BIODIVERSITY IMPACT ASSESSMENT REPORT

SISHEN

Terrestrial and Aquatic Ecological Assessments for the Proposed Railway Staging Lines alongside existing railway lines at Sishen in the Gamagara Local Municipality, Kgalagadi District Municipality, Northern Cape Province

STUDY & REPORT BY: FLORI SCIENTIFIC SERVICES cc

15 Kiaatsingel, Bosveldsig Phase 8, Modimolle, 0510

Tel: 082 564 1211

Email: johannes@flori.co.za

Contact Person: Johannes Maree, MSc, MBA, *Pr.Sci.Nat*

SACNASP Registration Number: 400077/91

PREPARED FOR:

Transnet SOC Limited

Transnet Freight Rail Division

JANUARY 2023

DOCUMENT INFORMATION

PROJECT TITLE: Sishen Staging Lines

STUDY NAME: Biodiversity Impact Assessment

COMPILED BY: Flori Scientific Services cc
15 Kiaatsingel, Bosveldsig Phase 8, Modimolle, 0510
Tel: (082) 564-1211
Email: johannes@flori.co.za

AUTHOR: Johannes Oren Maree, MSc.; MBA; *Pr. Sci. Nat.*
SACNASP Reg. No: 400077/91

PREPARED FOR: Transnet SOC Ltd
Transnet Freight Rail division

CONTACT PERSON Tashriq Naicker

DATE OF REPORT: 29 January 2023

REPORT STATUS: Final Report

REPORT NUMBER: BD/SH_01

EXECUTIVE SUMMARY

Currently Transnet SOC Ltd is implementing solutions for the Manganese expansion programme with respect to exporting manganese on the Saldanha corridor. The current scope of the project will present the expansion program with options to optimally utilize the rail capacities en route to Sishen and to provide appropriate and cost effective means of expanding those capacities to meet the validated tonnage demand. The proposed solution is to provide additional staging lines in Sishen and provide additional facilities for Vlermuislaagte.

The proposed Sishen expansion (total length of 5 km) includes, but not limited to the following:

- Relocation of Eskom pylons;
- Bridge alterations to ensure space/clearances underneath;
- Lines to be electrified to 50 kV AC;
- Relocation of the following:
    - Relocation of power line (132kV)
    - Relocation of power line (11 kV / 6.6 kV);
    - Service roads (4 m wide);
    - Overheard aerial feeder and return conductors; and
    - Optic fibre cables if on the impacted structures.
- Culverts extensions;
- Demolish and relocate retaining wall running parallel to the rail track;
- Drainage for additional lines;
- Two (2) lines to be added on the eastern side of the yard as per considered Option 4, which will accommodate three (3) rakes of 116 CR13/14 wagon for iron ore trains and three (2) rakes of 125 CR17 wagon for Manganese trains. These rakes will be pulled by a combination of 15E and 43D locomotives; and
- One (1) line to be added on the locomotive staging area.

The study site (footprint of the proposed project) is situated at Sishen Mine, east of the main mining areas, in the Gamagara Local Municipality, Northern Cape Province. The site is approximately 6,5km south of Kathu and west of the N14 Highway. Flori Scientific Services cc was appointed on behalf of Transnet SOC Limited by Remofilwe 2010 Trading (Pty) Ltd, as the independent specialist consultancy to conduct specialist environmental studies for the project. Field investigations were conducted on 08 December 2022.

Conclusions

The conclusions of the biodiversity study are as follows:

- The study site is situated within Kathu Bushveld and Kuruman Thornveld, both which are not threatened veldtypes / ecosystems, and both have a status of 'Least Concern'.
- There are a few scattered protected camelthorn trees in the south of the study area.
- There are no watercourses directly within the study site footprint. However, there is a depression wetland system close by (between 100 – 300m). It is possible that at a stage the systems were connected with surface stormwater flow.
- No RDL or ODL flora was observed during field investigations and none are expected to occur.
- No faunal species of conservation concern (SCC) were observed. However, it is more than likely that due to the remoteness of the area there will be the occasional SCC moving through the area. These would include priority bird species, which include many of the raptors found in the region.
- Ground-truthing supports (verifies) the screening tool assessment that the overall terrestrial biodiversity sensitivity is 'Low'.
- Ground-truthing disputes the screening tool assessment that the aquatic sensitivity is 'High'. During field investigations the aquatic sensitivity was determined to be 'Low'. Even though the site is within the Kathu-Sishen SWSA, which is a groundwater SWSA. The project will have absolutely no impact on groundwater. The nearby / adjacent depression wetlands have a sensitivity of 'High'.

Recommendations

The recommendations of the study are as follows:

- There are no fatal flaws and the project should be allowed to proceed.
- Mitigating measures should be implemented and form part of the conditions of any other documents and regulations, such as the EMP.
- A 32m buffer zone should be implemented around the nearby depression wetlands and should be viewed as a 'no-go zones'. It should be noted that the development footprint does not affect the wetlands.
- There are a few scattered protected camelthorn trees in the south of the study area. If any of these trees are to be removed, then a tree permit will first be required.

SPECIALIST EXPERTISE & DECLARATION

Expertise of Specialist

Qualifications & Expertise in: Terrestrial Ecology, Aquatic Ecology and Avifaunal Assessments.

- 2 Masters Degrees (MSc & MBA); 2 Diplomas (Business & Public Speaking).
- Co-Authored two books: Cut Flowers of the World. 2010 (1st ed) & 2020 (2nd ed), Briza, Pretoria.
- SAQA accreditation and qualifications in training, assessing & service provision (AgriSeta).
- Professional Memberships:
    - SA Council of Natural Scientific Professions (Reg. No. 400077/91)
    - South African Wetland Society (Reg. No: 998061)
    - Society of Wetland Scientists
- 21 years' experience in technical and managerial positions, project management and consultancy.
- 19 years' experience in writing of articles, books, training material, training & presentations.
- 14 years direct experience in EIAs.
- Has conducted hundreds of field investigations and compiled hundreds of technical specialist reports for EIAs, including ecological assessments (fauna & flora), wetland assessments and avifauna impact assessments.
- Projects involved in include power lines, roads, quarries, housing developments, mines and wind farms.

Declaration of Independence

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the 2014 NEMA Environmental Impact Assessment (EIA) Regulations (as amended on 7 April 2017).

I, **Johannes Oren Maree**, do hereby declare that I:

- Act as an independent specialist in compiling this report;
- Do not have any financial interests, or stand to gain in any way in the undertaking of this activity, other than remuneration for work performed;
- Do not have, nor will have, any vested interest in the proceeding activity or project;
- Have no, neither will engage in, conflicting interests in the undertaking of this activity;
- Undertake to disclose, to the competent authority, any material information that has, or may have, the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required; and
- Will provide competent authority access to my information regarding the report and investigations, whether such information is favourable to the applicant or not.

REPORT REQUIREMENTS

Below are the requirements for specialist reports as per Protocols for Specialist Studies (Government Gazette No. 43855, 30 October 2020) and Appendix 6 of the Environmental Impact Assessment Regulations (Gazette No. 40772, 7 April 2017, as amended). A specialist report prepared in terms of these regulations must contain the following as highlighted in the table below:

Requirement	Page No
(a) details of— (i) the specialist who prepared the report;	iv, 57
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	iv
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	iv
c) an indication of the scope of, and the purpose for which, the report was prepared;	12
(cA) an indication of the quality and age of base data used for the specialist report;	12
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	48
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	12
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	13
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Entire Report
(g) an identification of any areas to be avoided, including buffers;	Entire Report
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	45
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	12
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Entire Report
(k) any mitigation measures for inclusion in the EMPr;	48
(l) any conditions for inclusion in the environmental authorisation;	48
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	48
(n) a reasoned opinion —	
(i) whether the proposed activity, activities or portions thereof should be authorised;	51
(iA) regarding the acceptability of the proposed activity or activities; and	51
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	51
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	12
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	None
(q) any other information requested by the competent authority.	None

CONTENTS

DOCUMENT INFORMATION i

EXECUTIVE SUMMARY ii

SPECIALIST EXPERTISE & DECLARATION iv

REPORT REQUIREMENTS v

ACRONYMS x

1 BACKGROUND 11

1.1 Project Overview 11

1.2 Purpose for the Study 11

1.3 Quality and Age of the Base Data Used 12

1.4 Assumptions and Limitations 12

2 METHODOLOGY 13

2.1 Desktop Assessment 13

2.2 Field surveys 13

2.3 Present Ecological State 13

2.4 Ecological Importance and Sensitivity 16

2.5 Floristic Sensitivity 16

2.6 Faunal Sensitivity 17

2.7 Rating Scale for Floral and Faunal Sensitivity 17

2.8 Faunal Assessment – Species of Conservation Concern 18

2.9 Impact Assessment 18

2.9.1 Scoring Method 18

2.9.2 Criteria for the classification of an impact 19

3 RECEIVING ENVIRONMENT 21

3.1 Study Site Location 21

3.2 Topography 21

3.3 Geology and Soils 22

3.4 Climate 22

3.5 Landcover 24

3.6 Vegetation 24

3.6.1 General vegetation 24

3.6.2 Vegetation of the Study Area 25

3.7 Priority Floral Species 27

3.8 Protected Trees 27
3.9 Conservation status 27
3.10 Watercourses in the study area 29
3.11 Classification of Watercourses in the Study Area 31
3.12 Drainage Regions 32
3.13 Strategic Water Source Areas of South Africa 35
3.14 Present Ecological State of Watercourses 36
3.15 Ecological Importance & Sensitivity of Watercourses in the Study Area 37
3.16 Fauna 37
3.16.1 Mammals 38
3.16.2 Avifauna 38
3.16.3 Reptiles and Amphibians 39
3.16.4 Invertebrates 39
3.16.5 Faunal species of conservation concern 40

4 SENSITIVITY ASSESSMENT 42
4.1 DEA Screening Tool Assessment 42
4.2 Ecological Sensitivity 43
4.3 Ecological Sensitivity Analysis 44
4.4 National Priority Areas 44
4.5 Critical Biodiversity Areas & Ecological Support Areas 44
4.6 Sensitivity mapping of the study area 45
4.7 Buffer Zones 46

5 THE GO, NO-GO OPTION 47
5.1 Potential fatal flaws 47
5.2 Classification criteria 47

6 IMPACT ASSESSMENT 48
6.1 Existing Impacts 48
6.2 Potential Impacts 48
6.3 Assessment of potential impacts 48
6.4 Cumulative Effect 49

7 CONCLUSIONS & RECOMMENDATIONS 51

8 APPENDICES 52
8.1 List of floral species identified on site 52
8.2 Alien plants identified in the Study Area 52

8.3 Kathu Bushveld 52
8.4 Kuruman Thornveld 53
8.5 Definitions 53
8.5.1 Wetlands 53
8.5.2 Valley Bottom Wetlands 54
8.5.3 Riparian zones 54
8.6 Buffer Zones vs Regulated Zones 56
8.7 Short CV of Specialist 57

9 REFERENCES 58

LIST OF FIGURES

Figure 1: Study Site location 21
Figure 2: Rainfall zones of South Africa 23
Figure 3: Climatic zones of South Africa 23
Figure 4: Biomes of South Africa 25
Figure 5: Structure of categories used at the regional level 29
Figure 6: Main Rivers / Streams in the Region 30
Figure 7: Depression Wetlands close to the Study Site and Railway 30
Figure 8: Primary Drainage Areas (PDAs) of South Africa 34
Figure 9: New Water Management Areas (WMAs) of South Africa 34
Figure 10: Quaternary Drainage Areas (QDAs) 35
Figure 11: Butterfly hotspots 41
Figure 12: Snake hotspots 41
Figure 13: Lizard hotspots 42
Figure 14: CBAs and ESAs 45
Figure 15: Sensitivity Map 46
Figure 16: Basic classification of wetlands 55

LIST OF TABLES

Table 1: Habitat Assessment Criteria 14
Table 2: Scoring Guidelines for Habitat Assessment Criteria 15
Table 3: Wetland Integrity Categories 15
Table 4: EIS Categories and Descriptions 16

Table 5: Scoring Method for Impact Assessment 18
Table 6: Description of land types found in the region 22
Table 7: Vegetation classification of the study site 24
Table 8: Photos of the Vegetation found in the Study Area 26
Table 9: Veldtype status 27
Table 10: Ecosystem Status: Simplified explanation of categories used 28
Table 11: Photos of watercourses in the study area 31
Table 12: Classification of watercourses in the study area 31
Table 13: Classification levels 1 - 4 32
Table 14: Summary of Catchment Area information 33
Table 15: PES of Watercourses in the study area 36
Table 16: EIS of watercourses in the study area 37
Table 17: RDL butterfly species for the Province 40
Table 18: Priority Faunal Species likely to occur in the area 40
Table 19: Floristic sensitivity analysis 43
Table 20: Faunal sensitivity analysis 43
Table 21: Ecological sensitivity analysis 44
Table 22: Assessment of Potential Impacts 49

ACRONYMS

CBA	Critical Biodiversity Areas
CMA	Catchment Management Agencies
DEA	Department of Environmental Affairs (Old name for DFFE)
DFFE	Department of Forestry, Fisheries & the Environment
DWS	Department of Water and Sanitation
EIS	Ecological Importance & Sensitivity
EMC	Environmental Management Class
ESA	Ecological Support Area
HGM	Hydrogeomorphic
IBA	Important Bird Area(s)
MAP	Mean Annual Precipitation
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
ODL	Orange Data Listed
PDA	Primary Drainage Area
QDA	Quaternary Drainage Area
RDL	Red Data Listed
REC	Recommended Ecological Category (or Class)
REMC	Recommended Ecological Management Category (or Class)
SANBI	South African National Biodiversity Institute
SCC	Species of conservation concern
SWSA	Strategic Water areas of South Africa
TOPS	Threatened or Protected Species
WMA	Water Management Areas

1 BACKGROUND

1.1 Project Overview

Currently Transnet SOC Ltd is implementing solutions for the Manganese expansion programme with respect to exporting manganese on the Saldanha corridor. The current scope of the project will present the expansion program with options to optimally utilize the rail capacities en route to Sishen and to provide appropriate and cost effective means of expanding those capacities to meet the validated tonnage demand. The proposed solution is to provide additional staging lines in Sishen and provide additional facilities for Vlermuislaagte.

The proposed Sishen expansion (total length of 5 km) includes, but not limited to the following:

- Relocation of Eskom pylons;
- Bridge alterations to ensure space/clearances underneath;
- Lines to be electrified to 50 kV AC;
- Relocation of the following:
    - Relocation of power line (132kV)
    - Relocation of power line (11 kV / 6.6 kV);
    - Service roads (4 m wide);
    - Overheard aerial feeder and return conductors; and
    - Optic fibre cables if on the impacted structures.
- Culverts extensions;
- Demolish and relocate retaining wall running parallel to the rail track;
- Drainage for additional lines;
- Two (2) lines to be added on the eastern side of the yard as per considered Option 4, which will accommodate three (3) rakes of 116 CR13/14 wagon for iron ore trains and three (2) rakes of 125 CR17 wagon for Manganese trains. These rakes will be pulled by a combination of 15E and 43D locomotives; and
- One (1) line to be added on the locomotive staging area.

Flori Scientific Services cc was appointed on behalf of Transnet SOC Limited by Remofilwe 2010 Trading (Pty) Ltd, as the independent specialist consultancy to conduct specialist environmental studies for the project. Field investigations were conducted on 8 December 2022.

1.2 Purpose for the Study

The purpose of the study is to conduct a biodiversity impact assessment that consists of a terrestrial and an aquatic ecological assessment to determine the ecological sensitivities and habitats of the study area. To investigate the fauna and flora and determine if there are any priority species present. To investigate the presence of watercourses and, if present, to delineate and assess them. Furthermore,

the purpose of the study is to identify any potential fatal flaws, assess impacts, delineated buffer zones (if required), and to recommend mitigating measures aimed at reducing any potential negative impacts the project may have on the natural environment.

1.3 Quality and Age of the Base Data Used

The latest data sets were used for the report in terms of background information.

The source and age of the data used included the following:

- Threatened ecosystems: SANBI (www.bgis.sanbi.org) and NEMBA (G 34809, GN 1002), 9 December 2011).
- Protected areas: Protected Areas Register (PAR): DFFE – (https://portal.environment.gov.za).
- RDL species: Red List of South Africa Plants (latest update) – (www.redlist.sanbi.org).
- Veldtypes and ecosystems: Mucina & Rutherford, 2006. Updated 2012, 2018.
- SANBI data sets – latest updated website data (www. bgis.sanbi.org).
- Environmental Screening Tool – Dept. of Environmental Affairs (Now DFFE) (www.environment.gov.za).
- National Freshwater Ecosystem Priority Areas (NFEPA) – DWS & SANBI databases.
- National Wetland Map 5 (2018) – CSIR, SANBI (www.bgis.sanbi.org).
- Northern Cape Critical Biodiversity Areas (2016) - (www.bgis.sanbi.org).

1.4 Assumptions and Limitations

The assumptions and limitations for the assessment were as follows:

- All information regarding the project as provided by the Client is taken to be accurate.
- This study focuses on the biodiversity (terrestrial and aquatic ecology) of the study site.
- Field investigations were conducted on 8 December 2022, which is during the wet season (summer season) for the region.
- The Specialist who conducted this study has conducted previous projects and studies in the area and has a good working knowledge of the region. The footprint of the proposed project (study area) is very narrow (approximately 100m) and linear and it was easy to assess the entire site in a short period of time. Therefore, no additional field investigations or similar studies are required or considered necessary, including a dry season assessment.
- Precise buffer zones or exact GPS positions cannot be made using generalised corridors or KML files on Google Earth. However, the buffer zones, delineations, etc. drawn on maps and obtained in kml files, shapefiles, etc. are accurate to within 2-3m;
- Standard and acceptable methodologies were used, as required and used in South Africa.
- The latest data sets were used in terms of obtaining and establishing background information and desktop reviews for the project. The data sets were taken to be accurate but were verified

and refined during field investigations (ground-truthing). This includes the important DEA Screening Tool assessment.

- **NOTE**: Recommendations put forward in the report are based on actual biodiversity and specialist findings, but this does not mean that legal requirements do not still apply. In other words, recommendations do not negate legal requirements as set out in various acts such as NEMA (Act 107 of 1998) and NEMBA (Act 10 of 2004).
- No specific or highly specialised scientific equipment were used except standard soil augers, hand-held Garmin GPS instruments, relevant computer programmes, etc.
- There were no limitations encountered that hindered the project or potentially impacted on any outcomes of the study. All areas could be accessed with the full assistance and cooperation of landowners.
- Officials from Transnet SOC Ltd accompanied the Specialist during field investigations.

2 METHODOLOGY

2.1 Desktop Assessment

An initial desktop assessment was conducted regarding the main fauna and flora and watercourses of the region and study site. The primary sources used were those mentioned above in Section 1.3. Red data listed (RDL) and other priority species listed by the National Environmental Management: Biodiversity Act (Act No. 10 of 2004), as well as in other authoritative publications were also consulted. Alien invasive species and their different Categories (1, 2 & 3) as listed by the Conservation of Agricultural Resources Act (Act No. 43 of 1983) and the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) were also taken into account.

2.2 Field surveys

During field surveys undertaken on 08 December 2022, cognisance was taken of all environmental features and attributes, namely: Biophysical environment; Regional and site specific vegetation; Habitats ideal for potential red data fauna species; Sensitive floral habitats; Red data listed (RDL) fauna and flora species; Protected fauna and flora species; and Watercourses.

Digital photographs and GPS reference points of importance were recorded and used in the report where applicable.

2.3 Present Ecological State

The Present Ecological State (PES) is the current (present) ecological condition (state) in which the watercourse is found, prior to any further developments or impacts from the proposed project. The PES of watercourses found in the study area is just as important to determine, as are the potential impacts of

the proposed development. The PES of a watercourse is assessed relative to the deviation from the Reference State (also known as the Reference Condition). The reference state is the original, natural or pre-impacted condition of the system. The reference state is not a static condition but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES Method (DWA, 2005) was used to establish the present state (integrity) of the unnamed drainage line in the study area. The methodology is based on the modified Habitat Integrity approach of Kleynhans (1996, 1999). The criteria used for assessing the habitat integrity or present ecological state (PES) of watercourses can be found below in Table 1, along with Table 2, which describes the allocation of scores to the various attributes. These criteria were selected based on the assumption that anthropogenic modification of the criteria and attributes listed under each selected criterion can generally be regarded as the primary causes of the ecological integrity of a watercourse.

Table 3 gives a short description of each category. The approach is based on the assumption that extensive degradation of any of the attributes may determine the PES of the watercourse (DWA, 2005).

Table 1: Habitat Assessment Criteria

Rating Criteria	Relevance
Hydrology	
Flow modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural lands. Changes in flow regime (timing, duration, frequency), volumes, and velocity, which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water quality	
Water Quality Modification	From point or diffuse sources. Measured directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment Load Modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
Geomorphology & Hydraulics	
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive

	activities, which reduce or changes wetland habitat directly in inundation patterns.
Biota	
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive Plant Encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien Fauna	Presence of alien fauna affecting faunal community structure.
Over utilisation of Biota	Over-grazing, over-fishing, over-harvesting of plant material, etc.

Table 2: Scoring Guidelines for Habitat Assessment Criteria

Scoring guidelines per criteria	
Natural / unmodified	5
Mostly natural	4
Moderately modified	3
Largely modified	2
Seriously modified	1
Critically modified (totally transformed)	0

Table 3: Wetland Integrity Categories

Category	Mean Score	Description
A	>4	Unmodified, natural condition.
B	>3 to 4	Largely natural with few modifications, but with some loss of natural habitats.
C	>2,5 to 3	Moderately modified, but with some loss of natural habitats.
D	2 to 2,5	Largely modified. A large loss of natural habitats and basic ecosystem functions has occurred.
E	>0	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive.
F	0	Critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

The integrity of watercourses with a category rating of F, E & D are deemed to be Low. Category rating of C is deemed to be Medium, while Category ratings of B & A are deemed to be High.

2.4 Ecological Importance and Sensitivity

Ecological importance and sensitivity (EIS) looks at the importance of the wetland, watercourse or water ecosystem in terms of biodiversity and maintenance. The determination is not just based on the identified watercourse in isolation, but also its' importance in terms of supplying and maintaining services to the larger catchment and water systems up and downstream.

The ecological sensitivity (ES) part of the EIS looks at how sensitive the system is to changes in services and environmental conditions. The Recommended Environmental Management Class (REMC) is the recommended state to which the watercourse should be returned to or maintained at. The EIS categories and descriptions are outlined in the table below (Table 4).

A high REMC relates to ensuring a high degree of sustainability and a low risk of ecosystem failure occurring. A low REMC would ensure marginal sustainability, but with a higher risk of ecosystem failure. The REMC is based on the results obtained from assessing the ecosystem / watercourse / wetland in terms of EIS, PES and function, and the desire to with realistic recommendations and mitigating actions to return the system to a certain level of functionality and original state. The determination of the Environmental Importance and Sensitivity (EIS) of the watercourses identified in the study area are shown below (Table 4).

Table 4: EIS Categories and Descriptions

EIS Categories	Median Range	Category
Watercourses that are considered ecologically important and sensitive on a **national or international** level. The biodiversity of these watercourses is usually very sensitive to flow & habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	Very high 3 - 4	A
Watercourses that are considered to be ecologically important and sensitive. The biodiversity of these watercourses may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	High 2 - 3	B
Watercourses that are considered to be ecologically important and sensitive on a **provincial or local** scale. The biodiversity of these watercourses is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	Moderate 1 - 2	C
Watercourses that are not ecologically important and sensitive on any scale. The biodiversity of these watercourses is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	Low 0 - 1	D

2.5 Floristic Sensitivity

The methodology used to estimate the floristic sensitivity is aimed at highlighting floristically significant attributes and is based on subjective assessments of floristic attributes. Floristic sensitivity is determined across the spectrum of communities and habitats that typify the study area. Phytosociological attributes (species diversity, presence of exotic species, etc.) and physical

characteristics (human impacts, size, fragmentation, etc.) are important in assessing the floristic sensitivity of the various communities.

Criteria employed in assessing the floristic sensitivity vary in different areas, depending on location, type of habitat, size, etc. The following factors were considered significant in determining floristic sensitivity:

- Habitat availability, status and suitability for the presence of RDL species;
- Landscape and/or habitat sensitivity;
- Current floristic status, including diversity; and
- Ecological fragmentation.

2.6 Faunal Sensitivity

Determining the full faunal component of a study area during a short time scale of a few field trips can be highly limiting. Therefore, the different habitats within the study area and nearby surrounding areas were scrutinised for attributes that are deemed to be suitable for high diversity of fauna, as well as for Red Data species. Special consideration was given to habitats of pristine condition and high sensitivity.

Areas of faunal sensitivity were calculated by considering the following parameters:

- Habitat status – the status or ecological condition of the habitat. A high level of habitat degradation will often reduce the likelihood of the presence of Red Data species.
- Habitat linkage – Movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to surrounding habitats and adequacy of these linkages are evaluated for the ecological functioning of Red Data species within the study area
- Potential presence of Red Data species – Areas that exhibit habitat characteristics suitable for the potential presence of Red Data species are considered sensitive.

2.7 Rating Scale for Floral and Faunal Sensitivity

Floristic and/or Faunal Sensitivity Values are expressed as a percentage of the maximum possible value and placed in a particular class or level, namely:

- High: 80 – 100%
- Medium/high: 60 – 80%
- Medium: 40 – 60%
- Medium/low: 20 – 40%
- Low: 0 – 20%

High Sensitivity Index Values indicate areas that are considered pristine, unaffected by human influences or generally managed in an ecological sustainable manner. Nature reserves or even well managed game farms typify these areas.

Low Sensitivity Index Values indicate areas of poor ecological status or importance in terms of floristic attributes, including areas that have been negatively affected by human impacts or poor management. Each unit is subjectively rated on a scale of **1 to 10 (Sensitivity Values)** in terms of the influence that the particular Sensitivity Criterion has on the floristic or faunal status of the plant or animal community / habitat.

2.8 Faunal Assessment – Species of Conservation Concern

Literature was reviewed and relevant experts contacted to determine which faunal species of conservation concern (which include Red Data Listed (RDL) species) are present, or likely to be present, in the study area. A snapshot investigation of an area presents limitations in terms of locating and identifying RDL fauna species. Particular emphasis was therefore placed on the identification of habitat deemed suitable for the potential presence of RDL fauna species by associating available habitat to known habitat types of RDL species. The verification of the presence or absence of these species from the study area is not perceived as a complete or fundamental part of site investigation as a result of project limitations.

2.9 Impact Assessment

2.9.1 Scoring Method

The impact assessment takes into account the nature, scale and duration of the effects on the natural environment and whether such effects are positive (beneficial) or negative (detrimental). A scoring method (rating system) is applied to the potential impact on the affected environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each issue the following criteria are used and points awarded as shown in the table below (Table 5)

Table 5: Scoring Method for Impact Assessment

Magnitude (Intensity)	**Duration**
10 - Very high/unknown	5 - Permanent
8 - High	4 - Long-term (Impact ceases after operational life of the activity
6 - Moderate	3 - Medium-term (5-15 years)
4 - Low	2 - Short-term (0-5 years)
2 - Minor	1 - Immediate
0 - None	0 - None
Scale (Extent)	**Probability**
5 – International	5 – Definite / Unknown
4 – National	4 – Highly probable
3 – Regional	3 – Medium probability
2 – Local	2 – Low probability
1 - Site only	1 – Improbable
0 – None	0 – None

Once the above factors had been ranked for each impact, the overall risk (environmental significance) of each impact will be assessed using the following formula:

Significance (SP) = [Magnitude (M) + Duration (D) + Scale(S)] x Probability (P).

The maximum value is 100 significance points (SP). Environmental impacts will be rated as either that of High, Moderate or Low significance on the following basis:

- SP ≥60: Indicates **high** environmental significance;
- SP 31 ≥ 59: Indicates **moderate** environmental significance;
- SP ≤ 30: Indicates **low** environmental significance.

2.9.2 Criteria for the classification of an impact

Scale (Extent)

Considering the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact.

- Site: Within the construction site
- Local: Within a radius of 2 km of the construction site
- Regional: Provincial (and parts of neighbouring provinces)
- National: The whole of the country
- International: Impact is across countries

Duration

Indicates what the lifetime of the impact will be.

- Immediate: The impact will either disappear with mitigation or will be mitigated through natural process in a time span shorter than the construction phase.
- Short-term: The impact will either disappear with mitigation or will be mitigated through natural process within 0 – 5 years.
- Medium-term: The impact will either disappear with mitigation or will be mitigated through natural process within 5 – 15 years.
- Long-term: The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter. Impact ceases after the operational life of the activity.
- Permanent: The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

Magnitude (Intensity)

Describes whether an impact is destructive or benign.

- Low: Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
- Medium: Effected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way.
- High: Natural, cultural and social functions and processes are altered to extent that they temporarily cease.
- Very high / Unknown: Natural, cultural and social functions and processes are altered to extent that they permanently cease.

Probability

Probability is the description of the likelihood of an impact actually occurring.

- Improbable: Likelihood of the impact materialising is very low.
- Low probability / possible: The impact may occur.
- Medium probability: It is more than likely that the impact will occur.
- Highly probable: High likelihood that the impact will occur.
- Definite / Unknown: The impact will definitely (most certainly) occur, or is unknown and therefore needs to be afforded a high probability score.

Significance

Significance (environmental significance) constitutes the overall risk and is determined through a synthesis of impact characteristics. It is an indication of the importance of the impact in terms of both the physical extent and the time scale and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Status

Status gives an indication of the perceived effect of the impact on the area.

- Positive (+): Beneficial impact.
- Negative (-): Harmful or adverse impact.
- Neutral Impact (0): Neither beneficial nor adverse.

It is important to note that the status of an impact is assigned based on the *status quo.* That is, should the project not proceed. Therefore, not all negative impacts are equally significant. The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented

3 RECEIVING ENVIRONMENT

3.1 Study Site Location

The study site (footprint of the proposed project) is situated at Sishen Mine, east of the main mining areas, in the Gamagara Local Municipality, Northern Cape Province. The site is approximately 6,5km south of Kathu and west of the N14 Highway (Figure 1).

The footprint of the study site is: 5km long by 100m wide. Below are some of the main coordinates for the project:

- Sishen Mine: 27°45'3.69"S; 23° 0'51.55"E.
- Approximate centre of study site: 27°47'4.15"S; 23° 2'36.60"E.
- Start of study site (south): 27°48'20.42"S; 23° 2'30.89"E.
- End of study site (north): 27°45'43.91"S; 23° 2'8.11"E.
- Quarter Degree Square (QDS): 2723CC.
- Quaternary Drainage Area (QDA): D41J.

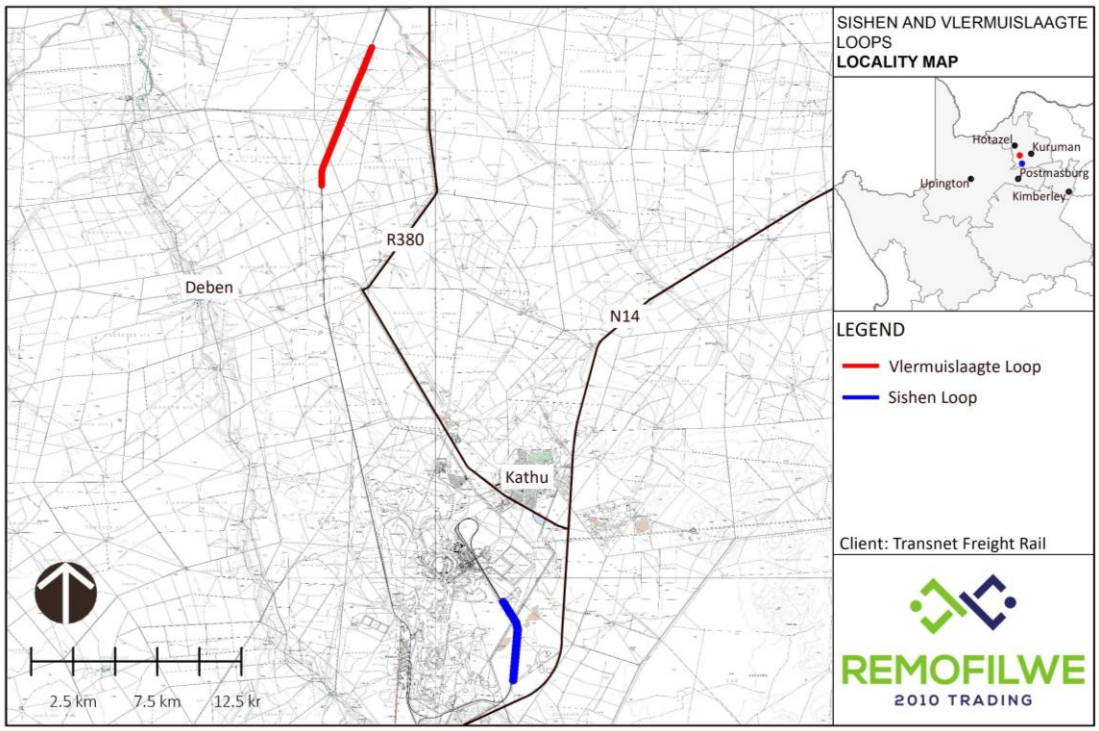

Figure 1: Study Site location

3.2 Topography

The topography of the study area is open flat to semi-arid bushveld and thornveld plains with few to no rocky outcrops or hills. The average height above sea level across the study site is about 1 210m, with a maximum and minimum elevation of around 1 114m and 1 107m, respectively. The average gradient

(slope) is very low at less than 1%, with the general downward slope being flat or moving mainly eastward.

3.3 Geology and Soils

The geology and soils of the study site and surrounding areas are typically that of Aeolian red sand and surface calcrete, deep (>1.2 m) sandy soils of Hutton and Clovelly soil forms. Land types are predominantly Ah and Ae, with some Ag (Mucina & Rutherford, 2010).

Short descriptions of the prominent landtypes of the study area are shown below (Table 6).

Table 6: Description of land types found in the region

Land Type	Description
Ae	RED-YELLOW APEDAL, FREELY DRAINED SOILS (Red, high base status soils, > 300 mm deep, without dunes). Moderately deep (average 500-1200 mm) red, freely drained, apedal (= structureless) soils. Soils occur in areas associated with low to moderate rainfall (300-700 mm per annum) in the interior of South Africa and have a high fertility status. A wide range of texture occurs (usually sandy loam to sandy clay loam).
Ag	RED-YELLOW APEDAL, FREELY DRAINED SOILS (Red, high base status soils, < 300 mm deep). These shallow (< 300 mm), red, freely-drained, apedal (= structureless) soils occur in arid to semi-arid areas associated with low rainfall (< 500 mm per annum) and are underlain by hard to weathered rock. A wide range of textures may occur (usually loamy sand to sandy loam). Stones or rocks are often present on the soil surface.
Ah	RED-YELLOW APEDAL, FREELY DRAINED SOILS (Red and yellow, high base status soils, usually < 15% clay). These red and yellow, apedal (= structureless), freely drained soils have a low clay content (< 15%) and thus a low fertility status. The soils usually have a sand or loamy sand texture and occur in moderately low rainfall areas (400-600 mm per annum). Wind-blown dunes may occasionally be present.

3.4 Climate

The study site is situated within the low rainfall zone of 201mm – 400mm per annum (Figure 2) and in the Arid Interior Climatic Zone of South Africa (Figure 3). Kuruman, which is about 53km northeast of the study site, normally receives about 266mm of rain per year, with most rainfall during the late summer months. Kuruman receives the lowest rainfall (0mm) in June and the highest (58mm) in February. The monthly distribution of average daily maximum temperatures of the town shows that the average midday temperatures range from 17.5°C in June to 32.6°C in January. The region is the coldest during June when the temperature can regularly drop to 0°C on average during the night. Frost is not frequent but does occur (saexplorer.co.za.).

The summer days can be hot to very hot, while the winter evenings and early mornings can be cold, with even light frost at times. However, the winter days tend to warm up quickly and become pleasant with cloudless sunny skies.

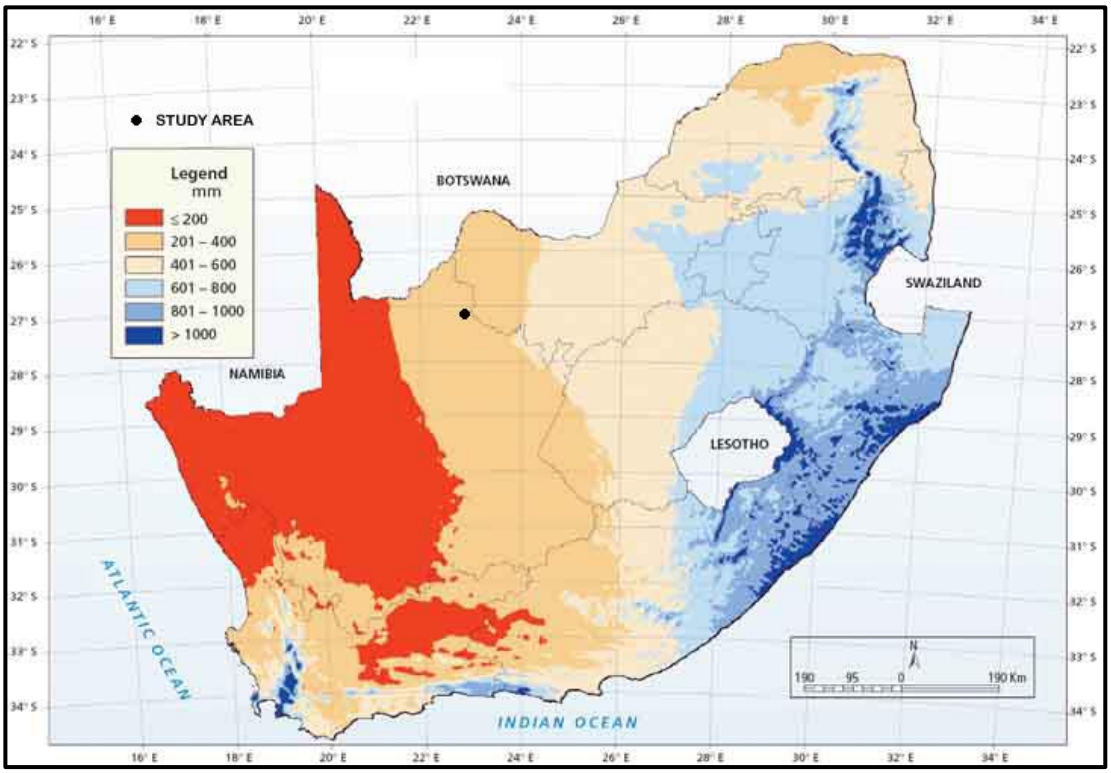

Figure 2: Rainfall zones of South Africa

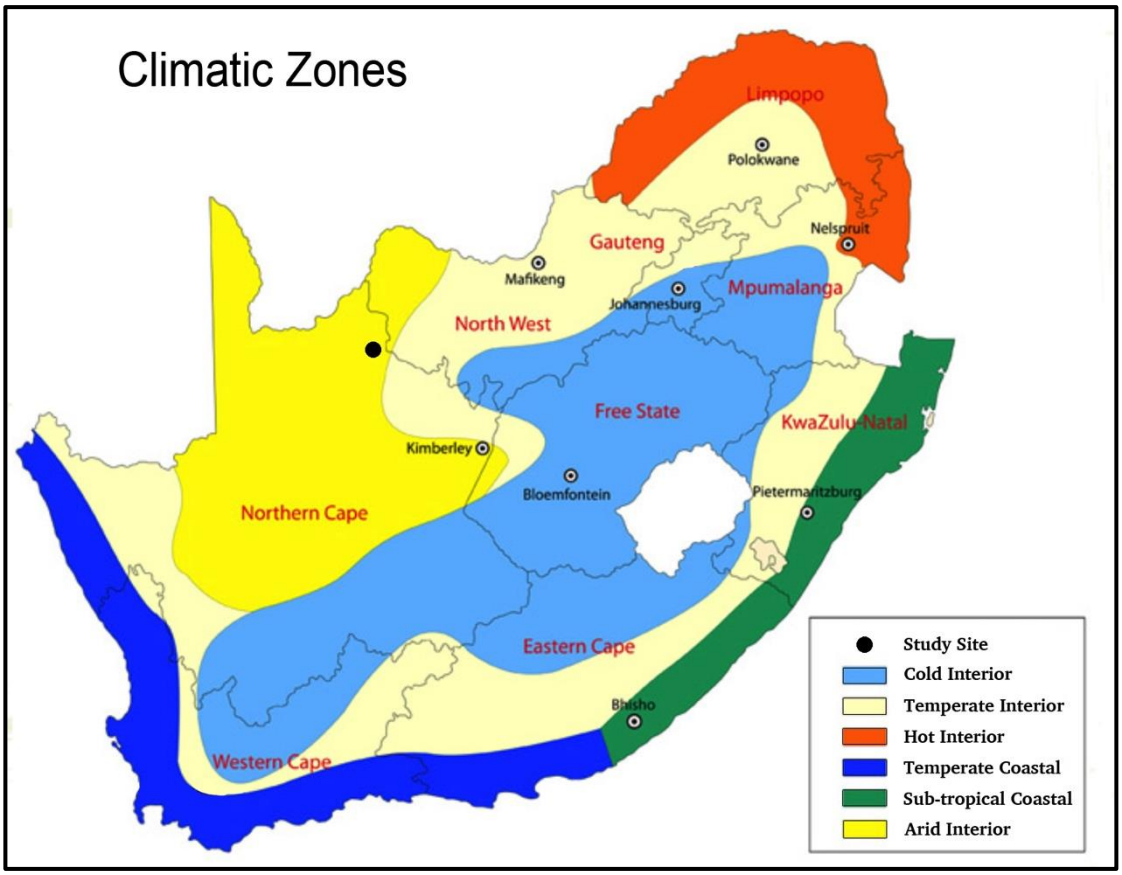

Figure 3: Climatic zones of South Africa

3.5 Landcover

The landcover or landuse of the study site is the shoulder reserve area of the existing railway line. The railway line is within an area that is sparsely urbanised with mostly large grazing farmlands, small, scattered towns and open cast mining operations.

3.6 Vegetation

3.6.1 General vegetation

The South African natural environment has been divided up into nine major terrestrial Biomes. The study area is within the **Savanna Biome**, which is also known as the Bushveld Biome (Figure 4). Savanna vegetation types tend to have a mix of a lower grassy layer; middle woody shrub layer; and an upper woody tree layer. The mix and ratio of the three layers varies from veldtype to veldtype within the Savanna Biome.

The Savanna Biome was divided into six Bioregions by Mucina & Rutherford (2010), namely, Central Bushveld; Mopane; Lowveld; Sub-Escarpment Savanna; Eastern Kalahari Bushveld; and Kalahari Duneveld (Mucina & Rutherford, 2006). The study area is found within the **Eastern Kalahari Bushveld Bioregion** and within the veldtypes / vegetation units commonly known as **Kathu Bushveld** and **Kuruman Thornveld** (Mucina & Rutherford, 2010). Both veldtypes / ecosystems are not threatened and both have a status of 'Least Concern'.

Kathu Bushveld is characterised by a medium-tall tree layer with *Vachellia (Acacia*) *erioloba* (Camelthorn) in places, but mostly open and including *Boscia albitrunca* (Shepherd's Tree) as the prominent trees. The dominant species present in the middle shrub layer are, *Sengalia* (*Acacia*) *mellifera*, *Diospyros lycioides* and *Lycium hirsutum*, while the lower grass layer is variable in cover depending on annual rainfall (Mucina & Rutherford, 2010).

Kuruman Thornveld is characterised by flat rocky plains and some sloping hills with very well-developed, closed shrub layer and well-developed open tree stratum consisting of *Vachellia* (*Acacia*) *erioloba* (Camelthorn). (Mucina & Rutherford, 2010).

Table 7, below, shows the hierarchy and classifications of the vegetation of the study area.

Table 7: Vegetation classification of the study site

Category Description	Classification
Biome	Savanna (Bushveld)
Bioregion	Eastern Kalahari Bushveld
Vegetation Types	Kathu Bushveld & Kuruman Thornveld
Status	Not threatened. Status of 'Least Concern'

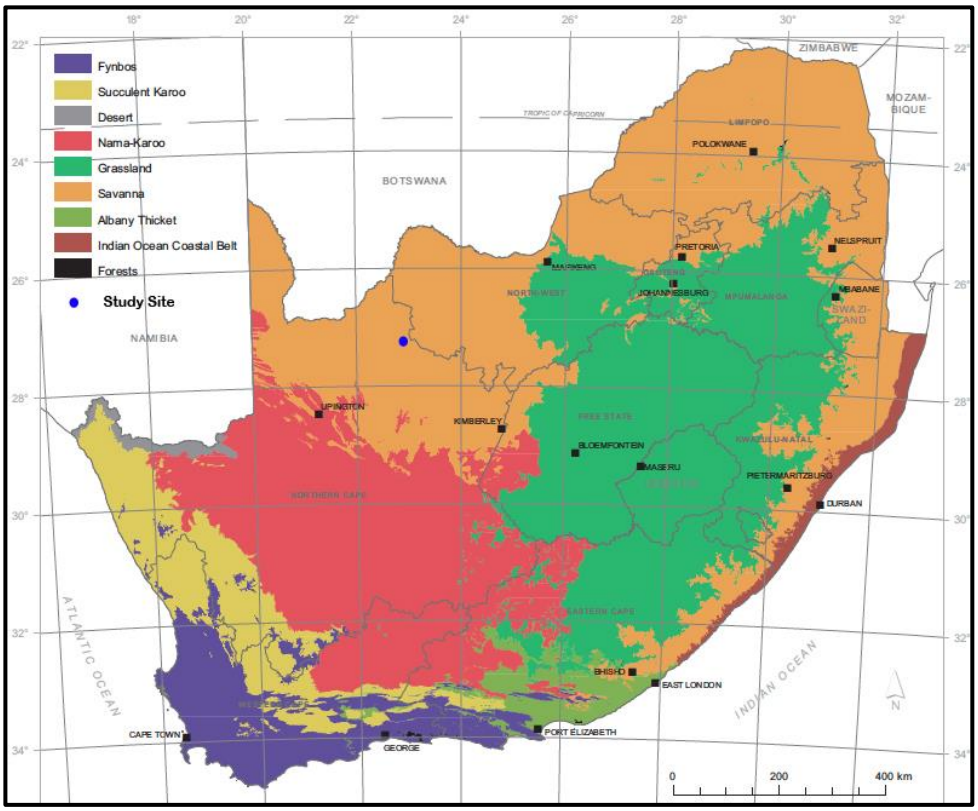

Figure 4: Biomes of South Africa

3.6.2 Vegetation of the Study Area

The northern half of the study site is within Kathu Bushveld and the southern half within Kuruman Thornveld. However, for the most part the environment of the study area is altered and degraded, with the presence of railway lines and gravel roads, resulting in the lack of any significant thornveld or bushveld. Although the study area (which is a linear footprint) crosses through the original extent of two veldtypes, there is little significant difference in the floral mix present. There are more camelthorn (*Vachellia (Acacia) erioloba*) present in the south in adjacent less disturbed farm areas. Common acacia thorn trees such as *Vachellia (Acacia) karoo* (Sweet thorn) and *Senegalia (Acacia) millifera* (Black thorn) are dominant.

A list of species noted during the site investigations is found in the appendices.

Table 8: Photos of the Vegetation found in the Study Area

	Study Site in the south in Kuruman Thornveld. However, the study site is within the railway 'reserve' and existing gravel road and the vegetation in the study area is degraded and altered, with very little thorn bush present
	The study site in the north in degraded and altered Kathu Bushveld. Looking south down the length of the study site with the existing railway lines to the right. There is no significant difference in the vegetation along the length of the study site because it is mostly altered and removed / destroyed. There are however more camelthorn trees in the south in adjacent open veld that is less degraded / altered.
	Alien bladder weed growing in the area of the study site. However, the site does not have significant presence of alien species or infestations.

	Study Site showing mostly altered environment with very little thorn trees or shrubs present. No RDL or ODL plant species were observed during site investigations.

3.7 Priority Floral Species

During field investigations no red data listed (RDL) (Critically endangered, endangered or vulnerable) species were observed. Furthermore, no orange data listed (ODL) plant species were observed either.

3.8 Protected Trees

A few camelthorns (*Vachellia (Acacia) erioloba*) are present within the study area, and some Shepherd's trees (*Bosica albitrunca*) are in nearby adjacent properties. Both trees are common to the region, both are nationally protected, and with a status of 'Least Concern'. If any of the camelthorn trees need to be removed or trimmed a tree permit will first need to be obtained. This can only be determined when designs and layouts have been finalised and certain areas pegged.

3.9 Conservation status

The conservation status (or threat status) of the veldtype / ecosystem in which the study site is found (Kathu Bushveld) is not threatened, with status of 'least concern' (bgis.sanbi.org.za, NEMBA (G 34809, Government Notice 1002), 2011) (Table 9).

Table 9: Veldtype status

Veldtype	Status	Info
Kathu Bushveld	Least Concern (LC)	As far as known none of the veldtype is conserved in statutory conservation areas. More than 1% is already transformed, including the iron ore mining locality at Sishen, one of the biggest open-cast mines in the world (Mucina & Rutherford, 2010).
Kuruman Thornveld	Least Concern (LC)	None of the veldtype is known to be conserved in statutory conservation areas. Only about 2% has already transformed. Erosion is very low (Mucina & Rutherford, 2010).

Table 10 below, gives a basic description of the status categories. The Biodiversity Act (Act 10 of 2004) provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or protected. The main purpose for the listing of threatened ecosystems is an attempt to reduce the rate of ecosystem and species destruction and habitat loss, leading to extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems (SANBI).

Table 10: Ecosystem Status: Simplified explanation of categories used

STATUS	% Transformed	Effect on Ecosystem
Least Threatened (LT)	0-20% (<20% loss)	No significant disruption of ecosystem functions
Vulnerable (VU)	20-40% (>20% loss)	Can result in some ecosystem functions being altered
Endangered (EN)	40-60% (>40% loss)	Partial loss of ecosystem functions
Critically Endangered (CR)	>60% or BT Index for that specific veldtype	Species loss. Remaining habitat is less than is required to represent 75% of species diversity
Source: South African National Spatial Biodiversity Assessment Technical Report. Volume 1: Terrestrial Component. 2004. SANBI. Mucina & Rutherford (eds) (2010).		

Note: BT stands for the Biodiversity Threshold and is an index value that differs for each veldtype. In other words, because the composition, recovery rate, etc. differs for each veldtype there will be a different threshold (in this case percentage transformed) at which species become extinct and ecosystems breakdown. That is, at which point the veldtype is critically endangered.

Figure 5 uses the term 'Least Concern' which is similar to that of 'Least Threatened'.

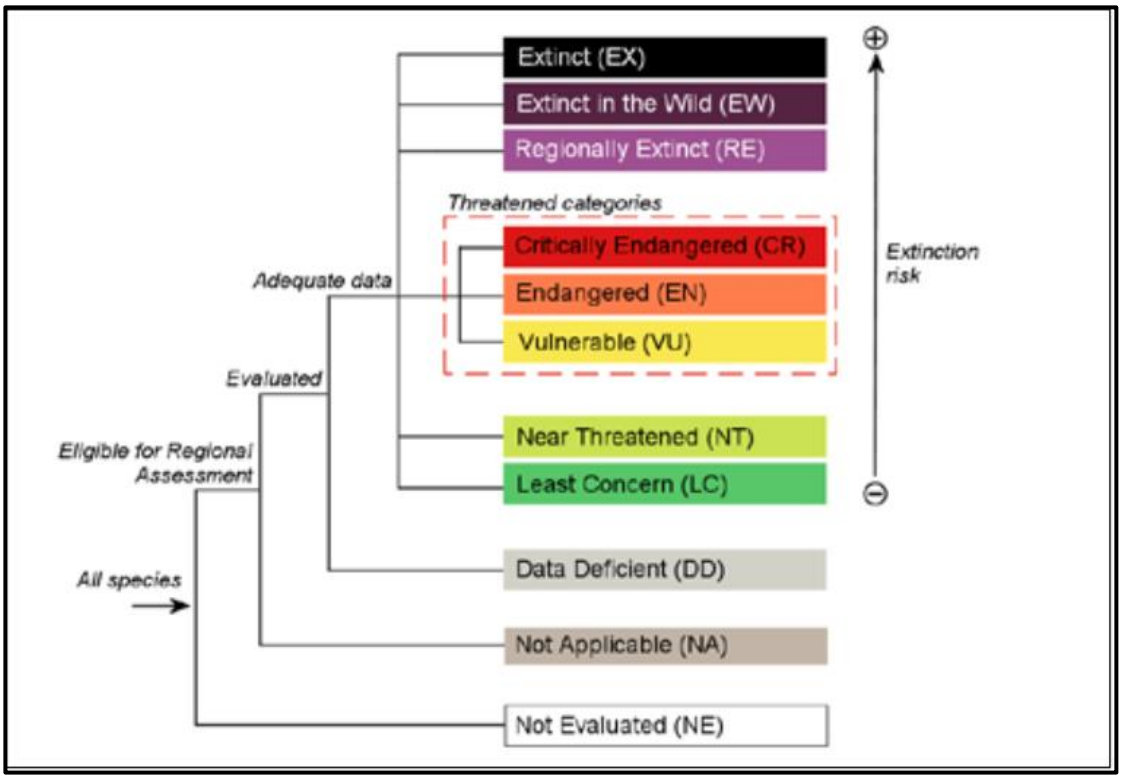

Figure 5: Structure of categories used at the regional level

3.10 Watercourses in the study area

The study site is within an arid region of the country with few perennial rives or streams. There are no rivers or streams in the study area and the closest significant river is the Ga-Mogara, which is approximately 1,7km at the closest point (Figure 6).

There is, however, a **depressional wetland** and drainage line system that runs across the middle of the study site in a southwest to northeast direction. The system has been cut in half (impeded) over decades now with the original construction of the existing railway lines and roads in that area that run in a north – south direction (Figure 7). Due to the aridness of the region the wetlands are dry for long periods of the year. However, they are still sensitive ecological features within the landscape. The wetland systems are not highlighted in the national wetland map (Map 5, 2018), but are in the NFEPA (2011) priority areas.

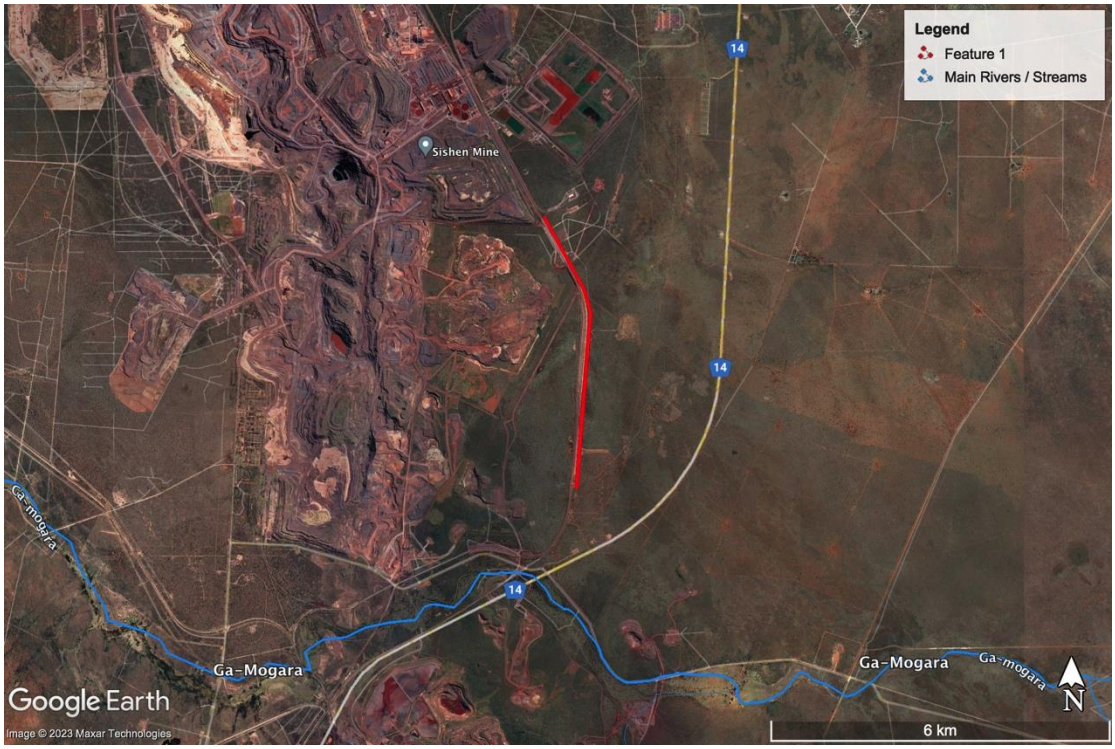

Figure 6: Main Rivers / Streams in the Region

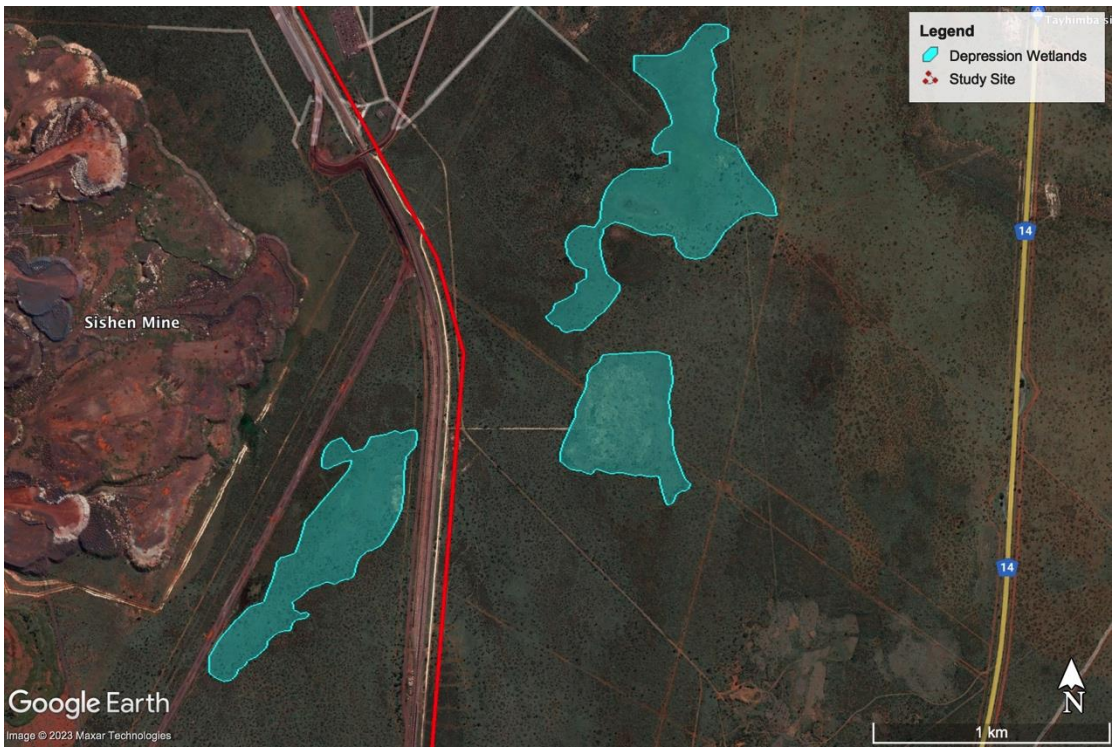

Figure 7: Depression Wetlands close to the Study Site and Railway

Table 11: Photos of watercourses in the study area

	The proposed staging lines will be adjacent and parallel to the existing railway lines. The stormwater culverts need to be aligned to ensure free flow of surface stormwater and no impeding or impounding.
	Active swallow's nest in the stormwater culverts. During construction no active nests may be disturbed. These are active during the late spring early summer and up until autumn

3.11 Classification of Watercourses in the Study Area

The classifications of the watercourses in the study area and general area are shown below, in Table 12. Identified watercourses are classified along different hydrogeomorphic (HGM) types or units, up to Level 4, in terms of various levels as refined for South Africa by Kleynhans, *et. al*. (2005) and as used in the Classification System for Wetlands user manual – SANBI Series 22 (Ollis *et. al.* 2013) (Table 13).

Table 12: Classification of watercourses in the study area

Delineated systems	Level 1 System	Level 2 Regional Setting (Ecoregion)	Level 3 Landscape Unit	Level 4 HGM Unit
Wetlands	Inland	Eastern Kalahari Bushveld (Group 1)	Plain	Depression (Endorheic)
Drainage Lines	Inland	Eastern Kalahari Bushveld (Group 1)	Plain	River (Lowland)

Table 13: Classification levels 1 - 4

LEVEL 1 System	LEVEL 2 Regional setting (Ecoregion)	LEVEL 3 Landscape Unit	LEVEL 4 HGM Unit	
			HGM Type	Landform
Inland	SA Ecoregions according to DWS and/or NFEPA	• Valley floor • Slope • Plain • Bench	River	• Mountain headwater stream • Mountain stream • Transitional stream • Upper foothill • Lower foothill • Lowland • Rejuvenated foothill • Upland floodplain
			Channeled valley bottom wetland	
			Unchannelled valley bottom wetland	
			Floodplain Wetland	
			Depression	• Exorheic • Endorheic • Dammed
			Seep	• With channel outflow (connected) • Without channel outflow (disconnected)
			Wetland flat	

3.12 Drainage Regions

South Africa is geographically divided up into a number of naturally occurring Primary Drainage Areas (PDAs) and Quaternary Drainage Areas (QDAs) (Figure 8). The different areas are demarcated into Water Management Areas (WMAs) and Catchment Management Agencies (CMAs). Previously there were 19 WMAs and 9 CMAs, but as of September 2016, these were revised and there are now officially only nine WMAs, which correspond directly in demarcation to the nine new CMAs (Government Gazette, 16 September 2016. No.1056, pg. 169-172) (Figure 9).

The study area is situated within the Primary Drainage Area (PDA) of **D** and the Quaternary Drainage Area (QDA) of **D41J** (Figure 10).

Table 14, below, gives a summary of the catchment and drainage area information for the study site.

Table 14: Summary of Catchment Area information

Level	Category
Primary Drainage Area (PDA)	D
Quaternary Drainage Area (QDA)	D41J
Water Management Area (WMA) – Previous / Old	Lower Vaal
Water Management Area (WMA) – New (as of Sept. 2016)	Vaal (WMA 5)
Sub-Water Management Area	Molopo
Catchment Management Agency (CMA)	Vaal (CMA 5)
Wetland Vegetation Ecoregion (WetVeg)	Eastern Kalahari Bushveld (Group 1)
RAMSAR Site	No
River FEPA	No
Wetland FEPA	No
Fish FEPA	No
Fish FSA	No
Fish Corridor	No
Fish Migratory	No
National Strategic Water Source Area (SWSA)	Yes (Sishen-Kathu)
Provincial important Water Source Area (WSA)	No
Priority Quaternary Catchment	Lower Vaal

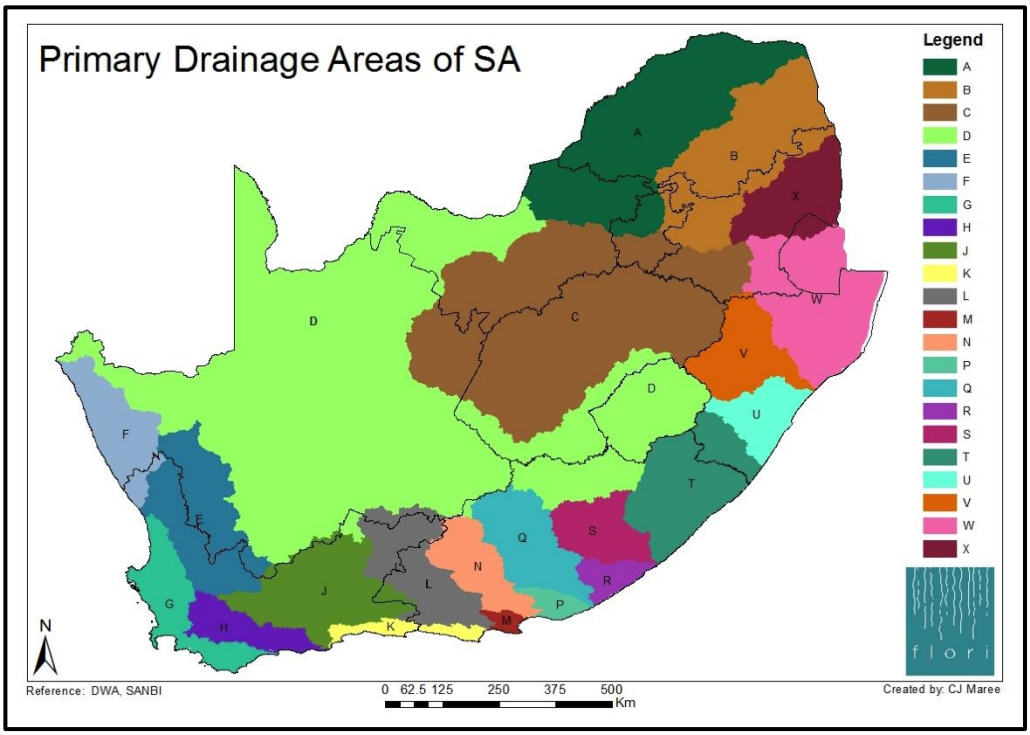

Figure 8: Primary Drainage Areas (PDAs) of South Africa

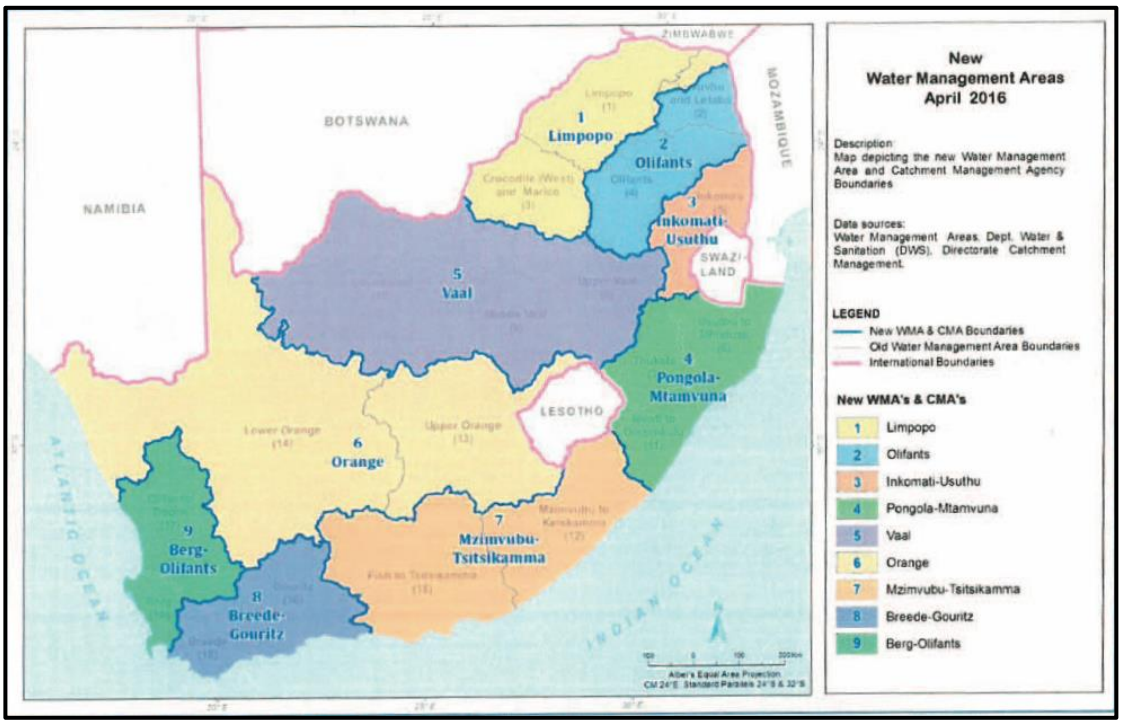

Figure 9: New Water Management Areas (WMAs) of South Africa

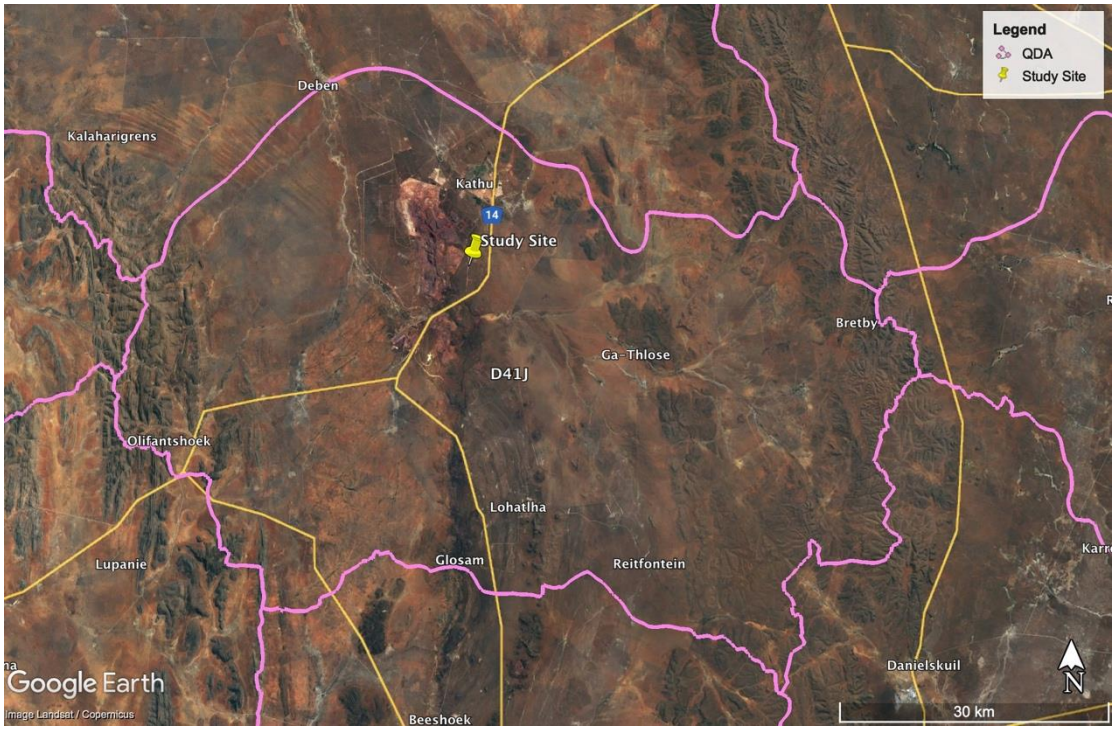

Figure 10: Quaternary Drainage Areas (QDAs)

3.13 Strategic Water Source Areas of South Africa

The study site is situated within the **Sishen-Kathu** national Strategic Water Source Areas (SWSA) of South Africa in terms of groundwater. A Water Source Area (WSA) is a water catchment or aquifer system that either supplies a relatively large volume of water for its size, or is the primary source of water for a town, city or industrial activity. Strategic Water Source Areas (SWSAs) are defined as areas of land that either: (a) supply a disproportionate (i.e. relatively large) volume of mean annual surface water runoff (i.e. water in streams, rivers and wetlands) in relation to their size and so are considered nationally important; or (b) have relatively high groundwater recharge and groundwater forms a nationally important resource (has high levels of use or settlements depend on it); or (c) areas that meet both criteria (a) and (b). A SWSA is one where the water that is supplied is considered to be of national importance for water security, but there are others, which are considered to be sub-nationally important (WRC, 2019).

According to SANBI, a Strategic Water Source Areas of South Africa (SWSA) are those areas that supply a disproportionate amount of mean annual runoff in relation to the size of the geographical region. These areas are important because they have the potential to contribute significantly to overall water quality and supply, supporting growth and development needs that are often a far distance away. These areas make up 8% of the land area across South Africa, Lesotho and Swaziland, but provide 50% of the water in these countries (SANBI).

3.14 Present Ecological State of Watercourses

All watercourses identified within the study area and surrounding areas were assessed to determine their Present Ecological State (PES) (Table 15). The assessment criteria and structure are based on the modified Habitat Integrity approach of Kleynhans (1996, 1999). The PES is calculated by looking at the hydrology, geomorphology, water quality and biota of each watercourse. Of importance is the overall PES of the system (Table 15).

The watercourses in the general of the study site have low levels of modification and mostly have a **PES of Category C (Moderately Modified)**. In the case of the nearby wetlands and drainage line the main modification is historical impeding and impounding by construction of the railway, roads, etc. through them. Impacts or modifications such as over-utilisation of resources are low.

Table 15: PES of Watercourses in the study area

Criteria	Identified Watercourses	
	Depression Wetlands	**Drainage Lines**
HYDROLOGY		
Flow modification	2	2
Permanent inundation	3	3
WATER QUALITY		
Water Quality Modification	3	3
Sediment Load Modification	3	3
GEOMORPHOLOGY		
Canalisation	3	3
Topographic Alteration	3	3
BIOTA		
Terrestrial Encroachment	3	3
Indigenous Vegetation Removal	3	3
Invasive Plant Encroachment	3	3
Alien Fauna	4	4
Over utilisation of Biota	3	3
Total:	33	33
Average:	3,0	3,0
Category:	**C**	**C**
Description	**Moderately Modified**	**Moderately Modified**
Description summary	Some loss of natural habitats and function	Some loss of natural habitats and function
Recommended EMC	**C**	**C**

3.15 Ecological Importance & Sensitivity of Watercourses in the Study Area

The Ecological Importance and Sensitivity (EIS) ratings of the watercourses were determined as shown in the table below (Table 16).

Table 16: EIS of watercourses in the study area

Determinants	Wetlands	Drainage Lines	Confidence
PRIMARY DETERMINANTS			
1. Rare & Endangered Species	2	0	4
2. Populations of Unique Species	2	1	4
3. Species/taxon Richness	2	1	4
4. Diversity of Habitat Types or Features	2	0,5	4
5 Migration route/breeding and feeding site for wetland species	1	0	3
6. Sensitivity to Changes in the Natural Hydrological Regime	2	0	3
7. Sensitivity to Water Quality Changes	3	1	3
8. Flood Storage, Energy Dissipation & Particulate / Element Removal	3	1	3
MODIFYING DETERMINANTS			
9. Protected Status	0	0	4
10. Ecological Integrity	3	1	4
TOTAL	20	5,5	-
AVERAGE	2,0	0,6	-
EIS Category	**C**	**D**	**-**
Description	**Moderate**	**Low**	**-**
	Ecologically important and sensitive on a **provincial or local** scale.	Not ecologically important and sensitive on any scale	

3.16 Fauna

There are potentially a number of different faunal species present in the study area and surrounding areas. There are some ideal habitats, especially within the less impacted on small drainage lines / streams and open grassland areas. However, although the area is open, with low density urbanisation, the natural environment has been badly impacted on over the years by cultivated farmlands and open-cast mining operations. This has led to a significant loss in faunal species, including large- to medium-

sized mammals and reptiles in particular. Other negative impacts have been on grassland birds, including the large storks and cranes that are very much ground foraging and dwelling birds.

3.16.1 Mammals

In terms of the larger to medium-sized mammals, which for the most part are highly mobile, this does not represent much of a problem. However, with the smaller mammals, even in the case of the bats (Order Chiroptera), it is considerably more meaningful to have locality data of greater precision in order to understand their habitat requirements more accurately. For example several of the fossorial small mammals such as the golden moles, or chrysochlorids (Order Insectivora; family Chrysochloridae) and the rodent moles, or mole-rats, or bathyergids (Order Rodentia; family Bathyergidae) are likely to display preferences for specific soil-types; similarly detailed knowledge of different cave-systems could provide clues as to why certain caves are preferentially used by certain species of bats in contrast with other caves utilized by different species of bats (Lloyd, 2000).

Of the 295 species and subspecies of South African mammals evaluated, 57 (19.3%) were assigned threat categories according to the IUCN Red List criteria as follows: 10 (3.4%) Critically Endangered 18 (6.1%) Endangered and 29 (9.8%) Vulnerable. Fifty-three (53) (18%) of species were assessed as being Data Deficient and therefore, a threat category could not be assigned to these species. 38 (12.9%) Species were assessed as being Near Threatened and 147 (49.8%) as Least Concern (Red Data Book of South African Mammals: A Conservation Assessment. 2000)

Species, or signs, observed during the site investigations include, but are not limited to: *Raphicerus campestris* (Steenbok), *Cynictis penicillate* (Yellow mongoose), *Lepus capensis* (Cape Hare), and *Hystrix africaeaustralis* (Porcupine). There are many common species of wild animals and mammals present in the greater area, including Duiker species (Sub-family: Cephalophinae), shrew species (*Graphiurus* spp.), rats and mice. black-backed jackal (*Canis mesomelas*), and possibly even a few caracal (rooikat) (*Caracal caracal*) and serval (*Leptailurus serval*). The protected Aardvark (*Orycteropus afer*) will also be found in the region, especially where there are softer soils / sands and presence of termites, although **during site investigations no signs of these animals were seen**.

3.16.2 Avifauna

The study area is not situated within an Important Bird Area (IBA). The closest IBA is the Kalagadi Transfrontier Park is approximately 254km northwest of the site and the Spitskop Dam about 170km southeast. Notwithstanding there will be common local bird species within the study area and surrounding open bushveld areas. However, due to the aridness of the region the species richness and numbers are not as high as compared to other bushveld areas of the country with higher rainfall. The

arid, Kalahari region is known for the presence of raptors, especially during the summer migration period. The project is of such a nature that it will have little to no negative impact on avifauna in the region.

3.16.3 Reptiles and Amphibians

Areas of high reptile diversity in South Africa are associated with the main winter rainfall area of the western and southern Cape coastal regions, and with the summer rainfall area of the eastern regions, i.e. Mpumalanga, Limpopo and KwaZulu-Natal provinces. The central arid regions (Great Karoo and southern Kalahari) have low reptile diversity, as do the highlands of Lesotho and adjacent Transkei (Bates, et. al. 2014).

Centres of snake endemism are evident in the southwestern Cape, Algoa Bay area in the Eastern Cape, the KwaZulu-Natal Midlands, Waterberg Range, and escarpment region of Mpumalanga and Limpopo provinces. Unlike lizards, snake endemism is low in Namaqualand and the Soutpansberg (Bates, et. al. 2014).

There will be a number of common snake species found in the general area, with the low possibility of the African rock python (*Python natalensis*), which is a priority species (species of conservation concern – SCC).

Lizards tend to prefer rocky habitats such as rocky hills (koppies), rocky ridges and rock sheets. However, there are very few such rocky habitats present in the study area. *Edioplanis lineoocellata* (Spotted Sand Lizard) was observed in the general area.

3.16.4 Invertebrates

Invertebrates such as spiders, scorpions and butterflies are important faunal groups, but are very difficult to properly assess in a short time period. During field investigations specific attention was given to priority species such as Mygalomorphae arachnids (Trapdoor and Baboon spiders) and red data butterflies. The nature and scope of the project is such that it will have low to negligible negative impact on these species should they occur. **No priority species were observed**.

Recorded butterfly fauna for the Northern Cape Provinces falls into: 5 families, 16 subfamilies, 74 genera, 179 species, 15 sub-species (194 taxa). Shared endemic genera: 12. Exclusive endemism: 19 species and 10 subspecies (29 taxa). Shared endemism: 50 species and 11 subspecies (61 taxa) (SA Red Data Book: Butterflies, SANBI Series 13). The species of conservation concern (SCC) for the Province are: *Anthene lindae, Chrysoritis trimeni.*

Table 17: RDL butterfly species for the Province

Scientific Name	Common name	Local Status	Present in study area
Anthene lindae	Linda's Hairtail	VU	No
Chrysoritis trimeni	Trimen's Opal	EN	No

CR= Critically Endangered**, EN=** Endangered**, NT =** Near Threatened**, VU=** Vulnerable**.**

3.16.5 Faunal species of conservation concern

During field investigations **no faunal species of conservation concern were encountered**. This can also be due to the limited time available for site investigations. There are some ideal habitats for some priority faunal species, which are mainly in less degraded grassland situated along or close to small seasonal streams and wetlands.

Table 18: Priority Faunal Species likely to occur in the area

Species	Common Name	Red Data Status	Preferred Habitat	Habitat Restrictions	Present in Study area
Frogs					
Pyxicephalus adspersus	Giant bullfrog	Threatened	Grassland; savanna	Temporary floodplains, pans	No
Mammals					
Atelerix frontalis	SA hedgehog	Near threatened	Most, broad	Broad	Possible
Manis temmincki	Pangolin (Scaly anteater)	Vulnerable	Grassland, savanna	Woody savanna, ants, termites	Possible
Mellivora capensis	Honey badger (Ratel)	Near threatened	Most, broad	Broad	Possible
Cloeotis percivali	Short-eared trident bat	Critically endangered	Savanna	Caves and subterranean habitat	No
Pipistrellus rusticus	Rusty bat	Near threatened	Most, broad	Woody savanna, large trees	No
Snakes					
Python natalensis	Southern African python	Vulnerable	Ridges, wetlands	Rocky areas; open water	No

The maps below show the Quarter Degree Squares (QDS) that are hotspots for the priority / SCC faunal groups of butterflies, snakes and lizards in South Africa (Figure 11, Figure 12 & Figure 13).

The study site is not within any of these known hotspots.

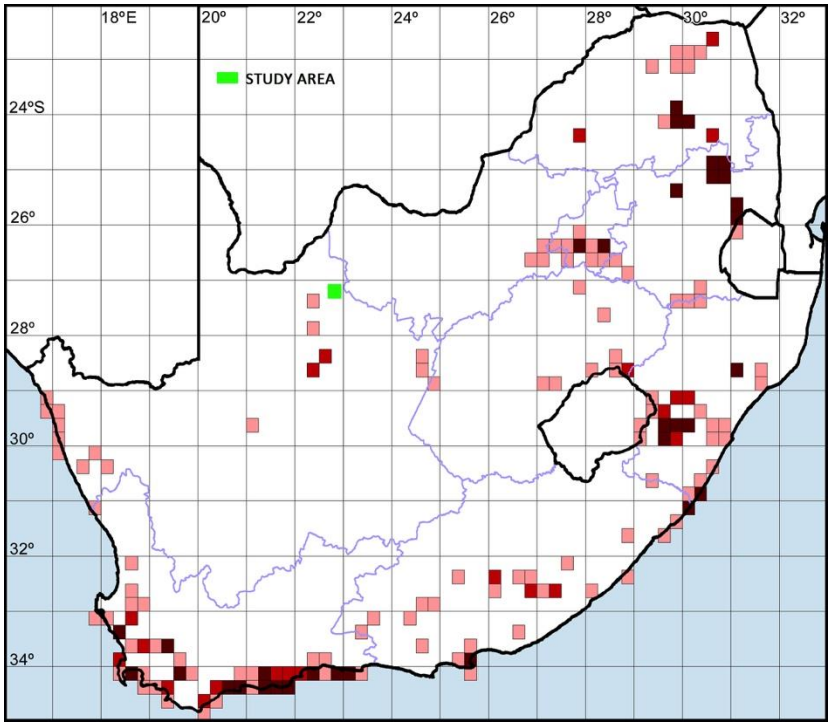

Figure 11: Butterfly hotspots

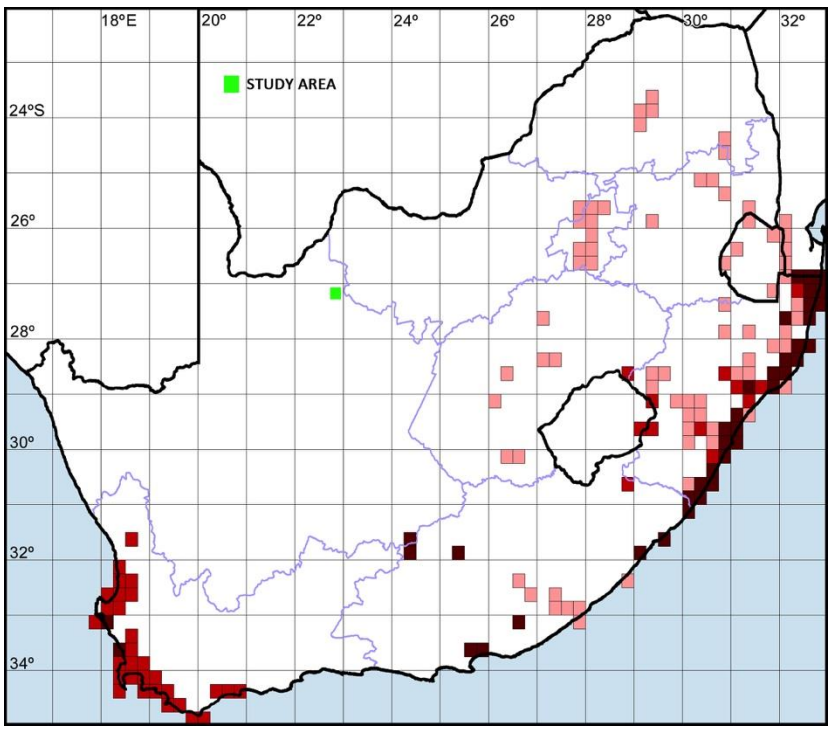

Figure 12: Snake hotspots

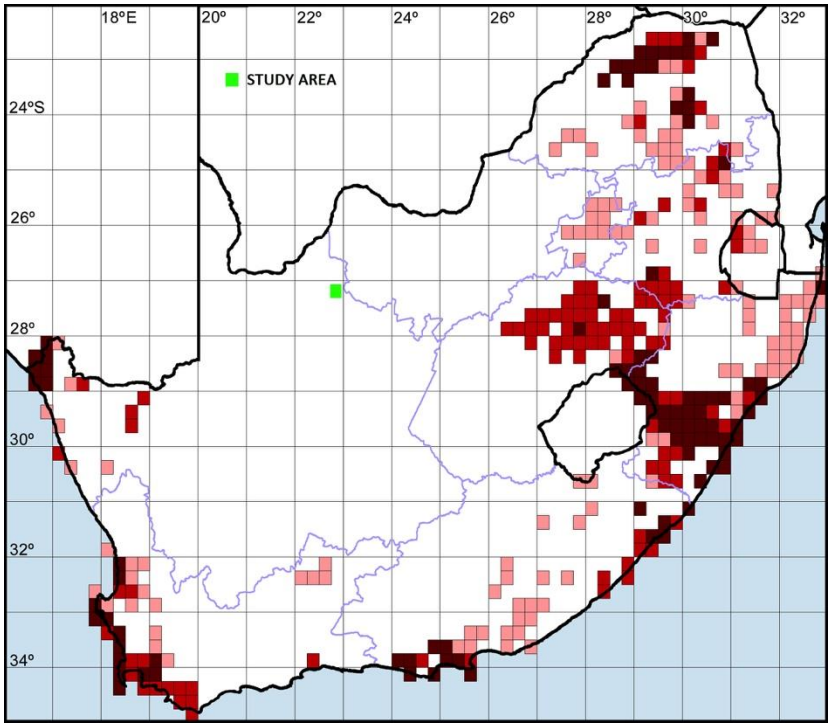

Figure 13: Lizard hotspots

4 SENSITIVITY ASSESSMENT

4.1 DEA Screening Tool Assessment

The Department of Forestry, Fisheries and Environment (DFFE) (Previously DEA) has developed a desktop screening tool that is to be used as a guideline in an initial desktop assessment of a project site (www.screening.environment.gov.za). The screening tool is a guideline tool that needs to be verified during site investigations (ground truthing). Depending on the levels of sensitivity shown in the screening assessment certain criteria in terms of assessments, studies, etc. may be required by the competent authorities. According to the screening tool (accessed in December 2022) the various sensitivities for the study site and immediate surroundings are as follows:

- Terrestrial biodiversity combined theme sensitivity: Low.
- Aquatic biodiversity combined theme sensitivity: Very High.
- Plant species theme sensitivity: Low.
- Animal species theme sensitivity: Medium.

The screening tool is a desktop screening which needs to be assessed and verified or disputed during field investigations, which took place in December 2022. The sensitivity levels of the terrestrial biodiversity, plants and animals were verified to be as per the screening tool assessment. However, the aquatic sensitivity is disputed. There are no watercourses within the development footprint but there are

seasonal depressional wetlands within the immediate surroundings (which will not be affected) and therefore the Aquatic sensitivity was determined to be 'Low'. Furthermore, the PES of the wetlands were identified to be largely modified, which additional substantiates the "low" sensitivity rating. It is understood that the site is within a SWSA groundwater area, but the project will have absolutely no impact on groundwater.

4.2 Ecological Sensitivity

The sensitivity assessment identifies those areas and habitats within the study area and nearby areas that have a high conservation value and that may be sensitive to disturbance or transformation. All watercourses (rivers, streams, drainage lines and wetlands) are, by default, considered sensitive (High Sensitivity), even if in a poor or degraded condition. Areas or habitats have a higher conservation value (or sensitivity) based on their threatened ecosystem status, ideal habitat for priority species, potential or real presence of RDL fauna and flora species, etc. The study area consists of one homogenous habitat, namely, arid bushveld.

The floral and faunal sensitivity analyses are shown in the tables below (Table 19 & Table 20).

Table 19: Floristic sensitivity analysis

Criteria	Habitats
	Arid Bushveld
Red Data Species	1
Habitat Sensitivity	3
Floristic Status	3
Floristic Diversity	3
Ecological Fragmentation	3
Sensitivity Index	26%
Sensitivity Level	Medium / Low

High: 80% – 100%; Medium/high: 60% – 80%; Medium: 40% – 60%; Medium/low: 20% – 40%; Low: 0% – 20%

Table 20: Faunal sensitivity analysis

Criteria	Habitats
	Arid Bushveld
Red Data Species	5
Habitat Sensitivity	3
Faunal Status	5
Faunal Diversity	5
Ecological Fragmentation	3
Sensitivity Index	38%
Sensitivity Level	Medium / Low

High: 80% – 100%; Medium/high: 60% – 80%; Medium: 40% – 60%; Medium/low: 20% – 40%; Low: 0% – 20%

4.3 Ecological Sensitivity Analysis

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated sensitivity unit of the two categories is taken to represent the sensitivity of that ecological unit, whether it is floristic or faunal in nature (Table 21).

Table 21: Ecological sensitivity analysis

Ecological community	Floristic sensitivity	Faunal sensitivity	Ecological sensitivity
Arid Bushveld	Medium / Low	Medium / Low	Medium / Low

High: 80% – 100%; Medium/high: 60% – 80%; Medium: 40% – 60%; Medium/low: 20% – 40%; Low: 0% – 20%

The five (5) sensitivity groups are then arranged into three (3) sensitivity groups of High, Medium, and Low. That is, High (High & Medium / High); Medium (Medium); and Low (Low & Medium / Low).

4.4 National Priority Areas

The Study Site is not within any national priority areas, including protected areas and important bird areas (IBAs). However, there are NFEPA wetlands along the edge of the study site.

National priority areas include formal and informal (private) protected areas (nature reserves); important bird areas (IBAs); RAMSAR sites; National fresh water ecosystem priority areas (NFEPA) and National protected areas expansion strategy focus areas (NPAES).

4.5 Critical Biodiversity Areas & Ecological Support Areas

According to the Northern Cape Critical Biodiversity Areas (2016), the study site is not within a critical biodiversity (CBA). However, the northern end of the site is within an ecological support area (ESA). The demarcated depression wetlands are also demarcated ESAs (Figure 14).

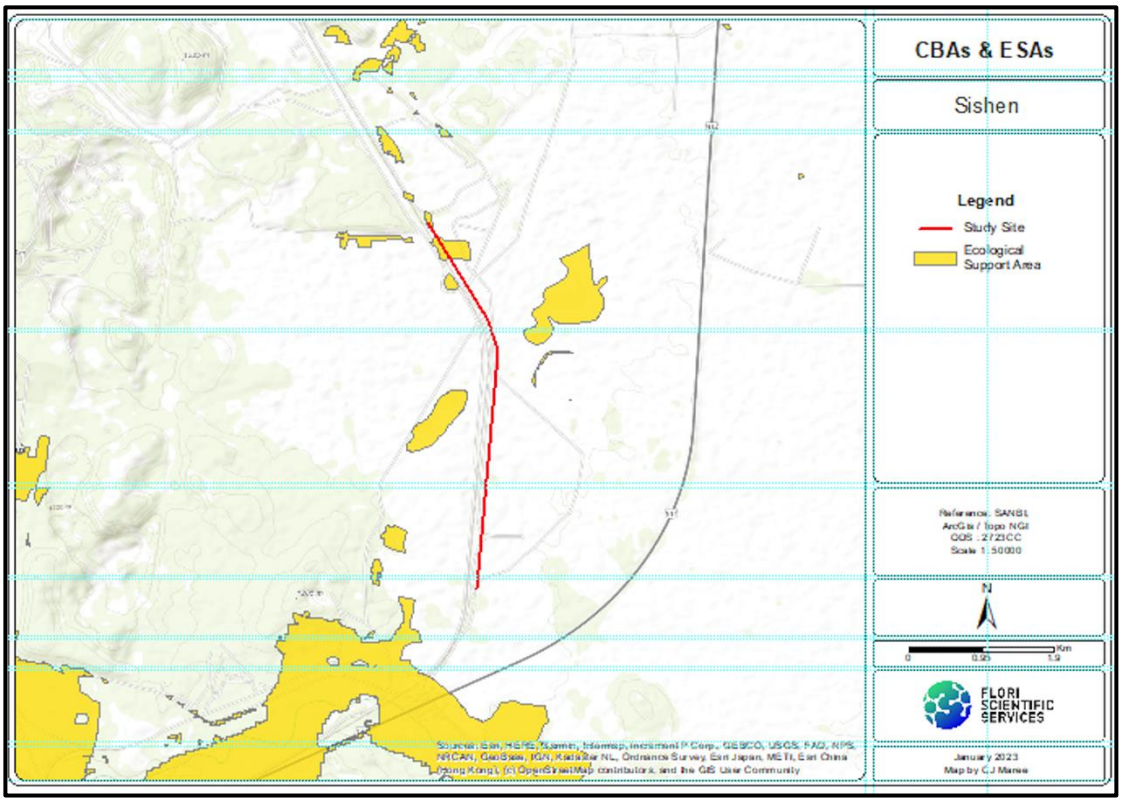

Figure 14: CBAs and ESAs

4.6 Sensitivity mapping of the study area

All relevant datasets, DEA screening desktop assessment and field investigations were taken into account in determining the sensitivity mapping of the study site. Figure 15, below, shows the sensitivity levels of the study area. **The depression wetlands are sensitivity and have been highlighted because they are within 500m radius of the study site, especially the one to the west**.

A summary of the sensitivities of the Study Area is as follows:

- The study site is not within a threatened veldtype / ecosystem.
- There are depression wetlands within 500m of the study site.
- The study site is not within any priority areas.
- According to the National Screening Tool the overal / combined terrestrial biodiversity sensitivity is 'Low'. This was verified during site investigations.
- There are no highly sensitive habitats, or no-go zones, present with the proposed study area, but the nearby depression wetlands are sensitive and need to be taken into consideration.
- There are no protected areas.

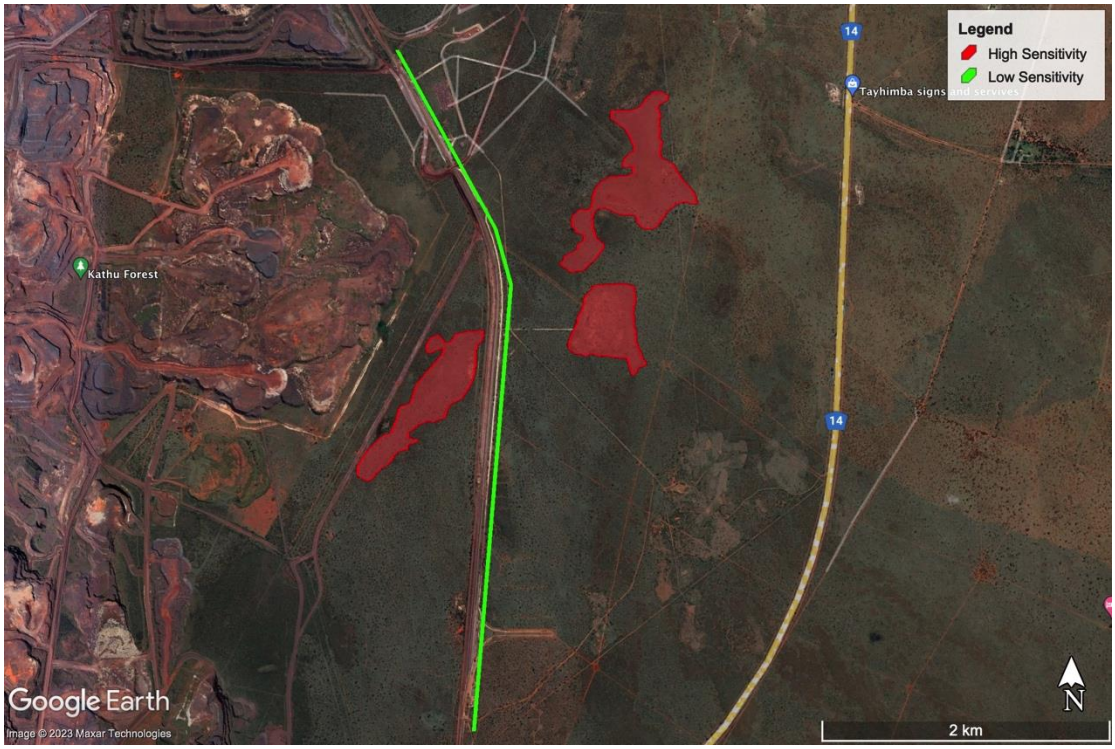

Figure 15: Sensitivity Map

4.7 Buffer Zones

A 32m buffer zones is recommended around the wetland systems and should be viewed as 'no-go' zones and avoided. It should be kept in mind that the proposed project will not impact the wetland systems in any event, as they lie outside of the development footprint.

5 THE GO, NO-GO OPTION

5.1 Potential fatal flaws

There are no obvious fatal flaws in terms of the ecological biodiversity and the project may proceed. However, mitigating measures must be implemented.

5.2 Classification criteria

The term '**fatal flaw**' is used to evaluate whether or not an impact would have a 'no-go' implication for the project. In the scoping and impact assessment stages, this term is not used. Rather impacts are described in terms of their potential significance.

A potential fatal flaw (or flaws) from a biodiversity perspective is seen as an impact that could have a "no-go" implication for the project. A 'no-go' situation could arise if residual negative impacts (i.e. those impacts that still remain after implementation of all practical mitigatory procedures/actions) associated with the proposed project were to:

a) Conflict with international conventions, treaties or protocols (e.g. irreversible impact on a World Heritage Site or Ramsar Site);

b) Conflict with relevant laws (e.g. clearly inconsistent with NEMA principles, or regulations in terms of the Biodiversity Act, etc.);

c) Make it impossible to meet national or regional biodiversity conservation objectives or targets in terms of the National Biodiversity Strategy and Action Plan (BSAP) or other relevant plans and strategies (e.g. transformation of a 'critically endangered' ecosystem);

d) Lead to loss of areas protected for biodiversity conservation;

e) Lead to the loss of fixed, or the sole option for flexible, national or regional corridors for persistence of ecological processes;

f) Result in loss of ecosystem services that would have a significant negative effect on lives (e.g. loss of a wetland on which local communities rely for water);

g) Exceed legislated standards (e.g. water quality), resulting in the necessary licences/approvals not being issued by the authorities (eg. WULA);

h) Be considered by the majority of key stakeholders to be unacceptable in terms of biodiversity value or cultural ecosystem services.

6 IMPACT ASSESSMENT

The impacts of the activities related to the proposed project were rated. There are existing negative impacts and a few potential negative impacts arising from the proposed project. Mitigating measures are recommended to help reduce the sum of the negative impacts (cumulative effect) on the natural environment in which the project is based. The impact assessment focuses mainly on the construction phase of the project, but does also consider the long-term impact the project may have on the natural environment. The operation phase is only considered in terms of ongoing, routine maintenance after clean-up and rehabilitation at the end of the construction phase. Any recommendations and mitigating measures for the operation phase should be included in the routine maintenance programme / schedules.

6.1 Existing Impacts

In terms of the natural ecology of the area, the primary existing negative impacts on the study area are farming practices (mainly in the form of grazing for livestock) and open-cast mining operations. Other existing impacts include general infrastructure in the area such as roads, power lines, farmhouses, and small settlements and towns. The largest impact in the immediate study area is the large Sishen open-cast mining area to the immediate west of the study site, along with existing railway line, next to which the proposed project is earmarked. The proposed project is mostly within the railway line reserve area, which is fenced, and between the existing railway line and neighbouring farms.

6.2 Potential Impacts

The potential negative impacts arising from the proposed project are **low to very low**. The footprint of the project is small and linear and within a mostly disturbed 'reserve' area next to the existing railway line. The main negative impacts will be some low-level loss of vegetation, which includes very few trees. There are no potential positive impacts arising from the proposed project.

6.3 Assessment of potential impacts

The assessment of potential impacts on the natural environment arising from the project and related activities is shown below in Table 22.

The scoring method used in the impact assessment is as follows:

- **SP = [extent (E) + duration (D) + magnitude (M)] x probability (P).**

The maximum value is 100 significance points (SP). Environmental impacts will be rated as either that of High, Moderate or Low significance on the following basis:

- SP ≥60: **High**; SP 31 ≥ 59: M**oderate**; SP ≤ 30: **Low**.

Further explanation of the assessment methodology is found in the section on methodology

6.4 Cumulative Effect

The Cumulative Effect can be defined as the total negative impacts on the natural environment which are caused by the combined (total) effects of past, current and future activities. Cumulative impacts (or the cumulative effect) are the sum of the overall impacts arising from the project (under the control of the developer / contractor), other activities (that may be under the control of others, including other developers, local communities, government and landowners) and other background pressures and trends which may be unregulated, including existing impacts.

The cumulative impacts are:

- Low in terms of localised impact on the study site.
- Very Low in terms of cumulative impact on the region.

Table 22: Assessment of Potential Impacts

Potential Impacts arising from Project	**Phase of Project**	**Impact Rating**					
Total Impact of Proposed Project							
		Extent	Duration	Magnitude	Probability	Total	**Significance**
	Construction Phase: Pre-mitigation	Local (2)	Short-term (2)	Low (4)	Medium (3)	24	**Low**
	Construction Phase: Post mitigation	Site (1)	Short-term (2)	Low (4)	Medium (3)	21	**Low**
	Operational Phase	Site (1)	Permanent (5)	Low (4)	Low (2)	20	**Low**
Mitigating Measures	1. Impacts on the existing natural environment related to the project are '**LOW**' 2. Any temporary storage, lay-down areas or accommodation facilities to be setup in existing railway reserve area only. No trees or shrubs must be cleared for a laydown area. 3. Ensure small footprint during construction phase. Movement of people and vehicles must stay within a 100m wide corridor. Existing gravel road next to existing railway line to be used as the main access road. 4. A 32m buffer zone is recommended around the wetlands. 5. All hazardous materials must be stored appropriately to prevent these contaminants from entering the groundwater environment; 6. All excess materials brought onto site for construction must be removed after construction. 7. No open trenches or mounds of soils to be left. 8. A basic Rehabilitation plan for disturbed areas to be compiled and implemented as part of the construction phase of the project.						
Cumulative Effect of the Project		Site (1)	Short-term (2)	Moderate (6)	Low (2)	18	**Low**
Individual Impacts							
		Extent	Duration	Magnitude	Probability	Total	Significance
1. Loss of natural vegetation	Construction Phase: Pre-mitigation	Local (2)	Long-term (4)	Low (4)	Medium (3)	30	**Low**
	Construction Phase: Post mitigation	Site (1)	Long-term (4)	Low (4)	Medium (3)	27	**Low**
	Operational Phase	Site (1)	Long-term (4)	Low (4)	Low (2)	18	**Low**

Mitigating Measures	1. The project footprint should be confined to the assessed corridor which is within a degraded area. Therefore the loss of vegetation resulting arising from the project will be low. 2. No RDL or ODL floral species are present. If any suspicious plants are found that need to be moved or destroyed then once again the ECO and/or specialist must first be contacted. 3. Open fires along the study site are not allowed. 4. A basic weed control programme must be implemented. This can form part of the routine maintenance programme.						
2. Loss or impact on wildlife	**Construction Phase: Pre-mitigation**	Site (1)	Short-term (2)	Moderate (6)	Medium (3)	27	**Low**
	Construction Phase: Post mitigation	Site (1)	Short-term (2)	Minor (2)	Low (2)	10	**Low**
	Operational Phase	Site (1)	Immediate (1)	Minor (2)	Improbable (1)	4	**Low**
Mitigating Measures	1. Care must be taken not to interact directly with any wild life encountered. 2. Any bird nests encountered must not be interfered with. If encountered must first be discussed with specialist. 3. During the summer months (rainy season) staff must be continually made aware of being cautious and vigilant in encountering snakes. No snakes encountered may be killed and must be removed by a specialist on site or called in when required. 4 . Fencing along the length of the railway line is important and must be routinely inspected.						
3. Impeding & Impounding waterflow	**Construction Phase: Pre-mitigation**	Local (2)	Short-term (2)	Moderate (6)	Medium (3)	30	**Low**
	Construction Phase: Post mitigation	Site (1)	Short-term (2)	Low (4)	Medium (3)	21	**Low**
	Operational Phase	Site (1)	Short-term (2)	Minor (2)	Low (2)	10	**Low**
Mitigating Measures	1. The project footprint should be confined to the assessed corridor as there are no watercourses directly within the development footprint. The region is also arid with low rainfall. 2. Stormwater culverts must be installed and where possible be in line with existing culverts along the adjacent existing railway line. This is important to allow for the free flow of any surface stormwater during rainfall periods. 3. The nearby depression wetlands need to be marked as 'no-go zones' and totally avoided. No movement of vehicles or personnel are allowed through them.						
6. Fringe impacts arising from the construction phase	**Construction Phase: Pre-mitigation**	Local (2)	Short-term (2)	Low (4)	Low (2)	16	**Low**
	Construction Phase: Post mitigation	Site (1)	Short-term (2)	Minor (2)	Low (2)	10	**Low**
	Operational Phase	Site (1)	Short-term (2)	Minor (2)	Low (2)	10	**Low**
Mitigating Measures	1. Due to the nature of the project the potential for any significant fringe benefits is low. 2. Care must be taken with heavy machinery used on the project. All access roads used during construction must be monitored and maintained. 3. Soils and stones excavated may be used on site as backfill, fixing of roads, filling of dongas, etc. (with permission from landowners). 4. Excavated soils and rocks may not be simply dumped in any open veld or even on the site. 5. All temporary access roads must be fully rehabilitated by the contractors prior to final signing off of the construction phase of the project. 6. Continual communication must be maintained with any and all adjacent landowners. A record of any official and general complaints must be kept on site. 7. The study area / project area must be securely fenced to prevent livestock and wild animals from wondering into the construction area and later the operational area.						

7 CONCLUSIONS & RECOMMENDATIONS

Conclusions

The conclusions of the biodiversity study are as follows:

- The study site is situated within Kathu Bushveld and Kuruman Thornveld, both which are not threatened veldtypes / ecosystems, and both have a status of 'Least Concern'.
- There are a few scattered protected camelthorn trees in the south of the study area.
- There are no watercourses directly within the study site footprint. However, there is a depression wetland system close by (between 100 – 300m). It is possible that at a stage the systems were connected with surface stormwater flow.
- No RDL or ODL flora was observed during field investigations and none are expected to occur.
- No faunal species of conservation concern (SCC) were observed. However, it is more than likely that due to the remoteness of the area there will be the occasional SCC moving through the area. These would include priority bird species, which include many of the raptors found in the region.
- Ground-truthing supports (verifies) the screening tool assessment that the overall terrestrial biodiversity sensitivity is 'Low'.
- Ground-truthing disputes the screening tool assessment that the aquatic sensitivity is 'High'. During field investigations the aquatic sensitivity was determined to be 'Low'. Even though the site is within the Kathu-Sishen SWSA, which is a groundwater SWSA. The project will have absolutely no impact on groundwater. The nearby / adjacent depression wetlands have a sensitivity of 'High'.

Recommendations

The recommendations of the study are as follows:

- There are no fatal flaws and the project should be allowed to proceed.
- Mitigating measures should be implemented and form part of the conditions of any other documents and regulations, such as the EMP.
- A 32m buffer zone should be implemented around the nearby depression wetlands and should be viewed as a 'no-go zones'. It should be noted that the development footprint does not affect the wetlands.
- There are a few scattered protected camelthorn trees in the south of the study area. If any of these trees are to be removed, then a tree permit will first be required.

8 APPENDICES

8.1 List of floral species identified on site

Trees and Shrubs

Senegalia (*Acacia*) *mellifera* subsp. *detinens*, *Diospyros lycioides* subsp. *lycioides*, *Dichrostachys cinerea*, *Grewia flava*, *Gymnosporia buxifolia*, *Grewia retinervis*, *Ziziphus mucronata, Tarchonanthus camphoratus, Searsia lancea,* Vachellia (*Acacia*) *erioloba*, *Boscia albitrunca*, *Lycium hirsutum*, *Tarchonanthus camphoratus*, *Gymnosporia buxifolia*, Vachellia (*Acacia*) *hebeclada* subsp. *hebeclada*

Herbaceous

Acrotome inflata, *Erlangea misera*, *Senna italica* subsp. *arachoides*.

Grasses

Aristida meridionalis, *Brachiaria nigropedata*, *Centropodia glauca*, *Eragrostis lehmanniana*, *Schmidtia pappophoroides*, *Stipagrostis ciliata*, *Aristida congesta*, *Eragrostis biflora*, *E. chloromelas*, *E. heteromera*, *E. pallens*, *Melinis repens*, *Schmidtia kalahariensis*, *Stipagrostis uniplumis*, *Tragus berteronianus*.

Aquatic / Semi-aquatic

None

Protected Trees

None.

Priority Species / Species of Conservation Concern (SCC)

None.

8.2 Alien plants identified in the Study Area

There was no significant presence of invasive alien species in the study area. However a few scattered species were observed as well as some in the general region. These inlcuded *Nicotiana glauca* (Tree Tabacco), *Argemone ochroleuca* (Mexican Poppy), *Schkuhria pinnata* (Dwarf Marigold), *Xanthium spinosum* (Spiny Cocklebur), *Chenopodium album* (White Goosefoot), *Alternanthera pungens* (Paper Thorn) and *Verbesina encelioides* (Wild Sunflower), *Prosopis glandulosa* (Mesquite), *Agave americana* and *Opuntia ficus-indica* (Prickly Pear).

8.3 Kathu Bushveld

Below is the list of floral species commonly found in the veldtype (Mucina & Rutherford, 2010).

Tall Tree: Vachellia (*Acacia*) *erioloba* (d). Small Trees: *Senegalia* (*Acacia*) *mellifera* subsp. *detinens* (d), *Boscia albitrunca* (d), *Terminalia sericea*. Tall Shrubs: *Diospyros lycioides* subsp. *lycioides* (d), *Dichrostachys cinerea*, *Grewia flava*, *Gymnosporia buxifolia*, *Rhigozum brevispinosum*. Low Shrubs:

Aptosimum decumbens, *Grewia retinervis*, *Nolletia arenosa*, *Sida cordifolia*, *Tragia dioica*. Graminoids: *Aristida meridionalis* (d), *Brachiaria nigropedata* (d), *Centropodia glauca* (d), *Eragrostis lehmanniana* (d), *Schmidtia pappophoroides* (d), *Stipagrostis ciliata* (d), *Aristida congesta*, *Eragrostis biflora*, *E. chloromelas*, *E. heteromera*, *E. pallens*, *Melinis repens*, *Schmidtia kalahariensis*, *Stipagrostis uniplumis*, *Tragus berteronianus*. Herbs: *Acrotome inflata*, *Erlangea misera*, *Gisekia africana*, *Heliotropium ciliatum*, *Hermbstaedtia fleckii*, *H. odorata*, *Limeum fenestratum*, *L. viscosum*, *Lotononis platycarpa*, *Senna italica* subsp. *arachoides*, *Tribulus terrestris*.
(d) = Dominant.

8.4 Kuruman Thornveld

Below is the list of floral species commonly found in the veldtype (Mucina & Rutherford, 2010).
Tall Tree: Vachellia (*Acacia*) *erioloba* (d). Small Trees: *Senegalia* (*Acacia*) *mellifera* subsp. *detinens* (d), *Boscia albitrunca* (d). Tall Shrubs: *Grewia flava* (d), *Lycium hirsutum* (d), *Tarchonanthus camphoratus* (d), *Gymnosporia buxifolia*. Low Shrubs: Vachellia (*Acacia*) *hebeclada* subsp. *hebeclada* (d), *Monechma divaricatum* (d), *Gnidia polycephala*, *Helichrysum zeyheri*, *Hermannia comosa*, *Pentzia calcarea*, *Plinthus sericeus*. Geoxylic Suffrutex: *Elephantorrhiza elephantina*. Graminoids: *Aristida meridionalis* (d), *A. stipitata* subsp. *stipitata* (d), *Eragrostis lehmanniana* (d), *E. echinochloidea*, *Melinis repens*. Herbs: *Dicoma schinzii*, *Gisekia africana*, *Harpagophytum procumbens* subsp. *procumbens*, *Indigofera daleoides*, *Limeum fenestratum*, *Nolletia ciliaris*, *Seddera capensis*, *Tripteris aghillana*, *Vahlia capensis* subsp. *vulgaris*.
(d) = Dominant.

8.5 Definitions

8.5.1 Wetlands

'Wetland' is a broad term and for the purposes of this study it is defined according the parameters as set out by the Department of Water & Sanitation (DWS) in their guideline (A practical field procedure for identification and delineation of wetlands and riparian areas, 2005).
According to the DWS document and the National Water Act (NWA) a wetland is defined as, "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near 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*."
Furthermore, the guidelines stipulate that wetlands must have one or more of the following defining attributes:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes); and
- A high-water table that results in saturation at or near surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

8.5.2 Valley Bottom Wetlands

Valley-bottom wetlands are mostly flat wetland areas located along a valley floor, often connected to an upstream or adjoining river channel. Although valley-bottom wetlands are generally sites of sediment accumulation or temporary storage, as in the case of floodplain wetlands, the process of river-derived deposition is not nearly as important in these systems as it is in floodplain wetlands. As such, there tend to be few (if any) depositional features present within a valley-bottom wetland that can be ascribed to current riverine processes, although erosional features relating to riverine processes may be present. Valley-bottom wetlands are not formed by the process of flooding and large-scale sediment movement (Ollis, *et. al*. 2013. SANBI Biodiversity Series 22).

Channelled valley-bottom wetlands must be considered as wetland ecosystems that are distinct from, but sometimes associated with, the adjacent river channel itself, which must be classified as a 'river'. Remember that some river channels, especially in the more arid parts of South Africa, are vegetated

Channelled valley-bottom wetlands are characterised by their location on valley floors, the absence of characteristic floodplain features and the presence of a river channel flowing through the wetland (Ollis, *et. al*. 2013. SANBI Biodiversity Series 22).

Unchannelled valley-bottom wetlands are without a river channel running through it. Unchannelled valley-bottom wetlands are characterised by their location on valley floors, an absence of distinct channel banks, and the prevalence of diffuse flows. These wetlands are generally formed when a river channel loses confinement and spreads out over a wider area, causing the concentrated flow associated with the river channel to change to diffuse flow (i.e. the river becomes an unchannelled valley-bottom wetland). This is typically due to a change in gradient brought about by a change in base level at the downstream edge of the wetland (for example, where an erosion-resistant dolerite dyke is present) and the resulting accumulation of sediment. In some cases, an unchannelled valley-bottom wetland could occur at the downstream end of a seep, where a slope grades into a valley near the head of a drainage line (Ollis, *et. al*. 2013. SANBI Biodiversity Series 22).

8.5.3 Riparian zones

Riparian vegetation is typically zonal vegetation closely associated with the course of a river or stream and found in the alluvial soils of the floodplain. According to the National Water Act (NWA) riparian habitat is defined as including "*The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.*"

It is important to note that the NWA states that the riparian zone has a floral composition distinct from those of adjacent areas. The NWA also defines riparian zones as areas that "c*ommonly reflect the high-energy conditions associated with the water flowing in a water channel, whereas wetlands display more diffuse flow and are lower energy environments*."

Figure 16, below, shows the basic classification of wetlands.

Hydrogeomorphic types		Description	Source of water maintaining the wetland[1]	
			Surface	Sub-surface
Floodplain		Valley bottom areas with a well defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel		Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel		Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***
Hillslope seepage linked to a stream channel		Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hillslope seepage		Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes Pans)		A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

[1] Precipitation is an important water source and evapotranspiration an important output in all of the above settings

Water source: * Contribution usually small

*** Contribution usually large

*/ *** Contribution may be small or important depending on the local circumstances

*/ *** Contribution may be small or important depending on the local circumstances.

 Wetland

Figure 16: Basic classification of wetlands

8.6 Buffer Zones vs Regulated Zones

A buffer zone implies or talks to a zone or area in which "nothing" should be done, or no activities are allowed to take place. A regulated zone (or area), has certain legal implications, under which certain or regulated activities may or may not take place.

The following areas / zones and regulations are relevant:

- The 32 m in the NEMA listed activities. This is 32 m from the 1:1 year flood line or first flood bank of the active stream area. This is not 32 metres from the 1:100 year flood line or 32 metres from the 500 m zone of the delineated wetland as determined by DWS. Experts keep on using definitions in the NEMA to support or define things or issues in the NWA or vice versa. This should not be done).
- The 1:100 flood line, or the riparian area (which ever is the furthest) as defined by the GN509 in terms of the NWA; or
- The wetland area and 500 m from the wetland area as defined by GN509 in terms of the NWA. This 500 m area is not a buffer zone, but a zone of observation to determine the presence of nearby wetlands that might require buffering.

These areas are the "Extent" or "regulated area" of a watercourse. In other words areas in which the applicable legislation applies. Before any activity can take place as defined by the legislation the activity must be authorised in terms of that legislation. The term is "Regulated Area".

This means an activity may take place within a regulated area. Only if after the necessary environmental evaluation processes have been followed and it has been determined that the impacts are acceptable or the mitigating actions implemented will address any unacceptable impacts.

8.7 Short CV of Specialist

QUALIFICATIONS

2000 MBA, Oxford Brookes University (England)
1998 Diploma in Small Business Management (Damelin College)
1988 MSc (Rand Afrikaans University)
1987 BSc (Hons.) (Rand Afrikaans University)
1986 BSc (Rand Afrikaans University)

FURTHER TRAINING AND DEVELOPMENT

- Diploma in Public Speaking & Communications Ambassador College (USA)
- SAQA Accreditation and Qualifications in Training, Assessing & Service Provision (AgriSeta)
- SASS 5 Training Course

PUBLICATIONS

- Co-Authored Book: Cut Flowers of the World. 2010. Briza, Pretoria.
- Cut Flowers of the World, 2ed. 2020. Briza, Pretoria.
- 100s of articles for popular magazines such as Farmer's Weekly & SA Landscape

PROFESSIONAL MEMBERSHIPS

- SA Council of Natural Scientific Professions (SACNASP)
    - Reg. No. 400077/91
- South African Wetland Society
    - Reg. No: 998061
- Society of Wetland Scientists

PROFESSIONAL EXPERIENCE

Position: **Director / Owner**
Employer: Flori Scientific Services
Period: 2000 to current
Scope of Work Done:

- Conduct specialist studies and reasearch for EIA projects.
- Specialist studies and consultancy includes
- Ecological studies
- Aquatic and Wetland assessments
- Avifaunal impact assessments
- Risk Matrices for water use licences
- Specialist Environmental Consultant
- Environmental Control Officer (ECO) work
- Specialist work involves field investigations and report writing.

Position: **Technical Manager**
Employer: Sunbird Flowers (Pty) Ltd
Period: 1997 - 2000
Scope of Work Done:

- Consulted on and managed projects in the agricultural & floricultural industries, with specific emphasis on high-yield agriculture.
- Managed existing and new projects.
- Involved in all aspects of project management from managing, planning; costing; marketing; budgeting, technical and training.
- Assisted emerging rural farmers in most aspects of agriculture

(i.e. Cut flower and vegetable production) including setting up of business plans, marketing, training and costings.

- Did "turn-key" projects in most agriculture related fields. This included – Tunnel and greenhouse production; Hydroponics; vegetables, cut flowers; field crops.

9 REFERENCES

- Bromilow, C. 2010. Problem plants and alien weeds of South Africa. Briza, Pretoria.
- Manning, J. 2009. Field Guide to Wild Flowers of South Africa. Stuirk, Cape Town.
- Mucina, L. & M.C. Rutherford (eds). 2006. The vegetation of South Africa, Lesotho and Swaziland. SANBI, Pretoria.
- Raimondo D., L. von Staden, W. Fonden, JE Victor, NA. Helme, RC. Turner, DA. Kamundi, PA. Manyama (eds). 2009. Red List of South African Plants. Strelitzia 25. SANBI. Pretoria.
- SANBI. South African National Biodiversity website. www.sanbi.org.
- Siebert, S.J, A-E van Wyk & G.J. Bredenkamp. 2001. The physical environment and major vegetation types of Sekhukhuneland, South Africa. SA Journal of Botany.
- South African National Biodiversity Institute (SANBI). Threatened ecosystems of South African Biomes. Draft 2009. www.sanbi.org or www.bgis.sanbi.org.
- Stuart, C. & T. Stuart. 2001. Field Guide to Mammals of Southern Africa. Struik, Cape Town.

The following are references consulted but not quoted directly in the report:

- Carruthers, V. 2001. Frogs and Frogging in Southern Africa. Struik, Cape Town.
- Palgrave, K.C. 1983. Trees of Southern Africa. 2ed. Struik, Cape Town.
- Gerber, A., Cilliers, CJ., van Ginkel, C. & Glen, R. 2004. Easy identification of Aquatic plants. Dept. of Water Affairs, Pretoria.
- Picker, M., Griffiths, C. & Weaving, A. 2004. Field guide to Insects of South Africa. Struik Nature, Cape Town.
- van Wyk, A-E. & S. Malan. 1988. Field guide to the wild flowers of the Witwatersrand and Pretoria region. Struik, Cape Town.
- van Wyk, E. & F. van Oudtshoorn. 2009. Guide to Grasses of Southern Africa. 2nd ed. Briza, Pretoria.
- Manning, J. 2009. Field Guide to Wild Flowers of South Africa. Struik Nature, Cape Town.
- Woodhall, S. 2005. Field Guide to Butterflies of South Africa. Struik, Cape Town.
- Branch, B. 1998. Field Guide to Snakes and other Reptiles of Southern Africa. 3d ed. Struik, Cape Town.
- Stuart, C. & T., Stuart. 2001. Field Guide to Mammals of Southern Africa. 3rd ed. Struik, Cape Town.