

FINAL ENVIRONMENTAL SCREENING REPORT

FOR THE INTEGRATED ENVIRONMENTAL IMPACT ASSESSMENT, WASTE MANAGEMENT LICENSE AND WATER USE LICENSE APPLICATION PROCESS FOR WET FLUE GAS DESULFURIZATION (WFGD) WASTE DISPOSAL FACILITIES IN MEDUPI POWER STATION, LIMPOPO PROVINCE.

Author: Shonisani Selahle

Date Issued: April 2026

Client: Eskom Holdings SOC Ltd

Address: 546 16th Road, Block 2, Constantia Park, Randjespark, 1682

Email: shonie@scprojects.co.za / admin@scprojects.co.za

Tel: 011 026 2560

Cell: 079 614 8298

Fax: 086 552 0171

QMS – ENV-BAR- WUL	ENVIRONMENTAL SCREENING REPORT	REV 001
		Page 1 of
		Year: 2026

Document Control Information

DOCUMENT STATUS			
Client	Eskom Holdings SOC Ltd		
Project Name	Integrated Environmental Impact Assessment, Waste Management License and Water Use License Application Process for Wet Flue Gas Desulfurization (WFGD) Waste Disposal Facilities in Medupi Power Station, Limpopo Province		
Document Name	Environmental Feasibility Report		
Project Number (Internally)	05_0525A_Eskom Medupi		
Version	002		
Issued Date	April 2026		
<u>Copyright and Confidentiality</u>			
Selahle Consultancy and Projects Pty Ltd rights reserved. This report and its contents are protected under the Copyright Act No. 98 of 1978 (as amended). This report is being submitted to ESKOM SOC Ltd by Selahle Consultancy and Projects Pty Ltd. No part of this document may be reproduced, distributed, or used without written permission from the copyright holder prior to written consent. This document could change at any time without warning.			
APPROVAL			
<i>This document has been approved for publishing by:</i>			
Action	Name / Designation	Signature	Date
Prepared by	Sibongile Hamisi <i>Can.Sci.Nat</i>		01/03/2025
Reviewed by	Shonisani Selahle <i>Pr.Sci.Nat Registered EAP</i>		14/04/2025
Approved by (internally)	Brenda Makanza <i>Pr.Sci.Nat Registered EAP</i>		
Accepted by			

DISTRIBUTION

Controlled copies of this document are distributed as follows:

No.	
1.	
2.	

REPORT DETAILS	
Title:	Feasibility Study for the proposed Wet Flue Gas Desulfurization (WFGD) Waste Disposal Facilities in Medupi Power Station, Limpopo Province of South Africa.
Purpose of this report	The purpose of this Report is to: ▫ Undertake a desktop sensitivity analysis based on the EIA Screening Tool and Limpopo Conservation Plan version 2. ▫ A brief site evaluation to become familiar with the habitat diversity and inherent ecological sensitivity and integrity of the site and the immediate surroundings. ▫ Suitability of the proposed landfill on the different sites. ▫ Provide a discussion on the applicable legislation and policies. ▫ Highlight opportunities and constraints for the proposed development. ▫ Compiling suitable maps, illustrating pertinent biophysical attributes of the area and surroundings; ▫ Identifying potential information gaps; and ▫ Presenting all results in a suitable report.

ABOUT THE AUTHORS

1. Researched and Compiled by:

Shonisani Selahle

Environmental Assessment Practitioner (EAPASA Registered EAP)

Qualifications and Expertise

- BSc Hons (Enviro. Management) – UNISA
- N. Dip Geology – TUT
- GIS Cert – UNIVEN
- ISO 14001 & 45001 – NOSA
- Stakeholder Engagement – GRI
- 15 years' experience in the Environmental Management field

Professional Affiliation

- Environmental Assessment Practitioners Association of South Africa (EAPASA): 2020/2646
- South African Council for Natural Scientific Professions (SACNASP): 134271
- South African Council for the Project and Construction Management Professions: Construction Health and Safety Manager – CHSM/1372/2025

EXECUTIVE SUMMARY

Executive Summary

Medupi Power Station was designed and constructed with provision for the installation of Wet Flue Gas Desulphurisation (WFGD) technology to ensure compliance with sulphur dioxide (SO₂) emission reduction requirements. In terms of the Atmospheric Emission Licence (AEL No. H16/1/13-AEL/M1/R1), issued on 1 December 2020, continuous operation of SO₂ abatement systems is required on all six generating units. The WFGD system uses Limestone as a sorbent, whereby Flue Gas is filtered through Pulse Jet Fabric Filters (PJFFs) and scrubbed in an absorber, producing gypsum as a by-product that requires safe disposal at a dedicated waste disposal facility.

This assessment evaluated Six Alternative Sites for the proposed WFGD Waste Disposal Facility through a structured and transparent site selection process. The process was informed by site visits, specialist studies, and a multi-criteria analysis incorporating Terrestrial Biodiversity, Freshwater, Heritage and Palaeontology, Social and Socio-Economic, Agricultural, Technical, Climate, Financial, and Legal Considerations. The objective was to identify a preferred site (or sites) that balances environmental protection, regulatory compliance, social acceptability, and operational feasibility. The broader Medupi–Lephalale area is characterised by a sensitive ecological and social landscape comprising Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), freshwater systems, agricultural land, conservation areas, and existing industrial infrastructure. As a result, avoidance of high-sensitivity areas and minimisation of cumulative impacts were key drivers in the evaluation.

From a biodiversity perspective, Sites 4 and 5 were identified as highly sensitive, being located within CBA 1 areas with intact Limpopo Sweet Bushveld vegetation, strong ecological connectivity, and direct interaction with the Sandloop River and associated drainage networks. Site 5 was classified as a “No-Go” Alternative due to its irreplaceable ecological value and hydrological sensitivity. In contrast, Sites 1, 3, and 6 are in more transformed and fragmented landscapes, largely influenced by existing infrastructure, and therefore present lower residual ecological risk.

The Freshwater Assessment reinforced these findings. Sites 1, 4, and 5 intersect multiple drainage features, increasing the risk of hydrological alteration and water quality impacts. Site 6 was identified as the most favourable alternative from a freshwater perspective, as it avoids all mapped drainage features; however, the presence of an unmapped pan and wetland within the site may affect its suitability and requires confirmation during the EIA phase. Sites 2 and 3 present intermediate and potentially manageable freshwater constraints. Heritage Assessments indicated generally low to moderate archaeological sensitivity across the study area due to historical transformation. However, Site 2 poses a higher heritage risk due to the presence of culturally significant sites and potential graves, while Sites 3 and 6 were assessed as having the lowest heritage constraints. Palaeontological sensitivity across all sites is low and can be managed through a standard Chance Find Protocol.

Social and Socio-Economic Assessments revealed that sites situated within existing industrial corridors (notably Sites 1 and 6) are more compatible with surrounding land uses and pose lower risks of land-use conflict and community disturbance. While the project is expected to generate positive socio-economic benefits during construction, including temporary employment and local procurement, potential negative

impacts can be effectively managed through the implementation of a Social Management Plan (SMP). When all specialist inputs were integrated through the weighted scoring matrix, Site 6 emerged as the highest-ranked and preferred alternative, followed by Site 1. Sites 3 and 2 were identified as conditionally viable, subject to specific constraints and mitigation measures. Sites 4 and 5 were consistently ranked lowest and were excluded from further consideration due to high environmental and regulatory risks.

In conclusion, the assessment demonstrates that a robust, evidence-based process supports the identification of preferred WFGD waste disposal sites at Medupi Power Station. Sites 6, 1, and 3 are identified as preferred alternatives, with Site 2 remaining as a feasible secondary option. The preferred outcome minimises environmental and social risks while supporting Eskom's operational requirements and compliance with emission reduction obligations. Ongoing refinement of the facility layout and implementation of recommended mitigation measures will be essential to ensure that residual impacts remain within acceptable limits during subsequent project phases.

The preferred site 6 has limited spatial extent constraints to accommodate all three WFGD waste by-products within a single footprint. In order to address this limitation while maintaining compliance with environmental and heritage protection requirements, it is recommended that a combined or clustered disposal approach be considered. Specifically, two or three of the higher-ranking sites (notably Sites 6, 3 and, where necessary, Site 1) may be integrated into a single disposal strategy, with each site accommodating specific waste streams or phased disposal cells. This approach would allow for the maximum available landfill capacity to be achieved while maintaining avoidance of sensitive heritage features, ecological habitats, freshwater buffers, and Critical Biodiversity Areas.

Eskom Holdings SOC Limited concluded the site selection process by identifying Site 6 as the preferred option and reducing the storage duration from 45 to 25 years to accommodate all identified by-product wastes (gypsum, chemical salts, and chemical sludge).

Despite environmental constraints identified through specialist studies, Site 6 remains the most feasible option. These constraints will be assessed in detail during the Environmental Impact Assessment (EIA) phase.

Portions of Sites 2 and 3 will be utilised for the proposed waste transport route, with a conveyor belt system identified as the preferred option. Figure 1 illustrates the demarcation of Site 6 to accommodate all WFGD by-product waste associated conveyor routes.

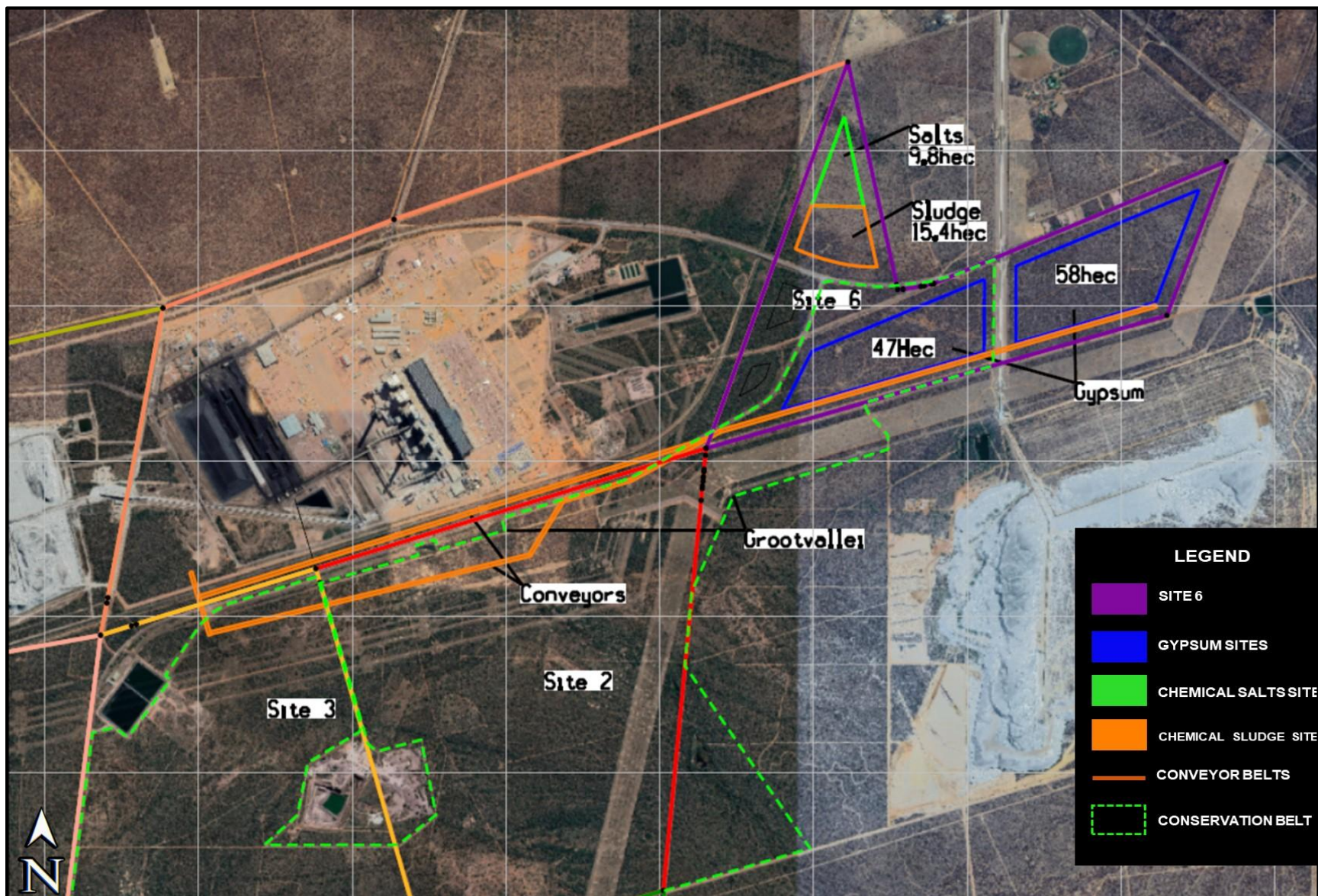


Figure 1: Preferred Land Parcel for the WFGD Waste Disposal By-Products

**SCREENING REPORT FOR THE PROPOSED THE INTEGRATED ENVIRONMENTAL IMPACT
ASSESSMENT, WASTE MANAGEMENT LICENSE AND WATER USE LICENSE
APPLICATION PROCESS FOR WET FLUE GAS DESULFURIZATION (WFGD) WASTE
DISPOSAL FACILITIES IN MEDUPI POWER STATION,
LIMPOPO PROVINCE.**

Contents	Page
EXECUTIVE SUMMARY	5
1 INTRODUCTION	17
1.1 Terms of Reference	17
1.1.1 The identification of environmental constraints through site walkabout and the use of tools such as GIS, EMF and the conservation plan. This aimed to achieve the following in identifying:	17
1.1.2 Undertaking specialist studies that would assist in informing the outcome of this screening report. Specialists' studies that were undertaken are:	18
2 PROJECT BACKGROUND	18
2.1 Project Location	20
3 SCOPE OF WORK	22
3.1.1 Sludge and Salts Disposal Facility	22
3.1.2 Gypsum facility	22
4 DESCRIPTION OF THE ENVIRONMENT	22
4.1 Climate and Temperature	22
4.2 Drainage	23
4.3 Geology and Soils	23
4.4 Vegetation	23
4.5 Topography	23
5 TOOLS USED IN INFORMING THE SCREENING REPORT	26
5.1 Limpopo Conservation Plan Version 2	26
5.2 Screening Report	29
5.2.1 Screening report findings	29
5.3 Waterberg District Environmental Management Framework Report	30
5.3.3 Zone 11: Major Infrastructure Corridors	31
6 METHODOLOGY AND APPROACH	33
6.1 Factors that were taken into consideration for the feasibility of each site include;	33
6.2 Methodology for WFGD Landfill Site Feasibility, Design & Permitting	33
6.2.1 Project overview & objectives	33
6.2.2 Staged approach (phases)	33
6.3 Purpose of the Methodology	36
6.4 Overview of the Site Evaluation Approach	36
6.5 Assessment Criteria	37
6.6 Weighting of Criteria	37
6.7 Scoring System	37
6.8 Criterion-Specific Score Descriptors	37
6.8.1 Environmental Criteria	37
6.8.2 Heritage Criteria	38
6.8.3 Social Criteria	38
6.8.4 Financial Criteria	38
6.8.5 Technical Criteria	38
6.8.6 Legal and Regulatory Criteria	38

6.9	Calculation of Weighted Scores	39
6.10	Site Ranking and Interpretation	39
7	SITE SCREENING	39
7.1	Determination of the approximate land size for all waste streams	39
7.2	Assumptions and Limitations	40
7.3	Site inspection	41
7.4	Site Visit findings	41
7.4.1	Site 1	44
7.4.2	Site 2	45
7.4.3	Site 3	47
7.4.4	Site 4	50
7.4.5	Site 5	51
7.4.6	Site 6	53
8	SPECIALIST FINDINGS	55
8.1	Terrestrial Biodiversity	55
8.1.1	Flora Survey	58
8.1.2	Fauna Survey	58
8.1.3	Sensitivity Assessment Outcomes and Recommendations	59
8.1.4	Potential Biodiversity Impacts	59
8.2	Heritage Impact Assessment	60
8.2.1	Findings	61
8.3	Avifauna Study	62
8.3.1	Alternatives Considered	62
8.3.2	Impact Statement	65
8.3.3	Specialist Opinion	65
8.4	Aquatic Assessment Study	65
8.4.1	National Freshwater Ecosystem Priority Ecosystems	66
8.4.2	Buffer Requirements	68
8.4.3	Alternatives Considered	71
8.5	Palaeontology Study	74
8.5.1	Geology and Palaeontology	74
8.5.2	Palaeontological context	75
8.5.3	Recommendation	77
8.6	Climate Change Assessment	77
8.7	Social and Socio-Economic Study	83
8.8	Agricultural Study	86
9	SITE RANKING RESULTS	88
9.1	Site Ranking and Interpretation	88
10	POTENTIAL IMPACTS	91
11	DISCUSSION OF SITE SELECTION RESULTS	93
11.1	Overview	93
11.2	Environmental and Biodiversity Considerations	93
11.3	Freshwater and Aquatic Systems	94
11.4	Heritage Sensitivity	94
11.5	Social and Socio-Economic Context	95
11.6	Agricultural Potential and Land Capability	95
11.7	Avifaunal Considerations	95
11.8	Integrated Site Ranking and Preferred Alternative	96
11.9	Conclusion	99
12	RECOMMENDATIONS	100
	REFERENCES	107

List of Figures

Figure 1: Preferred Land Parcel for the WFGD Waste Disposal By-Products	7
Figure 2: A schematic representation of a WFGD Process	19
Figure 3: The proposed WFGD waste disposal sites locality map	21
Figure 4: Site 1 – 5 Elevation Profile	24
Figure 5: Site 6 Elevation Profile	25
Figure 6: Proposed sites superimposed by a conservation and NFEPA wetland maps.	28
Figure 7: Environmental Management Zones	32
Figure 8: Sensitivity map from all shapefiles used for this feasibility.	35
Figure 9: Site attributes	42
Figure 10: Site attributes overlain by a conservation map.	43
Figure 11: Photographic evidence of Site 1 attributes; top left kraal with a herd of cows. Bottom left – indicating the residue remaining on the soil where the area is sometimes waterlogged due to the discharge from the power station and one of the overhead powerline servitudes traversing the site. Right image – indicates the presence of water/damming occurring on site, resulting from the discharge from the power station.....	44
Figure 12: Top left & right – indicates the pipes discharging water into site 1 premises originating from the power station. Bottom left – indicate the marshy features that originate from the water that is coming from the pipelines above. Bottom right – indicates the presence of a grave site.	45
Figure 13: left image – ponding on the site with white residue on tree trunks; Top right – ponding water indicating the presence of iron (brown/orange residue in soil). Bottom right – waterlogged area on the same site.	45
Figure 14: Several grave sites within the site and alien invasive plant species.	46
Figure 15: Top and bottom left images – show some of the culvert infrastructure developed throughout the site; Top and bottom right images indicate dams observed on site.	47
Figure 16: Left – waterlogged area on the Eskom service road where there is an overhead powerline; Right – rocky outcrop/ridge with an overhead powerline.....	47
Figure 17: Top left and Right -Collapsed bridge infrastructure of the existing Impala dam; Bottom left – Servitude on site; Bottom right – Borehole with a solar panel.	48
Figure 18: Top left and right - stockpiling and a crushing facility; Bottom left – Demarcated grave site; Bottom right – Medupi Raw water site; Middle – Solar panel.	49
Figure 19: Top and bottom left – connection chambers along Kuipersbult Road with ponding of wastewater; Middle – Discharge of wastewater into the site boundary along the Kuipersbult Road; Top right – Gravesite observed on-site. Bottom right – Waterlogged area that has dried up with white residue on the soil.	49
Figure 20: Bottom left – Kraal and farming activities observed on-site. Top left – stormwater pipe observed onsite; Centre – manmade stormwater channel leading to a dam; Top and bottom right – Wetland features observed on site.	50
Figure 21: Left – Nesting observed on the overhead powerline; Top-and-bottom centre – Dam and Ridge on -site; Top-and-bottom right – Reservoir with Jojo tanks and stormwater channel.	51
Figure 22: Top left – Eskom's servitude overhead powerline; Bottom left – kraal with cattle; Right - dirt Road that is waterlogged.	51

Figure 23: Top left – Sandloop River traversed by Kuipersbuld Road through a culvert bridge; Bottom left and Top right - provincially protected trees; Top centre – waterlogged dirt road; Bottom centre – Ridge or rocky outcrop observed on site; Bottom right – rocky outcrop.....	52
Figure 24: Left – Overhead powerlines and game found on site; Middle - stormwater infrastructure along the dirt road; Top-and-bottom right – Dam observed on site; Bottom right – White residue along the drainage line.....	53
Figure 25: Centre – a pan observed on site; All other images are adjacent to the west of the site, bordered by a railway line. There is the presence of an artificial wetland, thought to be caused by discharge from the Medupi Power Station. The area has developed wetland features i.e., vegetation. The water (top right) discharges into the site through a culvert bridge.	54
Figure 26: Wetland features observed adjacent to site 6.....	54
Figure 27: Proposed Disposal Sites in relation to the Bioregional Plan.....	57
Figure 28: Avifauna SEI site alternatives.	63
Figure 29: Delineated watercourses in terms of this study	67
Figure 30: Freshwater sensitivity for the project area of influence superimposed over the alternative project area sites.....	69
Figure 31: Zones of Regulation for the identified drainage features in relation to the project area	70
Figure 32: SAHRIS Palaeosensitivity map for the site for the six proposed WFGD disposal sites shown within the blue polygon.....	76
Figure 33: Site Suitability Ranking Scores	91
Figure 34: Site Suitability Ranking Scores based on the Specialists findings	97
Figure 35: Sensitivity Map from specialists consolidated finding	98
Figure 36: Developable Portion of lands per screening outcome	102
Figure 37: Preferred Land Parcel for the WFGD Waste Disposal By-Products.....	104
Figure 38: Preferred Land Parcel for the WFGD Waste Disposal By-Products.....	105
Figure 39: Preferred Land Parcel for the WFGD Waste Disposal By-Products.....	106

List Tables

Table 1: Proposed land parcel sizes in hectares.....	20
Table 2: Interpreting results.....	39
Table 3: Site and their extent.....	40
Table 4: Sensitivity Assessment Outcome & Recommendations	59
Table 5: Sensitivity rating for each site in terms of Avifauna.....	64
Table 6: Summary of the screening tool vs specialist assigned sensitivities	68
Table 7: Summarised findings for each alternative site	71
Table 8: Climate change factors.....	77
Table 9: Comparative Socio-Economic Sensitivity and Suitability	85
Table 10: Interpreting results.....	88
Table 11: Site 1 Score Rating.....	88
Table 12: Site 2 Score Rating.....	89
Table 13: Site 3 Score Rating.....	89
Table 14: Site 4 Score Rating.....	90
Table 15: Site 5 Score Rating.....	90
Table 16: Site 6 Score Rating.....	90

Table 17: Sizes of the Developable Area per Sites.....	101
Table 18: Sizes of the Developable Area per Sites.....	103

Appendices

- Appendix A: Environmental Screening Tool Report
- Appendix B: Terrestrial Biodiversity Report
- Appendix C: Avifauna Report
- Appendix D: Aquatic Assessment Report
- Appendix E: Heritage Impact Assessment Report
- Appendix F: Palaeontology Impact Assessment Report
- Appendix G: Climate Change Impact Assessment Report
- Appendix H: Agricultural Impact Assessment Report
- Appendix I: Socio-Economic Impact Assessment Report

DEFINITIONS

Activity (Development)	An action, either planned or existing, that may result in environmental impacts through pollution or resource use. For this report, the terms 'activity' and 'development' are freely interchanged.
Alternatives	Different means of meeting the general purpose and requirements of the activity, which may include site or location alternatives; alternatives to the type of activity being undertaken; the design or layout of the activity; the technology to be used in the activity and the operational aspects of the activity.
Applicant	The project proponent or developer is responsible for submitting an environmental application through the EAP to the relevant competent authority for environmental authorisation.
Biodiversity	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and ecological complexes.
Construction	The building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excludes the reconstruction of the same facility in the same location, with the same capacity and footprint.
Environment	In terms of the National Environmental Management Act (NEMA) (No 107 of 1998) (as amended), "Environment" means the surroundings within which humans exist and that are made up of: i. the land, water and atmosphere of the earth. ii. micro-organisms, plants and animal life. iii. any part or combination of (i) of (ii) and the interrelationships among and between them; and iv. d) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing
Environmental Assessment	The generic term for all forms of environmental assessment for projects, plans, programmes or policies and includes methodologies or tools such as environmental impact assessments, strategic environmental assessments and risk assessments.
Environmental Authorisation	An authorisation issued by the competent authority in respect of a listed activity, or an activity which takes place within a sensitive environment.
Environmental Assessment Practitioner (EAP)	The individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instrument introduced through the EIA Regulations.
Environmental Management	Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.
Groundwater	Water in the ground that is in the zone of saturation from which wells, springs, and groundwater run-off are supplied.

Hydrology	The science encompasses the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground.
Important areas	Sites that are important for the conservation of biodiversity in Gauteng; (Gauteng C-Plan Version.
Irreplaceable areas	Sites, which are essential in meeting targets set for the conservation of biodiversity in Gauteng; (Gauteng C-Plan Version 3)
Mitigate	The implementation of practical measures designed to avoid, reduce or remedy adverse impacts or enhance beneficial impacts of an action.
No-Go Option	In this instance, the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.
Sensitive Environments	Any environment identified as being sensitive to the impacts of the development
Sustainable Development	Development which meets the needs of current generations without hindering future generations from meeting their own needs.
The Act	Means the National Environmental Management Act, 1998 (Act No 107 of 1998)
Undeveloped	This means that no facilities, structures or infrastructure have been developed upon the land or property during the preceding 10 years.
Urban areas	This means areas situated within the urban edge (as defined or adopted by the competent authority), or in instances where no urban edge or boundary has been defined or adopted, it refers to areas situated within the edge of built-up areas
Vacant	Means not occupied for its lawful land use during the preceding ten-year period
Watercourse	Means i. a river or spring. ii. a natural depression in which water flows regularly or intermittently. iii. a wetland, lake or dam into which, or from which, water flows. iv. and v. (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and bank
Wetland	Means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil
WFGD	Wet Flue Gas Desulphurisation

Abbreviations (Definitions are above):

AIA	Agricultural Impact Assessment
BBBEE	Broad-Based Black Economic Empowerment
CA	Competent Authority
CBA	Critical Biodiversity Area
C-Plan	Conservation Plan
CI	Conservation Importance
DALRRD	Department of Agriculture, Land Reform and Rural Development
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FI	Functional Integrity
GNR	Government Notice Regulation
HIA	Heritage Impact Assessment
ID	Induced Draft
I&AP	Interested and Affected Party
IAIA	International Association for Impact Assessment
IAP	Invasive Alien Plants
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
NDP	National Development Plan
PPP	Public Participation Process
Ha	Hectare
LCPv2	Limpopo Conservation Plan Version 2
LEDET	Limpopo Provincial: Department of Economic Development, Environment and Tourism
MES	Minimum Emission Standards
NEMA	National Environmental Management Act
NEM: BA	National Environmental Management: Biodiversity Act
NEM: WA	National Environmental Management: Waste Act
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act
PAOI	Project Area of Interest
PES	Present Ecological State
PJFFs	Pulse Jet Fabric Filters
RR	Receptor Resilience
S&EIR	Scoping and Environmental Impact Assessment Report

SO ₂	Sulphur Dioxide
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SCP	Selahle Consultancy & Projects
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SEI	Site Ecological Importance
SEIA	Socio-Economic Impact Assessment
SIA	Social Impact Assessment
SMP	Social Management Plan
SWMP	Storm Water Management Plan
TBC	The Biodiversity Company
UVB	Unchanneled Valley Bottom
WDM	Waterberg District Municipality
WDEMF	Waterberg District Environmental Management Framework
WFGD	Wet Flue Gas Desulphurisation
WULA	Water Use License Application
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

Medupi is a coal-powered Power Station that forms part of the Eskom capital expansion programme. The word Medupi means “rain that soaks parched lands, giving economic relief” in the Sepedi language. Medupi Power Station (the Power Station) is located near Lephalale in the Limpopo Province and is approximately 370km North of Johannesburg, South Africa. The Power Station has an installed capacity of six (6) x 794 Megawatts (MW) units and utilises supercritical boiler and turbine technologies designed to operate at higher temperatures and pressures. This technology allows for maximum efficiency of the Power Station. The dry-cooling technology is efficient for operation in areas of water shortage, such as Lephalale, and utilises approximately 0.2 litres of water per unit of electricity produced. The Power Station has a design lifespan of 50 years, and its six (6) units were designed and constructed to accommodate the installation of a Wet Flue Gas Desulfurization (WFGD) technology that uses limestone. The WFGD process will produce three by-products namely: gypsum, chemical salts and sludge, that need to be disposed of in the landfill site.

Eskom Medupi has identified six land parcels that have been earmarked for the disposal of these by-products. As such, Eskom Generation (Eskom Gx) has appointed Selahle Consultancy and Projects Pty Ltd (herein referred to as SCP) to conduct an application for an Integrated Environmental Authorisation and Waste Management Licence (WML) in terms of the: National Environmental Management Act, 1998 (Act 107 Of 1998) EIA Regulations of 2024 as amended, National Environmental Management: Waste Act, 2008 (Act 59 Of 2008) and Waste Management Activities List: GNR 921 2013 as amended and Water Use License Application (WULA) in terms of Section 40 of the National of Water Act, (Act No. 36 of 1998).

1.1 Terms of Reference

The WFGD System is required to ensure compliance with the National Environmental Management: Air Quality Act (No. 39 of 2004) and the Minimum Emission Standards (MES) regulation for SO₂. Eskom was to comply with the MES, limiting SO₂ emissions to 1000 Milligrams Per Normal Cubic Meter (mg/Nm³) by March 2025, and plans to install an SO₂ Reduction Plant accordingly. However, on 31 March 2025, the Minister then increased the limit from 1000mg/Nm³ to 3 500 mg/Nm³ from 2030. The authorised WFGD process will produce three waste by-products, namely: Gypsum, Chemical Salts and Sludge. Accordingly, Eskom will need to establish designated disposal facilities to accommodate and manage the by-products generated from the process. Eskom have identified six land parcels that may be considered suitable for the disposal of these by-products.

The six designated land parcels are located to the south and northeast of the Medupi Power Station. To assess the feasibility of disposal sites and manage by-product waste, a dual-method approach was implemented to provide scientifically based recommendations. These activities include:

1.1.1 The identification of environmental constraints through site walkabout and the use of tools such as GIS, EMF and the conservation plan. This aimed to achieve the following in identifying:

- (i) Environmental attributes onsite
- (ii) Potential environmental impacts on sites.
- (iii) Potential significant environmental impact that can be avoided.
- (iv) How potential impacts which may be mitigated.
- (v) Any fatal flaws

- (vi) Residual impacts
- (vii) Any environmental impact that exceeds defined limits of acceptable change may lead to the integrated environmental authorisation being refused.

1.1.2 Undertaking specialist studies that would assist in informing the outcome of this screening report. Specialists' studies that were undertaken are:

- (i) Terrestrial Biodiversity.
- (ii) Heritage Study
- (iii) Palaeontology Study
- (iv) Aquatic Assessment Study
- (v) Avifauna Study
- (vi) Climate Change Study
- (vii) Social & Socio-Economic Study
- (viii) Agricultural Study

2 PROJECT BACKGROUND

Medupi Power Station was designed and constructed with provisions to accommodate the installation of the Wet Flue Gas Desulfurization (WFGD). All six (6) generating units were constructed independently, and they were constructed with Pulse Jet Fabric Filters (PJFFs) and Induced Draft (ID) fans.

The Medupi Power Station operates under an Atmospheric Emission Licence (AEL No. H16/1/13-AEL/M1/R1), issued on 1 December 2020, which requires continuous operation of SO₂ reduction systems on all six units. The station was built to accommodate a Wet Flue Gas Desulphurization (WFGD) system using limestone as a sorbent. In this system, Flue Gas is first filtered by Pulse Jet Fabric Filters (PJFFs), then scrubbed in an SO₂ absorber where limestone slurry reacts with SO₂ to form gypsum, which is collected and processed. Figure 2 summarises the overall WFGD process.

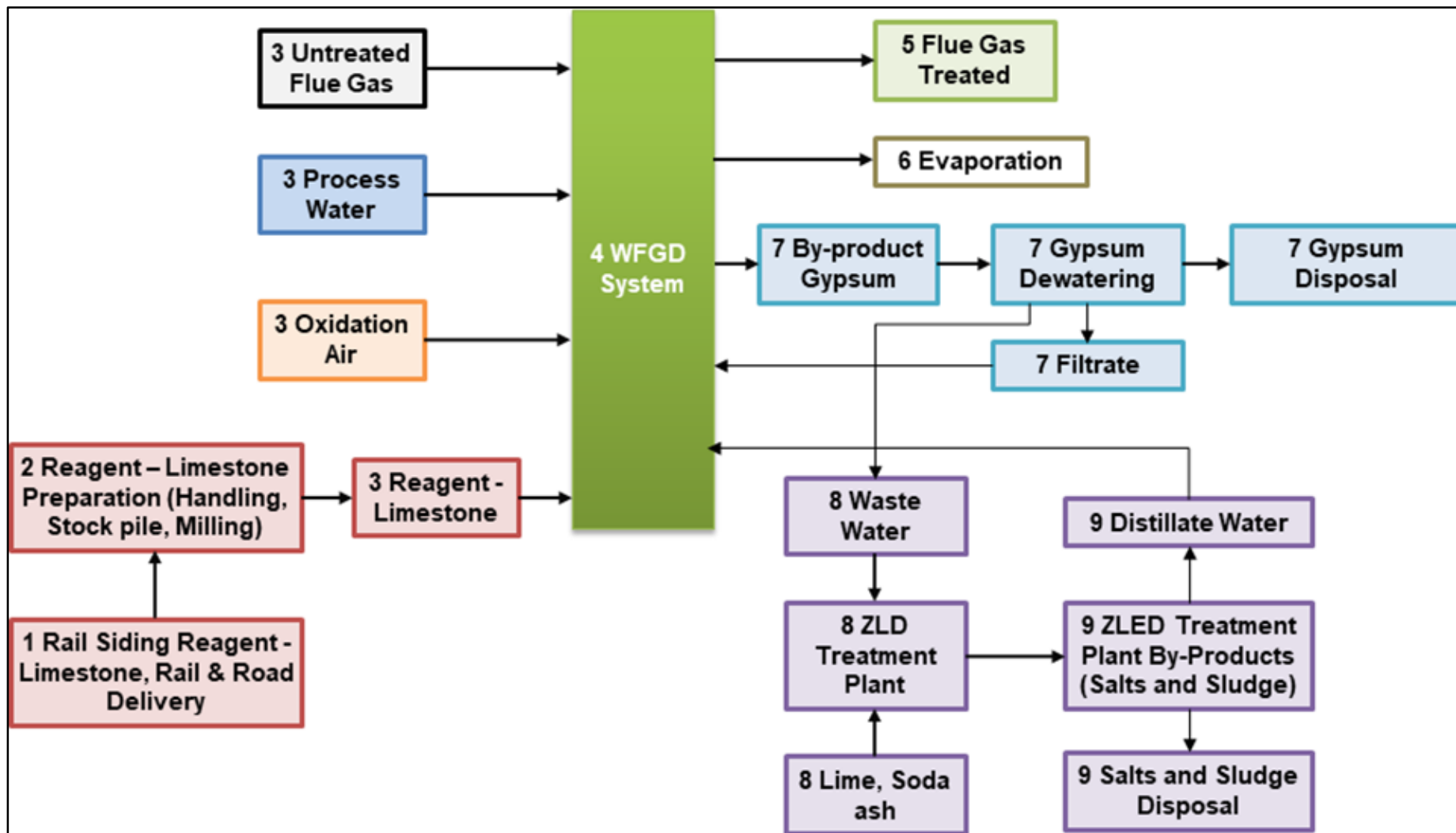


Figure 2: A schematic representation of a WFGD Process

The Power Station was said to meet an SO₂ emission limit of 1000 mg/Nm³ by 31 March 2025, as required by the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) and the MES Regulations for the SO₂. Eskom appealed the deadline, and a decision from the Minister, based on advice from the NECA Forum, the Minister granted Eskom until 2030. This directive was issued on 31 March 2025.

The retrofit design will generate gypsum as a by-product of the WFGD process. This by-product will have to be disposed of, like Ash, which is also a by-product of the coal burned for generating electricity. Furthermore, the WFGD will also have a Wastewater Treatment Plant (WWTP), which will also produce chemical salts and sludge as by-products. The retrofit design will allow for the potential commercial sale of the gypsum by installing take-off points. All by-products produced by either the WFGD process or the WWTP must be disposed of in an environmentally safe manner to mitigate any impacts on both ground and surface water.

2.1 Project Location

Medupi Power Station is situated approximately 20 km northwest of Lephalale township, 60km west of the Botswana West Border. The Power Station is situated within the jurisdiction of Lephalale Local Municipality, under the Waterberg District Municipality in Limpopo Province, South Africa (Refer to Figure 3). The site can be accessed via the R510 road. The proposed study area is in Ward 15 of Lephalale Local Municipality, and the earmarked site farm portions are indicated below.

Table 1: Proposed land parcel sizes in hectares

Site Number	Farm Name	Land Size (ha)
1	Kromdraai 690 LQ	1099,96
2	Portion 1 of the Farm Kuipersbult 511 LQ	568,43
3	Remainder Portion of Farm Kuipersbult 511 LQ	515,45
4	Portion 2 of Grootvallei 515 LQ	625,47
5	Remainder of Portion of Farm Grootvallei 515 LQ	1219,52
6	Portion 9 of Hanglip 508 LQ	295,66

The proposed sites are surrounded by the following land use:

- Medupi Power Station
- Matimba Power Station
- Exxaro Mine
- Matimba Ash Dam
- Grootvallei Conservation Area
- Railway line
- Regional and dirt/service Roads
- Conveyor Belts
- Overhead Powerlines
- Farms/Agricultural land
- Drainage lines
- Heritage sites

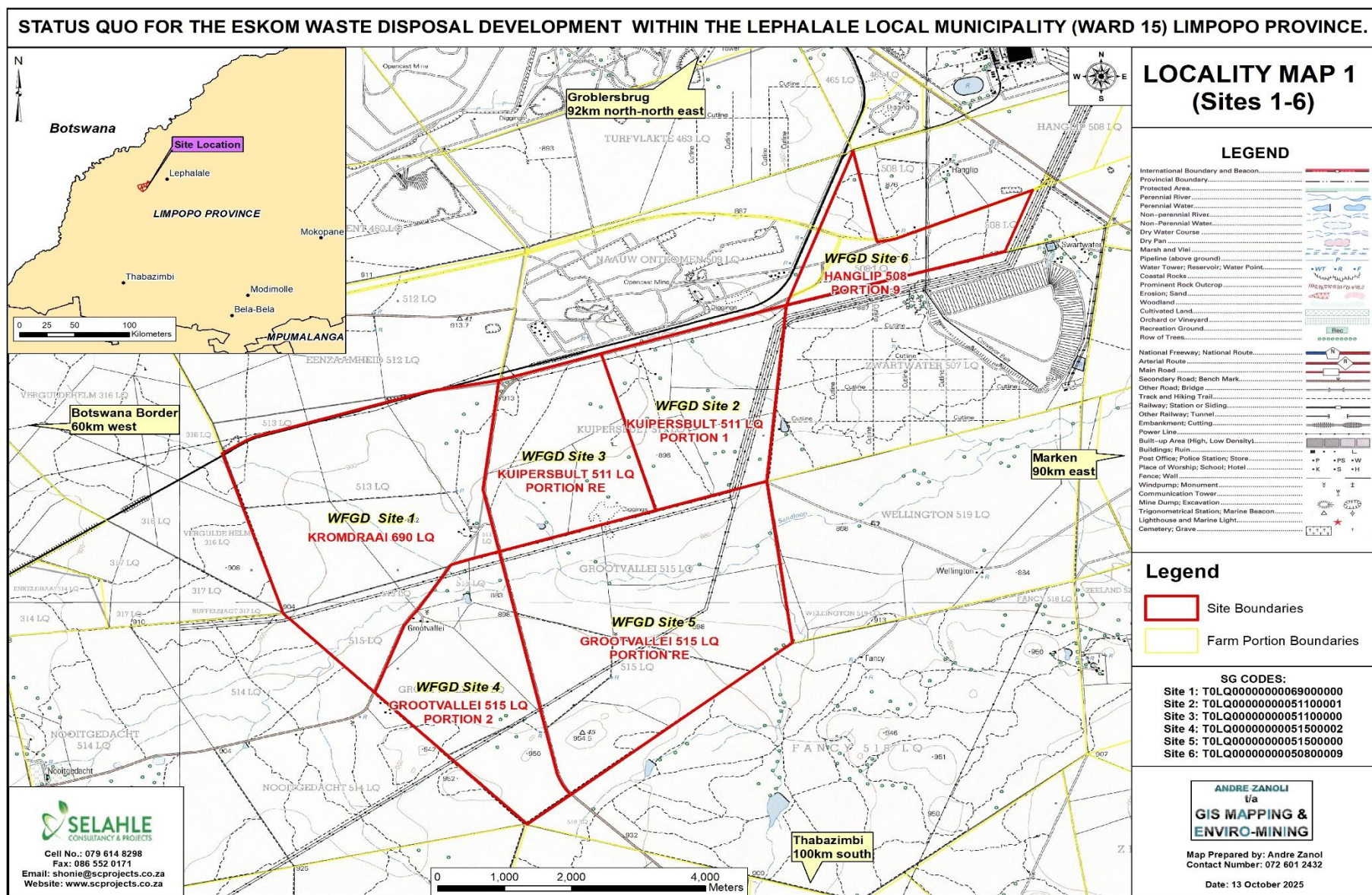


Figure 3: The proposed WFGD waste disposal sites locality map

3 SCOPE OF WORK

The handling and disposal of WFGD waste may have a potentially significant impact on soil, groundwater, surface water, air quality, and the general environment. There will be a need for an intermediate waste storage facility, especially in case of emergency, and it is to be governed by the applicable National Norms and Standards for Storage of Waste, 2013. The EIA studies must consider site/s that can serve as intermediate waste storage facilities. There should be no co-disposal of different waste streams even in the intermediate waste storage facilities. The waste classification study will be required to:

- Classify the three (3) WFGD wastes.
- Classify the requirements of the barrier system for the waste disposal facility according to the classification of the wastes.
- The waste classification is an essential input to the design of the WFGD disposal facility.
- Ash from Medupi and Matimba Power Stations is to be assessed and classified to be considered for use as part of the lining material for the WFGD disposal site/s.

3.1.1 Sludge and Salts Disposal Facility

The facility will cater to chemical salts, sludge and will have to comply with applicable legal requirements based on the waste classification outcome.

3.1.2 Gypsum facility

The facility will cater for gypsum waste and will have to comply with relevant requirements based on the waste classification outcome.

The project scope of work for the development and management of the disposal sites is outlined below, but not limited to:

- Disposal sites for Gypsum, Chemical Salts and Chemical Sludge
- Stormwater Infrastructure
- Waste Water Infrastructure
- Access and Internal Roads
- Conveyor Belts
- Rail; and
- Other Associated Infrastructure

4 DESCRIPTION OF THE ENVIRONMENT

4.1 Climate and Temperature

The northern and western regions of the area experience a hot and semi-arid climate. The southern and eastern regions are more humid and slightly cooler. The mean circulation of the atmosphere over southern Africa is anticyclonic throughout the year. Air circulation has implications for the dispersion of air pollution and is influenced by a variety of factors. The main source of information for the atmospheric conditions and wind was taken from the Waterberg District Municipality Air Quality Management Plan.

4.2 Drainage

The proposed site is in the Limpopo Catchment Management Area, formerly known as Crocodile (West) and Marico Catchment, and in Quaternary Catchment A21C. The Jukskei River is a significant water resource found approximately 9.37 km west of the site. On the southern boundary of the proposed site is a stream that is a tributary of the Jukskei River. The Jukskei begins in Ellis Park in Johannesburg. Its original spring was on the former Doornfontein farm, which measured 18,000 litres per hour. From there the river flows through Bezuidenhout Valley. It then meanders in a northerly direction through Bedfordview and Edenvale before flowing through Alexandra Township. It then turns northwest and flows in that direction before joining the Crocodile River. The stream is considered perennial. The site is drained through run-off, with stormwater collection towards the south of the site.

4.3 Geology and Soils

The Ellisras Basin is important economically for coal, especially the Grootgeluk Formation and interfingering Goedgedacht Formation, which are being mined by Exxaro for export and for the Matimba Power Station. According to the maps by the Geological Survey, all six sites lie in the undifferentiated Permian and Triassic deposits, with very old rocks to the south and east of Lephalale.

4.4 Vegetation

The Waterberg District, largely within the Savanna Biome with elements of the Grassland Biome on elevated areas, contains a high diversity of endemic and near-endemic vegetation types, covering approximately 70% of the district. The district supports 64 plant species of conservation concern, including 22 threatened species, as well as 45 mammal species of special concern, 21 threatened bird species, and 3 reptile species of conservation concern.

Approximately 84.8% of the district remains in a natural or near-natural condition, with only 1.3% urbanised and 10.9% under dryland agriculture. This intactness underpins the region's ecological infrastructure, which provides ecosystem services such as carbon storage, forage production, water regulation, and climate resilience.

All six sites are located entirely within the Limpopo Sweet Bushveld vegetation type (Mucina & Rutherford, 2006), part of the Savanna Biome. This vegetation is characterised by open to moderately closed bushveld with *Sclerocarya birrea* (*Marula*), *Vachellia nilotica*, *Senegalia nigrescens*, and *Boscia albitrunca* as dominant tree species. The area falls within the Savanna Biome, dominated by bushveld vegetation that sustains a variety of faunal assemblages, including large herbivores and carnivores that traverse between conservation area, Ecological Support Areas (ESAs), and surrounding cattle and game farming properties.

4.5 Topography

The terrain generally comprises gently undulating plains and low ridges, supporting a mosaic of woody and herbaceous vegetation that provides important forage for livestock and wildlife alike.

Additionally, the elevation on the earmarked sites ranges between 906m and 871m above ground level. The peak of the elevation is seen from Site 1 and the lowest elevation can be seen towards the eastern side of Site 5. Refer to Figure 4 for site 1-5 elevation map. Likewise, site 6's elevation ranges from 990m – 860m, refer to Figure 5 below.

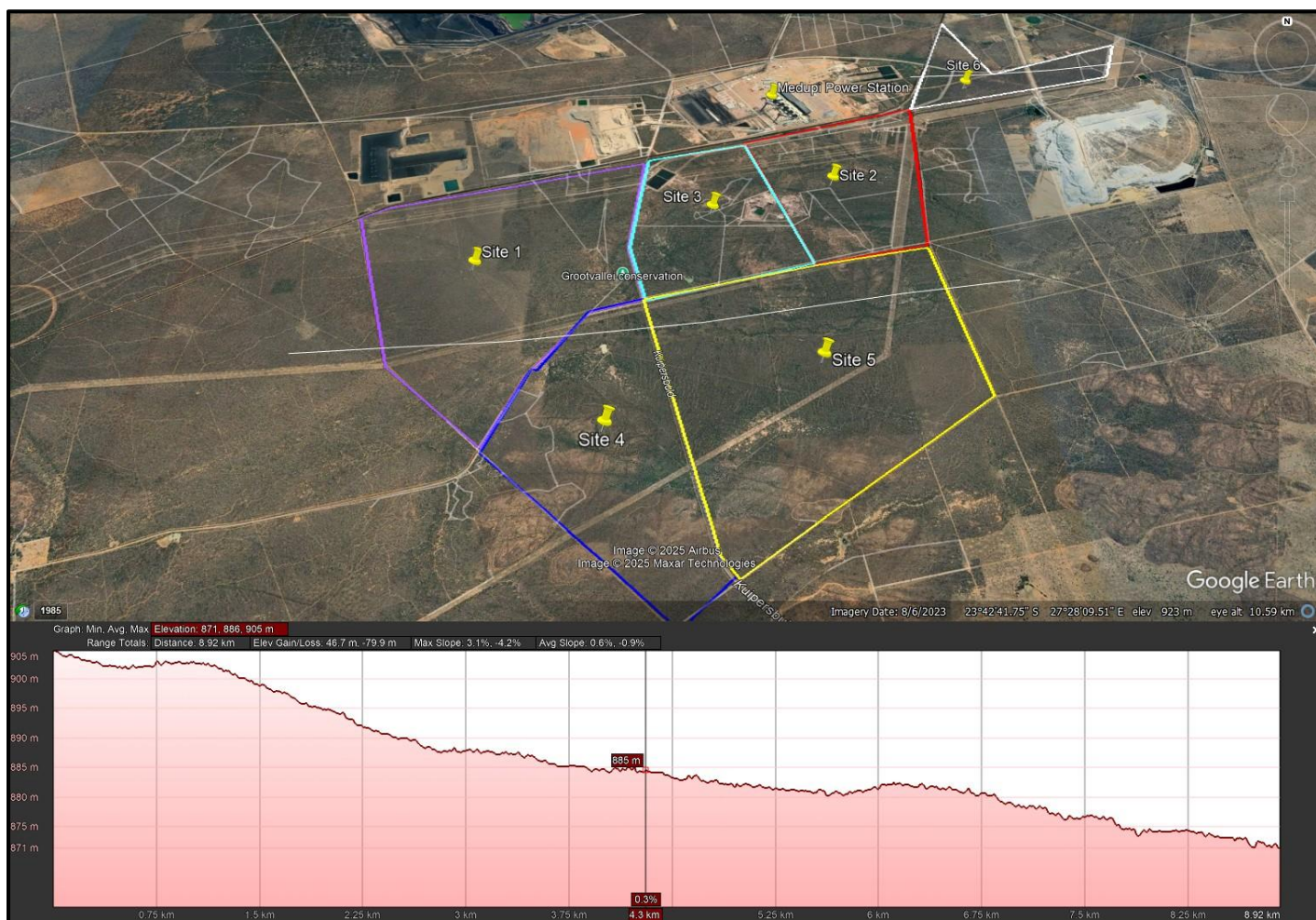


Figure 4: Site 1 – 5 Elevation Profile

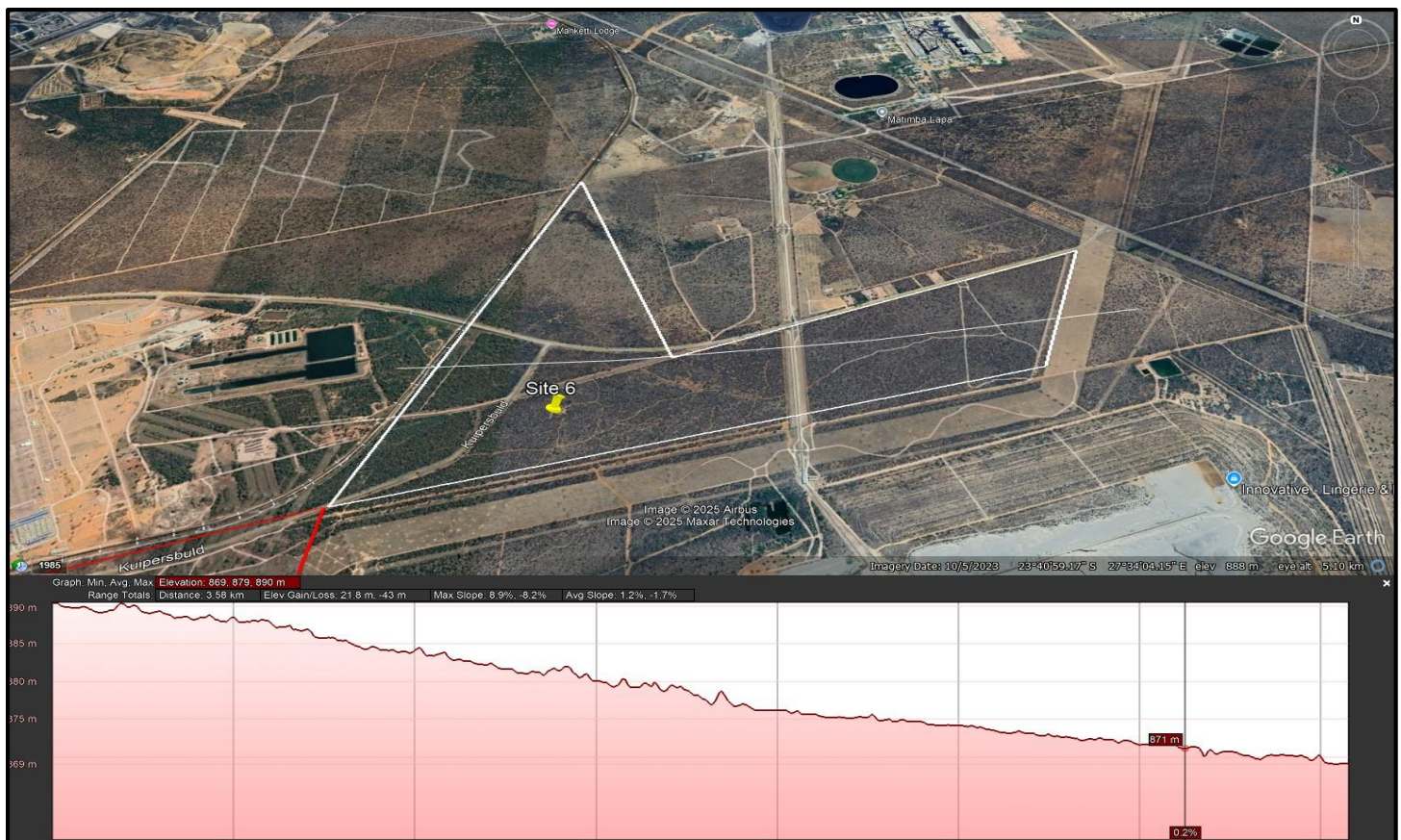


Figure 5: Site 6 Elevation Profile

5 TOOLS USED IN INFORMING THE SCREENING REPORT

5.1 Limpopo Conservation Plan Version 2

The Waterberg District Bioregional Plan (WDBP), prepared by LEDET (2016) and based on the Limpopo Conservation Plan v2 (LCPv2), serves as a spatial biodiversity management tool that guides land-use planning, environmental assessment, and decision-making across the district. Its main objective is to ensure that biodiversity priorities are systematically incorporated into municipal spatial development frameworks (SDFs), integrated development plans (IDPs), Environmental Management Frameworks (EMFs), and Environmental Impact Assessments (EIAs).

The Waterberg District, largely within the Savanna Biome with elements of the Grassland Biome on elevated areas, contains a high diversity of endemic and near-endemic vegetation types, covering approximately 70% of the district. The district supports 64 plant species of conservation concern, including 22 threatened species, as well as 45 mammal species of special concern, 21 threatened bird species, and 3 reptile species of conservation concern.

Approximately 84.8% of the district remains in a natural or near-natural condition, with only 1.3% urbanised and 10.9% under dryland agriculture. This intactness underpins the region's ecological infrastructure, which provides ecosystem services such as carbon storage, forage production, water regulation, and climate resilience.

According to the plan, terrestrial CBAs and ESAs together cover about 65.8% of the Waterberg District. The analysis revealed that Sites 1, 4, and 5 are located within Critical Biodiversity Area 1 (CBA 1), while Sites 2, 3, and 6 are situated within Ecological Support Area 1 (ESA 1), with slight overlaps into ESA 2 in some areas.

From a biodiversity planning and environmental assessment perspective, these findings carry significant implications for site selection and impact management. The identification of three sites (1, 4, and 5) within CBA 1 indicates that their development would likely lead to the loss of irreplaceable biodiversity assets and critical ecological processes, conflicting with the avoidance principle under the *National Environmental Management Act (NEMA, 1998)* and the *Waterberg Bioregional Plan's* conservation objectives.

Conversely, the remaining sites (2, 3, and 6) located within ESA 1, with minor overlaps into ESA 2, may present comparatively lower biodiversity risks, provided that ecological connectivity, drainage patterns, and vegetation corridors are maintained. These sites, while still sensitive, offer better opportunities for impact avoidance, mitigation, and rehabilitation within the existing landscape framework.

The final spatial outcome of the systematic conservation planning process is a map that delineates biodiversity priority areas for conservation and sustainable land use management. The map, which is commonly referred to as a Critical Biodiversity Areas or CBA Map, identifies biodiversity priority areas in several major categories:

- Protected Areas
- Critical Biodiversity Areas
- Ecological Support Area
- Threatened Ecosystems

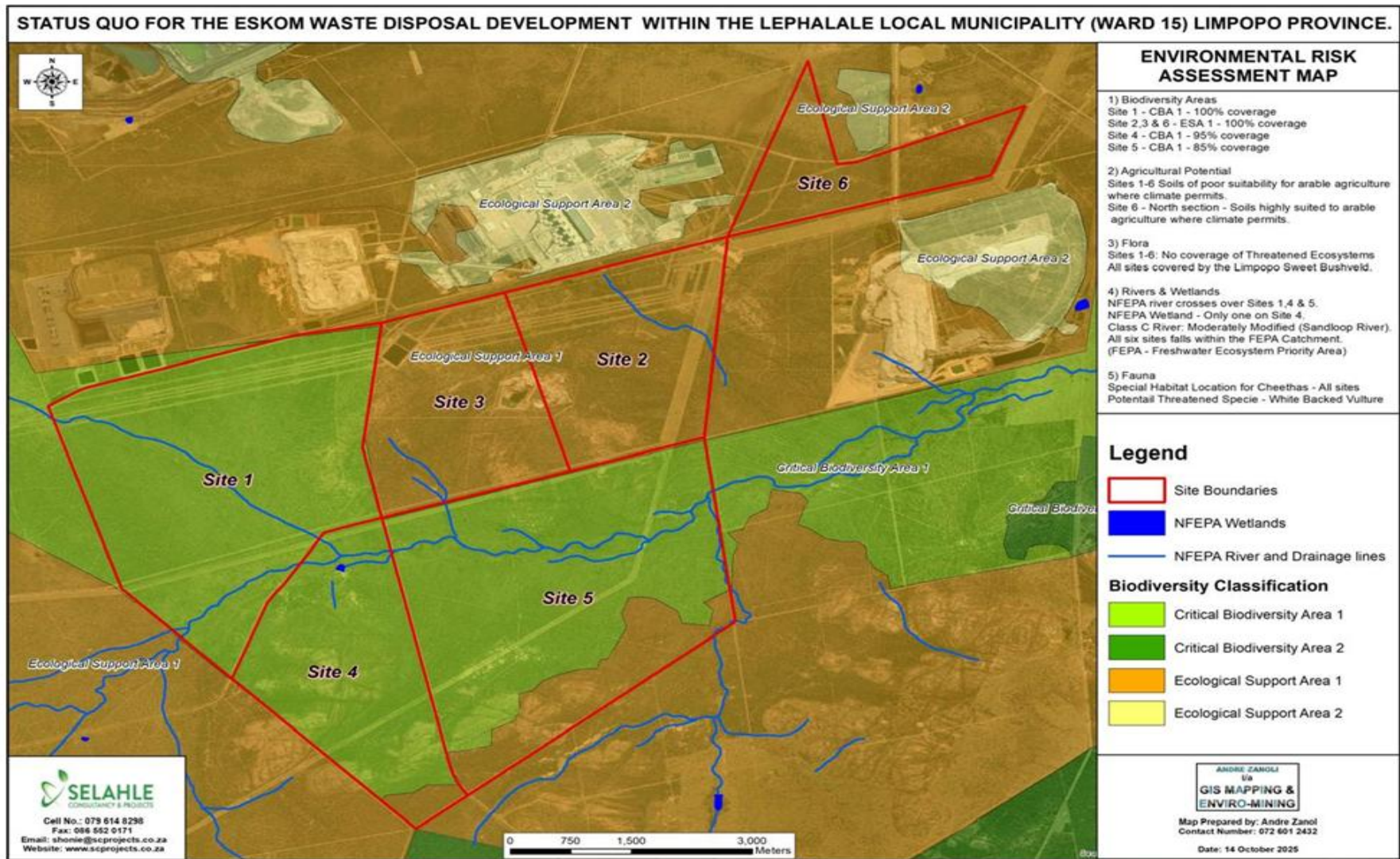


Figure 6: Proposed sites superimposed by a conservation and NFEPA wetland maps.

5.2 Screening Report

The National Web-based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to apply for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended, to screen their proposed site for any environmental sensitivities prior to application lodgement.

The Screening Tool also provides site-specific EIA process and review information, for example, the Screening Tool may identify if an industrial development zone, minimum information requirement, Environmental Management Framework (EMF) or bio-regional plan applies to a specific area. Some of these documents can then be accessed through the Screening Tool via links, for consideration during screening.

Further to this, the Screening Tool identifies related exclusions and/ or specific requirements, including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site. Finally, the Screening Tool allows for the generating of a Screening Report referred to in Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended whereby a Screening Report is required to accompany any application for Environmental Authorisation and as such the tool has been developed in a manner that is user friendly and no specific software or specialised GIS skills are required to operate this tool.

5.2.1 Screening report findings

Six screening reports were produced from the screening tool for each of the proposed sites, and combining these proposed sites required several specialist assessments to be undertaken during the full Environmental Impact Assessment. The following are required to be undertaken during the EIA phase:

- (i) Terrestrial Ecology Assessment Study
- (ii) Avifauna Assessment Study
- (iii) Social and Cultural Impact Assessment Study
- (iv) Wetland Delineation and Aquatic Assessment Study
- (v) Heritage Impact Assessment Study
- (vi) Palaeontological Assessment Study
- (vii) Geotechnical Study
- (viii) Agricultural / Land Capability and Soil Erosion Potential Assessment
- (ix) Visual Impact Assessment Study
- (x) Traffic Impact Assessment Study
- (xi) Climate Change Impact Assessment Study
- (xii) Atmospheric Impact Report
- (xiii) Socio-Economic Assessment Study
- (xiv) Health Impact Assessment Study
- (xv) Seismic Impact Assessment Study

5.3 Waterberg District Environmental Management Framework Report

The Environmental Management Framework (EMF) is an initiative of the national Department of Environmental Affairs (DEA) in partnership with the Limpopo Department of Economic Development, Environment and Tourism (LEDET), and the Waterberg District Municipality (WDM). The EMF will support decision-making in the Waterberg District Municipality area to facilitate appropriate and sustainable development. The EMF integrates policies and frameworks and aligns government mandates to streamline decision-making and to improve cooperative governance. The EMF has several specific objectives, which include identifying the status quo, development pressures and trends in the area and the development of a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

The purpose of this EMF is to develop a framework that will integrate policies and frameworks and align different government mandates in a way that will streamline decision-making to improve cooperative governance and guide future development in an environmentally responsible manner.

- The specific objectives of the EMF include:
- Encourage sustainable development;
- establish development priorities;
- identify strategic guidance and development management proposals;
- identify the status quo, development pressures and trends in the area;
- determine opportunities and constraints;
- identify geographical areas in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- specify additional activities within identified geographical areas that will require EIA based on the environmental attributes of such areas;
- specify currently listed activities that will be excluded from EIA within certain identified geographical areas based on the environmental attributes of such areas; and
- develop a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

The following Environmental Management Zones have been identified and are delineated: Environmental Management Zones:

- Zone 1: Protection of natural vegetation, scenic landscape and rock painting areas, with limited appropriate tourism;
- Zone 2: Nature and cultural tourism focus areas within a high-quality natural setting;
- Zone 3: Game and cattle farming (including hunting) areas with a commercial focus;
- **Zone 4: Mining focus areas;**
- Zone 5: Potential large industrial and related activities focus area;
- Zone 6: Restricted mining focus areas in aesthetic and/or ecological resource areas;
- **Zone 7: Urbanisation focus areas and nodes;**
- Zone 8: Rural settlement areas;
- Zone 9: Agriculture focus areas with a tourism component;
- Zone 10: Agriculture areas with a commercial focus; and
- **Zone 11: Major infrastructure corridors.**

The Medupi Power Station and proposed sites fall within the Zones 4, 7 and 11 of the Waterberg District Environmental Management Framework.

5.3.1 Zone 4: Mining Focus Area

This zone represents areas where significant mineral resources of strategic national importance occur within largely natural environments.

5.3.2 Zone 7: Urbanisation Focus Areas and Nodes

This zone represents areas that have been designated as the areas that form the urban development boundaries as defined by the relevant local Spatial Development Frameworks (SDF).

5.3.3 Zone 11: Major Infrastructure Corridors

This zone represents areas where the concentration of linear infrastructure is proposed to prevent the unnecessarily large impact that uncoordinated infrastructure location would have on the district. The following was considered in defining the corridors:

- The environmental management zones with their underlying sensitivities;
- Existing infrastructure and routes;
- Expected future development; and
- Existing and potential future links outside the district.

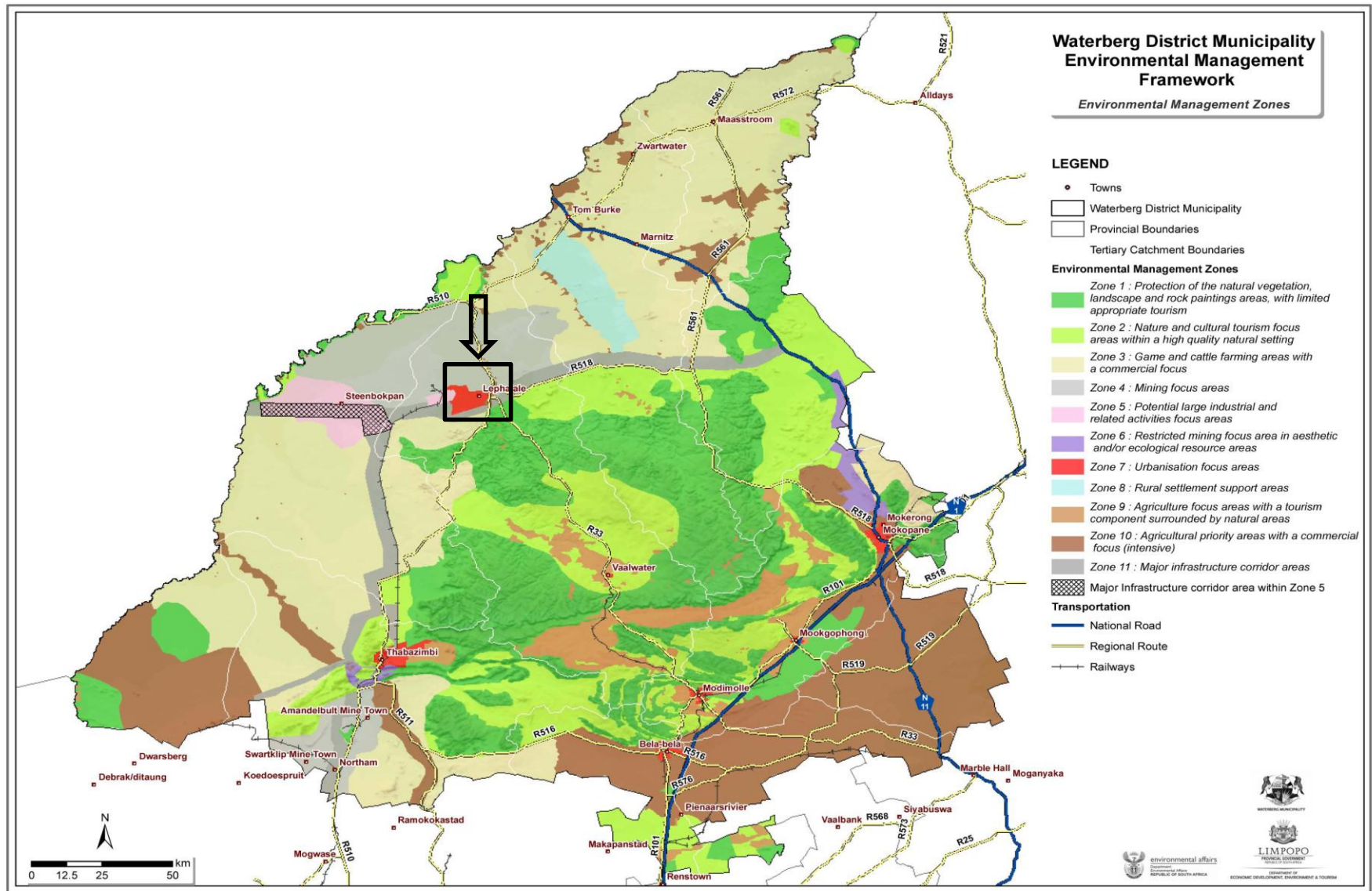


Figure 7: Environmental Management Zones

6 METHODOLOGY AND APPROACH

6.1 Factors that were taken into consideration for the feasibility of each site include;

- Proximity to the power station (transport costs, logistics)
- Environmental sensitivity (water sources, biodiversity, etc.)
- Geological stability (groundwater, soil type, etc.)
- Community impact (heritage sites, etc.)
- Land availability and ownership
- Infrastructure (access roads, power, water).
- Climate and air quality impacts (wind patterns, etc.)
- Waste management and disposal options
- Water resource availability and management
- Regulatory compliance and permitting requirements
- Social and economic benefits (jobs, local communities)
- Site topography and drainage
- Traffic and transportation impacts
- Archaeological and cultural heritage sites

For the landfill sites specifically;

- Liner system design and leachate management
- Groundwater monitoring and protection
- Landfill gas management (if applicable)
- Waste acceptance criteria and types of waste
- Capping and rehabilitation plans
- Buffer zones and setbacks from sensitive areas
- Monitoring and reporting requirements
- Public acceptance and stakeholder engagement

6.2 Methodology for WFGD Landfill Site Feasibility, Design & Permitting

6.2.1 Project overview & objectives

The project scope and objectives (capacity m³/yr, design life, anticipated waste types and quantities, acceptance criteria were identified.

6.2.2 Staged approach (phases)

Phase 1 — Desktop screening & long-list

- The candidate list was compiled from landowner which is Medupi, satellite imagery, and proximity to the generation source (Medupi Power Station) was determined.

- The use of GIS overlay of constraints (watercourses, protected areas, settlements, roads, geology, heritage, etc.) was done.
- The exclusion and buffering of sensitive buffers from sensitive receptors, within high-sensitivity ecosystems, the Sandloop River, heritage, avifauna, National freshwater ecosystem priority areas (NFEPA) wetlands) was done.
- Powerlines, main roads, and railway lines were excluded from the development footprint or sites
- The anticipated output for this screening exercise was a short list of candidate sites.

The purpose of the screening process was to avoid all socially and environmentally sensitive areas, minimising the potential for environmental and social issues later in the project that were identified on site. Refer to the Status Quo map below in Figure 8.

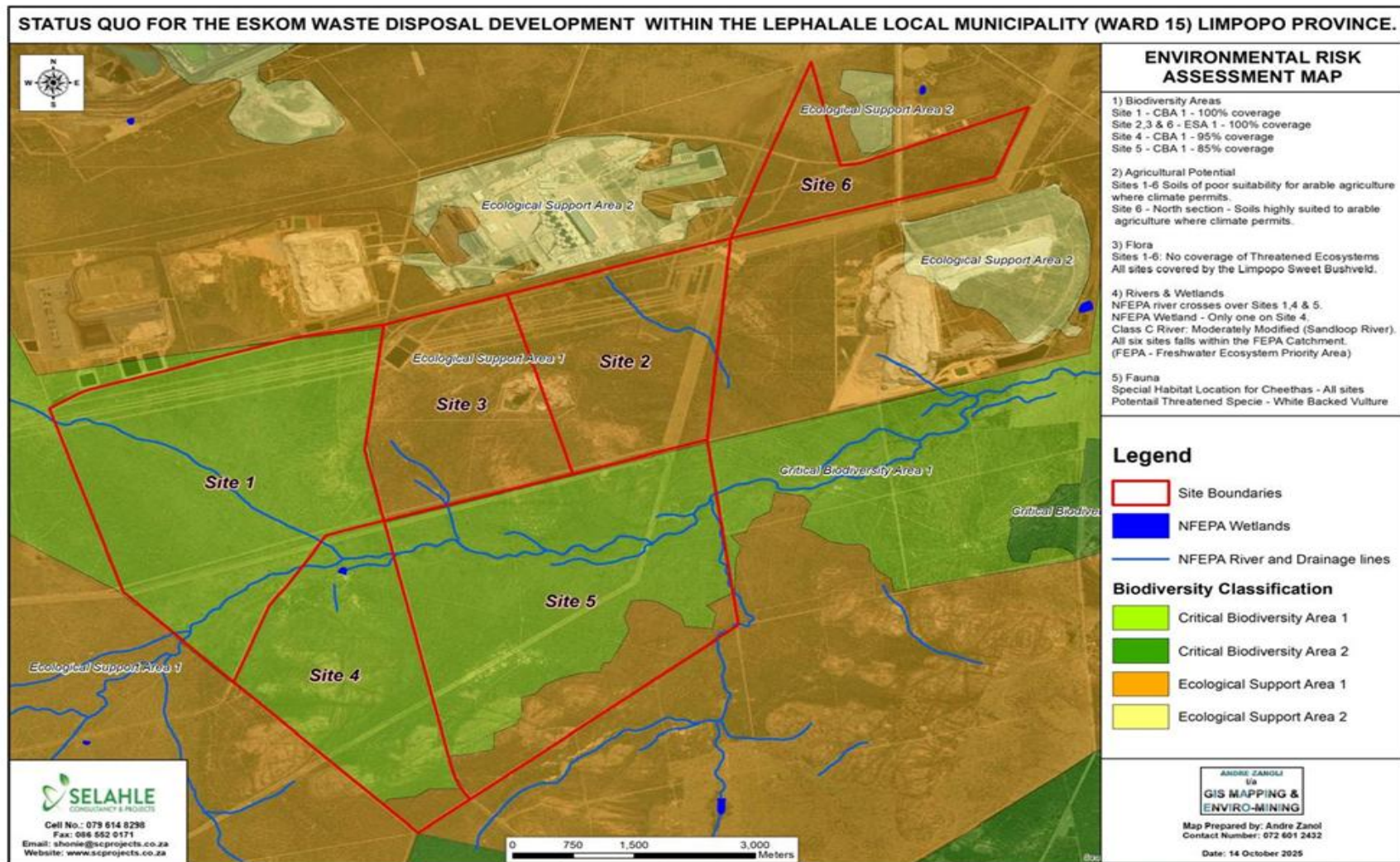


Figure 8: Sensitivity map from all shapefiles used for this feasibility.

Phase 2 — Preliminary feasibility/site ranking (short-list)

- The baseline data was collected and scored using the scoring matrix below.
- A site visit was undertaken on 9 – 11 July 2025 to confirm what was presented by the screening report and the conservation plan.
- Data gaps and specialist assessments were identified, and recommended investigations for Phase 3.
- The output for this phase was to obtain ranked sites and one or more preferred site candidates.

Phases 3 to 5 will be concluded during the Scoping and Environmental Impact assessment process

Phase 3 — Detailed site investigations & design

- Geotechnical, hydrogeological, groundwater baseline monitoring, ecology, archaeology, noise & traffic studies, air dispersion modelling, surface water/hydrology, detailed topography.
- Preliminary landfill engineering design (liner, leachate system, gas system if required).
- Social Impact Assessment (SIA), stakeholder engagement plan.
- Output: detailed feasibility report, risk register, permitting strategy.
- **Phase 4 — Final design, permitting & procurement**
 - Final engineering drawings, tender documents, environmental authorisations/permits, monitoring plans, community benefit plans.
 - Output: full permit-ready package and procurement documents.
- **Phase 5 — Construction, commissioning & monitoring**
 - Construction, baseline to operational transition, monitoring & reporting, closure/rehabilitation implementation schedule.

6.3 Purpose of the Methodology

This methodology outlines the approach used to identify, evaluate, and rank potential sites for the establishment of a Wet Flue Gas Desulphurisation (WFGD) landfill facility. The objective is to ensure that site selection is transparent, systematic, and defensible, taking into account environmental, heritage, social, technical, and legal considerations in line with South African environmental legislation and best-practice feasibility assessment principles.

6.4 Overview of the Site Evaluation Approach

A multi-criteria analysis (MCA) approach was adopted to compare alternative landfill sites. Each site was assessed against a set of defined criteria, weighted according to their relative importance to the feasibility and sustainability of a WFGD landfill facility. The methodology integrates specialist assessment, desktop studies, and available site-specific information.

The evaluation process involved the following steps:

1. Identification of assessment criteria relevant to WFGD landfill development.
2. Allocation of weighting factors to each criterion.
3. Scoring of each site on a standardised scale.
4. Calculation of weighted scores and total site scores.
5. Ranking of sites based on overall performance.

6.5 Assessment Criteria

The following criteria were used to assess each potential WFGD landfill site:

- Environmental
- Heritage
- Social
- Financial
- Technical
- Legal and regulatory

These criteria collectively address biophysical constraints, socio-economic considerations, engineering feasibility, cost implications, and regulatory compliance.

6.6 Weighting of Criteria

Each criterion was assigned a weighting factor (out of a total of 100) to reflect its relative importance to the overall feasibility of a WFGD landfill site. Higher weights were assigned to criteria with the greatest potential to present fatal flaws or long-term risks. The weighting structure was applied consistently across all sites to ensure comparability.

6.7 Scoring System

Each site was scored on a scale of **1 to 5** for every criterion, based on defined descriptors. The scoring scale was applied as follows:

- **5 – Very favourable:** No or negligible constraints; conditions are highly suitable for WFGD landfill development.
- **4 – Favourable:** Minor constraints present; impacts can be managed through standard mitigation measures.
- **3 – Moderately favourable:** Manageable constraints requiring mitigation and monitoring.
- **2 – Unfavourable:** Significant constraints; high mitigation effort and residual risk.
- **1 – Very unfavourable:** Severe constraints likely to prevent development or authorisation.

6.8 Criterion-Specific Score Descriptors

6.8.1 Environmental Criteria

Scores were assigned based on the presence of sensitive ecosystems, wetlands, watercourses, biodiversity value, and risks to surface and groundwater.

- **5:** No environmentally sensitive features present; negligible pollution risk.
- **4:** Low sensitivity features present; impacts are avoidable or easily mitigated.
- **3:** Moderate sensitivity; mitigation and monitoring required.
- **2:** High-sensitivity environments requiring extensive mitigation.
- **1:** Critical biodiversity areas or unacceptable environmental risk.

6.8.2 Heritage Criteria

Assessment considered archaeological, palaeontological, and cultural heritage resources.

- **5:** No heritage resources identified; minimal regulatory requirements.
- **4:** Low-significance resources present; impacts avoidable through design.
- **3:** Heritage resources present; mitigation and permitting required.
- **2:** High-significance resources requiring extensive mitigation.
- **1:** Nationally significant heritage resources likely to preclude development.

6.8.3 Social Criteria

Social scoring considered proximity to communities, land use compatibility, health and safety risks, and potential displacement.

- **5:** No nearby communities; negligible social impact.
- **4:** Limited receptors; impacts manageable.
- **3:** Communities within the area of influence; mitigation required.
- **2:** Proximity to settlements; significant social concerns.
- **1:** Resettlement required or unacceptable social impacts anticipated.

6.8.4 Financial Criteria

Financial scores reflected capital expenditure, operating costs, and long-term liabilities.

- **5:** Low capital and operating costs with high-cost certainty.
- **4:** Moderate costs; standard engineering solutions sufficient.
- **3:** Elevated costs due to mitigation or infrastructure requirements.
- **2:** High and uncertain costs affecting feasibility.
- **1:** Costs likely to render the project financially unviable.

6.8.5 Technical Criteria

The technical assessment focused on geotechnical conditions, hydrogeology, constructability, and operational risk.

- **5:** Suitable geology and hydrogeology; standard landfill design applicable.
- **4:** Minor technical challenges manageable through standard design.
- **3:** Moderate constraints requiring design optimisation.
- **2:** Significant technical challenges necessitating complex solutions.
- **1:** Technically unsuitable with high risk of failure.

6.8.6 Legal and Regulatory Criteria

Legal scoring considered land ownership, zoning, permitting complexity, and regulatory risk.

- **5:** Land secured; zoning compatible; authorisations readily achievable.
- **4:** Minor permitting requirements with low appeal risk.
- **3:** Standard EIA and licensing processes required.
- **2:** Complex approvals or land access constraints.
- **1:** Legal or regulatory barriers likely to prevent authorisation.

6.9 Calculation of Weighted Scores

For each criterion, the assigned score (1–5) was multiplied by the corresponding weighting factor to derive a weighted score. Weighted scores for all criteria were then summed to calculate a total site score out of a maximum of 500.

The overall percentage score for each site was calculated using the following formula:

$$\text{Percentage score} = (\text{Total weighted score} / 500) \times 100$$

6.10 Site Ranking and Interpretation

Sites were ranked based on their total weighted scores and percentage scores. Higher scores indicate greater overall suitability for the development of a WFGD landfill facility. Sites with low scores were considered to present a higher risk and, in some cases, potential fatal flaws.

Table 2: Interpreting results

Percentage score	Interpretation
≥80%	Highly suitable site
65–79%	Suitable with manageable risks
50–64%	Marginal – requires strong justification
<50%	Unsuitable/high risk

7 SITE SCREENING

7.1 Determination of the approximate land size for all waste streams

To determine the footprint requirements of the potential waste disposal site, the following technical specifications were utilised as extracted from the Medupi FGD Retrofit Basic Design Report 2014, Zitholele's Screening Workshop Technical Document and the Eskom Terms of Reference document:

Mass flows and densities:

- Gypsum production (85% CaCO₃) = 248 112kg/hr & density = 1 t/m³;
- Chemical Sludge production (85% CaCO₃) = 20 330kg/hr & density = 1.348 t/m³; and
- Chemical Solids production (96% CaCO₃) = 5 302kg/hr & density = 2.236 t/m³.

Calculation of waste volumes produced over 44 years of FGD production:

- Total Gypsum produced over the life of the facility would be in the order of 95,632,289.28 m³;
- Total Chemical Sludge produced over the life of the facility would be in the order of 5,813,052.82 m³;
- Total Chemical Solids produced over the life of the facility would be in the order of 913,954.78 m³;
- The maximum design life of the facility would be 44 years based on FGD becoming operational within six years following commercial operation of the respective generating units (Medupi FGD Retrofit Basic Design Report, 2014);

- The side slopes of the gypsum dump are assumed to be 1:5. The side slopes of the gypsum dump is based on the rehabilitation slopes used of dry ash facilities used at various other Eskom Power Stations; and
- The side slopes of the Chemical Solids and Chemical Sludge lagoons are assumed to be 1:3. The side slopes of the lagoons are based on the angle that the liner needs to be installed and on safety requirements during operation.

Table 3: Site and their extent

Site No:	Site Size in hectares
1	1099,96
2	568,43
3	515,45
4	625,47
5	1219,52
6	295,66

7.2 Assumptions and Limitations

- The site drive-through was undertaken during the winter season.
- The layout was not provided during the screening.
- Cost estimates and technical factors were estimated based on all sites' proximity to the Power station.
- Site 6 access was limited due to overgrown vegetation.
- Available dirt roads were used to screen the site; some environmental and heritage features might have been missed.
- The site visits were time-constrained.
- Any attributes that were not identified during the site visit are assumed that the specialist will identify.
- The difference between a watercourse, drainage line or discharge point will be determined and confirmed by a specialist.
- The purpose of the screening phase is to compare the six sites and identify the ones that will have the least environmental, social, and economic impacts.
- Waste products are assumed to be solid and will be transported to the disposal site using conveyors.
- Other transportation methods to be considered for waste conveyance may include piping, trucking, or rail operations.
- Chemical sludge will be disposed of in lagoons due to its high moisture content, which allows it to flow when it encounters water.
- Chemical solids will also be disposed of in lagoons for the same reason—their ability to flow when exposed to moisture.
- During the conceptual design phase, additional technology options will be considered, including covered storage of chemical solids on concrete surfaces, packaging of chemical solids in plastic bags, and storage on open concrete beds.
- All sites will be secured with fencing.
- The footprint areas were determined based on the maximum volumes of waste expected to be produced through the WFGD process.

7.3 Site inspection

The Selahle team undertook a site inspection from the 9 - 11 July 2025 on all six sites. A base map from the Limpopo Conservation Plan was used to identify sites within biodiversity areas and where watercourses were located.

7.4 Site Visit findings

Below is what was observed on-site, as depicted in Figures 9 and 10 below.

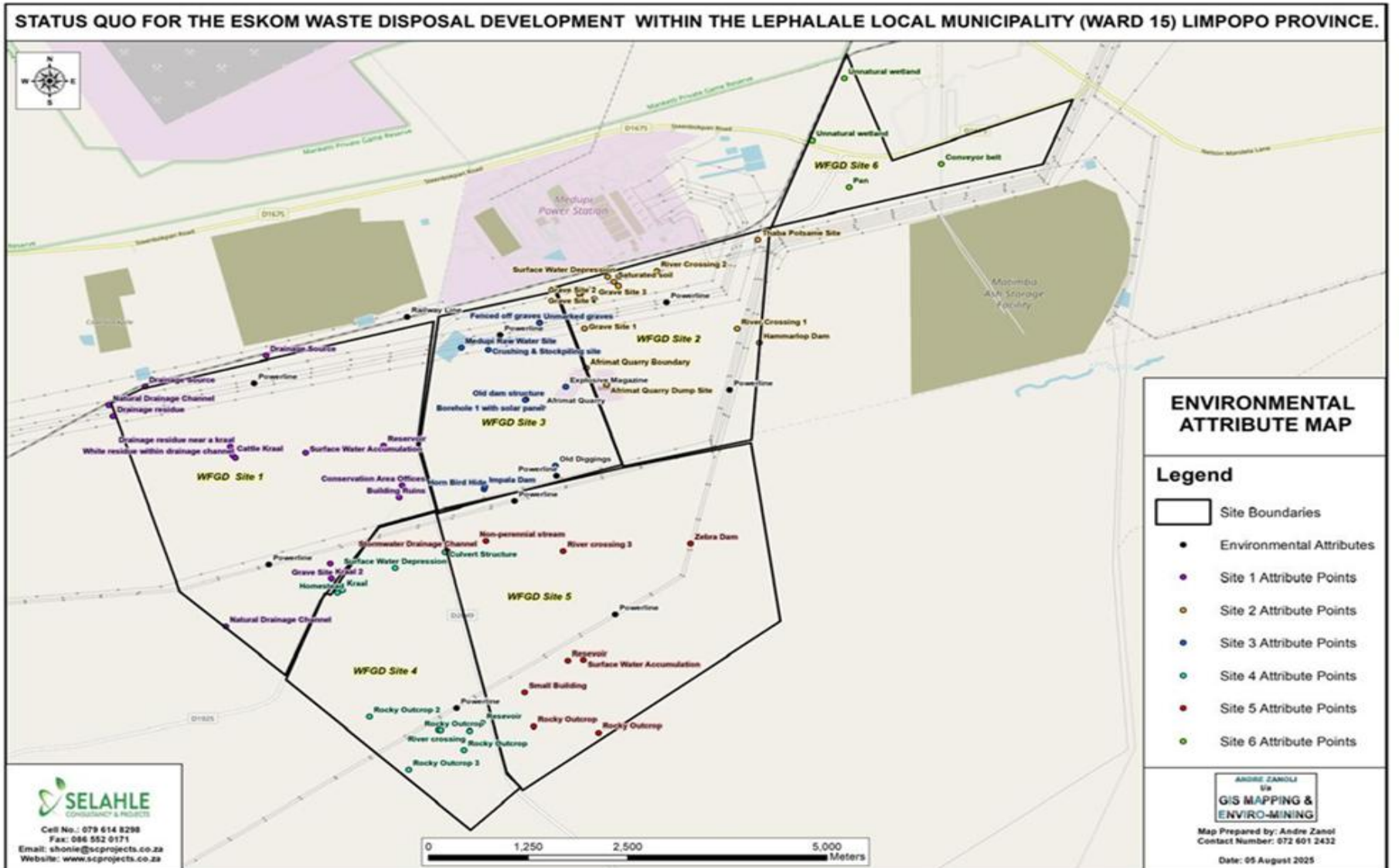


Figure 9: Site attributes

STATUS QUO FOR THE ESKOM WASTE DISPOSAL DEVELOPMENT WITHIN THE LEPHALALE LOCAL MUNICIPALITY (WARD 15) LIMPOPO PROVINCE.

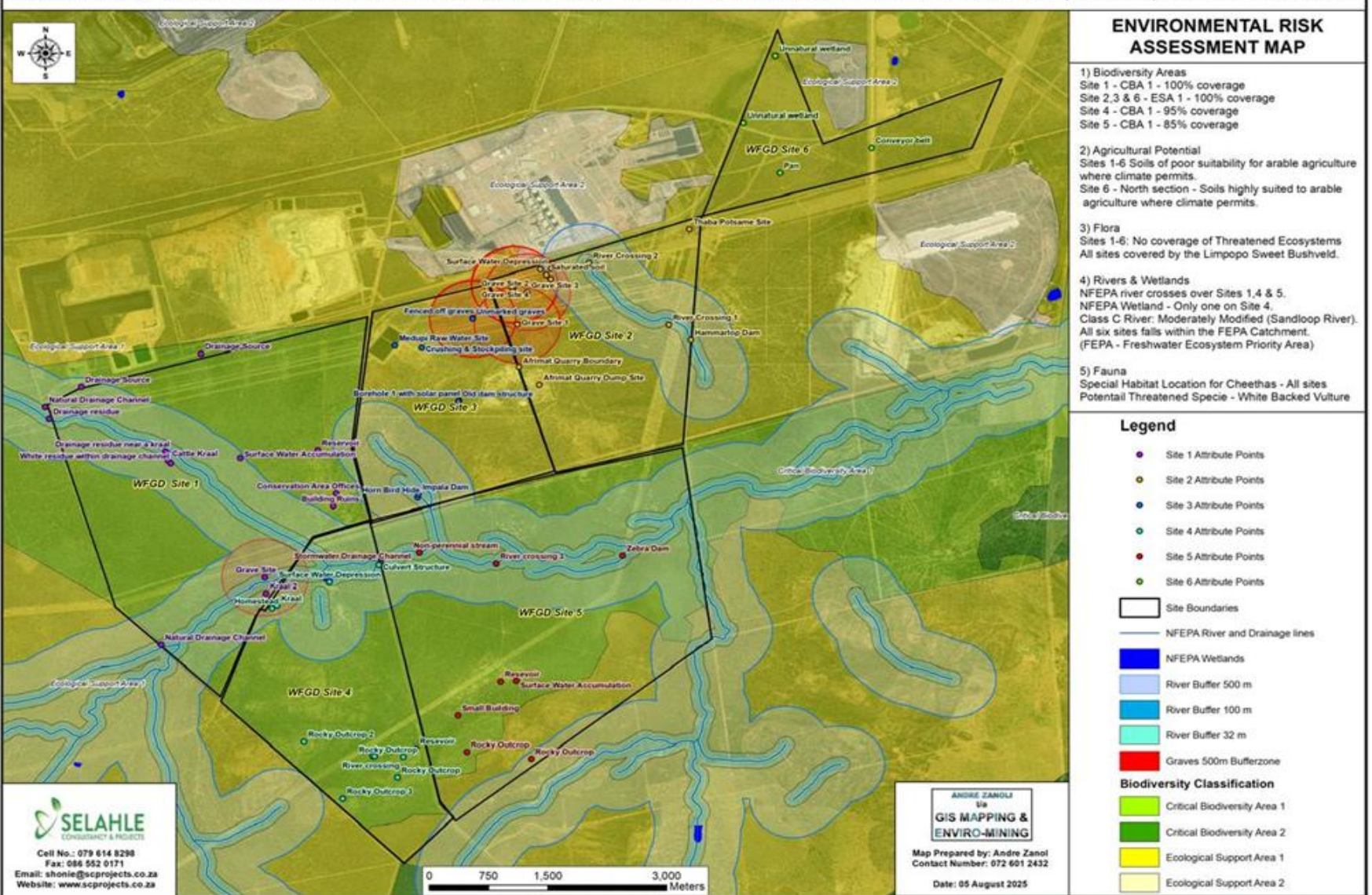


Figure 10: Site attributes overlain by a conservation map.

7.4.1 Site 1

The site is currently subjected to agricultural use, with two livestock kraals located within its boundaries. Several drainage lines are present across the area, some of which exhibit wetland indicators such as hydrophilic vegetation, saturated soils, and evidence of seasonal surface water retention. These features are particularly prominent along the boundary between Sites 1 and 4.

Overhead powerlines traverse the site, accompanied by established service roads that provide access for maintenance activities. The site is demarcated from the Medupi Power Station by an adjacent railway line. Along this boundary, multiple discharge points originating from the power station were identified (refer to Figure 11). Localised surface water accumulation was observed within portions of the site, suggesting impeded drainage or potential influence from nearby discharge activities (Figures 12, 13 and 14).

A grave site was also recorded within the study area, representing a culturally significant feature that requires consideration during planning and development processes.



Figure 11: Photographic evidence of Site 1 attributes; top left kraal with a herd of cows. Bottom left – indicating the residue remaining on the soil where the area is sometimes waterlogged due to the discharge from the power station and one of the overhead powerline servitudes traversing the site. Right image – indicates the presence of water/damming occurring on site, resulting from the discharge from the power station.



Figure 12: Top left & right – indicates the pipes discharging water into site 1 premises originating from the power station. Bottom left – indicate the marshy features that originate from the water that is coming from the pipelines above. Bottom right – indicates the presence of a grave site.



Figure 13: left image – ponding on the site with white residue on tree trunks; Top right – ponding water indicating the presence of iron (brown/orange residue in soil). Bottom right – waterlogged area on the same site.

7.4.2 Site 2

The site is separated from the Medupi Power Station by an access road forming its eastern boundary. An overhead powerline traverses the northern and eastern portions of the site, accompanied by associated service or maintenance corridors.

Four grave sites were identified within the study area, along with the culturally significant Thaba Potsame site (see Figure 13). These features constitute important heritage resources that require appropriate protection and management.

A surface water depression was observed on the site, along with areas of saturated soil, indicating potential seasonal water retention or shallow groundwater conditions. The water retention might also be caused by the discharge points from the Power station. The site also contains an Afrimat Quarry dump area, which may influence local soil structure and hydrological characteristics.

Two river crossings occur within the site boundary, associated with drainage lines that contribute to the broader surface water network.



Figure 14: Several grave sites within the site and alien invasive plant species.



Figure 15: Top and bottom left images – show some of the culvert infrastructure developed throughout the site; Top and bottom right images indicate dams observed on site.



Figure 16: Left – waterlogged area on the Eskom service road where there is an overhead powerline; Right – rocky outcrop/ridge with an overhead powerline.

7.4.3 Site 3

Site 3 is located immediately adjacent to Site 2 and is characterised by a combination of industrial, heritage, and ecological features. The Afrimat Quarry occupies a substantial portion of the site, accompanied by old excavation areas (old diggings) indicative of previous mineral extraction activities. Overhead powerlines

border both the northern and southern extents of the site, together with their associated access corridors (Figures 17 and 18).

The Medupi Raw Water Site is situated within the area, and in proximity to it is a crushing and stockpiling facility, contributing to ongoing disturbance and altered land surface conditions (Figure 18). Along the southwestern boundary, the site is in proximity to the Horn Bird Hide and Impala Dam, both of which represent ecologically sensitive features within the broader landscape. A collapsed bridge was also observed within the site, located upstream of the nearest dam (Figure 17). This structure represents a potential safety hazard and may affect site access, drainage patterns, and surface water flow in the immediate area.

Additional site features include a borehole equipped with a solar panel, as well as a disused dam structure. Several fenced-off graves were recorded on-site, along with the presence of unmarked graves, highlighting the need for heritage consideration and careful management during any future land-use activities.

Connection chambers located along Kuipersbult Road were observed to exhibit ponding of wastewater, indicating potential blockages within the system (Figure 18). In addition, an active discharge of wastewater was noted entering the site boundary from the Kuipersbult Road, suggesting an off-site source contributing to surface contamination within the affected area. Furthermore, a gravesite was identified within the site boundary, representing a sensitive heritage receptor.



Figure 17: Top left and Right -Collapsed bridge infrastructure of the existing Impala dam; Bottom left – Servitude on site; Bottom right – Borehole with a solar panel.



Figure 18: Top left and right - stockpiling and a crushing facility; Bottom left – Demarcated grave site; Bottom right – Medupi Raw water site; Middle – Solar panel.

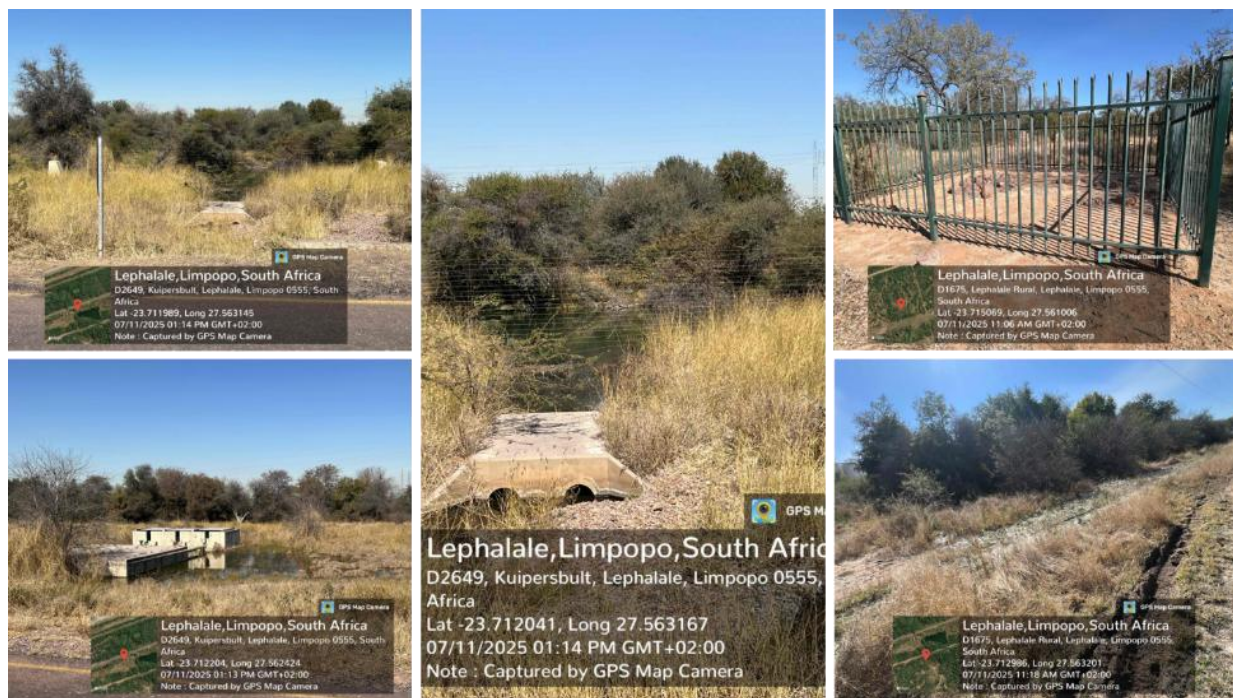


Figure 19: Top and bottom left – connection chambers along Kuipersbult Road with ponding of wastewater; Middle – Discharge of wastewater into the site boundary along the Kuipersbult Road; Top right – Gravesite observed on-site. Bottom right – Waterlogged area that has dried up with white residue on the soil.

7.4.4 Site 4

The site comprises an active livestock farming area, with agricultural activities evident upon entry through the main farm gate. A man-made dam is present within the central portion of the property. While traversing the site, several wildlife species—including springbok, warthog, and impala—were observed, indicating the presence of functional game movement corridors and suitable habitat.

A powerline runs parallel to the main tarred road, while an additional powerline traverses the interior of the site together with its associated maintenance road. The Sandloop River crosses the northern section of the property, where a surface water depression was also identified, suggesting periodic water accumulation and potential seasonal wetland characteristics (Figures 20 and 21).

A reservoir is located along the south-eastern boundary of the site. In the same vicinity, a river crossing was recorded, associated with the local drainage system. Several rocky outcrops occur throughout the area, extending towards the south-western boundary, contributing to the site's geomorphological heterogeneity (Figure 21).



Figure 20: Bottom left – Kraal and farming activities observed on-site. Top left – stormwater pipe observed onsite; Centre – manmade stormwater channel leading to a dam; Top and bottom right – Wetland features observed on site.



Figure 21: Left – Nesting observed on the overhead powerline; Top-and-bottom centre – Dam and Ridge on-site; Top-and-bottom right – Reservoir with Jojo tanks and stormwater channel.



Figure 22: Top left – Eskom's servitude overhead powerline; Bottom left – kraal with cattle; Right - dirt Road that is waterlogged.

7.4.5 Site 5

The Sandloop River traverses the northern portion of the site, forming a key hydrological feature within the landscape. Powerlines run along the northern boundary, and another line crosses through the central section of the property, accompanied by associated maintenance routes.

A stormwater drainage channel, along with two additional river crossings, was recorded along the course of the Sandloop River (Figures 23 and 24). A dam—referred to as the Zebra Dam—was observed along the drainage line/river system. Surface water accumulation was noted in the vicinity of the reservoir, indicating localised saturation and impeded drainage conditions.

Several newly constructed culvert bridges were identified on the site (see Figure 23), providing access across drainage features. Wildlife, including various game species, was observed, confirming the ecological function of the area. Soil characteristics changed noticeably across the site, reflecting varying moisture conditions and indicating the presence of subsurface water in certain areas.

Provincially protected tree species were recorded, contributing to the site's ecological sensitivity. Numerous bird species were observed within the Eskom servitude, suggesting that the corridor provides suitable habitat or movement pathways. A wetland or marsh-like watercourse feature was also identified on-site, characterised by hydrophilic vegetation and soil saturation indicators typical of wetland conditions.



Figure 23: Top left – Sandloop River traversed by Kuipersbuld Road through a culvert bridge; Bottom left and Top right - provincially protected trees; Top centre – waterlogged dirt road; Bottom centre – Ridge or rocky outcrop observed on site; Bottom right – rocky outcrop.



Figure 24: Left – Overhead powerlines and game found on site; Middle - stormwater infrastructure along the dirt road; Top-and-bottom right – Dam observed on site; Bottom right – White residue along the drainage line.

7.4.6 Site 6

The site is situated to the east of the Medupi Power Station and is separated from the facility by an area of open land characterised by dense, overgrown vegetation and a railway line. Discharges originating from the power station have resulted in the formation of wetland features on the adjacent property. These features drain into a defined drainage line that flows eastward into Site 6 (See Figures 25 and 26).

A pan was observed within the site boundary, as well as another pan located adjacent to the railway line in the southwestern portion of the site. These pans contribute to the site's hydrological complexity and may support wetland-dependent species during periods of inundation.

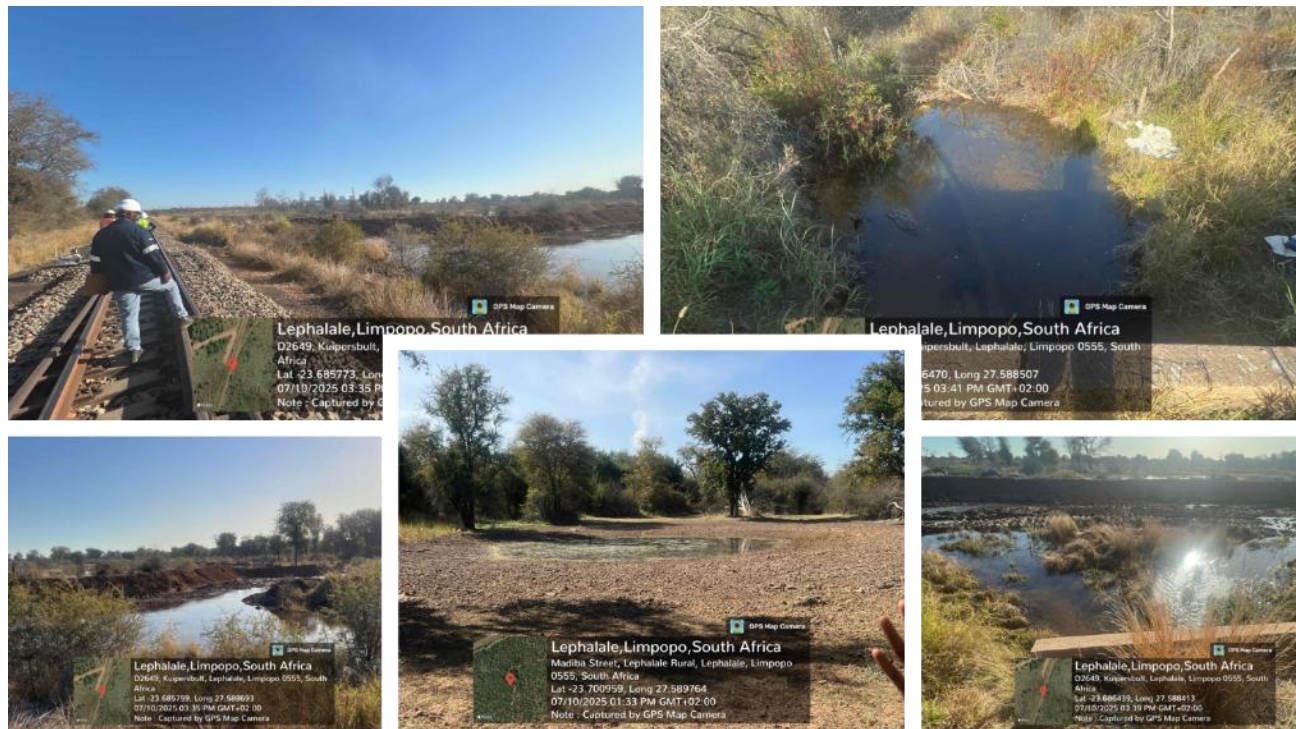


Figure 25: Centre – a pan observed on site; All other images are adjacent to the west of the site, bordered by a railway line. There is the presence of an artificial wetland, thought to be caused by discharge from the Medupi Power Station. The area has developed wetland features i.e., vegetation. The water (top right) discharges into the site through a culvert bridge.



Figure 26: Wetland features observed adjacent to site 6.

8 SPECIALIST FINDINGS

Specialist expertise that was outsourced for the proposed development and the screening phase was to be done in line with the Screening Tools and Protocols set out in Government Notice No. 648 and Appendix 6 of the EIA Regulations, 2014 (as amended). In accordance with Regulation 16(1)(b)(v) of the same Regulations, the Department of Forestry, Fisheries and the Environment (DFFE) Screening Tool Reports were generated for the proposed project. This report identifies the environmental sensitivities present within the project area and prescribes the specialist protocols that must be followed and complied with during the assessment process.

The screening tools for the 6 earmarked sites indicated the need for the following specialist studies:

- Terrestrial Ecology Assessment
- Avifauna Assessment
- Social and Cultural Impact Assessment
- Wetland Delineation and Aquatic Assessment
- Heritage Impact Assessment
- Palaeontological Assessment
- Geotechnical Study
- Agricultural / Land Capability and Soil Erosion Potential Assessment
- Visual Impact Assessment
- Traffic Impact Assessment
- Climate Change Impact Assessment
- Atmospheric Impact Report
- Socio-Economic Impact Assessment
- Health Impact Assessment
- Seismic Impact Assessment

For this screening exercise, only 8 out of 15 specialists' studies were undertaken, to ensure that all envisaged constraints and status quo constraints are thoroughly assessed, to assist the applicant with site selection as per the Terms of Reference. The specialists that were undertaken were:

- Terrestrial Biodiversity.
- Heritage Study
- Paleontology Study
- Aquatic Assessment Study
- Avifauna Study
- Climate Change Study
- Social & Socio-Economic Study
- Agricultural Study

Below, the findings of each specialist study are discussed, as well as the recommendations per discipline.

8.1 Terrestrial Biodiversity

Eco-Sentle was appointed to undertake the Terrestrial Biodiversity Screening for the proposed sites. The study was undertaken in line with the prescribed Screening Tool and Protocols. The study aimed at identifying

and describing key ecological considerations associated with the proposed project. The study comprised an assessment for both Flora and Fauna. The six earmarked sites were superimposed on the Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) map produced under the Limpopo Conservation Plan Version 2 (LCPv2, 2013). This spatial overlay was undertaken to determine the extent to which each site overlaps with biodiversity priority zones that have been identified as essential for maintaining the biodiversity pattern and ecological processes of the Waterberg District. The analysis revealed that Sites 1, 4, and 5 are located within Critical Biodiversity Area 1 (CBA 1), while Sites 2, 3 and 6 are situated within Ecological Support Area 1 (ESA 1), with slight overlaps into ESA 2 in some areas (refer to figure 27).

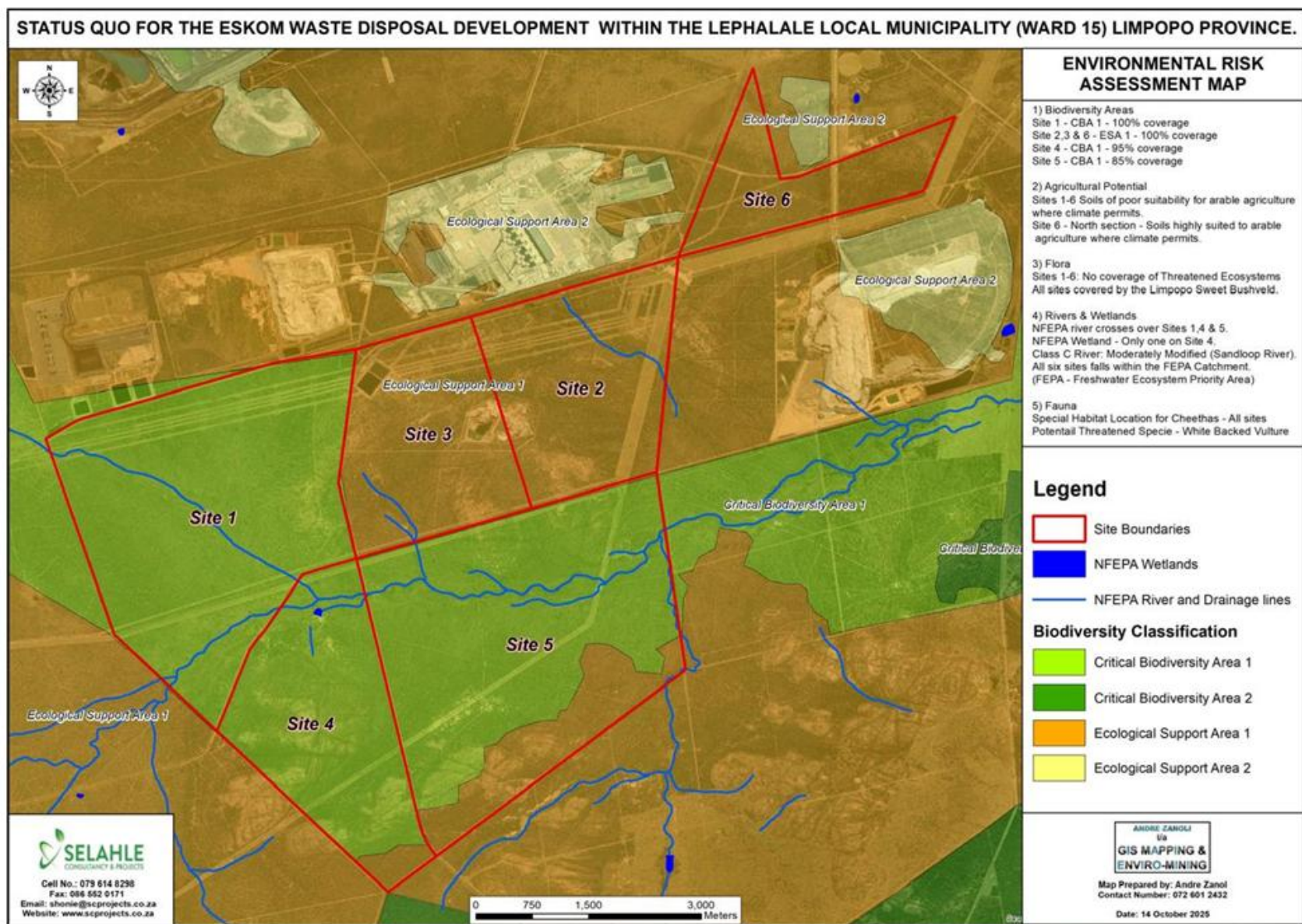


Figure 27: Proposed Disposal Sites in relation to the Bioregional Plan

8.1.1 Flora Survey

Homogeneous vegetation units were subjectively identified using satellite imagery and existing land cover maps, a process confirmed during the field survey. The assessment included evaluating floristic diversity and searching for protected plants and flora of conservation concern (SCC) throughout the study area.

It was found that all six sites are located entirely within the Limpopo Sweet Bushveld vegetation type (Mucina & Rutherford, 2006), part of the Savanna Biome. This vegetation is characterised by open to moderately closed *bushveld with Sclerocarya birrea (Marula)*, *Vachellia nilotica*, *Senegalia nigrescens*, and *Boscia albitrunca* as dominant tree species.

8.1.2 Fauna Survey

The fauna survey focused on mammal and bird communities within the project site and was based primarily on opportunistic observations of mammals and birds. The proximity of the Eskom Grootvallei Conservation Centre, located within the Medupi precinct, significantly contributes to local biodiversity stewardship. The centre manages and monitors wildlife within the Eskom estate, focusing on species rehabilitation, environmental education, and the conservation of key faunal groups such as raptors, small mammals, reptiles, and pollinators. The conservation office also maintains biodiversity records for the Medupi–Matimba complex, with ongoing collaborations with SANBI, Endangered Wildlife Trust (EWT), and other conservation entities.

Small mammals expected to occur include *Mastomys natalensis* (Multimammate Mouse), *Gerbilliscus leucogaster* (Bushveld Gerbil), *Crocidura cyanea* (Reddish-grey Musk Shrew), and *Graphiurus murinus* (Woodland Dormouse). However, the sites are expected to have potential Species of Conservation Concern as they rely on the intact bushveld vegetation and connected ecological corridors extending toward the Waterberg Biosphere Reserve and Eskom Conservation Area.

In addition, the warm, arid conditions of the Limpopo Sweet Bushveld provide ideal habitats for reptiles. Typical reptile species likely to occur include *Varanus albigularis* (Rock Monitor), *Trachylepis varia* (Variable Skink), *Agama atra* (Southern Rock Agama), *Hemidactylus mabouia* (Common Tropical Gecko), and *Python natalensis* (Southern African Python). The nearby Grootvallei Conservation Centre has records of *Python natalensis* relocations and monitoring, indicating their active occurrence in the Medupi–Lephalale landscape.

Amphibians in this semi-arid region are closely tied to seasonal pans, drainage lines, and the Sandloop River system. Common species likely to occur include *Ptychadena anchietae* (Anchieta's Ridged Frog), *Amietophrynus gutturalis* (Guttural Toad), *Xenopus laevis* (Common Platanna), and *Kassina senegalensis* (Red-legged Running Frog). Species of Conservation Concern potentially present include: *Pyxicephalus adspersus* (African Bullfrog) – Near Threatened due to habitat loss and collection pressure; protected under NEMBA ToPS. This species is known from the broader Lephalale area and is likely to breed in temporary depressions formed during summer rainfall events.

8.1.3 Sensitivity Assessment Outcomes and Recommendations

A structured Ecological Sensitivity Assessment was undertaken using the **Site Ecological Importance (SEI)** methodology, evaluating **Conservation Importance (CI)**, **Functional Integrity (FI)**, and **Receptor Resilience (RR)**.

Table 4: Sensitivity Assessment Outcome & Recommendations

Site	Biodiversity Zone	SEI Score	Sensitivity Class	Summary of Rationale	Recommendations
Site 1	CBA 1	12	High	- Intact vegetation; - seepage wetlands; - moderate resilience.	High sensitivity; wetland seepage requires strict control and ≥ 500 m ecological buffers.
Site 2	ESA 1	12	High	- Intact conservation area; - high fauna; - limited disturbance.	High sensitivity; align infrastructure along existing servitudes and maintain grazing corridors.
Site 3	ESA 1	9	Medium	- Northern half disturbed; - southern half intact.	Moderate sensitivity; focus activities within already transformed portions; apply restoration and waste-management measures.
Site 4	CBA 1	13	Very High	- Intact bushveld with Sandloop River; - core connectivity.	Avoid where possible; if unavoidable, restrict to the least-sensitive margins with strong mitigation and rehabilitation.
Site 5	CBA 1	14	Very High	- Most pristine; - extensive Sandloop reach; "No-Go" area.	No-Go Area – avoid any development due to irreplaceable ecological value and hydrological sensitivity.
Site 6	ESA 1	8	Medium	- Fragmented by roads/conveyors; - moderate residual value. - Railway line	Moderate sensitivity; focus activities within already transformed portions; apply restoration and waste-management measures.

8.1.4 Potential Biodiversity Impacts

The principal Terrestrial Biodiversity Impacts anticipated from the Sludge, Salts, and Gypsum Disposal Facilities and Associated Conveyance Systems include:

1. **Habitat Loss and Fragmentation** due to clearing for disposal platforms, access roads, and servitudes.

Most significant for Sites 5, 4, and 1 (CBAs).

2. **Soil and Vegetation Alteration** from dust deposition and chemical changes (salinity and sulphate enrichment) linked to gypsum and salts disposal.
Elevated risk for Sites 1 and 5 near seepage and riparian areas.
3. **Runoff and Sedimentation** into the **Sandloop River** and associated wetlands during construction and operation.
The highest risk is for Sites 4 and 5, where the river traverses the footprint.
4. **Faunal Disturbance, Displacement, and Road Mortality** from traffic, conveyor movement, and lighting.
Greatest effect on large-mammal populations in Sites 2, 4, and 5.
5. **Invasive Plant Establishment** along disturbed servitudes and waste-stack perimeters.
Moderate risk across all sites, manageable through invasive-species control.

In conclusion, all six fall within ecologically sensitive landscapes, and the degree of ecological integrity varies substantially. The southern conservation areas (Sites 4 and 5) provide critical habitat and connectivity and should be excluded from development. The northern and eastern ESA-linked sites (3 and 6) offer more feasible alternatives.

8.2 Heritage Impact Assessment

The proposed six alternatives are located on a privately owned farm, which can only be accessed through an appointment. The area is currently used for game and farming activities and is steep with very low undulating dunes which suddenly rise from the surrounding environment. Some of the land on which the development is proposed is transformed and extensively used for agriculture and game farming, while other is zoned for mining activities. The six alternatives are discussed further below:

Site 1

This first alternative is located on a portion of the farm Kromdraai 690LQ. The proposed land is fairly transformed and located in an area traversed by several power lines and access roads. Although no historical shelters were identified in the area, the ample stones on site could have easily been transformed into tools. As a result, Stone Age people likely roamed around this site.

Site 2

This site is located on farm Kuipersbult 511 LQ, and similarly to Site 1, this site has a high percentage of powerline disturbances, and no archaeological resources are expected here. However, experience has taught us that archaeological sites and isolated tools tend to remain stable under area were game or livestock farming is practised. Alternative 2 bears potential for graves and stone walling.

Site 3

The area proposed for alternative 3 is characterised by extensive mining activities, and part of it is where the mining activities are disturbed. Any archaeological materials that could have existed here in the past have been destroyed.

Site 4

This alternative is transformed agriculturally, such that no archaeological materials could have survived such disturbances. Thus, no archaeological material could have survived or remained in situ on the affected property.

Site 5

This site is in an area where experience has taught us that isolated tools tend to remain stable under area where game or livestock farming are practised. Alternative site 5 bears potential for isolated archaeological tools, although none were noted during survey.

Site 6

The impact of the proposed development on archaeological and cultural heritage remains is rated as being low on this proposed site. The probability of locating any important archaeological heritage remains during the construction of the project is low. The affected property is thus not considered to be very archaeologically sensitive.

8.2.1 Findings

The purpose of the survey was to evaluate potential heritage resources within the boundaries of the proposed WFGD landfill sites at Medupi Power Station and to determine whether any heritage constraints could influence site selection or development. The cultural landscape in the project area has been subjected to historical agricultural and industrial activities, which have had both positive and negative effects on heritage preservation. Mitigation measures are therefore essential to avoid, reduce, or offset any significant adverse impacts on heritage resources.

The assessment identified several sites of cultural heritage significance, particularly grave sites, most of which are unmarked and demarcated with stones. These graves are protected under Section 36(3) of the National Heritage Resources Act (Act 25 of 1999), prohibiting any disturbance without formal approval.

Two mitigation approaches are recommended for grave sites:

1. Heritage Management Plan (HMP) – the preferred approach. An HMP, prepared by a qualified heritage specialist, ensures ongoing conservation and is appropriate when graves are not directly threatened by the landfill footprint.
2. Phase 2 Mitigation (Relocation) – considered only as a last resort, requiring social consultation and regulatory approval. Graves older than 60 years or of unknown age require permits from the heritage authority, while graves younger than 60 years must involve a registered undertaker.

Based on the Phase I assessment and in combination with ecological, freshwater, and socio-economic considerations, the preferred WFGD landfill sites are Site 1 and Site 6. These sites demonstrate lower heritage sensitivity, with minimal risk of impacting grave sites or other cultural resources. In contrast, Sites 2 and 4 were identified as highly sensitive due to the presence of multiple heritage features, wetlands, and river crossings, and are therefore not recommended for development. Sites 3 and 5 are considered conditionally acceptable, provided that appropriate mitigation and heritage management measures are strictly implemented.

In conclusion, Site 1 is the preferred WFGD landfill site due to its combination of low heritage sensitivity, proximity to existing industrial infrastructure, and minimal risk of land-use conflict, with Site 6 retained as a secondary option if further technical or operational considerations warrant it. Early integration of the HMP into project planning is essential to ensure heritage resources are preserved, and compliance with the National Heritage Resources Act is maintained.

8.3 Avifauna Study

The avifauna field survey was conducted from 30 September to 3 October 2025. This constitutes a wet-season summer survey. The data from September 30 - October 3rd were supplemented with assessments conducted on January 29 - 30, January 2025, and 25 - 26 June 2025, as well as 16 - 17 October 2025 on the adjacent property, but still within the PAOI. SABAP2 data indicate that 247 avifauna species are expected for the PAOI and surrounds. Of these, fourteen (14) are considered SCC. During the field assessments, seven SCC were recorded: Black-crowned Night Heron (*Nycticorax nycticorax*), Black-winged Kite (*Elanus caeruleus*), Hamerkop (*Scopus umbretta*), Knob-billed Duck (*Sarkidiornis melanotos*), White-backed Vulture (*Gyps africanus*), Yellow-throated Sandgrouse (*Pterocles gutturalis*), and Saddle-billed Stork (*Ephippiorhynchus senegalensis*). Another SCC, Black Stork (*Ciconia nigra*), was identified by another specialist during another field survey. The screening tool identified an additional four SCCs that have a medium sensitivity within the project site: African Finfoot, Bateleur, Secretary bird and Tawny Eagle. Twenty-three (23) risk species were observed during the field investigations. Risk Species are considered threatened, rare, or prone to impacts from development.

8.3.1 Alternatives Considered

Six alternatives were provided for the development, and the alternatives are overlaid over the habitats and the SEI in Figure 28. From the map, alternatives 1, 4, 5, and 6 would be the most sensitive, while sites 3 and 2 would have lower sensitivity. However, because of the no-go nest buffer in alternative 2, this is not a preferred option. Overall, alternative option 3 is the preferred option from an avifauna perspective.

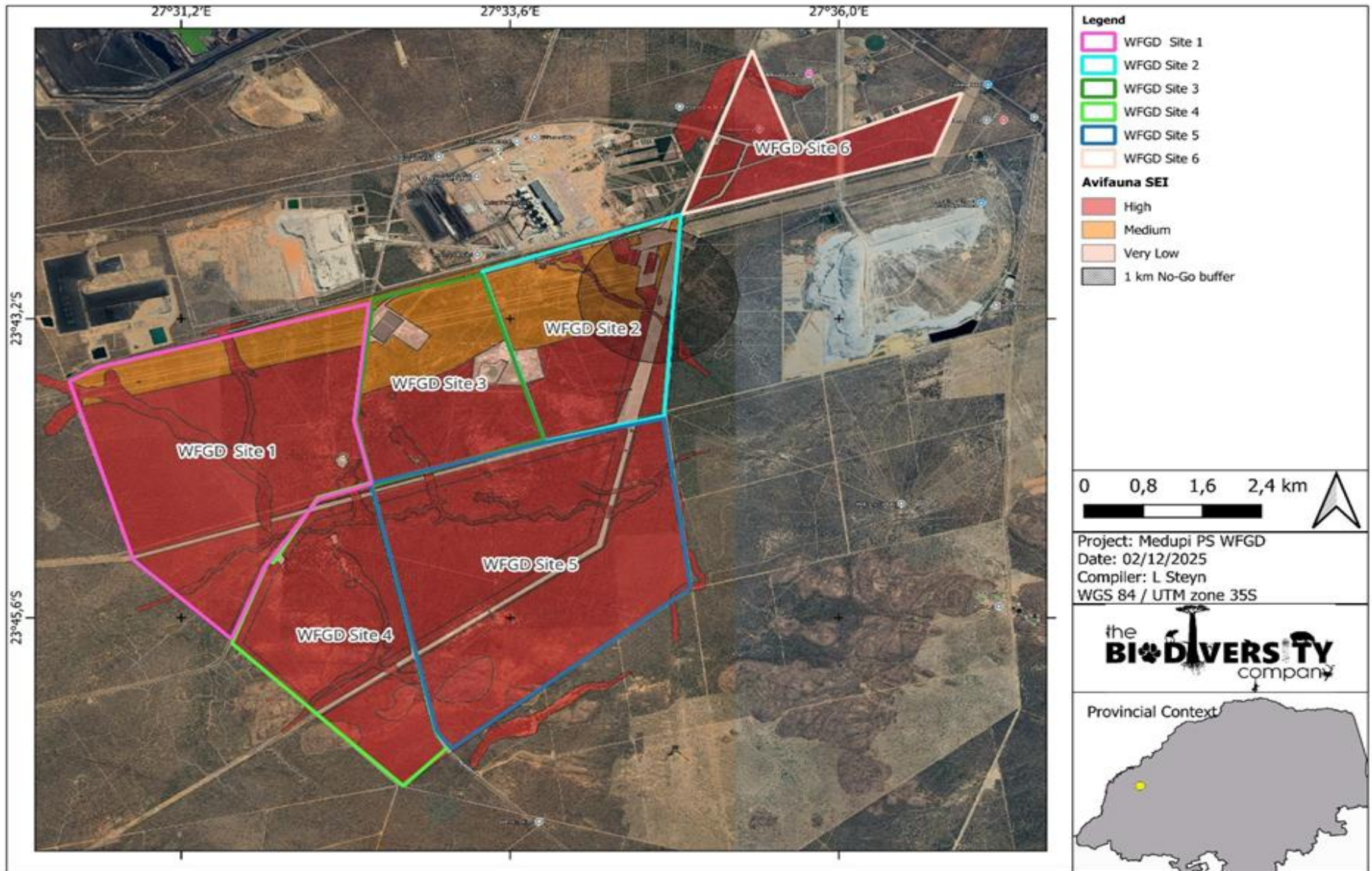


Figure 28: Avifauna SEI site alternatives.

Observing and monitoring nesting sites of SCC and/or priority species are important in ascertaining habitat sensitivity and evaluating the impact, risk significance of any proposed development. A Saddle-billed Stork nest was identified by the manager on site, and he has shared the details. A 1 km buffer was placed around the nest. A confirmation assessment will be required between the breeding season of March and July. If the nest is confirmed to be active, the avifauna specialist must advise on the way forward.

Much of the project area was found to be 'High' sensitivity, validating the screening tool's high sensitivity for the various habitats associated with the development. The habitat loss, pollution risk and displacement of SCC are regarded as the main impacts. Site alternative 3 is the preferred option, as a large part of the development area has a medium sensitivity; it also has fewer water resources, which would pose a risk and allows for a larger buffer area from the Saddle-billed Stork nest.

Table 5: Sensitivity rating for each site in terms of Avifauna

Site	Constraints	Sensitivity Class	Summary of Rationale	Recommendations
1	Habitat can support SCC	High, Medium	- These areas provide valuable and unique habitat for numerous avifauna species. Habitat can support SCC - Water features present	
2	Saddle-billed Stork nest; Habitat can support SCC	High, Medium, Very Low and 1km No-Go Zone	These areas provide valuable and unique habitat for numerous avifauna species. Habitat can support SCC Water features present	Walkdown required to confirm whether the nest is active during the breeding season.
3	Habitat can support SCC	High, Medium, and Very Low	These areas provide valuable and unique habitat for numerous avifauna species. Habitat can support SCC Water features present	Alternative 3 is the preferred option
4	Habitat can support SCC	High	These areas provide valuable and unique habitat for numerous avifauna species. Habitat can support SCC	

			Water features present	
5	Habitat can support SCC	High	These areas provide valuable and unique habitat for numerous avifauna species. Habitat can support SCC Water features present	
6	Habitat can support SCC	High	These areas provide valuable and unique habitat for numerous avifauna species. Habitat can support SCC Water features present	

8.3.2 Impact Statement

Overall, residual impacts are predominantly assigned a moderate residual impact. Mitigation measures as described in this report can be implemented to reduce the significance of the risk to an acceptable level. Considering that this area has been identified as being of significance for biodiversity maintenance and ecological processes (High sensitivity), development may proceed, but with caution and only with the implementation of mitigation measures.

8.3.3 Specialist Opinion

It is the opinion of the specialist that the development can be favourably considered should the mitigation measures and management actions be implemented, and avoidance of high sensitivity areas or reduction (<50% of the property area avoided) of the development area is evident in the final layout. In addition to the aforementioned information, the Saddle-billed Stork nest 1 km buffer must be treated as a no-go area until the activity at the nest has been determined.

8.4 Aquatic Assessment Study

A field survey for the area was conducted from September 30 to October 3, 2025 (spring), an early wet-season survey, to identify the presence of freshwater features (wetlands) and delineate their spatial extents. Furthermore, to determine the vegetation composition of the identified features and the likelihood of features being used as habitat for fauna. The seasonality is not considered a limiting factor in the assessment, and the results are conclusive.

8.4.1 National Freshwater Ecosystem Priority Ecosystems

One wetland type was identified within the PAOI, namely an unchanneled valley-bottom wetland, together with one river (Figure 29). According to the dataset, the identified wetland feature was classified as having a “Z3 – Heavily/Critically Modified” condition. Furthermore, the feature was classified as being artificial and as “Vulnerable” and “Not Protected” in terms of Ecosystem Threat Status and Ecosystem Protection Level, respectively. The identified river, Sandloop River, was classified as being in a “Moderately Modified” state.

No natural wetlands were identified within the PAOI (Figure 30). However, non-perennial drainage features were identified within the PAOI, one of which has been observed to actively flow due to hydrological input from the Medupi Power Station. In addition, multiple artificial wetlands were identified, which were classified as seep type systems that varied in size. All these wetlands were identified as being entirely dependent on water leakages or discharge from infrastructure. Evidence of active flows was observed in the larger seeps. Whereas the smaller seeps are presumed to have developed from topographical alterations which have created uneven surfaces that now accumulate water from rainfall and from the leaking infrastructure or discharge from the Medupi Power Station. The artificial wetlands are considered to provide minimal ecological value, attributed to their reliance on hydrological input, which, if stopped, would result in the features reverting to their original non-wet state.

Furthermore, several dams were identified within the PAOI, some of which are assumed to be constructed attenuation facilities or holding dams for process water emanating from Medupi Power Station, which are actively used, and others are smaller earthen farm dams. Most of these dams are off-channel systems, whereas three earthen dam features were instream due to their location within the natural drainage path.

The associated drainage features (or lines) for the project are classified as ‘A’ Section channels that convey surface runoff immediately after a storm event and are not associated with a baseflow (DWAF, 2005).

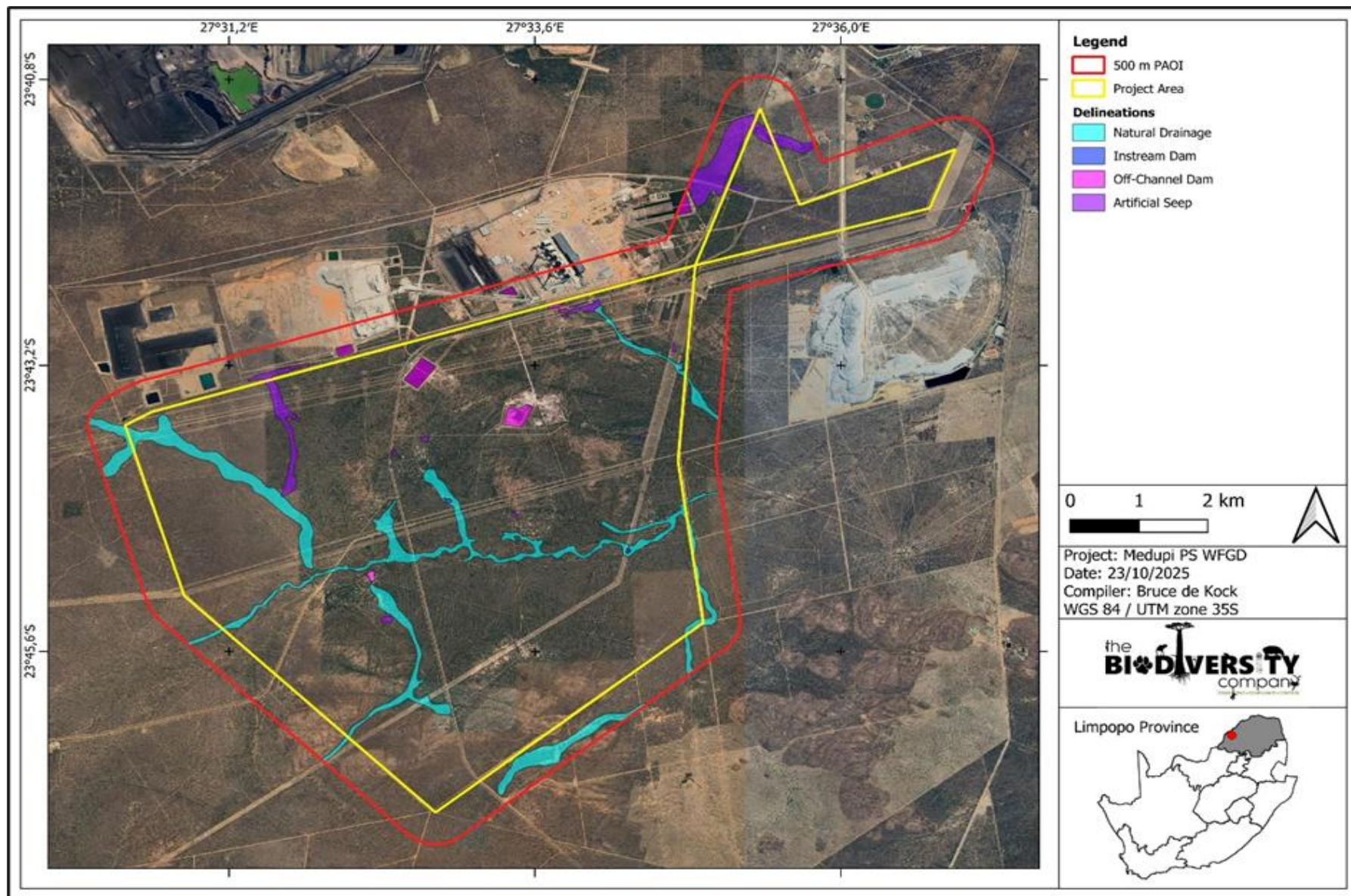


Figure 29: Delineated watercourses in terms of this study

8.4.2 Buffer Requirements

The buffer requirements for the watercourses were calculated using the Site-Based Tool: Determination of Buffer Zone Requirements for Wetland Ecosystems (Macfarlane *et al.*, 2014). The post-mitigation buffer for the drainage features was calculated to be 20 m; however, the legislated buffer zones were calculated to be 32m.

Table 6: Summary of the screening tool vs specialist assigned sensitivities

Features	Screening Tool Theme	Environmental Screening Tool Sensitivity	Specialist Sensitivity	Tool Validated or Disputed by Specialist - Reasoning
Artificial Seep Wetlands	Aquatic Biodiversity Theme	Very High	Low	Disputed – The artificial seep wetlands are entirely dependent on anthropogenic inputs, which is stopped which could cessation of these systems. Any attributes of these features are therefore considered to be temporary and reliant on human intervention.
Drainage Features Instream Dams	Aquatic Biodiversity Theme	Very High	Medium	Disputed – The drainage areas provide minimal ecological value, limited habitat for aquatic or semi-aquatic species, and limited contribution to the maintenance of natural hydrological or ecological processes due to their ephemeral nature.
Freshwater Buffers	Aquatic Biodiversity Theme	Very High	Low	Disputed – Buffers are important in the context of preventing impacts to the systems they encompass and are assigned sensitivities based on the sensitivities of the features they encompass.
Off-Channel Dams	Aquatic Biodiversity Theme	Very High	Low	Disputed – This includes features such as dams, which are all man-made and typically lack the biodiversity, habitat complexity, and ecological functionality associated with natural wetland systems. While these features may contribute marginally to hydrological processes (e.g., stormwater retention or flow attenuation), they do not support significant freshwater biodiversity.
Remaining Area	Aquatic Biodiversity Theme	Very High	Low	Disputed – No natural freshwater features were identified within this area.

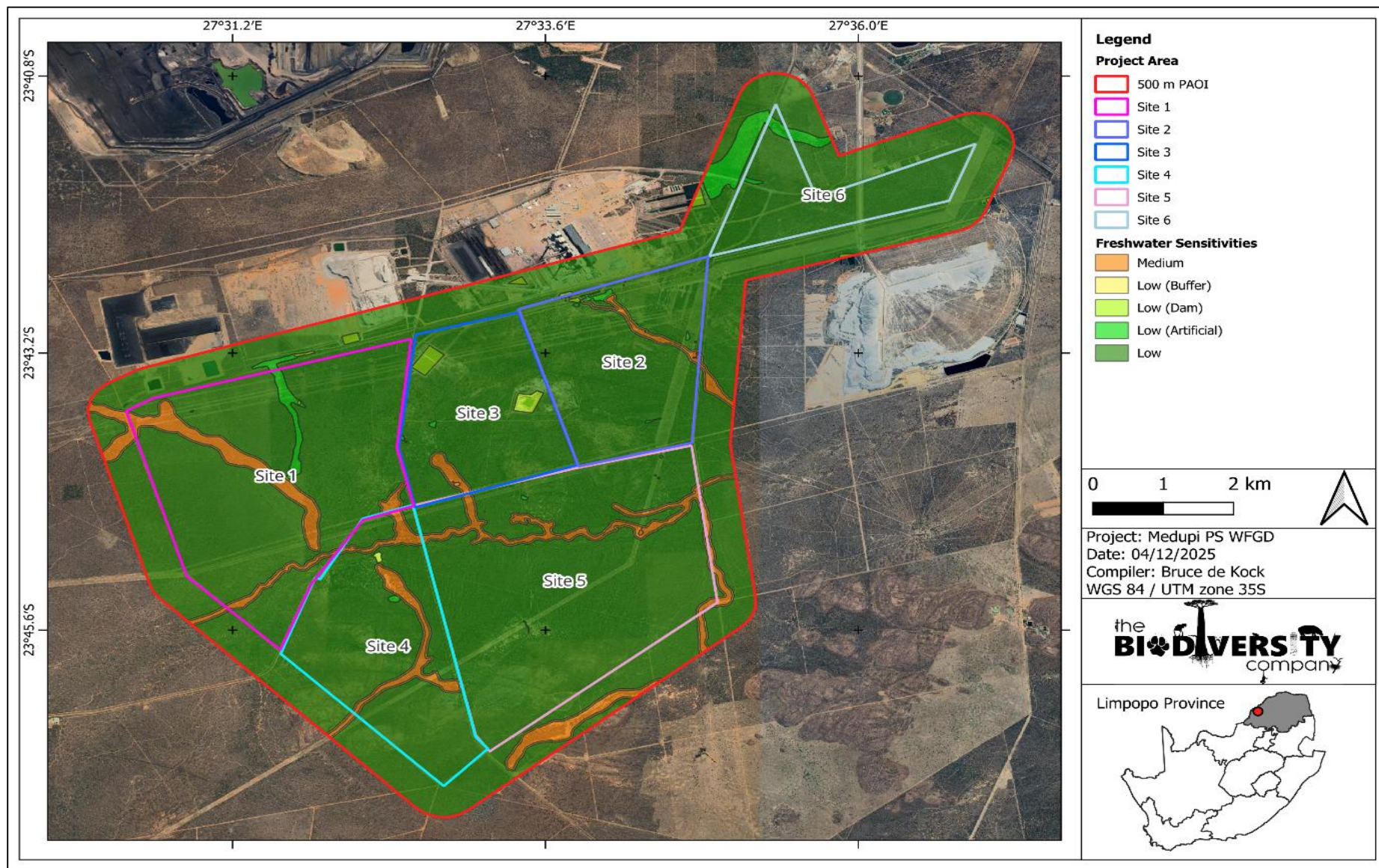


Figure 30: Freshwater sensitivity for the project area of influence superimposed over the alternative project area sites

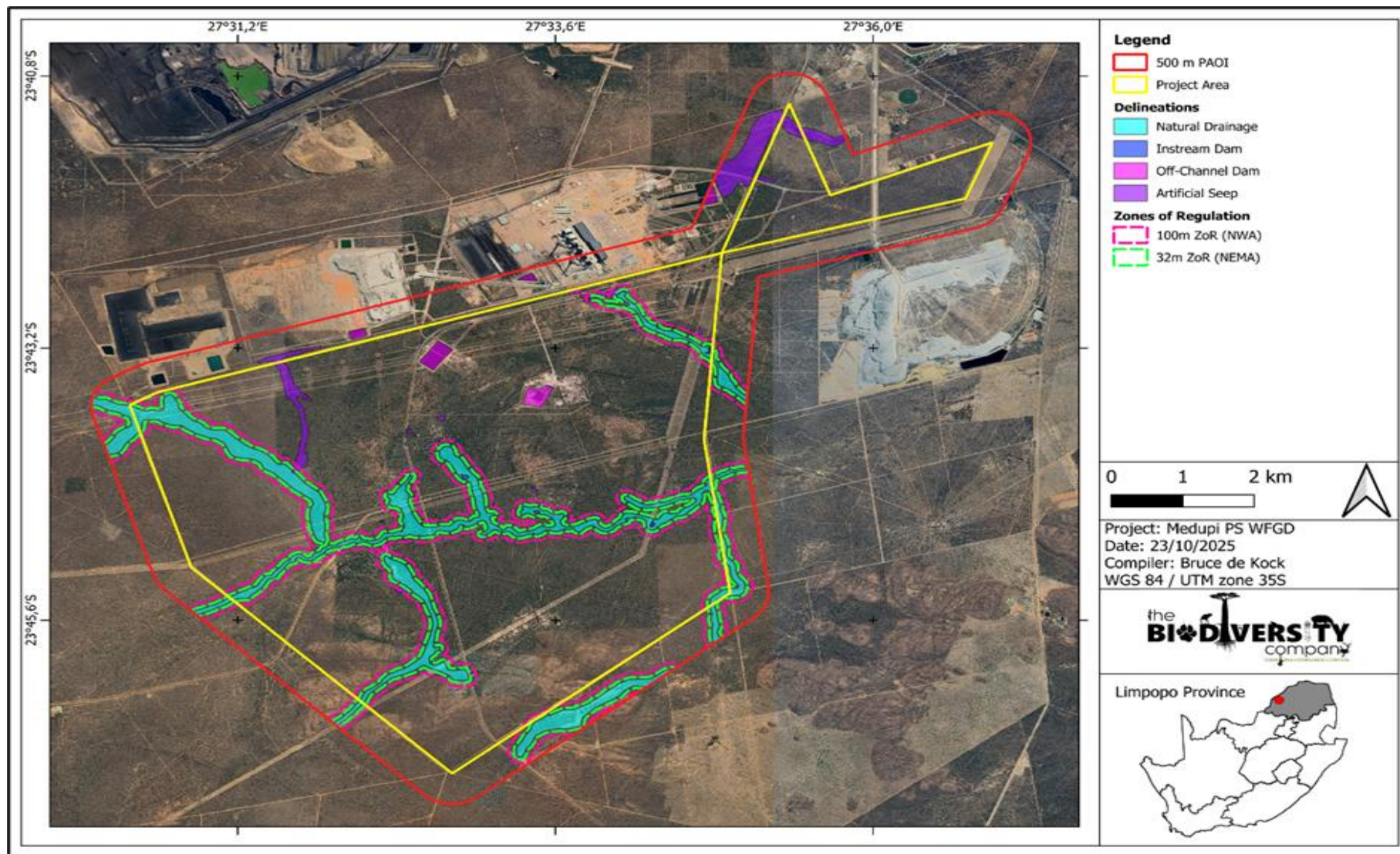


Figure 31: Zones of Regulation for the identified drainage features in relation to the project area

8.4.3 Alternatives Considered

Six alternative waste disposal facility sites (Sites 1–6) have been identified within the project area. Each alternative comprises a candidate footprint located within the greater 500 m PAOI. From a freshwater perspective, the alternatives were screened against the delineated water features as well as the recommended 20 m post-mitigation drainage buffer.

From a freshwater perspective, the key differentiator between the alternatives is the extent to which each site interacts with the mapped non-perennial drainage features and their recommended 20 m post-mitigation buffers. A comparative summary of the freshwater interactions for each site is provided in Table 6.

Based on this screening, Site 6 is considered the most favourable alternative because it avoids all mapped drainage features and is located entirely within a low-sensitivity area. Sites 2 and 3 have limited interaction with drainage features and are considered less preferred but still acceptable from a freshwater perspective, provided that the facility layout maintains separation from the drainage channels and associated buffers.

Sites 1 and 4 intersect several drainage lines and are therefore less preferred. Site 5 intersects the densest portion of the drainage network and presents the highest potential for alteration of surface hydrology and water-quality impacts; it is therefore the least preferred from a freshwater perspective.

“Fresh water feature coverage” in this table refers to the combined area of mapped non-perennial drainage features and their associated 20 m post-mitigation buffers located within each site.

The “Relative freshwater impact risk (pre-mitigation)” ratings are comparative indicators only and do not represent DWS Risk Assessment Matrix (RAM) significance ratings. They express the relative likelihood of each alternative site affecting the delineated non-perennial drainage features and their 20 m buffers, based on the areal coverage (ha) and configuration of those features within each site.

Table 7: Summarised findings for each alternative site

Site	Freshwater feature intersection and natural water feature coverage	Description of intersection with drainage network (relative degree of intersection)	Relative freshwater impact risk (pre-mitigation)*	Key mitigation considerations
1	Several non-perennial drainage features; Approx. 108.1 ha natural water feature coverage (≈9.9 % of site area). Artificial features present	High – Multiple drainage features are present, including a dense primary drainage line that effectively divides the site in half ,	Higher relative risk due to direct interaction with several drainage features and the relatively high proportion of the site intersecting	Avoid routing the facility over drainage lines; if selected, require realignment of the internal layout to keep main structures outside water feature coverage areas. Implement robust

Site	Freshwater feature intersection and natural water feature coverage	Description of intersection with drainage network (relative degree of intersection)	Relative freshwater impact risk (pre-mitigation)*	Key mitigation considerations
		resulting in only about half of the site being realistically available for placement of the main facility footprint.	the drainage network.	stormwater and erosion control measures and design to manage polluted water.
2	Short section of drainage feature along the eastern margin; Approx. 19.9 ha natural water feature coverage ($\approx 3.6\%$ of site area). Artificial features present	Moderate – A single drainage feature partitions approximately one-third of the site and flows downslope into a valley-bottom area. Around two-thirds of the site remains free of drainage interaction, but the layout must ensure that downstream flow connectivity is maintained and that no contaminated runoff is discharged into the valley-bottom system.	Moderate relative risk – interaction with the drainage network is localised but directly connected to the downstream valley-bottom area, requiring careful management of flows and water quality.	Maintain the facility footprint outside the drainage channel and its water feature coverage area; design access routes and stormwater infrastructure to avoid concentrating runoff toward the drainage; design to manage polluted water and protect downstream valley-bottom habitats.
3	Largely outside drainage network; short drainage segment at southern boundary; Approx. 14.4 ha natural water feature coverage ($\approx 2.9\%$ of site area). Artificial features present	Low–Moderate – Only limited drainage features occur in a small portion of the site, mainly along the southern boundary. Most of the site is unaffected by the drainage network and is available for use by the facility.	Lower relative risk – drainage interaction is minor and spatially restricted, allowing the facility to be micro-sited to avoid the affected area.	Micro-site infrastructure away from mapped water feature coverage; maintain separation from artificial water features; design to manage polluted water and prevent creation of new concentrated flow paths.

Site	Freshwater feature intersection and natural water feature coverage	Description of intersection with drainage network (relative degree of intersection)	Relative freshwater impact risk (pre-mitigation)*	Key mitigation considerations
4	Several drainage features crossing the northern/central parts of the site; Approx. 71.6 ha natural water feature coverage (≈ 11.4 % of site area). Artificial features present	Moderate–High – A dense network of multiple drainage features divides the site in half and further partitions it into smaller pockets , resulting in a high degree of interaction with the drainage network and leaving relatively limited contiguous ground available for the facility footprint.	Higher relative risk – substantial overlap and fragmentation caused by the drainage network increases the likelihood of altering natural surface-water flow paths and complicates layout planning.	If used, substantial layout optimisation is required to keep permanent infrastructure outside water feature coverage areas. Intensive stormwater and erosion control measures are required; design to manage polluted water and maintain existing drainage patterns.
5	Dense network of non-perennial drainage features across much of the northern boundary of the site; Approx. 84.3 ha natural water feature coverage (≈ 7.0 % of site area). Artificial features present	High – There is a large degree of interaction with a complex and dense valley-bottom drainage network that runs across the site. Although substantial parts of the site are technically available, the prominent, central drainage system creates a high risk of impact if the facility is placed here.	Highest relative risk – the complex and strongly connected valley-bottom drainage network traversing the site substantially raises the likelihood of cumulative hydrological alteration and water-quality impacts.	Not preferred from a freshwater perspective. If selected for other overriding reasons, would require extensive engineering to avoid or cross drainages, higher risk of cumulative hydrological and water-quality impacts, and stringent stormwater and erosion management.
6	No mapped drainage features; located entirely in low-sensitivity area; 0 ha natural water feature coverage (0 % of site area).	Low – No direct intersection with the mapped drainage network or 20 m buffers; the site lies entirely outside delineated water	Lowest relative risk – no direct interaction with mapped drainage features and lowest potential for alteration of	Preferred site from a freshwater perspective. Maintain a conservative setback from the nearest mapped drainage features during detailed design and manage

Site	Freshwater feature intersection and natural water feature coverage	Description of intersection with drainage network (relative degree of intersection)	Relative freshwater impact risk (pre-mitigation)*	Key mitigation considerations
	Artificial features present	features, with interaction limited to diffuse overland flow beyond the site boundary.	existing drainage patterns.	stormwater to prevent creation of new concentrated flow paths; design to manage polluted water.

No natural wetlands were found within the PAOI. However, several non-perennial drainage features and multiple artificial wetlands were identified. These artificial wetlands are dependent on water leakages or discharges from infrastructure, particularly the Medupi Power Station, and provide minimal ecological value as they would revert to non-wet conditions if the hydrological inputs ceased. Additionally, several dams were present, most of which are off-channel attenuation or holding facilities for process water, with a few smaller farm dams and three instream earthen dams located within natural drainage paths.

A post-mitigation buffer of 20 m has been calculated for the drainage features. The comparative screening of the six alternative disposal sites against freshwater features (Table 6) indicates that Site 6 has the lowest interaction with delineated drainage features and associated buffers and is therefore associated with the lowest potential risk to freshwater resources. Sites 2 and 3 have limited interaction with drainage features, while Sites 1, 4 and especially 5 intersect multiple drainage lines, resulting in higher relative risk.

For any site where the disposal facility footprint can be located entirely outside the mapped drainage features and the recommended 20 m buffers, residual risks to freshwater resources are expected to remain within the Low significance category, assuming implementation of the recommended mitigation measures.

8.5 Palaeontology Study

8.5.1 Geology and Palaeontology

The site lies in the Ellisras Basin, an equivalent of the main Karoo basin, where the lower Karoo Supergroup strata are exposed. These sediments unconformably overlie the much older Waterberg Group quartzites. Much of the area is overlain by aeolian sands and alluvium, especially along the rivers and streams.

The Palaeoproterozoic rocks of southern Africa occur in Limpopo, Mpumalanga and Gauteng Provinces and extend westwards into Botswana, and occur in three basins. Three main strata are recognised: the Soutspansberg Group, the Waterberg Group and the Blouberg Formation. Several attempts have been made to correlate the strata in the different basins, the Waterberg Basin, the Soutspansberg Basin and the Middelburg Basin.

The Waterberg Group occurs in the Waterberg and Nylstroom Basins (Barker et al., 2006) and rests unconformably on rocks of the Transvaal Supergroup and the Bushveld Complex. It is overlain by Karoo

Supergroup rocks. Three subgroups are recognised throughout the main Waterberg Basin, but only the oldest subgroup occurs in the Nylstroom Basin. Different formations are noted in the south, southwest and central areas compared to the North, northeast and central areas according to SACS (1980). In the northern part, the upper Kransberg Subgroup has three formations in its southern part, but in the northern part are the **Mogalakwena**, Cleremont and Vaalwater Formations (Barker et al., 2006).

8.5.2 Palaeontological context

The site for development is in three formations. From the SAHRIS map Figure 32, the area is indicated as very highly sensitive (red) for the Swartrand Formation, and moderately sensitive (green) for the Mogalakwena Formation and the Quaternary sands. The Waterberg Group sandstones represent four phases of sedimentary infilling of the three ancient basins. There is some evidence for periodic arid conditions indicated in the Makgabeng Formation from the dunes and crossbedding, and the braided streams channel sandstones in the Mogalakwena Formation (Corcoran et al., 2013). In contrast, Simpson et al. (2013) advocate the presence of microbial mats using the terminology of Noffke et al. (2001). Microbial activity is recognised by very subtle sedimentary structures such as roll-up structures, sand cracks, wrinkle structures, tufted microbial mats, biological soil crusts and gas-escape features. These structures have only been found in the Makgabeng Formation, but the SAHRIS palaeosensitivity map, based on the Palaeotechnical Report for Limpopo (Groenewald et al., 2014), suggests that they may be more widespread.

The Quaternary sands might cover fossil traps such as palaeo-pans and palaeo-springs, but these are not common in this region. River sand and alluvium might have transported fragmentary fossil bones and wood as they are more robust, but these fossils would be of limited scientific value as their primary context is lost. From the SAHRIS map (Figure 32), only the north and northeastern parts of Site 6 on farm Hangklip 508 are indicated as very highly sensitive (red). Sites 1-5 are on moderately sensitive rocks. The farm area is already very disturbed by previous agricultural activities, so it is unlikely that any fossils would be found on the land surface.

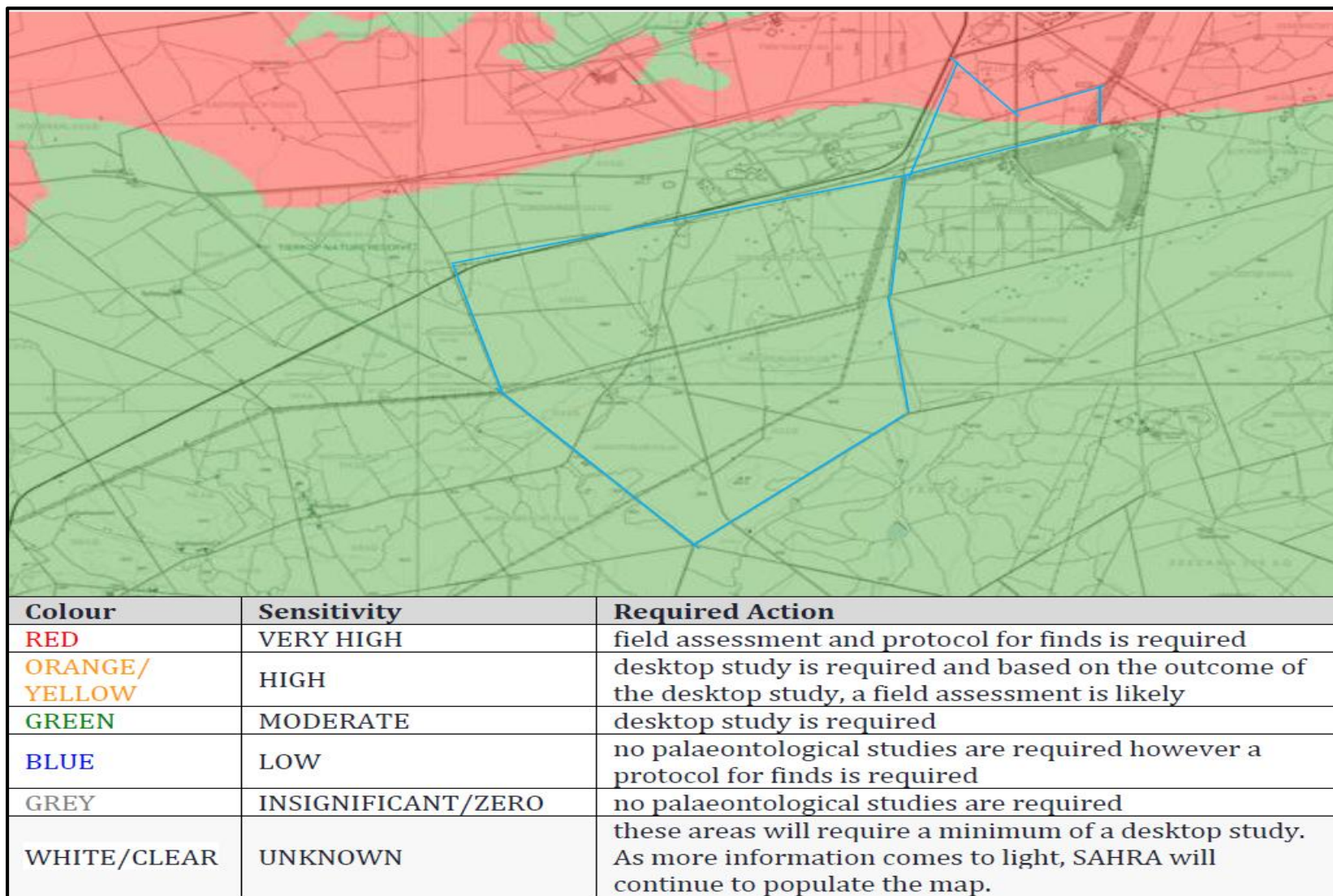


Figure 32: SAHRIS Palaeosensitivity map for the site for the six proposed WFGD disposal sites shown within the blue polygon

8.5.3 Recommendation

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying soils of the Quaternary. There is a very small chance that fossil plant fragments may occur below the land surface in the mudstones, siltstones or shales of the Swartrand Formation (Ecca Group, Karoo Supergroup), so a Fossil Chance Find Protocol should be added to the EMP. If fossils are found by the environmental officer, or other responsible person, once operations have commenced, then they should be rescued, and a palaeontologist should be called to assess and collect a representative sample. The impact on the palaeontological heritage would be low, as far as the palaeontology is concerned, so the project should be authorised. As far as the palaeontology is concerned, any of the sites 1-5 will have NO impact on the fossil heritage. Site 6 might impact the fossil heritage, but the chance is low.

8.6 Climate Change Assessment

Anthropogenic activities drive climate change, causing increased global atmospheric temperatures and weather extremes that are variable in extent and severity. These climate change risks are associated with specific hazards that drive the system and exert pressure on human settlements and the environment. Within these settlements and the environment, there are existing factors that could combat climate change effects or compound them.

Individual climate change stressors, their expected occurrence, local context and capacity for adaptation are defined below:

Table 8: Climate change factors

	Stressor	Exposure	Context within the region	Sensitivity	Capacity for Adaptation
Socioeconomic	Health impacts from increased storm events	Yes	• High proportion of vulnerable people (<5years & >60) • Insufficient health care capacity	High	• Lack of resources to deal with flooding events
	Increased heat stress	Yes	• El Nino effects	Medium	• Improve water access

	Stressor	Exposure	Context within the region	Sensitivity	Capacity for Adaptation
					Implement local water storage facilities
	Increased vector borne diseases from spread of mosquitoes, ticks, sandflies, and blackflies	Yes	Malaria	Low	Few standing surface water resources
	Increased water borne and communicable diseases (typhoid fever, cholera & hepatitis)	Yes	- Low water channelling capacity - Steep gradient lands with high potential for runoff	High	- Systems in place to deal with outbreaks - Improve municipal health facilities.
	Increased malnutrition and hunger because of food insecurity	Yes	- Rural areas reliant on subsistence farming - Increased cost of staple foods due to import because of shortages.	High	- Feeding schemes don't include the <5years age group. - Inaccessibility of rural groups
	Increased air pollution	Yes	Waterberg-Bonjala declared priority area for air quality	High	Admin developed for priority areas.
	Increased Occupational health problems	Yes	High proportion of workers at risk in	High	Private stakeholders to be engaged

	Stressor	Exposure	Context within the region	Sensitivity	Capacity for Adaptation
			construction and labour roles.		
	Increased impacts on strategic infrastructure	Yes	- Increased extreme rainfall events leading to enhanced erosion. - Low infrastructure maintenance capacity.	High	- Finance, - maintenance issues, - inventory is underway
	Increased impacts on informal dwellings	Yes	All six municipalities Some established along the riverbank	Medium	Some initiatives such as RDP housing
	Reduced food security		- Maize - Sunflower - Wheat	High	- Increased demand on local production - Land use change - Land transformation
	Increased isolation of rural communities	Yes	- Increased costs of travel on low quality roads - Low infrastructure maintenance capacity	High	Not enough budget or research
	Increased migration to urban and	Yes	- Poor service delivery - Decline in industrial	High	Finance

	Stressor	Exposure	Context within the region	Sensitivity	Capacity for Adaptation
	peri-urban areas		activity supporting rural communities. • Cut across all municipalities particularly (TBZ, Lephalale, Mogalakwen a)		
Water	Decreased quality of drinking water	Yes	• Cuts across local municipalities	Medium	• Water provision is maintained by another entity
	Decreased water quality in ecosystem due to increased concentrations of effluent and salt concentrations	Yes	• Raw sewage discharged into waterways and streams • Drying of natural surface water resources	High	• Water provision is maintained by another entity
	Less water available for irrigation and drinking	Yes	• High mining developments - pollution affecting and reducing natural water supply. • High temperatures and heat above 40C	Medium	• Promote water collection at the local scale • Water access initiatives • Prioritise drought and heat-resistant crops to reduce irrigation needs.
	Increased impacts of	Yes	• Aging infrastructure	High	• Local initiatives

	Stressor	Exposure	Context within the region	Sensitivity	Capacity for Adaptation
	flooding from litter blocking sewer system		- growing population - Low infrastructure maintenance capacity		Improved maintenance
	Increased fish mortality	Yes	Rivers are highly Eutrophicated	Low	- Focus on upstream activities - Local initiatives and learning
Economic	Change in grain (maize, wheat & barley) production	Yes	- Source of staple food - High-ranking economic activity	High	- Research policies in place (Dept of Agri.) - Institutional support limited to public domain
	Change in other crop production areas	Yes	Nuts	Unknown	- Private ownership - Research policies in place - Institutional support limited to public domain
	Increased risks to livestock (cattle, goats and pigs)	Yes	- Livestock farming - National Parks	High	- Policy & finance highly modified - Public institution support
	Increased risks to wildlife and game farming	Yes	Game farms	High	- Privately owned research - Limited funding

	Stressor	Exposure	Context within the region	Sensitivity	Capacity for Adaptation
Environmental	Decreased income from tourism	Yes	- Decreasing Fauna and Flora Wetlands - Major contributing sector to the region's economy	High	- Policy Institutional - Research and finance. - Adaptive measures in place.
	Loss of industrial productivity	Yes	- Decline in agriculture due to rainfall variability, drought and fire - Loss of revenue due to low quality infrastructure.	High	Financing - all to be determined through engagement with other stakeholders
	Loss of Grasslands	Yes	- Loss of indigenous grasses and wildlife - Economic value - Community development and livelihoods	Medium	- Private ownership - Institutional support - mainly public sector - Limited funding - Undocumented indigenous grassland

Mitigation Measures

The following measures are focused on the highest risk pathways for the WFGD waste disposal facilities at Medupi.

Design and water protection

- Double composite liner system with leachate collection and leak detection; leachate storage sized for $\geq 1:50$ -year, 72-hour storm plus 20% contingency; maintain ≥ 300 mm freeboard; alarmed sumps and pump-down within 24 hours of exceedance.

- Separate clean and dirty water systems; stormwater channels/detention sized for $\geq 1:50$ -year events with energy dissipation and rock armouring at outfalls; sediment forebays at dirty water outlets; quarterly inspections and defects repaired within 7 days.
- Slope stability criteria: factors of safety ≥ 1.5 (static) and ≥ 1.1 (pseudo-static); annual geotechnical inspections with corrective action plans if thresholds are not met.

Air quality and dust

- Moisture conditioning of gypsum and salts; enclosed or hooded transfer points; haul-road treatment and watering; wheel-wash at exits; site speed limit ≤ 30 km/h.
- Boundary PM₁₀ monitoring with site action levels: 24-hour average $50 \mu\text{g}/\text{m}^3$, plus operational wind trigger (e.g., >10 m/s from sensitive receptor sector) to pause tipping/handling and intensify suppression.
- Winter inversion protocol: daily SAAQIS check; delay high-dust activities during strong inversions; increase wet suppression and wind screening.

Heat and fire

- 10 m firebreaks and vegetation management around cells and infrastructure; hot-work permit system for mobile plant; on-site firefighting water provision ≥ 2 hours at 10 l/s; pre-season fire drill and toolbox talks.
- Heat-stress plan using WBGT thresholds with defined work/rest cycles; shaded rest areas and hydration stations within 100 m of workfaces.

Power and continuity

- N+1 standby generator capacity to operate critical WWTP/leachate pumps and control systems for ≥ 24 hours; quarterly runtime tests with logs.

Operations monitoring and performance

- Monthly water/leachate balance with storage utilisation (%), inflow/outflow and surplus capacity; action triggers for high utilisation.
- Dust performance: count of exceedances and operational pauses logged with root cause and corrective actions.
- Stormwater/erosion inspections after major events; close-outs within 7 days.
- Annual climate-risk review to update triggers and procedures using latest SAAQIS, municipal and Green Book information.

Access and emergency readiness

- Maintain all-weather access; regrade/repair storm-damaged segments within 72 hours; stock critical spares (culverts, riprap).
- Maintain emergency contact lists for LM/DM and adjacent landowners; integrate with district early-warning systems; record all advisories and engagements.

8.7 Social and Socio-Economic Study

The study was conducted through a combination of desktop research, field verification, spatial analysis, and stakeholder engagement, following the principles outlined in the Department of Forestry, Fisheries and the Environment (DFFE) SIA Guidelines (2014) and the International Association for Impact Assessment (IAIA) Framework (2021). The assessment incorporated national and municipal data from Statistics South Africa (2022), the Lephalale Integrated

Development Plan (2021–2026), and the Waterberg Spatial Development Framework (2021). Fieldwork by KMG included site inspections, photographic documentation, and verification of environmental and land-use attributes across six alternative disposal sites within Eskom-owned land. The baseline analysis confirmed that the Lephalale Municipality functions as a major energy and mining hub within the Limpopo Province, anchored by Medupi and Matimba Power Stations and Exxaro's Grootegeluk Coal Mine.

The municipality has experienced rapid population growth and urbanisation, driven by industrial expansion and the in-migration of job seekers. While this growth has stimulated economic opportunities, it has also resulted in housing shortages, service-delivery pressures, and uneven income distribution, with approximately 46% of households earning below R3,500 per month and youth unemployment exceeding 50%. The local economy is heavily dependent on the energy and mining sectors, which jointly contribute more than 70% of Lephalale's GDP, reflecting a narrow industrial base vulnerable to shifts in national energy policy. From a social perspective, the municipality exhibits a dual development pattern: an industrialised urban core centred on Lephalale Town, Onverwacht, and Marapong, and a peripheral rural landscape dominated by agriculture and conservation. Urban areas have better access to infrastructure and services, whereas rural settlements still experience limited access to water, sanitation, and healthcare. The public health profile shows improved clinic coverage, but persistent respiratory and chronic illnesses linked to industrial emissions and environmental conditions. Despite these challenges, the area maintains strong social networks through traditional leadership structures, churches, and community-based organisations, which continue to uphold social cohesion and cultural continuity.

The field verification of the six WFGD alternative sites identified varying environmental and socioeconomic sensitivities.

- Site 1 (adjacent to Medupi Ash Disposal Facility) is used for grazing and contains powerlines, a kraal, a reservoir, and graves, making it moderately sensitive but socially manageable.
- Site 2 exhibits high sensitivity due to multiple heritage features, river crossings, and wetlands, including the Thaba Potsame and Kgoro Heritage Sites.
- Site 3, previously disturbed by quarrying and water infrastructure, has potential for industrial reuse.
- Site 4 supports active farming and livestock activities near smallholdings, posing land-use conflict risks.
- Site 5 overlaps partially with conservation land and recreational resources, requiring ecological buffers.
- Site 6, aligned with existing conveyor and railway corridors, has the lowest environmental and social sensitivity, being already industrial in character.

Table 9: Comparative Socio-Economic Sensitivity and Suitability

Site	Dominant Attributes	Socio-Economic Sensitivity	KMG Finding – Suitability
1	Drainage, kraal, ruins, graves, reservoir	Moderate (managed heritage risk)	Suitable (Low–Moderate Sensitivity)
2	Rivers, heritage complexes, Afrimat quarry	High (heritage + hydrology)	Unsuitable for new disposal
3	Quarry, infrastructure, dams	Moderate (industrial reuse potential)	Conditionally Suitable
4	Kraal, farms, reservoirs	Moderate–High (livelihood interface)	Moderate Sensitivity – Avoid overlap with smallholdings
5	Conservation land, Zebra Dam	Moderate (eco-tourism risk)	Conditionally Suitable (with ecological constraints)
6	Conveyor, railway, pan	Low (industrial corridor)	Most Suitable (Lowest Social & Environmental Sensitivity)

Impact evaluation across the construction, operational, and decommissioning phases revealed that the most significant positive effects include temporary job creation, local procurement, and skills development opportunities. These benefits can directly support poverty alleviation and strengthen small businesses in Marapong and Lephalale Town if equitable recruitment and enterprise development measures are enforced. Potential negative impacts, including labour influx, community health and safety risks, and disruption of rural livelihoods, can be effectively mitigated through strict recruitment protocols, traffic and dust management, community liaison mechanisms, and heritage site protection measures. The Social Management Plan (SMP) developed by KMG provides a comprehensive framework for mitigating risks and enhancing local benefits. Key provisions include a 30–40% local labour target, the establishment of a Community Liaison Office, ongoing grievance tracking, and a Social Performance Monitoring System to be reviewed quarterly. The SMP also promotes partnerships with the Lephalale TVET College for training and apprenticeships, supporting long-term capacity building in line with Broad-Based Black Economic Empowerment (BBBEE) and the National Development Plan (NDP 2030).

Based on the comparative analysis, Sites 1 and 6 are identified as the most suitable socio-economically and environmentally, given their proximity to existing industrial infrastructure, limited residential interface, and minimal disruption to heritage or conservation resources. Site 6 is considered the preferred site, offering the highest development compatibility and the lowest risk of social conflict or land-use displacement. Sites 2 and 4 are the least suitable due to their high heritage and agricultural sensitivities, while Sites 3 and 5 are conditionally viable under strict environmental and social management measures (see Table 8).

In conclusion, the SEIA finds that, with the implementation of the recommended mitigation and management measures, the proposed WFGD disposal facility can be developed without significant long-term adverse socio-economic effects. The project is expected to contribute to local employment creation, enterprise development, and community investment, while supporting Eskom's compliance with environmental regulations and national emission-reduction objectives.

Continuous engagement with local stakeholders, transparent communication, and effective monitoring of social performance will be essential to maintain community trust and ensure equitable benefit distribution throughout the project life cycle.

8.8 Agricultural Study

This Agricultural Impact Assessment (AIA) was undertaken by KMG Environmental Solutions Services (Pty) Ltd on behalf of Eskom Holdings SOC Ltd – Medupi Power Station, to assess the agricultural potential and land capability of six (6) proposed alternative disposal sites for by-products of the Wet Flue Gas Desulphurisation (WFGD) system in Lephalale, Waterberg District, Limpopo Province. The assessment aimed to determine the baseline agricultural conditions, soil characteristics, land capability, and agricultural sensitivity of each proposed site, integrating desktop analysis, field verification, laboratory testing, and spatial mapping. The evaluation followed the Department of Agriculture, Land Reform and Rural Development (DALRRD) Guidelines for Agricultural Impact Assessments (2019) and was aligned with relevant legislative frameworks, including NEMA (Act 107 of 1998), CARA (Act 43 of 1983), and NEM: WA (Act 59 of 2008). The primary objective was to identify the least agriculturally sensitive and most operationally feasible site for the WFGD disposal facility, thereby ensuring that development occurs sustainably and responsibly with minimal loss of productive agricultural land.

The study area is characterised by a semi-arid climate typical of the Limpopo Sweet Bushveld, with mean annual rainfall ranging between 350–450 mm and potential evapotranspiration exceeding 1 900 mm per year. Soils have developed on the Waterberg Group sandstones and shales, forming deep, red sandy profiles with moderate to low fertility. The landscape is gently undulating, with slopes of less than 5%, suitable for mechanised activity but sensitive to erosion if vegetation is removed. Vegetation consists mainly of open savanna woodland dominated by *Vachellia tortilis*, *Terminalia sericea*, and *Eragrostis lehmanniana*, providing rangeland suitable for livestock grazing rather than arable cultivation. Field verification and soil sampling confirmed that the project area is dominated by *Calcic Luvisols*, *Rhodic Lixisols*, *Chromic Lixisols*, and *Rubic Arenosols*, representing a gradient from moderate to low fertility. Laboratory results revealed generally acidic soils (pH 4.1–5.0), low organic carbon and moderate to low Cation Exchange Capacity (CEC 7–20 cmol(+)/kg), consistent with the low nutrient-holding capacity typical of the region's soils. The overall land capability ranges from Class III (moderate potential) to Class VI (low potential), supporting extensive grazing but unsuitable for intensive cropping without irrigation and significant soil amendment. Spatial and soil-based analysis revealed distinct differences among the six sites.

Site 1, underlain by *Calcic Luvisols*, demonstrated the most balanced combination of moderate fertility, good drainage, and existing industrial disturbance, making it the preferred location for the WFGD disposal facility. The site currently supports managed grazing and lies adjacent to Eskom's existing Matimba Ash Disposal Facility (ADF), within an established industrial corridor containing power-line servitudes. The proposed development here would result in minimal incremental transformation of productive land and aligns with regional spatial planning objectives.

In contrast, Sites 2 and 4 contain fertile Rhodic Lixisols but coincide with Critical Biodiversity Areas (CBAs), water bodies, and active agricultural holdings, rendering them environmentally and socioeconomically sensitive. Site 3, while moderately fertile, has a limited usable area due to servitudes and existing infrastructure, and exhibits visible erosion along disturbed slopes.

Site 5, dominated by nutrient-poor Rubic Arenosols, falls within the Grootvallei Conservation buffer zone and is ecologically sensitive. Site 6 also comprises Rubic Arenosols but is heavily disturbed by conveyor and railway infrastructure, providing only conditional suitability due to engineering limitations and restricted developable space. Overall, the assessment concludes that the agricultural sensitivity across the study area is low to moderate, with land best suited for extensive grazing and conservation-compatible uses. The soils' low fertility, limited moisture retention, and high erosion potential constrain any viable arable production. Consequently, locating the new WFGD disposal facility at Site 1 represents the most sustainable option—minimising the loss of productive land while maximising operational integration within Eskom's existing industrial footprint. Site 6 may be retained as a secondary contingency area, subject to further technical feasibility review.

9 SITE RANKING RESULTS

9.1 Site Ranking and Interpretation

Sites were ranked based on their total weighted scores and percentage scores. Higher scores indicate greater overall suitability for the development of a WFGD landfill facility. Sites with low scores were considered to present a higher risk and, in some cases, potential fatal flaws.

Table 10: Interpreting results

Percentage score	Interpretation
≥80%	Highly suitable site
65–79%	Suitable with manageable risks
50–64%	Marginal – requires strong justification
<50%	Unsuitable/high risk

The findings of the terrestrial biodiversity, freshwater, heritage, social, agricultural, and related specialist studies were systematically integrated into the multi-criteria site selection scoring framework. This ensured that site ranking was informed by specialist evidence and that ecological, social, technical, and legal constraints were appropriately reflected in the final site suitability scores.

The practical conveyance of the linear activities was just an estimation from the proposed WFGD site; however, this will be determined by detailed engineering designs.

Specialist conclusions were translated into **standardised scores (1–5)** using predefined descriptors, allowing direct comparison between alternative sites.

Table 11: Site 1 Score Rating

Criteria	Weight	Site 1 score (1–5)	Site 1 Weighted
Environmental	25	4	100
Heritage	10	4	40
Social	15	2	30
Financial	15	5	75
Technical	20	1	20
Legal & Regulatory	15	3	45
TOTAL	100		310
Site 1 % score			62

Sites located within **CBA 1** and/or exhibiting **Very High ecological sensitivity** were assigned low environmental scores due to the presence of intact bushveld, ecological corridors, wetlands, and river systems (notably the Sandloop River). Sites within CBA, particularly those already fragmented by infrastructure, were scored more favourably.

Heritage scores were derived from the site visit and the Phase I Archaeological and Cultural Heritage Impact Assessment, with particular emphasis on:

- The likelihood of graves, stone tools, or cultural landscapes;
- The extent of prior disturbance;
- The probability that permitting or mitigation (Phase 2) would be required under the National Heritage Resources Act (Act 25 of 1999).

Sites with known or likely graves or intact cultural landscapes were assigned lower scores due to regulatory constraints and social sensitivity.

Table 12: Site 2 Score Rating

Criteria	Weight	Site 2 score (1–5)	Site 2 Weighted
Environmental	25	2	50
Heritage	10	2	20
Social	15	4	60
Financial	15	5	75
Technical	20	3	60
Legal & Regulatory	15	3	45
TOTAL	100		310
Site 2 % score			62

Table 13: Site 3 Score Rating

Criteria	Weight	Site 3 score (1–5)	Site 3 Weighted
Environmental	25	4	100
Heritage	10	3	30
Social	15	4	60
Financial	15	5	75
Technical	20	4	80
Legal & Regulatory	15	3	45
TOTAL	100		390
Site 3 % score			78

Table 14: Site 4 Score Rating

Criteria	Weight	Site 4 score (1–5)	Site 4 Weighted
Environmental	25	1	25
Heritage	10	5	50
Social	15	1	15
Financial	15	4	60
Technical	20	1	20
Legal & Regulatory	15	3	45
TOTAL	100		215
Site 4 % score			43

Table 15: Site 5 Score Rating

Criteria	Weight	Site 5 score (1–5)	Site 5 Weighted
Environmental	25	1	25
Heritage	10	3	30
Social	15	3	45
Financial	15	4	60
Technical	20	1	20
Legal & Regulatory	15	3	45
TOTAL	100		225
Site 5 % score			45

Table 16: Site 6 Score Rating

Criteria	Weight	Site 6 score (1–5)	Site 6 Weighted
Environmental	25	4	100
Heritage	10	5	50
Social	15	5	75
Financial	15	5	75
Technical	20	4	80
Legal & Regulatory	15	3	45
TOTAL	100		425
Site 6 % score			85

When weighted scores across all criteria were aggregated:

- **Site 6** achieved the highest overall score and is identified as the **preferred site**, offering the lowest environmental, social, and regulatory risk; however, the extent of the site doesn't meet the requirements for all three waste by-products.
- **Site 3** ranked second and represents a **feasible alternative**, particularly from an operational perspective.
- **Sites 1 and 2** are conditionally viable but constrained.
- **Sites 4 and 5** are excluded due to **very high ecological sensitivity and regulatory risk**.

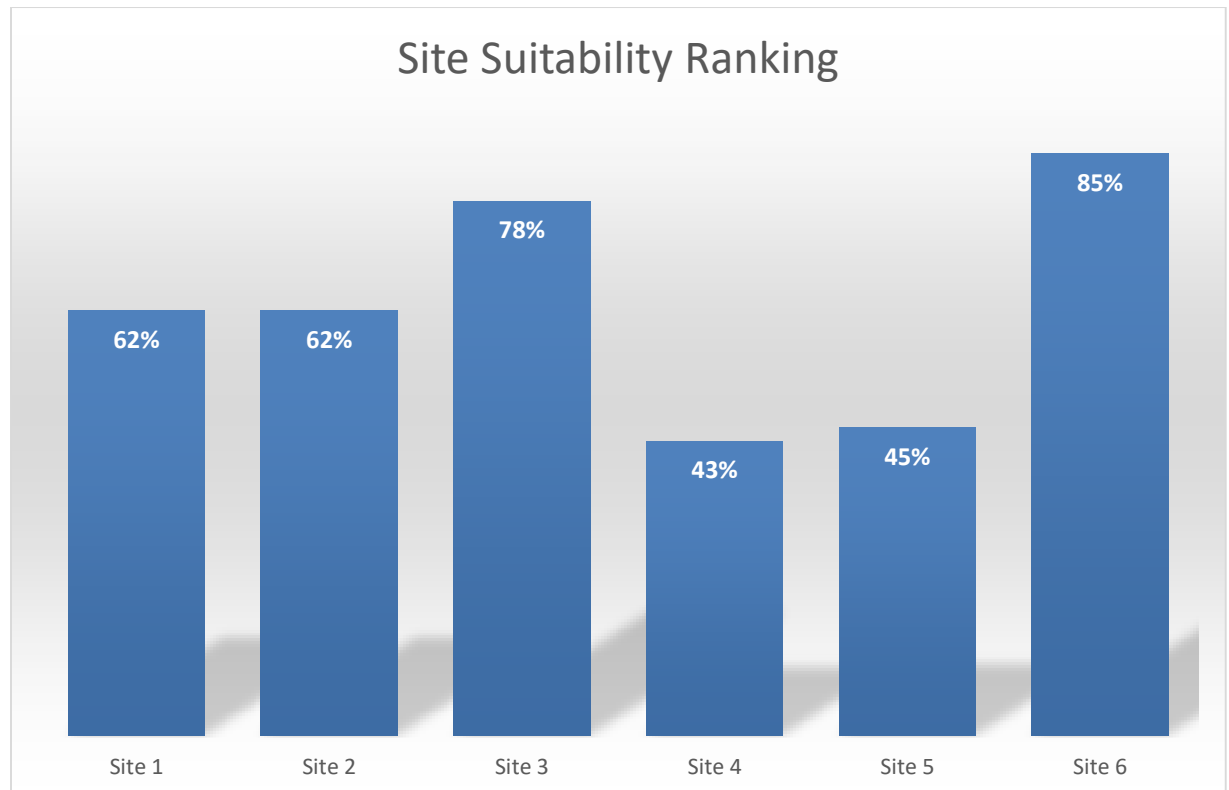


Figure 33: Site Suitability Ranking Scores

10 POTENTIAL IMPACTS

These are some of the environmental impacts identified by the specialist studies that were undertaken that might be associated with the proposed Construction of WFGD Waste Disposal sites:

1. *Heritage and Paleontology*
 - Impacts on graves and access to graves
 - Potential impacts on fossils
2. *Agriculture*
 - Reduction in arable or grazing land

- Erosion
- Loss of vegetation
- Loss of habitat for fauna
- Waterlogging and poor drainage
- Salinisation
- Organic matter depletion

3. *Aquatic*

- Change in the hydrological cycle
- Sedimentation
- Habitat fragmentation
- Altered overland flows
- Proliferation of alien invasive species
- Surface and groundwater contamination – leachate

4. *Avifauna*

- Habitat destruction within the project footprint;
- Destruction, degradation and fragmentation of surrounding habitats due to noise pollution, dust pollution and infringement;
- Displacement/emigration of avifauna community (including SCC);
- Direct mortality from persecution or poaching of avifauna species and collection of eggs;
- Direct mortality from increased vehicle and heavy machinery traffic.
- Collisions with infrastructure;
- Direct mortality from roadkill's, persecution or poaching of avifauna species and collection of eggs;
- Direct mortalities and hindrance of movement from fencing infrastructure;
- Leachate or runoff from waste disposal sites may contaminate nearby water bodies;
- Accumulation of heavy metals or other toxins can lead to bioaccumulation in birds because of pollution of the surrounding habitats.
- Collisions into and drownings in the open dams.

5. *Terrestrial Biodiversity*

- Habitat fragmentation
- Habitat loss
- Dust deposition on vegetation of gypsum, salts, etc
- Soil chemistry changes from dust/leachate
- Erosion and sedimentation
- Faunal disturbance
- Roadkill and operational mortality of fauna
- Cumulative hydrological alteration

6. *Climate Change*

- Air quality

- Socio-economic
- Health impacts
- Increased heat stress
- Increased vector and waterborne diseases
- Reduced food security
- Decreased quality of drinking water
- Increased risk to livestock

7. *Socio-economic*

- Employment
- Land use interference
- Heritage disturbance
- Traffic and safety
- Informal settlement influx
- Small business opportunities
- Social perception and trust

11 DISCUSSION OF SITE SELECTION RESULTS

11.1 Overview

The site selection process for the proposed Wet Flue Gas Desulphurization (WFGD) waste disposal facility was informed by brief site visits, a selection of specialist studies and a structured multi-criteria analysis. The discussion below synthesises the findings of the site visits, terrestrial biodiversity, freshwater, heritage, social, agricultural, technical, climate, financial, and legal assessments, and explains how these collectively informed the comparative evaluation and ranking of the six alternative sites.

Overall, the assessment confirmed that the broader Medupi landscape is ecologically and socially sensitive, forming part of a variety of conservation areas, grazing land, agricultural holdings, and industrial infrastructure. The assessment of alternative sites for the proposed WFGD disposal facility at Medupi Power Station considered a holistic approach of environmental and socio-economic factors, including biodiversity sensitivity, freshwater interactions, heritage and palaeontological resources, agricultural land capability, and social impacts. While all six alternatives are technically feasible to varying degrees, the degree of environmental integrity, regulatory risk, and potential social impact differs substantially between sites.

11.2 Environmental and Biodiversity Considerations

From an environmental perspective, biodiversity sensitivity emerged as one of the most critical differentiating factors between the alternatives. The terrestrial biodiversity screening confirmed that Sites 1, 4, and 5 are located within Critical Biodiversity Area 1 (CBA 1), while Sites 2, 3, and 6 fall

within Ecological Support Area 1 (ESA 1). This distinction is significant, as CBA 1 areas are essential for maintaining regional biodiversity patterns and ecological processes and are generally regarded as high-risk or exclusionary from a land-use planning perspective.

Sites 4 and 5 were identified as particularly sensitive due to their intact Limpopo Sweet Bushveld vegetation, strong ecological connectivity, and direct interaction with the Sandloop River and associated drainage networks. Site 5 was classified as a “No-Go” area owing to its irreplaceable ecological value and hydrological sensitivity. Development within these areas would pose a high risk of irreversible habitat loss, fragmentation of ecological corridors, and long-term impacts, including residual impacts on surface water and biodiversity, even with mitigation.

In contrast, Sites 3 and 6 are more disturbed and fragmented, with existing infrastructure such as roads, conveyors, and railway lines already impacting on ecological function. Site 6, which avoids all mapped drainage features and post-mitigation buffers, was assessed as having the lowest residual biodiversity and freshwater risk. These findings strongly influenced the environmental scores assigned in the multi-criteria analysis and supported the exclusion of Sites 4 and 5 from further consideration.

11.3 Freshwater and Aquatic Systems

The aquatic assessment further supported the differentiation between sites. Although no natural wetlands were identified within the project area, several non-perennial drainage features, artificial seep wetlands, and dams were mapped. The key determinant from a freshwater perspective was the extent to which each alternative intersected drainage features and associated buffers.

Sites 1, 4, and 5 intersect multiple drainage lines, with Site 5 showing the densest and most connected drainage network. These interactions substantially increase the risk of altered surface hydrology, sedimentation, and water quality impacts, particularly during construction and operational phases. On the contrary, Site 6 was confirmed to have no direct interaction with mapped drainage features, resulting in the lowest freshwater impact risk. However, the aquatic study did not pick up the pan located within site 6 and a wetland located in the southwestern portion of the site. These two watercourses might distort the outcome for site 6 when re-evaluated. Sites 2 and 3 occupy an intermediate position, with limited and manageable drainage interactions.

11.4 Heritage Sensitivity

The heritage and archaeological assessment indicate that much of the study area has been historically transformed through agriculture, mining, and infrastructure development, resulting in generally low archaeological sensitivity. However, graves and heritage sites were identified at certain alternatives, particularly Site 2, where significant cultural heritage resources (including the Thaba Potsame and Kgoro Heritage Sites) are present. These features represent a high constraint to development and require avoidance or formal mitigation in accordance with the National Heritage Resources Act (Act 25 of 1999). Site 2 presents a higher heritage risk due to the potential presence

of graves and stone walling, while Site 5 retains some potential for isolated archaeological tools associated with long-term farming and grazing use. In contrast, Sites 3 and 4 are heavily disturbed, and Sites 1 and 6 exhibit a relatively low probability of encountering significant heritage remains. These findings translated into higher heritage scores for Sites 3 and 6 and lower scores for Sites 2 and 5.

Palaeontological sensitivity across the sites is low, with only a very small chance of fossil plant material occurring within the underlying Swartrand Formation. A Fossil Chance Find Protocol is considered sufficient mitigation, and palaeontological impacts are not expected to constrain the project.

11.5 Social and Socio-Economic Context

The social assessment highlighted the dual nature of development sensitivity within the Lephalale municipal area, characterised by an industrialised core and a surrounding rural and conservation landscape. Sites located closer to active farming areas, conservation land, or smallholdings (notably Sites 2, 4, and 5) present a higher risk of land-use conflict, social opposition, and disruption of rural livelihoods.

Sites 1 and 6 are situated within or adjacent to established industrial corridors associated with the Medupi and Matimba Power Stations. As a result, these sites exhibit lower social sensitivity, minimal residential interface, and greater compatibility with existing land uses. Site 6 benefits from alignment with existing conveyor and railway infrastructure, reducing the likelihood of community disturbance and land-use displacement.

11.6 Agricultural Potential and Land Capability

The agricultural assessment confirmed that the broader study area is characterised by soils of moderate to low fertility, best suited to extensive grazing rather than intensive crop production. Nevertheless, differences in land capability and existing land use were identified between sites.

Site 1 was assessed as the most favourable from an agricultural perspective due to its existing industrial disturbance, moderate soil capability, and proximity to the Matimba Ash Disposal Facility. Sites 2 and 4, although containing more fertile soils in places, coincide with CBAs, water features, and active agricultural use, increasing the significance of potential impacts. Site 6, while already disturbed, is constrained by engineering limitations and restricted developable space, resulting in conditional suitability from an agricultural and technical perspective.

11.7 Avifaunal Considerations

The anticipated biodiversity impacts associated with the WFGD project include habitat loss and fragmentation, pollution risks to terrestrial and aquatic systems, and the displacement of Species of Conservation Concern (SCC). Of particular importance is the presence of high-value avifaunal

habitat, including areas capable of supporting large, disturbance-sensitive bird species such as the Saddle-billed Stork.

Several of the assessed alternatives overlap with habitats that provide critical foraging and breeding opportunities for SCC, and in some cases, confirmed nesting sites occur within proximity to the proposed development footprint. These findings underscore the need for strict adherence to spatial buffers, seasonal constraints, and ongoing monitoring. The identification of a 1 km no-go buffer around the Saddle-billed Stork nest is considered a key mitigation requirement and reflects best practice for safeguarding breeding success and long-term population viability.

11.8 Integrated Site Ranking and Preferred Alternative

When the findings of all specialist studies were integrated through the weighted scoring matrix, a clear ranking of alternatives emerged. Site 6 achieved the highest overall score, reflecting its low environmental and freshwater sensitivity, minimal heritage and social risks, and strong alignment with existing industrial infrastructure. Site 1 ranked second and represents a viable alternative, particularly from an operational and agricultural standpoint.

Sites 2 and 3 were identified as conditionally viable but constrained by heritage, freshwater, or layout considerations. Sites 4 and 5 consistently performed poorly across multiple criteria, particularly biodiversity, freshwater, and regulatory risk, and were therefore excluded from further consideration (see Figure 34 below).

Furthermore, figure 35 is a consolidate sensitivity map from all the undertaken specialists and their findings. Buffer zones have been superimposed in this map as per the legislation, so to assist the applicant to understand the viability of the proposed development in the earmarked land parcels. As per figure 34, this map compliments the findings on site and the site suitability ranking.

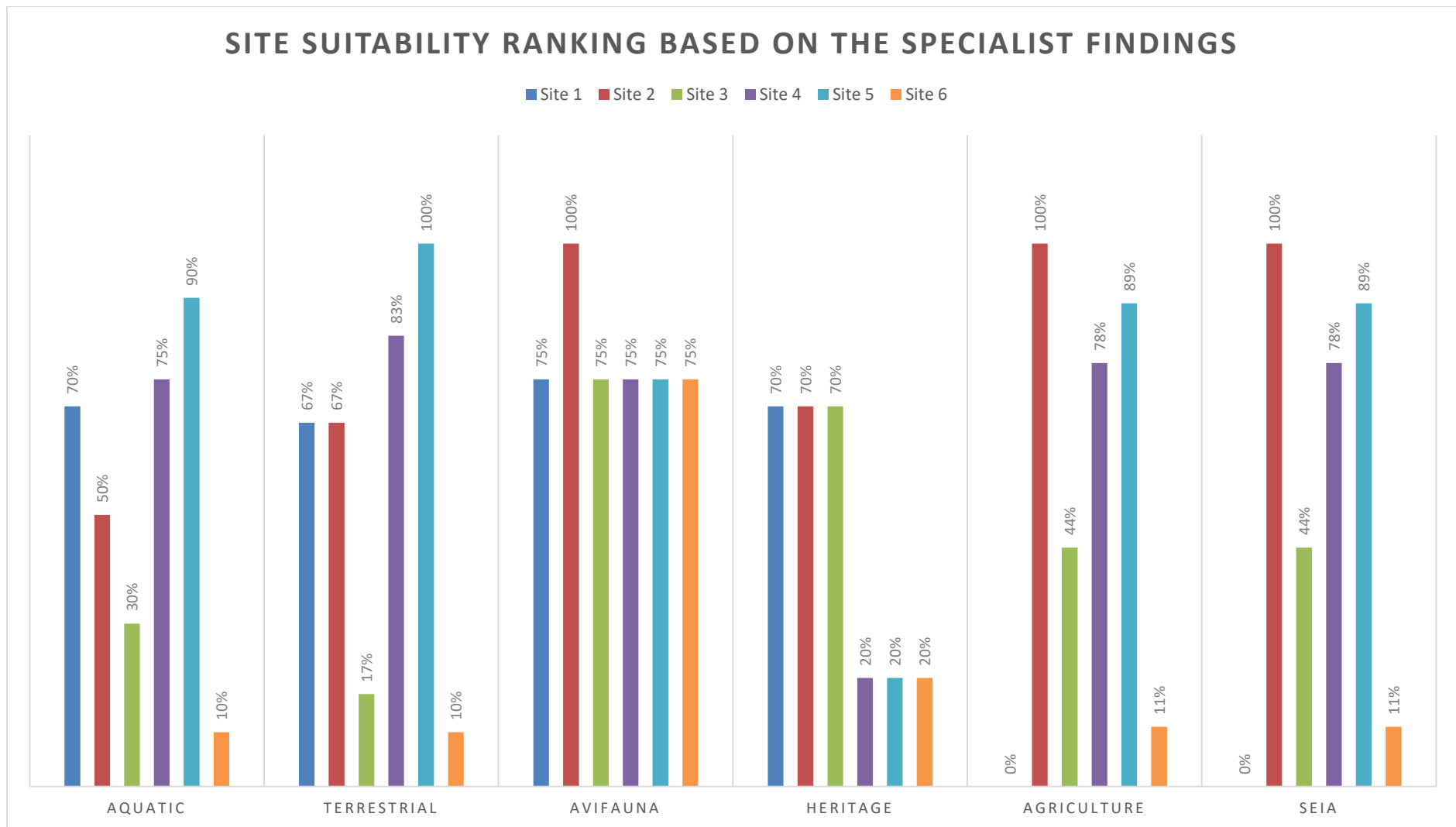


Figure 34: Site Suitability Ranking Scores based on the Specialists findings

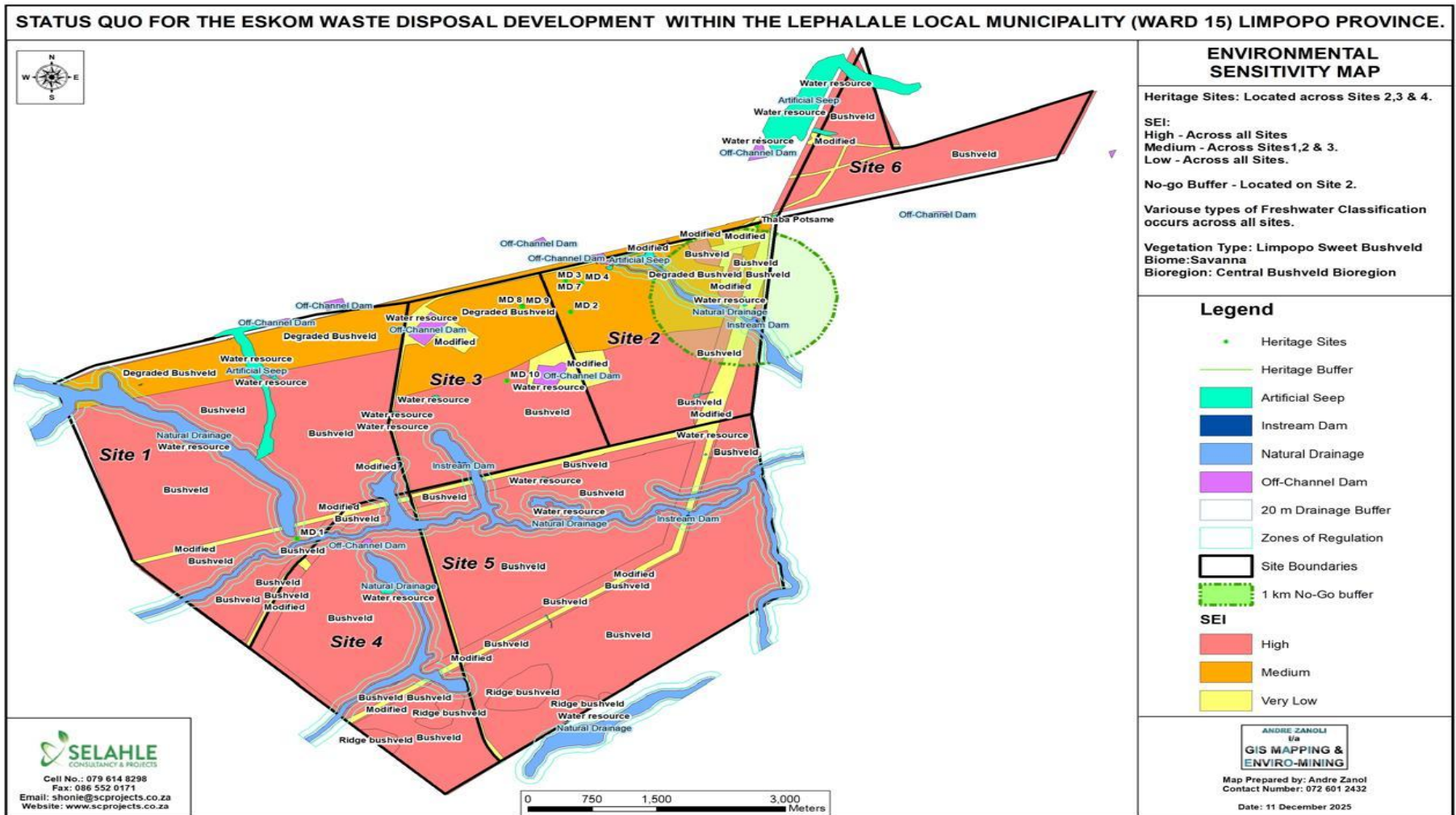


Figure 35: Sensitivity Map from specialists consolidated finding

11.9 Conclusion

When the findings of all specialist studies were integrated and assessed through a weighted multi-criteria scoring process, Site 6 achieved the highest overall score and is therefore identified as the preferred site for the WFGD landfill facility. Site 6 offers the lowest combined environmental, social, heritage, and regulatory risk due to its industrial character, absence of freshwater features, low biodiversity sensitivity relative to other alternatives, and minimal land-use conflict. However, a key limitation is that the **available footprint at Site 6 is insufficient to accommodate all three WFGD waste by-products**, which will require further technical refinement, potential optimisation of the facility layout, or consideration of complementary disposal solutions.

The identification of Sites 1,3 and 6 as preferred alternatives, with Site 2 as a feasible secondary option. These represent a balanced outcome that minimises environmental and social risk while supporting Eskom's operational requirements and compliance obligations. Continued refinement of the facility layout and the implementation of recommended mitigation measures will be essential to ensure that residual impacts remain within acceptable limits during subsequent project phases.

The assessment of alternative sites for the Wet Flue Gas Desulphurisation (WFGD) disposal facility at Medupi Power Station considered various environmental and socio-economic factors, such as biodiversity, freshwater interactions, heritage resources, agricultural capability, and social impacts. The findings indicate that while the broader area is environmentally sensitive, the sensitivity varies between alternatives, allowing for a preferred site identification.

Biodiversity assessments revealed that much of the project area is in Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), emphasising the need for impact avoidance. Sites 4 and 5 are particularly sensitive due to intact habitats and proximity to the Sandloop River. Sites 1, 3, and 6 are in more transformed landscapes, presenting lower ecological risks.

From a freshwater perspective, Site 6 is the most favourable, avoiding all mapped drainage features from a specialist point of view; however, the presence of two waterbodies may reduce the site's feasibility and increase its risk depending on the confirmation from the specialist during the EIA process. Sites 2 and 3 have manageable interactions, while Sites 1 and 4 intersect multiple drainage lines. Site 5 is the least preferred due to its dense drainage network, posing the highest hydrological risks.

The socio-economic assessment highlighted positive impacts during construction, including temporary job creation and local procurement, which could aid poverty alleviation in Marapong and Lephalale. However, potential negative impacts were deemed manageable through a Social Management Plan (SMP) that includes local labour targets and community engagement.

Site 6 ranked preferred site overall all the land parcels that were identified for the WFGD Waste Disposal Sites. It represents a feasible and defensible alternative, particularly from an operational and environmental perspective. It further presents lowest overall environmental, heritage, and regulatory risk. Though there would be space constraints as the Disposal sites were earmarked to function and operate for over 45 years, the site would only offer 25 years of waste storage.

Site 3 ranked second overall and represents a **feasible and defensible alternative**, particularly from an operational and environmental perspective, given its previously disturbed nature and manageable environmental constraints.

Sites 1 and 2 are considered conditionally viable, but are subject to notable constraints, including heritage sensitivity, freshwater interactions, and agricultural or land-use conflicts, which would necessitate careful layout optimisation and the implementation of stringent mitigation measures.

Sites 4 and 5 are excluded from further consideration, as their very high ecological sensitivity, interaction with Critical Biodiversity Areas, and elevated regulatory risk render them unsuitable for WFGD landfill development.

In conclusion, the integrated assessment confirms that the proposed WFGD landfill development at Medupi Power Station can proceed with site selection and relevant legislative processes, provided that the preferred sites are selected and all recommended mitigation and management measures are implemented. The project is expected to support Eskom's environmental compliance objectives while limiting long-term adverse environmental and socio-economic impacts, provided that adaptive management, continuous monitoring, and transparent stakeholder engagement are maintained throughout the project life cycle.

12 RECOMMENDATIONS

While Site 6 is identified as the preferred alternative based on the aggregated weighted scoring and presents the lowest overall environmental, heritage, and regulatory risk, its limited spatial extent constrains its ability to accommodate all three WFGD waste by-products within a single footprint. To address this limitation while maintaining compliance with environmental and heritage protection requirements, it was recommended that a combined or clustered disposal approach be considered.

Specifically, two or three of the higher-ranking sites (notably Sites 6, 3 and, where necessary, Site 1) may be integrated into a single disposal strategy, with each site accommodating specific waste streams or phased disposal sections, refer to Table 17 for the developable sizes as per the feasible site and figure 35.

This approach would allow for the maximum available landfill capacity to be achieved while maintaining avoidance of sensitive heritage features, ecological habitats, freshwater buffers, and Critical Biodiversity Areas, however, this approach may be costly when it comes to engineering designs in terms of conveyance or the waste by-products.

The implementation of a multi-site configuration must be informed by:

- Detailed layout optimisation to ensure all permanent infrastructure remains outside mapped heritage sites, graves, drainage features, and biodiversity buffer zones, or these areas can be completely avoided;
- A site-specific Heritage Management Plan (HMP) for any areas containing graves or cultural features;
- Consolidated stormwater and polluted water management systems designed to prevent cumulative freshwater impacts across sites;
- An integrated Biodiversity and Environmental Management Plan to ensure that ecological corridors and no-go areas are retained between disposal footprints;
- A phased development approach that allows for adaptive management and monitoring as disposal capacity requirements evolve.

This integrated strategy provides a practical and environmentally responsible solution to meeting the full WFGD waste disposal requirements while minimising the spatial footprint of individual landfills, reducing cumulative impacts, and maintaining compliance with the National Environmental Management Act (NEMA), the National Heritage Resources Act (NHRA), and associated specialist recommendations. Refer to figure 36 for the preferred land parcels based on the specialist's studies and the EAP findings.

Table 17: Sizes of the Developable Area per Sites

Site No:	Site Size in hectares
1	277
2	145
3	97
6	241

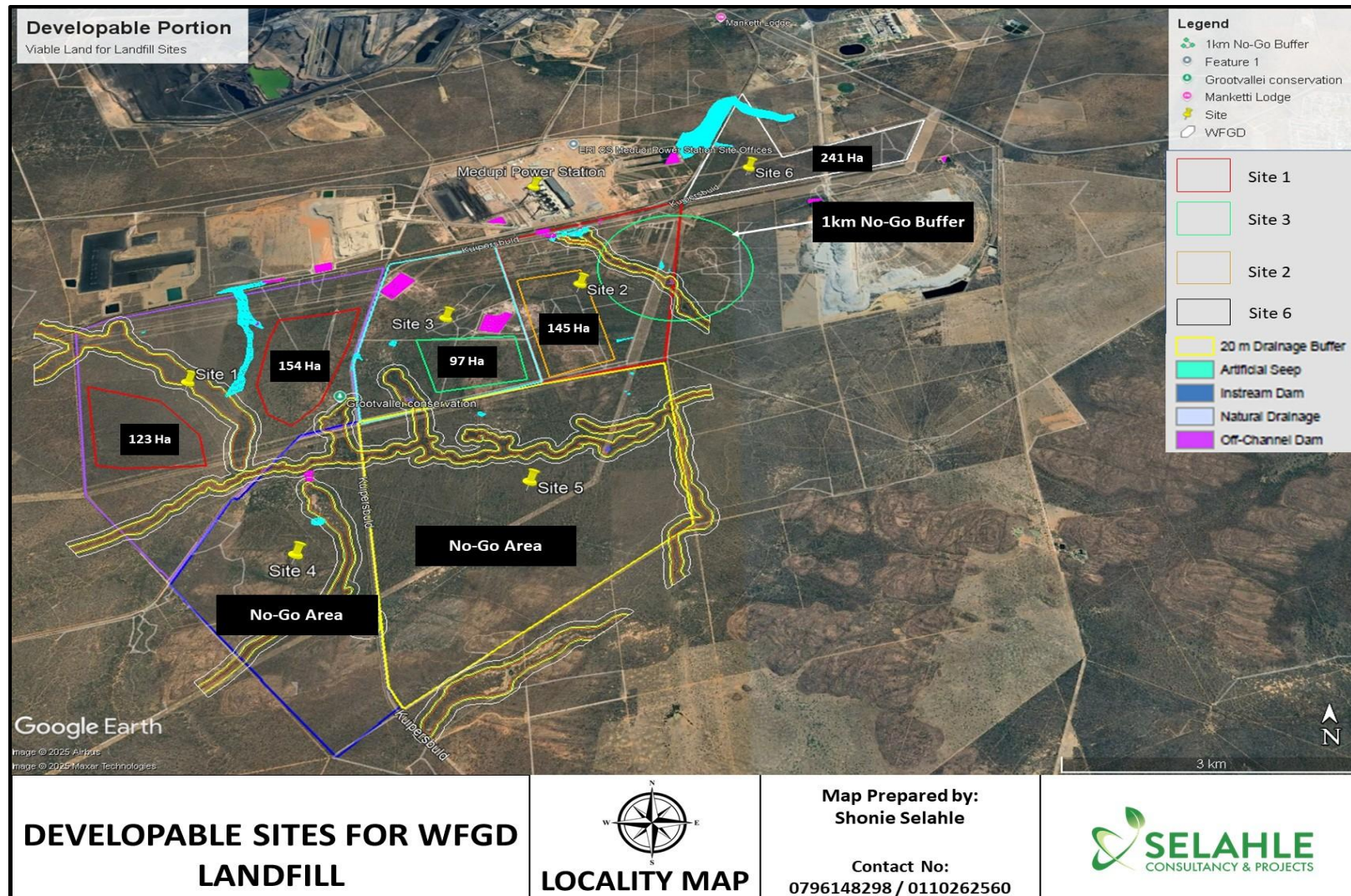


Figure 36: Developable Portion of lands per screening outcome

Eskom Holdings SOC Limited concluded the site selection process by identifying Site 6 as the preferred option and reducing the storage duration from 45 to 25 years to accommodate all identified by-product wastes (gypsum, chemical salts, and chemical sludge).

Despite environmental constraints identified through specialist studies, Site 6 remains the most feasible option. These constraints will be assessed in detail during the Environmental Impact Assessment (EIA) phase. Refer to Figure 38 for the constraint map.

Portions of Sites 2 and 3 will be utilised for the proposed waste transport route, with a conveyor belt system identified as the preferred option. Figure 37 illustrates the selected site and associated conveyor routes. Figure 39 and Table 18 illustrates the demarcation of Site 6 to accommodate all WFGD by-product waste.

Table 18: Sizes of the Developable Area per Sites

Waste Product	Waste Stream Footprint
Chemical Salts	9.8 Ha
Chemical Sludge	15.4 Ha
Gypsum	47 Ha
	58 Ha

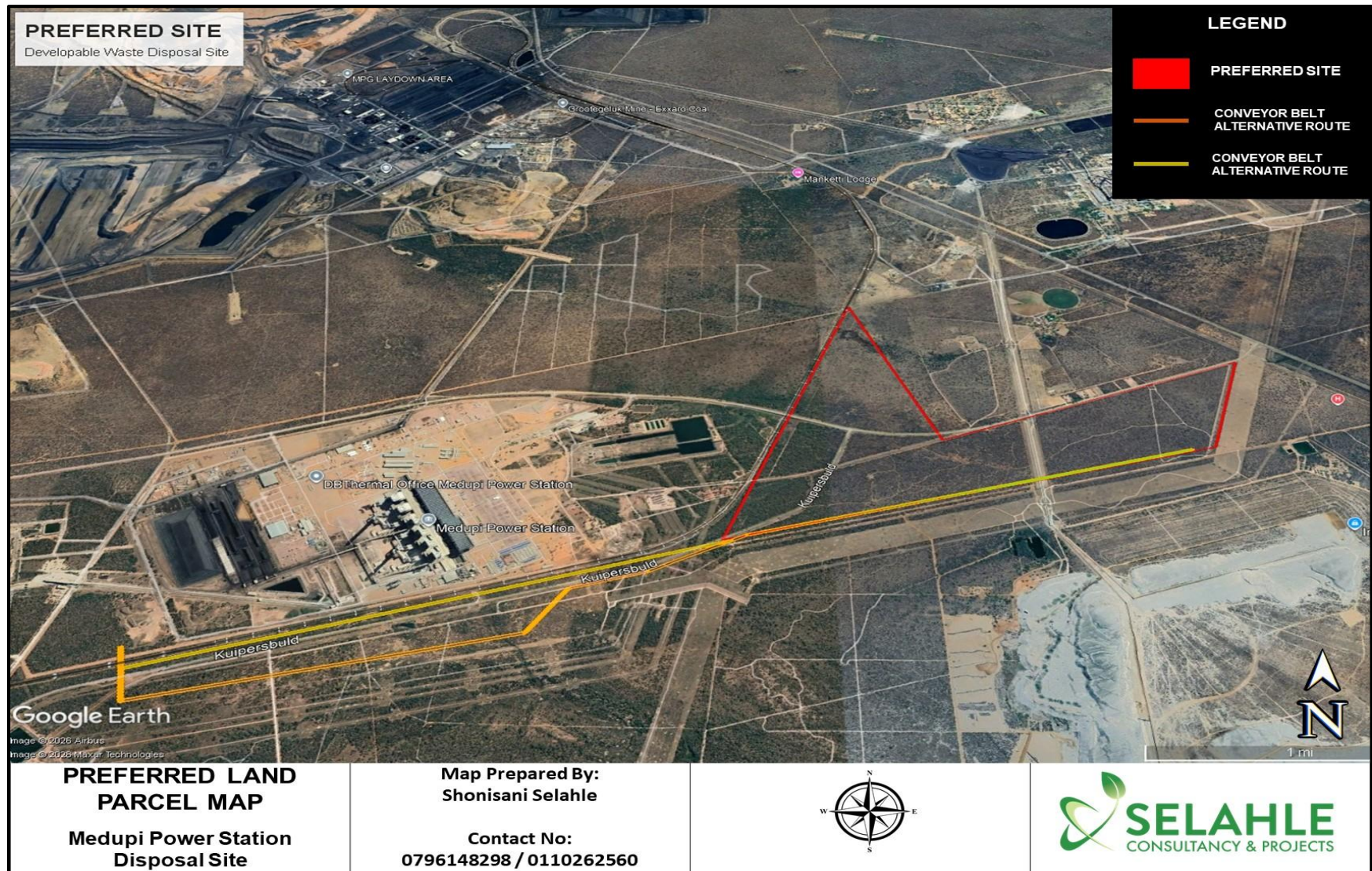


Figure 37: Preferred Land Parcel for the WFGD Waste Disposal By-Products

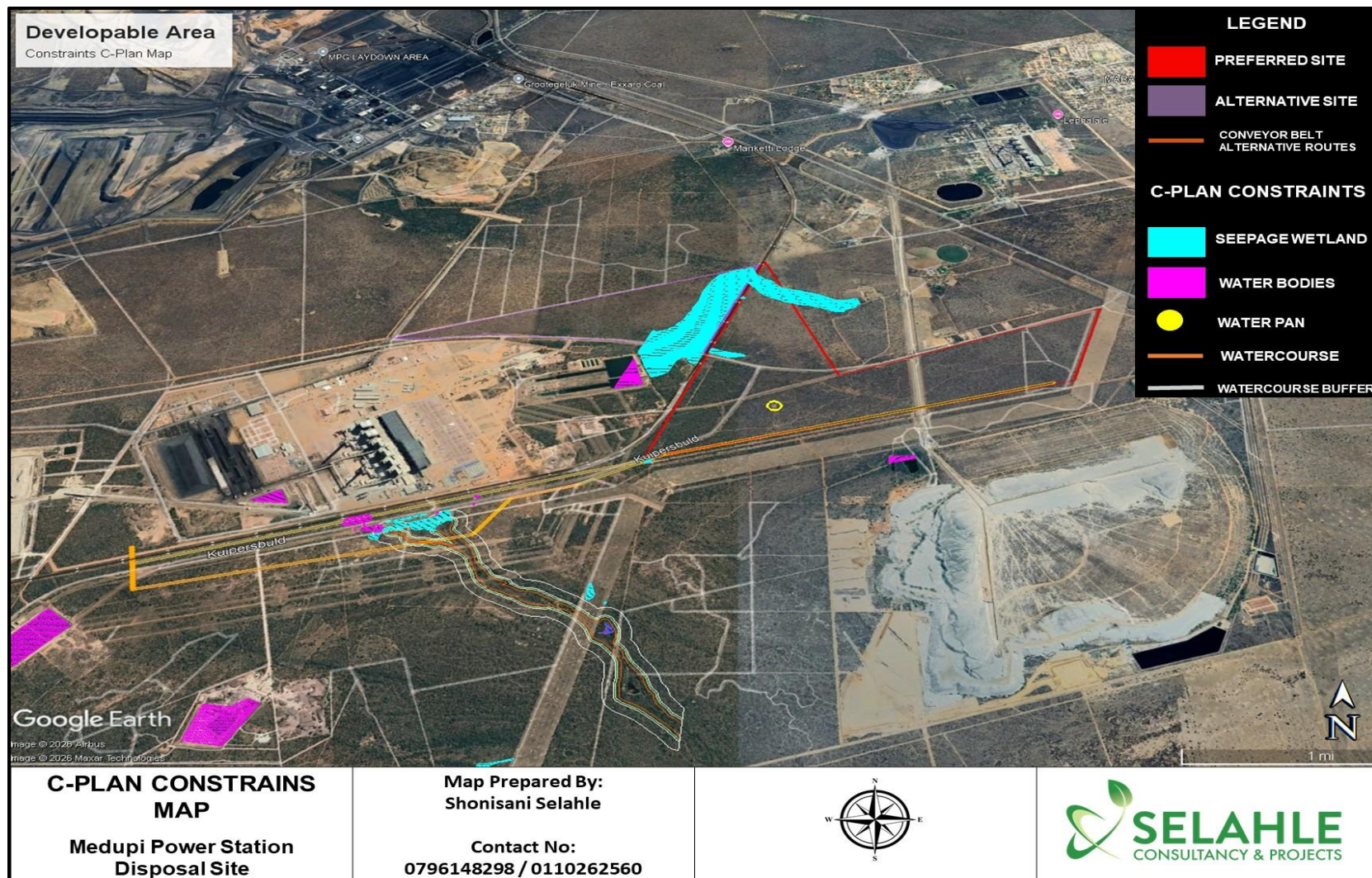


Figure 38: Preferred Land Parcel for the WFGD Waste Disposal By-Products

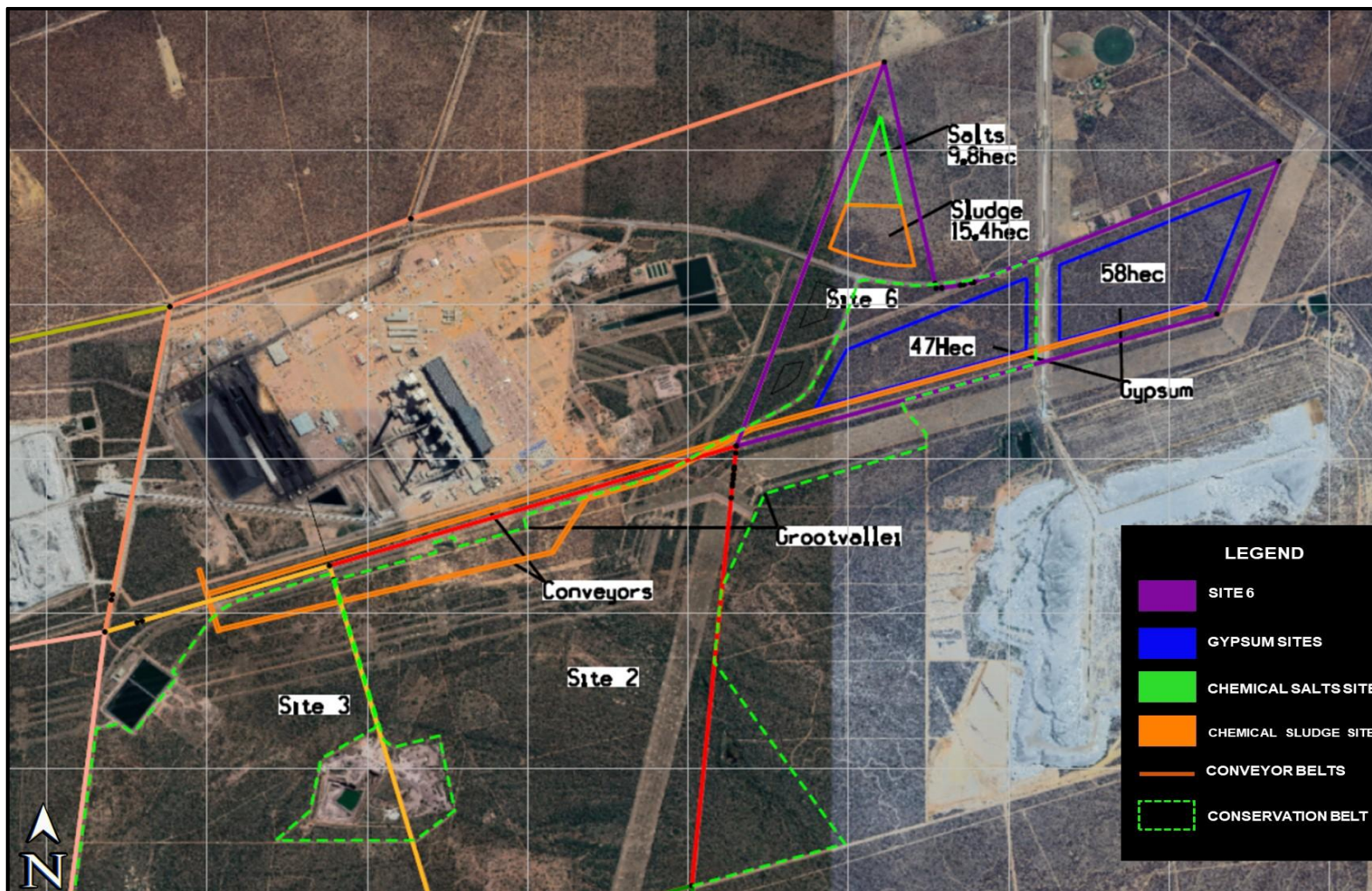


Figure 39: Preferred Land Parcel for the WFGD Waste Disposal By-Products

REFERENCES

Agricultural Research Council – Institute for Soil, Climate and Water (ARC-ISCW). (2020). *Land Capability Classification and Agricultural Potential of South Africa*. Pretoria: ARC-ISCW.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & de Villiers, M.S. (eds.). (2014). *Atlas and Red List of Reptiles of South Africa, Lesotho, and Swaziland*. Suricata 1. Pretoria: South African National Biodiversity Institute.

Bergh, S. (1999). *Archaeology and Prehistory of the Lephalale Area*. Pretoria: University of South Africa.

Biemond, C. (2002). *Historical Land Use Practices in the Limpopo Region*. Waterberg Heritage Research.

Binneman, J., Hine, D. & Maggs, T. (2011). *The Middle Stone Age in South Africa: Current Perspectives*. Cape Town: South African Archaeological Society.

Biodiversity Institute – Biodiversity GIS (BGIS). (2021). *Biodiversity GIS* [online]. Available at: <http://bgis.sanbi.org> (Accessed October 2021).

Bird Atlas Project (SABAP2). (2018). Available at: <http://vmus.adu.org.za>

Bird Atlas Project (SABAP2). (2022). Available at: <http://vmus.adu.org.za>

BirdLife International. (2021). *The IUCN Red List of Threatened Species 2021*.

BirdLife South Africa. (2015). *Fences & birds: Minimising unintended impacts*. Available at: <https://www.birdlife.org.za>

BirdLife South Africa. (2018). *Checklist of Birds in South Africa*. Available at: <https://www.birdlife.org.za>

BODATSA-POSA. (2016). *Plants of South Africa – an online checklist*. POSA ver. 3.0. Available at: <http://posa.sanbi.org> (Accessed August 2023).

Buckland, S., Anderson, D., Burnham, K.P. & Laake, J. (1993). *Distance Sampling: Estimating Abundance of Biological Populations*. London: Chapman and Hall.

Calvin, K., et al. (2023). *Climate Change 2023: Synthesis Report*. Geneva: IPCC. <https://doi.org/10.59327/IPCC/AR6-9789291691647>

Chen, Q. (2015). Influence of Flue Gas Desulfurization Gypsum and Potentially Toxic Elements on Sodic Soils. *Environmental Geochemistry and Health* [online]. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC4449716/>

Coordinated Avifaunal Roadcounts (CAR). (2020). Available at: <http://car.birdmap.africa>

CSIR. (2019). *Green Book – Detailed projections of future climate change over South Africa*. Pretoria: Council for Scientific and Industrial Research.

Cumming, G.S. & Henry, D.A.W. (2019). Point counts outperform line transects when sampling birds along routes in South African protected areas. *African Zoology*, 54(4), 187–198.

Davies, G. (1950s–1960s). *Early Stone Age Excavations in the Msunduzi Valley*. Pietermaritzburg: Natal Museum Archives.

de Jonge, M.M.J., et al. (2022). The impacts of linear infrastructure on terrestrial vertebrate wildlife populations. *Journal of Environmental Management* [online].

Del Hoyo, J., Collar, N.J., Christie, D.A., Elliott, A., Fishpool, L.D.C., Boesman, P. & Kirwan, G.M. (1996). *HBW and BirdLife International Illustrated Checklist of the Birds of the World*. Barcelona & Cambridge: Lynx Editions and BirdLife International.

Department of Agriculture, Forestry and Fisheries (DAFF). (2017). *Procedural and Policy Guidelines for Agricultural Impact Assessments*. Pretoria.

Department of Agriculture, Land Reform and Rural Development (DALRRD). (2019). *Guidelines for the Implementation of Agricultural Impact Assessments*. Pretoria.

Department of Agriculture, Land Reform and Rural Development (DALRRD). (2021). *National Policy on the Preservation and Development of Agricultural Land*. Pretoria: Government Printer.

Department of Employment and Labour (DEL). (2015). *Occupational Health and Safety Act (Act No. 85 of 1993)*. Pretoria.

Department of Environmental Affairs (DEA). (2017). *Guideline for the Assessment of Environmental Impacts on Agricultural Resources*. Pretoria.

Department of Environment, Forestry and Fisheries (DEFF). (2020). *Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes*. Pretoria.

Department of Forestry, Fisheries and the Environment (DFFE). (2014). *Guideline on the Assessment of Social Impacts as part of the EIA Process*. Pretoria.

Department of Forestry, Fisheries and the Environment (DFFE). (2020). *National Environmental Management Act*. Pretoria: Government Gazette.

Department of Forestry, Fisheries and the Environment (DFFE). (2020). *National Environmental Management: Waste Act*. Pretoria: Government Gazette.

Department of Forestry, Fisheries and the Environment (DFFE). (2021). *National Protected Areas Expansion Strategy*.

Department of Forestry, Fisheries and the Environment (DFFE). (2023). *National Greenhouse Gas Inventory Report 2000–2020*. Pretoria.

Department of Water and Sanitation (DWS). (2016). *General Authorisation under the National Water Act*. Pretoria.

Department of Water and Sanitation (DWS). (2023). *General Authorisation under the National Water Act*. Pretoria.

Driver, A., Nel, J.L., Murray, K., et al. (2011). *Implementation Manual for Freshwater Ecosystem Priority Areas*. WRC Report No. 1801/1/11.

EM-DAT. (n.d.). *The International Disaster Database*. Available at: <https://www.emdat.be>
Eskom Holdings SOC Ltd. (2022). *Environmental Health and Air Quality Monitoring Report*. Johannesburg.

Eskom Holdings SOC Ltd. (2025). *Site Screening Feedback: Medupi WFGD Alternative Sites*. Lephalale.

Equator Principles Association. (2020). *The Equator Principles (EP4)*.

FAO. (2022). *Guidelines for Soil Description* (5th ed.). Rome: FAO.

Federal Highway Administration (FHWA). (n.d.). *Impacts of roads on wildlife populations*.

Freiman, M.T. & Piketh, S. (2003). Air transport into and out of the industrial Highveld region of South Africa. *Journal of Applied Meteorology*, 42(7), 994–1002.

Germanwatch; NewClimate Institute; Climate Action Network International. (2024). *Climate Change Performance Index 2025*.

Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. (eds.). (2005). *Roberts – Birds of Southern Africa*. Cape Town.

Huffman, T. (1990). *Iron Smelting and Early Iron Age Settlements in Southern Africa*. Johannesburg.

Huffman, T.N. (2007). *Handbook to the Iron Age*. Scottsville.

IUCN. (2021). *The IUCN Red List of Threatened Species*. Available at: www.iucnredlist.org

Kotze, D.C., et al. (2009). *A technique for rapidly assessing ecosystem services supplied by wetlands*. Mondi Wetland Project.

Lephalale Local Municipality. (2021). *Spatial Development Framework 2021–2026*.

Lephalale Local Municipality. (2024). *Integrated Development Plan 2023–2027*.

Maiti, S. (2023). A comprehensive review of flue gas desulphurized gypsum. *Renewable & Sustainable Energy Reviews*.

Mucina, L. & Rutherford, M.C. (2012). *The Vegetation of South Africa, Lesotho and Swaziland*. Pretoria: SANBI.

SANBI. (2016). *Lexicon of Biodiversity Planning in South Africa*. Pretoria.

SANBI. (2020). *Species Environmental Assessment Guideline*. Pretoria.

Statistics South Africa. (2022). *Census 2022 Demographic Profile*. Pretoria.

Tyson, P., Garstang, M. & Swap, R. (1996). Large-scale recirculation of air over southern Africa. *Journal of Applied Meteorology*, 35(12), 2218–2236.

UNEP. (2021). *Sustainable Land Management and Soil Conservation Framework*. Nairobi.

WHO. (2020). *Ambient Air Pollution Exposure and Public Health Guidelines*. Geneva.

World Bank Group. (n.d.). *Integrating Resilience into Operations*. Washington DC.