	1
Nesomyidae	*Dendromus melanotis*	Gray African Climbing Mouse	LC	1
	Malacothrix typica	Large-eared African Desert Mouse	LC	2
	Mystromys albicaudatus	**African White-tailed Rat**	**VU**	**1, 2**
	Saccostomus campestris	Southern African Pouched Mouse	LC	1
	Steatomys krebsii	Kreb's African Fat Mouse	LC	1, 2
	Steatomys pratensis	Common African Fat Mouse	LC	1, 2
Nycteridae	*Nycteris thebaica*	Egyptian Slit-faced Bat	LC	1
Orycteropodidae	*Orycteropus afer*	Aardvark	LC	1
Pedetidae	*Pedetes capensis*	South African Spring Hare	LC	1
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	LC	1, 2
Pteropodidae	*Eidolon helvum*	African Straw-colored Fruit Bat	LC	1
	Epomophorus wahlbergi	Wahlberg's Epauletted Fruit Bat	LC	1, 2
Rhinocerotidae	***Ceratotherium simum***	**White Rhino**	**NT**	**1**
	Diceros bicornis	**Black Rhino**	**CR**	**1**
Rhinolophidae	***Rhinolophus blasii***	**Blasius's Horseshoe Bat**	**NT**	**1**
	Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	1, 2
	Rhinolophus darlingi	Darling's Horseshoe Bat	LC	1
	Rhinolophus simulator	Bushveld Horseshoe Bat	LC	1
Sciuridae	*Xerus inauris*	South African Ground Squirrel	LC	2
Soricidae	*Crocidura cyanea*	Reddish-gray Musk Shrew	LC	1
	Crocidura hirta	Lesser Red Musk Shrew	LC	1
	Crocidura maquassiensis	**Makwassie Musk Shrew**	**VU**	**1**
	Crocidura mariquensis	**Swamp Musk Shrew**	**NT**	**1, 2**
	Crocidura silacea	Lesser Gray-brown Musk Shrew	LC	1
	Crocidura sp.	Shrews		2

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS	SOURCE
	Myosorex varius	Forest Shrew	LC	2
	Suncus varilla	Lesser Dwarf Shrew	LC	1
Suidae	*Phacochoerus africanus*	Common Warthog	LC	1
	Potamochoerus larvatus	Bush-pig	LC	2
Thryonomyidae	*Thryonomys swinderianus*	Greater Cane Rat	LC	2
Vespertilionidae	*Eptesicus hottentotus*	Long-tailed House Bat	LC	1
	Kerivoula lanosa	Lesser Woolly Bat	LC	1
	Miniopterus natalensis	Natal Long-fingered Bat	LC	1
	Myotis tricolor	Temminck's Myotis	LC	1
	Myotis welwitschii	Welwitsch's Myotis	LC	1
	Neoromicia capensis	Cape Serotine	LC	1, 2
	Neoromicia nana	Banana Pipistrelle	LC	1
	Neoromicia zuluensis	Zulu Pipistrelle Bat	LC	1
	Pipistrellus rusticus	Rusty Pipistrelle	LC	2
	Scotophilus dinganii	Yellow-bellied House Bat	LC	1
Viverridae	*Genetta maculata*	Common Large-spotted Genet	LC	2
	Civettictis civetta	African Civet	LC	2
	Genetta genetta	Common Genet	LC	1, 2
	Genetta sp.	Genets		2
	Genetta tigrina	Cape Genet (Cape Large-spotted Genet)	LC	2

APPENDIX C3 –
ARCHAEOLOGICAL IMPACT ASSESSMENT

CES: PROPOSED ESKOM MESONG 400KV LOOP-IN LOOP-OUT PROJECT, EKURHULENI MUNICIPALITY GAUTENG PROVINCE

Archaeological Impact Assessment

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ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) IN THE LETHABONG AREA FOR THE PROPOSED ESKOM MESONG 400KV LOOP-IN LOOP-OUT PROJECT, EKURHULENI MUNICIPALITY, GAUTENG PROVINCE

Conducted for:
CES

Compiled by:
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DOCUMENT DISTRIBUTION LIST

Name	Institution
Greg Shaw	CES

DOCUMENT HISTORY

Date	Version	Status
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DECLARATION

I, Nelius Le Roux Kruger, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, including the relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980), the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment (SAHRA, AMAFA and the CRM section of ASAPA), regulations and any guidelines that have relevance to the proposed activity;
- I have not, 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 declaration are true and correct.

Signature of specialist
Company: Exigo Sustainability
Date: 25 July 2021

EXECUTIVE SUMMARY

This report details the results of an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project in the Lethabong area of the Ekurhuleni Municipality of the Gauteng Province. The proposed project entails the construction of a 400kV loo-in loop-out power line within a project area of approximately **10ha**. The report includes background information on the area's archaeology, its representation in Southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be supplied to the South African Heritage Resources Agency (SAHRA) and recommendations contained in this document will be reviewed.

Project Title	ESKOM Mesong 400kV Loop-In Loop-Out Project
Project Location	**S27.78891° E24.67335°**
1:50 000 Map Sheet	2628AA
Farm Portion / Parcel	Modderfontein
Magisterial District / Municipal Area	Ekurhuleni Municipality
Province	Gauteng Province

A number of academic archaeological and historical studies have been conducted in this section of the Gauteng Province and these studies all infer a relatively rich and diverse archaeological landscape, representative of most phases of human and cultural development in Southern Africa. Contained in its archaeology are traces of conquests by Bantu-speakers, Europeans and British imperialism encompassing the struggle for land, resources and political power. The history and archaeology of the greater Lethabong and Kempton Park area is well known for its Iron Age Farmer Period, Historical Period as well as industrial archaeological horizons.

An examination of historical aerial imagery and archive maps indicate that large portions of the project area subject to this assessment have been altered and transformed as a result of historical agriculture and more recent surface clearing, urban development, industrialization and refuse dumping. During the survey, no heritage receptors were noted in the project footprint and it might be assumed that this site is favorable for development. This inference is made on the assumption that no previously-undetected heritage remains are encountered during pre-construction vegetation clearing, earth moving activities and construction. The following general recommendations are made based on general observations in the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project in terms of heritage resources management.

- Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.
- It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the project area along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Also, since Stone Age material seems to originate from below present soil surfaces in eroded areas, the larger landscape should be regarded as

potentially sensitive in terms of possible subsurface deposits. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development.

This report details the methodology, limitations and recommendations relevant to these heritage areas, as well as areas of proposed development. It should be noted that recommendations and possible mitigation measures are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process).

NOTATIONS AND TERMS/TERMINOLOGY

Absolute dating: Absolute dating provides specific dates or range of dates expressed in years.

Archaeological record: The archaeological record minimally includes all the material remains documented by archaeologists. More comprehensive definitions also include the record of culture history and everything written about the past by archaeologists.

Artefact: Entities whose characteristics result or partially result from human activity. The shape and other characteristics of the artefact are not altered by removal of the surroundings in which they are discovered. In the Southern African context examples of artefacts include potsherds, iron objects, stone tools, beads and hut remains.

Assemblage: A group of artefacts recurring together at a particular time and place, and representing the sum of human activities.

Context: An artefact's context usually consists of its immediate *matrix*, its *provenience* and its *association* with other artefacts. When found in *primary context*, the original artefact or structure was undisturbed by natural or human factors until excavation and if in *secondary context,* disturbance or displacement by later ecological action or human activities occurred.

Cultural Heritage Resource: The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

Cultural landscape: A cultural landscape refers to a distinctive geographic area with cultural significance.

Cultural Resource Management (CRM): A system of measures for safeguarding the archaeological heritage of a given area, generally applied within the framework of legislation designed to safeguard the past.

Feature: Non-portable artefacts, in other words artefacts that cannot be removed from their surroundings without destroying or altering their original form. Hearths, roads, and storage pits are examples of archaeological features

Impact: A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Lithic: Stone tools or waste from stone tool manufacturing found on archaeological sites.

Matrix: The material in which an artefact is situated (sediments such as sand, ashy soil, mud, water, etcetera). The matrix may be of natural origin or human-made.

Midden: Refuse that accumulates in a concentrated heap.
Microlith: A small stone tool, typically knapped of flint or chert, usually about three centimetres long or less.
Monolith: A geological feature such as a large rock, consisting of a single massive stone or rock, or a single piece of rock placed as, or within, a monument or site.

Phase 1 CRM Assessment: An Impact Assessment which identifies archaeological and heritage sites, assesses their significance and comments on the impact of a given development on the sites. Recommendations for site mitigation or conservation are also made during this phase.

Phase 2 CRM Study: In-depth studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling is required. Mitigation / Rescue involves planning the protection of significant sites or sampling through excavation or collection (in terms of a permit) at sites that may be lost as a result of a given development.

Phase 3 CRM Measure: A Heritage Site Management Plan (for heritage conservation), is required in rare cases where the site is so important that development will not be allowed and sometimes developers are encouraged to enhance the value of the sites retained on their properties with appropriate interpretive material or displays.

Provenience: Provenience is the three-dimensional (horizontal and vertical) position in which artefacts are found. Fundamental to ascertaining the provenience of an artefact is *association,* the co-occurrence of an artefact with other archaeological remains; and *superposition,* the principle whereby artefacts in lower levels of a matrix were deposited before the artefacts found in the layers above them, and are therefore older.

Random Sampling: A probabilistic sampling strategy whereby randomly selected sample blocks in an area are surveyed. These are fixed by drawing coordinates of the sample blocks from a table of random numbers.

Scoping Assessment: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision making is expected to focus and to ensure that only key issues and reasonable alternatives are examined. The outcome of the scoping process is a Scoping Report that includes issues raised during the scoping process, appropriate responses and, where required, terms of reference for specialist involvement.

Site (Archaeological): A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity. These include surface sites, caves and rock shelters, larger open-air sites, sealed sites (deposits) and river deposits. Common functions of archaeological sites include living or habitation sites, kill sites, ceremonial sites, burial sites, trading, quarry, and art sites,

Stratigraphy: This principle examines and describes the observable layers of sediments and the arrangement of strata in deposits

Systematic Sampling: A probabilistic sampling strategy whereby a grid of sample blocks is set up over the survey area and each of these blocks is equally spaced and searched.

Trigger: A particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an *issue* and/or potentially significant *impact* associated with that proposed development that may require specialist input. Legal requirements of existing and future legislation may also trigger the need for specialist involvement.

LIST OF ABBREVIATIONS

Abbreviation	Description
ASAPA	Association for South African Professional Archaeologists
AIA	Archaeological Impact Assessment
BP	Before Present
BCE	Before Common Era
BGG	Burial Grounds and Graves
CRM	Culture Resources Management
EIA	Early Iron Age (also Early Farmer Period)
EIA	Environmental Impact Assessment
EFP	Early Farmer Period (also Early Iron Age)
ESA	Earlier Stone Age
GIS	Geographic Information Systems
HIA	Heritage Impact Assessment
ICOMOS	International Council on Monuments and Sites
K2/Map	K2/Mapungubwe Period
LFP	Later Farmer Period (also Later Iron Age)
LIA	Later Iron Age (also Later Farmer Period)
LSA	Later Stone Age
MIA	Middle Iron Age (also Early later Farmer Period)
MRA	Mining Right Area
MSA	Middle Stone Age
NHRA	National Heritage Resources Act No.25 of 1999, Section 35
PFS	Pre-Feasibility Study
PHRA	Provincial Heritage Resources Authorities
SAFA	Society for Africanist Archaeologists
SAHRA	South African Heritage Resources Association
YCE	Years before Common Era (Present)

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1 BACKGROUND

1.1 Scope and Motivation

Exigo Sustainability (Pty) Ltd (Exigo) was commissioned by CES to conduct an Archaeological Impact Assessment (AIA) study in support of an Environmental Impact Assessment (EIA) process for the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project in the Gauteng Province. The rationale of this AIA is to determine the presence of heritage resources such as archaeological and historical sites and features, graves and places of religious and cultural significance in previously unstudied areas; to consider the impact of the proposed project on such heritage resources, and to submit appropriate recommendations with regard to the cultural resources management measures that may be required at affected sites / features.

1.2 Project Direction

Exigo's expertise ensures that all projects be conducted to the highest international ethical and professional standards. As archaeological specialist for Exigo Sustainability, Mr Neels Kruger acted as field director for the project; responsible for the assimilation of all information, the compilation of the final consolidated AIA report and recommendations in terms of heritage resources on the demarcated project areas. Mr Kruger is an accredited archaeologist and Culture Resources Management (CRM) practitioner with the Association of South African Professional Archaeologists (ASAPA), a member of the Society for Africanist Archaeologists (SAFA) and the Pan African Archaeological Association (PAA) as well as a Master's Degree candidate in archaeology at the University of Pretoria.

1.3 Project Brief

Eskom Holdings SOC Ltd is proposing the development of 2 x 1 km 400 kV loop-in and loop-out overhead transmission lines (LILO). The proposed 400 kV lines are located within a Strategic Transmission Corridor (STC). The proposed LILO is located within a project area of approximately **10ha** on portions of the Farm Modderfontein on the property of the AECI Industrial Park, near Kempton Park West on the boarder of Johannesburg and Ekurhuleni municipalities. CES has been appointed by Eskom Holdings SOC Ltd as an independent Environmental Assessment Practitioner (EAP) to undertake a Basic Assessment (BA), including specialist studies, and apply for the necessary Environmental Authorisation (EA) for the proposed project.

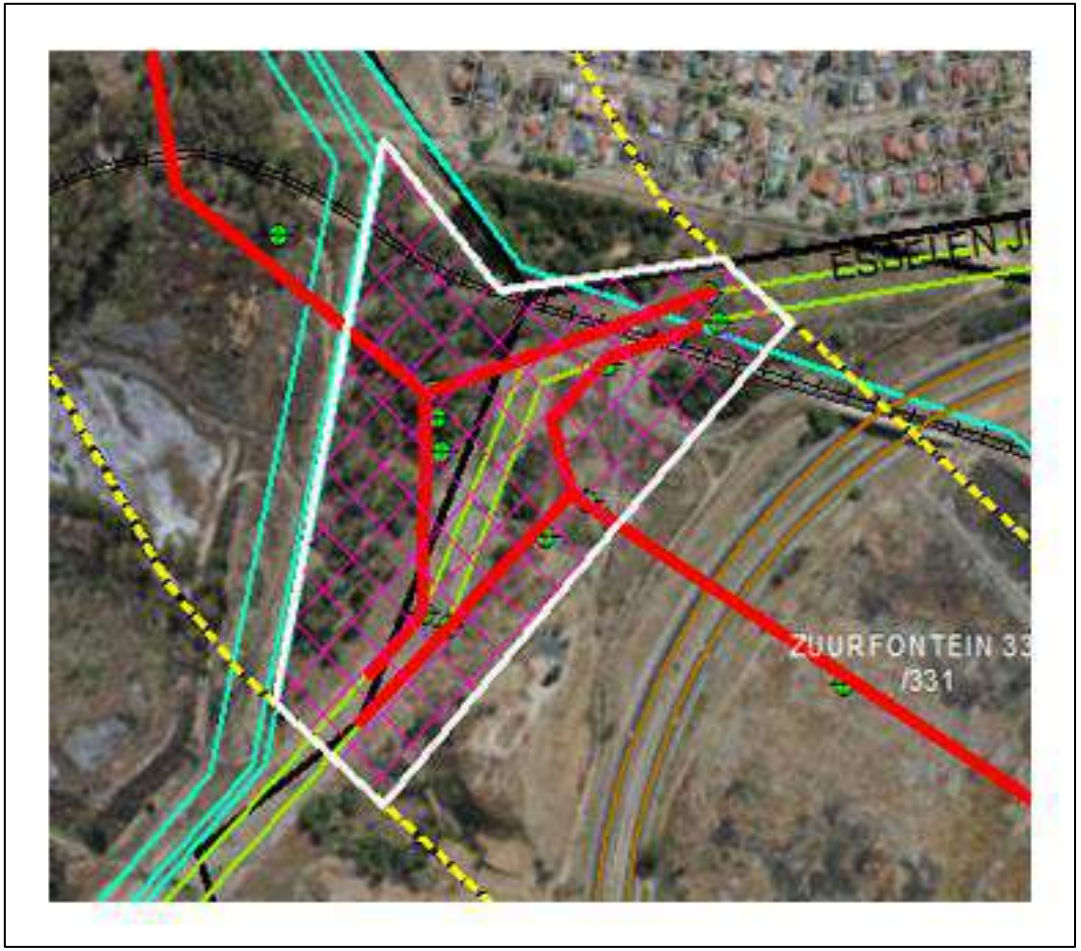

Figure 1-1: Aerial map indicating the project areas subject to the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project (plan provided by ESKOM).

1.4 Terms of Reference

Heritage specialist input into the Environmental Impact Assessment (EIA) process is essential to ensure that, through the management of change, developments still conserve our heritage resources. It is also a legal requirement for certain development categories which may have an impact on heritage resources. Thus, EIAs should always include an assessment of heritage resources. The heritage component of the EIA is provided for in the **National Environmental Management Act, (Act 107 of 1998)** and endorsed by section 38 of the **National Heritage Resources Act (NHRA - Act 25 of 1999)**. In addition, the NHRA protects all structures and features older than 60 years, archaeological sites and material and graves as well as burial sites. The objective of this legislation is to ensure that developers implement measures to limit the potentially negative effects that the development could have on heritage resources.

Based hereon, this project functioned according to the following **terms of reference for** heritage specialist input**:**

- *Provide a detailed description of all archaeological artefacts, structures (including graves) and settlements which may be affected, if any.*
- *Assess the nature and degree of significance of such resources within the area.*
- *Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;*
- *Assess and rate any possible impact on the archaeological and historical remains within the area emanating from the proposed development activities.*
- *Propose possible heritage management measures provided that such action is necessitated by the development.*
- *Liaise and consult with the South African Heritage Resources Agency (SAHRA). A Notification of Intent to Develop (NID) will be submitted to SAHRA at the soonest opportunity.*

1.5 CRM: Legislation, Conservation and Heritage Management

The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

1.5.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and its provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

a. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act No 25 of 1999 (section 35) the following features are protected as cultural heritage resources:

a. Archaeological artefacts, structures and sites older than 100 years

b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography

c. Objects of decorative and visual arts

d. Military objects, structures and sites older than 75 years

e. Historical objects, structures and sites older than 60 years

f. Proclaimed heritage sites

g. Grave yards and graves older than 60 years

h. Meteorites and fossils

i. Objects, structures and sites of scientific or technological value.

In addition, the national estate includes the following:

a. Places, buildings, structures and equipment of cultural significance

b. Places to which oral traditions are attached or which are associated with living heritage

c. Historical settlements and townscapes

d. Landscapes and features of cultural significance

e. Geological sites of scientific or cultural importance

f. Archaeological and paleontological sites

g. Graves and burial grounds

h. Sites of significance relating to the history of slavery

i. Movable objects (e.g. archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

b. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves and burial grounds are commonly divided into the following subsets:

a. ancestral graves
b. royal graves and graves of traditional leaders
c. graves of victims of conflict
d. graves designated by the Minister
e. historical graves and cemeteries
f. human remains

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and Ordinance on Excavations (Ordinance no. 12 of 1980) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments.

c. National Heritage Resources Act No 25 of 1999, section 35

This act (Act 107 of 1998) states that a survey and evaluation of cultural resources must be done in areas where development projects, that will change the face of the environment, will be undertaken. The impact of the development on these resources should be determined and proposals for the mitigation thereof are made. Environmental management should also take the cultural and social needs of people into account. Any disturbance of landscapes and sites that constitute the nation's cultural heritage should be avoided as far as possible and where this is not possible the disturbance should be minimized and remedied.

1.5.2 Background to HIA and AIA Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

A detailed guideline of statutory terms and requirements is supplied in Addendum 1.

2 REGIONAL CONTEXT

2.1 Area Location

The ESKOM Mesong 400kV Loop-In Loop-Out Project is located on portions of the farm Modderfontein south of Lethabong and west of Kempton Park in the Ekurhuleni Municipality, Gauteng Province. The project area is situated on the property of the AECI Industrial Park west of the R25.

The project area appears on 1:50000 map sheet 2628AA (see Figure 2-1) and coordinates for the proposed project are as follows:

- **S27.78891° E24.67335°**

2.2 Area Description: Receiving Environment

itself falls within the Savanna Biome, it is more representative of a transitional zone between the Savanna and the Grassland Biomes, with the woodland components representing the Savanna Biome and the grassveld areas representing the Grassland Biome. The most recent classification of the area by Mucina & Rutherford (2006) is the mixed woodland areas forming part of the Central Sandy Bushveld, with the grasslands more representative of the grassland biome due to the rocky and shallow nature of the soils preventing the growth of woody species. The major feature geological feature of this catchment is the large area of volcanic intrusive rock referred to as the Bushveld Igneous Complex. Formations in this complex are extremely rich in minerals.

2.3 Site Description

The footprint area of the proposed project is situated on portions of the farm Modderfontein on the property of the AECI Industrial Park within urban industrial zones of Lethabong. The project area has been altered for the most part by past agriculture and more recent human interventions such as digging, surface clearing and refuse dumping. A number of footpaths traverse the site and a large decommissioned refuse dumping site occurs in the area. The ventral part of the site is covered in pioneering species and tall grasses and a dense pocket of Eucalyptus Trees border the site to the west. A railway line forms its northern boundary.

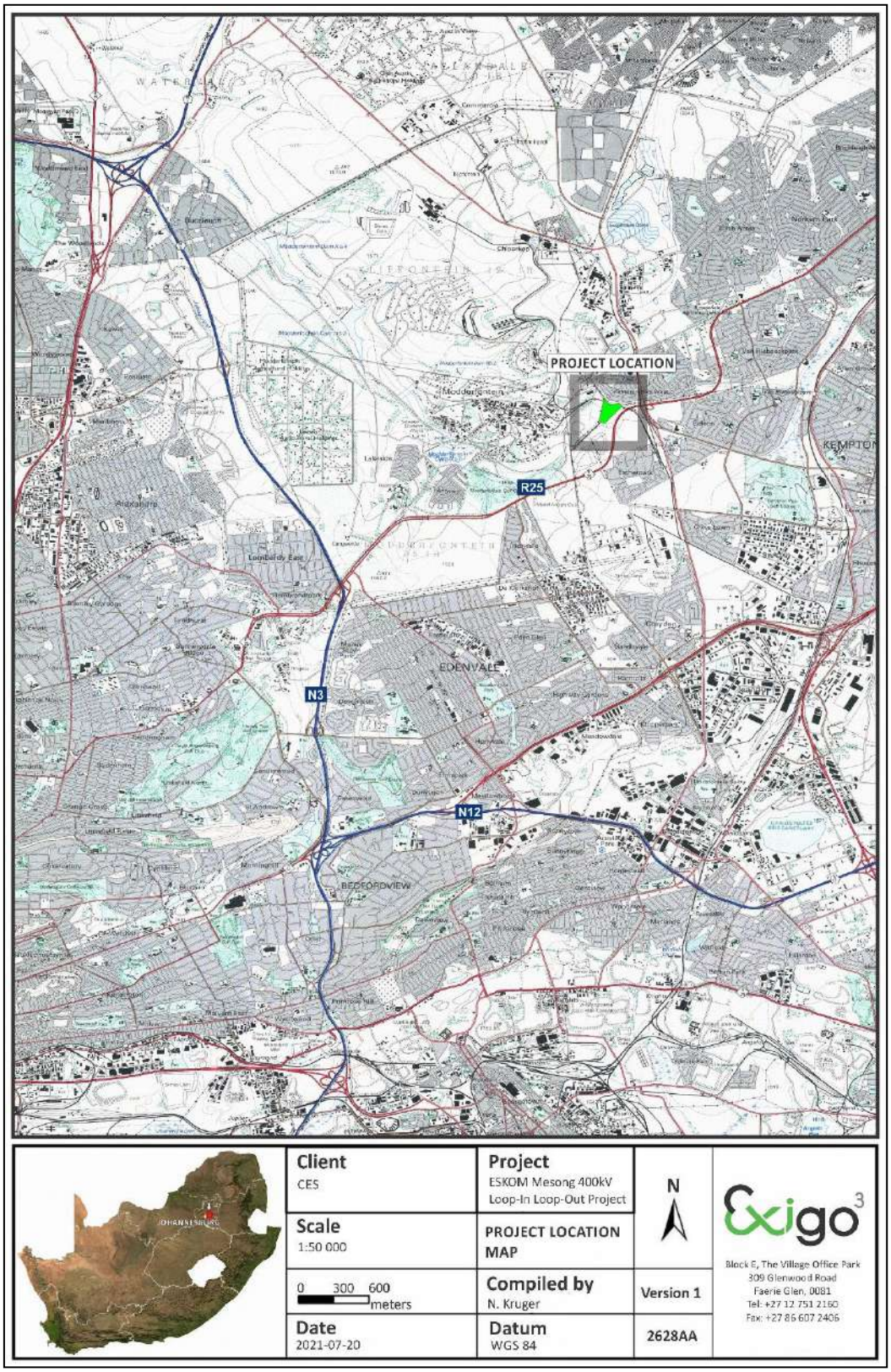

Figure 2-1: 1:50 00 Map representation of the location of the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project (sheet 2628AA).

Figure 2-2: Aerial map providing a regional context for the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project.

3 ARCHAEO-HISTORICAL CONTEXT

3.1 The archaeology of Southern Africa

Archaeology in Southern Africa is typically divided into two main fields of study, the **Stone Age** and the **Iron Age** or **Farmer Period**. The following table provides a concise outline of the chronological sequence of periods, events, cultural groups and material expressions in Southern African pre-history and history.

Table 1 Chronological Periods across Southern Africa

Period	Epoch	Associated cultural groups	Typical Material Expressions
Early Stone Age 2.5m – 250 000 YCE	Pleistocene	Early Hominins: *Australopithecines* *Homo habilis* *Homo erectus*	Typically large stone tools such as hand axes, choppers and cleavers.
Middle Stone Age 250 000 – 25 000 YCE	Pleistocene	First *Homo sapiens* species	Typically smaller stone tools such as scrapers, blades and points.
Late Stone Age 20 000 BC – present	Pleistocene / Holocene	*Homo sapiens sapiens* including San people	Typically small to minute stone tools such as arrow heads, points and bladelets.
Early Iron Age / Early Farmer Period 300 – 900 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	First Bantu-speaking groups	Typically distinct ceramics, bead ware, iron objects, grinding stones.
Middle Iron Age (Mapungubwe / K2) / early Later Farmer Period 900 – 1350 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	Bantu-speaking groups, ancestors of present-day groups	Typically distinct ceramics, bead ware and iron / gold / copper objects, trade goods and grinding stones.
Late Iron Age / Later Farmer Period 1400 AD -1850 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	Various Bantu-speaking groups including Venda, Thonga, Sotho-Tswana and Zulu	Distinct ceramics, grinding stones, iron objects, trade objects, remains of iron smelting activities including iron smelting furnace, iron slag and residue as well as iron ore.
Historical / Colonial Period ±1850 AD – present	Holocene	Various Bantu-speaking groups as well as European farmers, settlers and explorers	Remains of historical structures e.g. homesteads, missionary schools etc. as well as, glass, porcelain, metal and ceramics.

3.2 Discussion: The Gauteng Heritage Landscape

The history of this section of the Gauteng Province is reflected in a rich archaeological landscape, mostly dominated by Stone Age and Colonial Period occurrences. Numerous sites, documenting Earlier, Middle and Later Stone Age habitation occur across the landscape, mostly in open air locales or in sediments alongside rivers or pans. In addition, a wealth of Later Stone Age rock art sites, most of which are in the form of rock

engravings are to be found in the larger landscape. These sites occur on hilltops, slopes, rock outcrops and occasionally in river beds. Sites dating to the Iron Age occur in the north eastern part of the Northwest Province but environmental factors delegated that the spread of Iron Age farming westwards from the 17th century was constrained mainly to the area east of the Langeberg Mountains. However, evidence of an Iron Age presence as far as the Upington area in the eighteenth century occurs in the larger landscape area. Moving into recent times, the archaeological record reflects the development of a rich colonial frontier, characterised by, amongst others, a complex industrial archaeological landscape such as mining developments at Kimberley, which herald the modern era in South African history. Finally, the Northwest Province saw a number of war conflicts, particularly the Anglo Boer War (or the South African War) left behind the remnants of battlefields, skirmishes and concentration camps.

3.2.1 Early History and the Stone Ages

According to archaeological research, the earliest ancestors of modern humans emerged some two to three million years ago. The remains of Australopithecine and *Homo habilis* have been found in dolomite caves and underground dwellings in the Riverton Area at places such as Sterkfontein and Swartkrans near Krugersdorp. Homo habilis, one of the Early Stone Age hominids, is associated with Oldowan artefacts, which include crude implements manufactured from large pebbles. The Acheulian industrial complex replaced the Oldowan industrial complex during the Early Stone Age. This phase of human existence was widely distributed across South Africa and is associated with *Homo erectus*, who manufactured hand axes and cleavers from as early as one and a half million years ago. Middle Stone Age sites dating from as early as two hundred thousand years ago have been found all over South Africa. Middle Stone Age hunter-gatherer bands also lived and hunted in the Orange and Vaal River valleys. These people, who probably looked like modern humans, occupied campsites near water but also used caves as dwellings. They manufactured a wide range of stone tools, including blades and point s that may have had long wooden sticks as hafts and were used as spears.

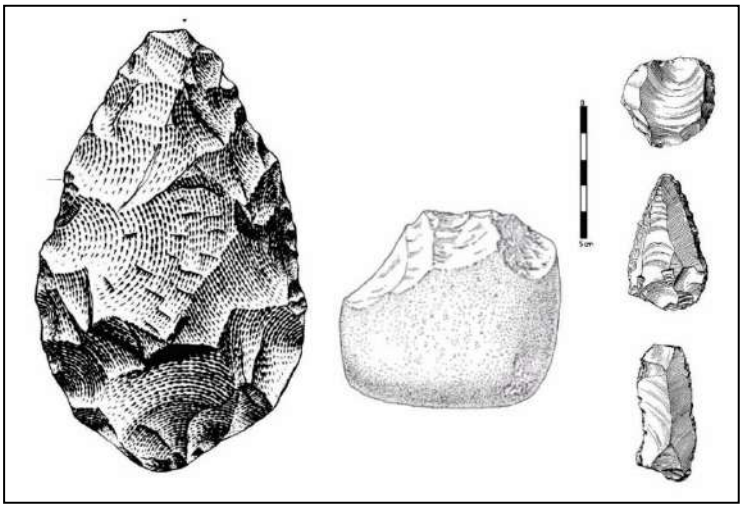

Figure 3-1: Typical ESA handaxe (left) and cleaver (center). To the right is a MSA scraper (right, top), point (right, middle) and blade (right, bottom).

The history of human occupation of and settlement in the Central Gauteng area, known so far, goes back at least 150 000 years, when groups of Early Stone Age people appeared periodically. These people survived by manufacturing simple tools and weapons of stone, bone and wood, which they used for hunting and gathering edible plants. No permanent settlement took place, and only deposits of stone artefacts, such as the one which previously existed on have remained behind. Following the Early Stone Age, Central Gauteng was the scene of the periodic occupation by Middle and probably also by Late Stone age groups. Some of the local rock was suitable for manufacturing stone artefacts, as is evident on the farm Waterval. Settlement,

which was only of a temporary nature, often occurred at sheltered spots close to rivers, such as Glenferness Cave. Numerous Middle Stone Age implements have been and are still are to be found along water-courses. The Later Stone Age (LSA) is of importance in geological terms as it marks the transition from the Pleistocene to the Holocene which was accompanied by a gradual shift from cooler to warmer temperatures. This change had its greatest influence on the higher lying areas of South Africa. Later Stone Age (LSA) sites occur both at the coast and inland as caves deposits, rock shelters, open sites and shell deposits. A number of Late Stone Age sites are located in the vicinity of Klipfontein 12 IR. These include the sites of Glenferness, Pietkloof and Zevenfontein.

3.2.2 Iron Age / Farmer Period

The beginnings of the Iron Age (Farmer Period) in Southern Africa are associated with the arrival of a new Bantu speaking population group at around the third century AD. These newcomers introduced a new way of life into areas that were occupied by Later Stone Age hunter-gatherers and Khoekhoe herders. Distinctive features of the Iron Age are a settled village life, food production (agriculture and animal husbandry), metallurgy (the mining, smelting and working of iron, copper and gold) and the manufacture of pottery. Iron Age people moved into Southern Africa by c. AD 200, entering the area either by moving down the coastal plains, or by using a more central route. From the coast they followed the various rivers inland. Being cultivators, they preferred rich alluvial soils. The Iron Age can be divided into three phases. The Early Iron Age includes the majority of the first millennium A.D. and is characterised by traditions such as Happy Rest and Silver Leaves. The Middle Iron Age spans the 10th to the 13th Centuries A.D. and includes such well known cultures as those at K2 and Mapungubwe. The Late Iron Age is taken to stretch from the 14th Century up to the colonial period and includes traditions such as Icon and Letaba. Complex stone wall clusters are scattered across the landscapes of the Southern Highveld and the Free State. These stone structures, commonly associated with Bantu speaking farming communities, are the remnants of a complex 500 year old sequence of stone wall building in central interior of South Africa. Tim Maggs, noted archaeologist of the later Farmer Period in southern Africa, named the first phase in this sequence “Type N” walling, dating to the 15th to 17th centuries AD (Maggs 1976). This phase, which mostly developed in the Free State, was characterised by central cattle kraals linked by outer walls, while the whole settlement was surrounded by a perimeter wall which also incorporated small stock enclosures. After the 17th century, the “Type N” style of building spread across the Vaal River in consecutive phases where it later became known as “Klipriviersberg” type walling (Taylor 1979a). These settlements typically displayed outer scalloped walls that demarcated back courtyards, a large number of small stock kraals and straight walls which separated household units in the domestic zone. Beehive huts would have housed communities on these sites.

Figure 3-2: Characteristic Klipriviersberg-type stone walled settlements east of Vereeniging on the Highveld (after Huffman [2007]).

The Klipriviersberg walling type dates to the 18th and 19th centuries and are associated with the Fokeng cluster of the Sotho-Tswana speaker group. The Difaqane (Sotho), or Mfekane ("the crushing" in Nguni) was a time of bloody upheavals in Natal and on the Highveld, which occurred around the early 1820's until the late 1830's. It came about in response to heightened competition for land and trade, and caused population groups like gun-carrying Griquas and Shaka's Zulus to attack other tribes. At the beginning of the nineteenth century, the predominant black tribe in the area north of Pretoria was the Manala-Ndebele. In 1832, Shaka's Zulu tribe passed by the south of Pretoria from the southeast in a westerly direction, through the current project landscape, in order to attack Mzilikazi's Ndebele. This group also went on raids in various other parts of the country to expand their area of influence. A site such as The Boulders was probably occupied by early Iron Age groups between 350 and 600 AD, followed by new periods of settlement by Tswana-speaking groups since the early 16th century. Several previous studies are on record for the general study area (Mason 1997, Huffman 1999 and Marais & Botes 2014 as well as Van Schalkwyk 1998 & 2007and Van der Walt 2014).

3.2.3 Later History: Reorganization, Colonial Contact and living heritage.

During the time of the Difaqane, a northwards migration of white settlers from the Cape was also taking place. Some travellers, missionaries and adventurers had gone on expeditions to the northern areas in South Africa, some already as early as the 1720's. In 1825 the Scottish adventurer David Hume made his journey a short distance to the north of the current project area, travelling first from the trade site at Kuruman in a north eastern direction towards the black village of Shoshong (today this is close to the present-day Mahalapye), then in a south eastern direction towards Pretoria, and finally back to Kuruman. In 1847 another famous traveller, David Livingstone, travelled through the area under investigation. Livingston is probably the best-known traveller to have made his journey through the northern provinces of South Africa, but is even better known for his travels into Central Africa. He arrived at Kuruman in 1941 as a missionary of the London Missionary Society. Two years later, he commenced a second journey into the northern provinces of South Africa. He first established a mission station at Mabotsa under the Kgatla (northwest of the presentday Zeerust), then travelled in a south easterly direction past Rustenburg and turned near the north of Johannesburg. Livingston then travelled past the area where Pretoria would later be established, through the farm area under investigation. Hereafter he made his way back to the mission station.

It was only by the late 1820's that a mass-movement of Dutch speaking people in the Cape Colony started advancing into the northern areas. This was due to feelings of mounting dissatisfaction caused by economical and other circumstances in the Cape. This movement later became known as the Great Trek. This migration resulted in a massive increase in the extent of that proportion of modern South Africa dominated by people of European descent. Permanent occupation by white settlers commenced in the early 1840s, when Voortrekker farmers such as Frederik Andries Strydom and Johannes Elardus Erasmus established the farms Olifantsfontein and Randjesfontein respectively. Gradually the entire area was divided into farms, often with names which describe the local geographical conditions. However, it was only since the 1880s that farms were formally surveyed and mapped, and when not only their names, but also the names of rivers and other features became permanent landmarks on maps. Until well into the 20th century, the development of Central Gauteng was determined by local agriculture. The original farms, which became more and more subdivided as the number of farmers increased, supplied food and fibre to the burgeoning populations of Pretoria in the north and the Witwatersrand in the south. Of the 19th and early 20th century farmsteads, only a few have survived. The O. R. Tambo International Airport was founded in 1952 as "Jan Smuts Airport", two years after his death, near the town of Kempton Park on the East Rand. It displaced the "Palmietfontein International Airport", which had handled European flights since 1945.

Kempton Park lies on what was two Boer farms in the South African Republic (ZAR) but the area was

inhabited long before this time: first by nomadic hunters and cattle farmers, and later by white settlers who had made their journey from the Cape. The first farm in this region was Zuurfontein No 369 with the title deed issued to Johannes Stephanus Marais on 25 October 1859 and surveyed to be 3000 morgen on 12 December 1859. The second farm northwest of the first was registered to Cornelius Johannes Beukes in March 1865 and was called Rietfontein 32 IR. After the discovery of gold in Johannesburg, 22 km southeast of the farms in 1886, a railway connecting Pretoria to Vereeniging and to the Cape line was constructed in the early 1890s. The railway line did not go through Johannesburg, but passed to the east through the two farms with a station called Zuurfontein. That station would be linked by a side-rail to the Zuid-Afrikaansche Fabrieken voor Ontplofbare Stoffen, a dynamite factory a few kilometres north-west. Between 1939 and 1940, farm boundaries were drawn up in an area that includes the present-day Kempton Park magisterial area. The founder of Kempton Park was one Carl Friedrich Wolff, who was born in Kempten, the capital of the Bavarian district Allgau in South Germany. It is for this reason that the town was named Kempton Park. The town was established in 1903, and the first records of a government school in the area (on Zuurfontein) dates back to 1904.

4 METHOD OF ENQUIRY

4.1 Sources of Information

Data from detailed desktop, aerial and field studies were employed in order to sample surface areas systematically and to ensure a high probability of heritage site recording.

4.1.1 Desktop Study

The larger landscape around Hartswater has been well documented in terms of its archaeology and history. A desktop study was prepared in order to contextualize the proposed project within a larger historical milieu. Numerous academic papers and research articles supplied a historical context for the proposed project and archival sources, aerial photographs, historical maps and local histories were used to create a baseline of the landscape's heritage. In addition, the study drew on available unpublished Heritage Assessment reports to give a comprehensive representation of known sites in the study area. Of particular interest to this assessment are the following previous assessments.

4.1.2 Aerial Survey

Aerial photography is often employed to locate and study archaeological sites, particularly where larger scale area surveys are performed. The site assessment of the project area relied on this method to assist the foot and automotive site survey. Here, depressions, variation in vegetation, soil marks and landmarks were examined and specific attention was given to shadow sites (shadows of walls or earthworks which are visible early or late in the day), crop mark sites (crop mark sites are visible because disturbances beneath crops cause variations in their height, vigour and type) and soil marks (e.g. differently coloured or textured soil (soil marks) might indicate ploughed-out burial mounds). Attention was also given to moisture differences, as prolonged dampening of soil as a result of precipitation frequently occurs over walls or embankments. In addition, historical aerial photos obtained during the archival search were scrutinized and features that were regarded as important in terms of heritage value were identified and if they were located within the boundaries of the project area they were physically visited in an effort to determine whether they still exist and in order to assess their current condition and significance. By superimposing high frequency aerial photographs with images generated with Google Earth as well as historical aerial imagery, potential sensitive areas were subsequently identified, geo-referenced and transferred to a handheld GPS device. These areas served as reference points from where further vehicular and pedestrian surveys were carried out.

4.1.3 Mapping of sites

Similar to the aerial survey, the site assessment of the project area relied on archive and more recent map renderings of the project area to assist the foot survey where historical and current maps of the project area were examined. By merging data obtained from the desktop study and the aerial survey, sites and areas of possible heritage potential were plotted on these maps of the larger Waterberg region using GIS software. These maps were then superimposed on high-definition aerial representations in order to graphically demonstrate the geographical locations and distribution of potentially sensitive landscapes.

4.1.4 Field Survey

Archaeological survey implies the systematic procedure of the identification of archaeological sites. An archaeological survey of the ESKOM Mesong 400kV Loop-In Loop-Out Project area was conducted on 15 July 2021. The process encompassed a random field survey in accordance with standard archaeological practice by which heritage resources are observed and documented. Particular focus was placed on GPS reference points identified during the aerial and mapping survey. Where possible, random spot checks were made and potentially sensitive heritage areas were investigated. Using a Garmin GPS, the survey was tracked and general surroundings were photographed with a Samsung Digital camera. Real time aerial orientation, by means of a mobile Google Earth application was also employed to investigate possible disturbed areas during the survey.

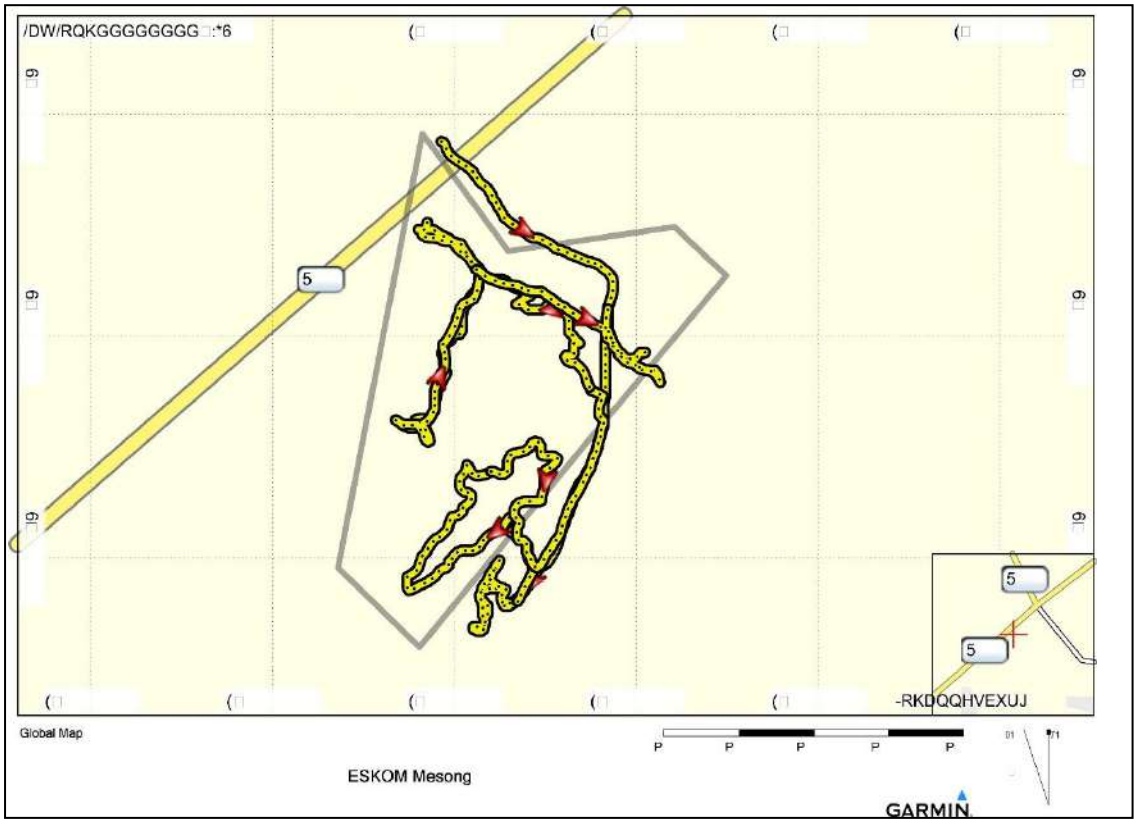

Figure 4-1: Map indicating the GPS Track log for the site survey (yellow line). The project footprint is indicated by the grey polygon.

4.2 Limitations

The site survey for the ESKOM Mesong 400kV Loop-In Loop-Out Project AIA primarily focused around areas tentatively identified as sensitive and of high heritage probability (i.e. those noted during the mapping and

aerial survey) as well as areas of potential high human settlement catchment In terms of on-site limitations during the survey, the following should be noted:

- Access control is applied to the area but arrangements were made and no access restrictions onto the site were encountered during the site visit.
- The surrounding vegetation in the project area mostly comprised out of occasional trees and mixed grasslands with pioneering species occurring in places and the general visibility at the time of the site inspection (July 2021) proved to be a minor constraint in the project area.

Cognisant of the constraints noted above, it should be stated that the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist

Figure 4-2: View of a pocket of Eucalyptus trees in the project area.

Figure 4-3: View of existing power lines in the project area.

Figure 4-4: View of vegetation in the project area.

Figure 4-5: A decommissioned refuse dumping facility in the project area.

Figure 4-6: A view of dense surface grasses and shrubs in the project area.

Figure 4-7: Excavated and transformed surfaces across much of the project area.

Figure 4-8: View of the project area, looking west.

Figure 4-9: View of the project area, looking north.

4.3 Impact Assessment

For consistency among specialists, impacts were rated and assessed using an Impact and Risk Assessment Methodology provided by CES[1], for the Scoping Phase of the EIA process in accordance with the requirement of EIA Regulations. **Please refer to Section 6 and Addendum 2**.

5 RESULTS: ARCHAEOLOGICAL SURVEY

5.1 The Off-Site Desktop Survey

In terms of heritage resources, the general landscape around the project area is primarily well known for its Colonial / Historical Period and Industrial archaeology related to farming and urban expansion during the past century. No particular reference to archaeological sites or features of heritage potential were recorded during an examination of published literature thematically or geographically related to the project area. An analysis of historical aerial imagery and archive maps reveals the following (see Figure 5-1 to Figure 5-4):

- The properties and farm portions subject to this assessment were established towards the end of the 19th century.
- A number of structures or features occur at the site on a topographic map dating to 1939. These features seem to disappear from the landscape with digging and a refuse dump site indicated on later maps of the area (1975, 1983).
- Van Warmelo (1935) indicate a number of BaPedi and BaTswana groups residing in the larger Johannesburg area in 1935.

5.2 The Archaeological Site Survey

An analysis of historical aerial imagery and archive maps of areas subject to this assessment suggests a landscape which has been subjected to agriculture, urbanization and quarrying activities possibly sterilising the area of heritage remains. This inference was confirmed during an archaeological site assessment during which no sites of heritage potential were identified. The following observations were made during the site

[1] CES Risk Assessment Methodologies Internal guideline document, 2019

survey:

5.2.1 The Stone Age

Stone Age material generally occurs along drainage lines and exposed surfaces in the landscape. During the site survey no Stone Age occurrences were documented in the project footprint area.

5.2.2 The Iron Age Farmer Period

No Farmer Period occurrences were noted in the project footprint area during the site survey.

5.2.3 Historical / Colonial Period and recent times

Johannesburg and its surroundings have a long and rich Colonial Period settlement history. From around the first half of the 19th century, the area was frequented by explorers, missionaries and farmers who all contributed to a recent history of contact and industrialization. However, no Historical / Colonial Period occurrences were observed in the project footprint area. In terms of the built environment, the project area has no significance, as there are no old buildings, structures, or features, old equipment, public memorial or monuments in the footprint areas.

5.2.4 Graves

No graves of human burial places were noted during the site investigation of the project footprint areas.

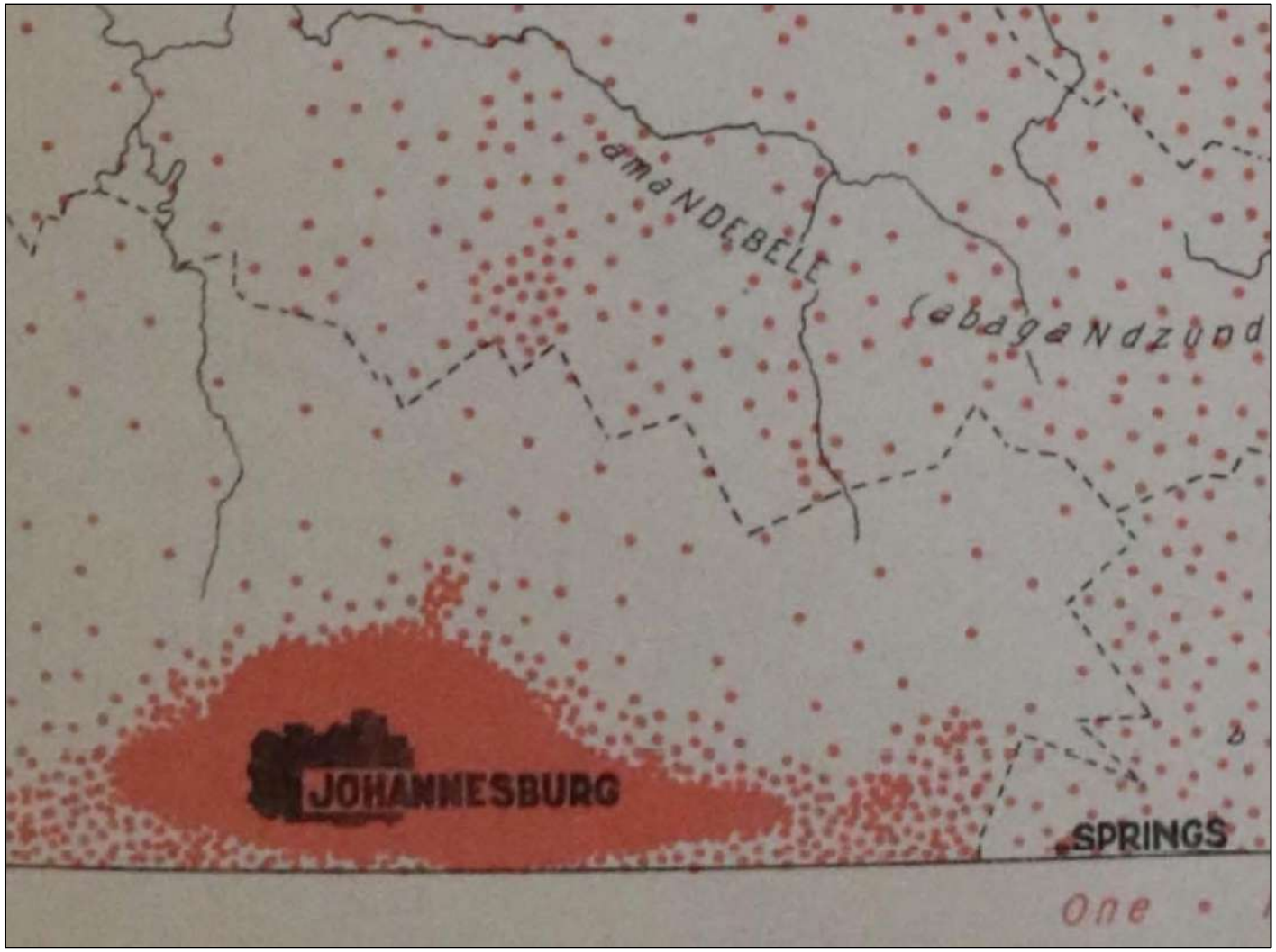

Figure 5-1: An excerpt of Van Warmelo's Map of the project landscape in Johannesburg dating to 1935. Each red dot represents "10 taxpayers).

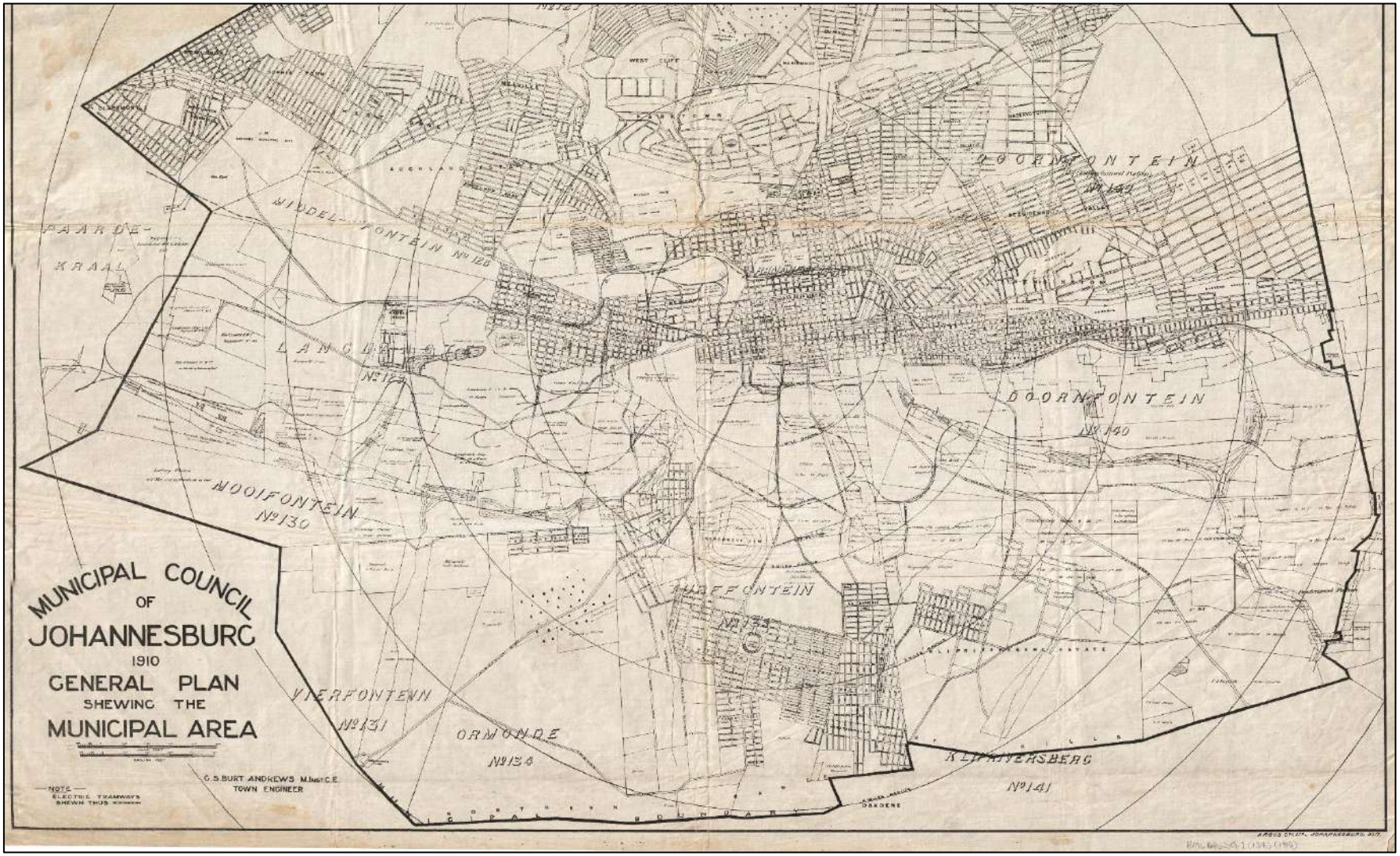

Figure 5-3: An excerpt of the Municipal Council of Johannesburg 1910 the project area around Doornfontein and Modderfontein.

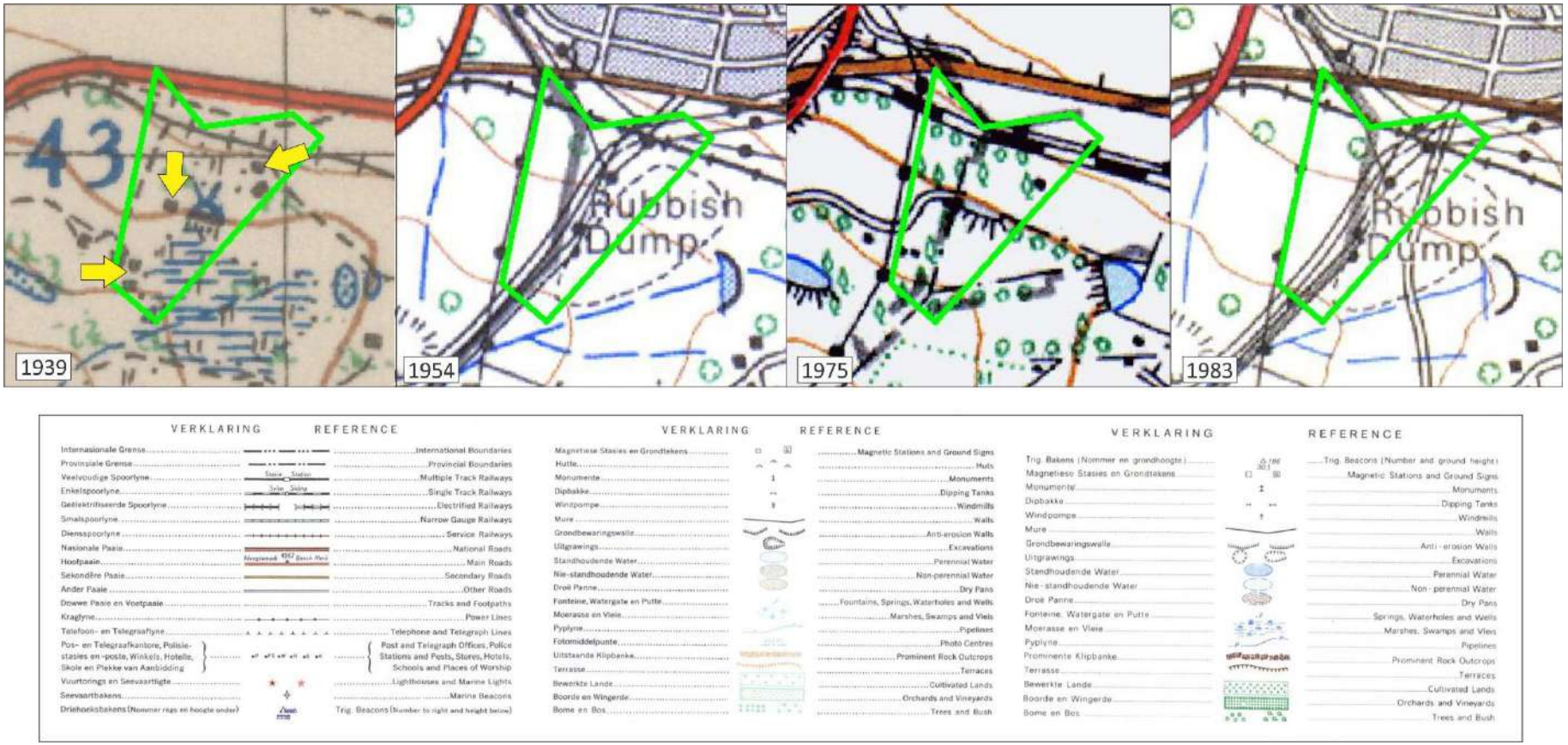

Figure 5-4: Historical topographic maps of the project area (green outlines) in the past decades. Yellow arrows indicate possible human settlement /man-made structures. Note the presence of a refuse dumping site in later years.

6 RESULTS: STATEMENT OF SIGNIFICANCE AND IMPACT RATING

6.1 Potential Impacts and Significance Ratings[2]

The following section provides a background to the identification and assessment of possible impacts and alternatives, as well as a range of risk situations and scenarios commonly associated with heritage resources management. A guideline for the rating of impacts and recommendation of management actions for areas of heritage potential within the study area is supplied in Section 10.2 of Addendum 3.

6.2 General assessment of impacts on heritage resources

Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts.

6.2.1 Issues Identification Matrix

As noted previously, impacts were rated and assessed using an Impact and Risk Assessment Methodology provided by CES, for the Scoping Phase of the EIA process in accordance with the requirement of EIA Regulations. **Please refer to Addendum 2**.

The following tables summarizes the potential extent of impacts to the heritage landscape of the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project.

[2] Based on: W inter, S. & Baumann, N. 2005. *Guideline for involving heritage specialists in EIA processes: Edition 1.*

Impact Assessment: Archaeology

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
Project Footprint	Negative	Short term	Study area	Slight	Definite	LOW NEGATIVE	Irreversible	Resource will not be lost	Achievable	LOW NEGATIVE

Impact Assessment: Built Environment

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
Project Footprint	Negative	Short term	Study area	Slight	Definite	LOW NEGATIVE	Irreversible	Resource will not be lost	Achievable	LOW NEGATIVE

Impact Assessment: Cultural Landscape

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
Project Footprint	Negative	Short term	Study area	Slight	Definite	LOW NEGATIVE	Irreversible	Resource will not be lost	Achievable	LOW NEGATIVE

Impact Assessment: Human Burial Sites

Criteria	Nature	Temporal Scale	Spatial Scale	Severity	Probability	Overall Significance before mitigation	Reversibility	Irreplaceable Loss	Mitigation Potential	Overall Significance after mitigation
Impact 1: Loss of Heritage Resources										
Project Footprint	Negative	Short term	Study area	Slight	Definite	LOW NEGATIVE	Irreversible	Resource will not be lost	Achievable	LOW NEGATIVE

Previous studies conducted in this section of the Gauteng Province suggest a rich and diverse archaeological landscape. Generally, the area is highly suitable for pre-colonial habitation and, even though the project area contains no visible tangible heritage remains, the probability of exposing archaeological remains that might be present in surface and sub-surface deposits along drainage lines and in pristine areas during development should not be excluded.

6.2.2 Archaeology

The study did not identify any archaeological receptors which will be directly impacted by the proposed project and no impact on archaeological sites or features is anticipated.

6.2.3 Built Environment

The study identified no buildings or structures of historical or heritage significance. For the rest of the project area, the general landscape holds varied significance in terms of the built environment as the area comprises historical farming remnants and relatively newly established industrial zones, settlements and townlands. However, no impact on built environment sites is anticipated.

6.2.4 Cultural Landscape

Generally, the proposed project area and its surrounds are characterised by open fields and farmlands. Further away from the project area, the landscape is typical of the rural north Gauteng with undulating hills with flatter plains in-between. This landscape stretches over many kilometres and the proposed project is unlikely to result in a significant impact on the landscape.

6.2.5 Graves / Human Burials Sites

No graves of human burial places were noted during the site investigation the project footprint. In the rural areas of the Gauteng Province graves and cemeteries sometimes occur within settlements or around homesteads but they are also randomly scattered around archaeological and historical settlements. The probability of additional and informal human burials encountered during development should thus not be excluded. In addition, human remains and burials are commonly found close to archaeological sites; they may be found in "lost" graveyards, or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It is often difficult to detect the presence of archaeological human remains on the landscape as these burials, in most cases, are not marked at the surface.

Human remains are usually observed when they are exposed through erosion. In some instances packed stones or rocks may indicate the presence of informal pre-colonial burials. If any human bones are found during the course of construction work then they should be reported to an archaeologist and work in the immediate vicinity should cease until the appropriate actions have been carried out by the archaeologist. Where human remains are part of a burial they would need to be exhumed under a permit from SAHRA (for pre-colonial burials as well as burials later than about AD 1500). Should any unmarked human burials/remains be found during the course of construction, work in the immediate vicinity should cease and the find must immediately be reported to the archaeologist, or the South African Heritage Resources Agency (SAHRA). Under no circumstances may burials be disturbed or removed until such time as necessary statutory procedures required for grave relocation have been met.

6.3 Management actions

Recommendations for relevant heritage resource management actions are vital to the conservation of heritage resources. A general guideline for recommended management actions is included in Section 10.4 of Addendum 3.

OBJECTIVE: ensure conservation of heritage resources of significance, prevent unnecessary disturbance and/or destruction of previously undetected heritage receptors.

- *The following general recommendations should be considered for the ESKOM Mesong 400kV Loop-In Loop-Out Project:*

PROJECT COMPONENT/S	All phases of construction and operation.		
POTENTIAL IMPACT	Damage/destruction of sites.		
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.		
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.		
MITIGATION: ACTION/CONTROL		**RESPONSIBILITY**	**TIMEFRAME**
Fixed Mitigation Procedure (**required**)			
General Site Monitoring: Regular examination of trenches and excavations for the total duration of construction.		ECO, HERITAGE SPECIALST	Monitor as frequently as practically possible.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.		
MONITORING	Successful location of sites by person/s monitoring.		

7 RECOMMENDATIONS

The larger landscape around the project area indicates a rich heritage horizon encompassing and Colonial / Historical Period archaeology primarily related to farming, rural expansion and industrialization of the past century. Locally, the project area has seen transformation as a result of more recent human settlement, quarrying and site clearing potentially sterilising surface and subsurface of heritage remains, especially those dating to pre-colonial and prehistorical times. Cognisance should nonetheless be taken of archaeological material that might be present in surface and sub-surface deposits, along drainage lines and in pristine areas. The following recommendations are made based on general observations in the proposed ESKOM Mesong 400kV Loop-In Loop-Out Project area:

- Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.
- It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the Study Area along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Also, since Stone Age material seems to originate from below present soil surfaces in eroded areas, the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development.

In addition to these site-specific recommendations, careful cognizance should be taken of the following:

- As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive.
- Water sources such as drainage lines, fountains and pans would often have attracted human activity in the past. As Stone Age material occur in the larger landscape, such resources should be regarded as potentially sensitive in terms of possible subsurface deposits.

8 BIBLIOGRAPHY

8.1 Published an Unpublished Literature

Acocks, J.P.H. 1988. Veld types of South Africa (3rd edition). Memoirs of the Botanical Survey of South Africa 57: 1-146

Bergh, J.S. 1999. Geskiedenisatlas van Suid-Afrika: die vier noordelike provinsies. Pretoria: J.L. van Schaik.

Breul, H. 1948. The Earlier Stone Age or Old Palaeolithic Industries in the Vaal River Basin. Archaeological Survey. Archaeological Series No. VI:8-18.

Deacon, H.J. 1970. The Acheulian Occupation at Amanzi Springs Uitenhage District, Cape Province. Cape provincial museums at the Albany Museum

Deacon, J. 1996. Archaeology for Planners, Developers and Local Authorities. National Monuments Council. Publication no. P021E.

Deacon, J.1997. Report: Workshop on Standards for the Assessment of Significance and Research Priorities for Contract Archaeology. In: Newsletter No 49, Sept 1998. Association for Southern African Archaeologists.

Deacon, H.J. & Deacon, J. 1999. Human Beginnings in South Africa. Cape Town: David Philip.

Esterhuysen, A., 2007. The Earlier Stone Age. In Bonner, P., Esterhuysen, A., Jenkins, T. (eds.): A Search for Origins: Science, History and South Africa's 'Cradle of Humankind'. Johannesburg: Wits University Press. Pg 110 -121.

Evers, T.M.1988. The recognition of Groups in the Iron Age of Southern Africa. PhD thesis. Johannesburg: University of the Witwatersrand.

Hall, M. 1987. The Changing Past: Farmers, Kings & Traders in Southern Africa 200 – 1860 Cape Town, Johannesburg: David Philip

Hamilton, C. (Ed.) 1995. The Mfecane Aftermath. Johannesburg: Wits U.P.

Huffman, T.N. 2007. Handbook to the Iron Age. Pietermaritzburg: University of Kwazulu-Natal Press

Maggs, TM.O. 1976. Iron Age Communities of the Southern Highveld. Pietermaritzburg: University of Natal Press.

Mason, R.J. 1962. The Prehistory of the Transvaal. Johannesburg: University of the Witwatersrand Press

Mason, R.J. 1986. Origins of black people of Johannesburg and the southern western central Transvaal AD 350--1880. Johannesburg: Witwatersrand University Press.

Raper, P.E. 2004. South African place names. Johannesburg: Jonathan Ball Publishers

Swanepoel, N. et al (Eds.) 2008. Five hundred years rediscovered. Johannesburg: Wits University Press

Van Warmelo, N.J. 1935. A Preliminary Survey of the Bantu Tribes of South Africa. Ethnographic Publications No. 5. Pretoria: Government Printer.

8.2 Web Sources and Legislation

Human Tissue Act and Ordinance 7 of 1925, Government Gazette, Cape Town

National Resource Act No.25 of 1999, Government Gazette, Cape Town

SAHRA, 2005. Minimum Standards for the Archaeological and the Palaeontological Components of Impact Assessment Reports, Draft version 1.4.

www.sahra.org.za/sahris
Accessed 2021-07-10
http://csg.dla.gov.za/index.html
Accessed 2021-07-10

8.3 Archive Sources and Maps

Troye 1899: New Railway and Postal Map of the Transvaal Colony

Jeppe 1899: Map of the Transvaal or SA Republic and Surrounding Territories

9 ADDENDUM 1: HERITAGE LEGISLATION BACKGROUND

9.1 CRM: Legislation, Conservation and Heritage Management

The broad generic term Cultural Heritage Resources refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

9.1.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and their provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

d. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act of 1999 a historical site is any identifiable building or part thereof, marker, milestone, gravestone, landmark or tell older than 60 years. This clause is commonly known as the "60-years clause". Buildings are amongst the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Iron Age settlements. "Tell" refers to the evidence of human existence which is no longer above ground level, such as building foundations and buried remains of settlements (including artefacts).

The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects, meteorites and rare geological specimens
- visual art objects
- military objects
- numismatic objects
- objects of cultural and historical significance
- objects to which oral traditions are attached and which are associated with living heritage
- objects of scientific or technological interest
- any other prescribed category

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

(d) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(e) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(f) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(g) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(h) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(i) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(j) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

e. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and the Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Local Authorities.

9.1.2 Background to HIA and AIA Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

The National Heritage Resources Act (Act No. 25 of 1999, section 38) provides guidelines for Cultural Resources Management and prospective developments:

***"38.** (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a*

development categorised as:

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site:

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."

And:

"The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): Provided that the following must be included:

(k) The identification and mapping of all heritage resources in the area affected;

(l) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;

(m) an assessment of the impact of the development on such heritage resources;

(n) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(o) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(p) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(q) plans for mitigation of any adverse effects during and after the completion of the proposed development (38. [3] 1999:64)."

Consequently, section 35 of the Act requires Heritage Impact Assessments (HIAs) or Archaeological Impact Assessments (AIAs) to be done for such developments in order for all heritage resources, that is, all places or objects of aesthetics, architectural, historic, scientific, social, spiritual, linguistic or technological value or significance to be protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60

years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects. Heritage resources management and conservation.

9.2 Assessing the Significance of Heritage Resources

Archaeological sites, as previously defined in the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people have lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities. Palaeontological sites are those with fossil remains of plants and animals where people were not involved in the accumulation of the deposits. The basic principle of cultural heritage conservation is that archaeological and other heritage sites are valuable, scarce and *non-renewable.* Many such sites are unfortunately lost on a daily basis through development for housing, roads and infrastructure and once archaeological sites are damaged, they cannot be re-created as site integrity and authenticity is permanently lost. Archaeological sites have the potential to contribute to our understanding of the history of the region and of our country and continent. By preserving links with our past, we may not be able to revive lost cultural traditions, but it enables us to appreciate the role they have played in the history of our country.

- Categories of significance

Rating the significance of archaeological sites, and consequently grading the potential impact on the resources is linked to the significance of the site itself. The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences. The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3 are used when determining the cultural significance or other special value of archaeological or historical sites. In addition, ICOMOS (the Australian Committee of the International Council on Monuments and Sites) highlights four cultural attributes, which are valuable to any given culture:

- *Aesthetic value:*

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria include consideration of the form, scale, colour, texture and material of the fabric, the general atmosphere associated with the place and its uses and also the aesthetic values commonly assessed in the analysis of landscapes and townscape.

- *Historic value:*

Historic value encompasses the history of aesthetics, science and society and therefore to a large extent underlies all of the attributes discussed here. Usually a place has historical value because of some kind of influence by an event, person, phase or activity.

- *Scientific value:*

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality and on the degree to which the place may contribute further substantial information.

- *Social value:*

Social value includes the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a certain group.

It is important for heritage specialist input in the EIA process to take into account the heritage management structure set up by the NHR Act. It makes provision for a 3-tier system of management including the South Africa Heritage Resources Agency (SAHRA) at a national level, Provincial Heritage Resources Authorities (PHRAs) at a provincial and the local authority. The Act makes provision for two types or forms of protection of heritage resources; i.e. formally protected and generally protected sites:

Formally protected sites:

- Grade 1 or national heritage sites, which are managed by SAHRA
- Grade 2 or provincial heritage sites, which are managed by the provincial HRA (MP-PHRA).
- Grade 3 or local heritage sites.

Generally protected sites:

- Human burials older than 60 years.
- Archaeological and palaeontological sites.
- Shipwrecks and associated remains older than 60 years.
- Structures older than 60 years.

With reference to the evaluation of sites, the certainty of prediction is definite, unless stated otherwise and if the significance of the site is rated high, the significance of the impact will also result in a high rating. The same rule applies if the significance rating of the site is low. The significance of archaeological sites is generally
ranked into the following categories.

Significance	Rating Action
No significance: sites that do not require mitigation.	None
Low significance: sites, which may require mitigation.	2a. Recording and documentation (Phase 1) of site; no further action required 2b. Controlled sampling (shovel test pits, auguring), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction
Medium significance: sites, which require mitigation.	3. Excavation of representative sample, C14 dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]
High significance: sites, where disturbance should be avoided.	4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism
High significance: Graves and burial places	4b. Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinternment [including 2a, 2b & 3]

Furthermore, the significance of archaeological sites was based on six main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter),
- Social value,
- Uniqueness, and
- Potential to answer current and future research questions.

10 ADDENDUM 2: IMPACT ASSESSMENT METHODOLOGY

10.1.1 Issues Identification Matrix

impacts were rated and assessed using an Impact and Risk Assessment Methodology provided by CES, for the Scoping Phase of the EIA process in accordance with the requirement of EIA Regulations. Here, two parameters and five factors are considered when assessing the significance of the identified issues, and each is scored. ***Significance*** is achieved by ranking the five criteria presented in Table 1 below, to determine the overall significance of an issue. The ranking for the "effect" (which includes scores for duration; extent; consequence and probability) and reversibility / mitigation are then read off the matrix presented in Table 2 below, to determine the overall significance of the issue. The overall significance is either negative or positive.

- ***Duration*** - The temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

- ***Extent*** - The spatial scale defines the physical extent of the impact.

- ***Consequence*** - The consequence scale is used in order to, as far as possible, objectively evaluate how severe a number of negative impacts associated with the issue
under consideration might be, or how beneficial a number of positive impacts associated with the issue under consideration might be.

- The ***probability*** of the impact occurring - The likelihood of impacts taking place as a result of project actions arising from the various alternatives. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development and alternatives. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

- ***Reversibility / Mitigation*** – The degree of difficulty of reversing and/or mitigating the various impacts ranges from easily achievable to very difficult. The four categories used are listed and explained in Table 1 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

10.1.2 Assessing Impacts

The CES rating scale used in this assessment takes into consideration the following criteria, and includes the new criteria for assessing post mitigation significance (residual impacts), by incorporating the principles of reversibility and irreplaceability:
- **Nature of impact** (Negative or positive impact on the environment).
- **Type of impact** (Direct, indirect and/or cumulative effect of impact on the environment).
- **Duration, Extent, Probability** (see **Table** below)

Duration (Temporal Scale)		Score
Short term	Less than 5 years	1
Medium term	Between 5-20 years	2
Long term	Between 20 and 40 years (a generation) and from a human perspective also permanent	3
Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there	4
Extent (Spatial Scale)		
Localised	At localised scale and a few hectares in extent	1
Study Area	The proposed site and its immediate environs	2
Regional	District and Provincial level	3
National	Country	3
International	Internationally	4
Probability (Likelihood)		
Unlikely	The likelihood of these impacts occurring is slight	1
May Occur	The likelihood of these impacts occurring is possible	2
Probable	The likelihood of these impacts occurring is probable	3
Definite	The likelihood is that this impact will definitely occur	4

- **Severity or benefits**

Impact Severity (The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party)		Score
Very severe	**Very beneficial**	4
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.	
Severe	**Beneficial**	3
Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy.	
Moderately severe	**Moderately beneficial**	2
Medium to long term impacts on the affected system(s) or party (ies), which could be mitigated. For example constructing the sewage treatment facility where there was vegetation with a low conservation value.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality.	
Slight	**Slightly beneficial**	1
Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.	
No effect	**Don't know/Can't know**	
The system(s) or party(ies) is not affected by the proposed development.	In certain cases it may not be possible to determine the severity of an impact.	

** In certain cases it may not be possible to determine the severity of an impact thus it may be determined: Don't know/Can't know*

The scores for the three criteria in the Tables above are added to obtain a composite score. They must then be considered against the severity rating to determine the overall significance of an activity. This is because the severity of the impact is far more important than the other three criteria. The overall significance is then obtained by reading off the matrix presented in the table below. The overall significance is either negative or positive (Criterion 1) and direct, indirect or cumulative (Criterion 2).

SEVERITY	COMPOSITE DURATION, EXTENT & PROBABILITY SCORE									
	3	4	5	6	7	8	9	10	11	12
Slight	3	4	5	6	7	8	9	10	11	12
Mod severe	3	4	5	6	7	8	9	10	11	12
Severe	3	4	5	6	7	8	9	10	11	12
Very severe	3	4	5	6	7	8	9	10	11	12

The **environmental significance** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

OVERALL SIGNIFICANCE *(The combination of all the above criteria as an overall significance)*	
VERY HIGH NEGATIVE	**VERY BENEFICIAL**
These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects. *Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance.* *Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.*	
HIGH NEGATIVE	**BENEFICIAL**
These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light. *Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.* *Example: The change to soil conditions will impact the natural system, and the impact on affected parties (such as people growing crops in the soil) would be HIGH.*	
MODERATE NEGATIVE	**SOME BENEFITS**
These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial. *Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.*	
LOW NEGATIVE	**FEW BENEFITS**
These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect. *Example: The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.* *Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.*	
NO SIGNIFICANCE	
There are no primary or secondary effects at all that are important to scientists or the public. *Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.*	
DON'T KNOW	
In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information. *Example: The effect of a particular development on people's psychological perspective of the environment.*	

10.1.3 Post Mitigation Significance

Once mitigation measure are proposed, the following criteria are then used to determine the overall post mitigation significance of the impact:

- Reversibility: The degree to which an environment can be returned to its original/partially original state.
- Irreplaceable loss: The degree of loss which an impact may cause.
- Mitigation potential: The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 5 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

Reversibility	
Reversible	*The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented.*
Irreversible	*The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.*
Irreplaceable loss	
Resource will not be lost	*The resource will not be lost/destroyed provided mitigation measures are implemented.*
Resource will be partly lost	*The resource will be partially destroyed even though mitigation measures are implemented.*
Resource will be lost	*The resource will be lost despite the implementation of mitigation measures.*
Mitigation potential	
Easily achievable	*The impact can be easily, effectively and cost effectively mitigated/reversed.*
Achievable	*The impact can be effectively mitigated/reversed without much difficulty or cost.*
Difficult	*The impact could be mitigated/reversed but there will be some difficultly in ensuring effectiveness and/or implementation, and significant costs.*
Very Difficult	*The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly.*

11 ADDENDUM 3: CONVENTIONS USED TO ASSESS THE SIGNIFICANCE OF HERITAGE

11.1 Site Significance Matrix

According to the NHRA, Section 2(vi) the **significance** of heritage sites and artefacts is determined by it aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these. The following matrix is used for assessing the significance of each identified site/feature.

2. SITE EVALUATION			
2.1 Heritage Value (NHRA, section 2 [3])	High	Medium	Low
It has importance to the community or pattern of South Africa's history or pre-colonial history.			
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.			
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.			
It is of importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.			
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.			
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.			
It has marked or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).			
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.			
It has significance through contributing towards the promotion of a local sociocultural identity and can be developed as a tourist destination.			
It has significance relating to the history of slavery in South Africa.			
It has importance to the wider understanding of temporal changes within cultural landscapes, settlement patterns and human occupation.			
2.2 Field Register Rating			
National/Grade 1 [should be registered, retained]			
Provincial/Grade 2 [should be registered, retained]			
Local/Grade 3A [should be registered, mitigation not advised]			
Local/Grade 3B [High significance; mitigation, partly retained]			
Generally Protected A [High/Medium significance, mitigation]			
Generally protected B [Medium significance, to be recorded]			
Generally Protected C [Low significance, no further action]			
2.3 Sphere of Significance	High	Medium	Low
International			
National			
Provincial			
Local			
Specific community			

11.2 Impact Assessment Criteria

The following table provides a guideline for the rating of impacts and recommendation of management actions for sites of heritage potential.

Significance of the heritage resource

This is a statement of the nature and degree of significance of the heritage resource being affected by the activity. From a heritage management perspective, it is useful to distinguish between whether the significance is embedded in the physical fabric or in associations with events or persons or in the experience of a place; i.e. its visual and non-visual qualities. This statement is a primary informant to the nature and degree of significance of an impact and thus needs to be thoroughly considered. Consideration needs to be given to the significance of a heritage resource at different scales (i.e. site-specific, local, regional, national or international) and the relationship between the heritage resource, its setting and its associations.

Nature of the impact

This is an assessment of the nature of the impact of the activity on a heritage resource, with some indication of its positive and/or negative effect/s. It is strongly informed by the statement of resource significance. In other words, the nature of the impact may be historical, aesthetic, social, scientific, linguistic or architectural, intrinsic, associational or contextual (visual or non-visual). In many cases, the nature of the impact will include more than one value.

Extent

Here it should be indicated whether the impact will be experienced:

- On a site scale, i.e. extend only as far as the activity;
- Within the immediate context of a heritage resource;
- On a local scale, e.g. town or suburb
- On a metropolitan or regional scale; or
- On a national/international scale.

Duration

Here it should be indicated whether the lifespan of the impact will be:

- Short term, (needs to be defined in context)
- Medium term, (needs to be defined in context)
- Long term where the impact will persist indefinitely, possibly beyond the operational life of the activity, either because of natural processes or by human intervention; or
- Permanent where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Of relevance to the duration of an impact are the following considerations:

- Reversibility of the impact; and
- Renewability of the heritage resource.

Intensity

Here it should be established whether the impact should be indicated as:

- Low, where the impact affects the resource in such a way that its heritage value is not affected;
- Medium, where the affected resource is altered but its heritage value continues to exist albeit in a modified way; and
- High, where heritage value is altered to the extent that it will temporarily or permanently be damaged or destroyed.

Probability

This should describe the likelihood of the impact actually occurring indicated as:

- Improbable, where the possibility of the impact to materialize is very low either because of design or historic experience;
- Probable, where there is a distinct possibility that the impact will occur;
- Highly probable, where it is most likely that the impact will occur; or
- Definite, where the impact will definitely occur regardless of any mitigation measures

Confidence

This should relate to the level of confidence that the specialist has in establishing the nature and degree of impacts. It relates to the level and reliability of information, the nature and degree of consultation with I&AP's and the dynamic of the broader socio-political context.

- High, where the information is comprehensive and accurate, where there has been a high degree of consultation and the socio-political context is relatively stable.
- Medium, where the information is sufficient but is based mainly on secondary sources, where there has been a limited targeted consultation and socio-political context is fluid.
- Low, where the information is poor, a high degree of contestation is evident and there is a state of socio-political flux.

Impact Significance

The significance of impacts can be determined through a synthesis of the aspects produced in terms of the nature and degree of heritage significance and the nature, duration, intensity, extent, probability and confidence of impacts and can be described as:

- Low; where it would have a negligible effect on heritage and on the decision
- Medium, where it would have a moderate effect on heritage and should influence the decision.
- High, where it would have, or there would be a high risk of, a big effect on heritage. Impacts of high significance should have a major influence on the decision;
- Very high, where it would have, or there would be high risk of, an irreversible and possibly irreplaceable negative impact on heritage. Impacts of very high significance should be a central factor in decision-making.

11.3 Direct Impact Assessment Criteria

The following table provides an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected

	TYPE OF DEVELOPMENT			
HERITAGE CONTEXT	**CATEGORY A**	**CATEGORY B**	**CATEGORY C**	**CATEGORY D**
CONTEXT 1 High heritage Value	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected	Very high heritage impact expected
CONTEXT 2 Medium to high heritage value	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected
CONTEXT 3 Medium to low heritage value	Little or no heritage impact expected	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected
CONTEXT 4 Low to no heritage value	Little or no heritage impact expected	Little or no heritage impact expected	Minimal heritage value expected	Moderate heritage impact expected

NOTE: A DEFAULT "LITTLE OR NO HERITAGE IMPACT EXPECTED" VALUE APPLIES WHERE A HERITAGE RESOURCE OCCURS OUTSIDE THE IMPACT ZONE OF THE DEVELOPMENT.

HERITAGE CONTEXTS	CATEGORIES OF DEVELOPMENT
Context 1: Of high intrinsic, associational and contextual heritage value within a national, provincial and local context, i.e. formally declared or potential Grade 1, 2 or 3A heritage resources **Context 2:** Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources. **Context 3:**	**Category A: Minimal intensity development** - No rezoning involved; within existing use rights. - No subdivision involved. - Upgrading of existing infrastructure within existing envelopes - Minor internal changes to existing structures - New building footprints limited to less than 1000m2. **Category B: Low-key intensity development** - Spot rezoning with no change to overall zoning of a site. - Linear development less than 100m

Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources **Context 4:** Of little or no intrinsic, associational or contextual heritage value due to disturbed, degraded conditions or extent of irreversible damage.	- Building footprints between 1000m2-2000m2 - Minor changes to external envelop of existing structures (less than 25%) - Minor changes in relation to bulk and height of immediately adjacent structures (less than 25%). **Category C: Moderate intensity development** - Rezoning of a site between 5000m2-10 000m2. - Linear development between 100m and 300m. - Building footprints between 2000m2 and 5000m2 - Substantial changes to external envelop of existing structures (more than 50%) - Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 50%) **Category D: High intensity development** - Rezoning of a site in excess of 10 000m2 - Linear development in excess of 300m. - Any development changing the character of a site exceeding 5000m2 or involving the subdivision of a site into three or more erven. - Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 100%)

11.4 Management and Mitigation Actions

The following table provides a guideline of relevant heritage resources management actions is vital to the conservation of heritage resources.

No further action / Monitoring

Where no heritage resources have been documented, heritage resources occur well outside the impact zone of any development or the primary context of the surroundings at a development footprint has been largely destroyed or altered, no further immediate action is required. Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation in order to ensure that no undetected heritage\ remains are destroyed.

Avoidance

This is appropriate where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. Mitigation is not acceptable or not possible. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources.

Mitigation

This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated to a degree of medium to low significance, e.g. the high to medium impact of a development on an archaeological site could be mitigated through sampling/excavation of the remains. Not all negative impacts can be mitigated.

Compensation

Compensation is generally not an appropriate heritage management action. The main function of management actions should be to conserve the resource for the benefit of future generations. Once lost it cannot be renewed. The circumstances around the potential public or heritage benefits would need to be exceptional to warrant this type of action, especially in the case of where the impact was high.

Rehabilitation

Rehabilitation is considered in heritage management terms as a intervention typically involving the adding of a new heritage layer to enable a new sustainable use. It is not appropriate when the process necessitates the removal of previous historical layers, i.e. restoration of a building or place to the previous state/period. It is an appropriate heritage management action in the following cases:

- The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation.
- Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal loss of historical fabric.
- Where the rehabilitation process will not result in a negative impact on the intrinsic value of the resource.

Enhancement

12 ADDENDUM 4: SPECIALIST CURRICULUM VITAE

NELIUS LE ROUX KRUGER

BHCS Hons. (Archaeology)

(Date compiled: 2021/01/10)

PERSONAL DETAILS

Nationality:	South African
Date of Birth:	3 April 1979
Postal Address:	Postnet Suite 74, Private Bag x04, Menlo Park, 0102
Work Address:	70 Regency Dr, Route 21 Business Park, Centurion, 0178
Telephone numbers:	W: +27 12 751 2160 C: +27 82 967 2131
Identity number:	790403 5029 087
Languages:	English, Afrikaans, Sepedi (Basic)

HIGHER EDUCATION

University Attended:	University of the Pretoria
Degree Obtained:	BA Archaeology *(Cum Laude)* 2002
Major Subjects:	Anthropology, Archaeology, English, Afrikaans
University Attended:	University of the Pretoria
Degree Obtained:	BHCS Hons. Archaeology (*Cum Laude)* 2004

PROFESSIONAL AFFILIATIONS

Member of the Association for South African Professional Archaeologists (ASAPA).

Member of the Council of the Association for South African Professional Archaeologists (ASAPA): CRM Portfolio

Member of the CRM Section of the Association for South African Professional Archaeologists (ASAPA).

Member of the Society of Africanist Archaeologists (SAFA).

Member of the South African Museums Association (SAMA).

Accredited Professional Archaeologist & CRM Practitioner by the Association for South African Professional Archaeologists (ASAPA) & Heritage Natal (AMAFA).

HONOURS AND AWARDS

Aage V. Jensen Development Foundation (Denmark) grant for participation in the joint SAFA/PAA Congress, Dakar, Senegal (2010).

Five Hundred Years Initiative (NRF) Research Grant (2008 – 2009).

University of Pretoria post-graduate Merit Grant for MA studies in Archaeology (2004 – 2008).

University of Pretoria (CINDEK) bursary for post-graduate studies awarded by the Centre of Indigenous Knowledge (2003).

South African Archaeological Society's Hanisch Award for best graduate student in the Department of Anthropology and Archaeology at the University of Pretoria (2003).

University of Pretoria Academic Honorary Colours (2002).

University of Pretoria Graduate Merit Grant (2002).

University of Pretoria honorarium for archaeological collections management at the Department of Archaeology and Anthropology (2001).

CURRENT STATUS

Heritage Resources Manager for Exigo Sustainability

Social impact Assessor and Research Associate for Exigo Sustainability

Associate and Unit Manager at Exigo Sustainability (formerly AGES Gauteng)

Part-time Lecturer (Archaeology) Department Anthropology and Archaeology (University of Pretoria)

SPECIALITY FIELDS

- Integrated Heritage and Archaeological Impact Assessment (Phase 1, 2 & 3), complying to SAHRA, PHRA and industry standards for heritage impact assessments.

- Industry standard Heritage Resources Management Plans, complying to SAHRA & PHRA standards for heritage impact assessments.

- Heritage destruction / alteration / excavation permitting facilitation and associated research.

- General facilitation in consultation and negotiation with heritage resources authorities (SAHRA, PHRA's).

- Heritage-related social consultation and focus group facilitation (for example, with Interested and Affected parties).

- Historical and anthropological studies.

- Heritage and Social Spatial Development Frameworks & Strategic Development Area Frameworks for municipalities.

- Industry standard and compliant Social Impact Assessments (SIA's).

- Mine Social and Labour Plans (SLP's)and social facilitation.

- Socio-cultural baseline studies and research.

- GIS and geo-spatial referencing and data analysis, heritage and social mapping.

PROFESSIONAL SKILLS & EXPERIENCE

Nelius Le Roux Kruger, an associate at Exigo Sustainability, is an accredited ASAPA (Association of Southern African Professional Archaeologists) archaeologist and Culture Resources Management (CRM) Practitioner with over 15 years' experience in the fields of heritage resources assessment, conservation management and social studies. In addition, he is involved in various aspects of social research and social impact assessment. He holds a BHCS (Hons) Archaeology degree from the University of Pretoria specializing in the Iron Age Farmer and Colonial Periods of South Africa. He has worked extensively on archaeological and heritage sites of the time periods and cultural contexts present in Southern Africa, both in the commercial and academics spheres and he holds vast experience in human remains relocation and related social consultation. Nelius has conducted social research projects across Southern Africa involving Social Impact Assessments as well as the compilation and monitoring of mining social and labor plans, public meeting facilitation and socio-cultural studies. His experience is not limited to South Africa and he has worked on archaeological and socio-cultural research projects across Africa and the Middle East. His publication record includes a number of academic publications in peer reviewed journals and books as well as a vast number of Heritage Management Reports. Nelius' expertise includes CRM assessment and management, applications in heritage legislation, Social Impact Assessment, social consulting as well as geospacing and Geographical Information Systems (GIS) applications in archaeology and CRM. Nelius is a conscientious and committed archaeologist and social scientist who is dedicated to the professionalism of the discipline of archaeology and social studies. He approaches all aspects of his specialst fields with enthusiasm, maintaining best practise at all times. When working with people, he strives to manage interpersonal communication and group dynamics with dedication, promoting positive group cohesion.

SELECTED PUBLICATIONS

Kruger, N. In Prep. Living the frontier: Ritual and Conflict in Ha-Tshirundu.
Kruger, N. 2016. Forthcoming. The Crocodile in his Pool: Notes on a significant find in the Ha-Tshirundu area, Limpopo Valley, South Africa. Nyame Akuma Bulletin of the Association of Africanist Archaeologists.
Antonites, A. & Kruger, N. et al. 2014. Report on excavations at Penge, a frst-millennium Doornkop settlement. Southern African Humanties 26:177-92
Antonites, A. & Kruger, N. 2012. **A Preliminary Assessment of Animal Distribution on a 19th Century VhaVenda Settlement. Nyame** Akuma Bulletin of the Association of Africanist Archaeologists. 2012:77
Kruger, N. In Prep. Living the frontier: Ritual and Conflict in Ha-Tshirundu.
Kruger, N. 2009. Forthcoming. The Crocodile in his Pool: Notes on a significant find in the Ha-Tshirundu area, Limpopo Valley, South Africa. Nyame Akuma Bulletin of the Association of Africanist Archaeologists.
Kruger, N. 2008. Ha Tshirundu: Landscape, Lived experience and Land Reform. Poster presented at the South African Association for Archaeologists Biannual Congress, Cape Town, March 2008.
Mathers, K. & Kruger, N. 2008. The Past is another Country: Archaeology in the Limpopo Province in Smith, A. & Gazin-

Schwartz, A (Eds.). 2008. Landscapes of Clearance: Archaeological and Anthropological Perspectives. California: Left Coast Press

SELECTED PROJECTS

NATIONAL

- Phase 1 Heritage Impact Assessment (HIA) and further heritage management for the upgrading of the Warrenton Anglo Boer War blockhouse, Warrenton, Northern Cape Province

- Phase 1 Heritage Impact Assessment (HIA) and Phase 2 Site Investigation for the restoration of the old Johannesburg Fort, Constitution Hill, Johannesburg, Gauteng Province

- Phase 1 Heritage Impact Assessment (HIA) and further heritage management for the upgrading/refurbishment of the Burgershoop MPCC, Mogale City, Gauteng Province

- Phase 1 Heritage Impact Assessment (HIA) of historical period heritage sites on the farm Roodekrans, Dullstroom area, Mpumalanga Province

- Phase 1 Heritage Impact Assessment (HIA) of a historical bridge on the farm Pienaarspoort 339jr at Delfsand, Gauteng Province

- Phase 1 Heritage Impact Basements (HIAs) for 20 PV Solar Parks on location at Upington, Kimberley, Vryburg, Kuruman, Kathu, Hotazel, Douglas, Groblershoop and Prieska, Northern Cape Province, South Africa.

- Phase 1 Heritage Impact Assessments (HIAs) for 18 large scale water supply projects on location at East London, Mthatha, Ngcobo, Barley East, Elliot, Cathcart, King Williams Town and Mdantsane, Eastern Cape Province, South Africa.

- Phase 1 Heritage Impact Assessments (HIAs) for more than 40 residential infrastructure developments across South Africa.

INTERNATIONAL

- Heritage Impact Assessment for the Kitumba Copper-Gold Project (KCGP), Zambia

- Heritage Scoping Study for the BTR Kitumba Project, Mumbwa, Zambia

- Heritage Scoping Study for the Buckreef Gold Project, Geita, Tanzania

- Phase 2 mitigation and heritage assessment of the Koidu Monkey Hill Iron Age metallurgy site, Koidu Diamond Mine, Sierra Leone

- Phase 2 heritage site mitigation of the Sessenge archaeological site, Kibali Gold Mine,Democratic Republic of the Congo

APPENDIX C4 –
AGRICULTURAL COMPLIANCE STATEMENT

Johann Lanz
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South Africa

Site sensitivity verification and Agricultural Compliance Statement for the proposed Eskom 400kV Mesong Loop-in and Loop-Out powerline project, Gauteng Province

Environmental authorisation is being sought for the above development. In terms of the National Environmental Management Act (NEMA), an application for environmental authorisation requires an agricultural assessment.

The Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources, gazetted on 20 March 2020, states that:

> *prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration, identified by the screening tool, must be confirmed by undertaking a site sensitivity verification that confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool.*

1 Site sensitivity verification

In terms of the gazetted agricultural protocol, a site sensitivity verification must be submitted that:

1. *confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc;*
2. *contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity.*

Agricultural sensitivity, in terms of environmental impact, and as used in the national web-based environmental screening tool, is a direct function of the capability of the land for agricultural production. The screening tool classifies agricultural sensitivity according to only two, independent criteria - the cultivation status and the land capability. The screening tool sensitivity categories for uncultivated land are based upon the Department of Agriculture's updated and refined, country-wide land capability mapping, released in 2016, which purely takes the natural agricultural resources of climate, soil and terrain into account.

The proposed site is identified on the national web based environmental screening tool as being of high and medium sensitivity for agricultural resources. This is because the site's land capability evaluation values, of 7 to 9 classify it within the medium (7-8) and high (9) sensitivity classes. A

map of the proposed development area overlaid on the screening tool sensitivity is given in Figure 1.

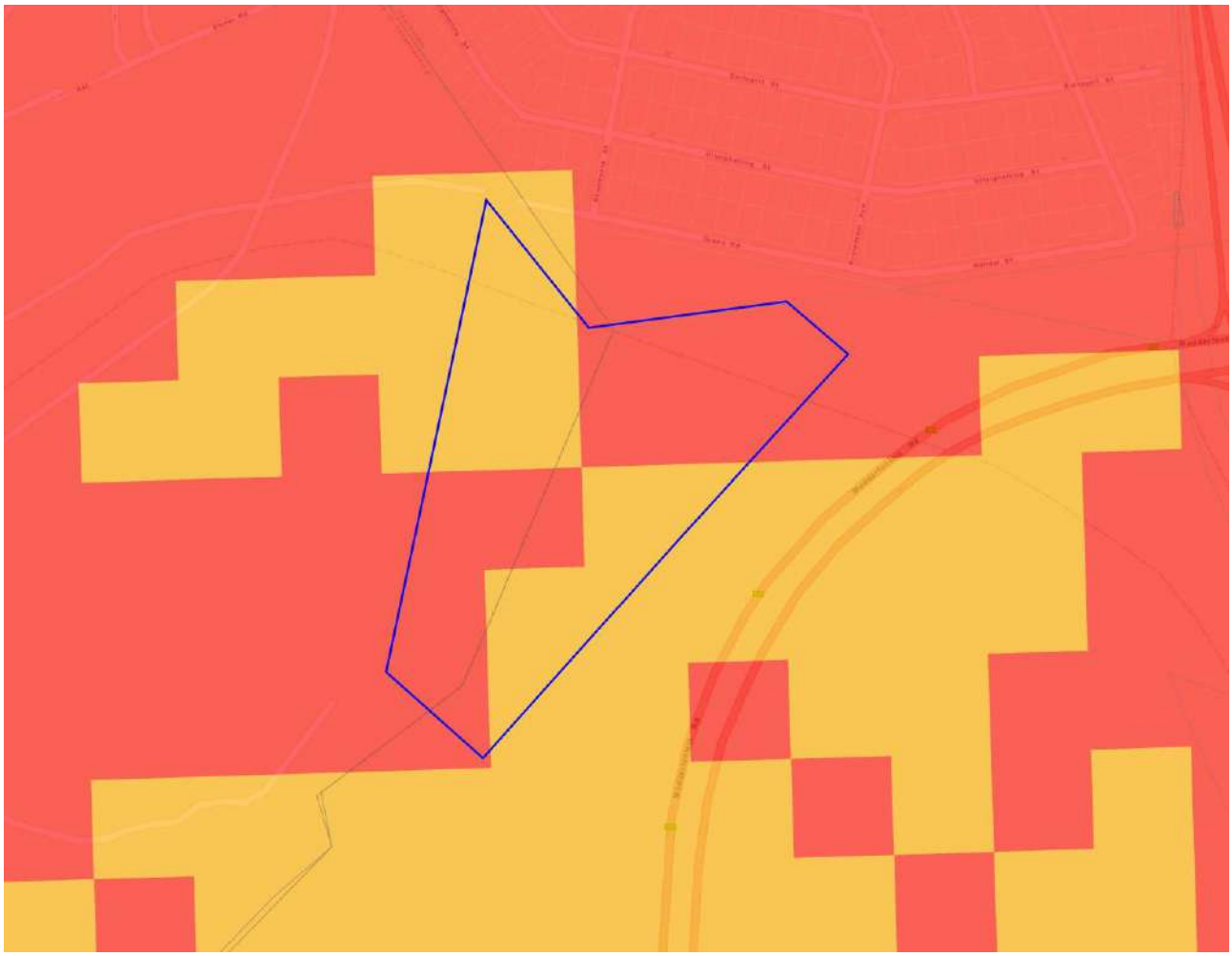

Figure 1. *The proposed development area (blue outline) overlaid on agricultural sensitivity as identified by the screening tool (green = low; yellow = medium; red = high; dark red = very high).*

The agricultural sensitivity, as identified by the screening tool, is disputed by this assessment. The motivation for disputing the sensitivity is that the screening tool does not take zoning or any urban land use or designation into account when classifying agricultural sensitivity. Even land occupied by buildings, in the middle of a city, can still be classified as high agricultural sensitivity by the screening tool, which obviously makes no sense. In reality, such land has zero potential for agricultural production and therefore for being high agricultural sensitivity.

Likewise, the classification of high agricultural sensitivity in this case does not take account of the fact that the site is within the urban area of Johannesburg, and although it has no buildings on it, could not possibly and practically be used for agricultural production. Its location negates any agricultural production potential. The site cannot, therefore, be considered to be of anything but low agricultural sensitivity, in terms of the available sensitivity categories, which are: low; medium; high; and very high. The designation of high agricultural sensitivity by the screening tool is therefore invalid, because the screening tool does not take any urban land use or designation into

account when classifying agricultural sensitivity.

The agricultural protocol further states:

> *An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of very high or high sensitivity for agricultural resources must submit an Agricultural Agro-Ecosystem Specialist Assessment unless:*
>
> *information gathered from the site sensitivity verification differs from the designation of very high or high agricultural sensitivity, and it is found to be of a medium or low sensitivity.*
>
> *If the above applies, an Agricultural Compliance Statement must be submitted.*

In this case, the above exception does apply, as has been argued above, and the required level of agricultural assessment is therefore an Agricultural Compliance Statement.

2 Agricultural Compliance Statement

It is hereby confirmed that the entire site is of low sensitivity for agriculture, because its location prevents any agricultural production potential. Furthermore, it is confirmed that, because the location already prevents current or future agricultural use of the land anyway, the proposed development cannot have an unacceptable negative impact on the agricultural production capability of the site. Therefore, from an agricultural impact point of view, it is recommended that the development be approved.

Given the above, the protocol requirement of confirmation that all reasonable measures have been taken through micro-siting to avoid or minimise fragmentation and disturbance of agricultural activities, is not relevant in this case. For the same reasons, there are no Environmental Management Programme inputs required for the protection of agricultural potential on the site.

The conclusion of this assessment on the acceptability of the proposed development and the recommendation for its approval is not subject to any conditions. In completing this statement, no assumptions have been made and there are no uncertainties or gaps in knowledge or data that are relevant to it. No further agricultural assessment of any kind is required for this application.

The required relevant experience, proving the specialist's fitness for completing this assessment, is given in the curriculum vitae overleaf.

J. Lanz (Pr. Sci.Nat.)
3 August 2021

Johann Lanz
Curriculum Vitae

Education

M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - 1997
B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I have been registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science since 2012 (registration number 400268/12) and am a member of the Soil Science Society of South Africa.

Soil & Agricultural Consulting **Self employed** **2002 - present**

In the past 5 years of running my soil and agricultural consulting business, I have completed more than 120 agricultural assessments (EIAs, SEAs, EMPRs) in all 9 provinces for renewable energy, mining, urban, and agricultural developments. My regular clients include: Aurecon; CSIR; SiVEST; Arcus; SRK; Environamics; Royal Haskoning DHV; Jeffares & Green; JG Afrika; Juwi; Mainstream; Redcap; G7; Mulilo; and Tiptrans. Recent agricultural clients for soil resource evaluations and mapping include Cederberg Wines; Western Cape Department of Agriculture; Vogelfontein Citrus; De Grendel Estate; Zewenwacht Wine Estate; and Goedgedacht Olives.

In 2018 I completed a ground-breaking case study that measured the agricultural impact of existing wind farms in the Eastern Cape.

Soil Science Consultant **Agricultural Consultors International (Tinie du Preez)** **1998 - 2001**

Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

Contracting Soil Scientist **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

Completed a contract to advise soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*