ENVIRONMENTAL & ENGINEERING

REPORT

OKOVANGO HOLDINGS (PTY) LTD

ENVIRONMENTAL AUTHORISATION APPLICATION IN SUPPORT OF A PROSPECTING RIGHT APPLICATION

DMRE REF: MP 30/5/1/1/2/17449 PR

DRAFT BASIC ASSESSMENT REPORT & ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

REPORT REF: 22-2123-AUTH (OKOVANGO 17449 PR)

PROSPECTING RIGHT APPLICATION FOR COAL IN RESPECT OF PORTIONS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 AND 15 OF THE FARM WONDERFONTEIN 341 IR. THE REMAINING EXTENT OF THE FARM KUILWATER 347 IR. PORTIONS 1, 2 AND 3 OF THE FARM GRUISFONTEIN 344 IR. PORTIONS 1, 3, 4, 17, 19, 26, 27, 28, 32 AND 35 OF THE FARM WONDERFONTEIN 350 IR LOCATED IN THE GOVAN MBEKI LOCAL MUNICIPALITY AND THE GERT SIBANDE DISTRICT MUNICIPALITRY MPUMALANGA PROVINCE.

VERSION BB
27 March 2023

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AA – draft	22/03/2023	Lian Roos		First draft for review / comments
BB – draft	24/03/2023	Riana Panaino		Technical Review
CC-draft		Leoni le Roux		Quality review
Approved for Distribution:				
0.0		Riana Panaino		Final report

Quality Control by:

Nature of Signoff:	Responsible Person:	Role / Responsibility	Qualification
Author	Lian Roos	Environmental Consultant	BSc Hons Water Utilisation BSc Environmental Science EAPASA - Candidate EAP (2022/4550)
Technical Reviewer	Riana Panaino	Divisional Head - Environmental Authorisations	BSc Honns Biodiversity and Conservation SACNASP - Professional Natural Scientist (117170) EAPASA – Registered EAP (2021/4135)
Quality Reviewer	Leoni le Roux	Project Administration	Professional Secretary and Personal Assistant

DISCLAIMER:

This is a legally binding document and many of the actions and recommendations remain the responsibility of the client (as the owner/lessee of the property).

EAP - was independent and performed the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application; have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity; ensure compliance with these Regulations;

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Take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge, as well as available information. Information utilised and contained in this report is based on data/information supplied to Eco E by the client and other external sources (including previous site investigation data and external specialist studies).

The author utilised his/her best scientific and professional knowledge in preparing this report and the content herein contained is and remains confidential in nature, save where otherwise ordered by a Court of law.

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EXECUTIVE SUMMARY

BACKGROUND

Okovango Holdings (Pty) Ltd (hereafter referred to as "Okovango" or the "applicant") applied for a **Prospecting Right** in terms of Section 16 of the Mineral and Petroleum Resources Development Act ("MPRDA", Act No.28 of 2002) for **coal** to the Regional Department of Mineral Resources & Energy ("DMRE" Mpumalanga) in respect of portions **1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 and 15 of the farm Wonderfontein 341 IR. The remaining extent of the farm Kuilwater 347 IR. Portions 1, 2 and 3 of the farm Gruisfontein 344 IR, and Portions 1, 3, 4, 17, 19, 26, 27, 28, 32 and 35 of the farm Wonderfontein 350 IR,** located in the local municipality of Govan Mbeki and the district municipality of Gert Sibande Mpumalanga Province.

Prospecting aims to determine if economically viable mineral deposits exist within an application area. In order to undertake prospecting activities, the applicant (Okovango) requires a Prospecting Right in terms of the MPRDA. An applicant is also required to obtain an Environmental Authorisation (EA) in terms of the National Environmental Management Act (NEMA, Act No. 107 of 1998) which involves the submission of a Basic Assessment Report (BAR) and Environmental Management Programme (EMP) to the local competent authority.

Eco Elementum (Pty) Ltd (hereafter referred to as "Eco Elementum") has been appointed by the applicant as the independent Environmental Assessment Practitioners (EAP), to undertake the Environmental Authorisation (EA) process.

PROJECT DESCRIPTION

Table 1-1: Project description

Item	Detail
Type of mineral	Coal
Prospecting method	Diamond drilling to test defined targets. Geotechnical drilling of 10 boreholes to an average depth of 100 – 200 meters.
Depth of the mineral below surface	To be established.
Geological formation	Highveld Ridge Coalfield
Prospecting Right Size	6445 hectares (ha).
Mineral Reserve	To be established.
Prospecting Right Properties	Portions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 and 15 of the farm Wonderfontein 341 IR. The remaining extent of the farm Kuilwater 347 IR. Portions 1, 2 and 3 of the farm Gruisfontein 344 IR, and Portions 1, 3, 4, 17, 19, 26, 27, 28, 32 and 35 of the farm Wonderfontein 350 IR.

Property Applicable to current application (SG Codes)	T0IR00000000034100001 T0IR00000000034400001 T0IR00000000034100002 T0IR00000000034400002 T0IR00000000034100003 T0IR00000000034400003 T0IR00000000034100004 T0IR00000000035000001 T0IR00000000034100005 T0IR00000000035000003 T0IR00000000034100006 T0IR00000000035000004 T0IR00000000034100007 T0IR00000000035000017 T0IR00000000034100008 T0IR00000000035000019 T0IR00000000034100009 T0IR00000000035000026 T0IR00000000034100010 T0IR00000000035000027 T0IR00000000034100012 T0IR00000000035000028 T0IR00000000034100014 T0IR00000000035000032 T0IR00000000034100015 T0IR00000000035000035 T0IR00000000034700000
Existing Authorisations	N/A
Life of mine	N/A

LOCATION

Leandra is located roughly 3 km to the northeast of the proposed prospecting area, while Balfour is located 30 km to the southwest and Delmas 34 km to the northwest. The demarcated study area falls within the Govan Mbeki Local Municipality and the Gert Sibande District Municipality in the Mpumalanga Province. The N17 national road runs in an east-west direction along a section of the northern boundary of the study area, while the R50 primary road runs in a northwest-southeast direction roughly 4 km to the east. The R548 secondary road runs in a northeast- southwest direction approximately 3.5 km to the west of the study area. Several local farm roads also intersect the study area.

PROJECT PROCESS

Table 1-2: Basic Assessment Timeline followed

Date	Basic Assessment timeline
N/A	Prospecting Right Application on SAMRAD.
25/11/2022	Acceptance received from DMRE.
31/03/2023	Advert Placed in Ridge Time's Newspaper.
27/03/2023	Interested and Affected Parties notified via email and SMS/WhatsApp.
27/03/2023 to 29/04/2023	30-day Public Participation for the NEMA BAR/EMP process.
02/05/2023	Submission of the final BAR/EMP.

The MPRDA requires compliance with related legislation, specifically the National Environmental Management Act of 1998. This Basic Assessment Report includes, amongst others, the following information as required in terms of the NEMA:

- A description of the environment likely to be affected by the proposed prospecting activities;
- An assessment of potential impacts on the environment, socio-economic conditions, as well as cultural and heritage aspects;
- A summary of the potential significance of identified impacts;
- Proposed mitigation and management measures to minimise adverse impacts and to optimise benefits; and

- Planned monitoring and performance assessment of the EMP and Rehabilitation measures of areas disturbed during prospecting.

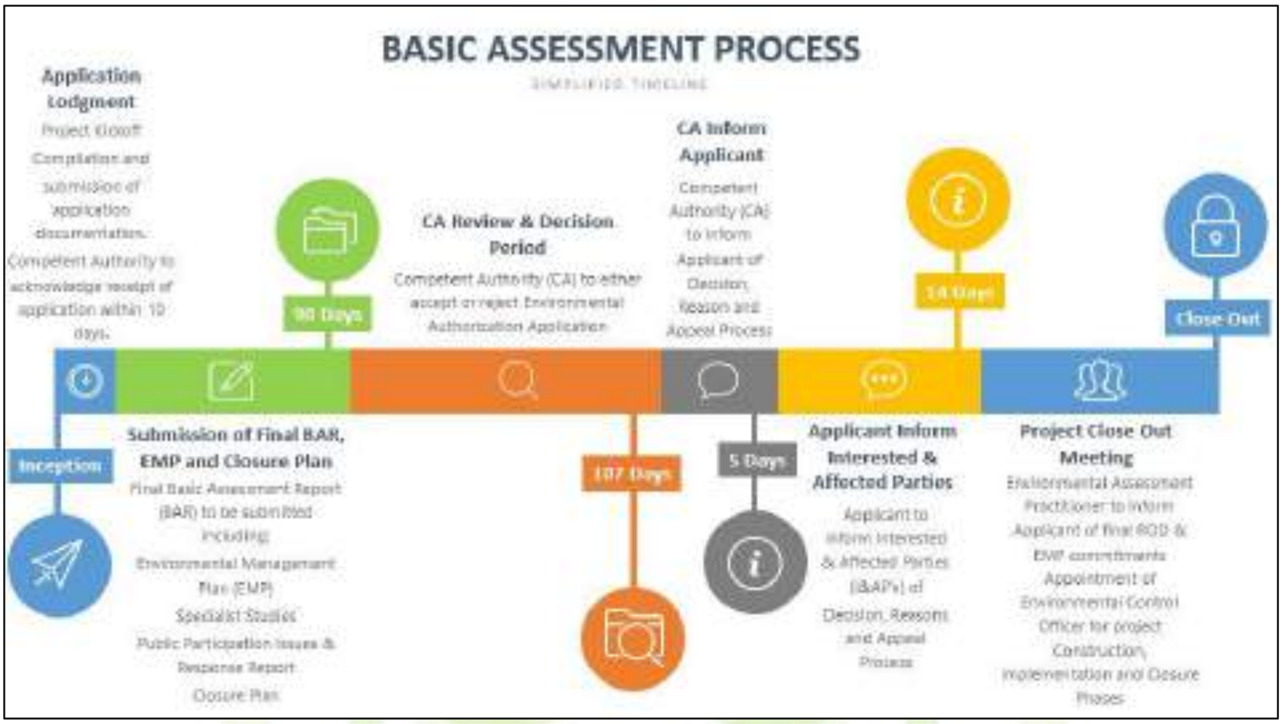

Figure 1-1: Basic Assessment Process Timeline

REGISTERED LANDOWNER

The registered owners of the farms were listed as follows:

Table 1-3: Directly affected landowners

Landowner	Farm Portion
JOHN CAMERON TRUST	Portion 1 of the farm WONDERFONTEIN 341 IR
CALITZ SUSANNA CATHARINA	Portion 2 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 3 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 4 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 5 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 6 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 7 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 8 of the farm WONDERFONTEIN 341 IR
DEMANRI PTY LTD	Portion 9 of the farm WONDERFONTEIN 341 IR
W & A FAMILIE TRUST	Portion 10 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 12 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 14 of the farm WONDERFONTEIN 341 IR

Landowner	Farm Portion
JOHN CAMERON TRUST	Portion 15 of the farm WONDERFONTEIN 341 IR
KUILWATER LANDGOED CC	Remaining extent of the farm KUILWATER 347 IR
LUPHONDO COMMUNAL PROP ASSOCIATION	Portion 1 of the farm GRUISFONTEIN 344 IR
LUPHONDO COMMUNAL PROP ASSOCIATION	Portion 2 of the farm GRUISFONTEIN 344 IR
LUPHONDO COMMUNAL PROP ASSOCIATION	Portion 3 of the farm GRUISFONTEIN 344 IR
QALABOTJHA BALIMI COMMUNAL PROP ASSOC	Portion 1 of the farm WATERVALSHOEK 350 IR
WATERVALSHOEK PLUIMVEE PTY LTD	Portion 3 of the remaining extent of the farm WATERVALSHOEK 350 IR
A S SIM SUNRISE FARMING PTY LTD	Portion 4 of the farm WATERVALSHOEK 350 IR
NATIONAL GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA	Portion 17 of the farm WATERVALSHOEK 350 IR
A S SIM SUNRISE FARMING PTY LTD	Portion 19 of the farm WATERVALSHOEK 350 IR
SWS VLEISMARK CC	Portion 26 of the farm WATERVALSHOEK 350 IR
A S SIM SUNRISE FARMING PTY LTD	Portion 27 of the farm WATERVALSHOEK 350 IR
A S SIM SUNRISE FARMING PTY LTD	Portion 28 of the farm WATERVALSHOEK 350 IR
WICKENS STUART PETER	Portion 32 of the farm WATERVALSHOEK 350 IR
VILLET LEON JAMES	Portion 35 of the farm WATERVALSHOEK 350 IR

Adjacent landowners are listed below:

Table 1-4: Adjacent landowners

Landowner	Farm Portion
FOR INFO REFER TO REGISTRAR OF DEEDS	The remaining extent of the farm WITBANK 340 IR
GOUDVELD BOERDERY PTY LTD	Portion 3 of the farm WITBANK 340 IR
GOUDVELD BOERDERY PTY LTD	Portion 13 of the farm WITBANK 340 IR
VOSSTOFFEL PTY LTD	Portion 1 of the farm VLAKPLAATS 348 IR
VOSSTOFFEL PTY LTD	Portion 3 of the farm VLAKPLAATS 348 IR
ERASMUS CASPER JAN HENDRIK	The remaining extent of the farm KAFFERSKUILEN 349 IR
SIYAKHULISA TRADING ENTERPRISE PTY LTD	Portion 3 of the farm KLIPFONTEIN 357 IR
NATIONAL GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA	Portion 16 of the farm WATERVALSHOEK 350 IR
NATIONAL GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA	Portion 20 of the farm WATERVALSHOEK 350 IR
NATIONAL GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA	Portion 29 of the farm WATERVALSHOEK 350 IR
NKOMO MALOMANE JOHANNES	Remaining extent of portion 45 of the farm WATERVALSHOEK 350 IR
QALABOTJHA BALIMI COMMUNAL PROP ASSOC	Portion 46 of the farm WATERVALSHOEK 350 IR

Landowner	Farm Portion
S K TRUST	Portion 3 of the farm WINTERHOEK 314 IR
S K TRUST	Portion 6 of the farm WINTERHOEK 314 IR
PEDRO CLINTON MICHAEL	Portion 20 of the farm PALMIETFONTEIN 316 IR
LOUW SUSANNA CATHARINA	The remaining extent of the farm WONDERFONTEIN 342 IR
NIEVAN TRUST	The remaining extent of the farm GROENKUIL 318 IR
HOFFMAN LOUWRENS NEL	Portion 11 of the farm WONDERFONTEIN 341 IR
HOFFMAN LOUWRENS NEL	Portion 16 of the farm WONDERFONTEIN 341 IR

Public Participation Process Followed & Outcome Of Consultation

Section 41 of NEMA Regulation 982 set out the Legal and Regulatory Requirement for Public Participation. The Public Participation Process (PPP) aims to involve the authorities and I&APs in the project process, and determines their needs, expectations and perceptions which in turn ensures a complete and comprehensive environmental study. An open and transparent process has been followed at all times and is based on reciprocal dissemination of information. The following will be undertaken during the PPP:

1. Identification of Interested and Affected Parties (IAPs);
2. Notification of IAPs regarding the proposed project;
3. A public information meeting;
4. Gathering comments, issues and concerns from IAPs;
5. Responding to IAP comments, issues and concerns;
6. Compilation and submission of results of consultation report to the DMRE; and
7. Providing IAPs with the opportunity to review and comment on the basic assessment report.

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT BASIC ASSESSMENT REPORT

AND

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: **Okovango Holdings (Pty) Ltd**

POSTAL ADDRESS: No 2346
Swaziland Street
Cosmo City Ext 2
2188

FILE REFERENCE NUMBER: MP 30/5/1/1/2/17449 PR

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Definition of Terms

Audit	a systematic, independent, and documented review of operations and practises to ensure that relevant requirements are met. Qualified professionals with relevant auditing experience should conduct audits and, where possible, independent external auditors should also be used.
Borehole	is a narrow shaft bored in the ground, either vertically or horizontally. A borehole may be constructed for many different purposes, including the extraction of water or other liquid (such as petroleum) or gases (such as natural gas), as part of a geotechnical investigation, environmental site assessment, mineral exploration, temperature measurement, as a pilot hole for installing piers or underground utilities, for geothermal installations, or for underground storage of unwanted substances, e.g. in Carbon capture and storage.
Clean Water	clean water is any water that has maintained the chemical, physical, and biological integrity of the waters by preventing point and nonpoint pollution sources.
Compliant	a full achievement of the performance requirement of a particular condition of the license or programme
Conservation	in relation to a water resource means the efficient use and saving of water, achieved through measures such as water saving devices, water-efficient processes, water demand management and water rationing;
Construction	the time period that corresponds to any event, process, or activity that occurs during the Construction phase (e.g., building of site, buildings, and processing units) of the proposed project. This phase terminates when the project goes into full operation or use.
Corrective Action Plan	an action plan developed by the proponent, contractor, or facility owner and approved by the external auditor that describes how the contractor or facility owner intends to resolve the non-conforming item. The Corrective Action Plan should be specific, measurable, achievable, realistic, and timely.
Director-General	means the Director-General of the Department;
Effluent	is defined by the United States Environmental Protection Agency as "wastewater - treated or untreated - that flows out of a treatment plant, sewer, or industrial outfall. Generally, refers to wastes discharged into surface waters". The Compact Oxford English Dictionary defines effluent as "liquid waste or sewage discharged into a river or the sea". Effluent in the artificial sense is in general considered to be water pollution.
Environmental Audit Report	a summary report prepared after an environmental audit that describes the attributes of the audit and the audit findings and conclusions.
Environmental Authorisation	is an environmental authorisation issued by a state department.
Environmental Component	an attribute or constituent of the environment (i.e., air quality; marine water; waste management; geology, seismicity, soil, and groundwater; marine ecology; terrestrial ecology, noise, traffic, socio-economic) that may be impacted by the proposed project.
Environmental Impact	a positive or negative condition that occurs to an environmental component as a result of the activity of a project or facility. This impact can be directly or indirectly caused by the project's different phases (i.e., Construction, Operation, and Decommissioning).
Groundwater	is the water located beneath the earth's surface in soil pore spaces and in the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. The depth at which soil pore spaces or fractures and voids in rock become completely saturated with water is called the water table. Groundwater is recharged from, and eventually flows to, the surface naturally; natural discharge often occurs at springs and seeps, and can form oases or wetlands
Non-conformance	constitutes a non-compliance, or an action plan or initial actions taken without tangible deliverables. Non-conformance may also be associated with activities breaching legislation. Non-Conformance findings therefore have a high priority and mitigation measures are mandatory.
Operation	the time period that corresponds to any event, process, or activity that occurs during the Operation (i.e., fully functioning) phase of the proposed project or development. (The Operation phase follows the Construction phase, and then terminates when the project or development goes into the Decommissioning phase.)
Partially Compliant	achievement with shortcomings (such as documented proof and or work in progress) and achievement where there is an obvious shortcoming in the delivery of the performance requirement.
Pollution	is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution.
Protection	in relation to a water resource, means - (a) Maintenance of the quality of the water resource to the extent that the water resource may be used in an ecologically sustainable way; (b) Prevention of the degradation of the water resource; and (c) the rehabilitation of the water resource;
Proponent	the person, company, or agency that is the primary responsible party for a development project and that is the permit applicant/holder for the project.
Rehabilitation	is the act of restoring something to its original state;
Responsible Authority	in relation to a specific power or duty in respect of water uses, means - (a) if that power or duty has been assigned by the Minister to a catchment management agency, that catchment management agency; or (b) if that power or duty has not been so assigned, the Minister;
Water Resource	includes a watercourse, surface water, estuary, or aquifer;

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.

Abbreviations

BA:	Basic Assessment
BAR:	Basic Assessment Report
CARA:	Conservation of Agricultural Resources Act, 43 of 1983
DFFE:	Department of Forestry, Fisheries and Environment
DMRE:	The Department of Mineral Resources and Energy
DWS:	Department of Water and Sanitation
EA:	Environmental Authorisation
ECO:	Environmental Control Officer
EIA:	Environmental Impact Assessment
EIR:	Environmental Impact Report
ELCA:	Environmental Legal Compliance Assessment
EMP:	Environmental Management Plan
EMPPA:	Environmental Management Programme Performance Assessment
EMPR :	Environmental Management Programme
EMS:	Environnemental Management System
GM:	General Manager
GN:	Government Notice
I&AP:	Interested & Affected Parties
IEM:	Integrated Environmental Management Series
ISO:	International Standards Organisation
IWUL:	Integrated Water Use License
IWULA:	Integrated Water Use Licence Application
IWWMP:	Integrated Water and Waste Management Plan
KG:	Knowledge Gap
MOC:	Management of Change
MPRDA:	Mineral and Petroleum Resources Development Act, 28 of 2002
MR:	Mining Right
MWP:	Mine Works Programme
N/R:	Applicable, but not required at the time of the audit
NC:	Non-conformance
NEMA:	National Environmental Management Act, 107 of 1998
NEMAQA:	National Environmental Management: Air Quality Act, 39 of 2004
NEMBA:	National Environmental Management: Biodiversity Act, 10 of 2004
NEMWA:	National Environmental Management: Waste Act, 59 of 2008
NHRA:	National Heritage Resources Act, 25 of 1999
NWA:	National Water Act, 36 of 1998
PCD:	Pollution Control Dam
PWP:	Prospecting Works Programme
ROM:	Run of Mine
RWD:	Return Water Dam
SAHRA:	South African Heritage Resources Authority
SHEQ:	Safety, Health, Environment and Quality
SLP:	Social and Labour Plan
SOP:	Standard Operating Procedure

SR:	Scoping Report
SWMP:	Storm Water Management Plan
WSA:	Water Services Act, 108 of 1997
WUL:	Water Use Licence

1. IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

2. OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

The objective of the basic assessment process is to, through a consultative process—

a. determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context.
b. identify the alternatives considered, including the activity, location, and technology alternatives.
c. describe the need and desirability of the proposed alternatives,
d. through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:
    i. the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
    ii. the degree to which these impacts—

aa. can be reversed.
bb. may cause irreplaceable loss of resources; and
cc. can be managed, avoided or mitigated.
e. through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
    i. identify and motivate a preferred site, activity and technology alternative;
    ii. identify suitable measures to manage, avoid or mitigate identified impacts; and
    iii. identify residual risks that need to be managed and monitored.

PART A

SCOPE OF ASSESSMENT & BASIC ASSESSMENT REPORT

3. CONTACT PERSON AND CORRESPONDENCE ADDRESS

3.1 DETAILS OF

3.1.1 Details of the EAP

Name of The Practitioner:	Lian Roos - Candidate EAP (2022/4550)
	Riana Panaino – EAP (2021/4135)
Tel No.:	012 807 0383
e-mail address:	lian@ecoe.co.za / riana@ecoe.co.za

3.1.2 Expertise of the EAP.

3.1.2.1 The qualifications of the EAP

Name	Lian Roos
Company	Eco Elementum (Pty) Ltd
Position	Environmental Consultant
Location	Glenfield Office Park, 361 Oberon Avenue, Faerie Glen, Pretoria
Email	lian@ecoe.co.za
Phone Number	012 807 0383 083 225 4589
Education	BSc Hons (App Sci) Water Utilisation, University of Pretoria BSc Environmental Science, University of Pretoria
Professional registration	EAPASA - Candidate EAP (2022/4550) SACNASP – Pr.Sci.Nat (Pending application)
Professional skills	Specialist Co-ordination. Project Management. Monitoring and Compliance. Compilation of Environmental Management. Compilation of Environmental Impact Assessment. Government Department Liaison.

Please refer to the CV attached in Appendix A.

3.1.2.2 Summary of the EAP's past experience.

Table 3-1: Qualifications of EAP

Name	Lian Roos
Skills	Environmental Impact Assessments. Basic assessments & EMP, WULA reports. Environmental Compliance Monitoring. Environmental Monitoring: Water Quality (Surface & Ground), Air Quality (Dust, $PM_{2.5}$, PM_{10}, SO_2, NO_2, HF), Noise (Ambient & Environmental) Environmental Control Officer. Environmental Awareness. External & Internal Auditing. Public consultation & Stakeholder engagement. Specialist coordination.

Experience	As an environmental consultant, Lian has attained a variety of environmental related skills and experiences in the broader industry. He is a driven individual and prides himself in his integral responsibilities regarding the supporting role he fulfils. His responsibilities range from environmental investigation and environmental monitoring to auditing and authorisation related engagements. His duties extend to advising clients in aligning with relevant legislation and policy requirements as part of the on-going environmental compliance process. Lian also engages with stakeholders for newly proposed projects.

3.2 LOCATION OF THE OVERALL ACTIVITY.

Table 3-2: Location of the activity

Farm Name:	Portions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 and 15 of the farm Wonderfontein 341 IR. The remaining extent of the farm Kuilwater 347 IR. Portions 1, 2 and 3 of the farm Gruisfontein 344 IR. Portions 1, 3, 4, 17, 19, 26, 27, 28, 32 and 35 of the farm Wonderfontein 350 IR.
Application area (Ha)	6445 hectares (ha).
Magisterial district:	Magisterial District of Balfour Gert Sibande District Municipality Govan Mbeki Local Municipality
Distance and direction from nearest town	Delmas is approximately 35 km north of the proposed prospecting right application area. Leandra is located roughly 8 km to the northeast of the proposed prospecting area, while Devon is located roughly 9 km to the northwest.
21-digit Surveyor General Code for each farm portion	T0IR00000000034100001 T0IR00000000034100002 T0IR00000000034100003 T0IR00000000034100004 T0IR00000000034100005 T0IR00000000034100006 T0IR00000000034100007 T0IR00000000034100008 T0IR00000000034100009 T0IR00000000034100010 T0IR00000000034100012 T0IR00000000034100014 T0IR00000000034100015 T0IR00000000034700000 T0IR00000000034400001 T0IR00000000034400002 T0IR00000000034400003 T0IR00000000035000001 T0IR00000000035000003 T0IR00000000035000004 T0IR00000000035000017 T0IR00000000035000019 T0IR00000000035000026 T0IR00000000035000027 T0IR00000000035000028 T0IR00000000035000032 T0IR00000000035000035
Locality map	A locality map at a **scale not smaller than 1:250 000 is attached in Appendix C.**
Description of the overall activity. (Indicate Mining Right, Mining Permit, Prospecting right, Bulk Sampling, Production Right, Exploration Right, Reconnaissance permit, Technical co-operation permit, Additional listed activity)	Okovango hereby applies for a Prospecting Right on various portions on the farms Wonderfontein 341 IR, Kuilwater 347 IR, Gruisfontein 344 IR and Watervalshoek 350 IR in the magisterial district of Balfour, province of Mpumlanaga. Prospecting aims to determine if economically viable mineral deposits exist within an application area. In order to undertake prospecting activities, an applicant requires a Prospecting Right in terms of the Mineral and Petroleum Resources Development Act ("MPRDA" Act No. 28 of 2002). An applicant is also required to obtain an Environmental Authorisation (EA) in terms of the

	National Environmental Management Act ("NEMA", Act No.107 of 1998) which involves the submission of a Basic Assessment Report ("BAR"). The Prospecting Right in terms of Section 16 of the MPRDA will be for coal on the above-mentioned portions. Coal in the Prospecting area is expected to be between 100 – 200 m below the surface (dependent on geological data and scientific reasoning). Prospecting is planned **without** bulk sampling.

3.3 LOCALITY MAP

(show nearest town, scale not smaller than 1:250000)

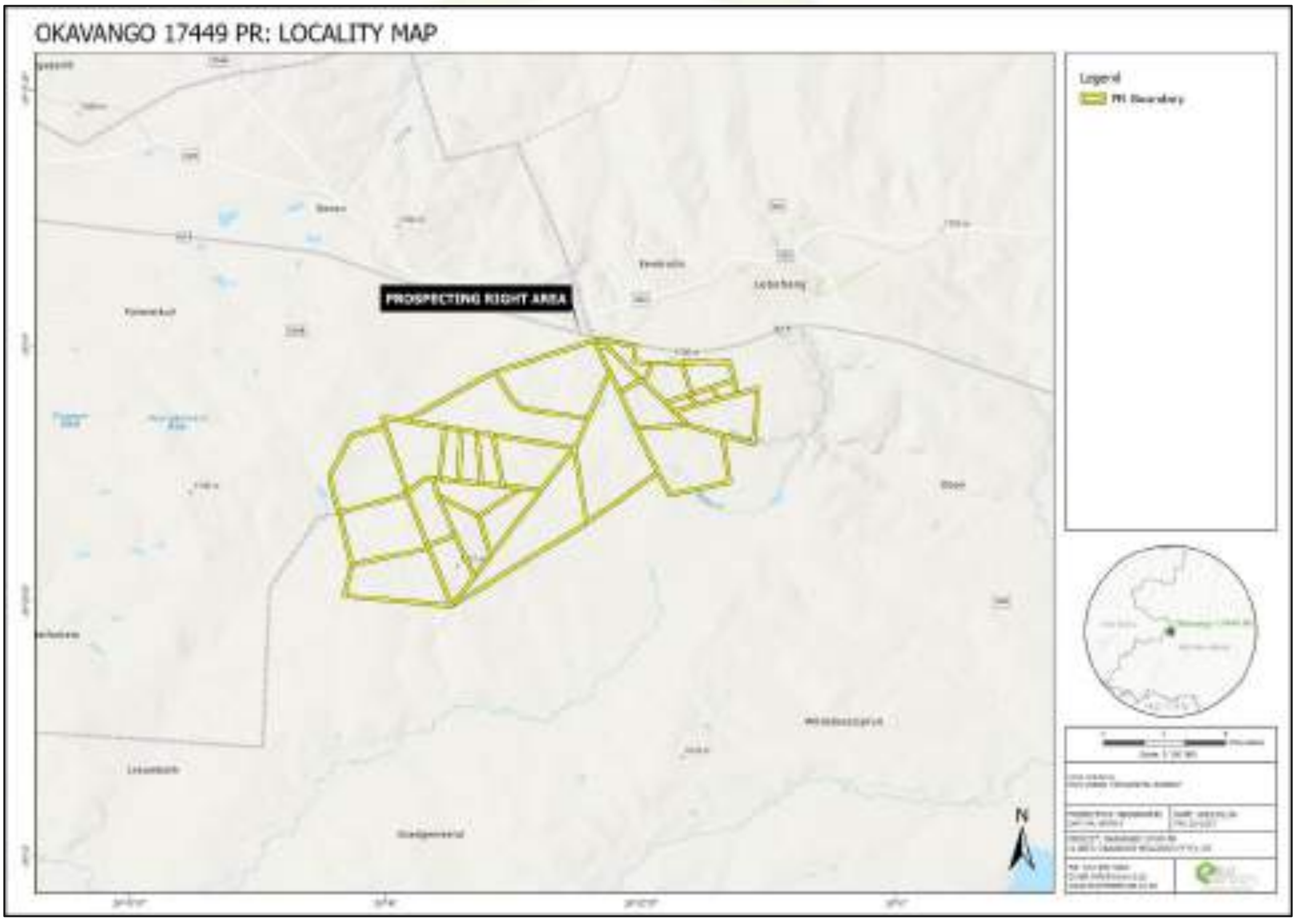


Figure 3-1: Locality Map

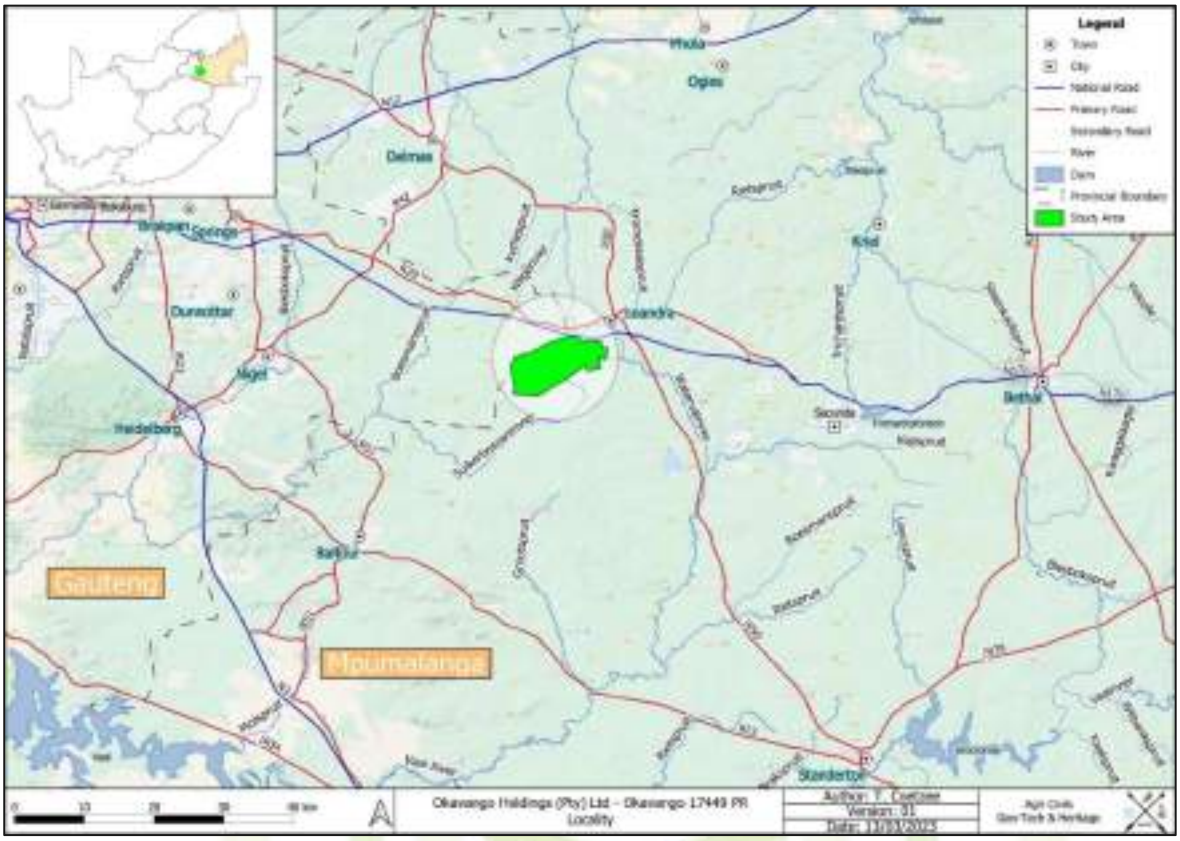


Figure 3-2:Regional and provincial location of the study area

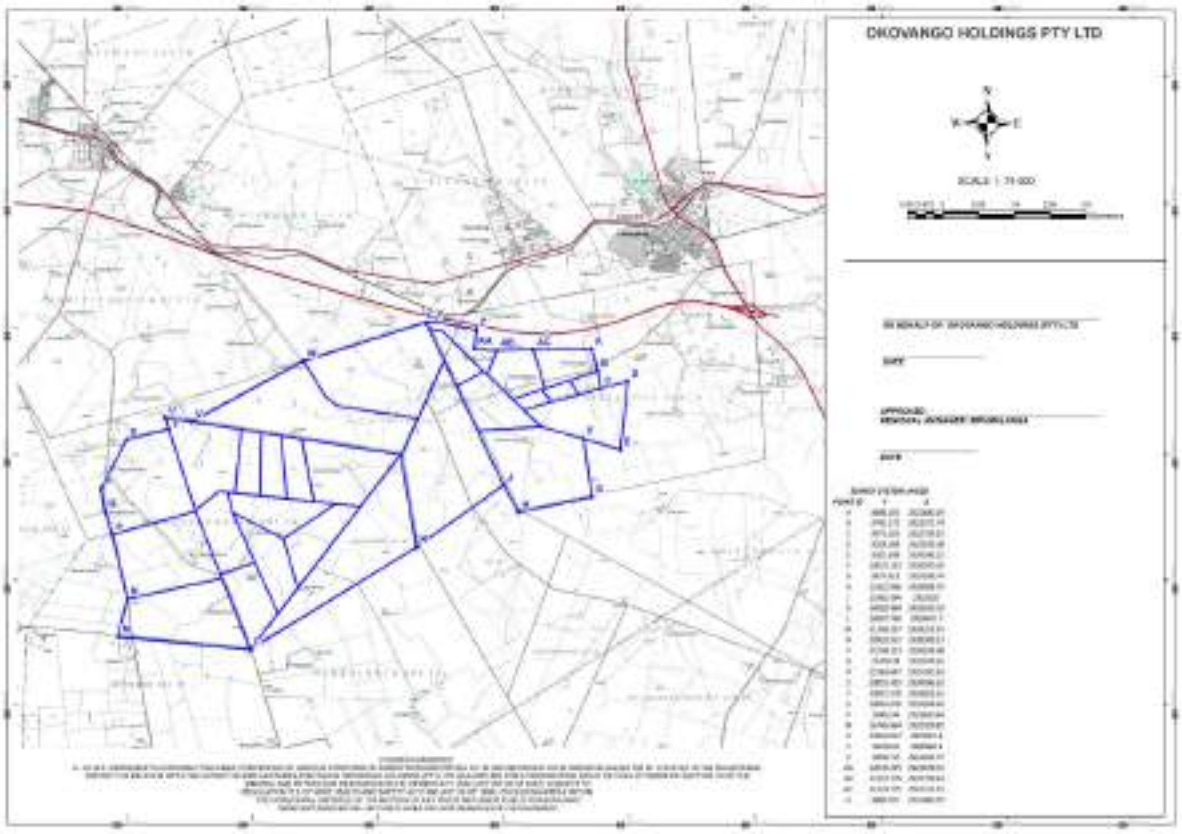


Figure 3-3: Regulation 2 (2) Map

3.4 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY.

The mineral distribution in the portions of the area will be determined following the mineral exploration methods which are outlined in the following text. These mineral exploration methods are planned to follow the mineral exploration value chain where a systematic, phased, and cost-effective approach of determining the minerals distribution is followed. At the end of each phase, a decision will be taken to proceed or to abandon the project.

1. The first phase will be information gathering which includes detailed desktop studies and geological mapping. This will result in a plan showing outcrops and any geological information that will be useful during the subsequent phases of exploration. Feasibility studies will also be conducted at the end of the exploration phases.
2. No geochemical survey is planned.
3. Geophysical Survey – a decision will be taken to conduct geophysical observations or procure geophysical data from commercial sources and organizations that collect them. The information that will be acquired will be chiefly magnetic which will be aimed at delineating structures of higher or lower magnetic susceptibility than the surrounding country rocks. If the company conducts the observations, it will be airborne surveys conducted with the auspices of a contractor.
4. Drilling will be conducted using a diamond drill rig. The core will be handled and logged in a designated area, sampling will also take place in the same area. Samples will be sent to a laboratory for chemical analyses.
5. No other excavations or bulk sampling will take place.

At the end of each phase there will be a brief period of compiling and evaluating results. The results will not only determine whether prospecting proceeds, but also the manner in which it will go forward. The applicant will only action the next phase of prospecting, once satisfied with the results obtained in the previous phases. In addition, smaller, non-core parts of the prospecting work program will be undertaken, if warranted.

Figure 3-4 below depicts the current land cover and farm portions of the proposed prospecting right area, the proposed areas of interest within the application area will be defined within the course of prospecting activities. It is anticipated that the invasive program will consist of 10 boreholes. An additional 10 core drilling and sampling will be done to be able to quantify the extent of the resource. Vegetation will be cleared at the borehole locations within the application area. The exact depths of the boreholes will be determined while the drilling program is underway as influenced by the depths and dips measured in the previous boreholes.

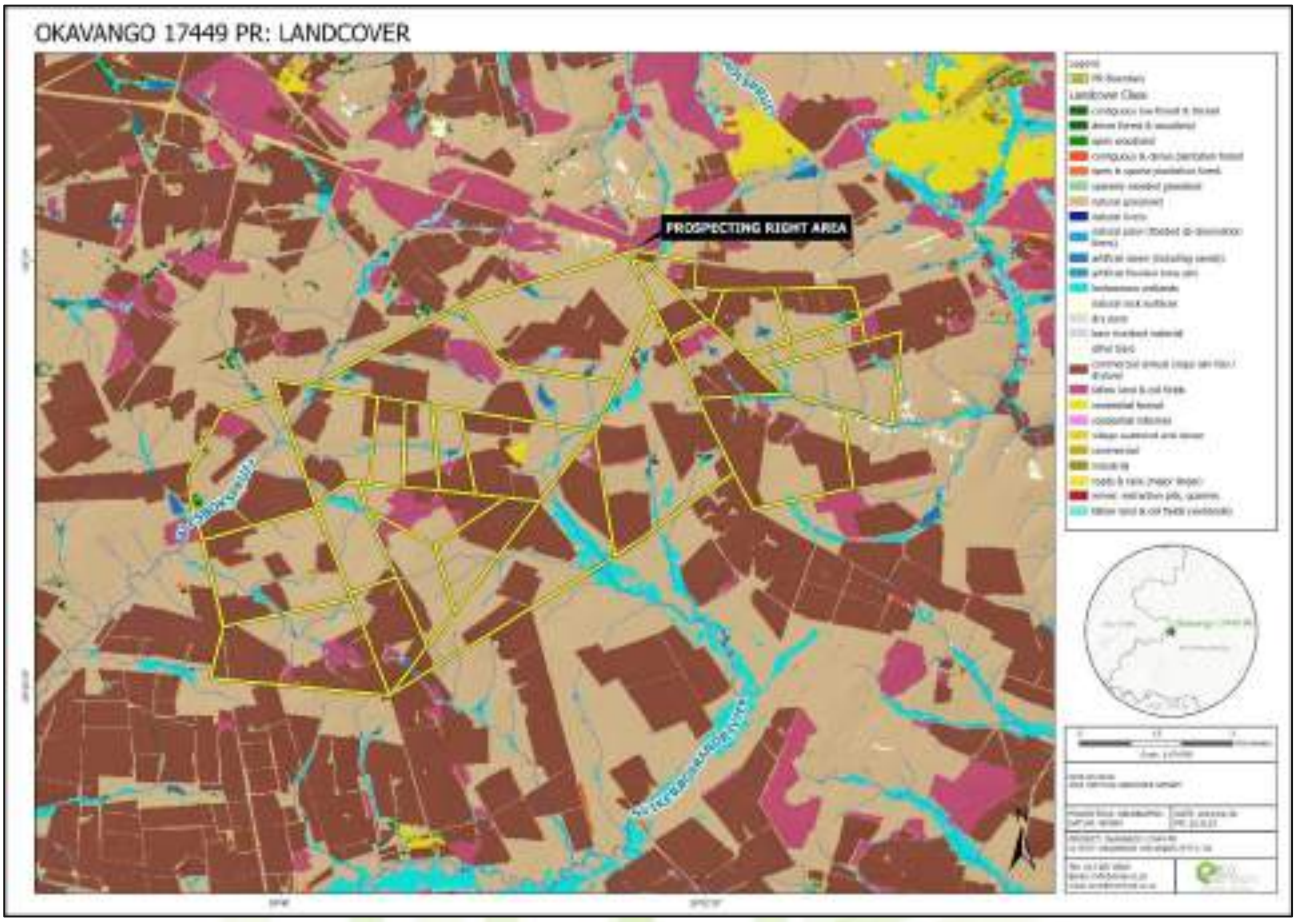


Figure 3-4: Current land cover map – Farm portions in realtion to the Prospecting Right application area

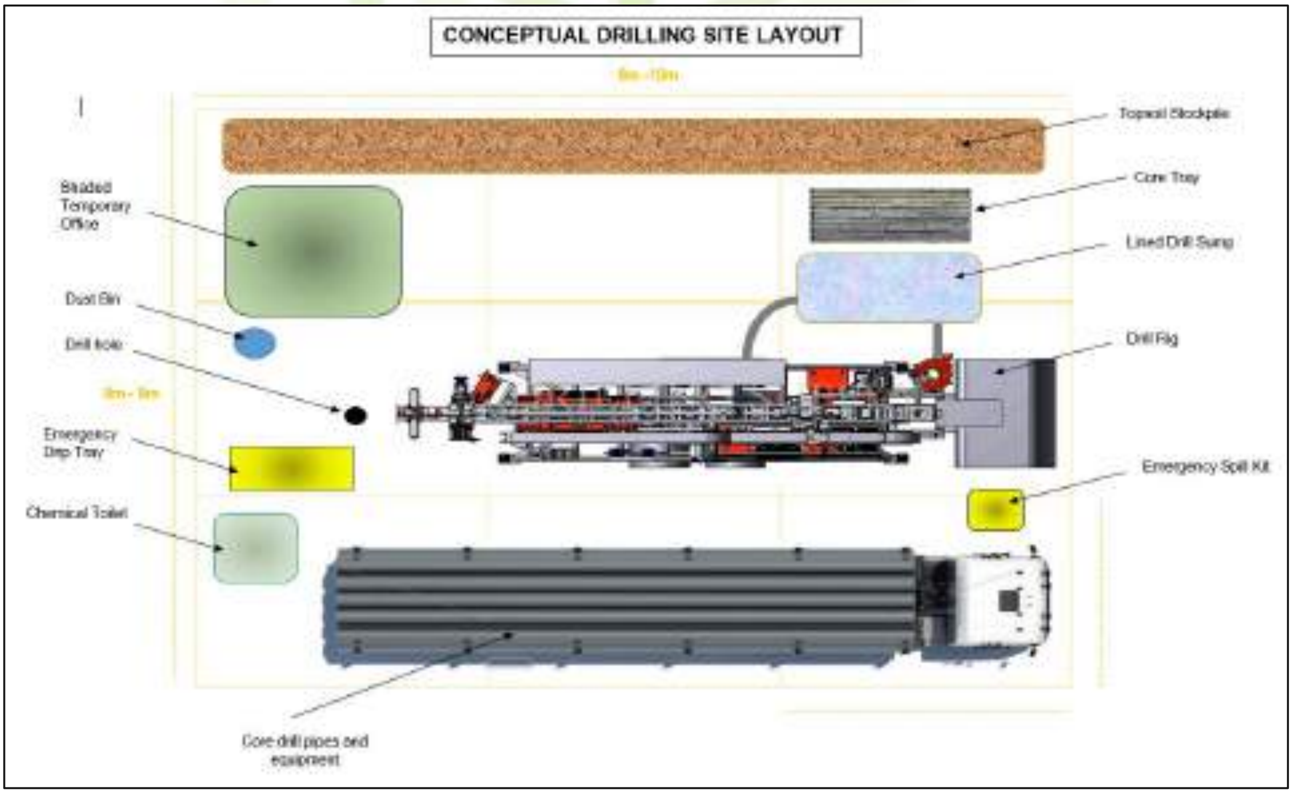


Figure 3-5: Conceptual drilling site layout

Figure 3-6: Depiction of an actual drilling site

3.4.1 Description of planned non-invasive activities

(These activities do not disturb the land where prospecting will take place e.g., aerial photography, desktop studies, aeromagnetic surveys, etc.)

The Non-Invasive methods which will be used during the exploration program span all the four phases in different time frames. They are outlined in the following text.

Phase 1 (month 0 to 12)

Airborne Surveys/Geophysical Surveys will be conducted upon issue of the Prospecting Right, to give an overview of the geophysical properties of the prospecting area.

3.4.2 Description of planned invasive activities

(These activities result in land disturbances e.g., sampling, drilling, bulk sampling, etc.)

Phase 2 (month 12 to 24)

Drilling will commence 12 months after initiation of Phase 1, and the process will be determined by local conditions but can generally be based on about drilling 25m per rig per day for a week.

The drill cores will be geologically logged and sampled and analyzed at an accredited facility to determine the economic viability. All core logging will be completed concurrently with the drilling programme to assist in determining the spectrum of viable coal seams. The drill wells will then be geo-physically logged for structural and geotechnical interpretation. After this, the holes will be cased, capped and marked to make it noticeable and safe for people and animals but also allow for future access by the exploration team.

Phase 3 (month 25 to 48)

Depending on the results of phase 2, the below will apply:

10 additional core drilling and sampling will be done to be able to quantify the bounds and extent of the coal resource. This phase will also be used to establish the mining techniques that may be required. Detailed evaluation and modeling of the results will be undertaken during this phase and several planning scenarios contemplated to ensure the best deployment of further exploration capital. The holes required for this phase of drilling may vary in depth and quality but should take the existence of geological features that are significant to mine planning and future rehabilitation issues into consideration.

Phase 4 (month 49 - 60)

Depending on the results of phase 2, the below will apply:

Overall environmental assessment, monitoring and rehabilitation. Prefeasibility study will be conducted. Should coal be economically viable, an application for a Mining Right will be decided, compiled, and submitted. Alternatively, if additional exploration is required in case the results are not conclusive, an application for the renewal of the Prospecting Right will be submitted at this phase.

A complete report covering all the findings of the above phases will be compiled and submitted within 60 days of the release of the last analysis results from the appointed coal laboratory.

Table 3-3: Timeframes for each of the proposed activities

Phase	**Activity** (What are the activities that are planned to achieve optimal prospecting)	**Skill(s) required.** (Refers to the competent personnel that will be employed to achieve the required results)	**Timeframe** (in months) for the activity)	**Outcome** (What is the expected deliverable, e.g., Geological report, analytical results, feasibility study, etc.)	**Timeframe for outcome** (deadline for the expected outcome to be delivered)	**What technical expert will sign off on the outcome?** (e.g., geologist, mining engineer, surveyor, economist, etc.)
1	**Non-Invasive phase** Literature review, Geological maps, satellite imagery, aerial photographs and historical borehole data, Geological reconnaissance	Exploration Geologist	0-6 months	Extraction of site specific geological map, information and geological report.	Month 4-6	Geologist
1	**Non-Invasive phase** Ground geophysical survey, airborne survey, geological mapping, stream, and soil sampling.	Geophysicist/Geologist	6-12 months	Interpretation of digital data into report. Correlation of geological and geophysical results.	Months 7-9	Geophysicist/Geologist
2	**Invasive phase** Site Establishment (25m X25m) Diamond core drilling (85MM) at 150m De-establishment	Exploration Geologist, Drilling Engineer, Site works foreman, laborer.	12-24 months	Geotechnical reporting from sidewall and soil sampling. Updating of data base, recording of borehole logs, evaluation and geological modelling. Pre-feasibility study and planning of phase 2 exploration drilling.	Month 12-24	Geologist
3	**Invasive phase** Further reverse circulation and diamond drilling.	Exploration Geologist, Drilling Engineer, Site works foreman, laborer's	24-48 months	Updating of data base, recording of borehole logs, evaluation and geological modeling	Month 24-48	Mineral Economist/Geologist/Mine Surveyor/Mine Engineer
4	**Invasive Phase**	Exploration Geologist, Final Rehabilitation & Environmental Assessment Practitioner, Mining Engineer	49-60 months	Environmental assessment, monitoring and rehabilitation, Conceptual mine planning Preliminary economic analyses	Month 49-60	Mine Engineer/EIA Specialist

3.4.3 Description of the activities to be undertaken

(Describe Methodology or technology to be employed, including the type of commodity to be prospected/mined and for a linear activity, a description of the route of the activity).

The mineral that will be prospected in the proposed site is coal. This section presents a detailed description of all the activities associated with the proposed prospecting application. Due to the nature of the Prospecting Works Programme, and the fact that the specific prospecting activities required are dependent on the preceding phase, assumptions are presented where required.

Access Roads

Access to the site will be required during mapping and drilling activities (Phase 2). Access requirements can only be determined after Phase 1 has been concluded. A number of existing roads and tracks already traverse the proposed prospecting site and where practicable, these roads will be used. All access on farms will be conducted in terms of a written agreement with the landowner. In instances where no access roads are available to the site location a single track will be selected as the best alternative on the basis of least environmental impact with natural habitat considered the last option.

During mapping activities, vehicle access will be gained to site through the veld and the establishment of a track to gain repeated access to a mapping site will not be required.

Once the drill sites have been identified, temporary access roads may be established for repeated access to the prospecting site if the identified drill site cannot be accessed via existing roads and tracks.

Vegetation and topsoil stockpile areas (if required)

Vegetation and topsoil will only be stockpiled in instances where settling sumps are required i.e., core drilling. During the excavation process the topsoil and available vegetation will be placed adjacent to the sumps. This will also serve as a storm water diversion berm. The excavated material will be placed back into the rehabilitated sumps on completion of the drilling process.

Footprint

For the prospecting phase, several sites will be selected for geotechnical drilling. These boreholes and its associated activities will impact on a surface area of between 25m^2 and 64 m^2 per drill site. The full extent of the drill site will also be demarcated, and no drilling will be done outside of the boundary.

Water Supply

Currently it is not known whether there are any water boreholes located on the site and whether access and supply will be granted by the landowner. Continuous water supply will be required during drilling, and therefore on-site water storage tanks with a capacity of 15,000 ℓ for water supply to the drill, will be used.

When core drilling will be undertaken, a number of settling sumps will be excavated and lined with impervious plastic sheets. The purpose of these sumps are to recycle water and drilling fluids by means of gravity which leads to heavier materials (e.g., drill cuttings) to settle and clean water being produced for re-use. The drill cuttings form a sludge which will be collected in the sumps. These sumps will be fenced, where required, to prevent livestock and public access. The plastic-lined sumps will be used to recycle water through a filter process in order to maintain a constant clean water source for the purpose of drilling. The plastic sheets will be removed, and sumps will be backfilled on completion of drilling. If required, the remaining sludge in sumps is to be treated with a suitable bio-remediation product prior to backfilling or disposal.

Additional water requirements relate to the potable water supply for employees and workers. A temporary 15 000 ℓ will be stored in tanks for drinking water and general use by persons and will be provided at the drill site. Additional facilities will include temporary portable toilets, berms on the upstream side of the drill rig to divert clean water around the drill site.

Ablution

Ablution facilities at the drill site will involve the hiring of drum or tank type portable toilets that will be maintained by a contractor.

Accommodation

No accommodation for staff and workers will be provided onsite. Workers will be transported to and from the prospecting site daily. No equipment will be stored onsite.

Storage of Dangerous Goods

During the diamond drilling activities limited quantities of diesel fuel, oil and lubricants will be used onsite, all chemicals and dangerous goods will be stored on the drilling trucks and be packed up at night and removed. The only dangerous goods that will be stored in any significant quantity is diesel fuel. A maximum amount of $30m^3$ will be stored in above ground diesel storage tanks located on an impermeable surface with bunds. Storage and use of hydrocarbons and other chemicals may only take place on impermeable surfaces with bunds to contain any accidental spills.

Hazardous material will be stored in appropriate containers and clearly marked. Drip trays and or impermeable surfaces with bunds must be placed under machinery that has the potential to leak. Material Safety Data Sheets will be available for all drilling and other chemicals kept on site.

Drill rig

In most cases, the drill rig will be a self-contained, truck-mounted unit that will be accompanied by a compressor and a generator. The drill rig will be driven to site and mobilised in the desired location, positioned over the hole site, and will be stabilised.

The footprint of disturbance for a prospecting rig and associated equipment is generally smaller than 25 - 64 m^2. Plastic sheets and drip trays will be placed underneath the rig for the duration of the drilling process at each site in order to avoid hydrocarbon spills and contamination. The full extent of the drill sites will be staked out and the drill crew will not operate beyond these boundaries. Depending on the locality, this perimeter may be fenced, marked with bunting or barricading. Please refer to Figure 3-5 for a layout plan of the drilling site.

Drill core storage area

During core drilling, a laydown area for the extracted core samples will be established within the footprint of the drill site. This area is usually 5m x 2m ($10m^2$) and is used to place the extracted core in sequence (according to depth) for later analysis by an appointed geologist. Core trays will be used to contain the core samples.

3.4.4 Listed and specified activities

Section 16 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) requires, upon request by the Minister that an Environmental Management Plan be submitted, and that the applicant must notify and consult with Interested and Affected Parties (I&APs). Section 24 of the NEMA requires that activities, which may impact on the environment must obtain an environmental authorisation from a relevant authority before commencing with the activities. The proposed prospecting activity triggers Listing Notice 1 activities:

Please refer to the following table for the details in terms of the listed activities.

Table 3-4: Listed and specified activities

NAME OF ACTIVITY (E.g., For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route etc. E.g., for mining,- excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)	**Aerial extent of the Activity Ha or m²**	**LISTED ACTIVITY** (Mark with an X where applicable or affected).	**APPLICABLE LISTING NOTICE** (GNR 983, GNR 984 or GNR 985)	**WASTE MANAGEMENT AUTHORISATION** (Indicate whether an authorisation is required in terms of the Waste Management Act). (Mark with an X)
Any activity including the operation of that activity which requires a prospecting right in terms of section 16 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to prospecting of a mineral resource, including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies.	640 m^2	X	GNR 983 – Listing Notice 1, Activity 20	n/a
Drill site clearing and establishment, mobile chemical ablution facility, drill rig equipment, return water lined sump, and sample storage trays.	640 m^2	X	GNR 983 – Listing Notice 1, Activity 20	n/a
Soil Sampling Activities (A typical sampling site will be approximately 25 m^2). It is unlikely that more than 10 samples will be taken, however, this will be confirmed on site as part of the prospecting activities.	50 m^2 per prospecting drill site	X	GNR 985 – Listing Notice 3, Activity 12	n/a
Roads (roads will be temporary gravel roads, not exceeding 3,5 m in width).	Approx. 20 000 m^2	-	-	n/a
Temporary Camp Site	Approx. 100 m^2	-	-	n/a
Site Clearance	Less than 20 ha	X	GNR 983 – Listing Notice 1, Activity 27	n/a
Hydrocarbon Storage	Less than 30 m^3	-	-	n/a

3.5 Policy and Legislative Context

Table 3-5: Policy and legislative table

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT. (E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	The project requires a prospecting right authorisation from the Department of Mineral Resources.	A prospecting right application was lodged with the DMRE. The application was accepted by DMRE on 25th of November 2022.
NEMA Environmental Impact Assessment (EIA) Regulations, as Amended 2017	This Basic Assessment and Environmental Management Plan to be conducted. Baseline environmental information of the project area will be assessed. Mitigation measures and recommendations were provided according to best practice standards.	An Application for Environmental Authorisation will be submitted to the Mpumalanga DMRE with the prospecting right application lodgement on SAMRAD.
The South African Constitution **The South African Constitution (Act 108 of 1996) constitutes the supreme law of the country and guarantee the rights of all people in South Africa**	Applied at potential impacts identification as well as mitigation measures and public participation.	A public participation process will be followed, and consultations will be done regarding the proposed project. An EMPr and awareness plan will be designed according to the issues raised during this process.
National Environmental Management: Biodiversity Act , 2004	Presence of critically endangered species if permit is required. To be determined by ecologist prior to prospecting activities.	The EMP will regulate the applicant to apply for Protected Species Removal Permit from the Relevant authority prior to the potential removal of any sensitive and/or protected species.
National Environmental Management: Waste Act	Provisions of the waste act were consulted to determine whether a waste license was required for any aspect of the proposed development.	The project activities do not trigger a waste management license, but proper waste management measures will be addressed in the EMPr.
Section 38 of the National Heritage Resources Act (Act No. 25 of 1999)	Legislation consulted during the impact assessment process, to determine what legal requirements with regards to the management of national heritage resources were relevant to this application.	An upload of the BAR will be done on the SAHRIS online system for comment.
National Water Act **The NWA (Act No. 36 of 1998)**	Triggered activities will be identified according to the Section 21 of the NWA.	The department has been notified of the proposed project and comments will be addressed. No Water Use activities are triggered.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLIY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT. (E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)
National Environmental Management: Air Quality Act, 2004 (Act no.39 of 2004);	Dust monitoring on site during the operation.	As part of the EMPr dust suppression methods will be used.
Mine Health and Safety Act, 1996 (Act No. 29 of 1996);	Health and Safety Policy.	Risk Impact Assessment to be conducted.
Mpumalanga Biodiversity Conservation Plan, 2007; **CBAs are terrestrial (land) and aquatic (water) features (e.g., vleis, rivers and estuaries) in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning in the long term (which is particularly important in the face of climate change). The desired management objective for CBAs is for them to remain in a natural or near- natural, i.e. to prevent further loss or degradation of natural habitat in these areas. Therefore, CBAs are biodiversity request priority that must be afforded special attention in assessing and evaluating impacts of prospecting or mining.** **Ecological Support Areas (ESA) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may include an aquatic or terrestrial feature. ESAs can be further subdivided into Critical Ecological Support Areas (CESA) and Other Ecological Support Areas (OESA). Critical Ecological Support Areas are aquatic features, with their terrestrial buffers, which fall within priority sub-catchments, whose protection is required in order to support the aquatic and terrestrial CBAs. An example might be a river reach which feeds directly into a CBA. Other Ecological Support Areas are all remaining aquatic ecosystems (not classed as CESA or CBA), with their terrestrial buffers, which have a less direct impact on the CBA, e.g. a wetland that is geographically isolated from a CBA, but contributes to ecological processes such as groundwater recharge, thereby indirectly impacting on a CBA downstream.** **Although CBAs have been identified at a very fine spatial scale in some provinces (Gauteng, Western Cape, KwaZulu-Natal), other areas they have been identified more at a broader scale (Eastern Cape, Northwest, Limpopo, and the Namakwa district of the Northern Cape). All CBAs require field verification, but this is particularly the case for broad scale CBAs where it is only in the intact areas of the CBA that mining should not be prohibited.** **Over time, CBAs will be identified in the Free State, and remaining areas of the Northern Cape, and may be identified at a finer scale in additional provinces.**	Used to identify possible mitigation measures.	Specialists have been appointed to undertake studies to determine if the application area falls within any CBAs & ESAs and recommend mitigation measures where applicable.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLIY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT. (E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)
Govan Mbeki Spatial Development Framework 2014 -2034	Source of background demographic and socio-economic information.	Utilized as a source of demographic and socio-economic information for the project.

3.6 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES.

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

The mining sector has been described as the "Continuous Sunrise Sector" by President Cyril Ramaphosa at the 'Investing in African Mining Indaba' in Cape Town during May 2022, this due to the significant contribution which the sector continues to have on the country's economy. Despite the many challenges created by the Covid-19 Pandemic, the mining sector continues to contribute substantially to export earnings, is a critical source of foreign direct investment and provides employment for a considerable number of people.

As the economic effects of the Covid-19 Pandemic begin to subside, the mining sector has significantly contributed to the recuperation of South Africa's economy. In 2021, the mining sector registered a growth of 11.8%, the largest growth seen across all the industries in the economy. The sector was able to recover production close to pre-covid conditions.

In 2019 StatSA provided a report detailing the mineral production, finances, employment, exports and imports statistics for South Africa. The results of the census conducted confirmed that the South African Mining Industry is a critical pillar of our economy, with R527,5 billion in total sales generated in 2019. Of this R527,5 billion, 61% (R323,8 billion) was sourced from outside the country through exports. Coal dominates production in South African, covering about 75% of the total mass of all minerals produced. In 2019, 306 million metric tons of coal was produced. Almost two-thirds of mining sales are from abroad, with 39% of coal produced being exported.

The extracting and processing of minerals requires a great deal of machinery and workforce. The South African mining industry employed 514 859 individuals in 2019, with 39% employed in the platinum group metals sector, 21% in the coal sector and 20% employed in the gold sector. Recent statistics note that mining in South Africa still directly employs over half a million people post-covid. At the 4th South African Investment Conference in 2022, investments of approximately R46 billion was pledged towards mining and mineral beneficiation, showing investor confidence in South Africa's mining potential and operations.

The mining industry is identified as one of the key components toward Rapid Economic Growth in order to reduce poverty and minimise unemployment Growth (State of the Nation Address, 2019). The key issues include:

- The need for a strong capable state;
- Cost reduction for businesses and consumers;
- The need for reindustrialisation and a revitalised mining sector;
- Faster growth in tourism;
- Improved infrastructure;
- Better support for small businesses; and
- Marked reduction in unemployment.

Mining's contribution to provincial GDP (2020) is 25.9% and the sector employs 53 000 people. The activity of mining has numerous social and economic benefits in local, regional and national context. These include:

- Job creation.
- Skills development.
- SMME development & local economic development.
- Contribution to local and national tax income (royalties, companies' tax etc.).
- Contribution to the national gross domestic product, and
- Future business opportunities.

The production of goods, supply of services or construction of infrastructure results in expenditure within a regional economy which has knock-on effects and results in additional expenditure which contributes to the regional economy.

Prospecting is a precursor to successful sustainable mining within an area, which in the long term can have positive economical inputs into the local area. Without successful prospecting, accurate profitable mining is less likely to be implemented.

3.7 Motivation for the overall preferred site, activities and technology alternative.

Some of the techniques employed in the non-invasive prospecting activities will include a literature survey, field reconnaissance / mapping, and geophysical survey of the geology, outcrops. Some of the invasive prospective activities include prospecting boreholes, boreholes to confirm continuity of mineralization and potential deposit size and resource definition drilling.

In terms of the technologies proposed, these have been chosen based on the long-term success of the company in terms of their prospecting history. The prospecting activities proposed in the Prospecting Works Programme is dependent on the preceding phase as previously discussed, therefore no alternatives are indicated, but rather a phased approach of trusted prospecting techniques.

Consultation with affected landowners and adjacent landowners will be conducted to keep them informed about the proposed prospecting activities as well as to capture any comments and concerns they may have regarding the prospecting activity.

It should be noted that the exact locations of the boreholes have not been identified at this stage. The location of these boreholes will be dependent on the findings of the non-invasive prospecting activities. Once the proposed target areas for the boreholes have been identified during the phases as set out in these areas will be investigated and will be subject to the conditions of this document.

3.8 Full description of the process followed to reach the proposed preferred alternatives within the site.

GIS and spatial analysis is used to determine the location of possible prospecting drill sites whilst considering environmental sensitivities.

3.8.1 Details of the development footprint alternatives considered.

With reference to the site plan provided in Appendix C and the location of the individual activities on site, provide details of the alternatives considered with respect to:

a) the property on which or location where it is proposed to undertake the activity;

Portions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 and 15 of the farm Wonderfontein 341 IR. The remaining extent of the farm Kuilwater 347 IR. Portions 1, 2 and 3 of the farm Gruisfontein 344 IR. Portions 1, 3, 4, 17, 19, 26, 27, 28, 32 and 35 of the farm Wonderfontein 350 IR (hereafter referred to as the “prospecting right application area”) is located in the Highveld Ridge Coalfield. The site is preferred due to the modified state (cultivated land) of the area and the deep nature of the coal reserve, which would mean underground mining in future with minimal surface disturbance, and continuation of current surface activities in most cases.

b) the type of activity to be undertaken;

Invasive prospecting can be done via drilling or bulk sampling. Drilling was chosen as the preferred option due to the cost of deeper drilling being more feasible, rehabilitation is easier and less costly, and the impact to the environment is less. Therefore, no bulk sampling will take place as part of this prospecting right application.

c) the design or layout of the activity;

The location of the invasive activities will only be determined following the results from Phase 1 of the Prospecting Works Programme. Environmental sensitive areas will be avoided as far as possible.

d) The technology to be used in the activity

Airborne Surveys/Geophysical Surveys will be conducted upon issue of the Prospecting Right, to give an overview of the geophysical properties of the prospecting area. Once the areas of target are identified, drilling will be strategically correlated with target areas. Deep ore bodies are most commonly evaluated by diamond drilling techniques. The essential part of exploratory drilling is that material broken out of the borehole must be recovered for analysis.

e) the operational aspects of the activity; and

No feasible alternative technologies are available to conduct prospecting as the target coal seams are too deep for bulk sampling.

f) the option of not implementing the activity.

The option of not approving and implementing the activities will result in a significant loss to valuable information regarding the mineral reserve status on this property. In addition to this, should economical reserves be present, and the applicant does not have the opportunity to prospect, the opportunity to utilize these reserves for future phases will be lost. Agricultural practises are likely to continue undisturbed should the option of not implementing the activity realises.

3.8.2 Details of the Public Participation Process Followed

(Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.)

Section 41 of NEMA Regulation 982 set out the Legal and Regulatory Requirement for Public Participation. The Public Participation Process (PPP) aims to involve the authorities and I&APs in the project process, and determines their needs, expectations and perceptions which in turn ensures a complete and comprehensive environmental study. An open and transparent process has been followed at all times and is based on reciprocal dissemination of information. The following will be undertaken during the PPP:

1. Identification of Interested and Affected Parties (IAPs);
2. Notification of IAPs regarding the proposed project;
3. A public information meeting;
4. Gathering comments, issues and concerns from IAPs;
5. Responding to IAP comments, issues and concerns;
6. Compilation and submission of results of consultation report to the DMRE; and
7. Providing IAPs with the opportunity to review and comment on the basic assessment report.

Landowner and property detail

The registered owners of the farms were listed as follows:

Table 3-6: Directly affected landowners

Landowner	Farm Portion
JOHN CAMERON TRUST	Portion 1 of the farm WONDERFONTEIN 341 IR
CALITZ SUSANNA CATHARINA	Portion 2 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 3 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 4 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 5 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 6 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 7 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 8 of the farm WONDERFONTEIN 341 IR

Landowner	Farm Portion
DEMANRI PTY LTD	Portion 9 of the farm WONDERFONTEIN 341 IR
W & A FAMILIE TRUST	Portion 10 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 12 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 14 of the farm WONDERFONTEIN 341 IR
JOHN CAMERON TRUST	Portion 15 of the farm WONDERFONTEIN 341 IR
KUILWATER LANDGOED CC	Remaining extent of the farm KUILWATER 347 IR
LUPHONDO COMMUNAL PROP ASSOCIATION	Portion 1 of the farm GRUISFONTEIN 344 IR
LUPHONDO COMMUNAL PROP ASSOCIATION	Portion 2 of the farm GRUISFONTEIN 344 IR
LUPHONDO COMMUNAL PROP ASSOCIATION	Portion 3 of the farm GRUISFONTEIN 344 IR
QALABOTJHA BALIMI COMMUNAL PROP ASSOC	Portion 1 of the farm WATERVALSHOEK 350 IR
WATERVALSHOEK PLUIMVEE PTY LTD	Portion 3 of the remaining extent of the farm WATERVALSHOEK 350 IR
A S SIM SUNRISE FARMING PTY LTD	Portion 4 of the farm WATERVALSHOEK 350 IR
NATIONAL GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA	Portion 17 of the farm WATERVALSHOEK 350 IR
A S SIM SUNRISE FARMING PTY LTD	Portion 19 of the farm WATERVALSHOEK 350 IR
SWS VLEISMARK CC	Portion 26 of the farm WATERVALSHOEK 350 IR
A S SIM SUNRISE FARMING PTY LTD	Portion 27 of the farm WATERVALSHOEK 350 IR
A S SIM SUNRISE FARMING PTY LTD	Portion 28 of the farm WATERVALSHOEK 350 IR
WICKENS STUART PETER	Portion 32 of the farm WATERVALSHOEK 350 IR
VILLET LEON JAMES	Portion 35 of the farm WATERVALSHOEK 350 IR

Surrounding landowners are listed below:

Table 3-7: Adjacent landowners

Landowner	Farm Portion
FOR INFO REFER TO REGISTRAR OF DEEDS	The remaining extent of the farm WITBANK 340 IR
GOUDVELD BOERDERY PTY LTD	Portion 3 of the farm WITBANK 340 IR
GOUDVELD BOERDERY PTY LTD	Portion 13 of the farm WITBANK 340 IR
VOSSTOFFEL PTY LTD	Portion 1 of the farm VLAKPLAATS 348 IR
VOSSTOFFEL PTY LTD	Portion 3 of the farm VLAKPLAATS 348 IR
ERASMUS CASPER JAN HENDRIK	The remaining extent of the farm KAFFERSKUILEN 349 IR
SIYAKHULISA TRADING ENTERPRISE PTY LTD	Portion 3 of the farm KLIPFONTEIN 357 IR

Landowner	Farm Portion
NATIONAL GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA	Portion 16 of the farm WATERVALSHOEK 350 IR
NATIONAL GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA	Portion 20 of the farm WATERVALSHOEK 350 IR
NATIONAL GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA	Portion 29 of the farm WATERVALSHOEK 350 IR
NKOMO MALOMANE JOHANNES	The remaining extent of portion 45 of the farm WATERVALSHOEK 350 IR
QALABOTJHA BALIMI COMMUNAL PROP ASSOC	Portion 46 of the farm WATERVALSHOEK 350 IR
S K TRUST	Portion 3 of the farm WINTERHOEK 314 IR
S K TRUST	Portion 6 of the farm WINTERHOEK 314 IR
PEDRO CLINTON MICHAEL	Portion 20 of the farm PALMIETFONTEIN 316 IR
LOUW SUSANNA CATHARINA	The remaining extent of the farm WONDERFONTEIN 342 IR
NIEVAN TRUST	The remaining extent of the farm GROENKUIL 318 IR
HOFFMAN LOUWRENS NEL	Portion 11 of the farm WONDERFONTEIN 341 IR
HOFFMAN LOUWRENS NEL	Portion 16 of the farm WONDERFONTEIN 341 IR

Site Notices

Site notices were placed around the proposed mining site in accordance with Regulation 41(2)(a), (3) and (4) of the Environmental Impact Assessment Regulations Published under Government Notice R982 in *Government Gazette* 38282 of 4 December 2014 (as amended). Refer to Appendix B for the Public Participation evidence.

PUBLIC PARTICIPATION NOTICE FOR THE ENVIRONMENTAL AUTHORISATION OF A PROSPECTING RIGHT APPLICATION: OKOVANGO HOLDINGS (PTY) LTD

APPLICATION REFERENCE: MP 30/5/1/1/2/17449 PR
DATE OF PUBLICATION OF THIS NOTICE: 27 March 2023

ECO ELEMENTUM REF: 22-2123-AUTH (Okovango 17449 PR)

NOTICE AND INVITATION TO PARTICIPATE IN A PUBLIC PARTICIPATION PROCESS FOR THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED OKOVANGO HOLDINGS (PTY) LTD PROSPECTING RIGHT APPLICATION FOR COAL IN TERMS OF SECTION 16 (MPRDA) ON VARIOUS PORTIONS OF THE FARMS WONDERFONTEIN 341 IR, KUILWATER 347 IR, GRUISFONTEIN 344 IR AND WATERVALSHOEK 350 IR IN THE MAGISTERIAL DISTRICT OF BALFOUR, MPUMALANGA PROVINCE

Notice is hereby given in terms of the Minerals and Petroleum Resources Development Act (Act No.28 of 2002) (MPRDA), together with Regulation 3 (6) of the National Environmental Management Act (Act No 107 Of 1998): Environmental Impact Assessment Regulations 2014 (As Amended) (NEMA) and the National Water Act,1998 (Act No. 36 of 1998) (NWA), that **Okovango Holdings (Pty) Ltd** applied for a Prospecting Right application **(MP 30/5/1/1/2/17449 PR) for coal** in terms of Section 16 (MPRDA) on the following farm portions: portions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 and 15 of the farm Wonderfontein 341 IR. The remaining extent of the farm Kuilwater 347 IR. Portions 1, 2 and 3 of the farm Gruisfontein 344 IR. Portions 1, 3, 4, 17, 19, 26, 27, 28, 32 and 35 of the farm Wonderfontein 350 IR.

Prospecting aims to determine if economically viable mineral deposits exist within an application area. In order to undertake prospecting activities, an applicant requires a Prospecting Right in terms of the MPRDA. An applicant is also required to obtain an Environmental Authorisation (EA) in terms of the National Environmental Management Act (NEMA) which involves the submission of a Basic Assessment Report (BAR). Eco Elementum has been appointed as the independent Environmental Assessment Practitioner to undertake the Environmental Authorisation and would like to engage the local property owners, Interested and Affected Parties in respect of the proposed prospecting activities.

The following applications and subsequent approvals are required prior to commencement of any prospecting activities:

- Prospecting Right (MPRDA)
- Environmental Authorisation (NEMA and EIA Regulations) namely: GN R983 – Activities 12, 20, 27

PROPOSED PROJECT:

The Prospecting Right application and associated activities triggers a Basic Assessment (BA) in terms of the NEMA EIA regulations, which will be undertaken as part of the Environmental Authorisation application process. A Basic Assessment Report (BAR) will be available for review for 30 days from **27 March 2023 to 29 April 2023.** The BAR will be available on Eco Elementum's website: Ecoelementum.co.za/downloads and can be shared electronically upon request. **Interested and affected parties (I&APs) are invited to register and provide written comments. I&APs should refer to the relevant reference number(s), and must provide their comments together with their name, contact details and an indication of any direct business, financial, personal or other interest which they have in the application to the contact person indicated below by latest 29 April 2023.**

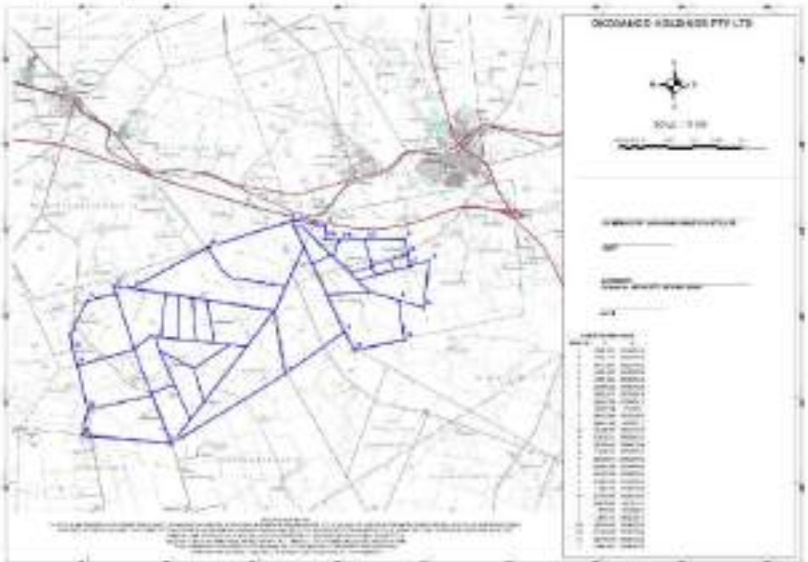
Queries regarding this matter should be referred to:

Contact person: Lian Roce
Office: 012 807 0383
Email: Lian@ecoe.co.za

Project:
22-2123-AUTH (Okovango 17449 PR)

In order to ensure that you are identified and registered as an interested and/or affected party, please submit your name, contact information and interest in the matter to the contact person by latest **29 April 2023**

The date and location of the public open day will be communicated to I&APs two weeks prior to the meeting taking place.



ENVIRONMENTAL & ENGINEERING

When registering as an I&AP a person consents to the lawful processing of personal information for the intended purposes, as described by the Protection of Personal Information Act, 2013 (Act no.4 of 2013). Your information will be used for this project including the application as well as subsequent related appeals, amendments, or audits where you are registered as an I&AP.
By registering, a person agrees that by submitting comment to inform this process, your contact details will where be required by a public body, be reflected in regulated reports that must be compiled and submitted to the public, registered stakeholder, organs of state, as well as the competent authority for consideration and decision making.

Background Information Document

A Background Information Document (BID) was compiled and sent to interested and affected Parties (I&APs) in accordance with Regulation 41(2)(b) and (3) of the Environmental Impact Assessment Regulations Published under Government Notice R982 in *Government Gazette* 38282 of 4 December 2014 (as amended). Refer to Appendix B for the Public Participation evidence.

Advert placement

An Advert will be placed in the ***Ridge Times*** on Friday 31 March 2023 in accordance with Regulation 41(2)(c) and (3) of the Environmental Impact Assessment Regulations Published under Government Notice R982 in *Government Gazette* 38282 of 4 December 2014 (as amended). Refer to Appendix B for the Public Participation evidence.

Proof of notification

Refer to Appendix B for the Public Participation evidence.

Email

An email notifying the I&APs of the proposed project, the public participation process, draft report review and how to comment, was sent to all identified I&APs.

SMS

A SMS notifying the I&APs of the proposed project, the public participation process, draft report review and how to comment, was sent to all identified I&APs.

Submission of Draft Basic Assessment Report

The Draft Report was submitted to the following Commenting Authorities for comment:

Department	Attention to
Mpumalanga Provincial Government DARDLEA.	Pamela Ntuli / Dineo Tswai
Gert Sibande District Municipality.	Pierre Rossouw
Govan Mbeki Local Municipality	Environmental department / Municipal manager
Mpumalanga Tourism and Park Agency.	Phumla Nkosi
Department of Agriculture Land Reform, and Rural Development.	Love Shabane
Department of Agriculture forestry and fisheries.	Doreen Sithole
Department of Mineral Resources and Energy.	Lucky Mugagadeli
South African Heritage Resources Agency.	Online submission

3.8.3 Summary of issues raised by I&APs

(Complete the table summarising comments and issues raised, and reaction to those responses)

The table summarising the comments and issues raised and the reaction to those responses will be updated in the Final Basic Assessment Report following the Public Participation period.

3.8.4 The Environmental attributes associated with the alternatives. (The environmental attributed described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

3.8.4.1 Baseline Environment

3.8.4.1.1 Type of environment affected by the proposed activity.

(its current geographical, physical, biological, socio- economic, and cultural character).

CLIMATE

The study area displays a mild climate, characterised by warm moist summers and cool dry winters typical of the Highveld climate. The region falls within the summer rainfall region of South Africa, rainfall occurs mainly as thunderstorms from October to March, with a mean annual precipitation of 668mm. This varies from 900mm in the central higher lying areas to 556mm in the lower lying northern and southern areas of the province. Mean annual temperature varies from approximately 19.3°C in the north of the province to 16.0°C in the south. The eastern and central areas, however, experience a lower mean annual temperature of around 15.0°C. There is large variation between summer and winter temperatures, with Gauteng experiencing a daily mean temperature in January and July of 21.2°C and 9.8°C, respectively (Schulze, 1997).

Due to the long clear nights, mild wind and dry air in Gauteng/Mpumalanga in winter, the occurrence of frost is common in the region. The region experiences on average 30 days of frost per year (Schulze, 1997). Winter atmospheric conditions cause temperature inversions, which have the effect of keeping polluted air close to the surface, so that winter air quality over the Highveld is generally poor.

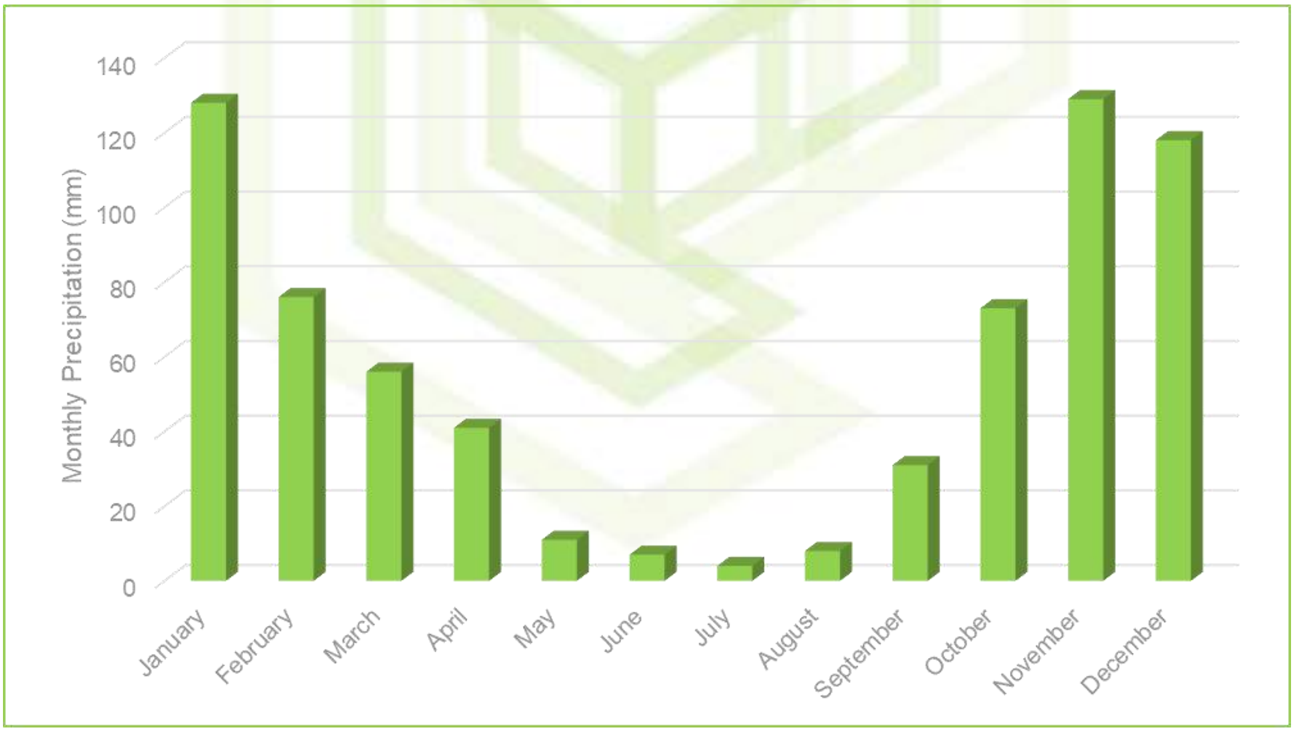


Figure 3-7: Monthly precipitation in the proposed study area (Magalela Associates, 2014)

GEOLOGY

Regional Geology

The Highveld Coalfield is in south-eastern Mpumalanga Province, immediately south of the Witbank Coalfield. The width of the coalfield is some 95km, stretching from Nigel and Greylingstad in the west to Davel in the east, and is about 90km long, from just north of Kriel to beyond Standerton in the south and covers an area of approximately 7,000km^2. After the Witbank Coalfield, the Highveld Coalfield is the next largest producing coalfield, on a tonnage basis, in South Africa.

The coalfield is host to up to five coal Seams contained within the middle Ecca Group sediments of the Karoo Supergroup. The Karoo Supergroup comprises sediments ascribed to deposition in glacial to fluvio-glacial and from shallow marine to fluvio-deltaic environments. The Karoo Supergroup comprises the following Groups (in decreasing age), although not all Groups are completely represented in the Highveld Coalfield to the present day erosion surface: Dwyka; Ecca; Beaufort; Stormberg and Drakensberg. The Ecca Group comprises sediments from the following formations (in decreasing age): Pietermaritzburg; Vryheid and Volksrust. The five identified coal Seams contained in the Vryheid Formation (middle Ecca Group) are named, from the base up, as follows: Number 1 Seam (No. 1 Seam, S1); Number 2 Seam (No. 2 Seam, S2); Number 3 Seam (No. 3 Seam, S3); Number 4 Seam (No. 4 Seam, S4) and Number 5 Seam (No. 5 Seam, S5). In certain areas of the coalfield, the No. 4 and No. 2 Seams are split by clastic partings and in those areas the Seams are called the No. 4 Upper and Lower Seams and the No. 2 Upper and Lower Seams.

The coalfield is characterised by the fact that in the northern regions, all the coal Seams, except for the No. 3 Seam, attain mineable thicknesses with economic potential, while in the southern regions, only the No. 4 Seam, and in very localised areas the No. 2 Seam, attain mineable dimensions of economic importance.

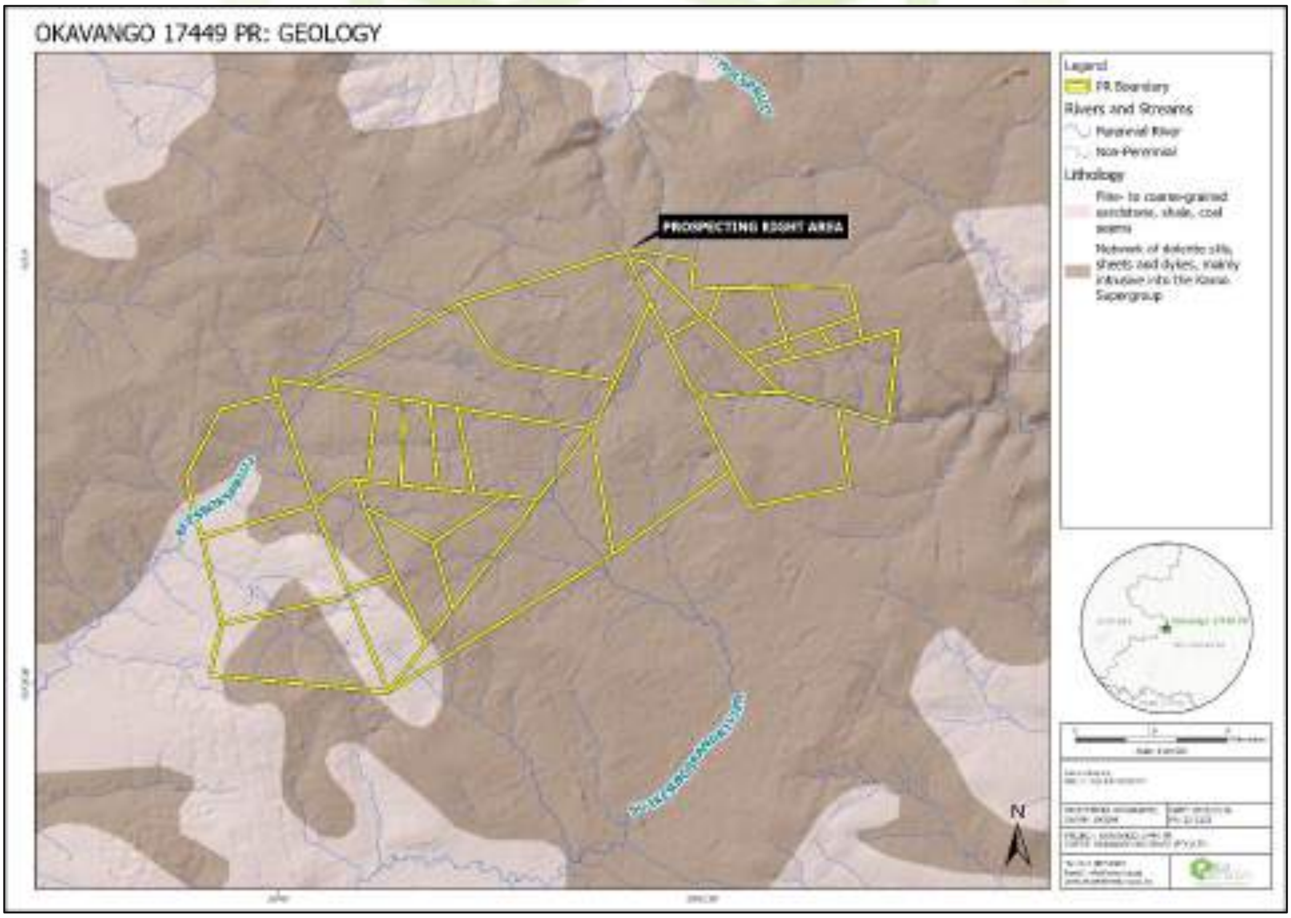


Figure 3-8: Geological formations in relation to the prospecting right application area

The depth to the coal Seams increases in a southerly direction, e.g. the No. 4 Seam can be mined by opencast in the Kriel (northern) district, while it occurs at a depth of around 200m in the Standerton (southern) district. The coal Seams are generally flat lying to gently undulating with a slight regional dip to the south.

Structurally, the coalfield is relatively undeformed with no prominent folding having been identified. Small-scale faulting (less than 1m) is not uncommon although large-scale faulting is. The only large-scale displacements identified are almost always associated with transgressive dolerite sills, intruded during the waning stages of the Karoo times. These intrusive dolerite sills and dykes are related to the Drakensberg Formation flood basalts. The dolerite intrusions adversely affect the coal Seams in the vicinity of the intrusions in terms of coal quality by devolatilizing and burning the coal. Large areas of coal have been rendered uneconomical because of dolerite intrusions.

The most important economic coal Seams are the No. 4 Seam and the No. 2 Seam. The No. 4 Seam accounts for approximately 80% of the economically recoverable coal within the Highveld Coalfield. The No. 2 and No. 4 Seams are mined in the northern parts of the coalfield while only the No. 4 Seam is mined in the southern parts. The bulk of the coal produced is consumed in power stations and to produce synth-fuels. A very limited quantity is exported.

Quaternary Catchment and Land Use

The site falls within the quaternary drainage regions B20E which is part of the Olifants Water Management Area, where the C21A and C12D catchments forms part of the Vaal Water Management Area (Figure 3-9).

From a land use perspective, the water management area still remains almost totally under natural vegetation. Sheep and goat farming is practiced over most of the area. Cultivation is restricted to isolated patches where the majority consists of low shrubland (Figure 3-10).

Large mining operations occur in various parts of the water management area. There are small urban developments and power stations in the water management area. Due to the arid climate, no extensive afforestation occurs. Invading alien vegetation is found along some tributary water courses on river banks and is a problem in some localised areas (DWS, 2016). The project site is situated in an agricultural area. Most of the land along the river is used for crop production, mainly pivot irrigation. The natural veld is used for sheep and cattle grazing and to a lesser extent game farming. The reference scores for each stream/river are listed in Table 3-8.

Table 3-8: Sub-Quaternary reach desktop data for the area assessed (DWS, 2016)

Reach	SQR Name	PES Category Median	EIS Category
B20E-1383	Wilge	C	High
C12D-1496	Waterval	D	Moderate
C12D-1547	Klip	C	Moderate
C12D-1554	Klip	C	Moderate
C21A-1492	Blesbok	C	Moderate
C21A-1531	Suikerbos	C	Moderate

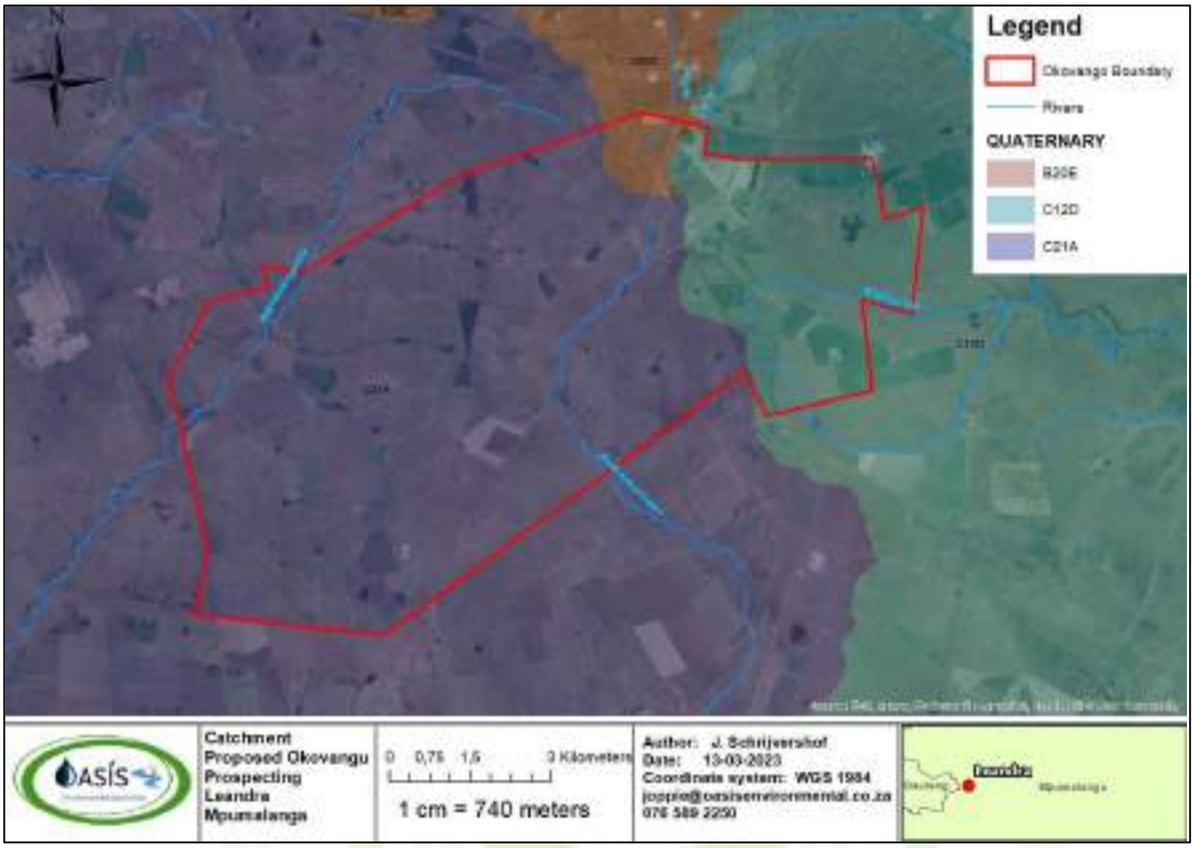


Figure 3-9: Quaternary Catchment map

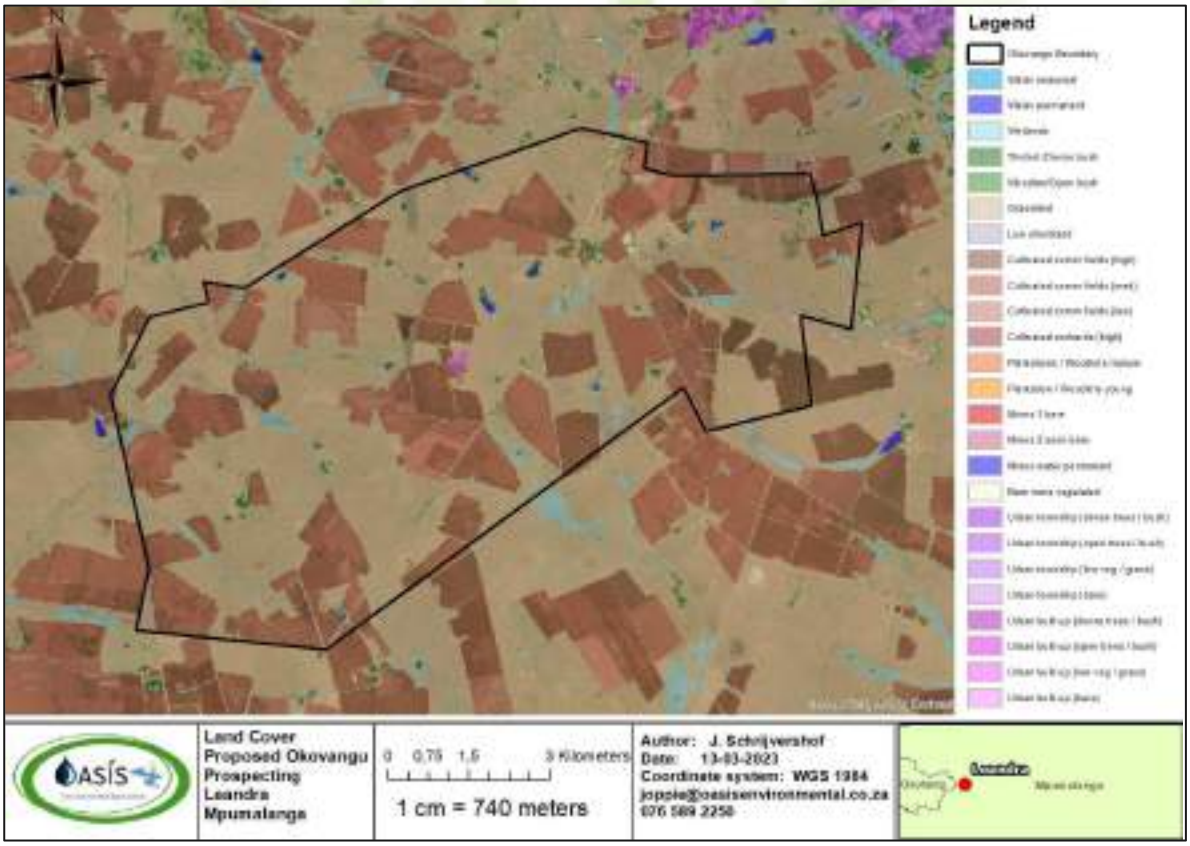


Figure 3-10: Land cover map

WETLANDS

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA)'s databases were undertaken for the project. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs. FEPAs are determined through a process of systematic biodiversity planning and involved collaboration of over 100 freshwater researchers and practitioners. They are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (MacFarlane et al., 2009).

The assessment of the study site involved the investigation of aerial photography, GIS databases including the NFEPA and South African National Wetland maps as well as literature reviews of the study site in order to determine the likelihood of wetland areas within this site.

Figure 3-11 below represents and describes all specific wetland types and have been divided into eight units. These units are described as follows (Kotze et al., 2008):

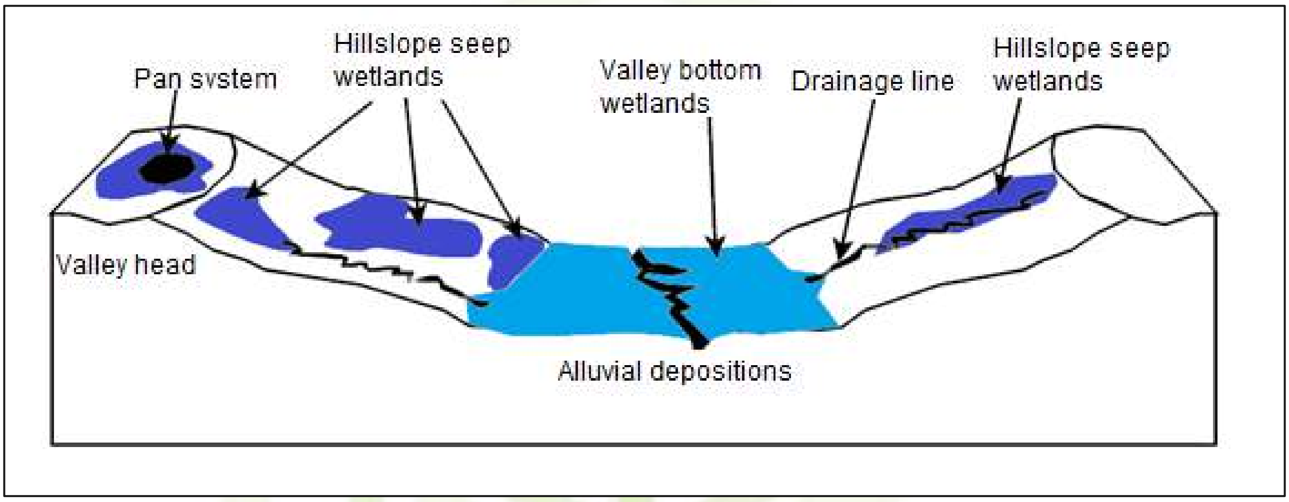


Figure 3-11: Diagrammatic representation of common wetland systems identified in Southern Africa (based on Kotze et al., 2008)

Identification of FEPA Wetlands is based on a combination of special features and modelled wetland conditions that include expert knowledge on features of conservation importance as well as available spatial data on the occurrence of threatened frogs and wetland-dependent birds.

Several small segments of seep and valley bottom wetlands were identified within the application area according to the NFEPA wetlands database (Figure 3-12).Ground-truthing the existence and condition of FEPA wetlands is important to understand local conditions which have an impact on the wetland system, their functional integrity and health. Field surveys of the proposed prospecting application area proofed to be difficult due some landowners denying the specialist the right to access property. It is essential that any wetlands be assessed by means of a field survey to ground truth the presence of the NFEPA wetlands identified in the desktop study.

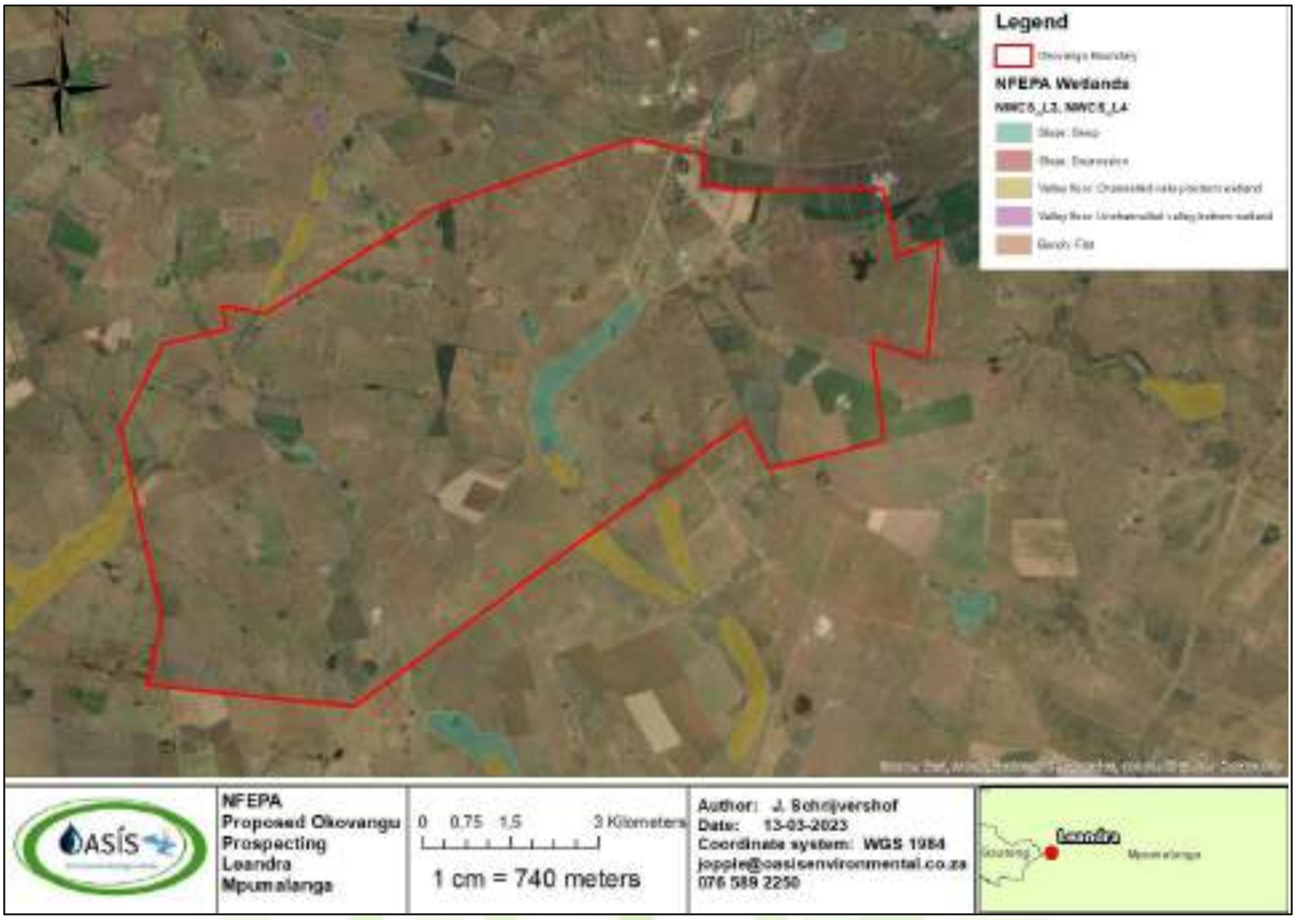


Figure 3-12: NFEPA Wetlands map

Wetland terrain indicator

The topography of an area is generally a good practical indicator for identifying those parts in the landscape where wetlands and pans are likely to occur. Generally, wetlands occur as a valley bottom unit however wetlands can also occur on steep to mid slopes where groundwater discharge is taking place through seeps and where pans can collect water in a depression (DWAF, 2005). In order to classify a wetland/pan system, the localised landscape setting must be taken into consideration through ground-truthing of the study site after initial desktop investigations (Ollis *et al.*, 2014).

The area ranges in altitude from 1629 m to 1705 m above sea level. A Digital Elevation Model (DEM) of the aerial photography of the site revealed that the topography of the landscape is a relatively flat with drainage line landscape. The landscape is drained towards the south-west to the Vaal catchment and north-east to the Olifants catchment (Figure 3-13).

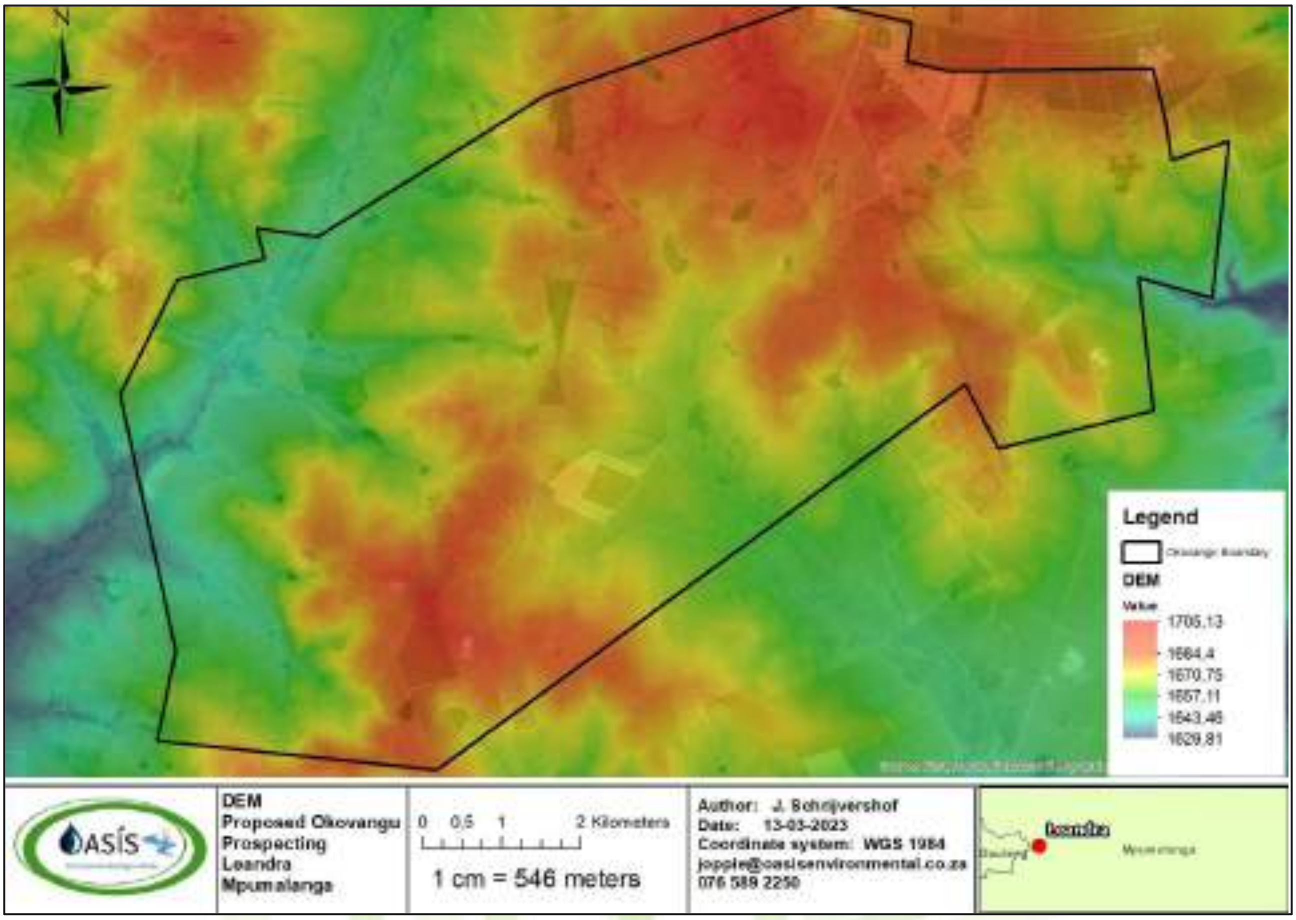


Figure 3-13: DEM of the proposed prospecting right application area

ECOLOGICAL

A desktop assessment was conducted to establish whether any potentially sensitive species/receptors might occur within the study area. The South African National Biodiversity Institute's online biodiversity tool, ADU (Animal Demography Unit) Virtual Museum was used to query a species list (Appendix A in the Desktop Wetland and Ecological Assessment attached in Appendix D – Specialist studies of this BAR) for the 2628BD Quaternary Degree Square (QDS) within which the study area is situated. To describe the overall site characteristics, and to identify points of interest within the site for evaluation, Google Earth Imagery and the 1:50 000 topographical maps were examined.

This was conducted by researching all available information resources including, but not limited to, the following:

- International Union for Conservation of Nature (IUCN) Red List of Threatened Species;
- The Endangered Wildlife Trust's Red List of Mammals of South Africa, Lesotho and Swaziland; and
- NEMBA List of Threatened or Protected Species (TOPS List);
- Animal Demography Unit (ADU) Virtual Museum;
- SANBI Biodiversity GIS tool; and
- Important Bird and Biodiversity Areas (IBAs) (Birdlife South Africa, 2016).

Vegetation

The project boundary overlaps with two major vegetation units in terms of Mucina and Rutherford (2013) namely the Soweto Highveld grassland and the Eastern temperate Fresh water Wetlands as listed in (Figure 3-14).

Soweto Highveld Grassland (Mucina and Rutherford, 2006)

Distribution: Stretches over the Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North-West) Provinces: In a broad band roughly delimited by the N17 road between Ermelo and Johannesburg in the north, Perdekop in the southeast and the Vaal River (border with the Free State) in the south. It extends further westwards along the southern edge of the Johannesburg Dome (including part of Soweto) as far as the vicinity of Randfontein. In southern Gauteng it includes the surrounds of Vanderbijlpark and Vereeniging as well as Sasolburg in the northern Free State. Altitude ranges between 1420 m to 1760 m.

Vegetation & Landscape Features: Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.

Geology and Soils: Shale, sandstone or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites which feature prominently in the area. In the south, the Volksrust Formation (Karoo Supergroup) is found and in the west, the rocks of the older Transvaal, Ventersdorp and Witwatersrand Supergroups are most significant. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types.

Climate: Summer-rainfall region with Mean Annual Precipitation of 662 mm. Cool-temperate climate with thermic continentality (high extremes between maximum summer and minimum winter temperatures, frequent occurrence of frost, large thermic diurnal differences, especially in autumn and spring).

Important Taxa: Graminoids: *Andropogon appendiculatus* (d), *Brachiaria serrata* (d), *Cymbopogon pospischilii* (d), *Cynodon dactylon* (d), *Elionurus muticus* (d), *Eragrostis capensis* (d), *E. chloromelas* (d*)*, *E. curvula* (d), *E. plana* (d), *E. planiculmis* (d), *E. racemosa* (d), *Heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Setaria nigrirostris* (d), *S. sphacelata* (d), *Themeda triandra* (d), *Tristachya leucothrix* (d), *Andropogon schirensis, Aristida adscensionis, A. bipartita, A. congesta, A. junciformis* subsp. *galpinii, Cymbopogon caesius, Digitaria diagonalis, Diheteropogon amplectens, Eragrostis micrantha, E. superba, Harpochloa falx, Microchloa caffra, Paspalum dilatatum*.

Herbs: *Hermannia depressa* (d), *Acalypha angustata, Berkheya setifera, Dicoma anomala, Euryops gilfillanii, Geigeria aspera* var. *aspera, Graderia subintegra, Haplocarpha scaposa, Helichrysum miconiifolium, H. nudifolium* var. *nudifolium, H. rugulosum, Hibiscus pusillus, Justicia anagalloides, Lippia scaberrima, Rhynchosia effusa, Schistostephium crataegifolium, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata.*

Geophytic Herbs: *Haemanthus humilis* subsp. *hirsutus, H. montanus. Herbaceous*

Climber: *Rhynchosia totta.*

Low Shrubs: *Anthospermum hispidulum, A. rigidum* subsp. *pumilum, Berkheya annectens*, *Felicia muricata, Ziziphus zeyheriana*.

Conservation: Listed as an endangered ecosyetsm. Only a handful of patches statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site). Almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have been flooded by dams (Grootdraai, Leeukuil, Trichardtsfontein, Vaal, Willem Brummer). Erosion is generally very low (93%).

Eastern Temperate Freshwater Wetlands (Mucina and Rutherford, 2006)

Distribution: Stretches over the Northern Cape, Eastern Cape, Free State, North-West, Gauteng, Mpumalanga and KwaZulu-Natal Provinces as well as in neighbouring Lesotho and Swaziland: Around water bodies with stagnant water (lakes, pans, periodically flooded vleis, edges of calmly flowing rivers) and embedded within the Grassland Biome. Altitude ranges between 750 m to 2000 m.

Vegetation & Landscape Features: Flat landscape or shallow depressions filled with (temporary) water bodies supporting zoned systems of aquatic and hygrophilous vegetation of temporarily flooded grasslands and ephemeral herblands.

Geology, Soil & Hydrology: Found on younger Pleistocene to recent sediments overlying fine-grained sedimentary rocks of the Karoo Supergroup (on sediments of both Ecca and Beaufort Groups due to the large extent of the area of occurrence) as well as of the much older dolomites of the Malmani Subgroup of the Transvaal Supergroup in the northwest. Especially the areas built by Karoo Supergroup sediments are associated with the occurrence of Jurassic Karoo dolerite dykes having a profound influence on run-off. Soils are peaty (Champagne soil form) to vertic (Rensberg soil form). The vleis form where flow of water is impeded by impermeable soils and/or by erosion resistant features, such as dolerite intrusions. Many vleis and pans of this type of freshwater wetlands are inundated and/or saturated only during the summer rainfall season, and for some months after this into the middle of the dry winter season, but they may remain saturated all year round. Surface water inundation may be present at any point while the wetland is saturated and some plant species will be present only under inundated conditions, or under permanently saturated conditions. The presence of standing water should not be taken as a sign of permanent wet conditions.

Climate: Exclusively summer-rainfall region with a Mean Annual Precipitation 421 mm - 915 mm. Cool-temperate pattern with MAT ranging between 12.6°C and 16.7°C. Due to high elevation, frost is a frequent phenomenon.

Important Taxa: Megagraminoid: *Cyperus congestus* (d).

Graminoids: *Agrostis lachnantha* (d), *Carex acutiformis* (d), *Eleocharis palustris* (d), *Eragrostis plana* (d), E. planiculmis (d), *Fuirena pubescens* (d), *Helictotrichon turgidulum* (d), *Hemarthria altissima* (d), *Imperata cylindrica* (d), *Leersia hexandra* (d), *Paspalum dilatatum* (d), *P. urvillei* (d), *Pennisetum thunbergii* (d), *Schoenoplectus decipiens* (d), *Scleria dieterlenii* (d), *Setaria sphacelata* (d), *Andropogon appendiculatus, A. eucomus, Aristida aequiglumis, Ascolepis capensis, Carex austro-africana, C. schlechteri, Cyperus cyperoides, C. distans, C. longus, C. marginatus, Echinochloa holubii, Eragrostis micrantha, Ficinia acuminata, Fimbristylis complanata, F. ferruginea, Hyparrhenia dregeana, H. quarrei, Ischaemum fasciculatum, Kyllinga erecta, Panicum schinzii, Pennisetum sphacelatum, Pycreus macranthus, P. nitidus, Setaria pallide-fusca, Xyris gerrardii*.

Herbs: *Centella asiatica* (d), *Ranunculus multifidus* (d), *Berkheya radula, B. speciosa, Berula erecta* subsp. *50erticilla, Centella coriacea, Chironia palustris, Equisetum ramosissimum, Falckia oblonga, Haplocarpha 50ertic, Helichrysum difficile, H. dregeanum, H. mundtii, Hydrocotyle sibthorpioides, H. 50erticillate, Lindernia conferta, Lobelia angolensis, L. flaccida, Mentha aquatica, Monopsis decipiens, Pulicaria scabra, Pycnostachys reticulata, Rorippa fluviatilis* var. *fluviatilis, Rumex lanceolatus, Senecio inornatus, S. microglossus, Sium repandum, Thelypteris confluens, Wahlenbergia banksiana*.

Geophytic Herbs: *Cordylogyne globosa, Crinum bulbispermum, Gladiolus papilio, Kniphofia ensifolia, K. fluviatilis, K. linearifolia, Neobolusia tysonii, Nerine gibsonii* (only in Eastern Cape), *Satyrium hallackii* subsp. *hallackii.*

Megagraminoids: *Phragmites australis* (d), *Schoenoplectus corymbosus* (d), *Typha capensis* (d), *Cyperus immensus*.

Graminoid: *Carex cernua.*

Aquatic Herbs: *Aponogeton junceus, Ceratophyllum demersum, Lagarosiphon major, L. muscoides, Marsilea capensis, Myriophyllum spicatum, Nymphaea lotus, N. nouchali* var. *caerulea, Nymphoides thunbergiana, Potamogeton thunbergia*.

Carnivorous Herb: *Utricularia inflexa.*

Herb: *Marsilea farinosa* subsp. *farinosa.*

Biogeographically Important Taxon: (Highveld endemic) Herb: *Rorippa fluviatilis* var. *caledonica*.

Endemic Taxa: Geophytic Herbs: *Disa zuluensis, Kniphofia flammula* (northern KwaZulu-Natal), *Nerine platypetala*. Succulent Herb: *Crassula tuberella*.

Conservation: About 5% statutorily conserved in the Blesbokspruit (a Ramsar site), Hogsback, Marievale, Olifantsvlei, Seekoeivlei (a Ramsar site), Wakkerstroom Wetland, Umgeni Vlei, Umvoti Vlei and Pamula Park Nature Reserves. It is also protected in private nature reserves such as the Korsman Bird Sanctuary and Langfontein. Some 15% has been transformed to cultivated land, urban areas or plantations. In places intensive grazing and use of lakes and freshwater pans as drinking pools for cattle or sheep cause major damage to the wetland vegetation. The following aliens are encountered in this type of wetland: *Bidens bidentata*, *Cirsium vulgare*, *Conyza bonariensis*, *Oenothera rosea*, *Physalis viscosa*, *Plantago lanceolata*, *Rumex crispus*, *Sesbania punicea*, *Schkuhria pinnata*, *Stenotaphrum secundatum* (native on South African coast, alien on highveld), *Trifolium pratense*, *Verbena bonariensis*, *V. brasiliensis*, *Xanthium strumarium*, etc.

Remarks: Vegetation patterning in the form of concentric belts ('rings') is often found in pans. Pan size and depth may be a factor limiting vegetation, as large water bodies with shallow water may experience wave action. This limits the presence of species with floating leaves as well as some submerged and marginal macrophytes. The situation is more complex in vleis as these often have variable microtopography and soil types within a single wetland. It is possible for seasonally inundated zones to occur embedded inside the permanently inundated zone of a vlei if this zone is present.

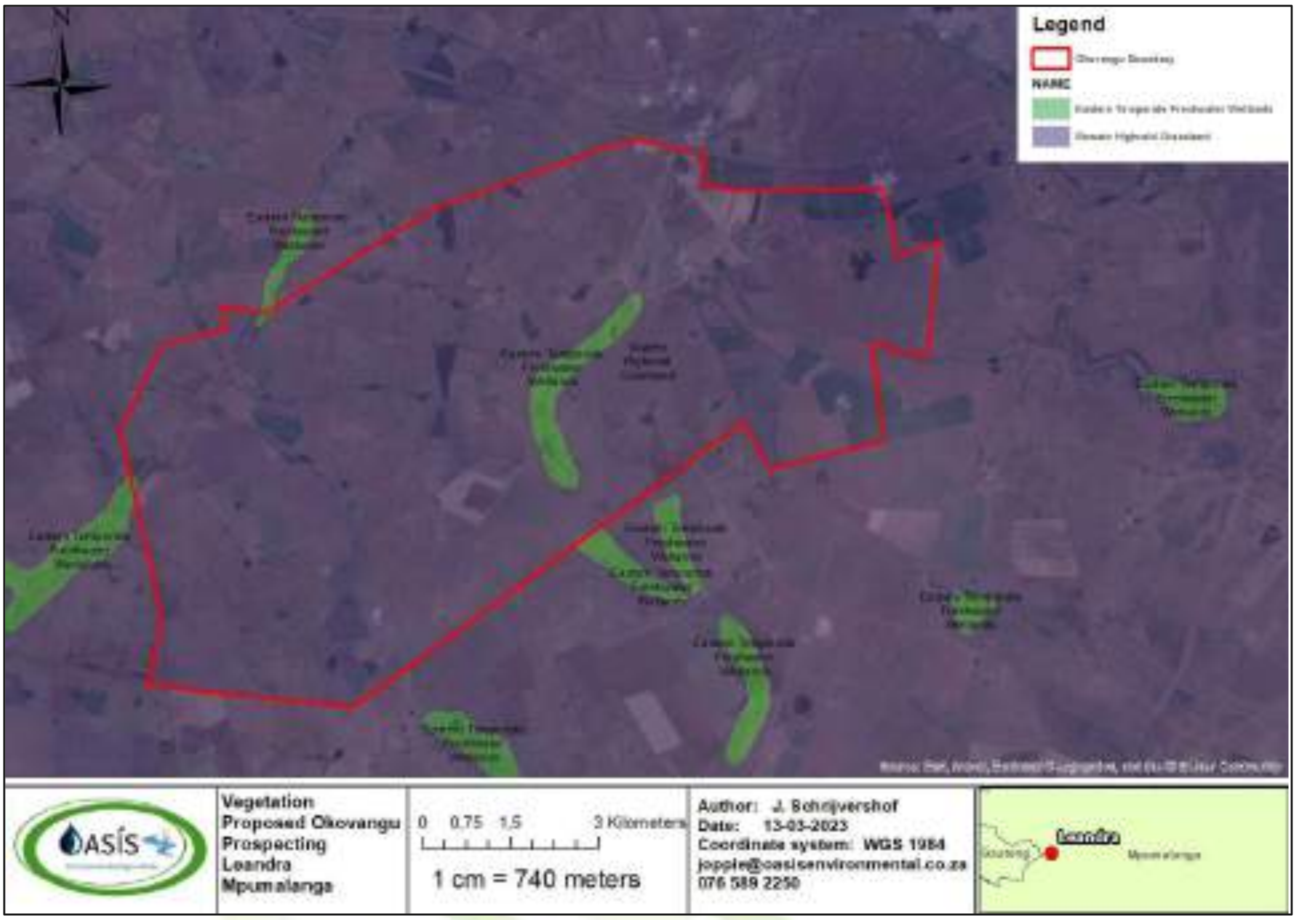


Figure 3-14: Vegetation map

Critical Biodiversity Areas

According to the Critical Biodiversity Areas datasets provided by SANBI (2023), a very large portion of application area falls within Critical Biodiversity Areas as seen in Figure 3-15. The remainder of the application area overlaps with Ecological Support Areas. The sensitive areas seem to be associated with the wetlands and rivers within the area.

According to SANBI the following fauna have been recorded within the area in the past. The Southern African Hedgehog (*Atelerix frontalis*), Serval (*Leptailurus serval*) and Schreiber's Long-fingered Bat (*Miniopterus Schreiber's*) all listed as Near Threatened. The likelihood of these species currently occurring within the application area is very unlikely due to it being in a heavily modified state (agricultural fields).

Figure 3-15: The proposed Prospecting Right area - Critical Biodiversity Areas map

Threatened Ecosystems and Protected areas

The proposed prospecting project does overlap with the Soweto Highveld Grassland and is listed as an endangered ecosystem. Only a handful of patches statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site). Almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have been flooded by dams (Grootdraai, Leeukuil, Trichardtsfontein, Vaal, Willem Brummer).

Important Bird Areas

The proposed prospecting project does not fall within/close to any Important Bird Areas.

Flora

Vegetation normally associated with the proposed prospecting right application area is listed in Appendix A of the Ecological specialist report(Found under Appendix D – Specialist Studies of this BAR: *Desktop Wetland and Ecological Assessment)* depicted from SANBI's POSA (Plants of Southern Africa) list. Information on plant species recorded in that area as extracted from the POSA list, indicate that 80 plant species have been recorded in the area queried of which 77 are endemic species are known to occur within the area queried. (Table 3-9**Error! Reference source not found.**). *Nerine gracilis* listed as Vulnerable and *Kniphofia typhoides*; *Stenostelma umbelluliferum*; *Gladiolus robertsoniae* listed as Near Threatened is thought to occur within these areas.

Table 3-9: Floral species summary for the area queried around the proposed areas as per SANBI (2023)

Number of Families	Number of species	Endemic species	Exotic species	IUCN Red Listed Species
28	80	77	3	4

Fauna

Disturbance factors such as anthropogenic activities result in disturbances to the naturally occurring faunal species. However faunal species normally associated with that area is listed in Appendix B of the Ecological specialist report (Found under Appendix D – Specialist Studies of this BAR: *Desktop Wetland and Ecological Assessment).*

Reptiles

No red data reptiles were identified as occurring in the quarter degree squares 2628BD.

Amphibians

No red data reptiles were identified as occurring in the quarter degree squares 2628BD.

Avifauna

All desktop findings were extracted from the ADU (Animal Demography Unit), SABAP (South African Bird Atlas Project) 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas and from the Red Data Book of Birds (Taylor *et al.,* 2015) with the distribution being confirmed in Roberts – Birds of Southern Africa, 7th edition (Hockey *et al*., 2005) Appendix C of the Ecological specialist report (Found under Appendix D – Specialist Studies of this BAR: *Desktop Wetland and Ecological Assessment*). Based on an evaluation of the pentads 2625_2845 and 2625_2850 the potential of these red listed species occurring within the area is provided in Table 3-10 below.

Table 3-10: Red listed avifaunal species identified during the desktop study around the proposed areas

Common Name	Scientific Name	Conservation Status
Pallid Harrier	*Circus macrourus*	Near Threatened
Black Harrier	*Circus maurus*	Vulnerable
Maccoa Duck	*Oxyura maccoa*	Near Threatened
Blue Crane	*Anthropoides paradiseus*	Vulnerable
Grey Crowned- (Crowned) Crane	*Balearica regulorum*	Endangered
Blue Korhaan	*Eupodotis caerulescens*	Near Threatened
Denham's (Stanley's) Bustard	*Neotis denhami*	Near Threatened
Secretarybird	*Sagittarius serpentarius*	Vulnerable

Mammals

The Highveld Golden Mole (*Amblysomus septentrionalis)* listed as Vulnerable; the Southern African Hedgehog (*Atelerix frontalis*); Southern African Vlei Rat (*Otomys auratus*); African Clawless Otter (*Aonyx capensis*); Swamp Musk Shrew (*Crocidura mariquensis*) and Serval (*Leptailurus serval*) listed as Near Threatened is thought to possibly occur within the area according to SANBI (2023).

HERITAGE

Historical topographical maps & aerial images

Historical images and topographical maps dating to 1953, 1958, 1965, 1969, 1975, 1984, 1991, 1995, 2007 and 2010 were used to determine the location and relative age of the structures and buildings associated with the demarcated portion (Table 8 of the Desktop Heritage Study found in Appendix D – Specialist Studies of this BAR), as well as to establish historical land uses associated with the demarcated area.

The study area: The proposed prospecting right application area

Much of the study area appears to consist of open veldt and cultivated land. The land use of the open sections is unknown but is likely to be utilised as pasture for cattle. The general surroundings appear to be associated with agricultural activities and crop cultivation. Several buildings and farmsteads are evident on the majority of the demarcated farm portions.

Archaeological and Historical Remains

Stone Age Remains

The heritage studies conducted in the general area did not locate any stone age material. Also, according to Bergh (1998), no major Stone Age site is located in the direct vicinity of the study area. Since such sites are often associated with water sources, Stone Age material is more likely to be encountered within the 500 m river buffer zone of the study area.

Iron Age Farmer Remains

Stone-walled sites are often detectable on satellite and aerial imagery. However, no such sites were observed. It should also be noted that the presence of such sites might be obscured by dense vegetation and poor preservation and are therefore more likely to be located in the undisturbed sections of the study area. Bergh (1998) also noted the presence of LIA sites directly to the south of the study area. The heritage studies conducted by Matakoma Heritage Consultants (2007), Coetzee (2017) and the National Cultural History Museum (2003) located no Iron Age sites.

Historical

Fifty-two sites associated with buildings/huts were identified on historical aerial imagery and topographical maps. These sites date to 1953 or earlier and to between 1953 and 1958. Nine (9) sites were also identified on the 1965 topographical map (Appendix A: Figure 27 of the Desktop Heritage Study found in Appendix D – Specialist Studies of this BAR), suggesting that the buildings/huts were constructed between 1958 and 1965 and could therefore potentially date to historical times (Table 4 of the Desktop Heritage Study found in Appendix D – Specialist Studies of this BAR). Based on contemporary satellite imagery, 11 of the identified historical and potentially historical sites are associated with surface infrastructure, while no surface remains were observed at the remaining 50 sites. It should be kept in mind that the sites still associated with surface remains might have been demolished and replaced by more recent buildings. Also, the 50 sites where no surface remains were noted might be associated with subsurface cultural remains and might therefore be sensitive from a heritage perspective. The heritage study conducted by Matakoma Heritage Consultants (2007) recorded several structures and buildings that might date to the Historic Period.

Contemporary Remains/Natural

Evidence from satellite and aerial imagery, as well as topographical maps, indicate the presence of 53 areas associated with modern infrastructure (Table 5 of the Desktop Heritage Study found in Appendix D – Specialist Studies of this BAR). These buildings and structures were constructed after 1965. Thirty-three (33) of these sites, however, appear to have been demolished. The 53 identified sites do not exceed 60 years of age. The heritage studies conducted by Matakoma Heritage Consultants (2007), Coetzee (2017) and the National Cultural History Museum (2003) did not record significant contemporary sites.

Graves

Three graves were noted on the topographical map dating to 1965 (Table 6 & Appendix A: Figure 27 of the Desktop Heritage Study found in Appendix D – Specialist Studies of this BAR). The current status of the graves, however, is unknown. Such sites are rarely visible on aerial imagery and are not always indicated on topographical maps. Burial sites are also often associated with historical farm- and homesteads and the possibility therefore exists that additional graves may be associated with the study area. The heritage studies conducted by Matakoma Heritage Consultants (2007) and the National Cultural History Museum (2003) mention the presence of several graves and cemeteries in the general area.

Table 3-11: Heritage report - Sensitive sites

Site No	Type	Farm Portion	Lat (y)	Lon (x)	Current Status	Age	Sensitivity
2628BD-B-001	Building	12/341	-26.467346	28.809614	Surface Remains	Historical	Sensitive
2628BD-B-002	Building	12/341	-26.463590	28.812563	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-003	Building	10,12/341	-26.480309	28.808585	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-004	Building	10/341	-26.454331	28.805268	Surface Remains	Historical	Sensitive
2628BD-B-005	Building	9/341	-26.442474	28.785815	Surface Remains	Historical	Sensitive
2628BD-B-006	Building	1/341	-26.439609	28.813338	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-007	Building	2/341	-26.432517	28.806843	Surface Remains	Historical	Sensitive
2628BD-B-008	Building	5/341	-26.448746	28.819696	Surface Remains	Historical	Sensitive
2628BD-B-009	Building	3/341	-26.439553	28.817260	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-010	Building	7/341	-26.433801	28.841964	Surface Remains	Historical	Sensitive
2628BD-B-011	Building	14/341	-26.431246	28.830394	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-012	Building	15/341	-26.434551	28.828865	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-013	Building	3/344	-26.417524	28.815361	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-014	Building	2/344	-26.420015	28.858225	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-015	Building	32/350	-26.407907	28.866471	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-016	Building	32/350	-26.406241	28.869889	Surface Remains	Historical	Sensitive
2628BD-B-017	Building	3/350	-26.414006	28.877028	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-018	Building	4/350	-26.409144	28.900519	Surface Remains	Historical	Sensitive
2628BD-B-019	Building	17/350	-26.420287	28.900845	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-020	Building	17/350	-26.421514	28.905385	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-021	Building	17/350	-26.419351	28.906597	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-022	Building	2/344	-26.416639	28.860201	Surface Remains	Historical	Sensitive
2628BD-B-023	Building	2,3/344	-26.421079	28.857294	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-024	Building	7/341	-26.430417	28.845307	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-025	Building	35/350	-26.404774	28.872774	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-026	Building	1/350	-26.428162	28.892691	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-027	Building	1/350	-26.437018	28.892499	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-028	Building	1/344	-26.417379	28.864841	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-029	Building	0/347	-26.434092	28.855437	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-030	Building	0/347	-26.462256	28.835339	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-031	Building	0/347	-26.467901	28.828866	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-032	Building	2/344	-26.409675	28.861057	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-033	Building	2/344	-26.403624	28.854191	No Surface Remains	Historical	Potentially Sensitive

Updated- 27/3/2023

Site No	Type	Farm Portion	Lat (y)	Lon (x)	Current Status	Age	Sensitivity
2628BD-B-034	Building	3/344	-26.422772	28.843891	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-035	Building	3/344	-26.419373	28.839262	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-036	Building	3/344	-26.422789	28.835979	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-037	Building	7/341	-26.429426	28.840886	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-038	Building	2/341	-26.430784	28.812063	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-039	Building	1/341	-26.444170	28.807324	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-040	Building	10/341	-26.458133	28.807198	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-041	Hut	9/341	-26.438134	28.791518	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-042	Hut	1/341	-26.455874	28.816234	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-043	Building	1/341	-26.443938	28.810789	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-044	Hut	1/341	-26.442563	28.807990	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-045	Building	2/341	-26.431337	28.815089	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-046	Building	8/341	-26.429368	28.818808	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-047	Grave	3/344	-26.420043	28.830526	Unknown	Potentially Historical	Sensitive
2628BD-B-048	Hut	2/344	-26.418657	28.858811	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-049	Building	4/350	-26.410390	28.899647	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-050	Building	28/350	-26.412980	28.902828	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-051	Hut	28/350	-26.414832	28.898256	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-052	Hut	28/350	-26.413430	28.896854	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-053	Hut	27/350	-26.414306	28.894872	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-054	Grave	1/350	-26.431745	28.899612	Unknown	Potentially Historical	Sensitive
2628BD-B-055	Grave	1/350	-26.433075	28.888226	Unknown	Potentially Historical	Sensitive
2628BD-B-056	Building	1/350	-26.433843	28.891729	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-064	Building	4/350	-26.408945	28.901807	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-067	Building	4/350	-26.409890	28.900203	Surface Remains	Historical	Sensitive
2628BD-B-107	Building	17/350	-26.420666	28.903742	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-108	Building	17/350	-26.419536	28.907749	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-109	Building	28/350	-26.410979	28.900584	Surface Remains	Historical	Sensitive
2628BD-B-110	Building	3/350	-26.416734	28.874731	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-114	Building	2/344	-26.405014	28.857224	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-115	Building	7/341	-26.434721	28.840814	No Surface Remains	Historical	Potentially Sensitive

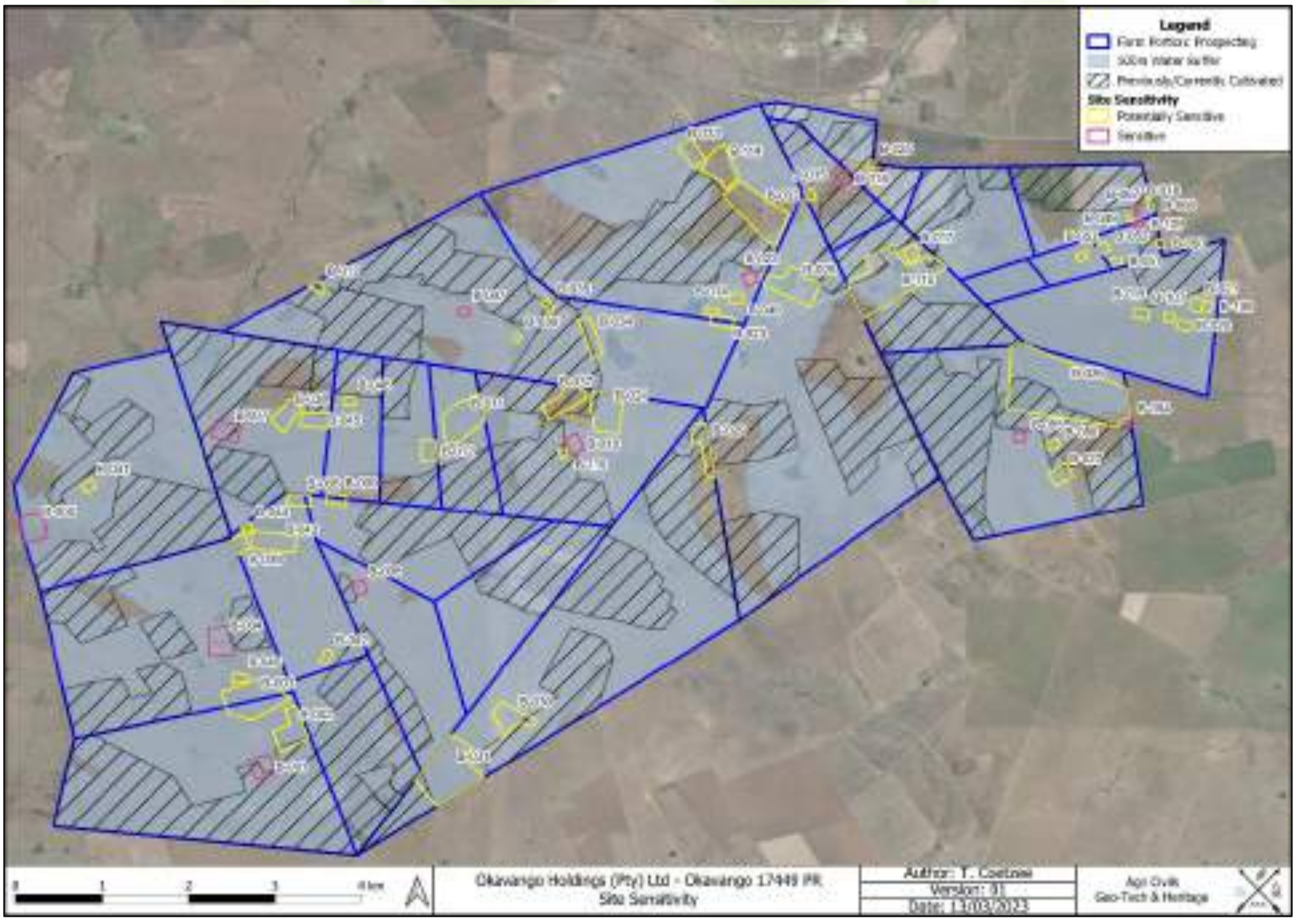


Figure 3-16: Heritage report site sensitivity of the proposed prospecting right application area

PALAEONTOLOGICAL

Geological Context

The project lies in the central part of the main Karoo Basin where the older strata are exposed and extensive dolerite incursions are evident (Figure 3-17). Along the watercourses are much younger sands and alluvium.

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu Natal south coast. It is bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates. During the Carboniferous Period South Africa was part of the huge continental landmass known as Gondwanaland and it was positioned over the South Pole. As a result, there were several ice sheets that formed and melted, and covered most of South Africa (Visser, 1986, 1989; Isbell et al., 2012). Gradual melting of the ice as the continental mass moved northwards and the earth warmed, formed fine-grained sediments in the large inland sea.

Figure 3-17: Geological map in relation to the proposed prospecting right application area (yellow rectangle)

These are the oldest rocks in the system and are exposed around the outer part of the ancient Karoo Basin and are known as the Dwyka Group. They comprise tillites, diamictites, mudstones, siltstones and sandstones that were deposited as the basin filled (Johnson et al., 2006).

Overlying the Dwyka Group rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. In the central and eastern part are the following formations, from base upwards: Pietermaritzburg, Vryheid and Volksrust Formations. All of these sediments have varying proportions of sandstones, mudstones, shales and siltstones and represent shallow to deep-water settings, deltas, rivers, streams and overbank depositional environments.

Large exposures of Jurassic dolerite dykes occur throughout the area. These intruded through the Karoo sediments around 183 million years ago at about the same time as the Drakensberg basaltic eruption.

Palaeontological Context

The palaeontological sensitivity of the area under consideration is presented in . The site for prospecting is in the non-fossiliferous dolerite and the very highly sensitive shales of the Vryheid Formation.

The Vryheid Formation lies on the uneven topography of pre-Karoo or Dwyka Group rocks in the northern and northwestern margins, but lies directly on the Pietermaritzburg Formation in the central and eastern part. The lithofacies show a number of upward-coarsening cycles, some very thick, and they are essentially deltaic in origin. There are also delta-front deposits, evidence of delta switching, and fluvial deposits with associated meandering rivers, braided streams, back swamps or interfluves and abandoned channels (Cadle et al., 1993; Cairncross, 1990; 2001; Johnson et al., 2006). Coal seams originated where peat swamps developed on broad abandoned alluvial plains, and less commonly in the backswamps or interfluves.

Figure 3-18: SAHRIS palaeosensitivity map for the site for the proposed Okovango 17449 PRA shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue

Most of the economically important coal seams occur in the fluvial successions (ibid). In the east (Mpumalanga and northern KwaZulu Natal), the Vryheid formation can be subdivided into a lower fluvial-dominated deltaic interval, a middle fluvial interval, and an upper fluvial-dominated deltaic interval again (Taverner-Smith et al., 1988). Vertebrates do not occur with the fossil plants.

Fossil plants of the Glossopteris flora occur in the Vryheid Formation. This flora includes Glossopteris leaves, seeds, fructifications, roots and wood, as well other groups such as the lycopods, sphenophytes, ferns, cordaitaleans and early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004).

Although coal is a product of intense alteration by heat and pressure on buried peats (dead plant matter), there are no visible plant structures in coal itself. Impressions and compression of the plants sometimes occur in the carbonaceous shales between coal seams. In the Leandra area the uppermost coal seam (No 5) is more than 20m below the ground surface and is covered by sandstone (based on borehole cores described by Snyman(1998), fig. 16), Furthermore, the area is sandstone-rich, with only narrow bands of shale and siltstone. Since sandstones are generally too coarse to preserve fossil leaves, shales are much better, the likelihood of fossil plants occurring in this area is low.

Social

Gert Sibande District Municipality

Gert Sibande District Municipality (GSDM) comprises seven local municipalities, including Govan Mbeki Local Municipality (GMLM). Spatially, Gert Sibande District Municipality is the largest of the three districts in Mpumalanga Province. The manufacturing sector, dominated by mining products, electricity generation and petrochemicals, is the leading industry (57.4%) in terms of gross value added (GVA) contribution to the district economy, followed by mining (14.1%) and community services (12.3%). Overall, GSDM was the second largest contributor to GVA in Mpumalanga in 2012 after Nkangala, and four of the ten coal-fired power stations in Mpumalanga are in the GSDM. GSDM also accommodates the largest agricultural sector in the province, supported by strong service centres such as Standerton, Ermelo, Bethal and Piet Retief. Almost 23% of the district land is under cultivation, 80% of which is under commercial dry land cultivation for producing grains. Other significant economic sectors in the GSDM are commercial forestry and tourism.

Figure 3-19: Gert Sibande District Municipality

Govan Mbeki Local Municipality

Socio-economic data contained in the paragraphs below was abstracted for the Govan Mbeki Local Municipality's Spatial Development Framework (2014 – 2034) (http://www.govanmbeki.gov.za/wp content/strategic_documents/sdf2034.pdf **)**

Population and Demographics

Govan Mbeki Municipality is situated in the south-eastern part of Mpumalanga, abutting Gauteng in the south, approximately 150km east of Johannesburg and approximately 300km southeast of Nelspruit. Govan Mbeki is one of 7 local municipalities under the jurisdiction of the Gert Sibande District Municipality. The municipality covers an area of approximately 2958km² and has a population of approximately 480 000 people, most of whom reside in the various urban areas.

The economic active population percentage of Govan Mbeki (43.3%) is higher than that of the country, province, district and Emalahleni, Steve Tshwete, Msukaligwa, Dipaleseng and Lesedi in the area. It has the same economic active population as Lekwa and lower than that of Victor Khanye (48.5%).

- The males (53.8%) economic active population is significantly more than the female (32.3%economic activity for Govan Mbeki.
- In all the other areas, the male economic activity rate exceeds the female activity rate by far.

Educational Status

Educational achievement is a key development indicator of a population. The majority of the population (ages over twenty) in the local study area as well as district municipality have not completed matric, however, there is a large percentage of learners who complete primary level education.

Employment and Labour

Mpumalanga employment contributes 7.6% to the national employment and the district 25% to Mpumalanga employment. Govan Mbeki contributes 40.7% to the district employment and 23.3% to the cluster consisting of Govan Mbeki and surrounding municipalities. Govan Mbeki as part of the district contributes:

- 68.4% to the manufacturing sector
- 55.6% to the mining sector
- 47.1% to trade sector
- 27.3% to construction sector
- 46% to finance sector
- 35% to households sector

Leandra's economic opportunities

Economic opportunities could be found in:

- the agricultural sector,
- mining and chemical sectors given the town's proximity to the Secunda complex, but such industries will in all likelihood be smaller that require less capital investment. For Leandra to attract such activities it will have to develop a sound economic and financial strategy.
- SMMEs endeavours uplifting local people and establishing small-scale industries, and

While the district is one of South Africa's strongest agricultural producing regions, it is very weak in further processing agricultural products, contributing only a small percentage to the agro-processing industry. The latter indicates that considerable leakages occur in this sector. Opportunities exist for the area to take advantage of its competitive positioning and availability of raw materials.

3.8.4.1.2 Description of the current land uses.

Access to the demarcated study area appears to be through local roads turning from the R548 secondary road and R50 primary roads that run to the east and west. Much of the study area appears to consist of open veldt and cultivated land. The land use of the open sections is unknown but is likely to be utilised as pasture for cattle. The general surroundings appear to be associated with agricultural activities and crop cultivation. Several buildings and farmsteads are evident on the majority of the demarcated farm portions.

3.8.4.1.3 Description of specific environmental features and infrastructure on the site.

Tributaries of associated wetland areas of the Blesbokspruit and Suikerbosrandriver transect the demarcated study area. The demarcated study area is made up of a mixture of CBA, ESA, Natural areas and heavily or moderately modified areas according to the Mpumalanga Biodiversity Sector Plan (Figure 3-20). Agro-processing industries like chicken broiler farming facilities are located on in the demarcated study area.

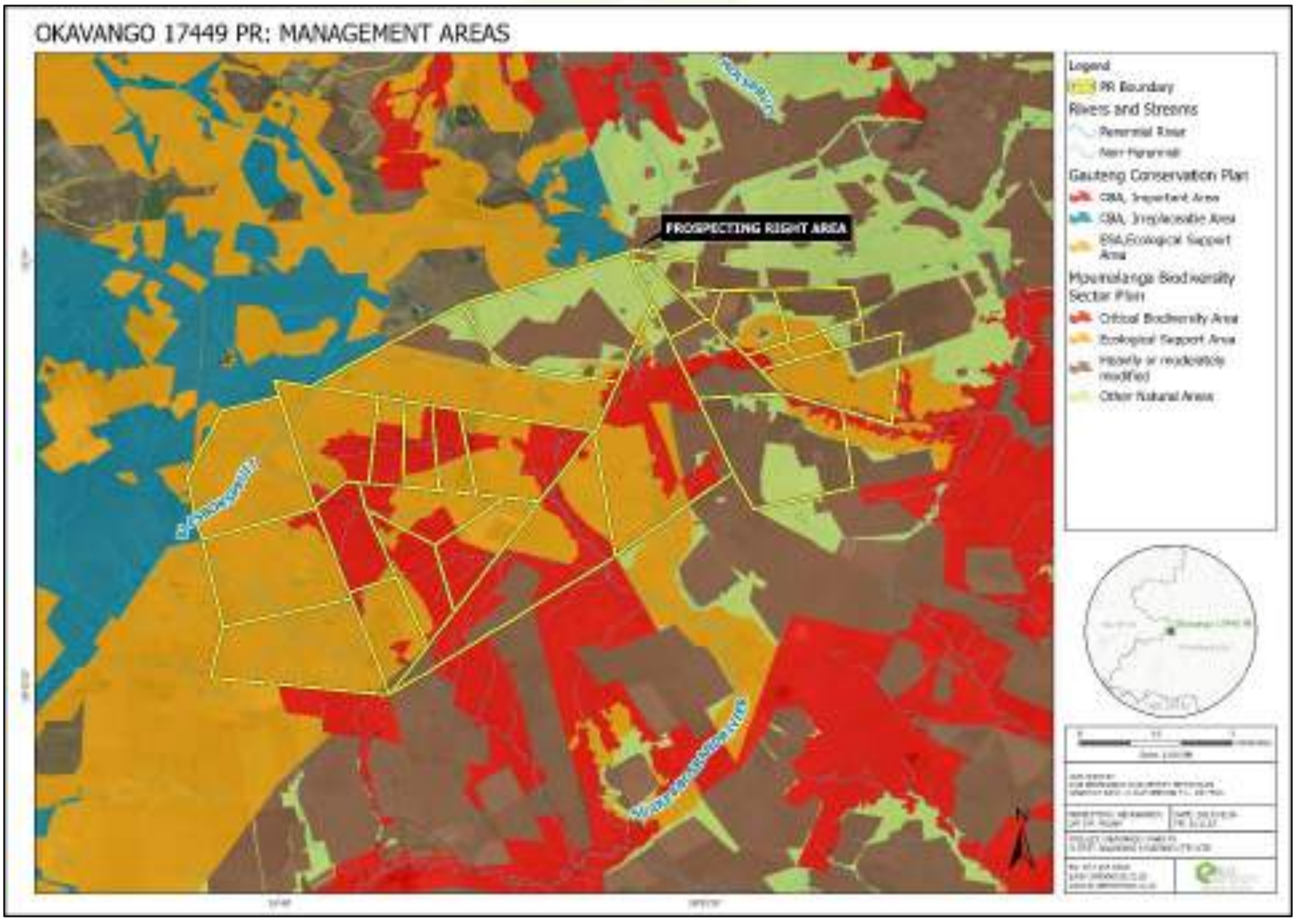


Figure 3-20: Proposed prospecting right application area - Environment Management areas map

3.8.4.1.4 Environmental and current land use map.

(Show all environmental and current land use features)

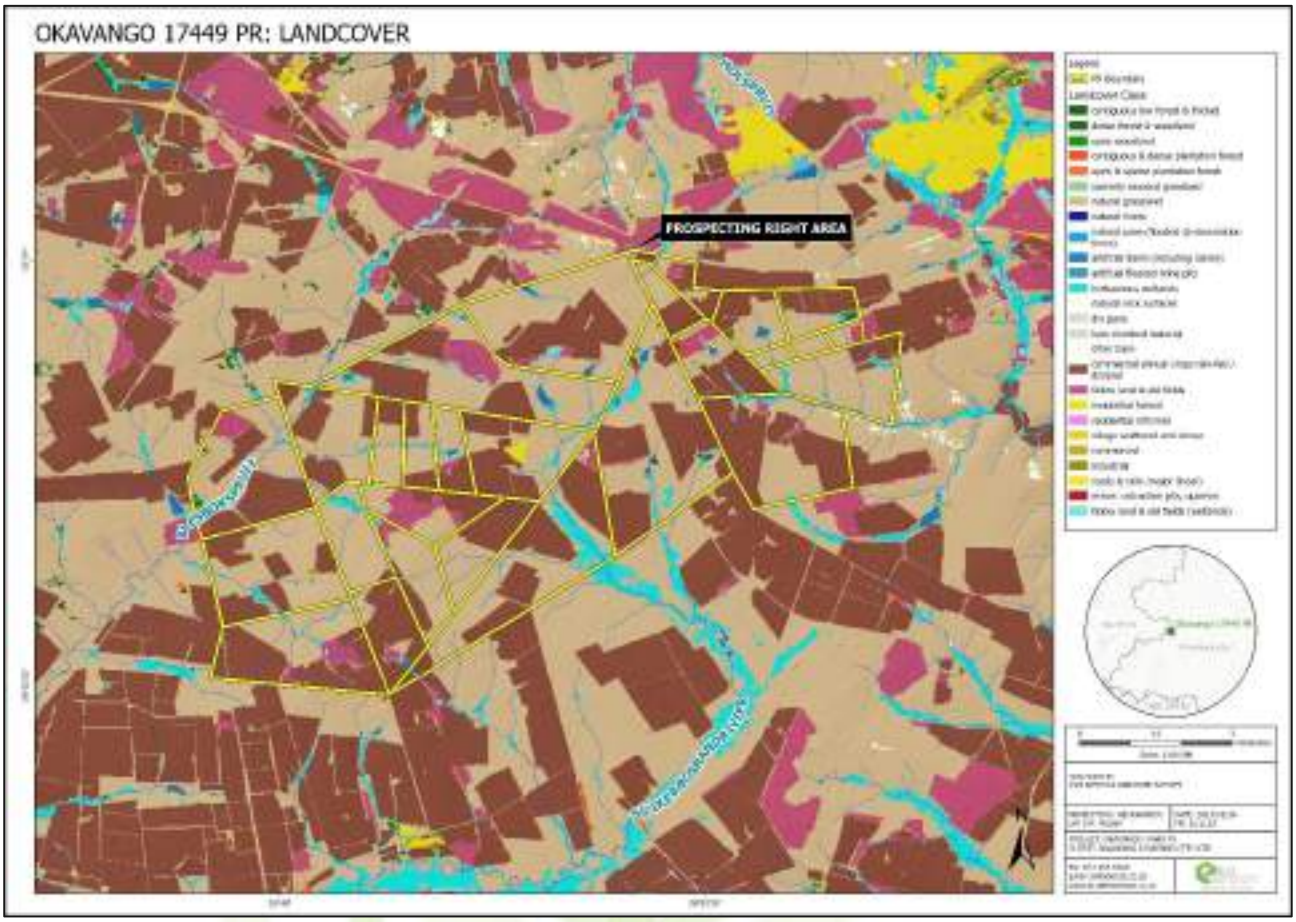


Figure 3-21: Land cover of the study area

3.8.5 Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impact can be reversed.

Wetlands & Ecological Impact Assessment

The site falls within the quaternary drainage regions B20E which is part of the Olifants Water Management Area, where the C21A and C12D catchments forms part of the Vaal Water Management Area. From a land use perspective, the water management area still remains almost totally under natural vegetation. Sheep and goat farming is practiced over most of the area. Cultivation is restricted to isolated patches where the majority consists of low shrubland.

No RAMSAR wetlands are found within the vicinity of the study site. Several small segments of seep and valley bottom wetlands were identified within the application area according to the NFEPA wetlands database. The area ranges in altitude from 1629 m to 1705 m above sea level. A Digital Elevation Model (DEM) of the aerial photography of the site revealed that the topography of the landscape is a relatively flat with drainage line landscape. The landscape is drained towards the south-west to the Vaal catchment and north-east to the Olifants catchment.

The project boundary overlaps with two major vegetation units in terms of Mucina and Rutherford (2013) namely the Soweto Highveld grassland and the Eastern temperate Freshwater Wetlands. According to the Critical Biodiversity Areas datasets provided by SANBI (2023), a very large portion of application area falls within Critical Biodiversity Areas. The remainder of the application area overlaps with Ecological Support Areas. The sensitive areas seems to be associated with the wetlands and rivers within the area. The proposed prospecting project does overlap with the Soweto Highveld Grassland and is listed as an endangered ecosystem. The proposed prospecting project not fall within/close to any Important Bird Areas.

Vegetation normally associated with that area is listed in (Appendix A in the Desktop Wetland and Ecological Assessment attached in Appendix D – Specialist studies of this BAR) depicted from SANBI's POSA list. Information on plant species recorded in that area was extracted from the POSA list, indicate that 80 plant species have been recorded in the area queried of which 77 are endemic species are known to occur within the area queried. *Nerine gracilis* listed as Vulnerable and *Kniphofia typhoides*; *Stenostelma umbelluliferum*; *Gladiolus robertsoniae* listed as Near Threatened is thought to occur within these areas.

All faunal species thought to occur within 2628BD is listed in (Appendix B in the Desktop Wetland and Ecological Assessment attached in Appendix D – Specialist studies of this BAR). No red data amphibians or reptiles were identified as occurring in the quarter degree squares 2628BD.

Based on an evaluation of the pentads 2625_2845 and 2625_2850 (Appendix C in the Desktop Wetland and Ecological Assessment attached in Appendix D – Specialist studies of this BAR) the potential of these red listed species occurring within the area include Pallid Harrier (*Circus macrourus*) listed as Near Threatened; Black Harrier (*Circus maurus*) listed as Vulnerable; Maccoa Duck (*Oxyura maccoa*) listed as Near Threatened; Blue Crane (*Anthropoides paradiseus*) listed as Vulnerable; Grey Crowned (Crowned) Crane (*Balearica regulorum*) listed as Endangered; Blue Korhaan (*Eupodotis caerulescens*) listed as Near Threatened; Denham's (Stanley's) Bustard (*Neotis denhami*) listed as Near Threatened and the Secretarybird (*Sagittarius serpentarius*) listed as Vulnerable.

The Highveld Golden Mole (*Amblysomus septentrionalis)* listed as Vulnerable; the Southern African Hedgehog (*Atelerix frontalis*); Southern African Vlei Rat (*Otomys auratus*); African Clawless Otter (*Aonyx capensis*); Swamp Musk Shrew (*Crocidura mariquensis*) and Serval (*Leptailurus serval*) listed as Near Threatened is thought to possibly occur within the area according to SANBI (2023).

Heritage Impact Assessment

As can be seen from previous research conducted in the area, the general study area appears to be sensitive from a heritage perspective and sites are likely to include LIA (Late Iron Age) sites, historical infrastructure, graves and cemeteries. Since heritage sites, such as burial sites, are not always clearly identifiable due to disturbed/removed surface features, care must be exercised when prospecting.

Figure 3-22 indicates historical and potentially historical sites, as well as a 500 m buffer area around water sources. The 500 m buffer area is considered to be potentially sensitive from a heritage perspective since archaeological sites are often located within this zone. Areas previously/currently associated with cultivated fields are indicated as well. These areas are considered to be less sensitive from a heritage perspective due to the areas being disturbed. The least sensitive areas are therefore areas that are located more than 500 m from a water source, fall within previously/currently cultivated fields and are not located within close proximity of potential heritage sites or contemporary infrastructure. From a heritage perspective, these areas are considered to be more favourable for the proposed prospecting activities.

Also, the cultivated sections located within the 500 m buffer zone indicate a disturbed context, but the potential for subsurface cultural material is slightly higher compared to areas falling outside of the buffer zone. Apart from the identified potential sites, open grassland areas falling outside of the previously/currently cultivated areas and within 500 m of a water source are considered to be the most sensitive areas from a heritage perspective. The possibility also exists that culturally sensitive sites, such as burial sites, might have been created after some of the cultivated fields fell into disuse, meaning that burial sites might be located on disturbed areas as well.

The 64 sites listed in (Table 8 of the Desktop Heritage Study found in Appendix D – Specialist Studies of this BAR), are associated with intact and demolished historical and potentially historical infrastructure that might exceed 60 years of age. The sites associated with surface remains are considered to be sensitive from a heritage perspective, while the sites where no surface remains are visible are considered to be potentially sensitive. The listed sites might therefore be protected under the NHRA (Act No. 25 of 1999). The three identified grave sites are also considered to be sensitive and significant from a heritage perspective as the Human Tissues Act (Act No. 65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act (Act No. 25 of 1999) could apply. The remaining 53 sites are of contemporary origin and are unlikely to be sensitive from a heritage perspective.

The least sensitive areas are areas that are located more than 500 m from a water source, fall within previously/currently cultivated fields and are not located within close proximity of potential heritage sites or contemporary infrastructure.

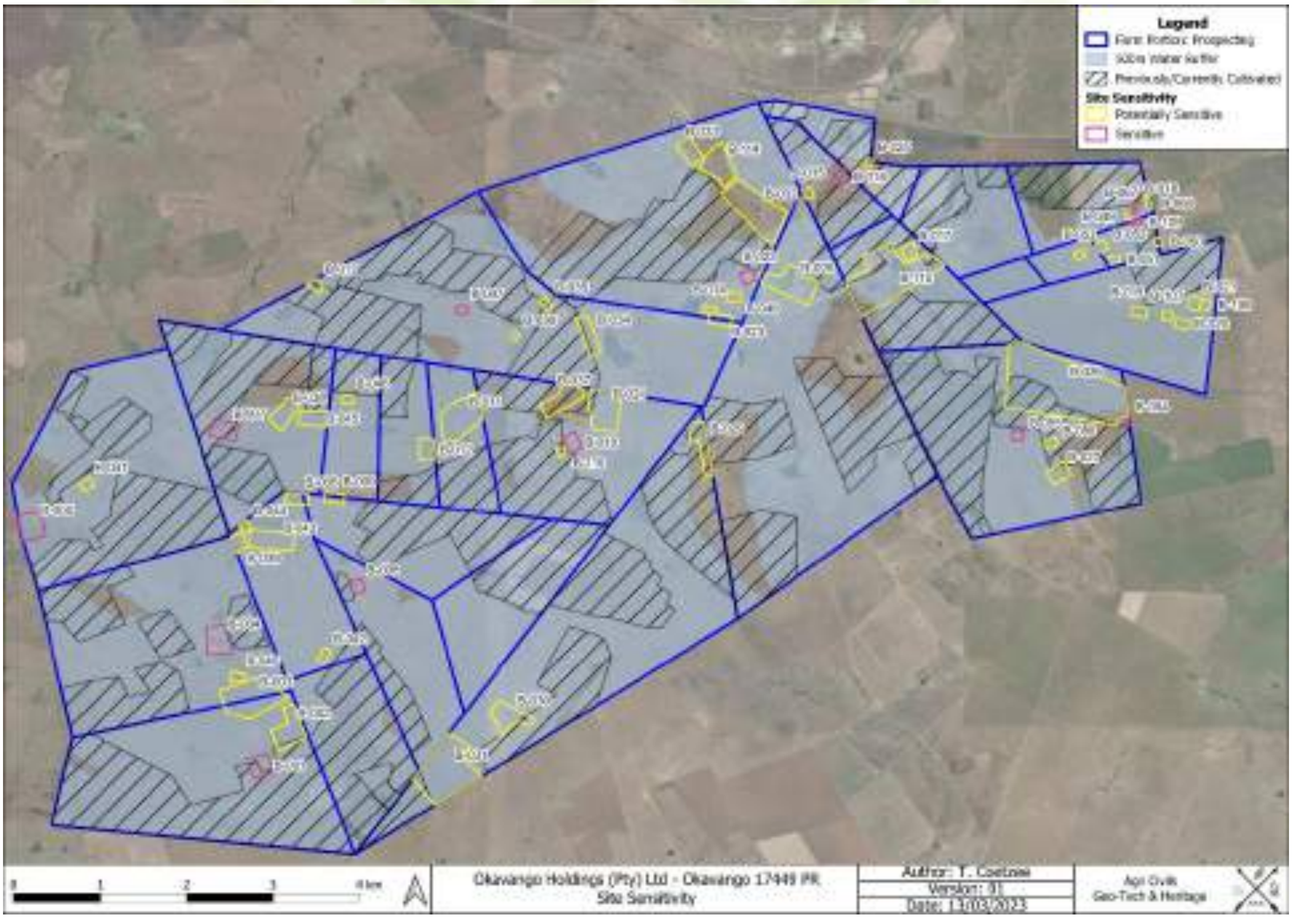


Figure 3-22: Heritage sensitivity map

Palaeontological Impact Assessment

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the wrong type to contain fossils (dolerite). Since there is a small chance that fossils from the Vryheid Formation may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and some might contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils.

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 and sands of the Quaternary. There is a very small chance that fossils may occur in the rare shales of the early Permian Vryheid Formation so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer or other responsible person once excavations and drilling for prospecting have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low, so as far the palaeontology is concerned, the prospecting permit should be granted. The results of the prospecting (presence of fossils and depth at which they occur) should be used for the mining right application.

Impact Assessment Table

Table 3-12: Impact Assessment

ACTIVITY	ASPECT	IMPACT	PHASE	±	SU[1]		±	SM[2]		MITIGATION MEASURES	ACTION PLAN
Heritage											
Subsurface activity.	Subsurface culturally significant material.	Destruction of subsurface culturally significant material.	Construction Operational Closure	Negative	4	Low	Negative	1,6	Low	Monitor material unearthed.	Monitor subsurface material during development and construction phases and contact a qualified archaeologist should culturally significant material be observed.
Site establishment.	Clearance of the site	Destruction of culturally significant material.	Construction Operational Closure	Negative	10	Low	Negative	6	Low	Avoid heritage sites of potential sensitivity and sensitivity when encountered. Adhere to the 50m buffer around sites of heritage significance (graves, burial sites, historical buildings, etc)	Monitor subsurface material during development and construction phases and contact a qualified archaeologist should culturally significant material be observed. Apply for permits to demolish or move sites of cultural significance.
Palaeontological											
Subsurface activity.	Subsurface culturally significant material.	Destruction of subsurface culturally significant material.	Construction Operational Closure	Negative	4	Low	Negative	1,6	Low	Monitor unearthed material & adhere to the Fossil Chance Find Protocol when material of palaeontological significance is found.	It is extremely unlikely that any fossils would be found in the loose soils and sands that cover the area. There might be fossils more than 5m below ground that will be disturbed if mining commences. Therefore, a Fossil Chance Find Protocol should be added to the EMPr.
Noise											
Invasive prospecting activities	Machinery and drilling operations. Movement of vehicles.	Increased Noise levels	Construction Operational Closure	Negative	10	Low	Negative	6	Low	Avoid travelling past residences. Speed limit of 40 km/h will be enforced. Liaise with landowner on areas sensitive to noise. Provide a buffer of 100 m from households. Drilling to take place during daylight hours.	Switching off equipment when not in use. Borehole site and access route selection to give cognisance to the location of noise receptors and efforts must be taken to minimise such disturbance.
Wetland & Ecological											

[1] Significance unmitigated
[2] Significance mitigated

ACTIVITY	ASPECT	IMPACT	PHASE	±	SU[1]		±	SM[2]		MITIGATION MEASURES	ACTION PLAN
Invasive prospecting activities	Establishment of drilling sites and access routes.	Removal / of damage natural vegetation.	Construction Operational Closure	Negative	48	Med	Negative	9,6	Low	Rehabilitation of the disturbed areas. Limiting instream sedimentation. Minimising pollutants entering the watercourse. Erosion control measures must be employed where required. Keep the footprint of disturbance as small as practicably possible. Vegetation to be left in place to protect soils where possible. Where vegetation clearance cannot be avoided, storm water management measures to be put in place if there is a risk of soil erosion. Erosion protection where cut and fill and levelling of the drill site occurred.	A 32 m buffer implemented for the wetland system. A topsoil stripping and stockpiling guideline must be completed to ensure rehabilitation success. Vegetation clearing must be undertaken as and when necessary, in phases. Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. Demarcate wetland areas to avoid unauthorised access. No releases of any substances that could be toxic to fauna or faunal habitats within the channels or any watercourses is permitted. Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities Portable toilets must be placed on impervious level surfaces that are lipped to prevent spillage. The general consensus is that they should be within 30 m to 50 m of a work face. Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas. Utilise existing access roads as far as possible. Keep the footprint of disturbance as small as practicably possible. Access roads to follow slope contours where possible. Vegetation to be left in place at sides of the road to protect the soils
Invasive prospecting activities	Establishment of drilling sites and access routes.	Degradation and destruction of sensitive biodiversity-Suitable habitat for the globally threatened species.	Construction Operational Closure	Negative	24	Low-Med	Negative	9,6	Low	The extent of the buffer zone that will be maintained varies according to factors including rainfall, nature of lateral flows and inputs, surrounding slope and soil characteristics, and will be determined by a wetland specialist prior to any prospecting taking place. A protected/threatened fauna and flora species search and rescue operation on the prospecting footprint prior to commencement of activities, to be conducted during the growing season. Alternatively, restrict prospecting to modified land only.	A protected/threatened fauna and flora species search and rescue operation on the prospecting footprint prior to commencement of activities, to be conducted during the growing season. Alternatively, restrict prospecting to modified land only.
Geology											
Invasive prospecting activities (drilling cores)	Removal of geological core	Creation of conduits between geological strata	Operation Closure	Negative	24	Low-Med	Negative	9,6	Low	Boreholes to be sealed with concrete.	Boreholes to be sealed with concrete. Keep a record of the backfilled boreholes that were cemented and sealed including all the attributes of the logging therein.
Groundwater & Surface water											

ACTIVITY	ASPECT	IMPACT	PHASE	±	SU[1]		±	SM[2]		MITIGATION MEASURES	ACTION PLAN
Invasive prospecting activities (drilling cores)	Seepage of fuels, oils and lubricants.	Contamination of groundwater.	Construction, Operation and Closure.	Negative	24	Low-Med	Negative	9,6	Low	Implement measures to protect soils from pollution. Boreholes to be outside of the 1 in 50-year flood line or 100 m from the edge of a watercourse, whichever is greater.	Consult the delineated wetland map or flood line determination for this project to determine the locations of the watercourses and where prospecting should be avoided/restricted.
Invasive prospecting activities (drilling cores)	Cross contamination of aquifers due to borehole construction.	Contamination of groundwater.	Construction, Operation and Closure.	Negative	24	Low-Med	Negative	9,6	Low	Boreholes that will not be used again will be backfilled with cement and sealed.	Keep a record of the backfilled boreholes that were cemented and sealed including all the attributes of the logging therein.
Hydrocarbon spills.	Water and soil contamination.	Spills from mining vehicles and machinery can pollute surface, groundwater and soil.	Construction Operation Closure	Negative	14	Low	Negative	2,8	Low	Impermeable liners or surfaces to be provided in areas where hydrocarbons are managed. Diesel storage areas to be bunded and regularly checked. Drip trays to be used when any vehicle maintenance is undertaken. Spill kits to be available at drill sites.	Report any hydrocarbon spillage.
Invasive prospecting activities (drilling cores)	Vegetation clearance and site establishment	Contamination of surface water.	Construction Operation Closure	Negative	33	Low-Med	Negative	13,2	Low	Implement measures to protect soils from pollution. Boreholes to be outside of the 1 in 50-year flood line or 100 m from the edge of a watercourse, whichever is greater.	Keep a record of the backfilled boreholes that were cemented and sealed including all the attributes of the logging therein. Consult the delineated wetland map or flood line determination for this project to determine the locations of the watercourses and where prospecting should be avoided/restricted.
Invasive prospecting activities (drilling cores)	Hydrocarbon spills Dirty Water release Sediment runoff.	Contamination of surface water.	Construction Operation Closure	Negative	33	Low-Med	Negative	13,2	Low	Implement measures for soil erosion control in accordance with risk assessment. Boreholes to be outside of the 1 in 50-year flood line or 100 m from the edge of a watercourse, whichever is greater.	Keep a record of the backfilled boreholes that were cemented and sealed including all the attributes of the logging therein. Consult the delineated wetland map or flood line determination for this project to determine the locations of the watercourses and where prospecting should be avoided/restricted.
Ablution	General and Human Waste	Contamination of surface water.	Construction Operation Closure	Negative	14	Low	Negative	2,8	Low	Contractors may only use designated toilets and waste disposal facilities.	Contract an ablution service provider for the short time during drilling activities.
Air Quality											
Exhaust fumes from vehicles and machinery related to prospecting activities.	Release of gaseous emissions.	Exhaust fumes from vehicles and machinery related to prospecting activities.	Construction Operational Closure	Negative	33	Low-Med	Negative	13.2	Low	No unnecessary revving of vehicles should take place. No vehicles must stand idling when not in use.	Switch off any vehicle or machine not in use. Ensure machinery is maintained and in good working condition.

ACTIVITY	ASPECT	IMPACT	PHASE	±	SU[1]		±	SM[2]		MITIGATION MEASURES	ACTION PLAN
Vehicles travelling on gravel roads	Dust fallout and fine matter emissions	Vehicles travelling on gravel roads	Construction Operational Closure	Negative	33	Low-Med	Negative	13.2	Low	Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur. Reduce exposure areas avoid dust creation	Demarcate areas of movement, and avoid areas where movement is not permitted. When using vehicles, minimise travel speed and distance and volume of traffic on the roads. Cleared areas should be revegetated during closure phase. Dust supresses drill sites.
Land use and Land Capability											
Invasive prospecting activities	Intrusion due to drilling and prospecting activities in an area where agricultural land uses are prominent.	Land use conflict	Construction Operational Closure	Negative	33	Low-Med	Negative	13.2	Low	Ensure landowner access agreements are in place and that conditions met in this BAR and any contractual specifics between the drill contractor and the landowner are met.	Drilling sites must be selected to minimise disturbance of current land use. Relevant agreements must be in place with landowners to define location and extent of drilling sites and rehabilitation measures that will be undertaken at the end of drilling.
Invasive prospecting activities.	Land clearing and transformation.	Reduction in land capability	Construction Operational Closure	Negative	33	Low-Med	Negative	13.2	Low	Rehabilitate drill sites. Where vegetation was cleared revegetation should follow in the closure phase. Water used during drilling should be kept in a sump and re-used where possible. Boreholes must be refilled (capped) after drilling and core logging. Drill sites should be restored as far as reasonably possible to pre prosecting activities.	Drilling sites must be selected to minimise disturbance of current land use. Relevant agreements must be in place with landowners to define location and extent of drilling sites and rehabilitation measures that will be undertaken at the end of drilling.
Socio-economic Development											
Prospecting activities	Employment and use of contractors and purchasing goods.	Contribution to the economy.	Construction Operational Closure	Positive	40	Med	Positive	75	Med-High	Preference to be given to the use of local employment, contractors and local suppliers.	A screening of trustworthy local suppliers must be undertaken and if an applicable contractor exists determine whether to appoint or make use of local employment. Where no such option exists, then the applicant may outsource this to whomever can fulfil the need for employment.
Prospecting activities	Dust and noise from prospecting activities	Creation of nuisance and disturbance to surrounding industries (agricultural and agro processing)	Construction Operational Closure	Negative	24	Low-Med	Negative	9,6	Low	Implement measures to minimise air quality and noise impacts. Surrounding neighbours and land owners must be allowed to raise issues and complaints associated with prospecting activities through means of an incident and complaints register. From there, their issues must be addressed promptly.	Implement an incident and complaints register on the prospecting site. Any complaints must be addressed and communicated to the relevant authority (municipality) by the contractor and applicant.
Prospecting activities	Movement of drilling contractors	Increase safety and security risk	Construction Operational Closure	Negative	24	Low-Med	Negative	9,6	Low	Drilling contractors not allowed moving outside of designated areas Access of personnel related to the prospecting operations will only be allowed on approval by the project manager.	All personnel that have access to the property will be provided with access cards. All personnel that have access to the property needs to be made visible.
Prospecting activities	Overnight accommodation of drilling contractors	Increase safety and security risk	Construction Operational Closure	Negative	24	Low-Med	Negative	9,6	Low	Drilling contractors to be housed off the drilling property.	Of-site accommodation must be procured by the drilling contractors and may be communicated to the relevant stakeholders when conducting invasive prospecting.

ACTIVITY	ASPECT	IMPACT	PHASE	±	SU[1]		±	SM[2]		MITIGATION MEASURES	ACTION PLAN
Prospecting activities	Prospecting activities is a predecessor to mining.	Prospecting on private property.	Post closure	Negative	40	Med	Negative	24	Low-Med	Comply with the MPRDA & NEMA Implement and Comply with the EMP.	Keep an updated I&AP database with which any future applications can be remedied. Appoint an independent EAP to conduct an EIA/BAR on any activities that may arise as a result of the decision made on the back of the prospecting activities/results.
Prospecting activities	Prospecting activities is a predecessor to mining.	Prospecting seen as a predecessor to mining and this raises a risk to various environmental impacts.	Post closure	Negative	48	Med	Negative	38,4	Low-Med	An application for a mining right will require a separate public participation process and IAP's will be provided with the opportunity to raise their concerns	Keep an updated I&AP database with which any future applications can be remedied. Appoint an independent EAP to conduct an EIA/BAR on any activities that may arise as a result of the decision made on the back of the prospecting activities/results.

3.8.6 The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

Refer to Table 3-12

3.8.7 Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

Table 3-13: Impact Criteria and Assigned Rating

Intensity (Magnitude)		ASSIGNED QUANTITATIVE SCORE
The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it has a significant, moderate or insignificant		
(L)OW	The impact alters the affected environment in such a way that the natural processes or functions are not affected.	**1**
(M)EDIUM	The affected environment is altered, but functions and processes continue, albeit in a modified way.	**3**
(H)IGH	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.	**5**
Duration		
The lifetime of the impact, that is measure in relation to the lifetime of the proposed development.		
(S)HORT TERM	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.	**1**
(SM) SHORT MEDIUM TERM	The impact will be relevant through to the end of a construction phase.	**2**
(M)MEDIUM	The impact will last up to the end of the development phases, where after it will be entirely negated.	**3**
(L)ONG TERM	The impact will continue or last for the entire operational lifetime (i.e. exceed 20 years) of the development, but will be mitigated by direct human action or by natural processes thereafter.	**4**
(P)ERMANENT	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact is transient.	**2**
Spatial Scale/Extent		
Classification of the physical and spatial aspect of the impact		
(F)OOTPRINT	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.	**1**

(S)ITE	The impact could affect the whole, or a significant portion of the site.	**2**
(R)EGIONAL	The impact could affect the area including the neighbouring Farms, the transport routes and the adjoining towns.	**3**
(N)ATIONAL	The impact could have an effect that expands throughout the country (South Africa).	**4**
(I)NTERNATIONAL	Where the impact has international ramifications that extend beyond the boundaries of South Africa.	**5**
Probability		
This describes the likelihood of the impact actually occurring. The impact may occur for any length of time during the life cycle of the activity. The classes are rated as follows:		
(I)MPROBABLE	The possibility of the Impact occurring is none, due to the circumstances or design. The chance of this Impact occurring is zero (0%)	**1**
(P)OSSIBLE	The possibility of the Impact occurring is very low, due either to the circumstances or design. The chance of this Impact occurring is defined as 25% or less	**2**
(L)IKELY	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of Impact occurring is defined as 50%	**3**
(H)IGHLY LIKELY	It is most likely that the Impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %.	**4**
(D)EFINITE	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.	**5**
Weighting Factor		
Subjective score assigned by Impact Assessor to give the relative importance of a particular environmental component based on project knowledge and previous experience. Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance		
(L)OW		**1**
LOW- MEDIUM		**2**
MEDIUM (M)		**3**
MEDIUM-HIGH		**4**
HIGH (H)		5
Mitigation Measures and Mitigation Efficiency		
Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures		
Mitigation measures were recommended to enhance benefits and minimise negative impacts and address the following: Mitigation objectives: what level of mitigation must be aimed at: For each identified impact, the specialist must provide mitigation objectives (tolerance limits) which would result in measurable reduction in impact. Where limited knowledge or expertise exists on such tolerance limits, the specialist must make "educated guesses" based on professional experience;		

Recommended mitigation measures: For each impact the specialist must recommend practicable mitigation actions that can measurably affect the significance rating. The specialist must also identify management actions, which could enhance the condition of the environment. Where no mitigation is considered feasible, this must be stated and reasons provided;

Effectiveness of mitigation measures: The specialist must provide quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of the proposed mitigation actions, where possible; and

Recommended monitoring and evaluation programme: The specialist is required to recommend an appropriate monitoring and review programme, which can track the efficacy of the mitigation objectives. Each environmental impact is to be assessed before and after mitigation measures have been implemented.

The management objectives, design standards, etc., which, if achieved, can eliminate, minimise or enhance potential impacts or benefits. National standards or criteria are examples, which can be stated as mitigation objectives.

HIGH	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.	**1.0**
MEDIUM-HIGH	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.	**0.8**
MEDIUM	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.	**0.6**
LOW -MEDIUM	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.	**0.4**
LOW	The impact will be mitigated to the point where it is of limited importance.	**0.2**

Table 3-14: Description of bio-physical assessment parameters with its respective weighting

Extent	Duration	Intensity	Probability	Weighting Factor (WF)	Significance Rating (SR)	Mitigation Efficiency (ME)	Significance Following Mitigation (SFM)
Footprint 1	Short term 1	Low 1	Probable 1	Low 1	Low 0-19	High 0,2	Low 0-19
Site 2	Short to medium 2		Possible 2	Low to medium 2	Low to medium 20-39	Medium to high 0,4	Low to medium 20-39
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 3	Medium 40-59	Medium 0,6	Medium 40-59
National 4	Long term 4		Highly Likely 4	Medium to high 4	Medium to high 60-79	Low to medium 0,8	Medium to high 60-79
International 5	Permanent 5	High 5	Definite 5	High 5	High 80-100	Low 1,0	High 80-100

Table 3-15: Significant Rating Scale Without Mitigation

Potential Impacts Without Mitigation Measures (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

SIGNIFICANT RATING EQUATION Significant Rating (SR) = (Extent + Intensity + Duration) x Probability		
S=0	INSIGNIFICANT	The impact will be mitigated to the point where it is regarded as insubstantial.
SR < 30	LOW (L)	The impact will be mitigated to the point where it is of limited importance.
20<SR<39	LOW- MEDIUM	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels;
40<SR<59	MEDIUM (M)	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
60<SR<79	MEDIUM-HIGH	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
80<SR<100	HIGH (H)	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

Table 3-16: Significant Rating Scale with Mitigation

Potential Impacts with Mitigation Measures (WM) – In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it will be necessary to re-evaluate the impact.		
SIGNIFICANT RATING WITH MITIGATION EQUATION Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency. Or WM = WOM x ME		
S=0	INSIGNIFICANT	The impact will be mitigated to the point where it is regarded as insubstantial.
SR < 30	LOW (L)	The impact will be mitigated to the point where it is of limited importance.
20<SR<39	LOW- MEDIUM	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels;
40<SR<59	MEDIUM (M)	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
60<SR<79	MEDIUM-HIGH	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
80<SR<100	HIGH (H)	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

3.8.8 Possible Mitigation Measure that could be applied and the level of risk

Refer to Table 3-12

3.8.9 Motivation where no alternative sites were considered.

The proposed prospecting right application area over portions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14 and 15 of the farm Wonderfontein 341 IR; the remaining extent of the farm Kuilwater 347 IR, portions 1, 2 and 3 of the farm Gruisfontein 344 IR portions 1, 3, 4, 17, 19, 26, 27, 28, 32 and 35 of the farm Wonderfontein 350 IR is preferred due to the modified state (cultivated land) of the area and the deep nature of an economically viable underground coal reserve.

3.8.10 Statement motivating the alternative development location within the overall site.

It should be noted that the exact locations of the boreholes have not been identified at this stage. The location of these boreholes will be dependent on the findings of the non-invasive prospecting activities. Once the proposed target areas for the boreholes have been identified during the phases as set out in these areas will be investigated and will be subject to the conditions of this document.

3.9 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY.

(Including (i) a description of all environmental issues and risks that are identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

The same impact ranking criteria and methodology was employed as discussed in Section 3.8.7 of this report.

3.10 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

Refer to Table 3-12.

3.11 Summary of Specialist Reports.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):

Table 3-17: Summary of Specialist Reports

List of Studies Undertaken	Recommendations of Specialist Reports	Recommendations that Have Been Included in the EIA Report	Reference to Applicable Section of Report
Archaeological Impact / Heritage Assessment.	The following recommendations are made in order to avoid the destruction of heritage remains within the area demarcated for prospecting: • Although the 50 demolished historical and potentially historical sites (Table 8 of the Desktop Heritage Study found in Appendix D – Specialist Studies of this BAR), appear not to be associated with surface remains anymore, subsurface culturally significant material might be present. The possibility also exists that historical surface remains exceeding 60 years of age are present, but are not detectable on aerial imagery. Therefore, it is recommended that the demarcated areas be avoided by the proposed prospecting activities. Should this not be possible, a qualified archaeologist should first inspect the sites in order to determine the potential presence of heritage remains. • The 11 sites that appear to be associated with historical surface infrastructure are likely to exceed 60 years of age (Table 8). Therefore, it is recommended that the demarcated areas be avoided by the proposed prospecting activities. Should this not be possible, a qualified archaeologist should first inspect the sites in order to determine the significance of the sites. • The buildings and structures associated with the 53 sites listed in (Table 5 of the Desktop Heritage Study found in Appendix D – Specialist Studies of this BAR) appear not to exceed 60 years of age and are unlikely	X	Table 3-17 & Section 3.8.4

List of Studies Undertaken	Recommendations of Specialist Reports	Recommendations that Have Been Included in the EIA Report	Reference to Applicable Section of Report
	to be significant from a heritage perspective. However, should impact to the sites be unavoidable, it is recommended that a qualified archaeologist inspect the sites prior to any impact. • **The three identified grave sites are considered to be sensitive from a heritage perspective.** o **Therefore, a radius of 50 m from the sites must be avoided by the proposed prospecting activities.** Should this not be possible, it is recommended that a qualified archaeologist first inspect the sites to provide the required recommendations. • **The 500 m buffer zone surrounding the perennial and non-perennial rivers is potentially sensitive from a heritage perspective.** Although the previously/currently cultivated areas that intersect the 500 m buffer zone are disturbed, the potential for subsurface cultural material still exists. Care should be exercised when prospecting in this vicinity. • **The least sensitive areas are associated with cultivated fields located outside of the 500 m buffer zone and areas not located within close proximity of potential heritage sites or contemporary infrastructure.** These areas should therefore be considered when selecting prospecting sites. • Apart from the identified potential sites, undisturbed areas located within 500 m of a water source are considered to be the most sensitive from a heritage perspective. Care should therefore be exercised when prospecting in these areas. • Should uncertainty regarding the presence of heritage remains exist, or of heritage sites are discovered by chance, it is advised that the potential site be avoided and that a qualified archaeologist be contacted. Alternatively, once the prospecting localities have been identified, a qualified archaeologist can inspect the proposed sites and provide recommendations that will aid the protection of heritage resources.		

List of Studies Undertaken	Recommendations of Specialist Reports	Recommendations that Have Been Included in the EIA Report	Reference to Applicable Section of Report
	• Prospecting should not take place in the vicinity of stone cairns, potential burial sites, stone-walling, building ruins or any other heritage material or structures. • Should the prospecting outcome result in further development or construction, a full Phase 1 Archaeological Impact Assessment must be conducted on the affected area if triggered. Also, a full Phase 1 AIA must be conducted should the cumulative impact of the proposed prospecting exceed 0.5 ha. • Since archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the prospecting phase, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed, all activities must be suspended and the relevant heritage resources authority must be contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)). From a heritage point of view, development may proceed on the demarcated areas, subject to the abovementioned conditions, recommendations, and approval by the South African Heritage Resources Agency.		
Wetland & Ecological Impact Assessment	• It is recommended that the proposed prospecting sites be assessed for any wetlands by means of a field survey to ground truth the presence of the NFEPA wetlands identified in the desktop study. The riverine areas should be assessed in terms of their ecological state and the aquatic risk assessment must be implemented. o Potential red listed species include: Pallid Harrier (Circus macrourus) listed as Near Threatened; Black Harrier (Circus maurus) listed as Vulnerable; Maccoa Duck (Oxyura maccoa) listed as Near Threatened; Blue Crane (Anthropoides paradiseus) listed as Vulnerable; Grey Crowned (Crowned) Crane (Balearica regulorum) listed as Endangered; Blue Korhaan (Eupodotis caerulescens) listed	X	Table 3-17 & Section 3.8.4

List of Studies Undertaken	Recommendations of Specialist Reports	Recommendations that Have Been Included in the EIA Report	Reference to Applicable Section of Report
	as Near Threatened; Denham's (Stanley's) Bustard (Neotis denhami) listed as Near Threatened and the Secretarybird (Sagittarius serpentarius) listed as Vulnerable. o The Highveld Golden Mole (Amblysomus septentrionalis) listed as Vulnerable; the Southern African Hedgehog (Atelerix frontalis); Southern African Vlei Rat (Otomys auratus); African Clawless Otter (Aonyx capensis); Swamp Musk Shrew (Crocidura mariquensis) and Serval (Leptailurus serval) listed as Near Threatened is thought to possibly occur within the area according to SANBI (2023). o *Nerine gracilis* listed as Vulnerable and *Kniphofia typhoides*; *Stenostelma umbelluliferum*; *Gladiolus robertsoniae* listed as Near Threatened is thought to occur within these areas. • The area must be surveyed to groundtruth any red listed fauna and flora species. • According to the Critical Biodiversity Areas datasets provided by SANBI (2023), a very large portion of application area falls within Critical Biodiversity Areas. The remainder of the application area overlaps with Ecological Support Areas. The sensitive areas seem to be associated with the wetlands and rivers within the area. o Avoidance of any sensitive areas is highly recommended for the prospection activities. • The proposed prospecting project not fall within/close to any Important Bird Areas. • The project boundary overlaps with two major vegetation units in terms of Mucina and Rutherford (2013) namely the **Soweto Highveld grassland** and the **Eastern temperate Freshwater Wetlands.**		
Paleontological Impact Assessment	• 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 and sands of the Quaternary.** There is a very small chance that fossils may occur in the rare shales of the early Permian Vryheid Formation so a **Fossil Chance Find Protocol should be added to the EMPr.** If fossils are found by the environmental	X	Table 3-17 & Section 3.8.4

List of Studies Undertaken	Recommendations of Specialist Reports	Recommendations that Have Been Included in the EIA Report	Reference to Applicable Section of Report
	officer or other responsible person once excavations and drilling for prospecting have commenced, then they should be rescued, and a paleontologist called to assess and collect a representative sample. **The impact on the paleontological heritage would be low, so as far the paleontology is concerned, the prospecting permit should be granted.** • Therefore, a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the contractor, miners, environmental officer, or other responsible person once excavations and mining have commenced then they should be rescued, and a paleontologist called to assess and collect a representative sample. **The impact on the paleontological heritage would be low, the areas are small and disturbed, so as far as the paleontology is concerned, the project should be authorised.**		

3.12 ENVIRONMENTAL IMPACT STATEMENT

3.12.1 Summary of the key findings of the environmental impact assessment;

The most significant impacts after mitigation and with a cumulative medium to high significance are:

Table 3-18: Summary of key findings

Activity	Aspect	Impact	Phase	+/-	SU	+/-	SM
Socio-economic development							
Prospecting activities	Employment and use of contractors and purchasing goods.	Contribution to the economy.	Construction Operational Closure	Positive	Med	Positive	Med - High
Land use & Land Capability							
Invasive prospecting activities	Intrusion due to drilling and prospecting activities in an area where agricultural land uses are prominent.	Land use conflict	Construction Operational Closure	Negative	Med	Negative	Low-Med
Heritage							
Site establishment.	Clearance of the site	Destruction of culturally significant material.	Construction Operational Closure	Negative	Med	Negative	Low-Med

3.12.2 Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attach as Appendix C.

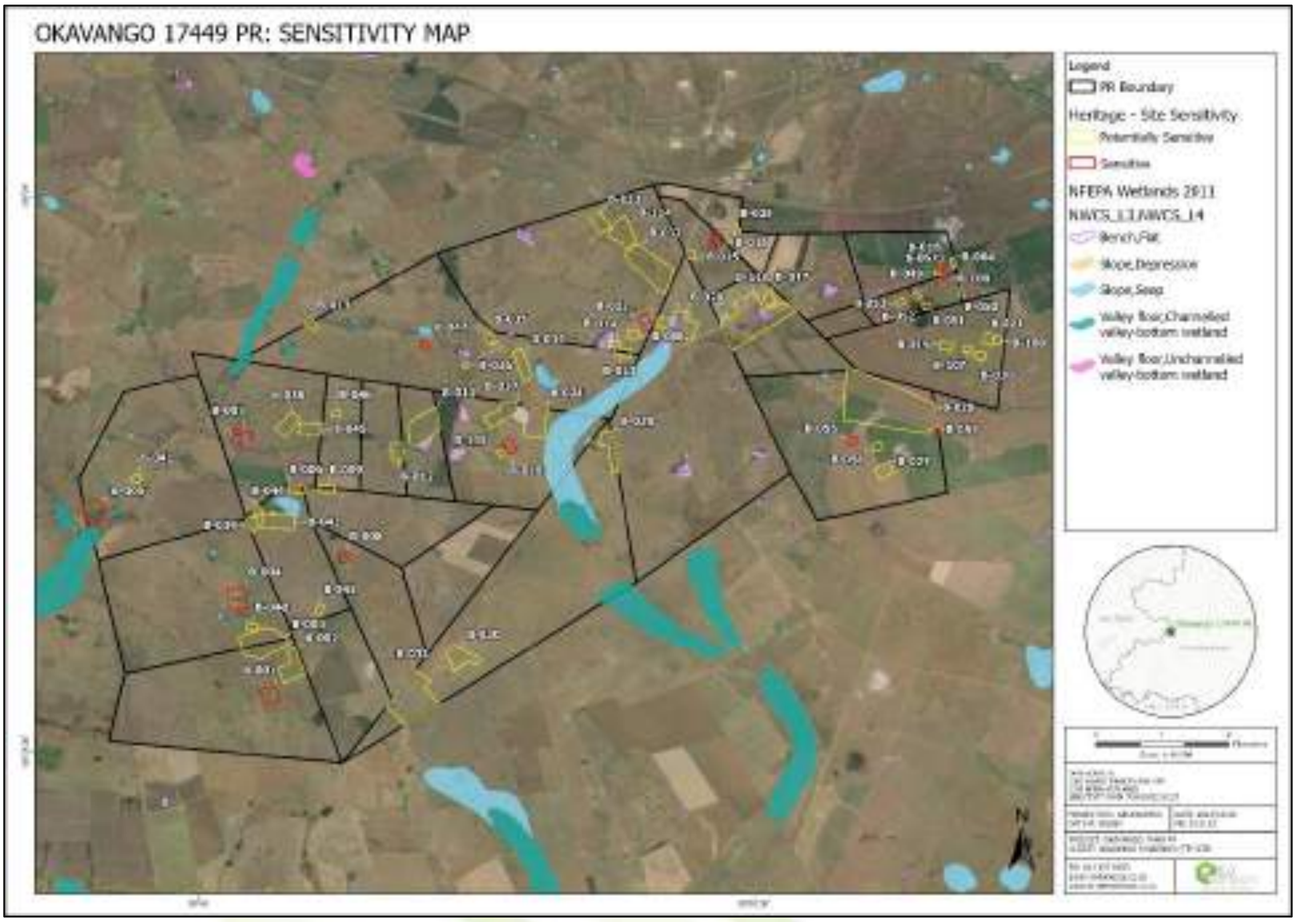


Figure 3-23: Proposed prospecting right application area - Final site map with environmental sensitivities

3.12.3 Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.

Description	Advantages	Disadvantages
Prospecting Alternatives		
Prospecting on cultivated (modified) area. **The preferred option**	• Remaining coal resources can be optimally logged and benefited from financially in the future if an underground operation is initiated. • Additional job creation.	• Small, localised site-specific production from cultivate land will be compromised for the duration of the operation until rehabilitation has established the area to pre-prospecting conditions.
The no go option of not drilling.	• Area remains a modified cultivated land and agricultural practises continue.	• No resource information in the form of drill core logs. • No additional jobs will be created.
Bulk sampling / trenching	• Provides a more representative and accurate estimate of the resource reserve body's grade and characteristics than smaller-scale sampling methods.	• Very invasive and not viable. The scientific reason places the resources at between 150 – 200m below surface. Therefore, bulk sampling will not be viable (both environmentally and economically)

3.13 PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR;

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

The objectives of impact mitigation and management are to:

- Primarily pre-empt impacts and prevent the realisation of these impacts - PREVENTION.
- To ensure activities that are expected to impact on the environment are undertaken and controlled in such a way so as to minimise their impacts – MODIFY and/or CONTROL.
- To ensure a system is in place for treating and/or rectifying any significant impacts that will occur due to the proposed activity – REMEDY.
- Implement an adequate monitoring programme to:
  - Ensure that mitigation and management measure are effective.
  - Allow quick detection of potential impacts, which in turn will allow for quick response to issue/impacts.
  - Reduce duration of any potential negative impacts.

Environmental impact management outcomes are:

- Efficient groundwater recharge.
- Record of Groundwater Levels.
- Limit of the extent of contamination plume.
- Prevention of groundwater pollution.
- Fair compensation for loss of groundwater.
- Prolong period before decanting and allow for decant to be of an acceptable quality.
- Minimised impact on aquifer recharge.
- Maintenance and improvement of water quality in the watercourse.
- Limited noise disturbance.
- No soil erosion on site.
- No soil compaction in areas outside of the construction / operation area.
- Preservation of topsoil and seed bank.
- No soils pollution occurrence.
- Offset of agricultural areas for sustainable co-existence.
- Minimal dust nuisance.
- Minimise the cumulative impact on sense of place.
- Maintenance and conservation of heritage resources.
- Increased employment in the local community.
- Improved economic status locally.
- health and safety issues within the community remain the same or improve.
- Social uplifting of neighbouring communities.

3.14 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION.

- Adhere to all recommendation and management measures contained in the EMPr.
- All relevant permits and authorisation must be obtained prior to construction commencing.
- Adhere to all monitoring requirements.
- A water use license must be obtained prior to any water uses undertaken on site (in terms of Section 21 of the National Water Act).
- Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further

archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended, and the relevant heritage resources authority contacted.

- From a palaeontological perspective – the possibility exists that fossiliferous significant material (plants, insects, bone, coal) may be exposed during the development (construction & operational phase). These materials generally occur below the surface and is of palaeontologic significance. In cases where such material is found, all activities must be suspended pending further palaeontological investigations by a qualified palaeontological scientist.
- No off-road driving, hunting, poaching, or fires should be permitted on the property.
- An incident and complaints register must be present on site and submitted to the competent authority as part of the audit process.
- Dust suppression on the drill sites should be implemented to reduce dust generation and fallout.

3.15 Description of any assumptions, uncertainties and gaps in knowledge.

Heritage

Using historical topographical maps and historical aerial images for locating heritage resources have several shortcomings. Potential heritage remains, such as buildings, structures and graves/cemeteries, are not always indicated on topographical maps and are often omitted between different publications. Historical aerial imagery, on the other hand, might have a poor image resolution that renders potential heritage sites invisible. Inaccuracies during the georeferencing process may also lead to some heritage sites not being plotted, as well as dense vegetation obscuring heritage sites. Due to the small size of some heritage sites, such as Stone Age sites, small Iron Age features, rock art sites and burials, such sites are rarely visible on aerial imagery and are generally only detected during pedestrian surveys.

Wetland and Ecological Assessment

It is difficult to apply pure scientific methods within a natural environment with limitations, where consequential assumptions need to be made. While every care is taken to ensure that the data presented is qualitatively adequate, inevitably conditions are never of such a nature that the data is entirely satisfactory. To conduct a comprehensive, completely factually based fauna study, requires an extensive amount of time over different seasons. Unfortunately, such comprehensive studies are generally limited by budget constraints and most importantly by time constraints subject to submission of EA Applications.

It should be noted that the findings of this study were largely based on desktop/historical assessments. Visibility of fauna indicators vary throughout seasons and it is therefore noted that, if in future, any further indicators are found on site, the author cannot be held liable for conclusions deducted in good faith based on the available resources and information provided at the time of the study. It is important that this report be viewed and acted upon with these limitations in mind.

Palaeontoligcal

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and some might contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils.

3.16 Reasoned opinion as to whether the proposed activity should or should not be authorised

3.16.1 Reasons why the activity should be authorized or not.

The EAP believes that the authorisation for the proposed prospecting activities over the application area should be granted. The risks of the proposed prospecting activity are minimal and can be mitigated by following the mitigation measures stipulated in the EMPr, which will reduce impacts significantly to acceptable levels.

3.16.2 Conditions that must be included in the authorisation

- Adhere to all recommendation and management measures contained in the EMPr.

- All relevant permits and authorisation must be obtained prior to construction commencing.
- Adhere to all monitoring requirements.
- A water use license must be obtained prior to any water uses undertaken on site (in terms of Section 21 of the National Water Act).
- Because archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended, and the relevant heritage resources authority contacted.
- From a palaeontological perspective – the possibility exists that fossiliferous significant material (plants, insects, bone, coal) may be exposed during the development (construction & operational phase). These materials generally occur below the surface and is of palaeontologic significance. In cases where such material is found, all activities must be suspended pending further palaeontological investigations by a qualified palaeontological scientist.
- No off-road driving, hunting, poaching, or fires should be permitted on the property.
- An incident and complaints register must be present on site and submitted to the competent authority as part of the audit process.
- Dust suppression on the drill sites should be implemented to reduce dust generation and fallout.

3.17 Period for which the Environmental Authorisation is required.

8 Years

3.18 Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.

For the undertaking refer to Part B: EMPr

3.19 FINANCIAL PROVISION

CALCULATION OF THE CLOSURE QUANTUM - PROSPECTING RIGHT								Version 1.0: Annual Closure Quantum Update for 2023
Operation: (Okovango PR - MP30/5/1/1/2/17449PR)					Province: Mpumlanga			
Evaluators: Eco Elementum (Pty) Ltd					Date: March 2023			
General Information	Risk Class	High (A)	PROPOSED PROSPECTING AREA					
	Environmental Sensitivity	Medium						
	WF 1: Nature of Terrain Weighting Factor	Flat 1.00						
	WF 2: Proximity to Urban Area Weighting Factor	Peri-Urban 1.05						
Component No	Main Activities Itemized Descriptions	[B] CPI Adjusted Master Rate	[A] Quantity	Units	[C] Multipliction Factor	[D] Weighting Factor 1: Nature of Terrain	Sub Totals [E = A*B*C*D]	NOTES & SUPPORTING EXPLANATIONS
		STEP 4.3	STEP 4.5		STEP 4.3	STEP 4.4		
1	Dismantling of processing plant and structures	R 17,46	0,00	m3	1,00	1,00	R 0,00	No processing plant and structures.
2(A)	Demolition of steel buildings and structures	R 243,19	0,00	m2	1,00	1,00	R 0,00	No steel buildings and structures. Temporary camp site.
2(B)	Demolition of reinforced concrete buildings and structures	R 358,39	0,00	m2	1,00	1,00	R 0,00	No reinforced concrete buildings and structures. Temporary camp site.
3	Rehabilitation of access roads	R 43,52	850,00	m2	1,00	1,00	R 36 990,45	Existing roads will be used as far as possible, and it is not possible to identify any new access roads at this stage as its route will be determined in conjunction with the landowner and activities on the property at that time. A budget of 850m² for new access roads was included. The drill operators can allocate this to drill sites accordingly. For example: If all 10 drill sites require a new access road of 30m x 2.83m from an existing road, then there is budget for it. (30m x 2.83m = 85m²) (85m² x 10 drill sites = 850m²). Distances subject to change, but should remain within the allocated budget.
4(A)	Demolition and rehabilitation of electrified railway lines	R 422,38	0,00	m	1,00	1,00	R 0,00	n/a
4(B)	Demolition and rehabilitation of non-electrified railway lines	R 230,39	0,00	m	1,00	1,00	R 0,00	n/a
5	Demolition of housing and facilities	R 486,38	0,00	m2	1,00	1,00	R 0,00	No other infrastructure, offices, or housing will be present within the prospecting site areas
6	Opencast rehabilitation including final voids and ramps	R 247 541,65	0,00	ha	0,52	1,00	R 0,00	n/a
7	Sealing of shafts, adits and inclines	R 130,55	0,00	m3	1,00	1,00	R 0,00	n/a
8(A)	Rehabilitation of overburden and spoils	R 169 976,89	0,00	ha	1,00	1,00	R 0,00	n/a
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	R 211 703,14	0,00	ha	1,00	1,00	R 0,00	n/a
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	R 614 886,28	0,00	ha	0,80	1,00	R 0,00	n/a
9	Rehabilitation of subsided areas	R 142 330,05	0,00	ha	1,00	1,00	R 0,00	n/a
10	General surface rehabilitation, including grassing of denuded areas	R 134 650,37	0,064	ha	1,00	1,00	R 8 617,62	Drill site clearing and establishment, mobile chemical ablution facility, drill rig equipment, return water lined sump, and sample storage trays. 64m² drill site = 8m x 8m. 10 sites = 640m²
11	River diversions	R 134 650,37	0,00	ha	1,00	1,00	R 0,00	n/a
12	Fencing	R 153,59	0,00	m	1,00	1,00	R 0,00	n/a
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)	R 51 197,86	0,064	ha	0,67	1,00	R 2 195,36	Drill site clearing and establishment, mobile chemical ablution facility, drill rig equipment, return water lined sump, and sample storage trays. 64m² drill site = 8m x 8m. 10 sites = 640m² Water abstraction for drilling purposes.
14	2 to 3 years of maintenance and after care	R 17 919,25	0,149	ha	1,00	1,00	R 2 669,97	Entire disturbed footprint
15	Specialist study	n/a	1,00	report	1,00	1,00	R 0,00	n/a
						Subtotal (1 to 15 above)	R 50 473,41	
	Subtotal 1	Weighting Factor 2				1,05	R 52 997,08	
1	Preliminary and General	12% of Subtotal 1 if less than R100mil 6% of Sub Total 1 if more than R100mil					R 6 359,65	
2	Contingency	10% of Sub Total 1					R 5 299,71	
						Subtotal 2 (Subtotal 1 plus sum of management and contingency)	R 11 659,36	
						Subtotal 3	R 64 656,44	
						GRAND TOTAL (Subtotal 3 plus 15% VAT)	R 74 354,90	

3.19.1 Explain how the aforesaid amount was derived.

Rates were provided by the DMR for calculation of the financial provision. A bill of quantity was determined for each of the units and applied to the rates to determine a closure cost per unit. The unit costs determined the category costs and the category costs resulted in a preliminary closure cost also called Sub-Total 1. A contingency of 10% was included on Subtotal 2 to obtain a Financial Liability Cost in Subtotal 3. Finally, a 15% VAT was added to Subtotal 3 to obtain a subtotal 4. Subtotal 3 is regarded as the Final closure liability of the mine.

3.19.2 Confirm that this amount can be provided for from operating expenditure.

The applicant confirms that this amount will be provided for.

3.20 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

3.20.1 Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:

3.20.1.1 Impact on the socio-economic conditions of any directly affected person.

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as an **Appendix D**.

Prospecting operations.	Employment and income opportunity.	Med -	Med -
Employee training.	Upskilling of Labour force.	Low-Med +	Low-Med +
Drilling on property disbursements.	Increase community investment funds and support to local communities.	Med-High -	Med -

3.20.1.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act. (Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix 2.19.2 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

Apart from any identified potential heritage sensitive sites, undisturbed areas located within 500 m of a water source are considered to be the most sensitive from a heritage perspective. Care should therefore be exercised when prospecting in these areas.

3.21 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT.

Section 24(4) (b) (i) of the Act specifies “investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity”. The alternatives assessed and the impacts associated with the alternatives assessed have been fully presented in Section 3.8.

PART B

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

4. ENVIRONMENTAL MANAGEMENT PROGRAMME

4.1 Details of the EAP

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

Name of The Practitioner:	Lian Roos – Candidate EAP (2022/4550)
	Riana Panaino – EAP (2021/4135)
Tel No.:	012 807 0383
Fax No. :	
e-mail address:	lian@ecoe.co.oza / riana@ecoe.co.za

4.2 Description of the Aspects of the Activity

The mineral distribution in the portions of the area will be determined following the mineral exploration methods which are outlined in the following text. These mineral exploration methods are planned to follow the mineral exploration value chain where a systematic, phased, and cost-effective approach of determining the minerals distribution is followed. At the end of each phase, a decision will be taken to proceed or to abandon the project.

1. The first phase will be information gathering which includes detailed desktop studies and geological mapping. This will result in a plan showing outcrops and any geological information that will be useful during the subsequent phases of exploration. Feasibility studies will also be conducted at the end of the exploration phases.
2. No geochemical survey is planned.
3. Geophysical Survey – a decision will be taken to conduct geophysical observations or procure geophysical data from commercial sources and organizations that collect them. The information that will be acquired will be chiefly magnetic which will be aimed at delineating structures of higher or lower magnetic susceptibility than the surrounding country rocks. If the company conducts the observations, it will be airborne surveys conducted with the auspices of a contractor.
4. Drilling will be conducted using a diamond drill rig. The core will be handled and logged in a designated area, sampling will also take place in the same area. Samples will be sent to a laboratory for chemical analyses.
5. No other excavations or bulk sampling will take place.

At the end of each phase there will be a brief period of compiling and evaluating results. The results will not only determine whether prospecting proceeds, but also the manner in which it will go forward. The applicant will only action the next phase of prospecting, once satisfied with the results obtained in the previous phases. In addition, smaller, non-core parts of the prospecting work program will be undertaken, if warranted.

Figure 4-1 below depicts the current land cover and farm portions of the proposed prospecting right area, the proposed areas of interest within the application area will be defined within the course of prospecting activities. It is anticipated that the invasive program will consist of 10 boreholes. An additional 10 core drilling and sampling will be done to be able to quantify the extent of the resource. Vegetation will be cleared at the borehole locations within the application area. The exact depths of the boreholes will be determined while the drilling program is underway as influenced by the depths and dips measured in the previous boreholes.

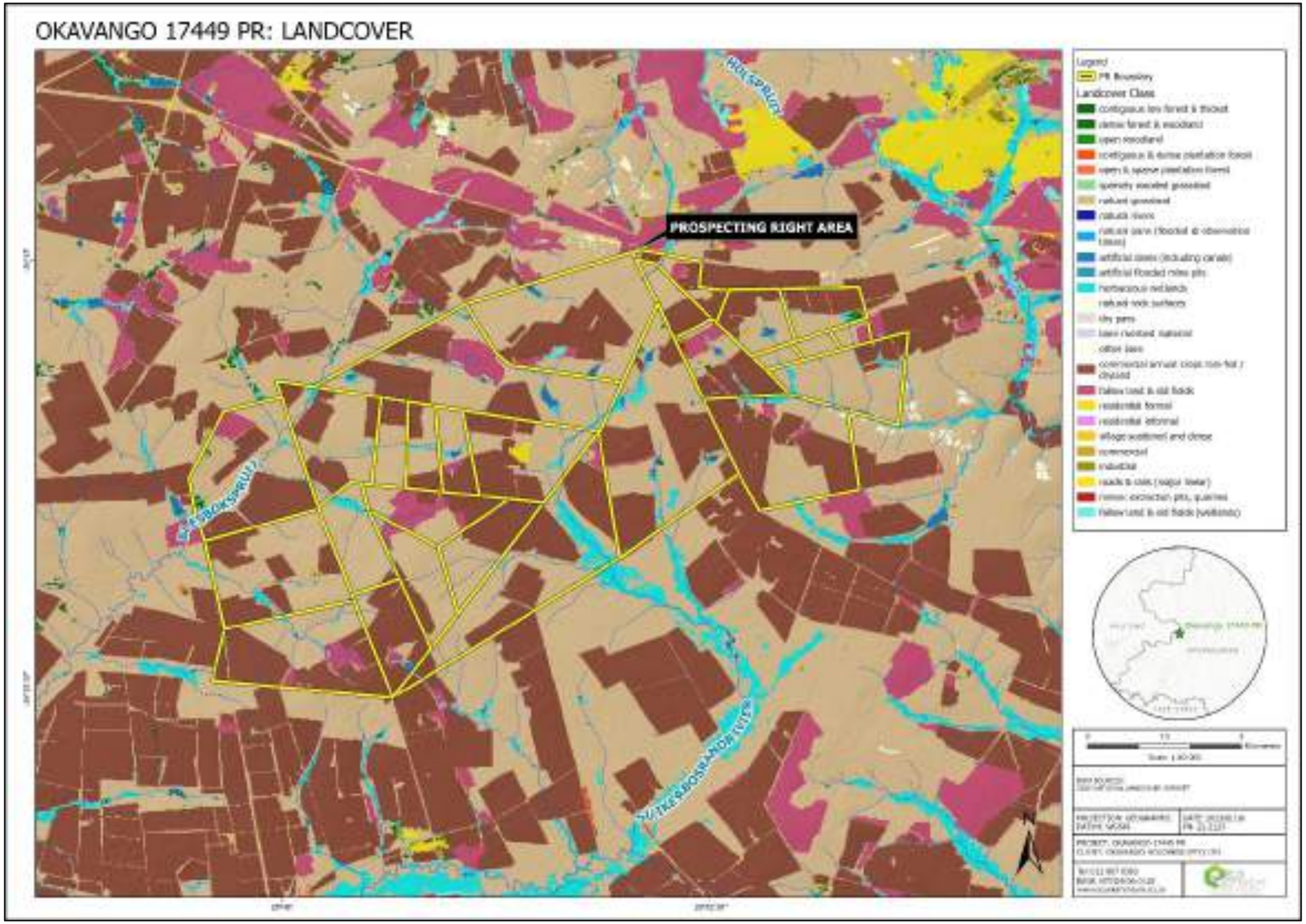


Figure 4-1: Current land cover map – Farm portions in realtion to the Prospecting Right application area

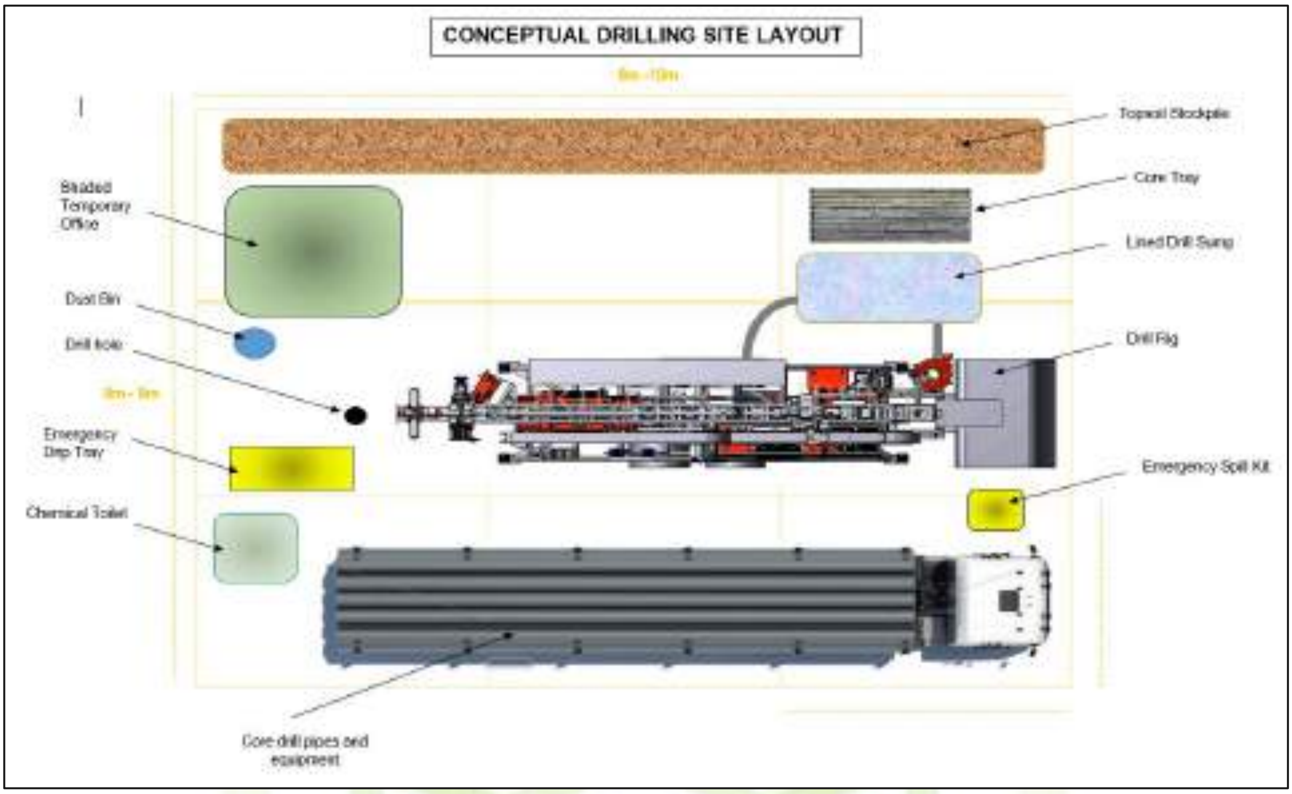


Figure 4-2: Conceptual drilling site layout

Figure 4-3: Depiction of an actual drilling site

4.2.1 Description of planned non-invasive activities

(These activities do not disturb the land where prospecting will take place e.g., aerial photography, desktop studies, aeromagnetic surveys, etc.)

The Non-Invasive methods which will be used during the exploration program span all the four phases in different time frames. They are outlined in the following text.

Phase 1 (month 0 to 12)

Airborne Surveys/Geophysical Surveys will be conducted upon issue of the Prospecting Right, to give an overview of the geophysical properties of the prospecting area.

4.2.2 Description of planned invasive activities

(These activities result in land disturbances e.g., sampling, drilling, bulk sampling, etc.)

Phase 2 (month 12 to 24)

Drilling will commence 12 months after initiation of Phase 1, and the process will be determined by local conditions but can generally be based on about drilling 25m per rig per day for a week.

The drill cores will be geologically logged and sampled and analyzed at an accredited facility to determine the economic viability. All core logging will be completed concurrently with the drilling programme to assist in determining the spectrum of viable coal seams. The drill wells will then be geo-physical logged for structural and geotechnical interpretation. After this, the holes will be cased, caped and marked to make it noticeable safe for people and animals but also allow for future access by the exploration team.

Phase 3 (month 25 to 48)

Depending on the results of phase 2, the below will apply:

10 additional core drilling and sampling will be done to be able to quantify the bounds and extent of the coal resource. This phase will also be used to establish the mining techniques that may be required. Detailed evaluation and modeling of the results will be undertaken during this phase and several planning scenarios contemplated to ensure the best deployment of further exploration capital. The holes required for this phase of drilling may vary in depth and quality but should take the existence of geological features that are significant to mine planning and future rehabilitation issues into consideration.

Phase 4 (month 49 - 60)

Depending on the results of phase 2, the below will apply:

Overall environmental assessment, monitoring and rehabilitation. Prefeasibility study will be conducted. Should coal be economically viable, an application for a Mining Right will be decided, compiled, and submitted. Alternatively, if additional exploration is required in case the results are not conclusive, an application for the renewal of the Prospecting Right will be submitted at this phase.

A complete report covering all the findings of the above phases will be compiled and submitted within 60 days of the release of the last analysis results from the appointed coal laboratory.

Table 4-1: Timeframes each of the proposed activities

Phase	**Activity** (What are the activities that are planned to achieve optimal prospecting)	**Skill(s) required.** (Refers to the competent personnel that will be employed to achieve the required results)	**Timeframe** (in months) for the activity)	**Outcome** (What is the expected deliverable, e.g., Geological report, analytical results, feasibility study, etc.)	**Timeframe for outcome** (deadline for the expected outcome to be delivered)	**What technical expert will sign off on the outcome?** (e.g., geologist, mining engineer, surveyor, economist, etc.)
1	**Non-Invasive phase** Literature review, Geological maps, satellite imagery, aerial photographs and historical borehole data, Geological reconnaissance	Exploration Geologist	0-6 months	Extraction of site specific geological map, information and geological report.	Month 4-6	Geologist
1	**Non-Invasive phase** Ground geophysical survey, airborne survey, geological mapping, stream, and soil sampling.	Geophysicist/Geologist	6-12 months	Interpretation of digital data into report. Correlation of geological and geophysical results.	Months 7-9	Geophysicist/Geologist
2	**Invasive phase** Site Establishment (25m X25m) Diamond core drilling (85MM) at 150m De-establishment	Exploration Geologist, Drilling Engineer, Site works foreman, laborer.	12-24 months	Geotechnical reporting from sidewall and soil sampling. Updating of data base, recording of borehole logs, evaluation and geological modelling. Pre-feasibility study and planning of phase 2 exploration drilling.	Month 12-24	Geologist
3	**Invasive phase** Further reverse circulation and diamond drilling.	Exploration Geologist, Drilling Engineer, Site works foreman, laborer's	24-48 months	Updating of data base, recording of borehole logs, evaluation and geological modeling	Month 24-48	Mineral Economist/Geologist/Mine Surveyor/Mine Engineer
4	**Invasive Phase**	Exploration Geologist, Final Rehabilitation & Environmental Assessment Practitioner, Mining Engineer	49-60 months	Environmental assessment, monitoring and rehabilitation, Conceptual mine planning Preliminary economic analyses	Month 49-60	Mine Engineer/EIA Specialist

4.2.3 Description of the activities to be undertaken

((Describe Methodology or technology to be employed, including the type of commodity to be prospected/mined and for a linear activity, a description of the route of the activity).

The mineral that will be prospected in the proposed site is coal. This section presents a detailed description of all the activities associated with the proposed prospecting application. Due to the nature of the Prospecting Works Programme, and the fact that the specific prospecting activities required are dependent on the preceding phase, assumptions are presented where required.

Access Roads

Access to the site will be required during mapping and drilling activities (Phase 2). Access requirements can only be determined after Phase 1 has been concluded. A number of existing roads and tracks already traverse the proposed prospecting site and where practicable, these roads will be used. All access on farms will be conducted in terms of a written agreement with the landowner. In instances where no access roads are available to the site location a single track will be selected as the best alternative on the basis of least environmental impact with natural habitat considered the last option.

During mapping activities, vehicle access will be gained to site through the veld and the establishment of a track to gain repeated access to a mapping site will not be required.

Once the drill sites have been identified, temporary access roads may be established for repeated access to the prospecting site if the identified drill site cannot be accessed via existing roads and tracks.

Vegetation and topsoil stockpile areas (if required)

Vegetation and topsoil will only be stockpiled in instances where settling sumps are required i.e., core drilling. During the excavation process the topsoil and available vegetation will be placed adjacent to the sumps. This will also serve as a storm water diversion berm. The excavated material will be placed back into the rehabilitated sumps on completion of the drilling process.

Footprint

For the prospecting phase, several sites will be selected for geotechnical drilling. These boreholes and its associated activities will impact on a surface area of between 25m^2 and 64 m^2 per drill site. The full extent of the drill site will also be demarcated, and no drilling will be done outside of the boundary.

Water Supply

Currently it is not known whether there are any water boreholes located on the site and whether access and supply will be granted by the landowner. Continuous water supply will be required during drilling, and therefore on-site water storage tanks with a capacity of 15,000 ℓ for water supply to the drill, will be used.

When core drilling will be undertaken, a number of settling sumps will be excavated and lined with impervious plastic sheets. The purpose of these sumps are to recycle water and drilling fluids by means of gravity which leads to heavier materials (e.g., drill cuttings) to settle and clean water being produced for re-use. The drill cuttings form a sludge which will be collected in the sumps. These sumps will be fenced, where required, to prevent livestock and public access. The plastic-lined sumps will be used to recycle water through a filter process in order to maintain a constant clean water source for the purpose of drilling. The plastic sheets will be removed, and sumps will be backfilled on completion of drilling. If required, the remaining sludge in sumps is to be treated with a suitable bio-remediation product prior to backfilling or disposal.

Additional water requirements relate to the potable water supply for employees and workers. A temporary 15 000 ℓ will be stored in tanks for drinking water and general use by persons and will be provided at the drill site. Additional facilities will include temporary portable toilets, berms on the upstream side of the drill rig to divert clean water around the drill site.

Ablution

Ablution facilities at the drill site will involve the hiring of drum or tank type portable toilets that will be maintained by a contractor.

Accommodation

No accommodation for staff and workers will be provided onsite. Workers will be transported to and from the prospecting site daily. No equipment will be stored onsite.

Storage of Dangerous Goods

During the diamond drilling activities limited quantities of diesel fuel, oil and lubricants will be used onsite, all chemicals and dangerous goods will be stored on the drilling trucks and be packed up at night and removed. The only dangerous goods that will be stored in any significant quantity is diesel fuel. A maximum amount of $30m^3$ will be stored in above ground diesel storage tanks located on an impermeable surface with bunds. Storage and use of hydrocarbons and other chemicals may only take place on impermeable surfaces with bunds to contain any accidental spills.

Hazardous material will be stored in appropriate containers and clearly marked. Drip trays and or impermeable surfaces with bunds must be placed under machinery that has the potential to leak. Material Safety Data Sheets will be available for all drilling and other chemicals kept on site.

Drill rig

In most cases, the drill rig will be a self-contained, truck-mounted unit that will be accompanied by a compressor and a generator. The drill rig will be driven to site and mobilised in the desired location, positioned over the hole site, and will be stabilised.

The footprint of disturbance for a prospecting rig and associated equipment is generally smaller than 25 - 64 m^2. Plastic sheets and drip trays will be placed underneath the rig for the duration of the drilling process at each site in order to avoid hydrocarbon spills and contamination. The full extent of the drill sites will be staked out and the drill crew will not operate beyond these boundaries. Depending on the locality, this perimeter may be fenced, marked with bunting or barricading. Please refer to Figure 3-5 for a layout plan of the drilling site.

Drill core storage area

During core drilling, a laydown area for the extracted core samples will be established within the footprint of the drill site. This area is usually 5m x 2m ($10m^2$) and is used to place the extracted core in sequence (according to depth) for later analysis by an appointed geologist. Core trays will be used to contain the core samples.

4.3 Composite Map

(Provide a map **(Attached as an Appendix)** at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

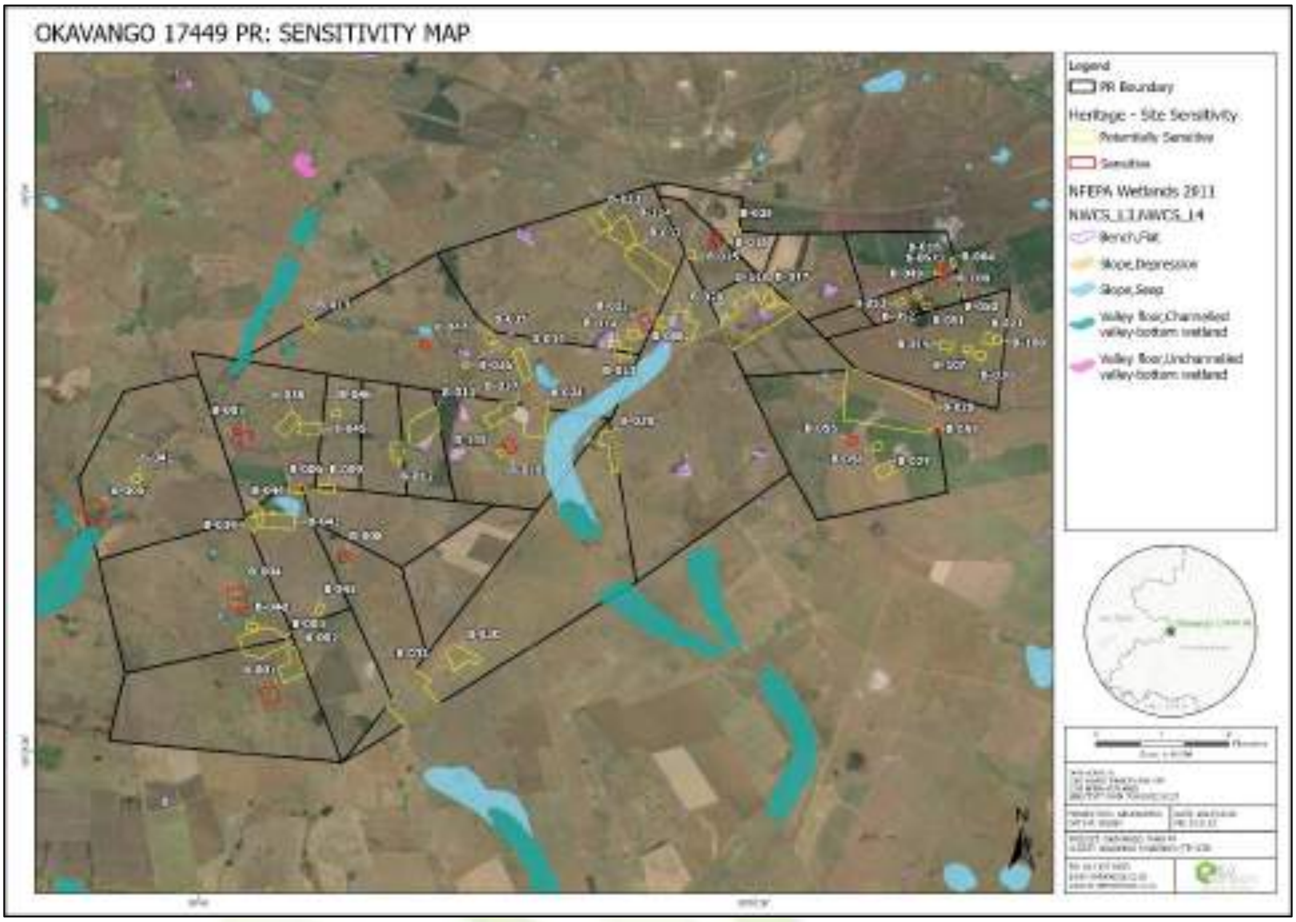


Figure 4-4: Composite map

4.4 Description of Impact Management Objectives Including Management Statements

4.4.1 Determination of closure objectives.

The closure vision is supported by the objectives as listed below;

- Create a safe, physically stable rehabilitated landscape that limits long-term erosion potential and environmental degradation;
- Rehabilitation to minimise contamination of surface water resources (the philosophy of dilution and dispersion);
- Meet with prevailing environmental legal requirements outlined in this report; and
- Prevent / Minimise negative impacts and risks as identified in this report.

4.4.2 Volumes and rate of water use required for the operation.

A small continuous water supply will be required during drilling, and on-site water storage tanks with a capacity of 15,000 ℓ for water supply to the drill, will be used for prospecting activities. Water will also be brought onto site for potable use, this is estimated at 5 litres per person/day. No water use licence will be applied for. No activities trigger a National Water Act Section 21 Water Use.

4.4.3 Impacts to be mitigated in their respective phases.

Table 4-2: Impacts to be mitigated in their respective phases, Impact Management outcomes, Impact Management Action

ACTIVITIES (E.g. For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route etc…etc…etc. E.g. For mining, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	PHASE (Of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	SIZE AND SCALE of disturbance (volumes, tonnages and hectares or m²)	MITIGATION MEASURES (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	COMPLIANCE WITH STANDARDS (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	TIME PERIOD FOR IMPLEMENTATION Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. With regard to Rehabilitation, therefore state: -. Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
Prospecting (drill) site clearance	Construction	640 m^2	The prospecting is aimed at minimising disturbance to natural vegetation once the positions have been finalised. No-go areas to be identified. Environmental awareness training of all employees responsible for drilling. A heritage assessment and paleontological impact assessment need to be undertaken prior to any invasive site activities. ECO to approve drill site location considering biodiversity, water resources, heritage and land use, consult with landowner on drill site location, demarcates drill site for safety. Create an upstream berm to divert, clean stormwater around the site. Create a downstream berm to contain any dirty water.	NEM: BA SANBI Resources Act Implementation of the Impact management hierarchy to avoid, minimise, mitigate and rehabilitate. Compliance to GN704 of the National Water Act	Prior to construction.
Establish water recycling sumps	Construction	2 m^2	Remove topsoil where sumps will be placed for rehabilitation. Line drill sumps with plastic to limit groundwater seepage.	To meet rehabilitation standards. To limit groundwater contamination.	During construction.

ACTIVITIES (E.g. For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route etc…etc…etc. E.g. For mining, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	PHASE (Of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	SIZE AND SCALE of disturbance (volumes, tonnages and hectares or m²)	MITIGATION MEASURES (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	COMPLIANCE WITH STANDARDS (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	TIME PERIOD FOR IMPLEMENTATION Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. With regard to Rehabilitation, therefore state: -. Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
Clearance of access roads	Construction	850 m^2	ECO to approve access road Route. Limit clearance to two lane tracks.	Implementation of the Impact management hierarchy to avoid, minimise, mitigate and rehabilitate.	During construction.
Establish prospecting site	Construction	25 – 64 m^2	Chemical toilets need to be placed near the drill site All chemicals and fuels need to be stored in a bunded area. Bins for general waste need to be provided. signage indicating hazards need to be placed at the entrance of the site. Drill rig operators and labourers need to be provided with identification cards. No labourers are to be housed on site.	Occupation Health requirement. Management of hazardous substances.	During construction.
Operation of the drill site	Operation	25 – 64 m^2	General waste need to be collected and dispose at a licensed facility. During rainfall events the drilling sumps need to be covered with plastic. No employee is allowed outside of the drill site barricading without permission from the site manager. Water is to be sourced from existing users. Working hours is only permitted during daytime hours. Vehicles are not permitted to exceed 30 km/h within the drill properties.	Impact mitigation.	During operations.
Decommissioning and rehabilitation of the drill site Access roads.	Rehabilitation	25 – 64 m^2	All infrastructure needs to be removed from the site. All waste and spillage need to be cleaned and disposed of appropriately. Drill sump water should be reused or allowed to evaporate. plastic from drill sumps need to be removed. Chemical toilets need to be cleaned before I can be moved to the following	Rehabilitation standards and objectives.	Rehabilitation.

ACTIVITIES (E.g. For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route etc…etc…etc. E.g. For mining, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	**PHASE** (Of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure).	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. With regard to Rehabilitation, therefore state: -. Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
			drill site. The drill hole must be capped or sealed to limit water ingress and ensure safety for humans and animals. Vehicles are not permitted to exceed 30 km/h within the drill properties.		

4.4.4 Financial Provision

4.4.4.1 Determination of the amount of Financial Provision.

4.4.4.1.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation.

The closure vision is supported by the objectives as listed below;

- Meet with prevailing environmental legal requirements outlined in this report; and
- Prevent / Minimise negative impacts and risks as identified in this report.

4.4.4.1.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

The basic assessment report and environmental management programme will be provided to IAPs for review and comment for 30 days. The objective is to be communicated to IAP's during the public consultation process.

4.4.4.1.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.

The rehabilitation sites will have an approximate footprint of 8m x 8m as this is the area determined that needs to be cleared for drilling from previous experience. The prospecting will be limited to proposed prospecting application areas) and a maximum of 20 holes are required to determine the available resource. Only one prospecting site will be active at a time as there is only one drill rig that will be used. This therefore allows minimum exposure and impact as concurrent rehabilitation can be carried out. Once drilling is complete at one site (usually within one day) the rehabilitation can be done immediately and soils and vegetation replaced.

Existing roads will be used as far as possible, and it is not possible to identify any new access roads at this stage as its route will be determined in conjunction with the landowner and activities on the property at that time. No other infrastructure, offices, or housing will be present within the prospecting area and all employees will be housed in nearby towns. Vegetation establishment is monitored after the first rain to ensure sustainability in the rehabilitation efforts.

4.4.4.1.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The rehabilitation plan aims to provide a project site that is similar to the pre-prospecting environment through the shaping of drill areas, capping of boreholes and vegetating of disturbed areas (where not within cultivated lands).

4.4.4.1.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

CALCULATION OF THE CLOSURE QUANTUM - PROSPECTING RIGHT								Version 1.0: Annual Closure Quantum Update for 2023
Operation: (Okovango PR - MP30/5/1/1/2/17449PR)				Province: Mpumlanga				
Evaluators: Eco Elementum (Pty) Ltd				Date: March 2023				
General Information	Risk Class	High (A)	PROPOSED PROSPECTING AREA					
	Environmental Sensitivity	Medium						
	WF 1: Nature of Terrain Weighting Factor	Flat 1.00						
	WF 2: Proximity to Urban Area Weighting Factor	Peri-Urban 1.05						
Component No	Main Activities Itemized Descriptions	[B] CPI Adjusted Master Rate	[A] Quantity	Units	[C] Multipliction Factor	[D] Weighting Factor 1: Nature of Terrain	Sub Totals [E = A*B*C*D]	NOTES & SUPPORTING EXPLANATIONS
		STEP 4.3	STEP 4.5		STEP 4.3	STEP 4.4		
1	Dismantling of processing plant and structures	R 17,46	0,00	m3	1,00	1,00	R 0,00	No processing plant and structures.
2(A)	Demolition of steel buildings and structures	R 243,19	0,00	m2	1,00	1,00	R 0,00	No steel buildings and structures. Temporary camp site.
2(B)	Demolition of reinforced concrete buildings and structures	R 358,39	0,00	m2	1,00	1,00	R 0,00	No reinforced concrete buildings and structures. Temporary camp site.
3	Rehabilitation of access roads	R 43,52	850,00	m2	1,00	1,00	R 36 990,45	Existing roads will be used as far as possible, and it is not possible to identify any new access roads at this stage as its route will be determined in conjunction with the landowner and activities on the property at that time. A budget of 850m² for new access roads was included. The drill operators can allocate this to drill sites accordingly. For example: If all 10 drill sites require a new access road of 30m x 2.83m from an existing road, then there is budget for it. (30m x 2.83m = 85m²) (85m² x 10 drill sites = 850m²). Distances subject to change, but should remain within the allocated budget.
4(A)	Demolition and rehabilitation of electrified railway lines	R 422,38	0,00	m	1,00	1,00	R 0,00	n/a
4(B)	Demolition and rehabilitation of non-electrified railway lines	R 230,39	0,00	m	1,00	1,00	R 0,00	n/a
5	Demolition of housing and facilities	R 486,38	0,00	m2	1,00	1,00	R 0,00	No other infrastructure, offices, or housing will be present within the prospecting site areas
6	Opencast rehabilitation including final voids and ramps	R 247 541,65	0,00	ha	0,52	1,00	R 0,00	n/a
7	Sealing of shafts, adits and inclines	R 130,55	0,00	m3	1,00	1,00	R 0,00	n/a
8(A)	Rehabilitation of overburden and spoils	R 169 976,89	0,00	ha	1,00	1,00	R 0,00	n/a
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	R 211 703,14	0,00	ha	1,00	1,00	R 0,00	n/a
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	R 614 886,28	0,00	ha	0,80	1,00	R 0,00	n/a
9	Rehabilitation of subsided areas	R 142 330,05	0,00	ha	1,00	1,00	R 0,00	n/a
10	General surface rehabilitation, including grassing of denuded areas	R 134 650,37	0,064	ha	1,00	1,00	R 8 617,62	Drill site clearing and establishment, mobile chemical ablution facility, drill rig equipment, return water lined sump, and sample storage trays. 64m² drill site = 8m x 8m. 10 sites = 640m²
11	River diversions	R 134 650,37	0,00	ha	1,00	1,00	R 0,00	n/a
12	Fencing	R 153,59	0,00	m	1,00	1,00	R 0,00	n/a
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)	R 51 197,86	0,064	ha	0,67	1,00	R 2 195,36	Drill site clearing and establishment, mobile chemical ablution facility, drill rig equipment, return water lined sump, and sample storage trays. 64m² drill site = 8m x 8m. 10 sites = 640m² Water abstraction for drilling purposes.
14	2 to 3 years of maintenance and after care	R 17 919,25	0,149	ha	1,00	1,00	R 2 669,97	Entire disturbed footprint
15	Specialist study	n/a	1,00	report	1,00	1,00	R 0,00	n/a
						Subtotal (1 to 15 above)	R 50 473,41	
	Subtotal 1	Weighting Factor 2				1,05	R 52 997,08	
1	Preliminary and General	12% of Subtotal 1 if less than R100mil					R 6 359,65	
		6% of Sub Total 1 if more than R100mil						
2	Contingency	10% of Sub Total 1					R 5 299,71	
						Subtotal 2 (Subtotal 1 plus sum of management and contingency)	R 11 659,36	
						Subtotal 3	R 64 656,44	
						GRAND TOTAL (Subtotal 3 plus 15% VAT)	R 74 354,90	

4.4.4.1.6 Confirm that the financial provision will be provided as determined.

The applicant hereby commits to undertaking to provide the calculated amount in the form of either method provided in section 53 of the MPRD Regulations and the financial provisioning regulations, 2015 Published under Government Notice R1147 (GN R. 39425 of 2015). It should however be noted that no new guideline for determining the quantum for closure and rehabilitation has been published and therefore the guideline published under the MPRDA regulation was used to assess the quantum for closure liability.

MECHANISMS FOR MONITORING COMPLIANCE WITH A PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON, INCLUDING –

4.4.4.1.7 Monitoring of Impact Management Actions (Table 4-3).

4.4.4.1.8 Monitoring and reporting frequency (Table 4-3).

4.4.4.1.9 Responsible persons (Table 4-3).

4.4.4.1.10 Time period for implementing impact management actions (Table 4-3).

4.4.4.1.11 Mechanism for monitoring compliance (Table 4-3).

Table 4-3: Monitoring compliance

Source activity	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (for the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Drill site establishment, moving and rehabilitation	Disturbance of vegetation, Degradation and destruction of sensitive biodiversity Suitable habitat for the globally threatened red data avifaunal species. Contamination of ground and surface water. Disturbance of heritage Resources. Land use conflicts Noise and dust generation. Rehabilitation sustainability.	Pre-site establishment, with no go areas and approval by EO and avifaunal specialist. Pre-site establishment risk Assessment. Pre-site establishment risk assessment. Complaint register. Rehabilitation closure report.	Project environmental officer. Site manager. Project environmental officer. Project environmental officer.	Prior to site establishment. (once off). During operations and closure. (bi-monthly). Prior to site establishment. Prior to site establishment (once off). During operations and closure. (continuous) Post closure.
Entire operational site	All activities and impacts identified.	Auditing all site activities in compliance with the management commitments.	Project environmental officer.	During life of project. (monthly).

4.4.4.1.12 Indicate the frequency of the submission of the performance assessment/ environmental audit report.

Monitoring will be undertaken as stipulated in Table 4-3 above. The performance assessment will be conducted internally twice a year and by an external consultant annually throughout the life of operation as required under NEMA. This is conducted to assess the adequacy and compliance to the EMP, EA and the relevant legislation. The reports should be submitted to the DMRE.

4.4.4.1.13 Emergency Preparedness, Response and Environmental Awareness Plan

Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

An environmental awareness training manual will be developed for the project.

All employees must be provided with environmental awareness training to inform them of any environmental risks that may result from their work and of the manner in which the risks must be dealt with to avoid pollution or the degradation of the environment.

Employees should be provided with environmental awareness training before operations start. All new employees should be provided with environmental awareness training. Environmental awareness and training is an important aspect of the implementation of the EMP. The onus is on the different parties involved in the various stages of the life cycle of the project to be environmentally conscious. Hence, it is suggested that all members of the project team are familiar with the findings of the site-specific EA report and the EMPr. For instance, the contractor is responsible for the lack of environmental knowledge of his/her crew members. The contractor could forward internal environmental awareness and training procedures to the project manager and environmental officer for comment prior to the commencement of the project. Likewise, the above is applicable to the programming, design, operations and maintenance, and decommissioning teams. Environmental awareness ensures that environmental accidents are minimized and environmental compliance maximized.

All staff and contractors will be submitted to an annual training / awareness course as to inform the staff of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment.

Section 39 (3) (c) requires that an applicant who prepares an Environmental Management Programme or Environmental Management Plan must “develop an environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risks which may result from the work and the manner in which the risks must be dealt with in order to avoid pollution and degradation of the environment”. Environmental Awareness is required not only for management and employees (as described in Section 39 (3) (c) but also for visitors to the site. the following strategies and plans will be put into place for each of the parties.

Visitor Environmental Awareness

Visitor/sub-contractor environmental awareness will be generated through the provision of a signboard describing very briefly the environmental considerations applicable to them. The signboard should contain the following information:

- Statement of the applicant’s commitment to environmental principles;
- List of the “rules” to which the visitor must abide. This will include:
    - No littering. Dispose of all waste in the bins provided;
    - No fires;
    - Stay on demarcated roadways and paths only;
    - Kindly report any environmental infringements they may notice;
    - Check your vehicle/equipment for diesel/oil leaks.

Senior and Middle Management Environmental Awareness:

Achieving environmental awareness at upper levels of management is slightly different from the process at the operational level. There is often a fair level of the general value of environmental awareness but site-specific issues will most often need to be communicated. This will be achieved by:

- Management must make themselves fully familiar with the EMPr;
- Ensuring that there is a spare copy of the approved EMPr at his/her disposal; management is encouraged to make notes in the document regarding the difficulty / ease of implementing the environmental management measures. These notes should be sent to the consultants to assist in future revisions of the EMPr;
- The manager must ensure that the operators perform regular monitoring of their workstations / areas.

During the management's execution of their activities/being at the site, the management must constantly be aware of and observant of especially the following:

- Dust levels - movement outside of demarcated areas;
- Litter management - general housekeeping;
- Erosion during rainy season.

Topsoil management - fuel/oil management/leaks/changes;

- Success of operational re-vegetation; and
- Alien vegetation.

Operator / Workforce Environmental Awareness:

Achieving environmental awareness amongst the operators and labour is probably the most important because they are usually present at the place where most environmental transgressions take place or in fact cause them. It is the aim of increased environmental awareness to reduce any such environmental transgressions.

Increasing environmental awareness at these levels can be achieved through the following strategies:

- Induction environmental training must take place prior to any contract period.
- Training: Each and every employee (contractor or not) must go through an environmental training process where at least the following items area covered:
  - The oil/fuel management policy must be explained to the employees. The reason for the policy must also be explained (i.e. to not impact on groundwater, surface water, soil quality etc.);
  - The domestic and industrial waste management policy & method must also form part of the training;
  - The topsoil handling method and the reasons for preserving topsoil (i.e. post prospecting re vegetation, erosion prevention etc.);
  - Alien vegetation management: How to recognize and remove such species;
  - Protection of the natural veld by not driving/manoeuvring or walking through the demarcated protection areas. Reporting that demarcation posts/tape is broken or removed;

Emergency management procedures such as dealing with oil spills or fires must also be drilled; and

- Such training will, in this case, be carried out by the site manager/resident engineer.

Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

Training, as detailed above, will address the specific measures and actions as listed in the EMPr and also conditions of the EA. In this way the team will be provided the knowledge required to conduct the mining activities without resulting in environmental non-compliance, the liability of which would lie with the applicant. Secondly, informing the team of the EMPr will also assist the team in identifying if an impact is likely to occur / has occurred and communicate this appropriately to the Environmental Manager.

In order for appropriate action to be taken, proper communications network and reporting protocol must be established, with the team and the site manager reporting all environmental issues to the Environmental Manager and then all social issues to the General Manager.

4.4.4.1.14 Specific information required by the Competent Authority

The following specific information will be required by the competent authority:

- The financial provision will be reviewed annually.

1) UNDERTAKING

The EAP herewith confirms

a. the correctness of the information provided in the reports ☒

b. the inclusion of comments and inputs from stakeholders and I&APs ; ☒

c. the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and

d. that the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein. ☒

Signature of the Environmental Assessment Practitioner:

Eco Elementum

Name of Company:

22/03/2023

Date:

-END-

APPENDIX A: EAP CV

APPENDIX B: PUBLIC PARTICIPATION REPORT

APPENDIX C: LAYOUT MAPS

APPENDIX D: SPECIALIST STUDIES

ANNEXURE A

EAP CV

ENVIRONMENTAL CONSULTANT

LIAN ROOS

ABOUT

As an environmental consultant, Lian has attained a variety of environmental related skills and experiences in the broader industry. He is a driven individual and prides himself in his integral responsibilities regarding the consulting role he fulfils. His responsibilities range from environmental investigation, analysis, and planning, monitoring, and auditing to all environmental authorisation related engagements. His duties extend to advising clients in aligning with relevant legislation and policy requirements as part of the on-going environmental compliance process. Lian also engages with stakeholders for newly proposed projects.

CAREER HISTORY

Environmental Consultant
Eco Elementum (Pty) Ltd
Pretoria
Jul 2021 – current

Environmental Monitoring Technician
Eco Elementum (Pty) Ltd
Pretoria
Nov 2018 - Jun 2021

Role:
Environmental monitoring and compliance
Environmental analysis and planning, management, and co-ordination of EIAs & EMPr
Environmental auditing
Stakeholder engagement (public participation and commenting authority liaison)
Proposals & project management
Prospecting and Mining Right applications
Water Use Licence applications
Waste Management Licence applications

QUALIFICATIONS

Senior Certificate Matric
Hoërskool Waterkloof
2014

BSc Environmental Science
University of Pretoria
2017

BSc Hons (App Sci) Water Utilisation
University of Pretoria
2019

EXPERTISE AND SKILLS

Skills and experience include, but are not limited to:

- Environmental Compliance Monitoring.
- Environmental Monitoring:
  - Water Quality (Surface & Ground)
  - Air Quality (Dust, PM2.5, PM10, SO_2, NO_2, HF)
  - Noise (Ambient & Environmental)
- Environmental Control Officer.
- Environmental Awareness.
- External & Internal Auditing.
- Environmental Impact Assessments and Authorisations
  - EIA, BA & EMPr report compilation
  - Stakeholder engagement & Public consultation
  - Proposal & project management
  - Specialist coordination & departmental liaison
  - Water Use Licence application
  - Waste Management Licence application
  - Prospecting and Mining Right applications

REGISTRATIONS

Professional Registrations

- EAPASA – Environmental Assessment Practitioner Association of South Africa, Candidate EAP membership – 2022/4550
- SACNASP - South African Council of Natural Science Professionals, Pending Professional Natural Scientist membership
- LaRRSA - Land Rehabilitation Society of South Africa, Membership ID: 32905
- IAIAsa – International Association for Impact Assessment South Africa, Membership ID: 7168

361 Oberon Ave, Glenfield Office Park, Nika Building, Pretoria, 0081
lian@ecoe.co.za
012 807 0383

PROJECT EXPERIENCE

ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT PLANS

DATE	CLIENT & PROJECT	DESCRIPTION
Dec 2022	IPP Mining – Ndndanganeni Colliery S102 Mining Right application (Mpumalanga)	Project Management, coordination, and BA and EMP report compilation as well as public consultation of the various aspects on this project.
Aug 2022	Mafatiki Amalgamated Commodities – Mining Permit application (Mpumalanga)	Project Management, coordination, and BA and EMP report compilation as well as public consultation of the various aspects on this project.
Jun 2022	Peacanwood Resources - Mining permit application (Mpumalanga)	Project Management, coordination, and BA and EMP report compilation as well as public consultation of the various aspects on this project.
Jan 2022	Sastrobuzz – Mining permit application (Mpumalanga)	Project Management, coordination, and BA and EMP report compilation as well as public consultation of the various aspects on this project.
Jan 2022	Kapalpha Solutions – Mining permit application (Mpumalanga)	Project Management, coordination, and BA and EMP report compilation as well as public consultation of the various aspects on this project.
Jul 2022	Xakwa – Prospecting Right application (North Wes)	BA and EMP report compilation as well as public consultation of the various aspects on this project.
May 2022	Tsebeblox - Prospecting right application (Mpumalanga)	BA and EMP report compilation as well as public consultation of the various aspects on this project.
AUDITING & COMPLIANCE MONITORING		
DATE	**CLIENT & PROJECT**	**DESCRIPTION**
Jan 2022	Afri Readymix (North West)	Environmental Due Diligence
Oct 2021	Anglo American Modikwa Platinum (Limpopo)	NEMA Reg 43 Audit & Integrated Water Use Licence Audit
Oct 2021	HCI Palesa Coal (Mpumalanga)	EMP PAR
Sep 2021	HCI Palesa Coal (Mpumalanga)	External Water Use License Audit
Apr 2021	Potch Plastics Recycling (North West)	External Waste Management Licence Audit
ENVIRONMENTAL MONITORING		
DATE	**CLIENT & PROJECT**	**DESCRIPTION**
2019 – 2021	Mylotex – Springlake Colliery (KZN)	Water Quality (Surface & Ground), Air Quality (Dust)
2019 – 2021	Kleinfontein Mining Holdings – Kleinfontein Colliery (Mpumalanga)	Water Quality (Surface & Ground), Air Quality (Dust)
2018 - 2022	Yoctolux Colliery (Mpumalanga)	Water Quality (Surface & Ground), Air Quality (Dust, PM10) Noise (Environmental)
2019 - 2021	Trifert Groblersdal (Limpopo)	Air quality (Dust, SO_2, NH_3, NO_2 & HF)
2018 - 2021	Into Africa – Doornrug, Lakeside & Leeuwfontein, Vunene Colliery (Mpumalanga)	Water Quality (Surface & Ground), Air Quality (Dust) Noise (Environmental)
2020 - 2021	AFGRI (Free State, Mpumalanga & Gauteng)	Air Quality (Dust)
2019 – 2021	AfriSam (Mpumalanga, KZN & Gauteng)	Air Quality (Dust)
SPECIALIST STUDIES & REHABILITATION		
DATE	**CLIENT & PROJECT**	**DESCRIPTION**
Aug 2022	Aangewys Mining Permits	Rehabilitation, Decommissioning & Mine Closure Plans
May 2022	Wildfontein Mining Permits	Rehabilitation, Decommissioning & Mine Closure Plans
Aug 2021	Aangewys Mining Right	Noise Assessment input for the EIA
2019 - 2021	Tau Tona Kebrafield Colliery	River diversion – wetland monitoring
2020 - 2021	HCI Mbali & Palesa Colliery (Mpumalanga)	Rehabilitation monitoring
Aug 2019	AEMFC	Weather Station Installation & Training

15088902

University of Pretoria

The Council and Senate hereby declare that
at a congregation of the University the degree

Bachelor of Science Honours

Applied Science
Water Utilisation

with all the associated rights and privileges was conferred on

Johannes Gysbertus Roos

in terms of the Higher Education Act, 1997 and the
Statute of the University

On behalf of the Council and Senate

T. Kupe

Vice-Chancellor and Principal

CERTIFIED COPY
TRUE COPY

05/08/2022

Suzette Hartzer-Marais
COMMISSIONER OF OATHS
fficio: Admitted Attorney of the Republic of South Africa
Block C8, Block@Nature
472 Botterklapper street, The Willows, 0081

Registrar

UNIVERSITATIS PRETORIENSIS SIGILLUM

00081350

00332598-01-AQ3I

2020/05/05

15088902

Universiteit van Pretoria

Die Raad en die Senaat verklaar hiermee dat die graad

Baccalaureus Scientiae

in

Omgewingswetenskappe

met al die regte en voorregte daaraan verbonde tydens
'n kongregasie van die Universiteit toegeken is aan

Johannes Gysbertus Roos

kragtens die Wet op Hoër Onderwys, 1997 en die
Statuut van die Universiteit

EDWIN KRUGER
Commissioner of Oaths / Kommissaris van Ede
Ex Officio
Professional Accountant (S.A.)
Professionele Rekenmeester (S.A.)
SAIPA Membership number / SAIPA Lidnommer 20228
206 Propshaft str, Sunnypark, Pretoria, 0184

Namens die Raad en die Senaat

L. de la Rey

4/02/19

E. Kruger

Visekanselier en Rektor

Certified a true copy of the original

Gesertifiseer 'n ware afskrif van die oorspronklike

Registrateur

SIGILLUM UNIVERSITATIS PRETORIENSIS

00038038

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04/18/2018

NOTICE OF PERSONAL PARTICULARS

1. Any changes to the personal particulars in your ID Book must be communicated to all relevant parties.

NOTICE OF CHANGE OF ADDRESS

1. Keep the NOTICE OF CHANGE OF ADDRESS form in this pocket to report a change of address or a change in particular of your present address e.g. name of street and/or street number etc.
2. Hand in at or post to the nearest regional/district office of the DEPARTMENT OF HOME AFFAIRS

I.D. No. 960118 5060 080

S.A.CITIZEN

SURNAME
ROOS

FORENAMES
JOHANNES GYSBERTUS

COUNTRY OF BIRTH
SOUTH AFRICA

DATE OF BIRTH
1996-01-18

DATE ISSUED
2013-11-25

ISSUED BY AUTHORITY OF THE DIRECTOR-GENERAL HOME AFFAIRS

CERTIFIED COPY
TRUE COPY

05/08/2022

Suzette Hartzer-Marais

COMMISSIONER OF OATHS

Ex officio: Admitted Attorney of the Republic of South Africa

Block C8, Block@Nature

472 Botterklapper street, The Willows,0081

Environmental Assessment Practitioners Association of South Africa

Registration No. 2022/4550

Herewith certifies that

Johannes Gysbertus Roos

is registered as an

Candidate Environmental Assessment Practitioner

Registered in accordance with the prescribed criteria of Regulation 15. (1) of the Section 24H Registration Authority Regulations (Regulation No. 849, Gazette No. 40154 of 22 July 2016, of the National Environmental Management Act (NEMA), Act No. 107 of 1998, as amended).

Effective: 01 March 2023

Expires: 29 February 2024

Chairperson

Registrar

SAQA

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

IAIAsa Secretariat
Tel +27(0)11 655 7183
Fax 086 662 9849

Address:
43 Birchwood Court, Montrose Street, Vorna Valley, Midrand, 1618

Postal address:
PO Box 11666, Vorna Valley, 1686
Email: operations@iaiasa.co.za
Website: www.iaiasa.co.za

IAIAsa Confirmation of Membership: 2023/2024
Lian Roos Membership Number: 7168

03 Mar 2023

TO WHOM IT MAY CONCERN

Mr Lian Roos , Eco Elementum (Pty) Ltd (IAIAsa membership Number **7168**) is a paid-up Full Member in good standing of International Association for Impact Assessment, South Africa and has been a member of IAIAsa since 01 Mar 2023.

Membership has been continous from 01 Mar 2023 to date.

This membership is valid from 01 Mar 2023 to 29 Feb 2024.

IAIAsa is a voluntary organisation and is not a statutory body regulating the profession. Its members are however expected to abide by the organisation's code of ethics which is available on our website.

IAIAsa is an Affiliate of IAIA which is an international body through a memorandum of understanding. IAIA is not responsible or liable for the actions or activities of the Affiliates. Membership of one does not imply membership of the other.

Any enquiries regarding this membership may be directed to the Secretariat at the above contact details.

Yours sincerely

Monique Sham
President 2022/2023

LaRSSA

LAND REHABILITATION SOCIETY
OF SOUTHERN AFRICA

Land Rehabilitation Society of Southern Africa

hereby certifies that

Mr Lian Roos

is a fully paid-up member of the Society having all the
rights and privileges of a

REGULAR MEMBER

I.D: 32905

on behalf of the Executive Council

President
M. Aken

Vice-President
A. van Deventer

DIVISIONAL HEAD: ENVIRONMENTAL AUTHORISATIONS

Riana Panaino

ABOUT

With more than 14 years' experience in the environmental consulting industry she has a firm understanding of Environmental Management. She can adapt to a wide range of working environments, has a strong problem-solving ability and work towards team and client satisfaction. Riana has a passion for Environmental Authorisation Processes (Basic Assessments, Environmental Impact Assessments, Monitoring, Environmental Management Plans, Waste Licence Applications, Closure Application and Integrated Water Use License Applications) in terms of the South African legislative regime.

CAREER HISTORY

Environmental Consultant and Divisional Head
Eco Elementum (Pty) Ltd
Pretoria
April 2019 – Present
Role: Environmental Impact Assessments, Water Use Licenses, Waste Applications, Rectification Applications, Stakeholder Engagement, Project Mangement, Specialist Management, Divisional Managment.

Senior Environmental Consultant
GCS
Rivonia
March 2012 – November 2013 and June 2014 – March 2019
Role: Project Management, management and coordination of specialists, compilation of Environmental Impact Assessments, Environmental Waste Licence application. Public Participation, Environmental Management Programs.

Senior Environmental Scientist
Jones and Wagener
Pretoria
December 2013 – May 2014
Role: Project Management, management and coordination of specialists, compilation of Environmental Impact Assessments, Public Participation, Environmental Management Programs.

Wetland Consultant
Golder Associates Africa
Midrand
March 2008 – February 2012
Role: Wetland Delineation, characterisation, PES- EIS- Functional Assessment, Impact identification and determination.

QUALIFICATIONS

BSc Hons (Biodiversity & Conservation)
University of Johannesburg
2007

BSc (Botany and Zoology)
University of Johannesburg
2004 - 2006

Senior Certificate Matric
Hoërskool Westernaria
2003

EXPERTISE AND SKILLS

Skills include, but are not limited to:

- Specialist Co-ordination.
- Project Management.
- Moniting and Compliance.
- Compilation of Environmental Management Plans.

Skills include, but are not limited to:

- Compilation of Environmental Impact Assessment.
- Government Department Liaison.
- Assessment of Wetland Status and Functionality.
- Determination of Wetland Boundaries.

REGISTRATIONS

Professional Registrations

- IAIASA
- South African Council of Natural Science Professionals (SACNASP)

riana@ecoe.co.za | 012 807 0383 | 361 Oberon Ave, Glenfield Office Park, Nika Building, 1st Floor, Faerie Glen, Pretoria, 0081 | www.ecoe.co.za

PROJECT EXPERIENCE

ENVIRONMENTAL MANAGEMENT AND MONITORING		
DATE	**CLIENT**	**DESCRIPTION**
2008, 2009, 2010	Matla,Mpumalanga, South Africa	Matla Wetland Monitoring and Management Plan for Matla coal mine. Responsibilities included: weekly site visits and reporting of findings during the construction of the Matla river diversion and assisted in compilation of the wetland management plan.
BIOLOGICAL SCIENCES		
2009	Eskom DPSS, Freestate/KwaZulu Natal, South Africa	Assisted in the capture of fish for genetic sampling to map distribution patterns between two different catchment.
ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT PLANS AND PROGRAMMES		
2020	Trentra Vlaklaagte Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project
2020	Leeuwfontein Section 102 Amendment Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project
2020	Lakeside Section 102 Amendment Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project
2019	Kleinfontein Holdings(Pty) Ltd S102 EMP Amendment to include new portions and remove a discard dump	EMP Report Compilation and review of specialist reports
2019	Yoctolux Investments (Pty) Ltd Mining Right Section 102 EIA/EMPr and wetland rehabilitation application.	EMP Report Compilation and review of wetland rehabilitation plan
2019	Blesboklaagte 102 Amendment Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project
2019	Beryl Colliery Section 102 Amendment Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project
2019	Wildebeestfontein Colliery Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project
2019	Weltevreden Colliery Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project
2019	South32 Klipspruit Prinshof Extension, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project
2016	Exxaro NBC Project	Project Consultant, coordination, BA and EMP report compilation as well as public consultation of the various aspects on this project.
2016	Exxaro Coal Central Eloff Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project.
2015	Exxaro Belfast Project, Mpumalanga, South Africa	Environmental Control Officer
2015	Exxaro Matla Project, Mpumalanga, South Africa	Project Consultant, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project.
2015	Exxaro UCG Project, Limpopo, South Africa	Project Management, coordination and public consultation of the various aspects on this project.
2014	Quantum Crushing and Screening, KwaZulu-Natal, South Africa	Project Management, coordination and BA and EMP report compilation as well as public consultation of the various aspects on this project.
2013	Glencore Rietvly – Northwest, South Africa	Project Management, coordination and BA and EMP report compilation as well as public consultation of the various aspects on this project.
2012	Jacomynspan, Northern Cape, South Africa	Project Management, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project.
2012	Bighorn Substation, Northwest, South Africa	Project assistance, coordination and report compilation as well as public consultation of the various aspects on this project.
2012	Otjozondu, Namibia	Environmental Impact Assessment Report Compilation.
2012	Leeuwpan, Mpumalanga, South Africa	Project Management, coordination and EIA and EMP report compilation as well as public consultation of the various aspects on this project.
2008	Lonmin Akanani, Limpopo, South Africa	Project assistance, coordination and report compilation of the various studies done on this project.

PROJECT EXPERIENCE

ENVIRONMENTAL MANAGEMENT AND MONITORING		
DATE	**CLIENT**	**DESCRIPTION**
	ECOLOGY	
2012	Schoongezicht, Mpumalanga South Africa	Ecological studies with responsibilities that included wetland input for the IWULA. Wetland delineation, classification and characterisation were done on the wetlands found during this study.
2012	Mooiplaats, Mpumalanga South Africa	Ecological studies with responsibilities that included wetland input for the IWULA. Wetland delineation, classification and characterisation were done on the wetlands found during this study.
2011	Kromdraai Pipeline, Mpumalanga, South Africa	Ecological studies with responsibilities that included wetland input for the project EIA. Wetland delineation, classification and characterisation were done on the wetlands found during this study.
2010	New Vaal Life Expansion, Free State, South Africa	Ecological studies with responsibilities that included wetland input for the project EIA. Wetland delineation, classification and characterisation were done on the wetlands found during this study.

ANNEXURE B

Public Participation Process

Draft Basic Assessment Report

Proof of Public Participation Report will be included in the Final Basic Assessment Report after the 30-day commenting period.

Please remember to notify the EAP in order to be registered as a Interested and Affected Party for this project.

Environmental Assessment Practitioner - Eco Elementum info@ecoe.co.za

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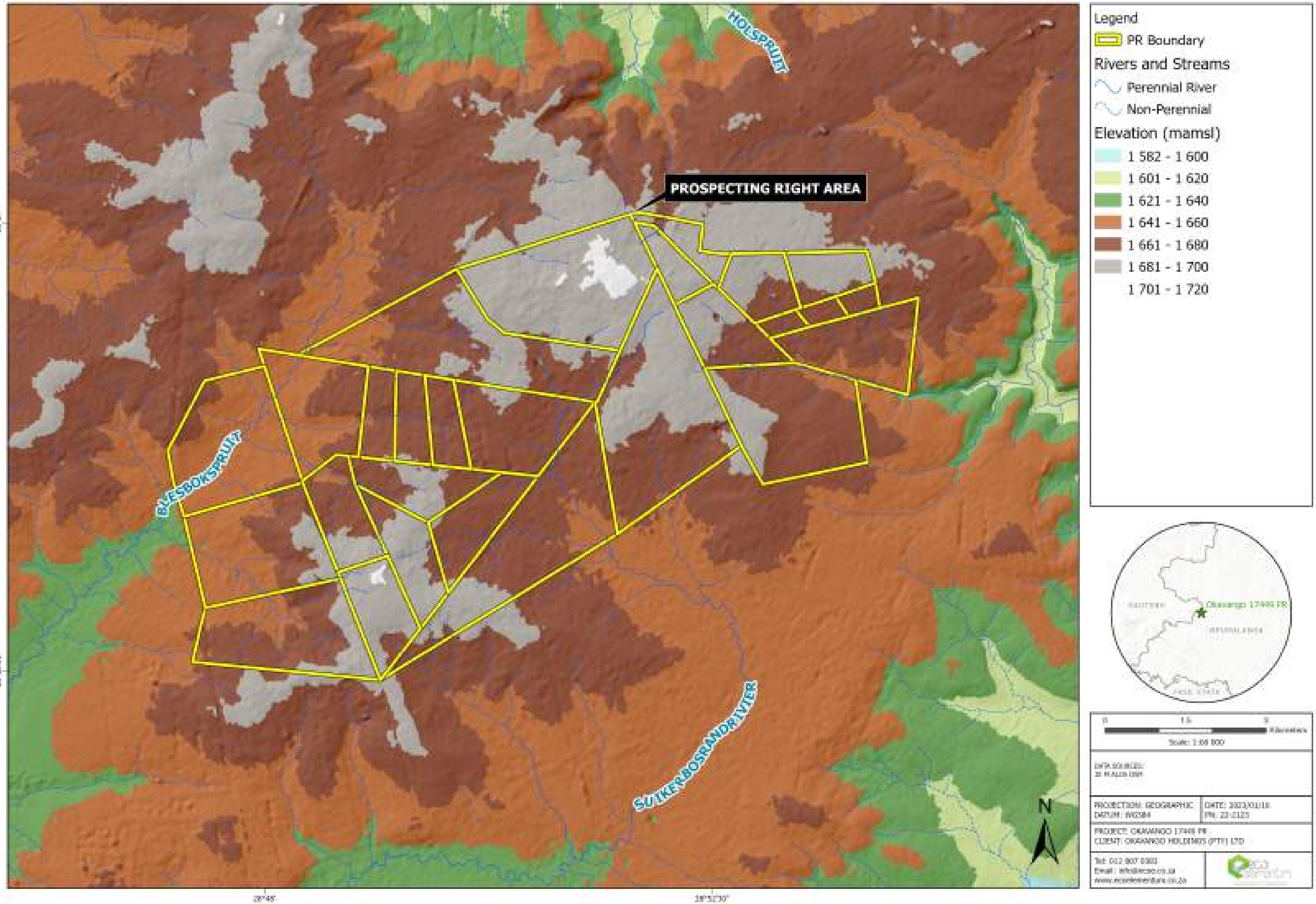
ANNEXURE C

Conceptual Site Layout and Maps

OKAVANGO 17449 PR: LOCALITY MAP

OKAVANGO 17449 PR: LANDCOVER

OKAVANGO 17449 PR: TOPOGRAPHY



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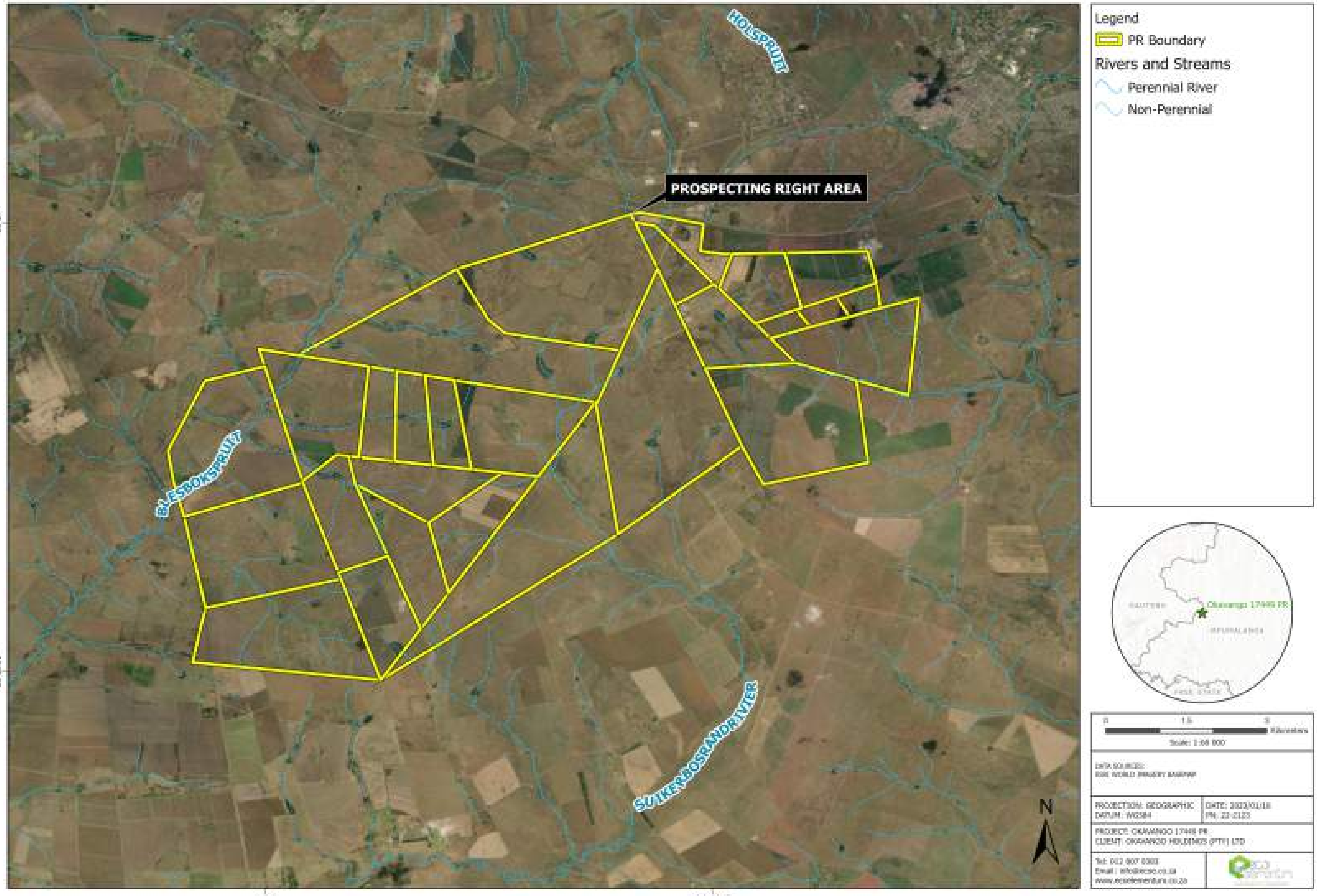
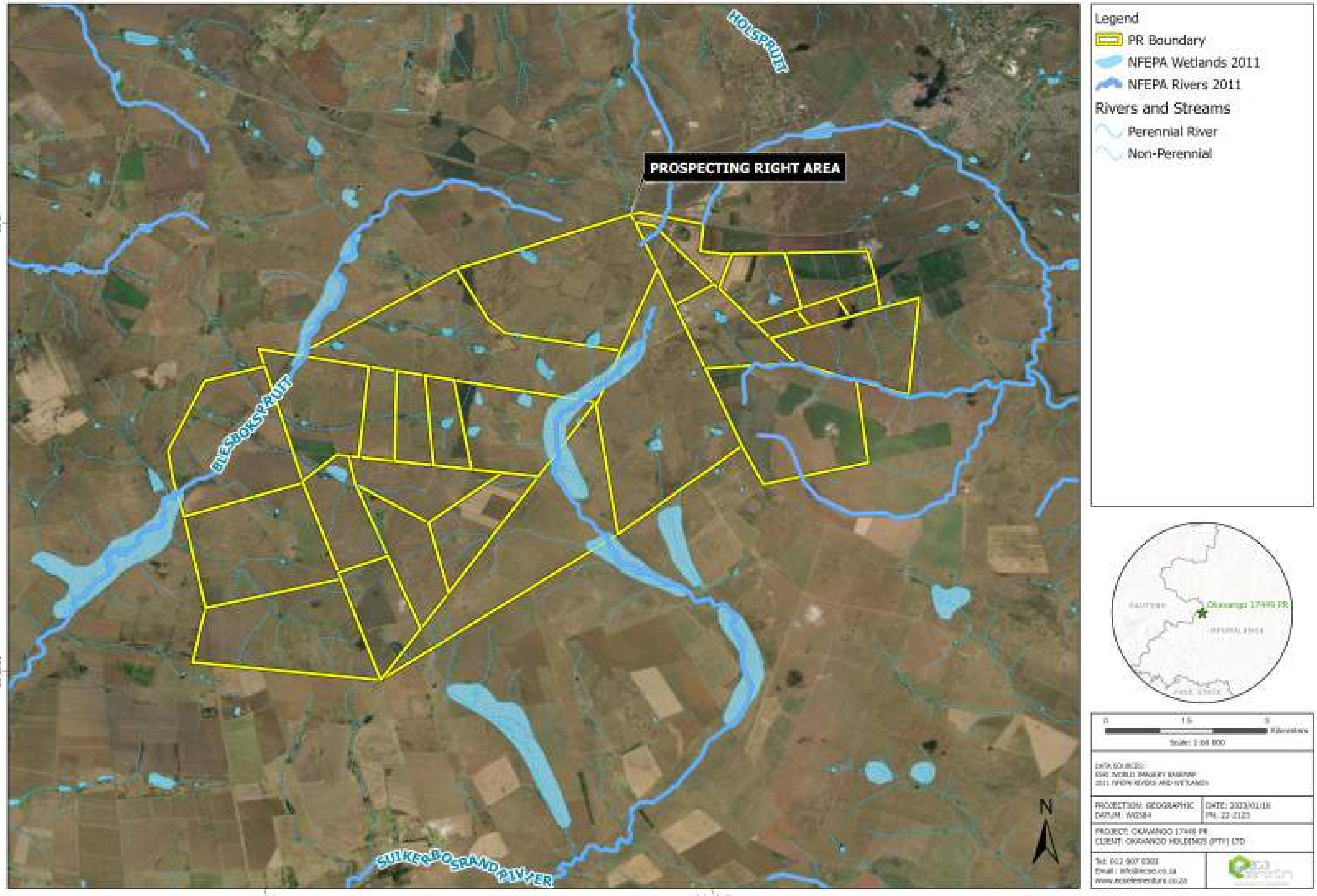
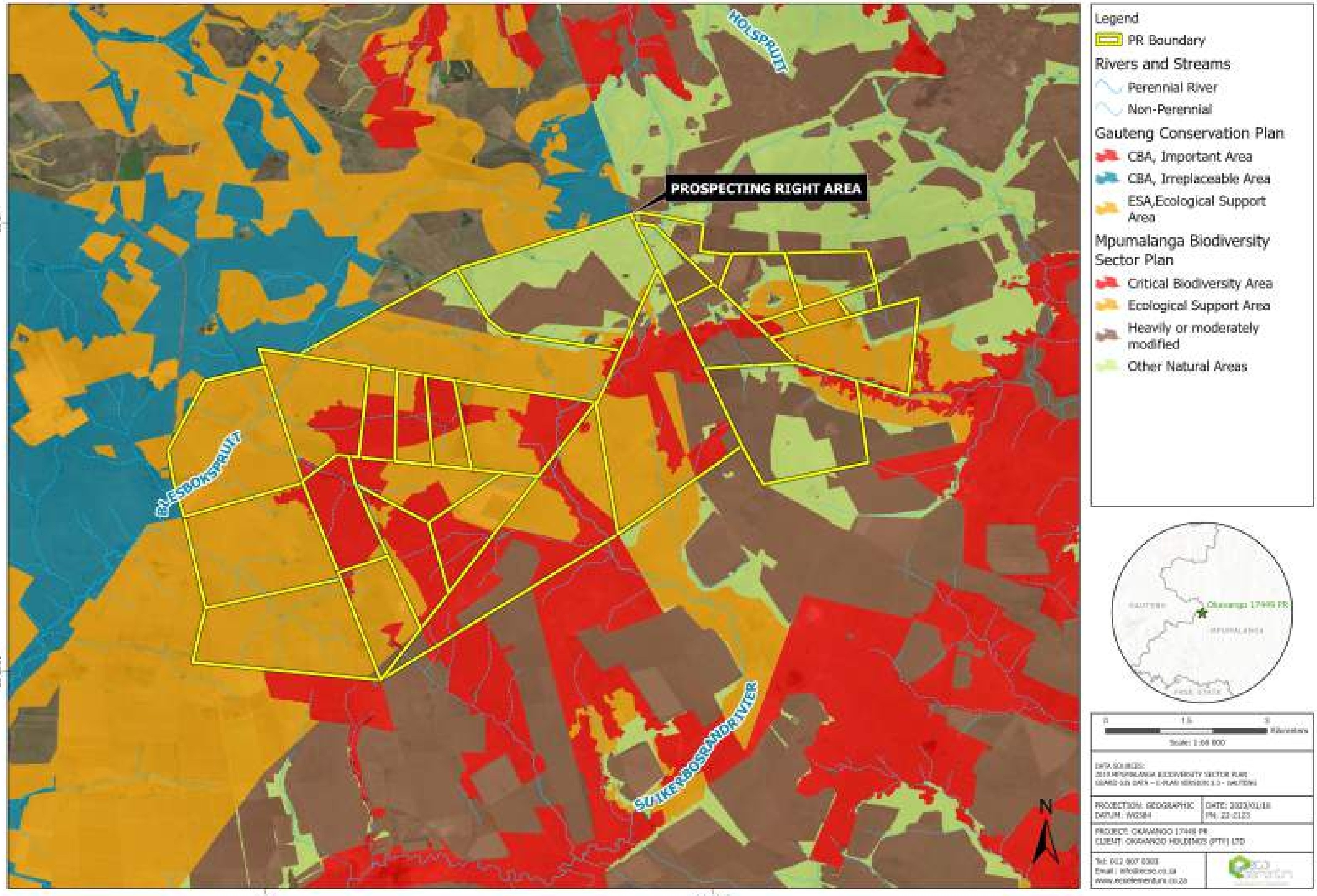


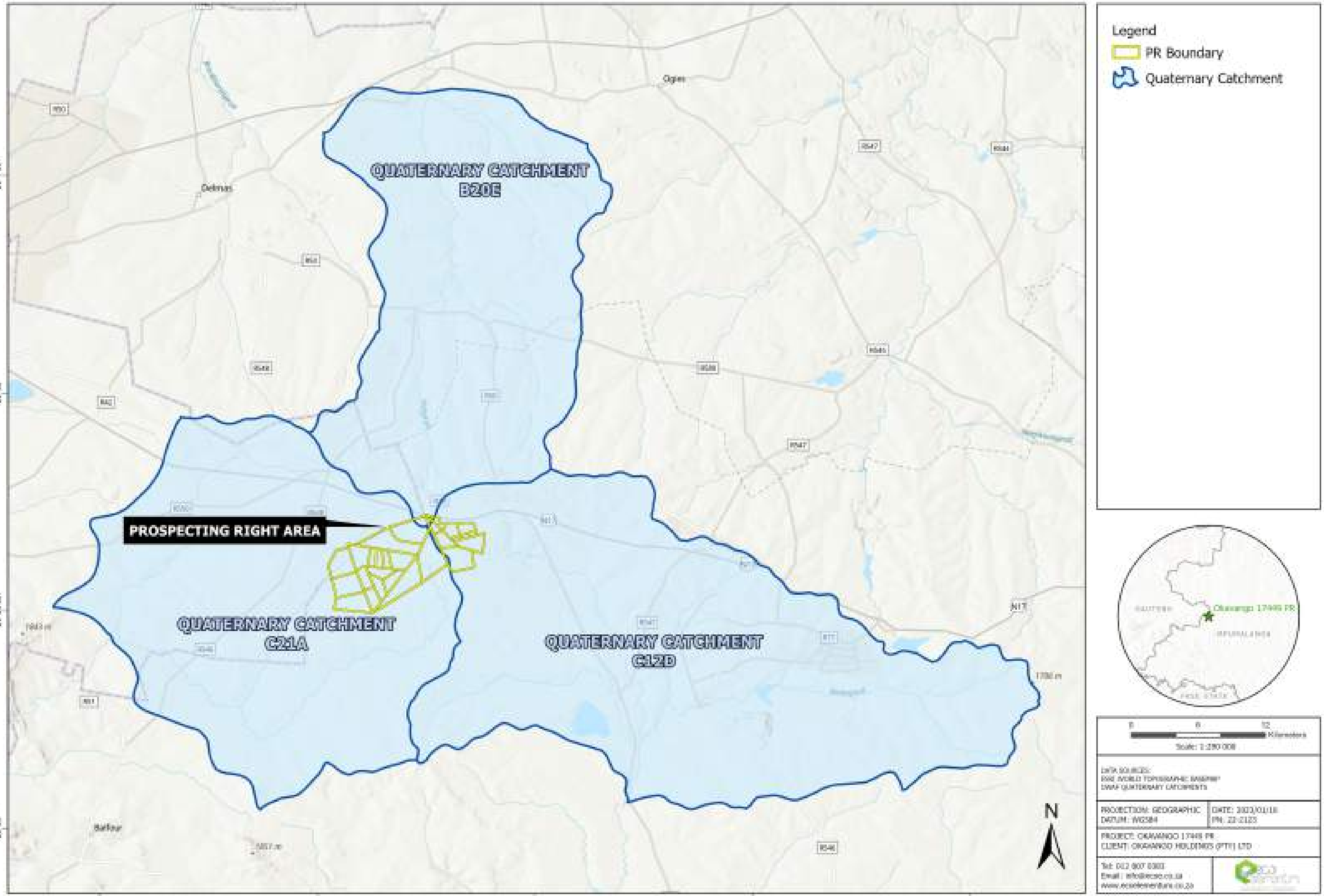
OKAVANGO 17449 PR: 2011 NFEPA WETLANDS



OKAVANGO 17449 PR: MANAGEMENT AREAS



OKAVANGO 17449 PR: QUATERNARY CATCHMENT



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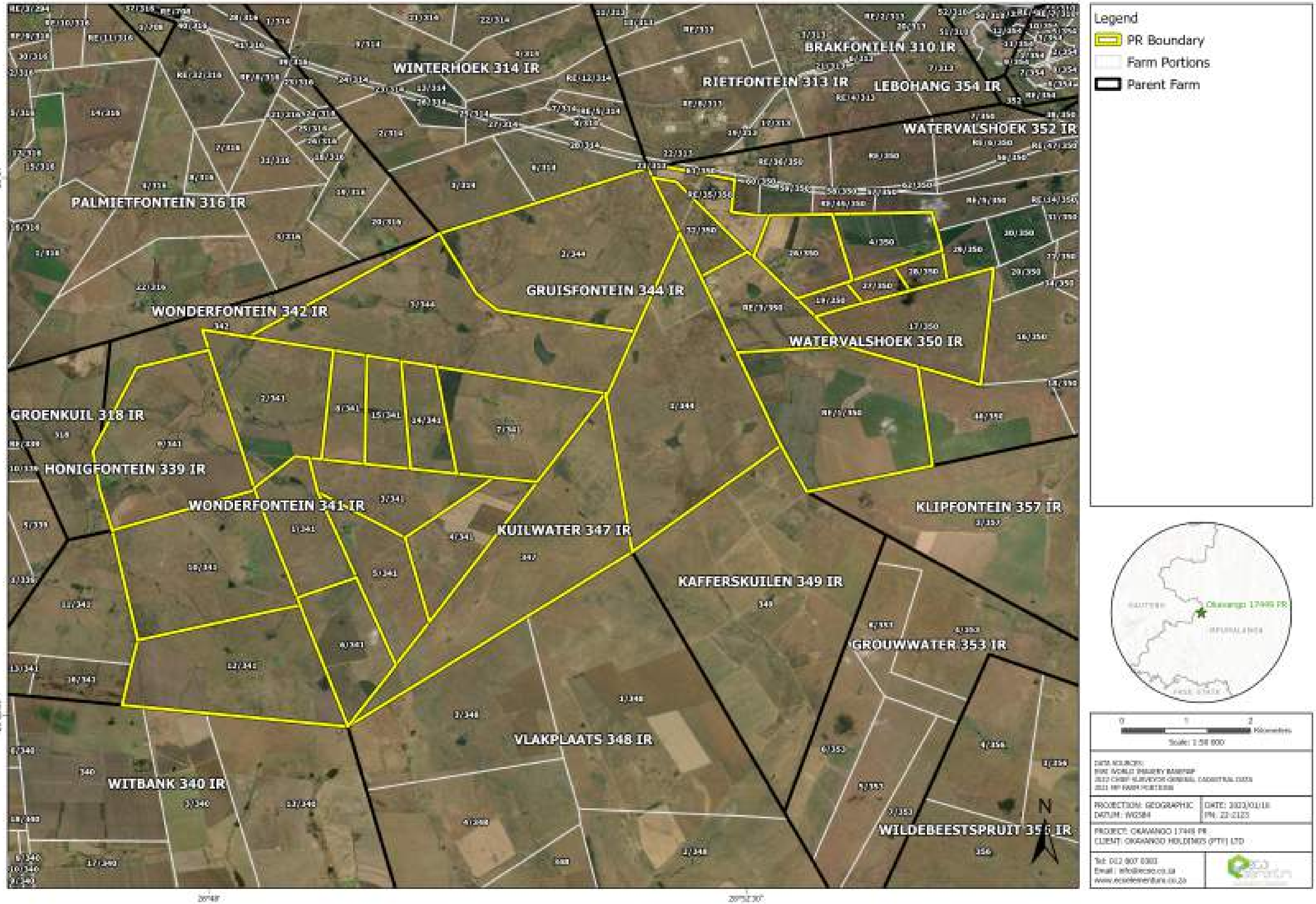

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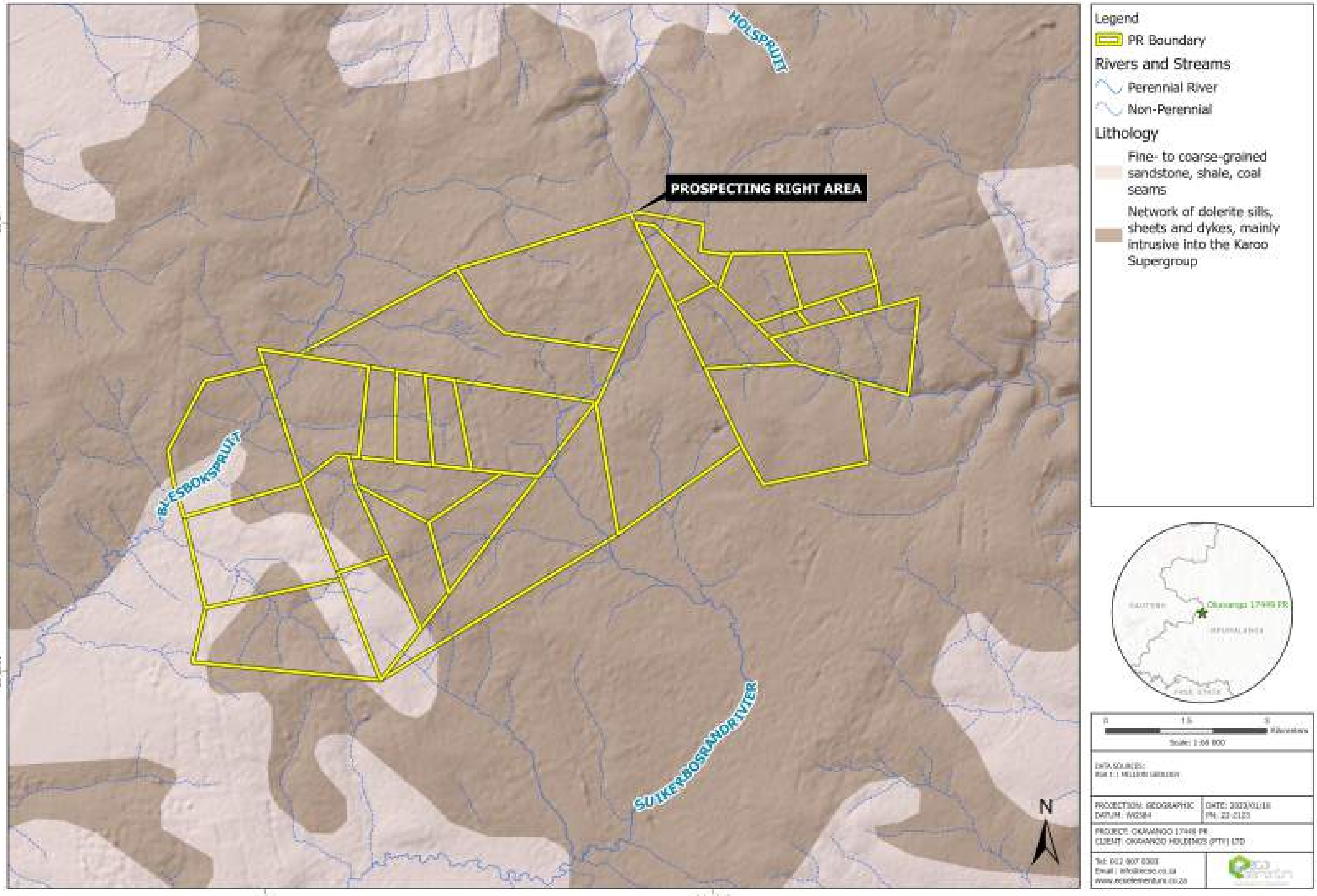
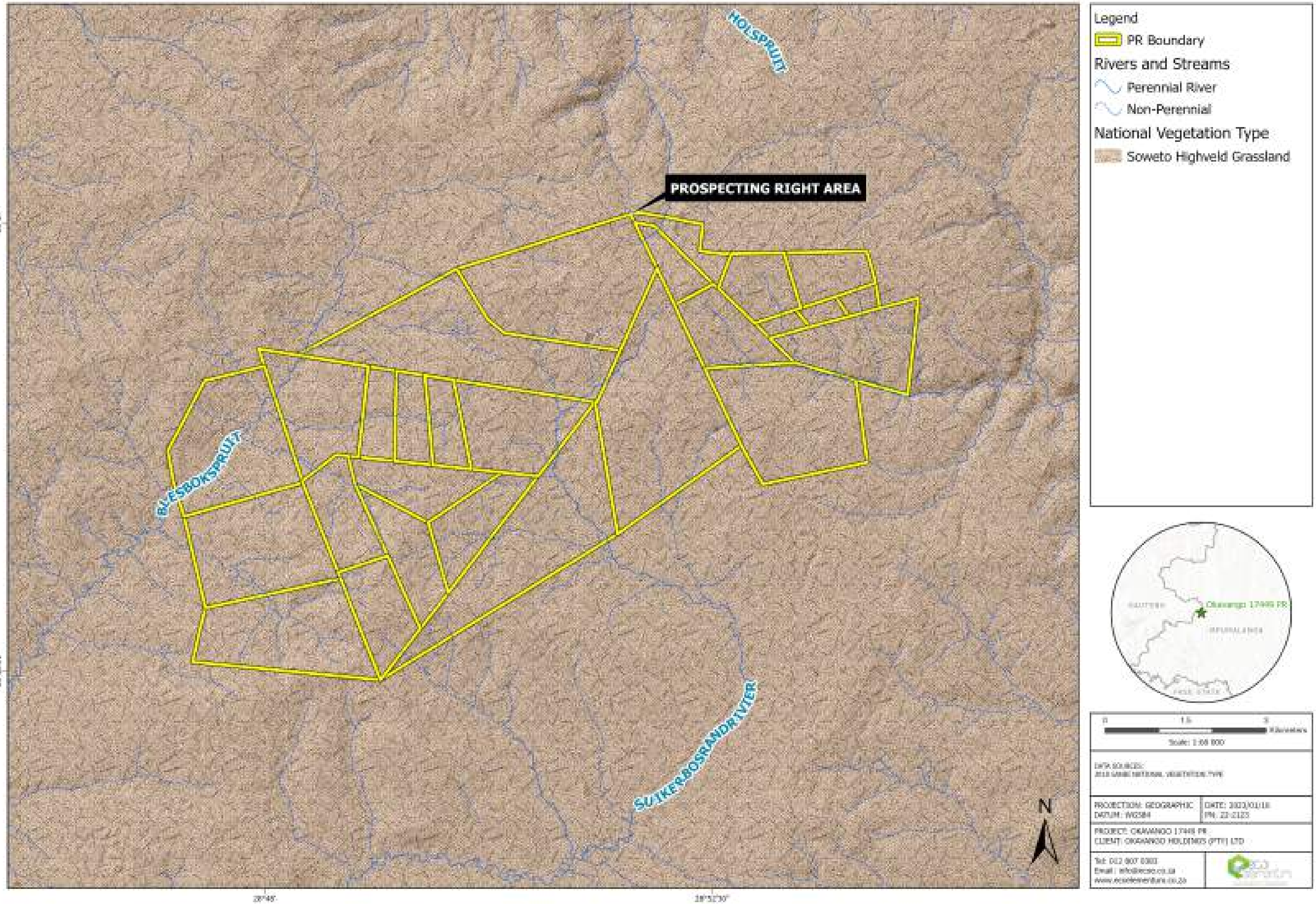
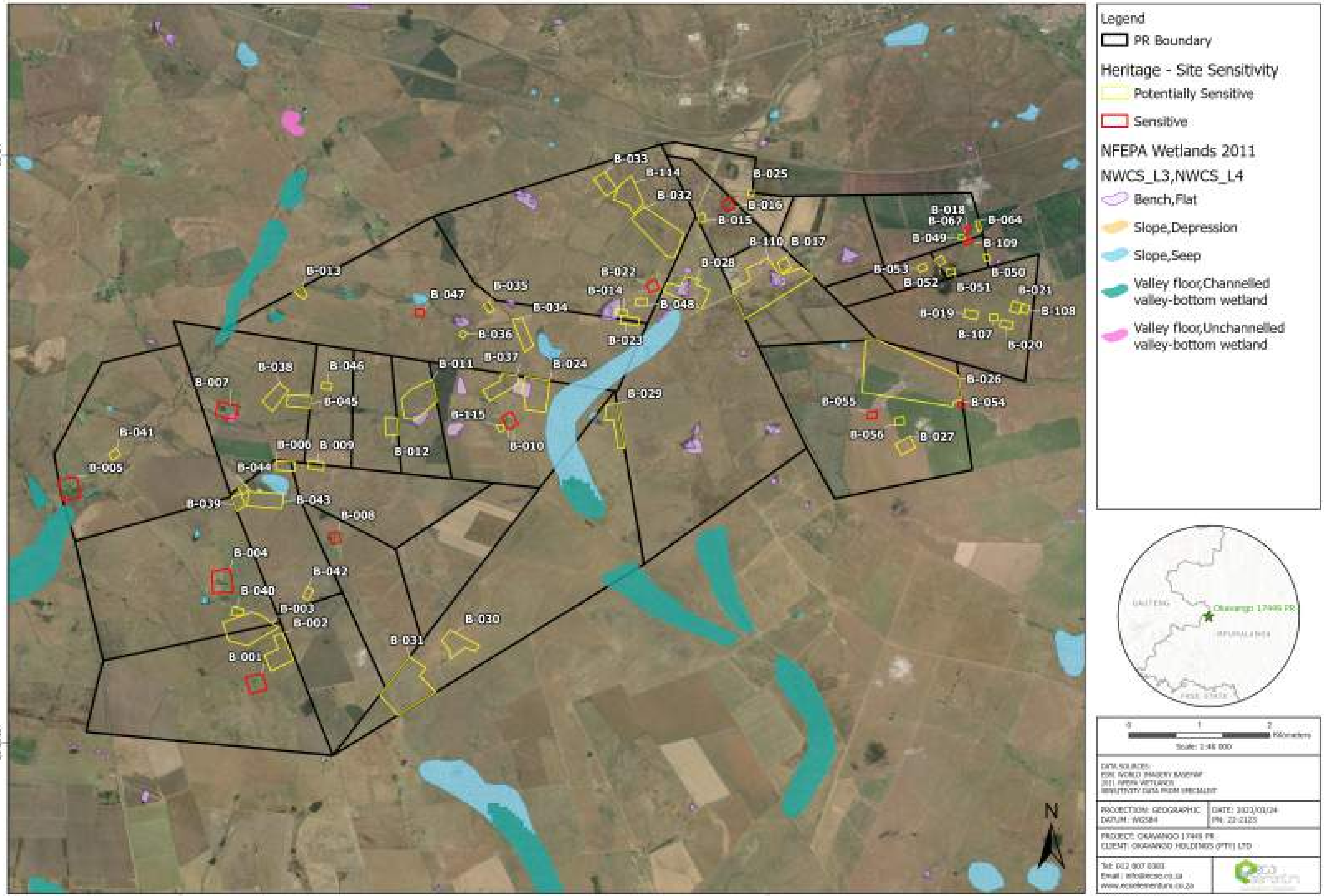


OKAVANGO 17449 PR: VEGETATION



OKAVANGO 17449 PR: SENSITIVITY MAP



ANNEXURE D

Specialist Studies

ARCHAEOLOGICAL DESKTOP STUDY

for the Proposed Okavango 17449 Prospecting Right Application near Balfour, Mpumalanga

For:
Eco Elementum (Pty) Ltd

Project Ref:
Okavango 17449 PR

Date:
21/03/2023

Archaeological Desktop Study for the Proposed Okavango 17449 Prospecting Right Application near Balfour, Mpumalanga

Project Ref:	Okavango 17449 PR
Report No:	EE_2103231
Report Version:	1

I, Tobias Coetzee, declare that –

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

Author	Qualification	Email	Date	Signature
Tobias Coetzee	MA (Archaeology – UP)	tcoetzee.heritage@gmail.com	21/03/2023	Coetzee

Executive Summary

Agri Civils Geo-Tech & Heritage was appointed by Eco Elementum (Pty) Ltd to undertake an Archaeological Desktop study for Okavango Holdings (Pty) Ltd on several portions of the Farms Wonderfontein 341 IR, Watervlashoek 350 IR, Kuilwater 347 IR and Gruisfontein 344 IR (**Table 1)** within the Govan Mbeki Local Municipality in the Mpumalanga Province. The study area is located roughly 30 km northeast of Balfour. The aim of this report is to contextualise the general study area in terms of heritage resources and will provide the developers with general information regarding potentially sensitive areas. This will also shed light on what is to be expected during a Phase 1 Archaeological Impact Assessment and aid in interpreting finds.

A total of 114 sites consisting of buildings/huts and three grave sites were noted on historical topographical maps and aerial imagery. Analysis indicates that 52 of the building/hut sites date to historical times, while nine sites potentially date to historical times. Fifty (50) of the historical and potentially historical sites, however, appear to have been demolished since no surface infrastructure could be identified on contemporary satellite imagery. Because buildings and structures are not always identifiable on aerial imagery and since some sites might be associated with subsurface historical material likely to exceed 60 years of age, the demarcated areas are considered to be sensitive from a heritage perspective. Should building remains dating to historical times be present, the remains might be protected under the National Heritage Resources Act (Act No. 25 of 1999). The 61 historical and potentially historical sites, as well as the three grave sites, should therefore be avoided by the proposed prospecting activities. Should this not be possible, the sites must first be inspected by a qualified archaeologist.

The remaining 53 sites, 33 of which were demolished, appear not to exceed 60 years of age and are unlikely to be significant from a heritage perspective. However, should impact to the sites be unavoidable, it is recommended that a qualified archaeologist inspect the sites prior to any impact.

The grave sites are considered to be sensitive and significant from a heritage perspective and a buffer zone of 50 m around the graves should be avoided by the proposed prospecting activities since the Human Tissues Act (Act No. 65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act (Act No. 25 of 1999) could apply.

The 500 m water source buffer is considered to be potentially sensitive from a heritage perspective and care should be exercised when prospecting within this area, while areas previously/currently associated with cultivated fields are considered to be disturbed and are less sensitive from a heritage perspective. Although the previously/currently cultivated areas that intersect the 500 m buffer are considered to be disturbed, the possibility of encountering subsurface cultural material still exists. Care should therefore be exercised when prospecting in such areas. The least sensitive areas are areas that are located more than 500 m from a water source, fall within previously/currently cultivated fields and are not located within close proximity of potential heritage sites or contemporary infrastructure.

Apart from the identified potential sites, open and undisturbed areas falling outside of the previously/currently cultivated areas and within the 500 m buffer zone are considered to be the most sensitive, especially due the potential presence of Late Iron Age and Historic sites in the general area. Care should therefore be exercised when prospecting in these areas. The possibility also exists that culturally sensitive sites, such as burial sites, might have been created after some cultivated fields fell into disuse, meaning that burial sites might be located on disturbed areas as well. Therefore, should uncertainty regarding heritage remains exist, it is advised that a qualified archaeologist be contacted prior to any impact.

A full Phase 1 Archaeological Impact Assessment must be conducted should any development that triggers an Archaeological Impact Assessment result from the prospecting project, including if the cumulative impact of the proposed prospecting project exceeds 0.5 ha.

List of Abbreviations

AIA – Archaeological Impact Assessment

CRM – Cultural Resource Management

DMR – Department of Mineral Resources

EIA – Environmental Impact Assessment

ESA – Early Stone Age

ha – Hectare

HIA – Heritage Impact Assessment

km – Kilometre

LIA – Late Iron Age

LSA – Later Stone Age

m – Metre

MASL – Metres Above Sea Level

MEC – Member of the Executive Council

MSA – Middle Stone Age

NHRA – National Heritage Resources Act

SAHRA – South African Heritage Resources Agency

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1. Project Background

1.1 Introduction

Eco Elementum (Pty) Ltd appointed Agri Civils Geo-Tech & Heritage to undertake an Archaeological Desktop Study for the proposed Okavango 17449 prospecting right application on the entire extent of the Farms Kuilwater 347 IR, Gruisfontein 344 IR, as well as on portions 1-10, 12, 14, 15 of the Farm Wonderfontein 341 IR and portions 1, 3, 4, 17, 19, 26, 27, 28, 32 and 35 of the Farm Watervlashoek 350 IR within the Govan Mbeki Local Municipality in the Mpumalanga Province. The study area is located roughly 3 km southwest of Leandra and 30 km northeast of Balfour (**Figure 1 & Table 1**). The purpose of this study is to contextualise the demarcated study area in order to determine the scope of heritage resources that might be encountered during the prospecting phase and subsequent heritage studies, as well as to provide recommendations for the safeguarding of archaeological resources during prospecting. The aim of this report is to provide the developer with information regarding heritage resources in the vicinity of the study area based on results from previous studies, written historical information and historical topographical maps and aerial photographs.

In the following report, a broad overview of the proposed prospecting right application for coal is provided and the study area is contextualised in terms of heritage resources. The legislation section included serves as a guide towards the effective identification and protection of heritage resources and will apply to any such material unearthed during the prospecting phase.

Figure 1: Regional and provincial location of the study area.

1.2 Legislation

The South African Heritage Resources Agency (SAHRA) aims to conserve and control the management, research, alteration and destruction of cultural resources of South Africa and to prosecute if necessary. It is therefore crucially important to adhere to heritage resource legislation contained in the Government Gazette of the Republic of South Africa (Act No.25 of 1999), as many heritage sites are threatened daily by development. Conservation legislation requires an impact assessment report to be submitted for development authorisation that must include an AIA if triggered.

Archaeological Impact Assessments (AIAs) should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources that might occur in areas of development and (b) make recommendations for protection or mitigation of the impact of the sites.

1.2.1 The EIA (Environmental Impact Assessment) and AIA processes

Phase 1 Archaeological Impact Assessments generally involve the identification of sites during a field survey with assessment of their significance, the possible impact that the development might have, and relevant recommendations.

All Archaeological Impact Assessment reports should include:

a. Location of the sites that are found;

b. Short descriptions of the characteristics of each site;

c. Short assessments of how important each site is, indicating which should be conserved and which mitigated;

d. Assessments of the potential impact of the development on the site(s);

e. In some cases a shovel test, to establish the extent of a site, or collection of material, to identify the associations of the site, may be necessary (a pre-arranged SAHRA permit is required); and

f. Recommendations for conservation or mitigation.

This AIA report is intended to inform the client about the legislative protection of heritage resources and their significance and make appropriate recommendations. It is essential to also provide the heritage authority with sufficient information about the sites to enable the authority to assess with confidence:

a. Whether or not it has objections to a development;

b. What the conditions are upon which such development might proceed;

c. Which sites require permits for mitigation or destruction;

d. Which sites require mitigation and what this should comprise;

e. Whether sites must be conserved and what alternatives can be proposed to relocate the development in such a way as to conserve other sites; and

f. What measures should or could be put in place to protect the sites which should be conserved.

When a Phase 1 AIA is part of an EIA, wider issues such as public consultation and assessment of the spatial and visual impacts of the development may be undertaken as part of the general study and may not be required from the archaeologist. If, however, the Phase 1 project forms a major component of an AIA it will be necessary to ensure that the study addresses such issues and complies with Section 38 of the National Heritage Resources Act.

1.2.2 Legislation regarding archaeology and heritage sites

National Heritage Resource Act No.25 of April 1999

Buildings are among the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Farming Community settlements. The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;
- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives;
- any other prescribed category.

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

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

and

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

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

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

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

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

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources authority:

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

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

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

On the development of any area the gazette states that:

"…any person who intends to undertake a development categorised as:

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

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

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

i. *exceeding 5000m² in extent; or*

ii. *involving three or more existing erven or subdivisions thereof; or*

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

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

(d) *the re-zoning of a site exceeding 10000m² in extent; or*

(e) *any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."* (38. [1] 1999:62-64)

and

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

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

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

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

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

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

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

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

Human Tissue Act and Ordinance 7 of 1925

The Human Tissues Act (Act No. 65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) protects graves younger than 60 years. These fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Local Authorities. Graves 60 years or older fall under the jurisdiction of the National Heritage Resources Act as well as the Human Tissues Act, 1983.

2. Study Area and Project Description

2.1 Location & Physical Environment

The proposed Okavango prospecting project is situated on the land parcels listed in **Table 1** and is illustrated in **Figure 2**.

Table 1: Land parcels & coordinates.

No	Property	Portion	Map Reference (1:50 000)	Lat (y)	Lon (x)	Extent (ha)
1	Wonderfontein 341 IR	1/341	2628BD	-26.448942	28.813149	164.6
2	Wonderfontein 341 IR	2/341	2628BD	-26.430707	28.808950	277.3
3	Wonderfontein 341 IR	3/341	2628BD	-26.443776	28.825700	166.5
4	Wonderfontein 341 IR	4/341	2628BD	-26.450206	28.835243	166.2
5	Wonderfontein 341 IR	5/341	2628BD	-26.455479	28.824194	165.9
6	Wonderfontein 341 IR	6/341	2628BD	-26.464953	28.819424	164.5
7	Wonderfontein 341 IR	7/341	2628BD	-26.434147	28.841978	272.6
8	Wonderfontein 341 IR	8/341	2628BD	-26.432284	28.819204	90.5
9	Wonderfontein 341 IR	9/341	2628BD	-26.437112	28.794506	413.5
10	Wonderfontein 341 IR	10/341	2628BD	-26.454285	28.799118	397.2
11	Wonderfontein 341 IR	12/341	2628BD	-26.468769	28.803977	391.8
12	Wonderfontein 341 IR	14/341	2628BD	-26.433763	28.830363	91.3
13	Wonderfontein 341 IR	15/341	2628BD	-26.433049	28.824716	92.7
14	Gruisfontein 344 IR	1/344	2628BD	-26.431748	28.866041	625.4
15	Gruisfontein 344 IR	2/344	2628BD	-26.410552	28.850845	531.6
16	Gruisfontein 344 IR	3/344	2628BD	-26.420723	28.833837	569.1
17	Kuilwater 347 IR	347	2628BD	-26.452872	28.844665	533.2
18	Watervalshoek 350 IR	1/350	2628BD	-26.432731	28.888361	431.6
19	Watervalshoek 350 IR	3/350	2628BD	-26.418389	28.877307	166.4
20	Watervalshoek 350 IR	4/350	2628BD	-26.408627	28.894427	112.3
21	Watervalshoek 350 IR	17/350	2628BD	-26.420662	28.899776	248.5
22	Watervalshoek 350 IR	19/350	2628BD	-26.417009	28.886775	25.7
23	Watervalshoek 350 IR	26/350	2628BD	-26.410455	28.883000	126.8
24	Watervalshoek 350 IR	27/350	2628BD	-26.414978	28.893484	27.7
25	Watervalshoek 350 IR	28/350	2628BD	-26.413015	28.899737	28.0
26	Watervalshoek 350 IR	32/350	2628BD	-26.407162	28.868392	76.7
27	Watervalshoek 350 IR	35/350	2628BD	-26.403577	28.871014	72.8
Total Extent						**6430.2**

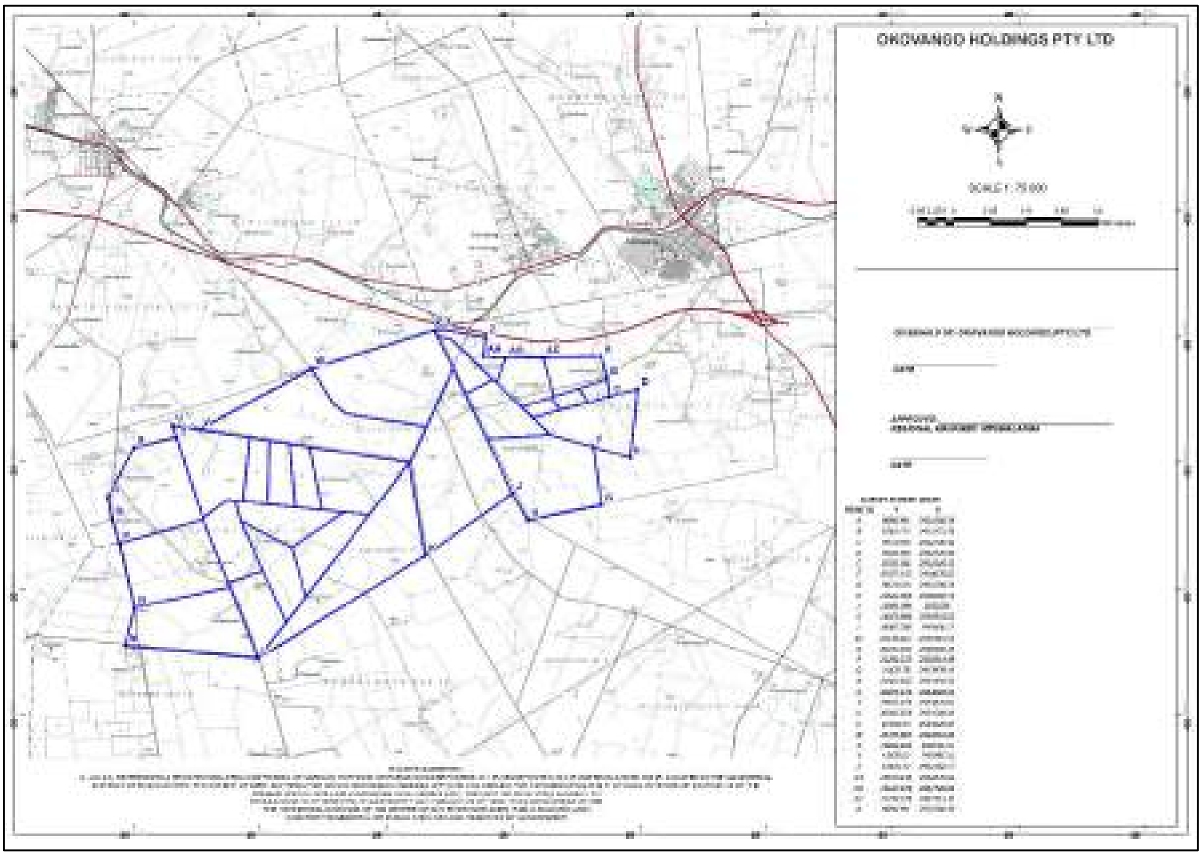

Figure 2: Reg 2(2) layout map (Provided by Eco Elementum 2023).

Leandra is located roughly 3 km to the northeast of the proposed prospecting area, while Balfour is located 30 km to the southwest and Delmas 34 km to the northwest. The demarcated study area falls within the Govan Mbeki Local Municipality and the Gert Sibande District Municipality in the Mpumalanga Province. The N17 national road runs in an east-west direction along a section of the northern boundary of the study area, while the R50 primary road runs in a northwest-southeast direction roughly 4 km to the east. The R548 secondary road runs in a northeast- southwest direction approximately 3.5 km to the west of the study area. Several local farm roads also intersect the study area.

In terms of vegetation, the study area falls within the Grassland Biome and Mesic Highveld Grassland Bioregion. On a local scale, the study area falls within the Soweto Highveld Grassland vegetation unit (Mucina & Rutherfords 2006).

Soweto Highveld Grassland is found in the Mpumalanga and Gauteng Provinces between Ermelo and Johannesburg in the north, Perdekop in the southeast and the Vaal River in the south. The western parts extend along the southern edge of the Johannesburg Dome as far as Randfontein and include Vanderbijlpark and Vereeniging in southern Gauteng, as well as Sasolburg in the northern Free State. This type of vegetation is considered to be endangered and has a conservation target of 24%. Only small patches are conserved and cultivation, urban sprawl, mining, dams and road infrastructure have transformed about half of the area. Erosion is generally very low (Mucina & Rutherfords 2006).

According to Mucina & Rutherfords (2006), the average elevation for Soweto Highveld Grassland ranges from 1420 to 1760 Metres Above Sea Level (MASL). The average elevation of the study area is 1670 MASL and the general area appears to be associated with an undulating landscape.

The study area falls within the summer rainfall region and the average annual rainfall is roughly 790 mm per year. The average annual temperature is 15.8 ºC. The average summer temperature is 19.6 ºC, while the winter temperature averages 9.3 ºC (Climate-data.org accessed 14/03/2023).

The study area falls within in the B20E, C12D and C21A quaternary catchments. The B20E quaternary catchment forms part of the Olifants Water Management Area, while the C12D and C21A quaternary catchments fall within the Olifants Water Management Area. The Waterval perennial river intersects portions 1 and 17 of the Farm Watervalshoek 350 IR, while the Suikerbosrand perennial river intersects the Farm Kuilwater 347 IR and Portions 1 and 3 of the Farm Gruisfontein 344 IR, as well as Portion 7 of the Farm Wonderfontein 341 IR. Another perennial offshoot also intersects portion 2 of the Farm Gruisfontein 344 IR and portions 2 and 9 of the Farm Wonderfontein 341 IR. Additionally, several non-perennial streams and perennials pans intersect the demarcated study area. Westoe Dam is located approximately 37 km to the west of the study area and the Vaal Dam 64 km to the southwest.

Access to the demarcated study area appears to be through local roads turning from the R548 secondary road and R50 primary roads that run to the east and west. The majority of the study area appears to consist of open veldt and cultivated land. The land use of the open sections is unknown, but is likely to be utilised as pasture for cattle. The general surroundings appear to be associated with agricultural activities and crop cultivation. Several buildings and farmsteads are evident on the majority of the demarcated farm portions.

2.2 Project description

The prospecting right application for coal covers approximately 6430 ha (**Figures 3 & 4**). For the prospecting phase, however, several sites will be selected for geotechnical drilling. These boreholes and its associated activities will impact a surface area of between 250 and 625 m². The full extent of the drill site will also be demarcated and no drilling will be done outside of the boundary.

Prospecting activities will include the following:

Current access roads will be used as far as possible, but in cases where access roads to drill sites do not exist, a single track will be selected based on the area where the least environmental impact will occur. The same tracks will be used should repeated access be required. Vegetation and topsoil excavated during the drilling process will be stockpiled next to sumps where it will serve as a storm water diversion berm. On completion of the drilling process, the rehabilitated sumps will be backfilled with the stockpiled material. Because a constant water supply is needed for the drilling process, 15 000l will be stored in tanks. The plastic-lined sumps will be used to recycle water through a filter process in order to maintain a constant clean water source for the purpose of drilling. In terms of potable water for employees and workers, a temporary 260l tank will be placed on-site. Additional facilities will include temporary portable toilets, berms, and a maximum of $60m^3$ of diesel fuel located on an impermeable surface with bunds.

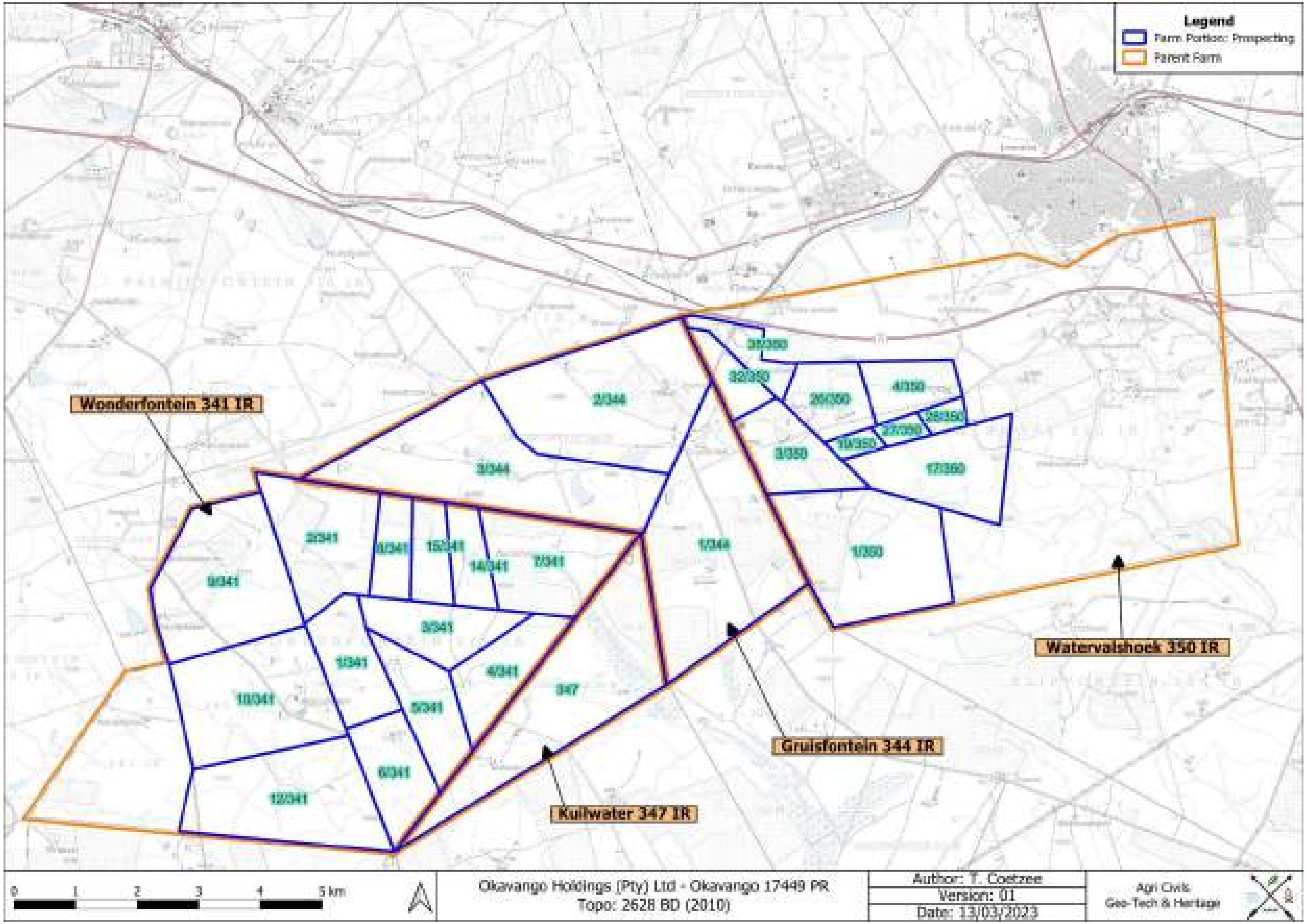

Figure 3: Segment of SA 1:50 000 2628 BD indicating the area demarcated for prospecting.

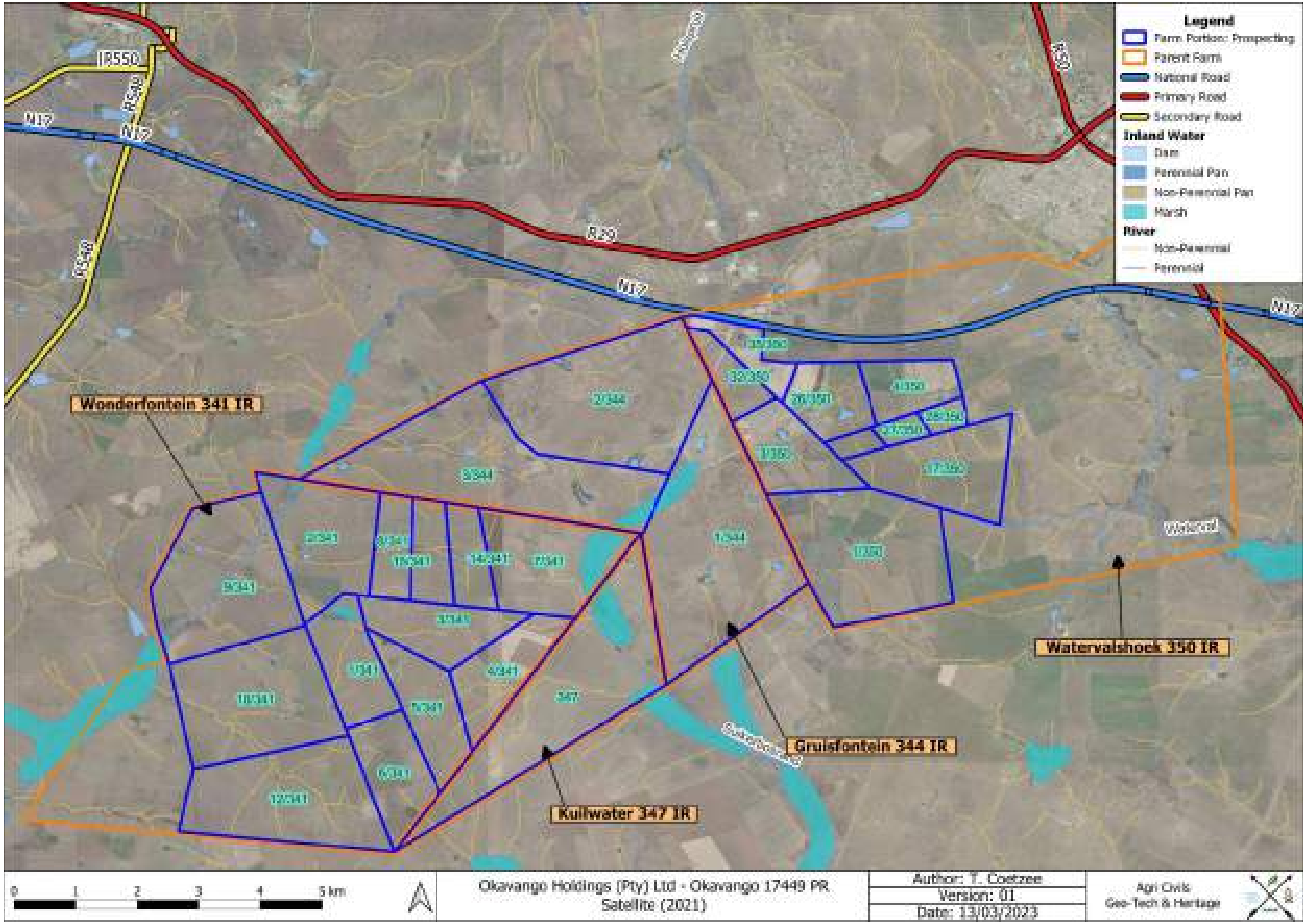

Figure 4: Proposed prospecting area portrayed on a 2021 satellite image.

3. Methodology

Archaeological reconnaissance of the study area was conducted by means of inspecting historical aerial imagery and topographical maps in order to identify potential heritage remains (**Appendix A**). The historical topographical datasets dating to 1965, 1984, 1995, and 2010, as well as the historical aerial images dating to 1953, 1958, 1969, 1975, 1991 and 2007, proved useful in terms of providing an indication of potential heritage sites and past land uses associated with the study area. One hundred and seventeen (117) potential sites were observed within the demarcated boundary using these data sources (**Table 2 & Figures 5 – 8**). It should be noted that the prefix '2628BD' is not used when referring to the site names due to the length of the name, but is recorded as such in **Tables 2 & 8**. Based on contemporary satellite imagery, 83 of the sites appear to have been demolished since no surface remains are visible (**Figures 9 – 11).** Three of the sites have been identified as graves, but it is unknown if surface remains are still present (Sites B-047, B-054, B-055). The remaining 31 sites appear to be associated with intact surface infrastructure, some that are likely to date to the historic period (B-001, B-004, B-005, B-007, B-008, B-010, B-016, B-018, B-022, B-058, B-061, B-066, B-067, B-071, B-072, B-083, B-084, B-092 – 096, B-098 – 105, B-109). The total area inspected was 6430.2 ha. Because heritage resources are often associated with water sources such as perennial and non-perennial rivers/streams, these water sources were buffered by a distance of 500 m, indicating a potentially sensitive area (**Figure 24**). The areas previously/currently associated with cultivated land were traced and plotted as shown on topographical maps, indicating disturbed areas that are less sensitive from a heritage perspective (**Figure 24**).

Table 2: Site & potential site location.

Site No	Type	Parent Farm	Farm Portion	Current Status	Age	Estimated Extent (ha)	Lat (y)	Lon (x)
2628BD-B-001	Building	Wonderfontein 341 IR	12/341	Surface Remains	Historical	5.15	-26.467346	28.809614
2628BD-B-002	Building	Wonderfontein 341 IR	12/341	No Surface Remains	Historical	9.84	-26.463590	28.812563
2628BD-B-003	Building	Wonderfontein 341 IR	10,12/341	No Surface Remains	Historical	20.53	-26.460339	28.808585
2628BD-B-004	Building	Wonderfontein 341 IR	10/341	Surface Remains	Historical	7.89	-26.454331	28.805266
2628BD-B-005	Building	Wonderfontein 341 IR	9/341	Surface Remains	Historical	7.08	-26.442474	28.785815
2628BD-B-006	Building	Wonderfontein 341 IR	1/341	No Surface Remains	Historical	3.13	-26.439609	28.813338
2628BD-B-007	Building	Wonderfontein 341 IR	2/341	Surface Remains	Historical	5.05	-26.432517	28.805843
2628BD-B-008	Building	Wonderfontein 341 IR	5/341	Surface Remains	Historical	1.88	-26.448746	28.819696
2628BD-B-009	Building	Wonderfontein 341 IR	3/341	No Surface Remains	Historical	2.21	-26.439553	28.817260
2628BD-B-010	Building	Wonderfontein 341 IR	7/341	Surface Remains	Historical	2.91	-26.433801	28.841964
2628BD-B-011	Building	Wonderfontein 341 IR	14/341	No Surface Remains	Historical	16.07	-26.431246	28.830394
2628BD-B-012	Building	Wonderfontein 341 IR	15/341	No Surface Remains	Historical	3.77	-26.434551	28.826865
2628BD-B-013	Building	Gruisfontein 344 IR	3/344	No Surface Remains	Historical	1.51	-26.417524	28.815361
2628BD-B-014	Building	Gruisfontein 344 IR	2/344	No Surface Remains	Historical	1.16	-26.420015	28.856225
2628BD-B-015	Building	Watervalshoek 350 IR	32/350	No Surface Remains	Historical	1.12	-26.407907	28.866471
2628BD-B-016	Building	Watervalshoek 350 IR	32/350	Surface Remains	Historical	2.13	-26.406241	28.869869
2628BD-B-017	Building	Watervalshoek 350 IR	3/350	No Surface Remains	Historical	2.19	-26.414006	28.877028
2628BD-B-018	Building	Watervalshoek 350 IR	4/350	Surface Remains	Historical	0.36	-26.409144	28.900519
2628BD-B-019	Building	Watervalshoek 350 IR	17/350	No Surface Remains	Historical	1.87	-26.420267	28.900845
2628BD-B-020	Building	Watervalshoek 350 IR	17/350	No Surface Remains	Historical	1.6	-26.421514	28.905385
2628BD-B-021	Building	Watervalshoek 350 IR	17/350	No Surface Remains	Historical	1.97	-26.419351	28.906597
2628BD-B-022	Building	Gruisfontein 344 IR	2/344	Surface Remains	Historical	1.84	-26.416639	28.860201
2628BD-B-023	Building	Gruisfontein 344 IR	2,3/344	No Surface Remains	Historical	2.66	-26.421079	28.857294
2628BD-B-024	Building	Wonderfontein 341 IR	7/341	No Surface Remains	Historical	13.91	-26.430417	28.845307
2628BD-B-025	Building	Watervalshoek 350 IR	35/350	No Surface Remains	Historical	0.55	-26.404774	28.872774
2628BD-B-026	Building	Watervalshoek 350 IR	1/350	No Surface Remains	Historical	77.1	-26.428162	28.892691
2628BD-B-027	Building	Watervalshoek 350 IR	1/350	No Surface Remains	Historical	3.63	-26.437018	28.892499
2628BD-B-028	Building	Gruisfontein 344 IR	1/344	No Surface Remains	Historical	13.68	-26.417379	28.864841
2628BD-B-029	Building	Kuilwater 347 IR	0/347	No Surface Remains	Historical	6.8	-26.434092	28.855437
2628BD-B-030	Building	Kuilwater 347 IR	0/347	No Surface Remains	Historical	8.71	-26.462256	28.835339
2628BD-B-031	Building	Kuilwater 347 IR	0/347	No Surface Remains	Historical	29.59	-26.467901	28.828866
2628BD-B-032	Building	Gruisfontein 344 IR	2/344	No Surface Remains	Historical	22.4	-26.409675	28.861057
2628BD-B-033	Building	Gruisfontein 344 IR	2/344	No Surface Remains	Historical	4.88	-26.403624	28.854191

Site No	Type	Parent Farm	Farm Portion	Current Status	Age	Estimated Extent (ha)	Lat (y)	Lon (x)
2628BD-B-034	Building	Gruisfontein 344 IR	3/344	No Surface Remains	Historical	5.83	-26.422772	28.843691
2628BD-B-035	Building	Gruisfontein 344 IR	3/344	No Surface Remains	Historical	1.18	-26.419373	28.839262
2628BD-B-036	Building	Gruisfontein 344 IR	3/344	No Surface Remains	Historical	0.59	-26.422789	28.835979
2628BD-B-037	Building	Wonderfontein 341 IR	7/341	No Surface Remains	Historical	8.35	-26.429426	28.840886
2628BD-B-038	Building	Wonderfontein 341 IR	2/341	No Surface Remains	Historical	5.96	-26.430784	28.812063
2628BD-B-039	Building	Wonderfontein 341 IR	1/341	No Surface Remains	Historical	2.42	-26.444170	28.807324
2628BD-B-040	Building	Wonderfontein 341 IR	10/341	No Surface Remains	Historical	1.54	-26.458133	28.807198
2628BD-B-041	Hut	Wonderfontein 341 IR	9/341	No Surface Remains	Potentially Historical	1.32	-26.438134	28.791518
2628BD-B-042	Hut	Wonderfontein 341 IR	1/341	No Surface Remains	Potentially Historical	1.34	-26.455874	28.816234
2628BD-B-043	Building	Wonderfontein 341 IR	1/341	No Surface Remains	Historical	9.18	-26.443939	28.810769
2628BD-B-044	Hut	Wonderfontein 341 IR	1/341	No Surface Remains	Potentially Historical	1.05	-26.442563	28.807990
2628BD-B-045	Building	Wonderfontein 341 IR	2/341	No Surface Remains	Historical	4.93	-26.431337	28.815089
2628BD-B-046	Building	Wonderfontein 341 IR	8/341	No Surface Remains	Historical	1.15	-26.429366	28.818608
2628BD-B-047	Grave	Gruisfontein 344 IR	3/344	Unknown	Potentially Historical	1.13	-26.420043	28.830526
2628BD-B-048	Hut	Gruisfontein 344 IR	2/344	No Surface Remains	Potentially Historical	1.53	-26.418657	28.858811
2628BD-B-049	Building	Watervalshoek 350 IR	4/350	No Surface Remains	Potentially Historical	0.55	-26.410390	28.899647
2628BD-B-050	Building	Watervalshoek 350 IR	28/350	No Surface Remains	Historical	0.62	-26.412990	28.902828
2628BD-B-051	Hut	Watervalshoek 350 IR	28/350	No Surface Remains	Potentially Historical	0.92	-26.414832	28.898256
2628BD-B-052	Hut	Watervalshoek 350 IR	28/350	No Surface Remains	Potentially Historical	1.16	-26.413430	28.896954
2628BD-B-053	Hut	Watervalshoek 350 IR	27/350	No Surface Remains	Potentially Historical	0.98	-26.414306	28.894672
2628BD-B-054	Grave	Watervalshoek 350 IR	1/350	Unknown	Potentially Historical	0.52	-26.431745	28.899612
2628BD-B-055	Grave	Watervalshoek 350 IR	1/350	Unknown	Potentially Historical	1.23	-26.433075	28.888226
2628BD-B-056	Building	Watervalshoek 350 IR	1/350	No Surface Remains	Potentially Historical	1.21	-26.433843	28.891729
2628BD-B-057	Building	Watervalshoek 350 IR	1/350	No Surface Remains	No	0.86	-26.433252	28.889803
2628BD-B-058	Building	Watervalshoek 350 IR	1/350	Surface Remains	No	4.33	-26.427154	28.884917
2628BD-B-059	Building	Watervalshoek 350 IR	17/350	No Surface Remains	No	1.53	-26.423152	28.905638
2628BD-B-060	Building	Watervalshoek 350 IR	17/350	No Surface Remains	No	1.26	-26.420165	28.904981
2628BD-B-061	Building	Watervalshoek 350 IR	26/350	Surface Remains	No	0.73	-26.412266	28.880430
2628BD-B-062	Building	Watervalshoek 350 IR	4/350	No Surface Remains	No	0.8	-26.409166	28.898039
2628BD-B-063	Building	Watervalshoek 350 IR	4/350	No Surface Remains	No	1.1	-26.410572	28.897525
2628BD-B-064	Building	Watervalshoek 350 IR	4/350	No Surface Remains	Historical	0.73	-26.408945	28.901807
2628BD-B-065	Building	Watervalshoek 350 IR	4/350	No Surface Remains	No	0.32	-26.409315	28.901098
2628BD-B-066	Building	Watervalshoek 350 IR	4/350	Surface Remains	No	0.5	-26.409500	28.899822
2628BD-B-067	Building	Watervalshoek 350 IR	4/350	Surface Remains	Historical	0.21	-26.409890	28.900203

Site No	Type	Parent Farm	Farm Portion	Current Status	Age	Estimated Extent (ha)	Lat (y)	Lon (x)
2628BD-B-068	Building	Watervalshoek 350 IR	28/350	No Surface Remains	No	0.65	-26.412757	28.898289
2628BD-B-069	Building	Watervalshoek 350 IR	28/350	No Surface Remains	No	3.36	-26.414126	28.899445
2628BD-B-070	Building	Watervalshoek 350 IR	28/350	No Surface Remains	No	0.59	-26.411995	28.900479
2628BD-B-071	Building	Gruisfontein 344 IR	1/344	Surface Remains	No	1.57	-26.415713	28.862833
2628BD-B-072	Building	Kuilwater 347 IR	0/347	Surface Remains	No	2.63	-26.463457	28.833394
2628BD-B-073	Building	Gruisfontein 344 IR	2/344	No Surface Remains	No	0.64	-26.400805	28.855072
2628BD-B-074	Building	Gruisfontein 344 IR	2/344	No Surface Remains	No	1.08	-26.402166	28.855550
2628BD-B-075	Building	Gruisfontein 344 IR	2/344	No Surface Remains	No	0.6	-26.418167	28.859862
2628BD-B-076	Building	Gruisfontein 344 IR	2/344	No Surface Remains	No	0.69	-26.419271	28.856697
2628BD-B-077	Building	Gruisfontein 344 IR	2/344	No Surface Remains	No	0.55	-26.419582	28.857876
2628BD-B-078	Building	Gruisfontein 344 IR	3/344	No Surface Remains	No	0.65	-26.420258	28.843895
2628BD-B-079	Building	Wonderfontein 341 IR	7/341	No Surface Remains	No	1.46	-26.435623	28.842247
2628BD-B-080	Building	Wonderfontein 341 IR	7/341	No Surface Remains	No	0.68	-26.430341	28.854657
2628BD-B-081	Building	Wonderfontein 341 IR	2/341	No Surface Remains	No	0.91	-26.431818	28.804243
2628BD-B-082	Building	Wonderfontein 341 IR	1/341	No Surface Remains	No	1.37	-26.439902	28.811723
2628BD-B-083	Building	Wonderfontein 341 IR	5/341	Surface Remains	No	0.48	-26.449447	28.818402
2628BD-B-084	Building	Wonderfontein 341 IR	5/341	Surface Remains	No	0.71	-26.450218	28.819899
2628BD-B-085	Building	Wonderfontein 341 IR	3/341	No Surface Remains	No	1.31	-26.446311	28.824291
2628BD-B-086	Building	Wonderfontein 341 IR	3/341	No Surface Remains	No	0.59	-26.449073	28.828750
2628BD-B-087	Building	Wonderfontein 341 IR	4/341	No Surface Remains	No	0.79	-26.448919	28.830480
2628BD-B-088	Building	Wonderfontein 341 IR	4/341	No Surface Remains	No	0.78	-26.450189	28.829148
2628BD-B-089	Building	Wonderfontein 341 IR	5/341	No Surface Remains	No	0.98	-26.463551	28.826432
2628BD-B-090	Building	Wonderfontein 341 IR	10/341	No Surface Remains	No	4.49	-26.458020	28.810860
2628BD-B-091	Building	Wonderfontein 341 IR	9/341	No Surface Remains	No	0.85	-26.439307	28.790898
2628BD-B-092	Building	Wonderfontein 341 IR	9/341	Surface Remains	No	4.59	-26.436958	28.791808
2628BD-B-093	Building	Wonderfontein 341 IR	9/341	Surface Remains	No	3.71	-26.433622	28.787486
2628BD-B-094	Building	Watervalshoek 350 IR	26/350	Surface Remains	No	1.32	-26.415422	28.881294
2628BD-B-095	Building	Watervalshoek 350 IR	26/350	Surface Remains	No	1.5	-26.413809	28.879751
2628BD-B-096	Building	Watervalshoek 350 IR	26/350	Surface Remains	No	0.45	-26.412902	28.880556
2628BD-B-097	Building	Watervalshoek 350 IR	35/350	No Surface Remains	No	0.6	-26.404443	28.869659
2628BD-B-098	Building	Watervalshoek 350 IR	35/350	Surface Remains	No	1.53	-26.400154	28.867958
2628BD-B-099	Building	Gruisfontein 344 IR	1/344	Surface Remains	No	2.23	-26.410704	28.866567
2628BD-B-100	Building	Wonderfontein 341 IR	4/341	Surface Remains	No	0.4	-26.449677	28.828765
2628BD-B-101	Building	Wonderfontein 341 IR	7/341	Surface Remains	No	0.66	-26.432041	28.842637

Site No	Type	Parent Farm	Farm Portion	Current Status	Age	Estimated Extent (ha)	Lat (y)	Lon (x)
2628BD-B-102	Building	Wonderfontein 341 IR	9/341	Surface Remains	No	0.28	-26.433498	28.786465
2628BD-B-103	Building	Watervalshoek 350 IR	3/350	Surface Remains	No	4.46	-26.414630	28.870058
2628BD-B-104	Building	Gruisfontein 344 IR	1/344	Surface Remains	No	0.85	-26.411655	28.864967
2628BD-B-105	Building	Gruisfontein 344 IR	1/344	Surface Remains	No	0.47	-26.412090	28.866373
2628BD-B-106	Building	Wonderfontein 341 IR	7/341	No Surface Remains	No	0.91	-26.431737	28.843417
2628BD-B-107	Building	Watervalshoek 350 IR	17/350	No Surface Remains	Historical	0.99	-26.420666	28.903742
2628BD-B-108	Building	Watervalshoek 350 IR	17/350	No Surface Remains	Historical	1.12	-26.419536	28.907749
2628BD-B-109	Building	Watervalshoek 350 IR	28/350	Surface Remains	Historical	0.7	-26.410979	28.900564
2628BD-B-110	Building	Watervalshoek 350 IR	3/350	No Surface Remains	Historical	39.74	-26.416734	28.874731
2628BD-B-111	Building	Watervalshoek 350 IR	1/350	No Surface Remains	No	1.37	-26.432774	28.885868
2628BD-B-112	Building	Watervalshoek 350 IR	1/350	No Surface Remains	No	1.05	-26.435192	28.885480
2628BD-B-113	Building	Watervalshoek 350 IR	1/350	No Surface Remains	No	0.86	-26.433913	28.887285
2628BD-B-114	Building	Gruisfontein 344 IR	2/344	No Surface Remains	Historical	10.32	-26.405014	28.857224
2628BD-B-115	Building	Wonderfontein 341 IR	7/341	No Surface Remains	Historical	0.7	-26.434721	28.840814
2628BD-B-116	Building	Wonderfontein 341 IR	7/341	No Surface Remains	No	4.78	-26.432440	28.839646
2628BD-B-117	Building	Wonderfontein 341 IR	3/341	No Surface Remains	No	1.18	-26.439732	28.814982

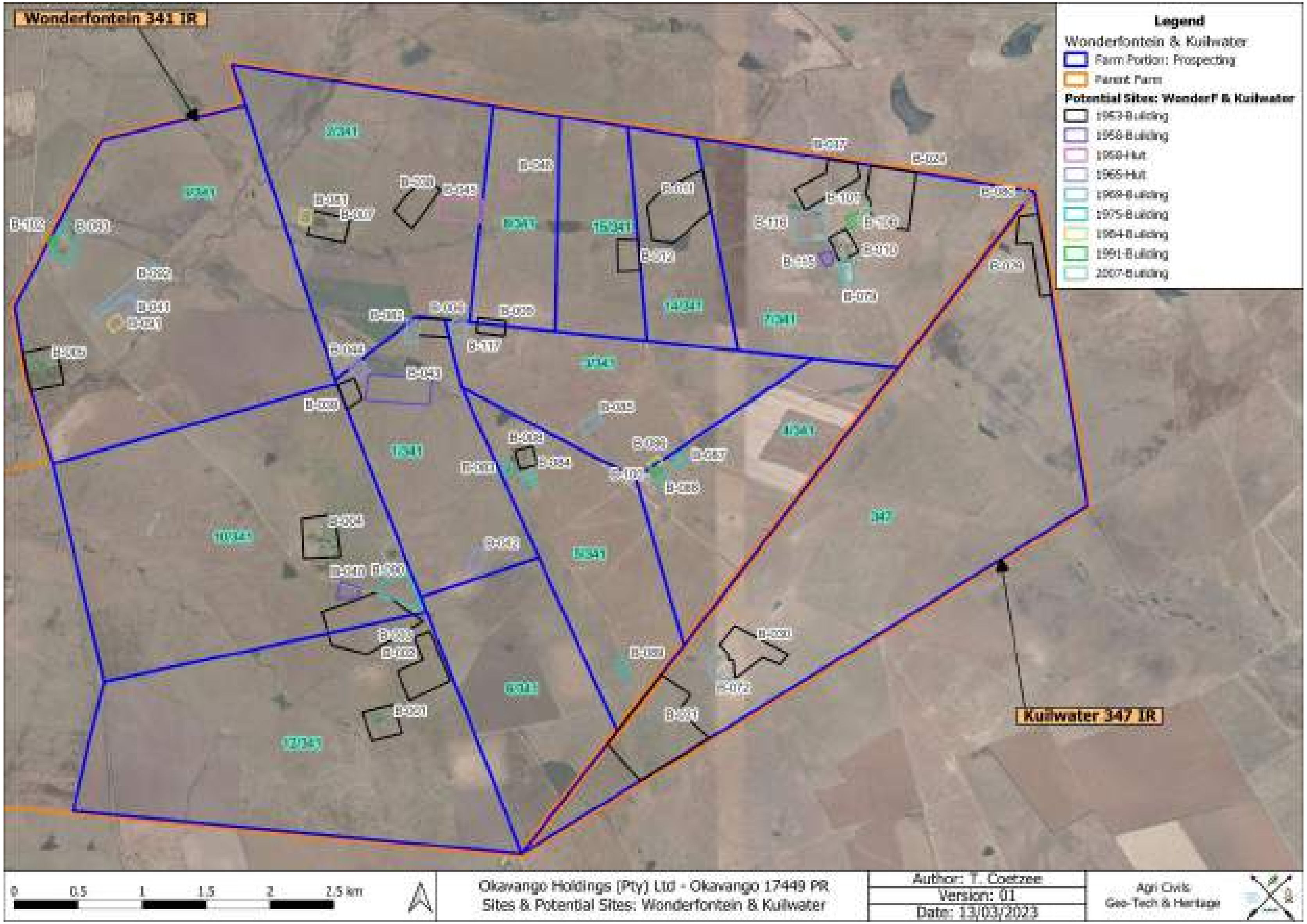

Figure 5: Sites & Potential Sites: Wonderfontein & Kuilwater.

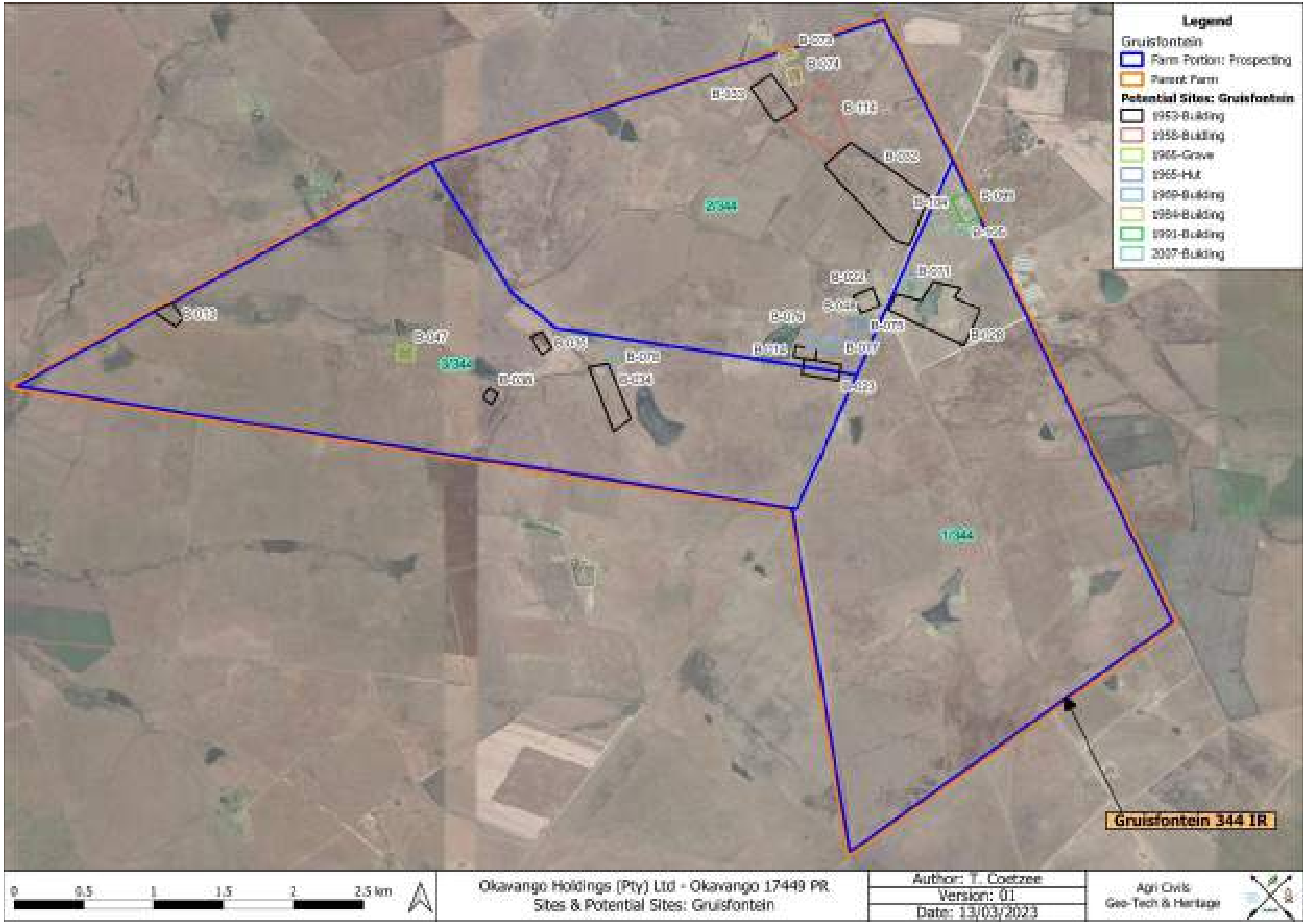

Figure 6: Sites & Potential Sites: Gruisfontein.

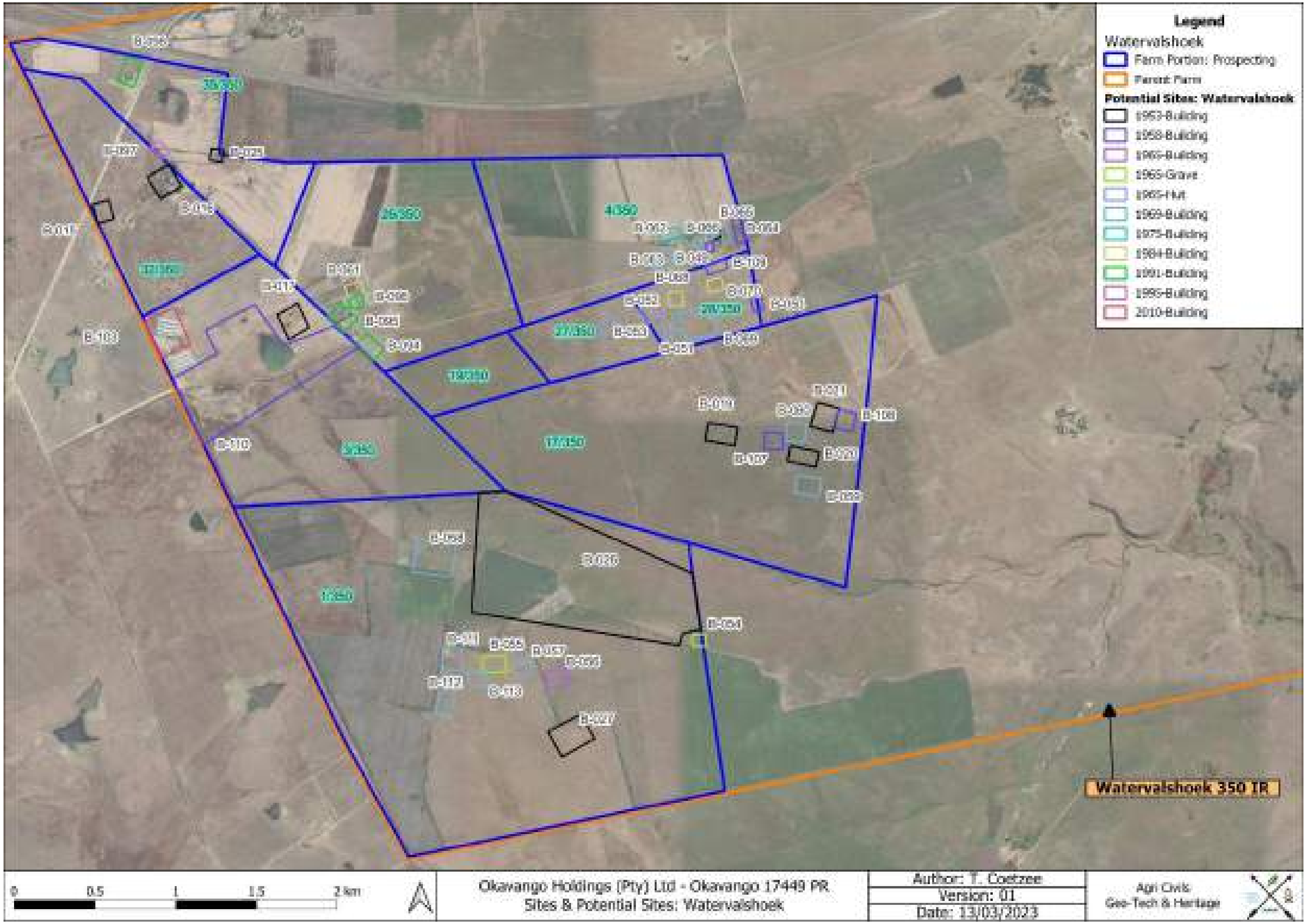

Figure 7: Sites & Potential Sites: Watervalshoek.

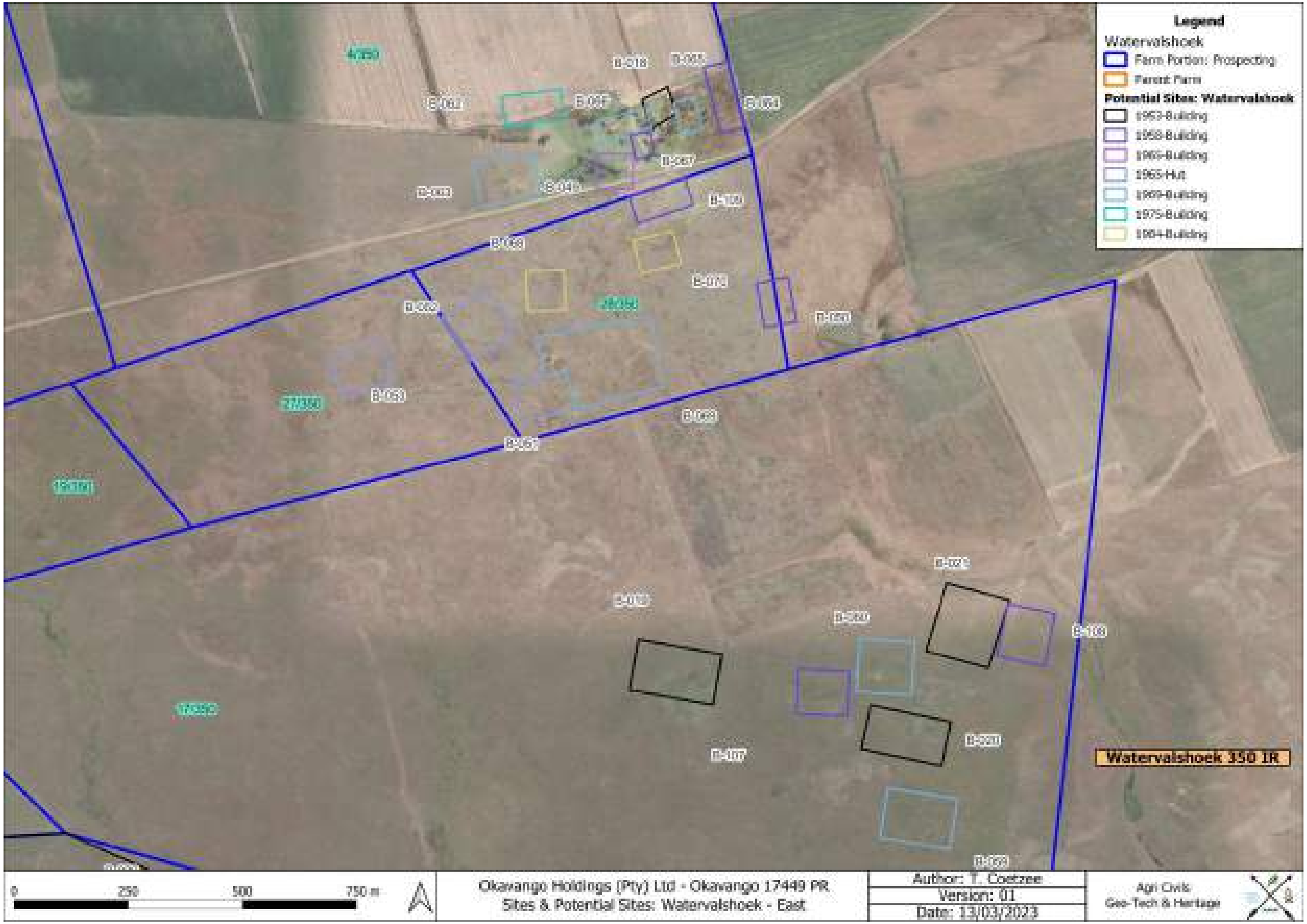

Figure 8: Sites & Potential Sites: Watervalshoek: East

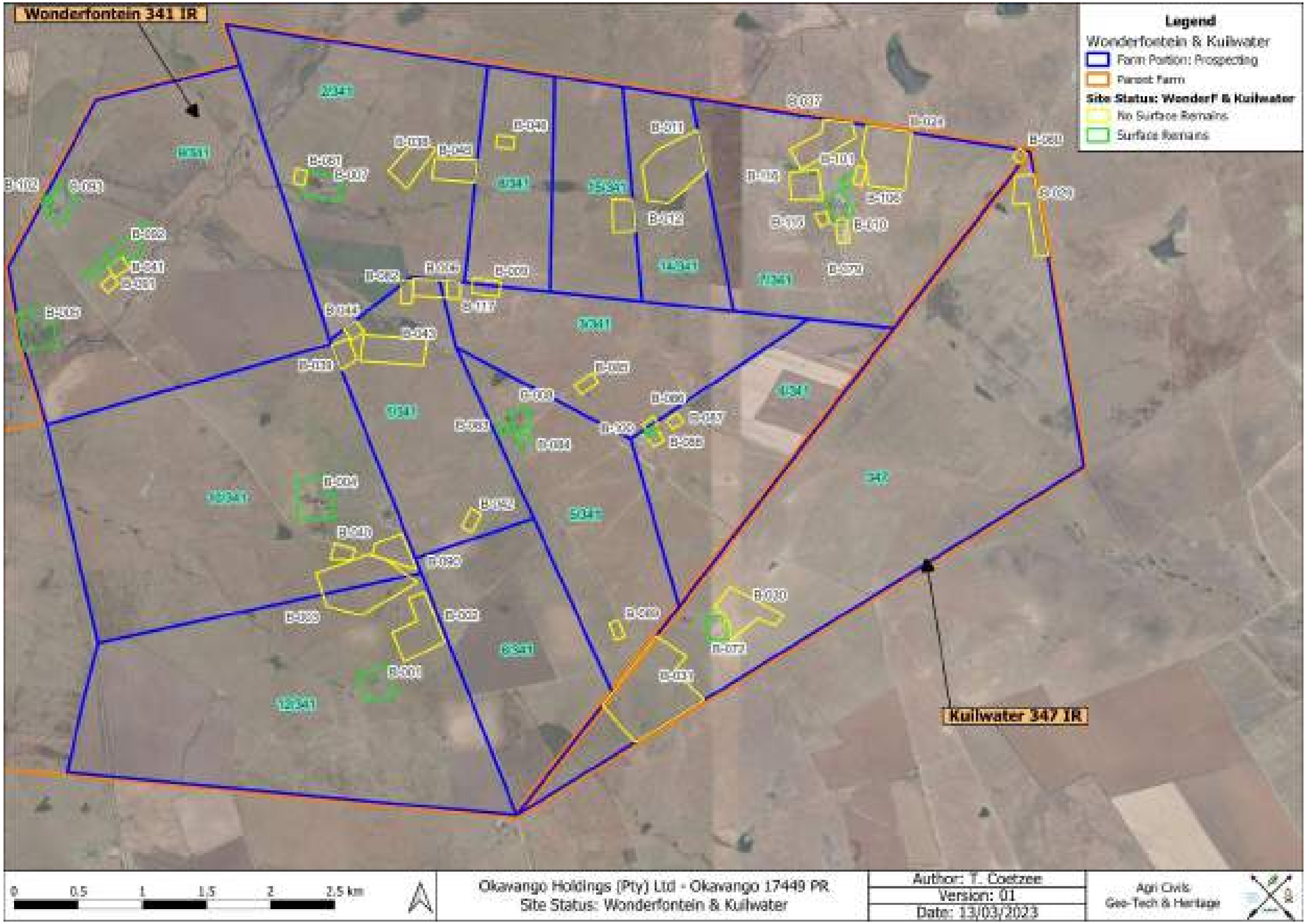

Figure 9: Site Status: Wonderfontein & Kuilwater.

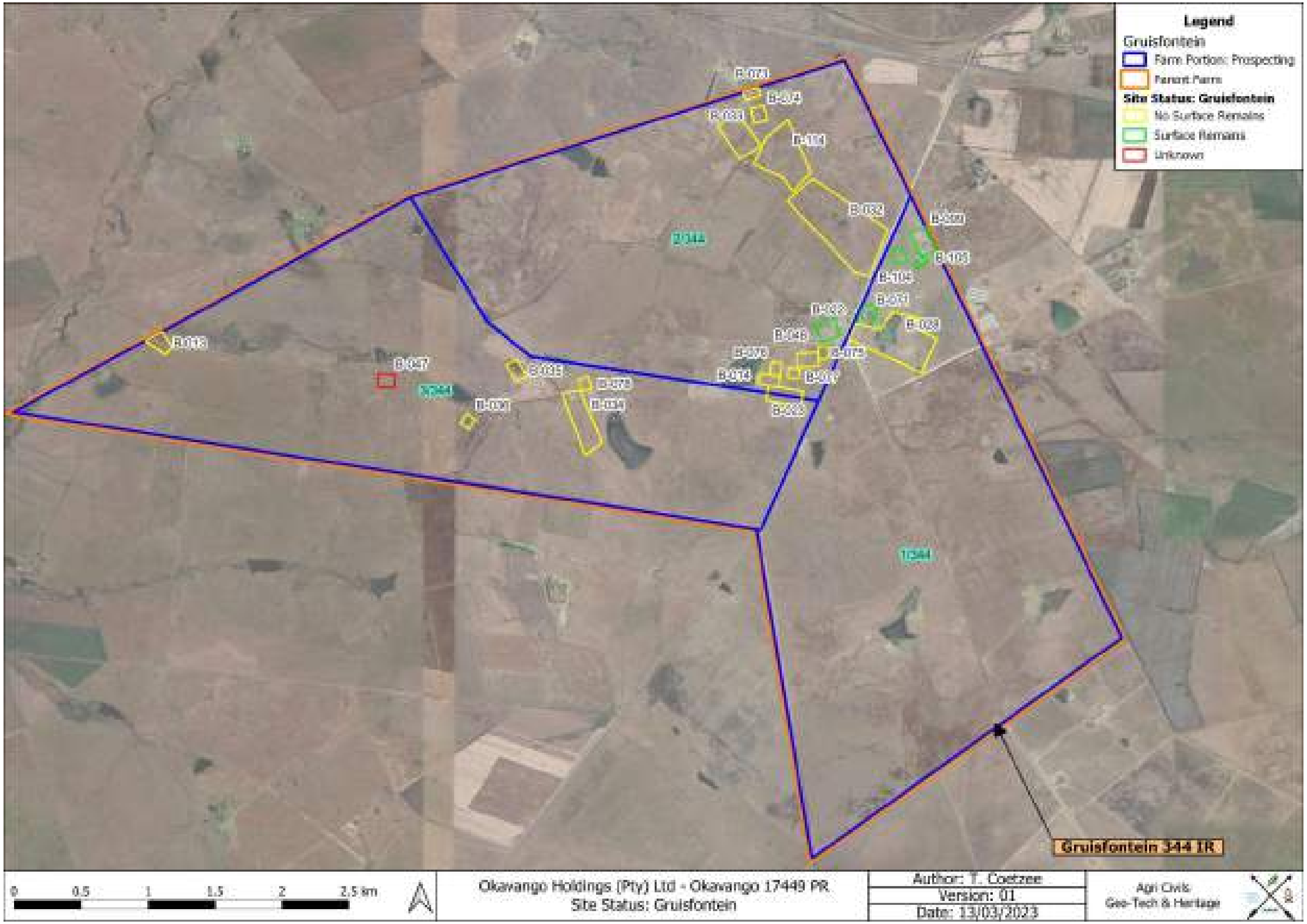

Figure 10: Site Status: Gruisfontein.

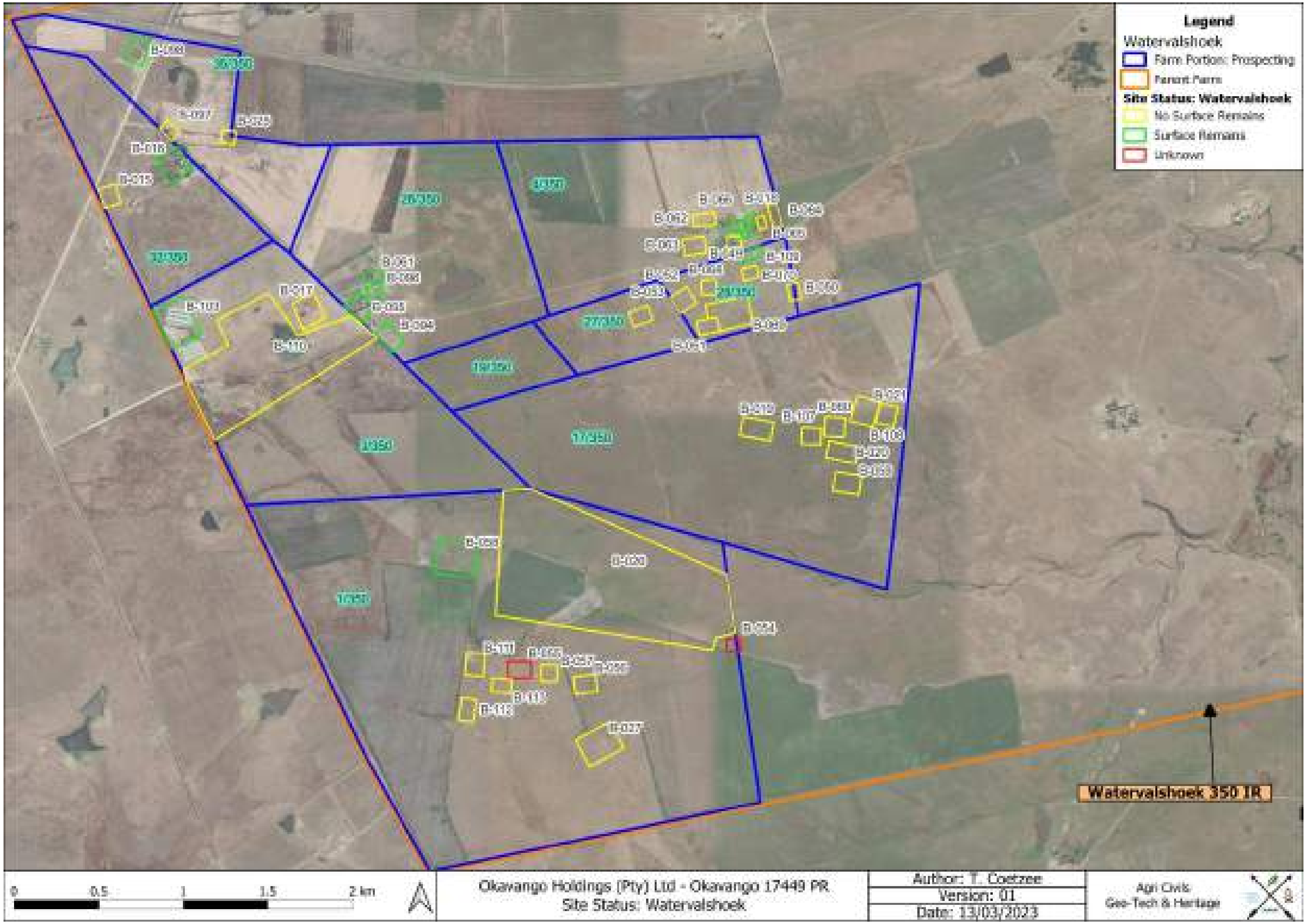

Figure 11: Site Status: Watervalshoek.

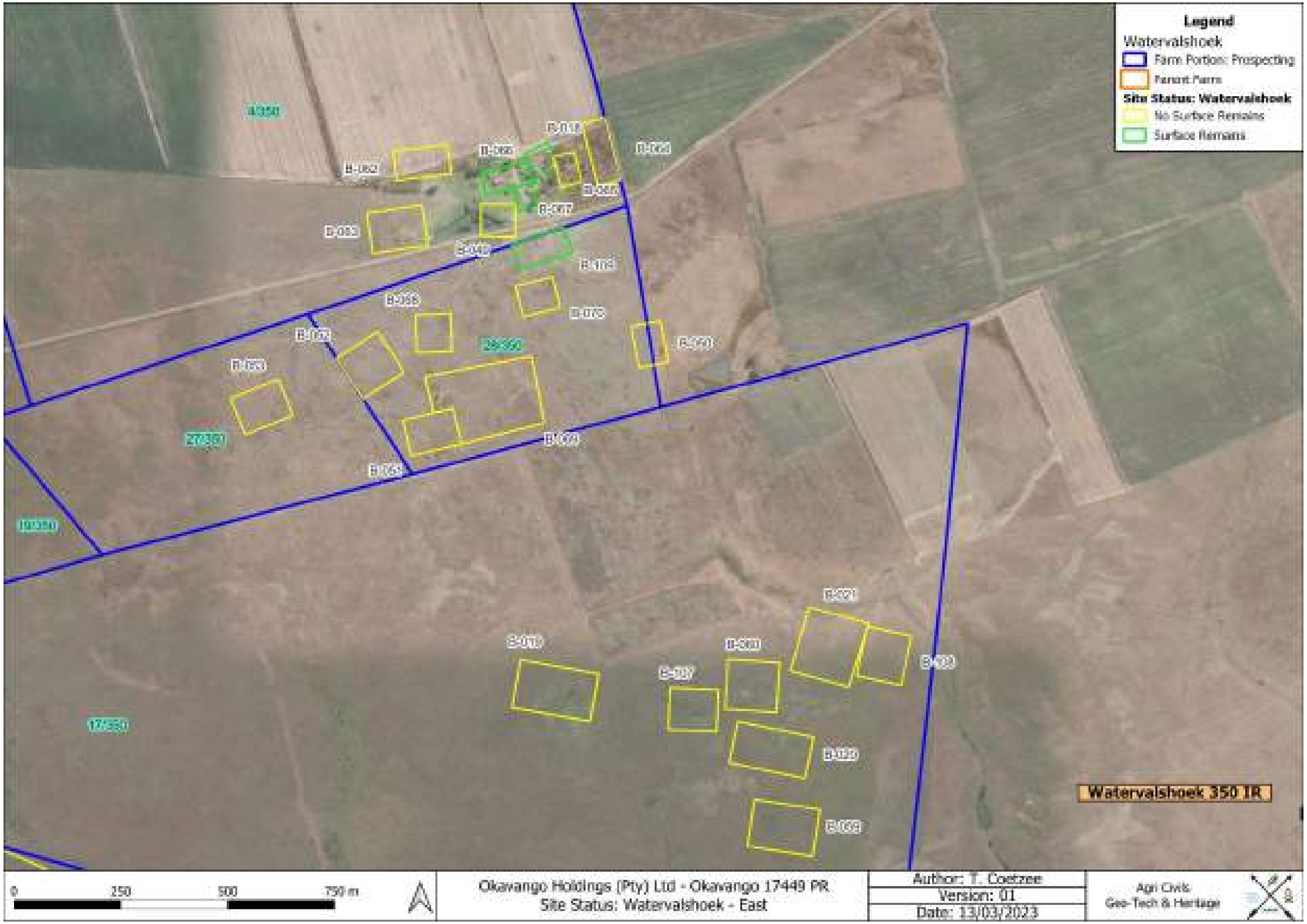

Figure 12: Site Status: Watervalshoek – East.

3.1 Limitations

Using historical topographical maps and historical aerial images for locating heritage resources have several shortcomings. Potential heritage remains, such as buildings, structures and graves/cemeteries, are not always indicated on topographical maps and are often omitted between different publications. Historical aerial imagery, on the other hand, might have a poor image resolution that renders potential heritage sites invisible. Inaccuracies during the georeferencing process may also lead to some heritage sites not being plotted, as well as dense vegetation obscuring heritage sites. Due to the small size of some heritage sites, such as Stone Age sites, small Iron Age features, rock art sites and burials, such sites are rarely visible on aerial imagery and are generally only detected during pedestrian surveys.

4. Archaeological Background

Southern African archaeology is broadly divided into the Early, Middle and Later Stone Ages; Early, Middle and Later Iron Ages; and Historical or Colonial Periods. This section of the report provides a general background to archaeology in South Africa.

4.1 The Stone Age

The earliest stone tool industry, the Oldowan, was developed by early human ancestors which were the earliest members of the genus *Homo,* such as *Homo habilis*, around 2.6 million years ago. It comprises tools such as cobble cores and pebble choppers (Toth & Schick 2007). Archaeologists suggest these stone tools are the earliest direct evidence for culture in southern Africa (Clarke & Kuman 2000). The advent of culture indicates the advent of more cognitively modern hominins (Mitchell 2002: 56, 57).

The Acheulean industry completely replaced the Oldowan industry. The Acheulian industry was first developed by *Homo ergaster* between 1.8 to 1.65 million years ago and lasted until around 300 000 years ago. Archaeological evidence from this period is also found at Swartkrans, Kromdraai and Sterkfontein. The most typical tools of the ESA (Early Stone Age) are handaxes, cleavers, choppers and spheroids. Although hominins seemingly used handaxes often, scholars disagree about their use. There are no indications of hafting, and some artefacts are far too large for it. Hominins likely used choppers and scrapers for skinning and butchering scavenged animals and often obtained sharp ended sticks for digging up edible roots. Presumably, early humans used wooden spears as early as 5 million years ago to hunt small animals.

Middle Stone Age (MSA) artefacts started appearing about 250 000 years ago and replaced the larger Early Stone Age bifaces, handaxes and cleavers with smaller flake industries consisting of scrapers, points and blades. These artefacts roughly fall in the 40-100 mm size range and were, in some cases, attached to handles, indicating a significant technical advance. The first *Homo sapiens* species also emerged during this period. Associated sites are Klasies River Mouth, Blombos Cave and Border Cave (Deacon & Deacon 1999).

Although the transition from the Middle Stone Age to the Later Stone Age (LSA) did not occur simultaneously across the whole of southern Africa, the Later Stone Age ranges from about 20 000 to 2000 years ago. Stone tools from this period are generally smaller, but were used to do the same job as those from previous periods; only in a different, more efficient way. The Later Stone Age is associated with: rock art, smaller stone tools (microliths), bows and arrows, bored stones, grooved stones, polished bone tools, earthenware pottery and beads. Examples of Later Stone Age sites are Nelson Bay Cave, Rose Cottage Cave and Boomplaas Cave (Deacon & Deacon 1999). These artefacts are often associated with rocky outcrops or water sources.

4.2 The Iron Age & Historical Period

The Early Iron Age marks the movement of farming communities into South Africa in the first millennium AD, or around 2500 years ago (Mitchell 2002:259, 260). These groups were agro-pastoralist communities that settled in the vicinity of water in order to provide subsistence for their cattle and crops. Archaeological evidence from Early Iron Age sites is mostly artefacts in the form of ceramic assemblages. The origins and archaeological identities of this period are largely based upon ceramic typologies. Some scholars classify Early Iron Age ceramic traditions into different “streams” or “trends” in pot types and decoration, which emerged over time in southern Africa. These “streams” are identified as the Kwale Branch (east), the Nkope Branch (central) and the Kalundu Branch (west). Early Iron Age ceramics typically display features such as large and prominent inverted rims, large neck areas and fine elaborate decorations. This period continued until the end of the first millennium AD (Mitchell 2002; Huffman 2007). Some well-known Early Iron Age sites include the Lydenburg Heads in Mpumalanga, Happy Rest in the Limpopo Province and Mzonjani in Kwa-Zulu Natal.

The Middle Iron Age roughly stretches from AD 900 to 1300 and marks the origins of the Zimbabwe culture. During this period cattle herding appeared to play an increasingly important role in society. However, it was proved that cattle remained an important source of wealth throughout the Iron Age. An important shift in the Iron Age of southern Africa took place in the Shashe-Limpopo basin during this period, namely the development of class distinction and sacred leadership. The Zimbabwe culture can be divided into three periods based on certain capitals. Mapungubwe, the first period, dates from AD 1220 to 1300, Great Zimbabwe from AD 1300 to 1450, and Khami from AD 1450 to 1820 (Huffman 2007: 361, 362).

The Late Iron Age (LIA) roughly dates from AD 1300 to 1840. It is generally accepted that Great Zimbabwe replaced Mapungubwe. Some characteristics include a greater focus on economic growth and the increased importance of trade. Specialisation in terms of natural resources also started to play a role, as can be seen from the distribution of iron slag which tend to occur only in certain localities compared to a wide distribution during earlier times. It was also during the Late Iron Age that different areas of South Africa were populated, such as the interior of KwaZulu Natal, the Free State, the Gauteng Highveld and the Transkei. Another characteristic is the increased use of stone as building material. Some artefacts associated with this period are knife-blades, hoes, adzes, awls, other metal objects as well as bone tools and grinding stones.

The Historical period mainly deals with Europe's discovery, settlement and impact on southern Africa. Some topics covered by the Historical period include Dutch settlement in the Western Cape, early mission stations, Voortrekker routes and the Anglo Boer War. This time period also saw the compilation of early maps by missionaries, explorers, military personnel, etc.

4.2.1 The South African War

Several small skirmishes took place in the general area. The phase in the South African War that is significant in terms of the study area relates to the period after the British occupied Pretoria on 5 June 1900. During this time, the republican forces retreated towards the eastern boundary of the Zuid-Afrikaansche Republiek under General Louis Botha and started employing guerrilla tactics (Matakoma Heritage Consultants 2007).

One of the more important and well-known South African War sites in the vicinity of the study area is the Battle of Bakenlaagte, located approximately 20 km northeast of the study area. The battle took place on 30 October 1901 between Lieutenant Colonel George Benson's Flying Column and the joint forces of General Louis Botha and General Sarel Grobler. Benson's Flying Column continuously threatened Boer commandos that caused the commandos to move camp every two days. Grobler had been following Benson's trail and harassed his rearguard, but it was only after Botha and his commando joined Grobler's commando that an attack could be launched. Benson's column was enroute from Syferfontein to Balmoral to resupply his men and horses. The column, consisting of more than 300 wagons, 800 horses and 600 infantry, aimed to camp at Bakenlaagte farmstead (Von der Heyde 2013: 208-209).

During the march, the column stretched out over a distance of approximately 2 km. The advance guard reached the Bakenlaagte farmstead at 09:00, but one of the rearguard wagons got stuck in mud when crossing a drift. Because the Boers were close by and visibility was poor, Benson rode back towards the rearguard and ordered two field guns be placed on a stony ridge between the camp and the rearguard. Benson was on his way to rescue the wagon when Botha with 800 men launched his attack. Upon seeing the attack, Benson ordered a retreat to Gun Hill, where the field guns were positioned. Two companies were also on their way from the camp to Gun Hill. At this stage Benson ordered some of the rearguard toward the northeast to protect the camp, creating a gap through which the Boers attacked. The position was overrun and of the 280 soldiers, the British suffered 231 casualties. Before Benson succumbed to his wounds, he ordered the camp to fire their guns at the hill, despite the danger to him and his men. The shelling drove the Boers back, but ambulance wagons provided cover and they manged to capture the two field guns. The Boers lost almost 100 men and decided not to follow up with an attack. The 73 British soldiers, including Benson, who were killed in the Battle were buried on Gun Hill, but were later exhumed and reburied in Germiston's Primrose Cemetery (Von der Heyde 2013: 208-209).

4.2.2 Coal mining general history on the Highveld

Mpumalanga, especially the area between eMalahleni, Middelburg, Bethal, Hendrina, Ermelo and Carolina, is associated with vast coal fields. These coal fields formed between 200 and 300 million years ago from rotten forests in swamps. During this period, Africa was still attached to South America, India and Antarctica as part of the Gondwana supercontinent. By 250 million years ago, the climate changed to dry warm conditions and the swamps in Mpumalanga were replaced by desert-like conditions around 200 million years ago. By 180 million years ago, when the Gondwana supercontinent started to split up, volcanic lava fields covered areas in Mpumalanga (De Wit 2007: 37).

With the rich coal deposits in Mpumalanga, it was only a matter of time before its value was realised and the coal extracted. Coal mining is Mpumalanga's most important industrial activity and produces about 80% of South Africa's coal. The earliest coal mining in the area dates to 1868 when farmers extracted coal for personal use in the Middelburg district. Large-scale coal mining around eMalahleni, however, only started after the discovery of gold on the Witwatersrand in 1886. Due to the discovery of coal in the Brakpan and Springs surroundings in 1887 and no railway linking eMalahleni with the Rand, these early eMalahleni coal mines closed down. It was more cost effective to exploit the closer Brakpan and Springs coal deposits than the coal found at eMalahleni (Schirmer 2007: 316).

After the construction of the railway line between the Rand and eMalahleni the deposits were exploited on large scale again. The coal fields, which are about 40 km wide, are concentrated around eMalahleni and run towards Belfast in the east. The first collieries around eMalahleni were Douglas, Transvaal and Delagoa Bay, Witbank and Landau and are of a higher quality compared to the coal found at Brakpan and Springs. During the 1890s some of the coal was exported via Delagoa Bay. In addition, the coal was readily accessible as the deposits occurred at a depth of 100 m or less (Schirmer 2007: 316-317). It should also be noted that the railway line between Pretoria and Lorenço Marques (Maputo) was completed on 2 November 1894 and the connection between eMalahleni and Johannesburg during the 1910s (Heydenrych 1999).

Between 1900 and 1920 many new collieries were established and the coal price dropped. This led to the establishment of the Transvaal Coal Owners' Association with the main aim to regulate output coal prices. This also acted to counter possible competition. It should also be noted that not all collieries joined this association. The establishment of the Transvaal Coal Owners' Association had positive as well as negative influences. On the one hand eliminating the competition might have impacted negatively on efficiency and the workers. On the other hand, it is possible that the capacity of coal mines was enhanced and facilitated further development in the industry. One positive point was that the association eased interaction with international buyers. During the 1930s, however, the coal price continued to drop and resulted in mechanisation. This introduced electric coal cutters and eliminated the need for high number of unskilled workers. By 1946 eMalahleni and Middelburg saw the emergence of a modern coal industry. The Transvaal had 34 large collieries that were responsible for 99.7% of the province's coal (Schirmer 2007: 317-319).

Between 1940 and 1960 coal output in the Eastern Transvaal increased from 13 million to 25 million tons. Although industrialisation expanded throughout this time in South Africa and a demand existed for coal both locally and internationally, a steady shift to oil as the dominant form of energy was noted. In light of these developments Anglo American Corporation launched three research programmes in the 1960s. As a result of these programmes the region's coal mines became export orientated. This trend continued throughout the 1980s. During these times a series of coal-burning power stations around the eastern Highveld coal deposits were constructed (Schirmer 2007: 321).

4.2.3 Balfour general history

The town of Balfour was established in 1896 with the name of McHattiesburg. In 1906 the town was renamed Balfour in honour of Arthur Balfour, the British Prime Minister who made a speech on the local railway station. In 1920 the municipality was established (Bulpin 1986: 642).

According to Bergh (1998), a rather large area to the south of the study area is associated with LIA sites. Bergh (1998) also noted the movement of the Ndzundza-Ndebele through the general area during the *Difaqane*.

4.2.4 Historical aerial Imagery and topographical maps

Historical images and topographical maps dating to 1953, 1958, 1965, 1969, 1975, 1984, 1991, 1995, 2007 and 2010 (**Appendix A**) were used to determine the location and relative age of the structures and buildings associated with the demarcated portion (**Table 3**), as well as to establish historical land uses associated with the demarcated area.

Table 3 indicates the identified sites, the date of the aerial images and topographical maps on which the sites are visible, as well as the date range for the construction and demolishment of the sites. One hundred and seventeen (117) sites were identified. These consist of 107 sites associated with buildings, three grave sites and seven areas associated with huts. Fifty-two historical sites were identified and 12 potentially historical sites. The remaining 53 sites date to contemporary times. Also, 31 of the sites appear to be associated with surface remains, while no surface remains were noted at 83 of the sites. It is unknown whether surface remains are associated with the three grave sites. Potential sites were identified on all the demarcated farm portions, except portion 19 of the Farm Watervalshoek 350 IR.

Table 3: Site age.

Site No	1953 Aerial	1958 Aerial	1965 Topo	1969 Aerial	1975 Aerial	1984 Topo	1991 Aerial	1995 Topo	2007 Aerial	2010 Topo	Constructed	Demolished
B-001	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	<=1953	N/A
B-002	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	<=1953	1975-1984
B-003	Yes	Yes	Yes	Yes	No	No	No	No	No	No	<=1953	1969-1975
B-004	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	<=1953	N/A
B-005	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	<=1953	N/A
B-006	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	<=1953	1984-1991
B-007	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	<=1953	N/A
B-008	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	<=1953	N/A
B-009	Yes	Yes	Yes	No	No	No	No	No	No	No	<=1953	1965-1969
B-010	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	<=1953	N/A
B-011	Yes	Yes	Yes	Yes	No	No	No	No	No	No	<=1953	1969-1975
B-012	Yes	Yes	Yes	Yes	No	No	No	No	No	No	<=1953	1969-1975
B-013	Yes	Yes	Yes	Yes	No	No	No	No	No	No	<=1953	1969-1975
B-014	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	<=1953	1984-1991
B-015	Yes	Yes	Yes	No	No	No	No	No	No	No	<=1953	1965-1969
B-016	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	<=1953	N/A
B-017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	<=1953	1995-2007
B-018	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	<=1953	N/A
B-019	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	<=1953	1995-2007
B-020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	<=1953	1995-2007
B-021	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	<=1953	1984-1991
B-022	Yes	Yes	No	No	Yes	Yes	No	No	Yes	No	<=1953	N/A
B-023	Yes	Yes	No	Yes	Yes	Yes	No	No	No	No	<=1953	1984-1991
B-024	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	<=1953	1984-1991
B-025	Yes	No	No	No	No	No	No	No	No	No	<=1953	1953-1958
B-026	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	<=1953	1995-2007
B-027	Yes	Yes	No	Yes	Yes	No	No	No	No	No	<=1953	1975-1984
B-028	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	<=1953	1995-2007
B-029	Yes	Yes	Yes	No	No	No	No	No	No	No	<=1953	1965-1969
B-030	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	<=1953	1984-1991
B-031	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	<=1953	1984-1991
B-032	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	<=1953	1984-1991
B-033	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	<=1953	1984-1991

Site No	1953 Aerial	1958 Aerial	1965 Topo	1969 Aerial	1975 Aerial	1984 Topo	1991 Aerial	1995 Topo	2007 Aerial	2010 Topo	Constructed	Demolished
B-034	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	<=1953	1991-1995
B-035	Yes	Yes	No	Yes	No	No	No	No	No	No	<=1953	1969-1975
B-036	Yes	Yes	No	No	No	No	No	No	No	No	<=1953	1958-1965
B-037	Yes	Yes	Yes	No	No	No	No	No	No	No	<=1953	1965-1969
B-038	Yes	Yes	No	Yes	No	No	No	No	No	No	<=1953	1969-1975
B-039	Yes	No	No	No	No	No	No	No	No	No	<=1953	1953-1958
B-040	No	Yes	Yes	Yes	No	No	No	No	No	No	1953-1958	1969-1975
B-041	No	No	Yes	Yes	Yes	No	No	No	No	No	1958-1965	1975-1984
B-042	No	No	Yes	Yes	No	No	No	No	No	No	1958-1965	1969-1975
B-043	No	Yes	Yes	Yes	No	No	No	No	No	No	1953-1958	1969-1975
B-044	No	No	Yes	No	No	No	No	No	No	No	1958-1965	1965-1969
B-045	No	Yes	Yes	No	No	No	No	No	No	No	1953-1958	1965-1969
B-046	No	Yes	Yes	No	No	No	No	No	No	No	1953-1958	1965-1969
B-047	No	No	Yes	No	No	No	No	No	No	No	1958-1965	N/A
B-048	No	No	Yes	Yes	Yes	Yes	No	No	No	No	1958-1965	1984-1991
B-049	No	No	Yes	No	No	No	No	No	No	No	1958-1965	1965-1969
B-050	No	Yes	Yes	No	No	No	No	No	No	No	1953-1958	1965-1969
B-051	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	1958-1965	1995-2007
B-052	No	No	Yes	No	No	No	No	No	No	No	1958-1965	1965-1969
B-053	No	No	Yes	No	No	No	No	No	No	No	1958-1965	1965-1969
B-054	No	No	Yes	No	No	No	No	No	No	No	1958-1965	N/A
B-055	No	No	Yes	No	No	No	No	No	No	No	1958-1965	N/A
B-056	No	No	Yes	No	No	No	No	No	No	No	1958-1965	1965-1969
B-057	No	No	No	Yes	Yes	Yes	No	No	No	No	1965-1969	1984-1991
B-058	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1965-1969	N/A
B-059	No	No	No	Yes	Yes	Yes	No	No	No	No	1965-1969	1984-1991
B-060	No	No	No	Yes	Yes	Yes	Yes	No	No	No	1965-1969	1991-1995
B-061	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	1975-1984	N/A
B-062	No	No	No	No	Yes	Yes	Yes	Yes	No	No	1969-1975	1995-2007
B-063	No	No	No	Yes	Yes	Yes	Yes	No	No	No	1965-1969	1991-1995
B-064	No	Yes	No	No	No	Yes	Yes	Yes	No	No	1953-1958	1995-2007
B-065	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	1965-1969	2007-2010
B-066	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1965-1969	N/A
B-067	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1953-1958	N/A

Site No	1953 Aerial	1958 Aerial	1965 Topo	1969 Aerial	1975 Aerial	1984 Topo	1991 Aerial	1995 Topo	2007 Aerial	2010 Topo	Constructed	Demolished
B-068	No	No	No	No	No	Yes	No	No	No	No	1975-1984	1984-1991
B-069	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No	1965-1969	1995-2007
B-070	No	No	No	No	No	Yes	No	Yes	No	No	1975-1984	1995-2007
B-071	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1965-1969	N/A
B-072	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1965-1969	N/A
B-073	No	No	No	No	No	Yes	No	No	No	No	1975-1984	1984-1991
B-074	No	No	No	No	No	Yes	No	No	No	No	1975-1984	1984-1991
B-075	No	No	No	Yes	Yes	Yes	No	No	No	No	1965-1969	1984-1991
B-076	No	No	No	Yes	Yes	Yes	No	No	No	No	1965-1969	1984-1991
B-077	No	No	No	Yes	Yes	Yes	No	No	No	No	1965-1969	1984-1991
B-078	No	No	No	Yes	Yes	Yes	Yes	No	No	No	1965-1969	1991-1995
B-079	No	No	No	No	Yes	Yes	No	No	No	No	1969-1975	1984-1991
B-080	No	No	No	Yes	Yes	Yes	No	No	No	No	1965-1969	1984-1991
B-081	No	No	No	No	No	Yes	Yes	No	Yes	No	1975-1984	2007-2010
B-082	No	No	No	Yes	Yes	Yes	No	No	No	No	1965-1969	1984-1991
B-083	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	1969-1975	N/A
B-084	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	1969-1975	N/A
B-085	No	No	No	Yes	Yes	Yes	No	No	No	No	1965-1969	1984-1991
B-086	No	No	No	No	No	Yes	No	No	No	No	1975-1984	1984-1991
B-087	No	No	No	No	Yes	Yes	No	No	No	No	1969-1975	1984-1991
B-088	No	No	No	No	Yes	Yes	Yes	No	No	No	1969-1975	1991-1995
B-089	No	No	No	No	Yes	Yes	No	Yes	No	No	1969-1975	1984-1991
B-090	No	No	No	No	Yes	Yes	No	No	No	No	1969-1975	1984-1991
B-091	No	No	No	No	No	Yes	No	No	No	No	1975-1984	1984-1991
B-092	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	1965-1969	N/A
B-093	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	1969-1975	N/A
B-094	No	No	No	No	No	No	Yes	Yes	Yes	Yes	1984-1991	N/A
B-095	No	No	No	No	No	No	Yes	Yes	Yes	Yes	1984-1991	N/A
B-096	No	No	No	No	No	No	Yes	Yes	Yes	Yes	1984-1991	N/A
B-097	No	No	No	No	No	No	No	Yes	No	No	1991-1995	1995-2007
B-098	No	No	No	No	No	No	Yes	Yes	Yes	No	1984-1991	N/A
B-099	No	No	No	No	No	No	Yes	Yes	Yes	Yes	1984-1991	N/A
B-100	No	No	No	No	No	No	Yes	Yes	Yes	Yes	1984-1991	N/A
B-101	No	No	No	No	No	No	Yes	Yes	Yes	Yes	1984-1991	N/A

Site No	1953 Aerial	1958 Aerial	1965 Topo	1969 Aerial	1975 Aerial	1984 Topo	1991 Aerial	1995 Topo	2007 Aerial	2010 Topo	Constructed	Demolished
B-102	No	No	No	No	No	No	Yes	Yes	Yes	Yes	1984-1991	N/A
B-103	No	No	No	No	No	No	No	No	No	Yes	2007-2010	N/A
B-104	No	No	No	No	No	No	No	No	Yes	Yes	1995-2007	N/A
B-105	No	No	No	No	No	No	No	No	Yes	Yes	1995-2007	N/A
B-106	No	No	No	No	No	No	No	No	Yes	Yes	1995-2007	>=2010
B-107	No	Yes	No	Yes	No	No	No	No	No	No	1953-1958	1969-1975
B-108	No	Yes	No	Yes	No	No	No	No	No	No	1953-1958	1969-1975
B-109	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	1953-1958	N/A
B-110	No	Yes	Yes	Yes	No	No	No	No	No	No	1953-1958	1969-1975
B-111	No	No	No	Yes	No	No	No	No	No	No	1965-1969	1969-1975
B-112	No	No	No	Yes	No	No	No	No	No	No	1965-1969	1969-1975
B-113	No	No	No	Yes	No	No	No	No	No	No	1965-1969	1969-1975
B-114	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No	1953-1958	1984-1991
B-115	No	Yes	No	No	No	No	No	No	No	No	1953-1958	1958-1965
B-116	No	No	No	Yes	No	No	No	No	No	No	1965-1969	1969-1975
B-117	No	No	No	Yes	Yes	No	No	No	No	No	1965-1969	1975-1984

4.3 Examples of Heritage Sites

Figures 13 – 23 are examples of heritage sites often encountered. Iron Age and Stone Age sites are often associated with water sources, rocky outcrops and hills and should be avoided by the proposed prospecting activities.

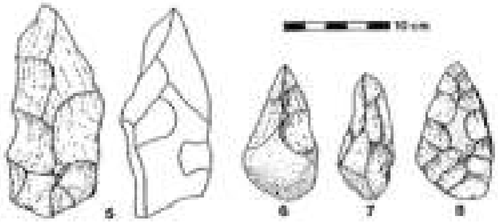

Figure 13: ESA artefacts from Sterkfontein (Volman 1984).

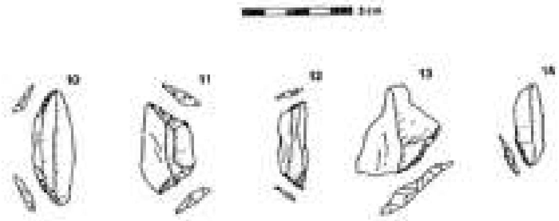

Figure 14: MSA artefacts from Howiesons Poort (Volman 1984).

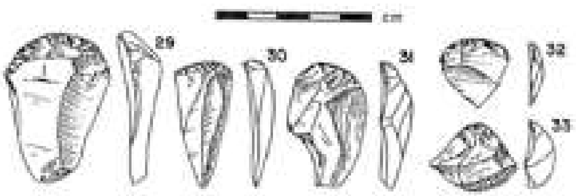

Figure 15: LSA scrapers (Klein 1984).

Figure 16: Example of undecorated Iron Age potsherds.

Figure 17: Example of a decorated Iron Age potsherd.

Figure 18: Example of a potential Iron Age granary base.

Figure 19: Example of a stone-walled Iron Age site.

Figure 20 : Example of a broken lower grinding stone dating to the LIA.

Figure 21: Example of a dilapidated stone-walled site dating to the LIA.

Figure 22: Example of a historical building.

Figure 23: Example of a potential informal grave.

4.4 Previous Heritage Studies

Khutala Colliery, Nkangala District

Matakoma Heritage Consultants (2007) conducted a Heritage Impact Assessment for the BHP Billiton Khutala Colliery on certain portions of the farms Zondagsvlei, Schoongezicht, Leeuwfontein, Klippoortje, Springboklaagte, Cologne, Bombardie and Smithfield in the Nkangala district. The HIA recorded 24 cemeteries consisting of approximately 735 graves, as well as 15 historical structures. This development is located roughly 33 km northeast of the proposed Okavango prospecting project.

Coal mining on the Farm Grootfontein 165 IR, District Nigel

A Cultural Heritage Impact Assessment, conducted by Francois Coetzee (2017) for a mining right application on the Farm Grootfontein 165 IR, revealed no material of heritage importance. According to the report, the survey area focused on Portions 23, 52 and 85 of the Farm Grootfontein 165 IR, as well as the remaining extent of the Farm Vogelstruisbult 127 IR and covered 170 hectares. The surveyed area is located approximately 32 km to the west-northwest of the study area concerned in this report.

Goedehoop Coal Mine, Mpumalanga

An Archaeological and Cultural Historical survey and impact assessment was conducted by the National Cultural History Museum (2003) for the development of the Goedehoop opencast coal mine near Hendrina in the Mpumalanga Province. The Goedehoop site is located roughly 56 km east of the proposed Okavango prospecting project. Opencast areas that were surveyed included portions of the Farms Schurvekop 227 IS, Vlakkuilen 76 IS, Middelkraal 50 IS, and Halfgewonnen 190 IS. It was noted that a few graveyards located outside of the study areas were observed and would therefore not be impacted.

5. Archaeological and Historical Remains

This section serves as an indication of heritage material associated with the study area based on previous research, as well as historical aerial images and topographical maps.

5.1 Stone Age Remains

The heritage studies conducted in the general area did not locate any stone age material. Also, according to Bergh (1998), no major Stone Age site is located in the direct vicinity of the study area. Since such sites are often associated with water sources, Stone Age material is more likely to be encountered within the 500 m river buffer zone of the study area.

5.2 Iron Age Farmer Remains

Stone-walled sites are often detectable on satellite and aerial imagery. However, no such sites were observed. It should also be noted that the presence of such sites might be obscured by dense vegetation and poor preservation and are therefore more likely to be located in the undisturbed sections of the study area. Bergh (1998) also noted the presence of LIA sites directly to the south of the study area.

The heritage studies conducted by Matakoma Heritage Consultants (2007), Coetzee (2017) and the National Cultural History Museum (2003) located no Iron Age sites.

5.3 Historical Remains

Fifty-two sites associated with buildings/huts were identified on historical aerial imagery and topographical maps. These sites date to 1953 or earlier and to between 1953 and 1958. Nine (9) sites were also identified on the 1965 topographical map (**Appendix A: Figure 27**), suggesting that the buildings/huts were constructed between 1958 and 1965 and could therefore potentially date to historical times (**Table 4**). Based on contemporary satellite imagery, 11 of the identified historical and potentially historical sites are associated with surface infrastructure, while no surface remains were observed at the remaining 50 sites. It should be kept in mind that the sites still associated with surface remains might have been demolished and replaced by more recent buildings. Also, the 50 sites where no surface remains were noted might be associated with subsurface cultural remains and might therefore be sensitive from a heritage perspective.

The heritage study conducted by Matakoma Heritage Consultants (2007) recorded several structures and buildings that might date to the Historic Period.

Table 4: Historical Sites.

Site No	Dataset date & site type	Current Status	Age	Farm Portion	Lat (y)	Lon (x)
B-001	1953-Building	Surface Remains	Historical	12/341	-26.467346	28.809614
B-002	1953-Building	No Surface Remains	Historical	12/341	-26.463590	28.812563
B-003	1953-Building	No Surface Remains	Historical	10,12/341	-26.460339	28.808585
B-004	1953-Building	Surface Remains	Historical	10/341	-26.454331	28.805266
B-005	1953-Building	Surface Remains	Historical	9/341	-26.442474	28.785815
B-006	1953-Building	No Surface Remains	Historical	1/341	-26.439609	28.813338
B-007	1953-Building	Surface Remains	Historical	2/341	-26.432517	28.805843
B-008	1953-Building	Surface Remains	Historical	5/341	-26.448746	28.819696
B-009	1953-Building	No Surface Remains	Historical	3/341	-26.439553	28.817260
B-010	1953-Building	Surface Remains	Historical	7/341	-26.433801	28.841964
B-011	1953-Building	No Surface Remains	Historical	14/341	-26.431246	28.830394
B-012	1953-Building	No Surface Remains	Historical	15/341	-26.434551	28.826865
B-013	1953-Building	No Surface Remains	Historical	3/344	-26.417524	28.815361
B-014	1953-Building	No Surface Remains	Historical	2/344	-26.420015	28.856225
B-015	1953-Building	No Surface Remains	Historical	32/350	-26.407907	28.866471
B-016	1953-Building	Surface Remains	Historical	32/350	-26.406241	28.869869
B-017	1953-Building	No Surface Remains	Historical	3/350	-26.414006	28.877028
B-018	1953-Building	Surface Remains	Historical	4/350	-26.409144	28.900519
B-019	1953-Building	No Surface Remains	Historical	17/350	-26.420267	28.900845
B-020	1953-Building	No Surface Remains	Historical	17/350	-26.421514	28.905385
B-021	1953-Building	No Surface Remains	Historical	17/350	-26.419351	28.906597
B-022	1953-Building	Surface Remains	Historical	2/344	-26.416639	28.860201
B-023	1953-Building	No Surface Remains	Historical	2,3/344	-26.421079	28.857294
B-024	1953-Building	No Surface Remains	Historical	7/341	-26.430417	28.845307
B-025	1953-Building	No Surface Remains	Historical	35/350	-26.404774	28.872774
B-026	1953-Building	No Surface Remains	Historical	1/350	-26.428162	28.892691
B-027	1953-Building	No Surface Remains	Historical	1/350	-26.437018	28.892499
B-028	1953-Building	No Surface Remains	Historical	1/344	-26.417379	28.864841
B-029	1953-Building	No Surface Remains	Historical	0/347	-26.434092	28.855437
B-030	1953-Building	No Surface Remains	Historical	0/347	-26.462256	28.835339
B-031	1953-Building	No Surface Remains	Historical	0/347	-26.467901	28.828866
B-032	1953-Building	No Surface Remains	Historical	2/344	-26.409675	28.861057
B-033	1953-Building	No Surface Remains	Historical	2/344	-26.403624	28.854191
B-034	1953-Building	No Surface Remains	Historical	3/344	-26.422772	28.843691
B-035	1953-Building	No Surface Remains	Historical	3/344	-26.419373	28.839262
B-036	1953-Building	No Surface Remains	Historical	3/344	-26.422789	28.835979
B-037	1953-Building	No Surface Remains	Historical	7/341	-26.429426	28.840886
B-038	1953-Building	No Surface Remains	Historical	2/341	-26.430784	28.812063
B-039	1953-Building	No Surface Remains	Historical	1/341	-26.444170	28.807324
B-040	1958-Building	No Surface Remains	Historical	10/341	-26.458133	28.807198
B-041	1965-Hut	No Surface Remains	Potentially Historical	9/341	-26.438134	28.791518
B-042	1965-Hut	No Surface Remains	Potentially Historical	1/341	-26.455874	28.816234
B-043	1958-Building	No Surface Remains	Historical	1/341	-26.443939	28.810769
B-044	1965-Hut	No Surface Remains	Potentially Historical	1/341	-26.442563	28.807990
B-045	1958-Hut	No Surface Remains	Historical	2/341	-26.431337	28.815089
B-046	1958-Hut	No Surface Remains	Historical	8/341	-26.429366	28.818608
B-048	1965-Hut	No Surface Remains	Potentially Historical	2/344	-26.418657	28.858811
B-049	1965-Building	No Surface Remains	Potentially Historical	4/350	-26.410390	28.899647
B-050	1958-Building	No Surface Remains	Historical	28/350	-26.412990	28.902828
B-051	1965-Hut	No Surface Remains	Potentially Historical	28/350	-26.414832	28.898256

Site No	Dataset date & site type	Current Status	Age	Farm Portion	Lat (y)	Lon (x)
B-052	1965-Hut	No Surface Remains	Potentially Historical	28/350	-26.413430	28.896954
B-053	1965-Hut	No Surface Remains	Potentially Historical	27/350	-26.414306	28.894672
B-056	1965-Building	No Surface Remains	Potentially Historical	1/350	-26.433843	28.891729
B-064	1958-Building	No Surface Remains	Historical	4/350	-26.408945	28.901807
B-067	1958-Building	Surface Remains	Historical	4/350	-26.409890	28.900203
B-107	1958-Building	No Surface Remains	Historical	17/350	-26.420666	28.903742
B-108	1958-Building	No Surface Remains	Historical	17/350	-26.419536	28.907749
B-109	1958-Building	Surface Remains	Historical	28/350	-26.410979	28.900564
B-110	1958-Building	No Surface Remains	Historical	3/350	-26.416734	28.874731
B-114	1958-Buidling	No Surface Remains	Historical	2/344	-26.405014	28.857224
B-115	1958-Building	No Surface Remains	Historical	7/341	-26.434721	28.840814

5.4 Contemporary Remains

Evidence from satellite and aerial imagery, as well as topographical maps, indicate the presence of 53 areas associated with modern infrastructure (**Table 5**). These buildings and structures were constructed after 1965. Thirty-three (33) of these sites, however, appear to have been demolished. The 53 identified sites do not exceed 60 years of age.

The heritage studies conducted by Matakoma Heritage Consultants (2007), Coetzee (2017) and the National Cultural History Museum (2003) did not record significant contemporary sites.

Table 5: Contemporary Sites.

Site No	Dataset date & site type	Current Status	Age	Farm Portion	Lat (y)	Lon (x)
B-057	1969-Building	No Surface Remains	Contemporary	12/341	-26.433252	28.889803
B-058	1969-Building	Surface Remains	Contemporary	12/341	-26.427154	28.884917
B-059	1969-Building	No Surface Remains	Contemporary	10,12/341	-26.423152	28.905638
B-060	1969-Building	No Surface Remains	Contemporary	10/341	-26.420165	28.904981
B-061	1984-Building	Surface Remains	Contemporary	9/341	-26.412266	28.880430
B-062	1975-Building	No Surface Remains	Contemporary	1/341	-26.409166	28.898039
B-063	1969-Building	No Surface Remains	Contemporary	2/341	-26.410572	28.897525
B-065	1969-Building	No Surface Remains	Contemporary	5/341	-26.409315	28.901098
B-066	1969-Building	Surface Remains	Contemporary	3/341	-26.409500	28.899822
B-068	1984-Building	No Surface Remains	Contemporary	7/341	-26.412757	28.898289
B-069	1969-Building	No Surface Remains	Contemporary	14/341	-26.414126	28.899445
B-070	1984-Building	No Surface Remains	Contemporary	15/341	-26.411995	28.900479
B-071	1969-Building	Surface Remains	Contemporary	1/350	-26.415713	28.862833
B-072	1969-Building	Surface Remains	Contemporary	1/350	-26.463457	28.833394
B-073	1984-Building	No Surface Remains	Contemporary	17/350	-26.400805	28.855072
B-074	1984-Building	No Surface Remains	Contemporary	17/350	-26.402166	28.855550
B-075	1969-Building	No Surface Remains	Contemporary	26/350	-26.418167	28.859862
B-076	1969-Building	No Surface Remains	Contemporary	4/350	-26.419271	28.856697
B-077	1969-Building	No Surface Remains	Contemporary	4/350	-26.419582	28.857876
B-078	1969-Building	No Surface Remains	Contemporary	4/350	-26.420258	28.843895
B-079	1975-Building	No Surface Remains	Contemporary	4/350	-26.435623	28.842247
B-080	1969-Building	No Surface Remains	Contemporary	28/350	-26.430341	28.854657

Site No	Dataset date & site type	Current Status	Age	Farm Portion	Lat (y)	Lon (x)
B-081	1984-Building	No Surface Remains	Contemporary	28/350	-26.431818	28.804243
B-082	1969-Building	No Surface Remains	Contemporary	28/350	-26.439902	28.811723
B-083	1975-Building	Surface Remains	Contemporary	1/344	-26.449447	28.818402
B-084	1975-Building	Surface Remains	Contemporary	0/347	-26.450218	28.819899
B-085	1969-Building	No Surface Remains	Contemporary	2/344	-26.446311	28.824291
B-086	1984-Building	No Surface Remains	Contemporary	2/344	-26.449073	28.828750
B-087	1975-Building	No Surface Remains	Contemporary	2/344	-26.448919	28.830480
B-088	1975-Building	No Surface Remains	Contemporary	2/344	-26.450189	28.829148
B-089	1975-Building	No Surface Remains	Contemporary	2/344	-26.463551	28.826432
B-090	1975-Building	No Surface Remains	Contemporary	3/344	-26.458020	28.810860
B-091	1984-Building	No Surface Remains	Contemporary	7/341	-26.439307	28.790898
B-092	1969-Building	Surface Remains	Contemporary	7/341	-26.436958	28.791808
B-093	1975-Building	Surface Remains	Contemporary	2/341	-26.433622	28.787486
B-094	1991-Building	Surface Remains	Contemporary	1/341	-26.415422	28.881294
B-095	1991-Building	Surface Remains	Contemporary	5/341	-26.413809	28.879751
B-096	1991-Building	Surface Remains	Contemporary	5/341	-26.412902	28.880556
B-097	1995-Building	No Surface Remains	Contemporary	3/341	-26.404443	28.869659
B-098	1991-Building	Surface Remains	Contemporary	3/341	-26.400154	28.867958
B-099	1991-Building	Surface Remains	Contemporary	4/341	-26.410704	28.866567
B-100	1991-Building	Surface Remains	Contemporary	4/341	-26.449677	28.828765
B-101	1991-Building	Surface Remains	Contemporary	5/341	-26.432041	28.842637
B-102	1991-Building	Surface Remains	Contemporary	10/341	-26.433498	28.786465
B-103	2010-Building	Surface Remains	Contemporary	9/341	-26.414630	28.870058
B-104	2007-Building	Surface Remains	Contemporary	9/341	-26.411655	28.864967
B-105	2007-Building	Surface Remains	Contemporary	9/341	-26.412090	28.866373
B-106	2007-Building	No Surface Remains	Contemporary	26/350	-26.431737	28.843417
B-111	1969-Building	No Surface Remains	Contemporary	26/350	-26.432774	28.885868
B-112	1969-Building	No Surface Remains	Contemporary	26/350	-26.435192	28.885480
B-113	1969-Building	No Surface Remains	Contemporary	35/350	-26.433913	28.887285
B-116	1969-Building	No Surface Remains	Contemporary	35/350	-26.432440	28.839646
B-117	1969-Building	No Surface Remains	Contemporary	1/344	-26.439732	28.814982

5.5 Graves

Three graves were noted on the topographical map dating to 1965 (**Table 6 & Appendix A: Figure 27**). The current status of the graves, however, is unknown. Such sites are rarely visible on aerial imagery and are not always indicated on topographical maps. Burial sites are also often associated with historical farm- and homesteads and the possibility therefore exists that additional graves may be associated with the study area.

The heritage studies conducted by Matakoma Heritage Consultants (2007) and the National Cultural History Museum (2003) mention the presence of several graves and cemeteries in the general area.

Table 6: Graves & Cemeteries.

Site No	Dataset date & site type	Current Status	Age	Farm Portion	Lat (y)	Lon (x)
B-047	Grave	Unknown	Potentially Historical	3/344	-26.420043	28.830526
B-054	Grave	Unknown	Potentially Historical	1/350	-26.431745	28.899612
B-055	Grave	Unknown	Potentially Historical	1/350	-26.433075	28.888226

6. Evaluation

The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences.

A fundamental aspect in the conservation of a heritage resource relates to whether the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. There are many aspects that must be taken into consideration when determining significance, such as rarity, national significance, scientific importance, cultural and religious significance, and not least, community preferences. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and if appropriate mitigated in order to gain data / information which would otherwise be lost. Such sites must be adequately recorded and sampled before being destroyed.

6.1 Field Ratings

All sites should include a field rating in order to comply with section 38 of the National Heritage Resources Act (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA.

Table 7: Prescribed Field Ratings

Rating	Field Rating/Grade	Significance	Recommendation
National	Grade 1		National site
Provincial	Grade 2		Provincial site
Local	Grade 3 A	High	Mitigation not advised
Local	Grade 3 B	High	Part of site should be retained
General protection A	4 A	High/Medium	Mitigate site
General Protection B	4 B	Medium	Record site
General Protection C	4 C	Low	No recording necessary

*These site ratings can only be assigned following a Phase 1 AIA.

7. Statement of Significance & Recommendations

7.1 Statement of Significance

The study area: Okavango PR

As can be seen from previous research conducted in the area, the general study area appears to be sensitive from a heritage perspective and sites are likely to include LIA sites, historical infrastructure, graves and cemeteries. Since heritage sites, such as burial sites, are not always clearly identifiable due to disturbed/removed surface features, care must be exercised when prospecting.

Figure 24 indicates historical and potentially historical sites, as well as a 500 m buffer area around water sources. The 500 m buffer area is considered to be potentially sensitive from a heritage perspective since archaeological sites are often located within this zone. Areas previously/currently associated with cultivated fields are indicated as well. These areas are considered to be less sensitive from a heritage perspective due to the areas being disturbed. The least sensitive areas are therefore areas that are located more than 500 m from a water source, fall within previously/currently cultivated fields and are not located within close proximity of potential heritage sites or contemporary infrastructure. From a heritage perspective, these areas are considered to be more favourable for the proposed prospecting activities. Also, the cultivated sections located within the 500 m buffer zone indicate a disturbed context, but the potential for subsurface cultural material is slightly higher compared to areas falling outside of the buffer zone. Apart from the identified potential sites, open grassland areas falling outside of the previously/currently cultivated areas and within 500 m of a water source are considered to be the most sensitive areas from a heritage perspective. The possibility also exists that culturally sensitive sites, such as burial sites, might have been created after some of the cultivated fields fell into disuse, meaning that burial sites might be located on disturbed areas as well.

The 64 sites listed in **Table 8** are associated with intact and demolished historical and potentially historical infrastructure that might exceed 60 years of age. The sites associated with surface remains are considered to be sensitive from a heritage perspective, while the sites where no surface remains are visible are considered to be potentially sensitive. The listed sites might therefore be protected under the NHRA (Act No. 25 of 1999). The three identified grave sites are also considered to be sensitive and significant from a heritage perspective as the Human Tissues Act (Act No. 65 of 1983) and Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925), as well as the National Heritage Resources Act (Act No. 25 of 1999) could apply. The remaining 53 sites are of contemporary origin and are unlikely to be sensitive from a heritage perspective.

Table 8: Sensitive Sites.

Site No	Type	Farm Portion	Lat (y)	Lon (x)	Current Status	Age	Sensitivity
2628BD-B-001	Building	12/341	-26.467346	28.809614	Surface Remains	Historical	Sensitive
2628BD-B-002	Building	12/341	-26.463590	28.812563	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-003	Building	10,12/341	-26.460339	28.808585	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-004	Building	10/341	-26.454331	28.805266	Surface Remains	Historical	Sensitive
2628BD-B-005	Building	9/341	-26.442474	28.785815	Surface Remains	Historical	Sensitive
2628BD-B-006	Building	1/341	-26.439609	28.813338	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-007	Building	2/341	-26.432517	28.805843	Surface Remains	Historical	Sensitive
2628BD-B-008	Building	5/341	-26.448746	28.819696	Surface Remains	Historical	Sensitive
2628BD-B-009	Building	3/341	-26.439553	28.817260	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-010	Building	7/341	-26.433801	28.841964	Surface Remains	Historical	Sensitive
2628BD-B-011	Building	14/341	-26.431246	28.830394	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-012	Building	15/341	-26.434551	28.826865	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-013	Building	3/344	-26.417524	28.815361	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-014	Building	2/344	-26.420015	28.856225	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-015	Building	32/350	-26.407907	28.866471	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-016	Building	32/350	-26.406241	28.869869	Surface Remains	Historical	Sensitive
2628BD-B-017	Building	3/350	-26.414006	28.877028	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-018	Building	4/350	-26.409144	28.900519	Surface Remains	Historical	Sensitive
2628BD-B-019	Building	17/350	-26.420267	28.900845	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-020	Building	17/350	-26.421514	28.905385	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-021	Building	17/350	-26.419351	28.906597	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-022	Building	2/344	-26.416639	28.860201	Surface Remains	Historical	Sensitive
2628BD-B-023	Building	2,3/344	-26.421079	28.857294	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-024	Building	7/341	-26.430417	28.845307	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-025	Building	35/350	-26.404774	28.872774	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-026	Building	1/350	-26.428162	28.892691	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-027	Building	1/350	-26.437018	28.892499	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-028	Building	1/344	-26.417379	28.864841	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-029	Building	0/347	-26.434092	28.855437	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-030	Building	0/347	-26.462256	28.835339	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-031	Building	0/347	-26.467901	28.828866	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-032	Building	2/344	-26.409675	28.861057	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-033	Building	2/344	-26.403624	28.854191	No Surface Remains	Historical	Potentially Sensitive

Site No	Type	Farm Portion	Lat (y)	Lon (x)	Current Status	Age	Sensitivity
2628BD-B-034	Building	3/344	-26.422772	28.843691	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-035	Building	3/344	-26.419373	28.839262	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-036	Building	3/344	-26.422789	28.835979	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-037	Building	7/341	-26.429426	28.840886	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-038	Building	2/341	-26.430784	28.812063	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-039	Building	1/341	-26.444170	28.807324	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-040	Building	10/341	-26.458133	28.807198	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-041	Hut	9/341	-26.438134	28.791518	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-042	Hut	1/341	-26.455874	28.816234	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-043	Building	1/341	-26.443939	28.810769	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-044	Hut	1/341	-26.442563	28.807990	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-045	Building	2/341	-26.431337	28.815089	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-046	Building	8/341	-26.429366	28.818608	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-047	Grave	3/344	-26.420043	28.830526	Unknown	Potentially Historical	Sensitive
2628BD-B-048	Hut	2/344	-26.418657	28.858811	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-049	Building	4/350	-26.410390	28.899647	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-050	Building	28/350	-26.412990	28.902828	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-051	Hut	28/350	-26.414832	28.898256	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-052	Hut	28/350	-26.413430	28.896954	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-053	Hut	27/350	-26.414306	28.894672	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-054	Grave	1/350	-26.431745	28.899612	Unknown	Potentially Historical	Sensitive
2628BD-B-055	Grave	1/350	-26.433075	28.888226	Unknown	Potentially Historical	Sensitive
2628BD-B-056	Building	1/350	-26.433843	28.891729	No Surface Remains	Potentially Historical	Potentially Sensitive
2628BD-B-064	Building	4/350	-26.408945	28.901807	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-067	Building	4/350	-26.409890	28.900203	Surface Remains	Historical	Sensitive
2628BD-B-107	Building	17/350	-26.420666	28.903742	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-108	Building	17/350	-26.419536	28.907749	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-109	Building	28/350	-26.410979	28.900564	Surface Remains	Historical	Sensitive
2628BD-B-110	Building	3/350	-26.416734	28.874731	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-114	Building	2/344	-26.405014	28.857224	No Surface Remains	Historical	Potentially Sensitive
2628BD-B-115	Building	7/341	-26.434721	28.840814	No Surface Remains	Historical	Potentially Sensitive

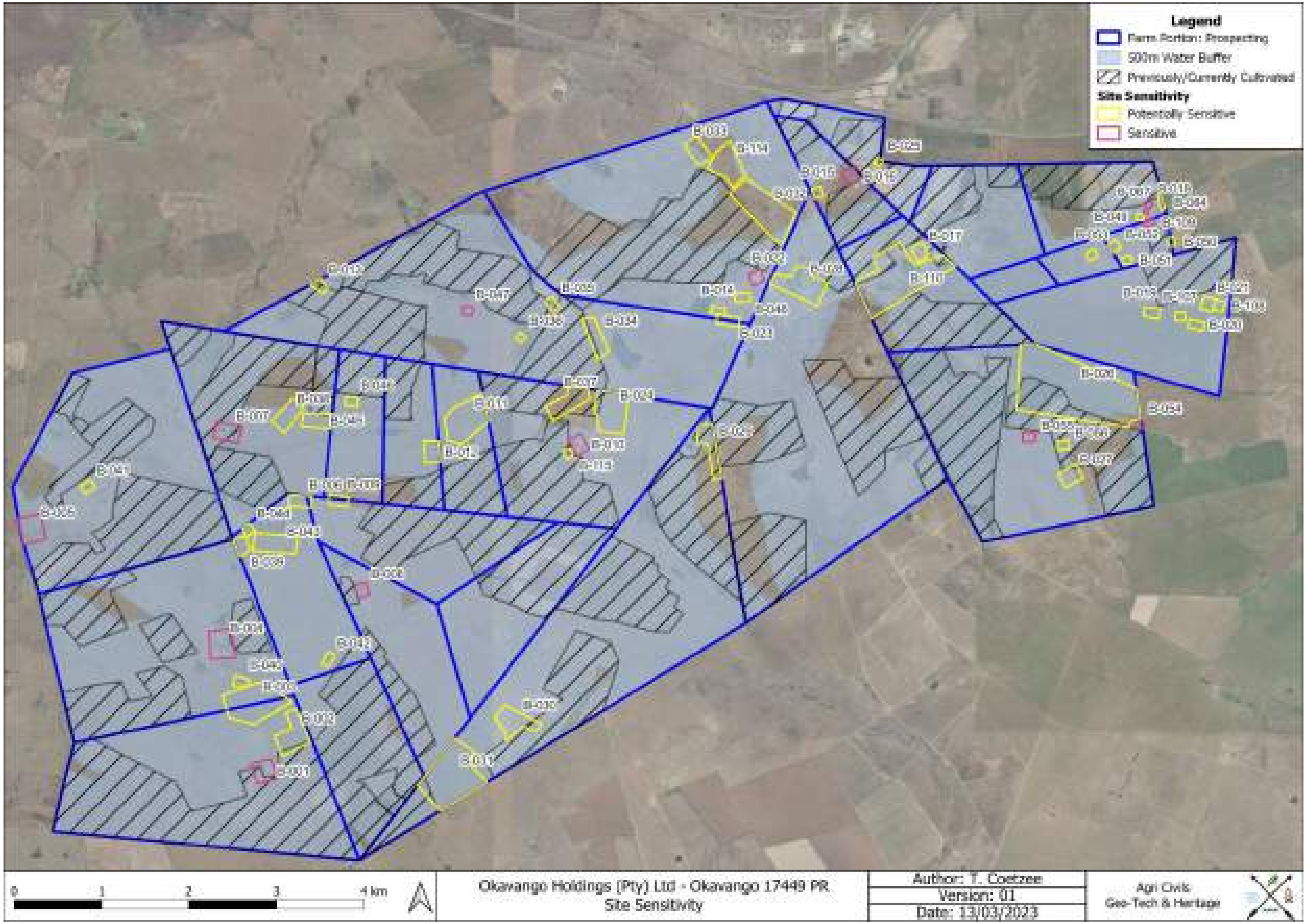

Figure 24: Sensitive Areas.

7.2 Recommendations

The following recommendations are made in order to avoid the destruction of heritage remains within the area demarcated for prospecting:

- Although the 50 demolished historical and potentially historical sites (**Table 8**) appear not to be associated with surface remains anymore, subsurface culturally significant material might be present. The possibility also exists that historical surface remains exceeding 60 years of age are present, but are not detectable on aerial imagery. Therefore, it is recommended that the demarcated areas be avoided by the proposed prospecting activities. Should this not be possible, a qualified archaeologist should first inspect the sites in order to determine the potential presence of heritage remains.

- The 11 sites that appear to be associated with historical surface infrastructure are likely to exceed 60 years of age (**Table 8**). Therefore, it is recommended that the demarcated areas be avoided by the proposed prospecting activities. Should this not be possible, a qualified archaeologist should first inspect the sites in order to determine the significance of the sites.

- The buildings and structures associated with the 53 sites listed in **Table 5** appear not to exceed 60 years of age and are unlikely to be significant from a heritage perspective. However, should impact to the sites be unavoidable, it is recommended that a qualified archaeologist inspect the sites prior to any impact.

- The three identified grave sites are considered to be sensitive from a heritage perspective. Therefore, a radius of 50 m from the sites must be avoided by the proposed prospecting activities. Should this not be possible, it is recommended that a qualified archaeologist first inspect the sites to provide the required recommendations.

- The 500 m buffer zone surrounding the perennial and non-perennial rivers is potentially sensitive from a heritage perspective. Although the previously/currently cultivated areas that intersect the 500 m buffer zone are disturbed, the potential for subsurface cultural material still exists. Care should be exercised when prospecting in this vicinity.

- The least sensitive areas are associated with cultivated fields located outside of the 500 m buffer zone and areas not located within close proximity of potential heritage sites or contemporary infrastructure. These areas should therefore be considered when selecting prospecting sites.

- Apart from the identified potential sites, undisturbed areas located within 500 m of a water source are considered to be the most sensitive from a heritage perspective. Care should therefore be exercised when prospecting in these areas.

- Should uncertainty regarding the presence of heritage remains exist, or of heritage sites are discovered by chance, it is advised that the potential site be avoided and that a qualified archaeologist be contacted. Alternatively, once the prospecting localities have been identified, a qualified archaeologist can inspect the proposed sites and provide recommendations that will aid the protection of heritage resources.

- Prospecting should not take place in the vicinity of stone cairns, potential burial sites, stone-walling, building ruins or any other heritage material or structures.

- Should the prospecting outcome result in further development or construction, a full Phase 1 Archaeological Impact Assessment must be conducted on the affected area if triggered. Also, a full Phase 1 AIA must be conducted should the cumulative impact of the proposed prospecting exceed 0.5 ha.

- Since archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the prospecting phase, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed, all activities must be suspended and the relevant heritage resources authority must be contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)).

- From a heritage point of view, prospecting may proceed on the demarcated portions, subject to the abovementioned conditions and recommendations.

8. Conclusion

The proposed Okavango Prospecting Project that consists of the prospecting of coal on the demarcated farm portions intersecting the Farms Watervalshoek 350 IR, Gruisfontein 344 IR, Wonderfontein 341 IR and Kuilwater 347 IR covers approximately 6430.2 ha. The general area is characterised by open grassland and cultivated land. The Archaeological Desktop Study examined the area using a combination of historical aerial imagery, historical topographical maps, contemporary satellite imagery, as well as written sources and previous heritage studies conducted in the area. Sixty-one (61) historical and potentially historical sites, 53 areas associated with contemporary infrastructure, as well as three grave sites were noted. These areas should be avoided by the proposed prospecting activities. Other potentially sensitive areas include the 500 m buffer zone surrounding rivers, as well as undisturbed sections.

Should the recommendations made in this study be adhered to, the proposed Okavango Prospecting Project may proceed.

9. Addendum: Terminology

Archaeology:

The study of the human past through its material remains.

Artefact:

Any portable object used, modified, or made by humans; e.g. pottery and metal objects.

Assemblage:

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

Context:

An artefact's context usually consist of its immediate *matrix* (the material surrounding it e.g. gravel, clay or sand), its *provenience* (horizontal and vertical position within the matrix), and its *association* with other artefacts (occurrence together with other archaeological remains, usually in the same matrix).

Cultural Resource Management (CRM):

The safeguarding of the archaeological heritage through the protection of sites and through selvage archaeology (rescue archaeology), generally within the framework of legislation designed to safeguard the past.

Excavation:

The principal method of data acquisition in archaeology, involving the systematic uncovering of archaeological remains through the removal of the deposits of soil and other material covering and accompanying it.

Feature:

An irremovable artefact; e.g. hearths or architectural elements.

Ground Reconnaissance:

A collective name for a wide variety of methods for identifying individual archaeological sites, including consultation of documentary sources, place-name evidence, local folklore, and legend, but primarily actual fieldwork.

Matrix:

The physical material within which artefacts is embedded or supported, i.e. the material surrounding it e.g. gravel, clay or sand.

Phase 1 Assessments:

Scoping surveys to establish the presence of and to evaluate heritage resources in a given area.

Phase 2 Assessments:

In-depth culture resources management studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling is required.

Sensitive:

Often refers to graves and burial sites although not necessarily a heritage place, as well as ideologically significant sites such as ritual / religious places. *Sensitive* may also refer to an entire landscape / area known for its significant heritage remains.

Site:

A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity.

Surface survey:

There are two kinds: (1) unsystematic and (2) systematic. The former involves field walking, i.e. scanning the ground along one's path and recording the location of artefacts and surface features. Systematic survey by comparison is less subjective and involves a grid system, such that the survey area is divided into sectors and these are walked ally, thus making the recording of finds more accurate.

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

Removal of Graves and Dead Bodies Ordinance No. 7 of 1925, Government Gazette, Cape Town

Appendix A: Historical Aerial Imagery & Topographical Maps

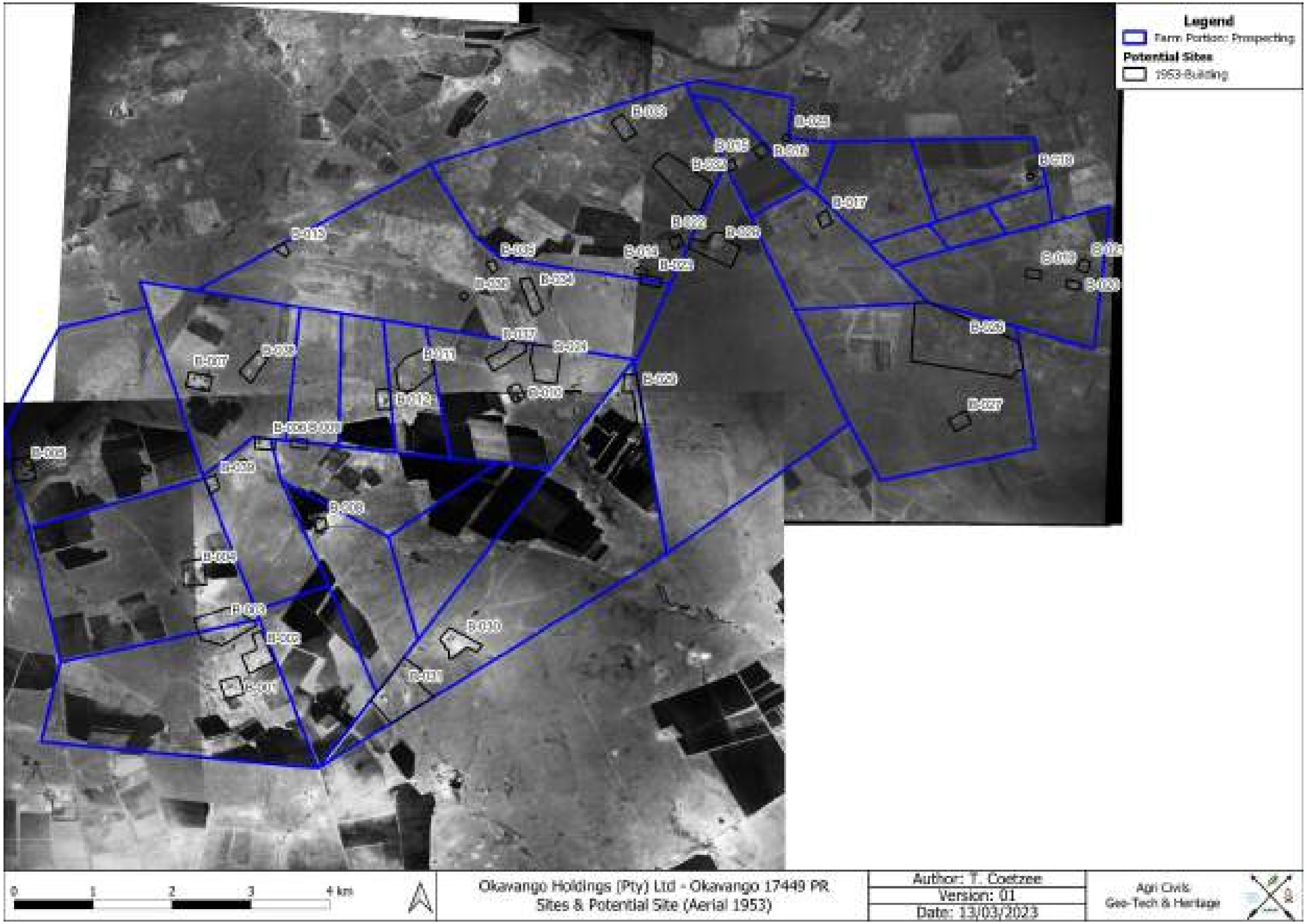

Figure 25: 1953 Aerial image of the study area.

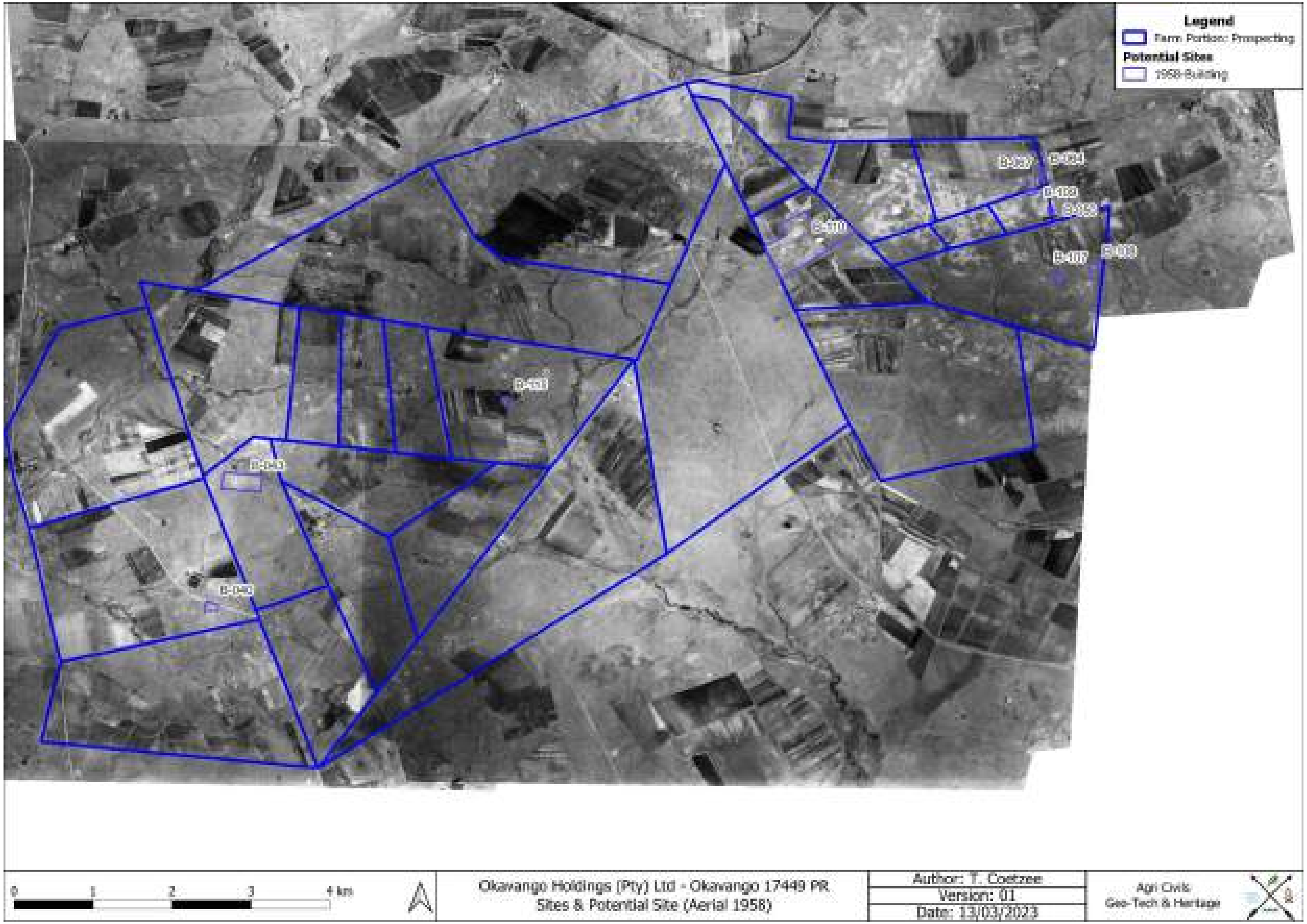

Figure 26: 1958 Aerial image of the study area.

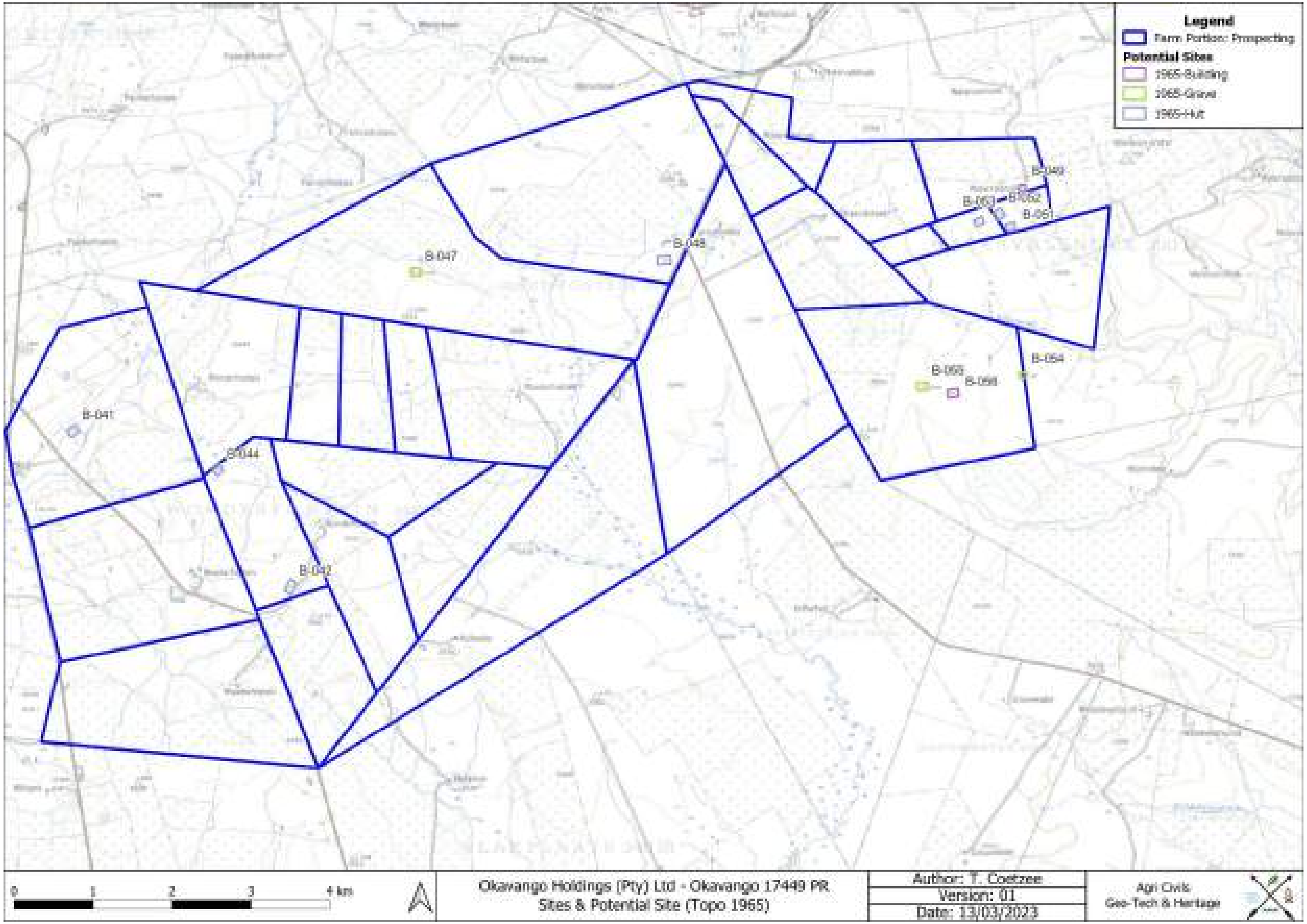

Figure 27: Segment of 1965 1:50 000 2628 BD indicating the study area.

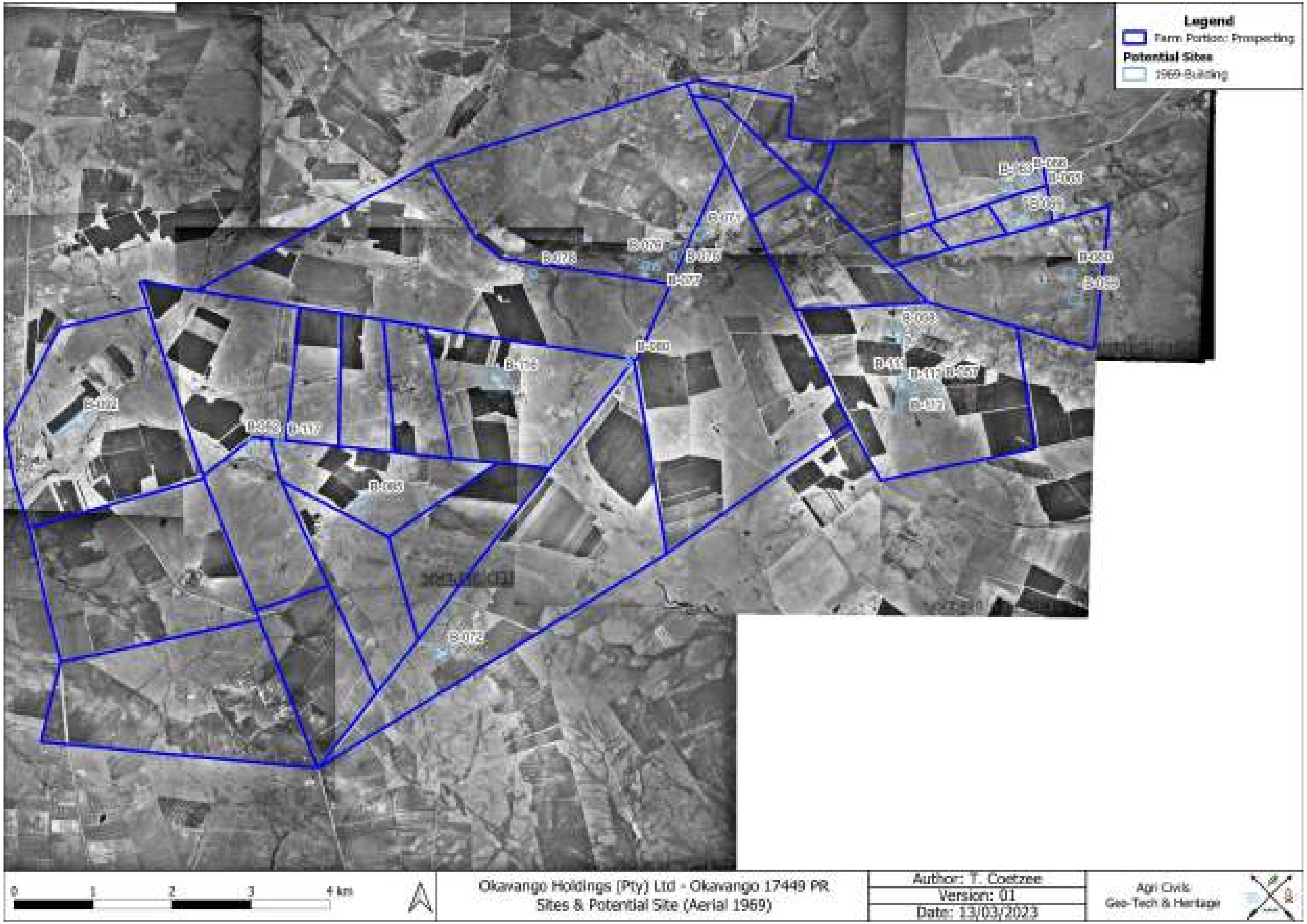

Figure 28: 1969 Aerial image of the study area.

Figure 29: 1975 Aerial image of the study area.

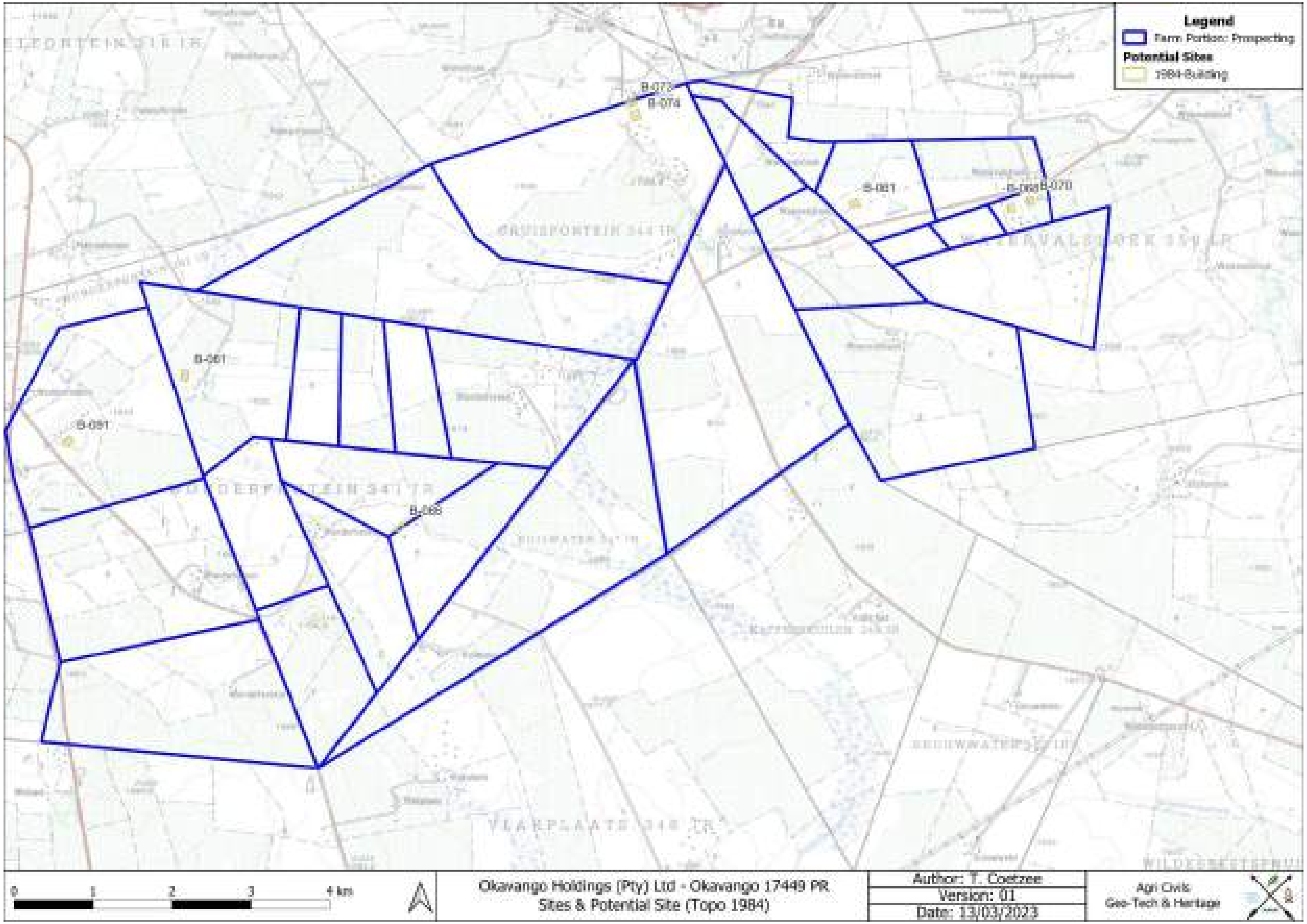

Figure 30: Segment of 1984 1:50 000 2628 BD indicating the study area.

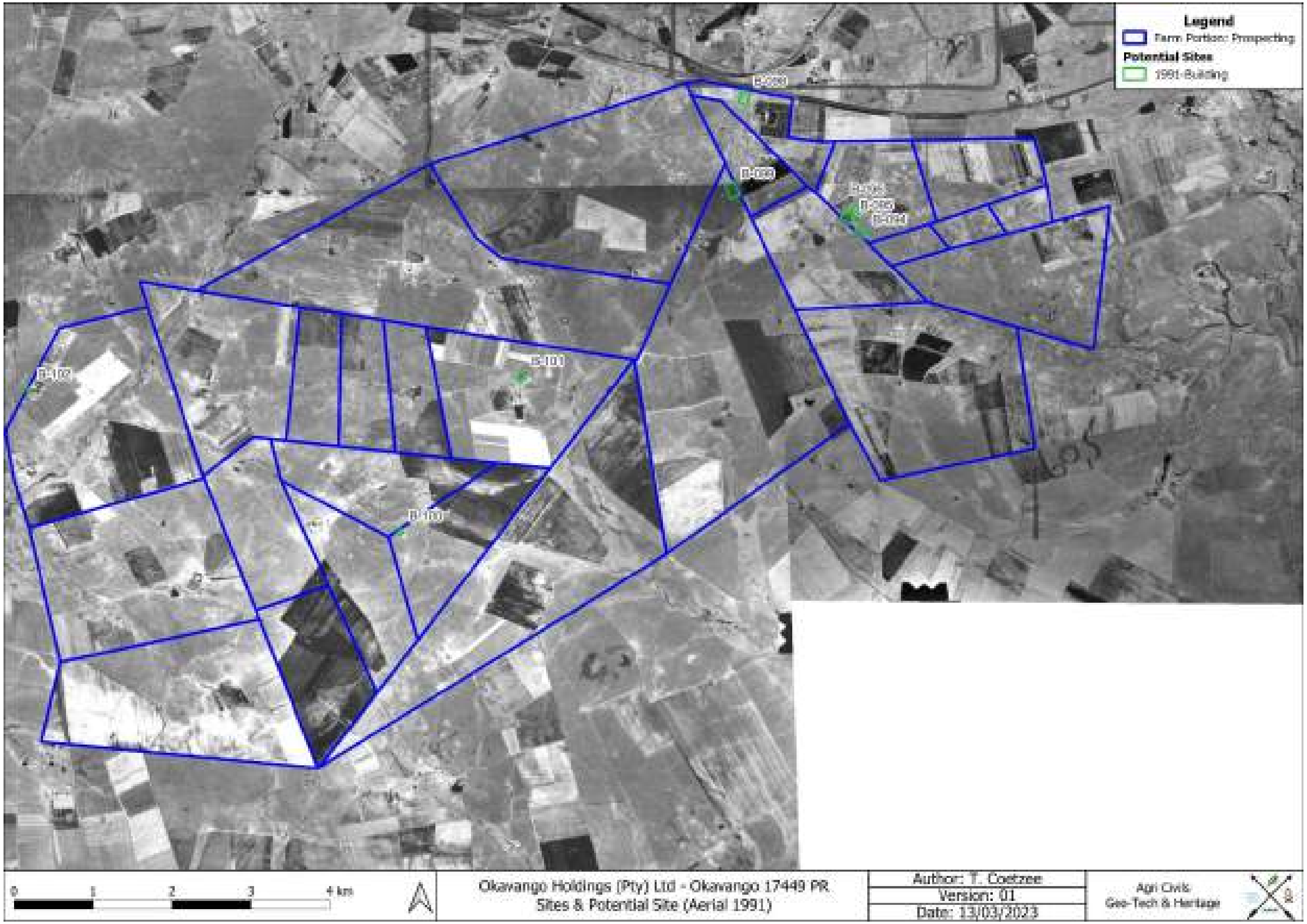

Figure 31: 1991 Aerial image of the study area.

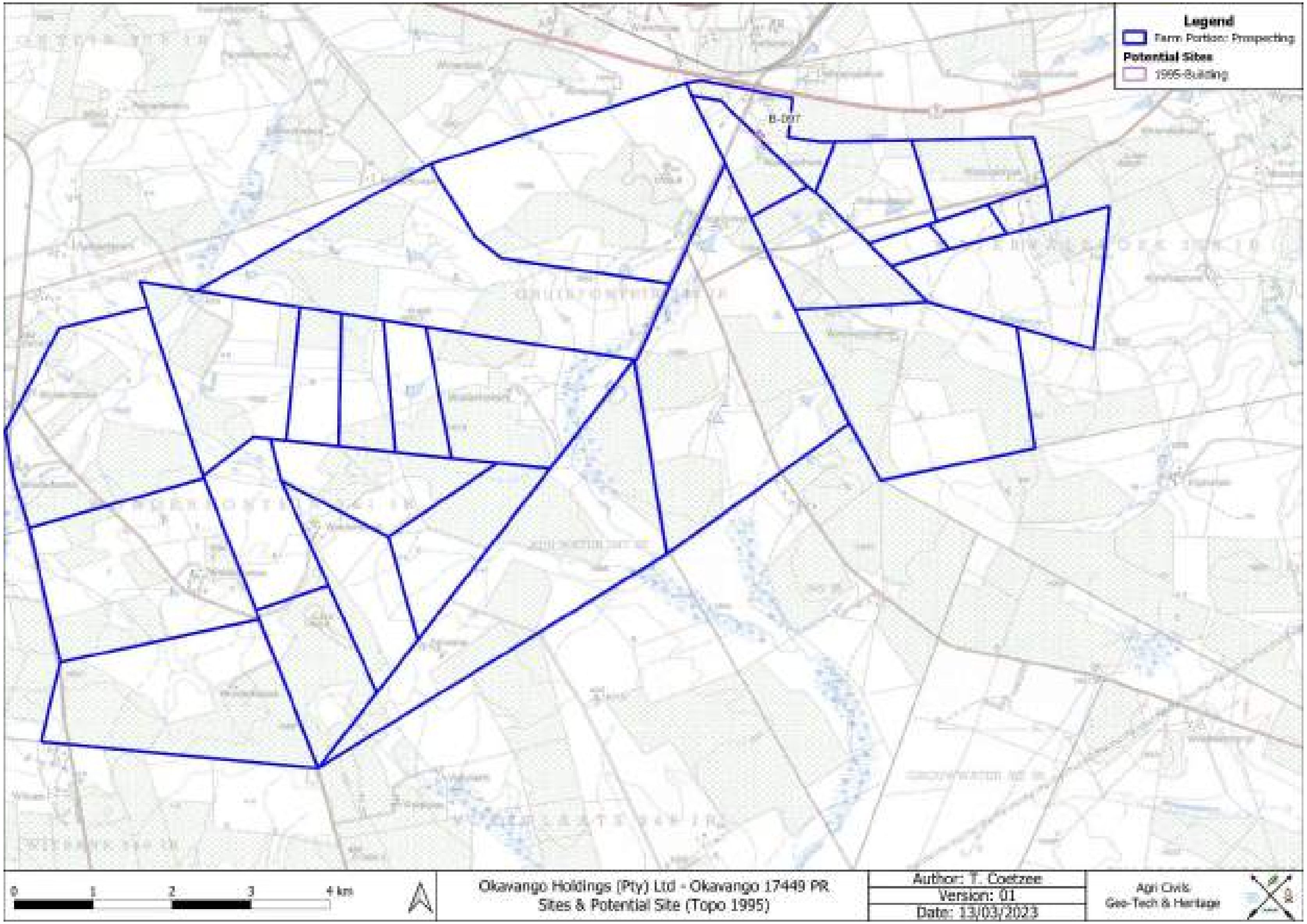

Figure 32: Segment of 1995 1:50 000 2628 BD indicating the study area.

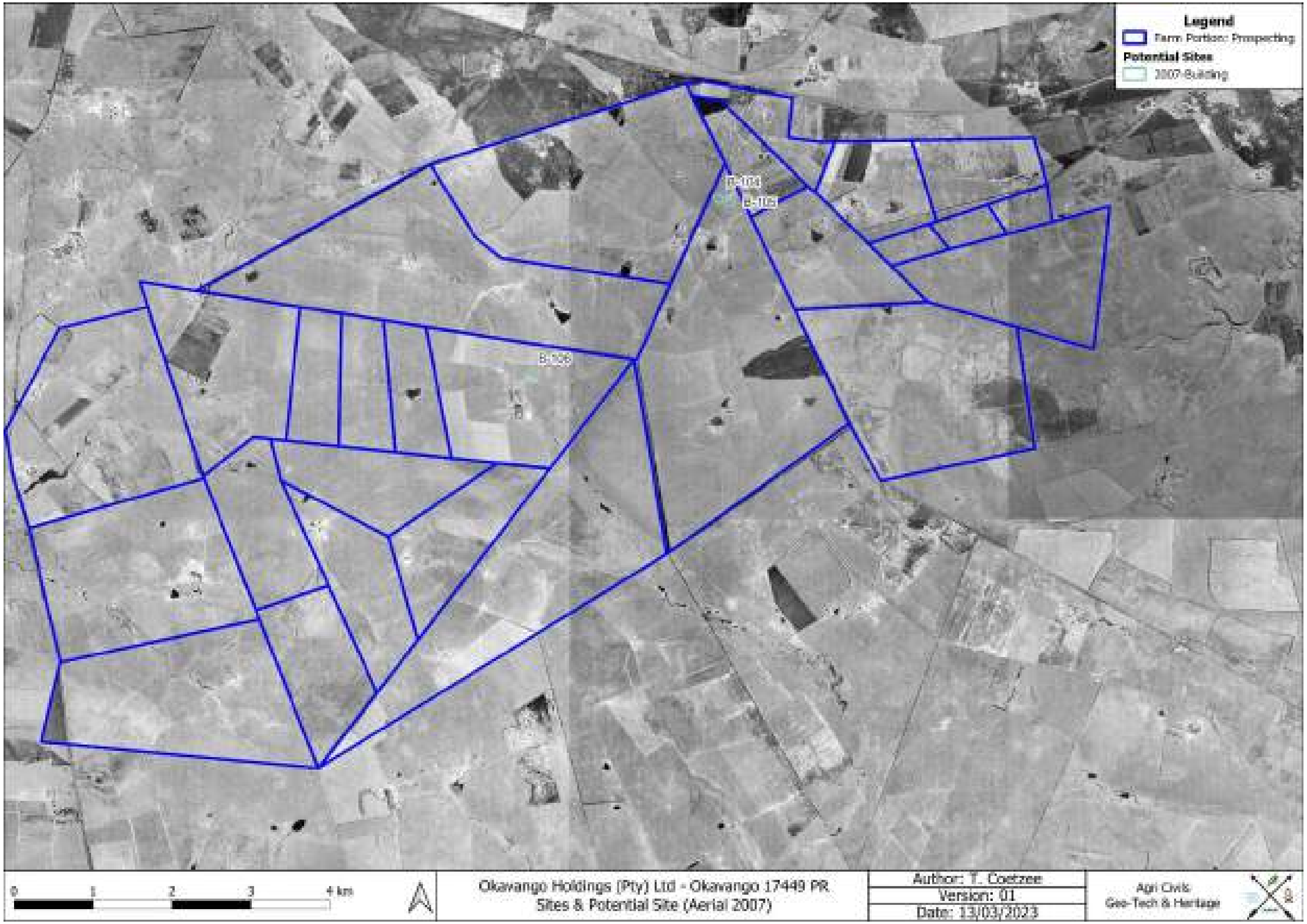

Figure 33: 2007 Aerial image of the study area.

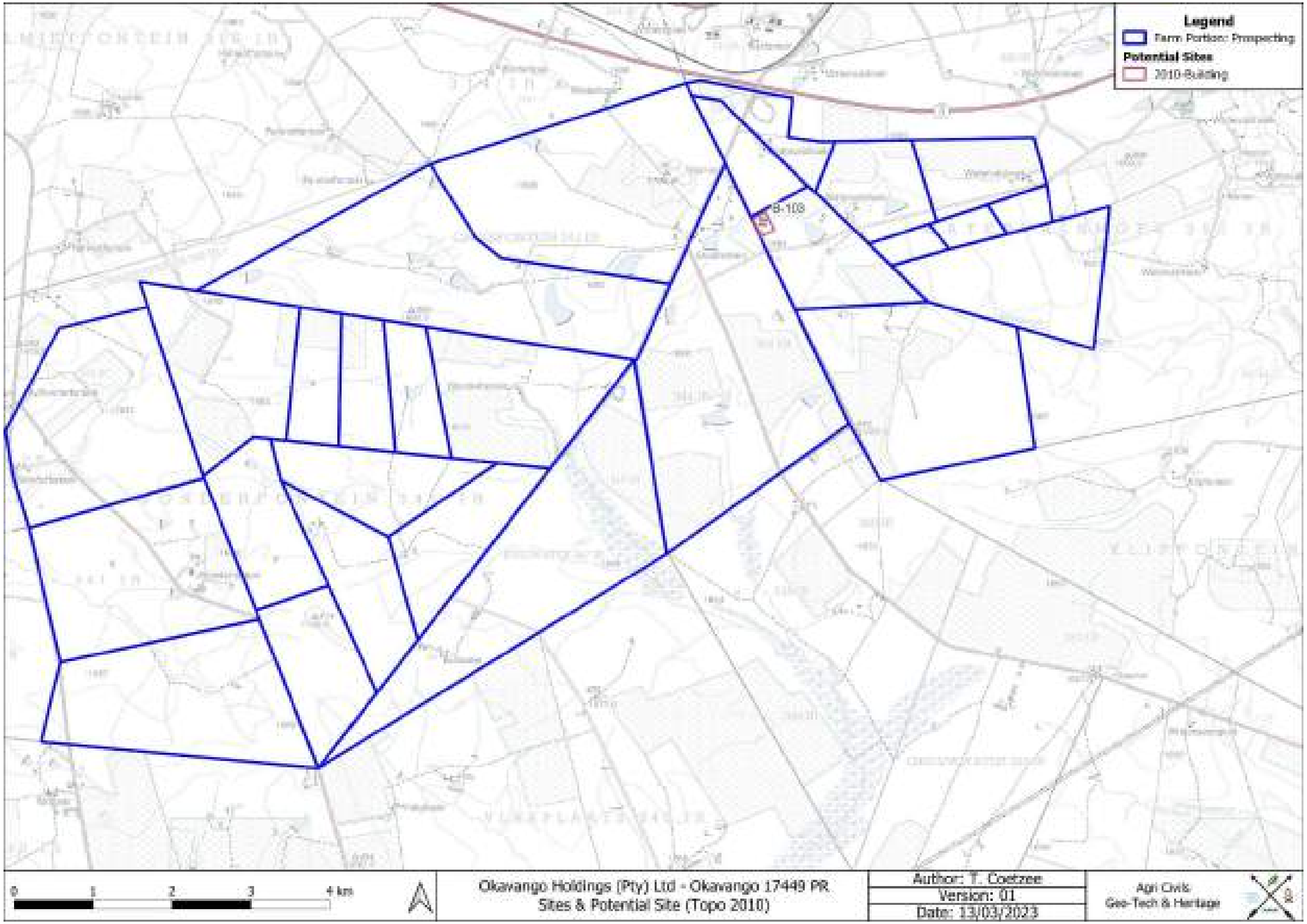

Figure 34: Segment of 2010 1:50 000 2628 BD indicating the study area.

WETLAND AND ECOLOGICAL DESKTOP ASSESSMENT

PROPOSED OKOVANGU PROSPECTING, LEANDRA MPUMALANGA PROVINCE

March 2023

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I, **Jacob Schrijvershof,** declare that -

- I act as the independent specialist in this matter;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist assessment relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998) (NEMA) and the National Water Act (Act 36 of 1998), regulations and any guidelines that have relevance to the proposed activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; all the particulars furnished by me in this report are true and correct;
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B (1) of the National Environmental Management Act, 1998 (Act 107 of 1998); and
- I understand that any false information published in this document is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Joppie Schrijvershof

Executive summary

The purpose of this report is to summarise the Wetland and Ecological Desktop findings for the proposed prospecting activities for Okovangu near Leandra in the Mpumalanga Province.

The scope of work entailed to the Wetland and Ecological Desktop Assessment following:

- Assess the NFEPA database for any wetlands in the vicinity of the project area;
- Assess the topography of the surrounding area via a Digital Elevation Model (DEM) for any occurrences of any wetlands;
- An examination of SANBI GIS databases on Endemic and Red Data faunal and floral species in the study area; and
- A literature search on Red Data Book species predicted to occur in the study area.

A summary of the results obtained during the study:

- The site falls within the quaternary drainage regions B20E which is part of the Olifants Water Management Area, where the C21A and C12D catchments forms part of the Vaal Water Management Area. From a land use perspective, the water management area still remains almost totally under natural vegetation. Sheep and goat farming is practiced over most of the area. Cultivation is restricted to isolated patches where the majority consists of low shrubland.
- No RAMSAR wetlands are found within the vicinity of the study site.
- Several small segments of seep and valley bottom wetlands were identified within the application area according to the NFEPA wetlands database.
- The area ranges in altitude from 1629 m to 1705 m above sea level. A Digital Elevation Model (DEM) of the aerial photography of the site revealed that the topography of the landscape is a relatively flat with drainage line landscape. The landscape is drained towards the south-west to the Vaal catchment and north-east to the Olifants catchment.
- The project boundary overlaps with two major vegetation units in terms of Mucina and Rutherford (2013) namely the Soweto Highveld grassland and the Eastern temperate Freshawater Wetlands. According to the Critical Biodiversity Areas datasets provided by SANBI (2023), a very large portion of application area falls within Critical Biodiversity Areas. The remainder of the application area overlaps with Ecological Support Areas. The sensitive areas seems to be associated with the wetlands and rivers within the area. The proposed

prospecting project does overlap with the Soweto Highveld Grassland and is listed as an endangered ecosystem. The proposed prospecting project not fall within/close to any Important Bird Areas.

- Vegetation normally associated with that area is listed in **Appendix A** depicted from SANBI's POSA list. Information on plant species recorded in that area was extracted from the POSA list, indicate that 80 plant species have been recorded in the area queried of which 77 are endemic species are known to occur within the area queried. *Nerine gracilis* listed as Vulnerable and *Kniphofia typhoides*; *Stenostelma umbelluliferum*; *Gladiolus robertsoniae* listed as Near Threatened is thought to occur within these areas.
- All faunal species thought to occur within 2628BD is listed in **Appendix B**. No red data amphibians or reptiles were identified as occurring in the quarter degree squares 2628BD.
- Based on an evaluation of the pentads 2625_2845 and 2625_2850 (**Appendix C**)the potential of these red listed species include Pallid Harrier (*Circus macrourus*) listed as Near Threatened; Black Harrier (*Circus maurus*) listed as Vulnerable; Maccoa Duck (*Oxyura maccoa*) listed as Near Threatened; Blue Crane (*Anthropoides paradiseus*) listed as Vulnerable; Grey Crowned (Crowned) Crane (*Balearica regulorum*) listed as Endangered; Blue Korhaan (*Eupodotis caerulescens*) listed as Near Threatened; Denham's (Stanley's) Bustard (*Neotis denhami*) listed as Near Threatened and the Secretarybird (*Sagittarius serpentarius*) listed as Vulnerable.
- The Highveld Golden Mole (*Amblysomus septentrionalis)* listed as Vulnerable; the Southern African Hedgehog (*Atelerix frontalis*); Southern African Vlei Rat (*Otomys auratus*); African Clawless Otter (*Aonyx capensis*); Swamp Musk Shrew (*Crocidura mariquensis*) and Serval (*Leptailurus serval*) listed as Near Threatened is thought to possibly occur within the area according to SANBI (2023).
- It is recommended that the proposed prospecting sites be assessed for any wetlands by means of a field survey to ground truth the presence of the NFEPA wetlands identified in the desktop study. The riverine areas should be assessed in terms of their ecological state and the aquatic risk assessment must be implemented. The area must be surveyed for any red listed fauna and flora species.

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LIST OF ABBREVIATIONS AND ACCRONYMS

ADU:	Animal Demographic Unit
CBA:	Critical Biodiversity Area
EA:	Environmental Authorisations
ESA:	Ecological Support Areas
DEM:	Digital Elevation Model
DWS:	Department of Water Affairs and Sanitation
DWAF:	Department of Water Affairs and Forestry
IUCN:	International Union for Conservation of Nature
MAP:	Mean Annual Precipitation
MAMSL:	Meters Above Mean Sea Level
MPRDA:	Mineral and Petroleum Resources Development Act (No. 28 of 2002)
NEMA:	National Environmental Management Act (No. 107 of 1998) [as amended]
NEMBA:	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NFEPA:	National Freshwater Priority Area
QDS:	Quaternary Degree Square
SANBI:	South African National Biodiversity Institute
WMA	Water Management Area

1 INTRODUCTION

1.1 Background

Oasis Environmental Specialists (Pty) Ltd was appointed by Eco Elementum (Pty) Ltd to conduct the Wetland and Ecological Desktop Assessment for a prospecting right for Okovangu near Leandra in the Mpumalanga Province (**Figure 1**).

The proposed project area is 6 400 ha in extend. The development area farm portions falls within the 2628BD Quaternary Degree Square (QDS). The site is currently surrounded by smallscale agricultural activities, low shrubland and urban development (**Figure 2)**.

1.2 Scope of work

The scope of work entailed to the Wetland Desktop Assessment following:

- Assess the NFEPA database for any wetlands in the vicinity of the project area; and
- Assess the topography of the surrounding area via a Digital Elevation Model (DEM) for any occurrences of any wetlands.

The scope of work entailed to the Ecological Desktop Assessment following:

- An examination of SANBI GIS databases on Endemic and Red Data faunal and floral species in the study area; and
- A literature search on Red Data Book species predicted to occur in the study area.

1.3 Assumptions and Limitations

It is difficult to apply pure scientific methods within a natural environment with limitations, where consequential assumptions need to be made. While every care is taken to ensure that the data presented is qualitatively adequate, inevitably conditions are never of such a nature that the data is entirely satisfactory. To conduct a comprehensive, completely factually based fauna study, requires an extensive amount of time over different seasons. Unfortunately, such comprehensive studies are generally limited by budget constraints and most importantly by time constraints subject to submission of EA Applications.

It should be noted that the findings of this study were largely based on desktop/historical assessments. Visibility of fauna indicators vary throughout seasons and it is therefore noted that, if in future, any further indicators are found on site, the author cannot be held liable for conclusions deducted in good faith based on the available resources and information provided at the time of the study. It is important that this report be viewed and acted upon with these limitations in mind.

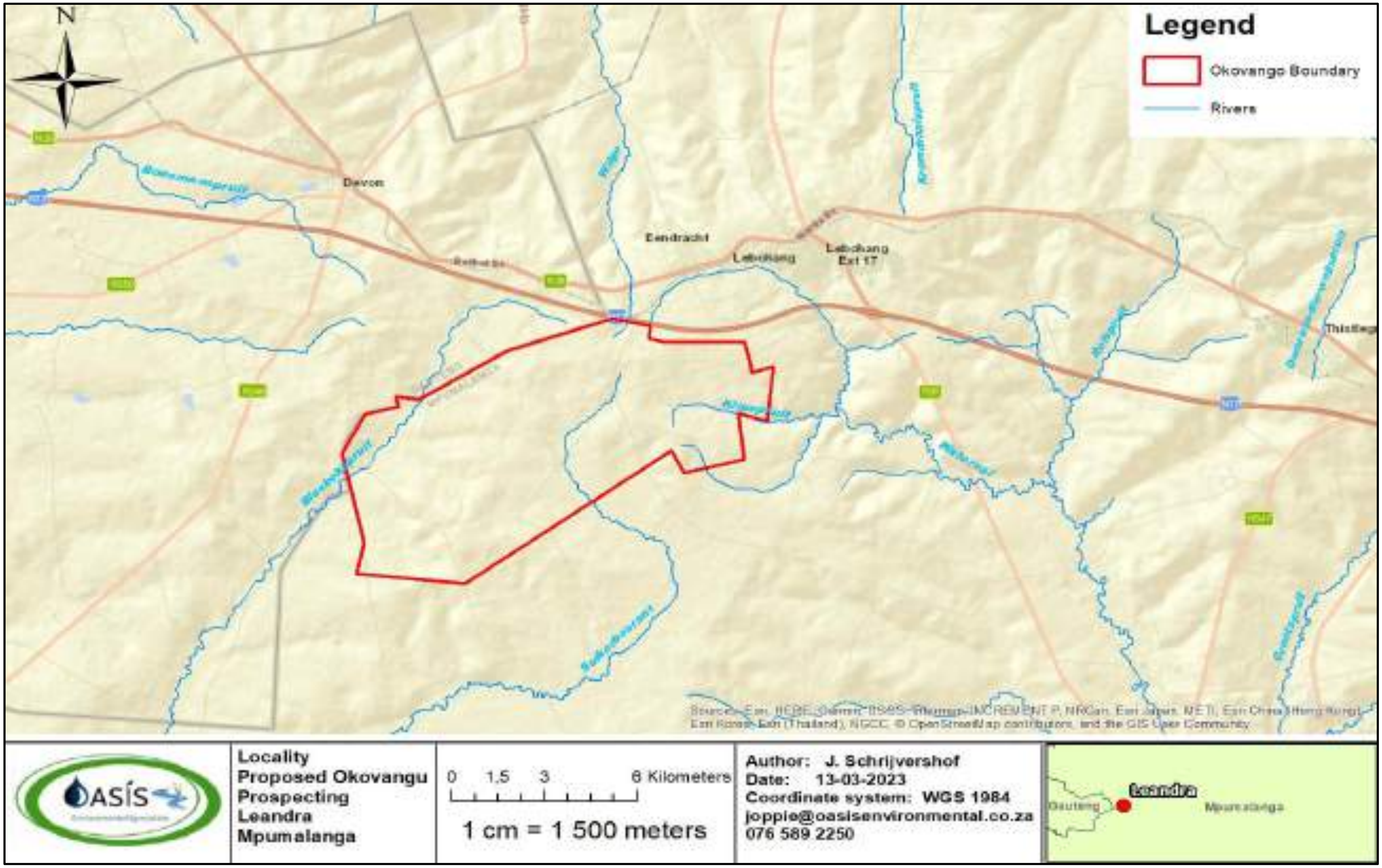

Figure 1: Locality of the proposed prospecting activities**.**

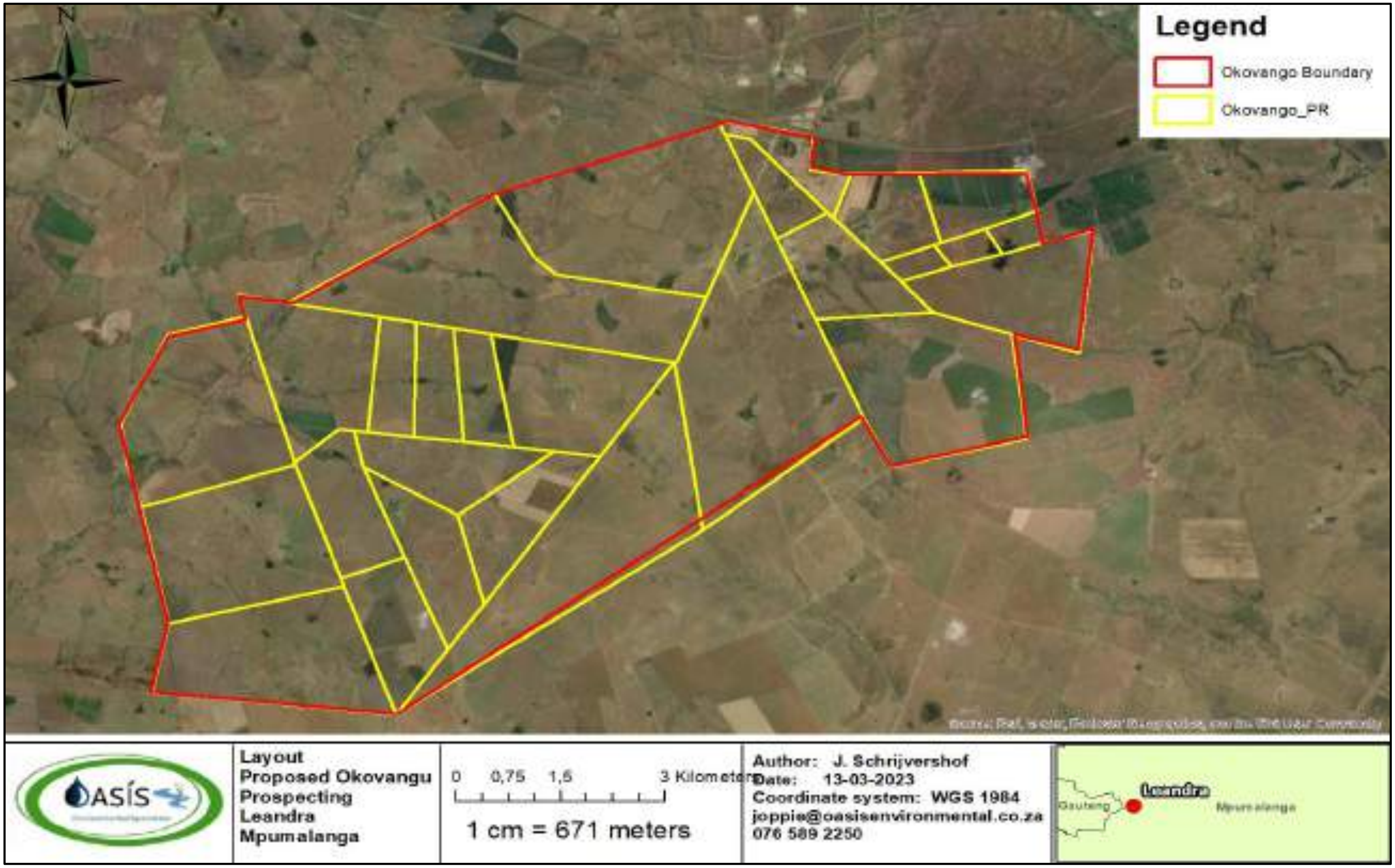

Figure 2: Layout of the proposed prospecting activities.

2 METHODOLOGY

This section details the different techniques and methods utilised to obtain the data for this report in order to finally assess the wetland and riparian conditions of the site based on the various inputs as explained below.

2.1 Desktop Wetland Assessment

For the purpose of this assessment, wetlands and pans are considered as those ecosystems defined by the National Water Act No. 36 of 1998 as:

Wetlands: *''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'';* and

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA)'s databases were undertaken for the project. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs. FEPAs are determined through a process of systematic biodiversity planning and involved collaboration of over 100 freshwater researchers and practitioners. They are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (MacFarlane *et al*., 2009).

The assessment of the study site involved the investigation of aerial photography, GIS databases including the NFEPA and South African National Wetland maps as well as literature reviews of the study site in order to determine the likelihood of wetland areas within this site.

The following data sources and GIS information provided in **Table 1** was utilised to inform the delineation.

Table 1: Information used to inform the desktop assessment.

DATA	USE	SOURCE
Latest and Historic Google Earth ™ imagery	Used to assist with identifying potential areas within the study boundary for the presence of wetland systems.	Google Earth PRO™ On-line
River line	Mapping of watercourses outside of the study site.	Surveyor General
National Wetland Classification System	Assistance with information collection about the site and surrounding areas.	SANBI
National Freshwater Ecosystem Priority Area maps and database	Information gathering regarding the presence of FEPA wetlands on the site and within surrounding areas.	Water Research Commission, Implementation: Manual and Maps for FEPA

Figure 3 below represents and describes all specific wetland types and have been divided into eight units. These units are described as follows (Kotze *et al*., 2008):

Channel (river, including the banks) - an open conduit with clearly defined margins that continuously or periodically contains flowing water. Dominant water sources include concentrated surface flow from upstream channels and tributaries, diffuse surface flow or interflow, and/or groundwater flow.

Channelled valley-bottom wetland - a mostly flat valley-bottom wetland dissected by and typically elevated above a channel. Dominant water inputs to these areas are typically from the channel, either as surface flow resulting from overtopping of the channel bank/s or as interflow, or from adjacent valley-side slopes (as overland flow or interflow).

Un-channelled valley-bottom wetland - a mostly flat valley-bottom wetland area without a major channel running through it, characterised by an absence of distinct channel banks and the prevalence of diffuse flows, even during and after high rainfall events.

Floodplain wetland - the mostly flat or gently sloping wetland area adjacent to and formed by a Lowland or Upland Floodplain river, and subject to periodic inundation by overtopping of the channel bank.

Depression - a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates. Dominant water sources are precipitation, ground water discharge, interflow and (diffuse or concentrated) overland flow.

Flat - a near-level wetland area (i.e. with little or no relief) with little or no gradient, situated on a plain or a bench in terms of landscape setting. The primary source of water is precipitation.

Hillslope seep - a wetland area located on (gentle to steep) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope.

Valley head seep - a gently-sloping, typically concave wetland area located on a valley floor at the head of a drainage line, with water inputs mainly from subsurface flow.

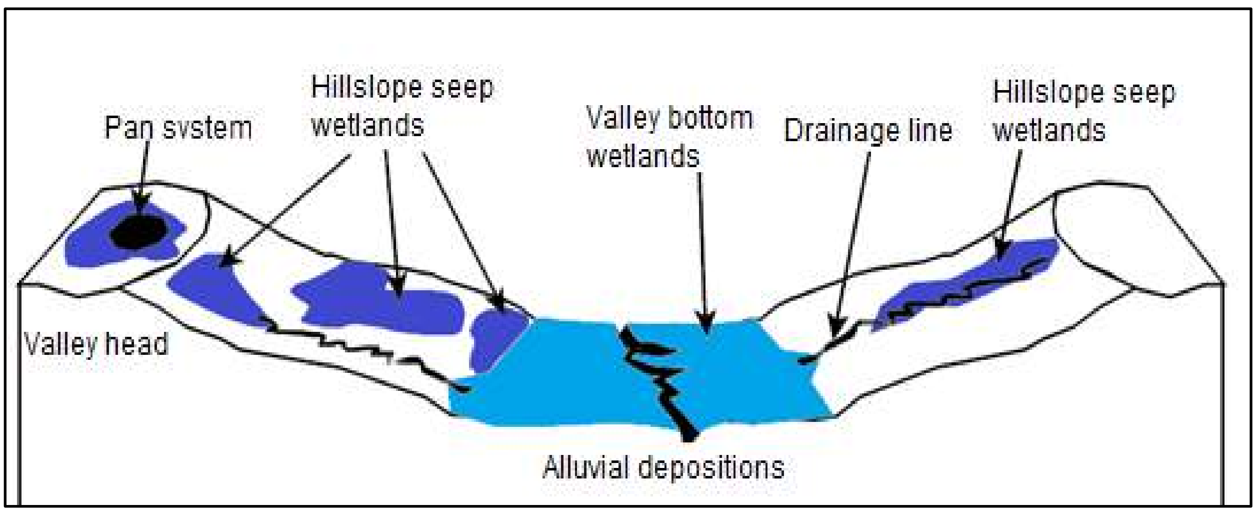

Figure 3: Diagrammatic representation of common wetland systems identified in Southern Africa (based on Kotze *et al*., 2008).

2.2 Desktop Ecological Assessment

It is important to note that many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have previously been disturbed. Assessing the impacts of a proposed project often requires evaluating the conservation value of the site relative to other natural areas in the surrounding area.

Thus, the general approach and angle adopted for this type of study is to identify any potential faunal species that may be affected by the proposed development. This means that the focus of this report will be on rare, threatened, protected and conservation-worthy species. The general approach adopted for this type of study is thus to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws.

Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which is most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National Legislation protecting environmental and biodiversity resources.

A desktop assessment was conducted to establish whether any potentially sensitive species/receptors might occur within the study area. The South African National Biodiversity Institute's online biodiversity tool, ADU (Animal Demography Unit) Virtual Museum was used to query a species list (**Appendix A**) for the 2628BD Quaternary Degree Square (QDS) within which the study area is situated. To describe the overall site characteristics, and to identify points of interest within the site for evaluation, Google Earth Imagery and the 1:50 000 topographical maps were examined.

This was conducted by researching all available information resources including, but not limited to, the following:

- International Union for Conservation of Nature (IUCN) Red List of Threatened Species;
- The Endangered Wildlife Trust's Red List of Mammals of South Africa, Lesotho and Swaziland; and
- NEMBA List of Threatened or Protected Species (TOPS List);
- Animal Demography Unit (ADU) Virtual Museum;
- SANBI Biodiversity GIS tool; and
- Important Bird and Biodiversity Areas (IBAs) (Birdlife South Africa, 2016).

Biodiversity areas represent terrestrial and aquatic sites identified as Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESA), Other Natural Areas and No Natural Remaining Areas conducted by SANBI.

2.2.1 Critical Biodiversity Areas

Critical Biodiversity Areas are those areas required to meet biodiversity thresholds. CBA's are areas of terrestrial or aquatic features (or riparian vegetation alongside CBA aquatic features) which must be protected in their natural state to maintain biodiversity and ecosystem functioning (Desmet *et al*., 2013). According to Desmet *et al* (2013), these CBAs include:

i) Areas that need to be protected in order to meet national biodiversity pattern thresholds (target area);

ii) Areas required to ensure the continued existence and functioning of species and ecosystems (including the delivery of ecosystem services); and/or

iii) Important locations for biodiversity features or rare species.

2.2.2 Ecological Support Areas

Ecological Support Areas (ESA) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may include an aquatic or terrestrial feature. ESAs can be further subdivided into Critical Ecological Support Areas (CESA) and Other Ecological Support Areas (OESA). Critical Ecological Support Areas are aquatic features, with their terrestrial buffers, which fall within priority sub-catchments, whose protection is required in order to support the aquatic and terrestrial CBAs. An example might be a river reach which feeds directly into a CBA. Other Ecological Support Areas are all remaining aquatic ecosystems (not classed as CESA or CBA), with their terrestrial buffers, which have a less direct impact on the CBA, e.g. a wetland that is geographically isolated from a CBA, but contributes to ecological processes such as groundwater recharge, thereby indirectly impacting on a CBA downstream. (Desmet *et al.*, 2010).

2.2.3 Other Natural Areas

Other Natural Areas are areas of lesser biodiversity importance whose protection is not required in order to meet national biodiversity thresholds. Other Natural Areas may withstand some loss in terms of biodiversity through the conversion of their natural state for development. However, if all Critical Biodiversity Areas are not protected, certain Other Natural Areas will need to be reclassified as Critical Biodiversity Areas in order to meet thresholds. (Desmet *et al.*, 2010).

No Natural Remaining Areas are those areas that have been irreversibly transformed through urban development, plantation and agriculture and poor land management. As a result, these areas no longer contribute to the biodiversity of the region. However, in some cases transformed land may be classified as an ESA or CBA if they still support biodiversity (Desmet *et al.,* 2010).

2.2.4 Threatened Ecosystems

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver *et al*., 2012). Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver *et al*., 2012).

2.2.5 Important Bird Areas

Important Bird Areas are areas that are important for the long-term survival of threatened, restricted avian species (Birdlife South Africa, 2016). BirdLife's Important Bird and Biodiversity Area concept has been developed and applied for over 30 years. Considerable effort has been devoted to refining and agreeing a set of simple but robust criteria that can be applied worldwide.

Important Bird and Biodiversity Areas (IBAs) are:

- Places of international significance for the conservation of birds and other biodiversity;
- Recognised world-wide as practical tools for conservation;
- Distinct areas amenable to practical conservation action;
- Identified using robust, standardised criteria; and
- Sites that together form part of a wider integrated approach to the conservation and sustainable use of the natural environment.

3 Findings

3.1 Desktop Assessment

3.1.1 Quaternary catchment and Land Use

The site falls within the quaternary drainage regions B20E which is part of the Olifants Water Management Area, where the C21A and C12D catchments forms part of the Vaal Water Management Area (**Figure 4**).

From a land use perspective, the water management area still remains almost totally under natural vegetation. Sheep and goat farming is practiced over most of the area. Cultivation is restricted to isolated patches where the majority consists of low shrubland (**Figure 5**).

Large mining operations occur in various parts of the water management area. There are small urban developments and power stations in the water management area. Due to the arid climate, no extensive afforestation occurs. Invading alien vegetation is found along some tributary water courses on river banks and is a problem in some localised areas (DWS, 2016). The project site is situated in an agricultural area. Most of the land along the river is used for crop production, mainly pivot irrigation. The natural veld is used for sheep and cattle grazing and to a lesser extent game farming. The reference scores for each stream/river are listed in **Table 2**.

Table 2: Sub-Quaternary reach desktop data for the area assessed (DWS, 2016).

Reach	SQR Name	PES Category Median	EIS Category
B20E-1383	Wilge	C	High
C12D-1496	Waterval	D	Moderate
C12D-1547	Klip	C	Moderate
C12D-1554	Klip	C	Moderate
C21A-1492	Blesbok	C	Moderate
C21A-1531	Suikerbos	C	Moderate

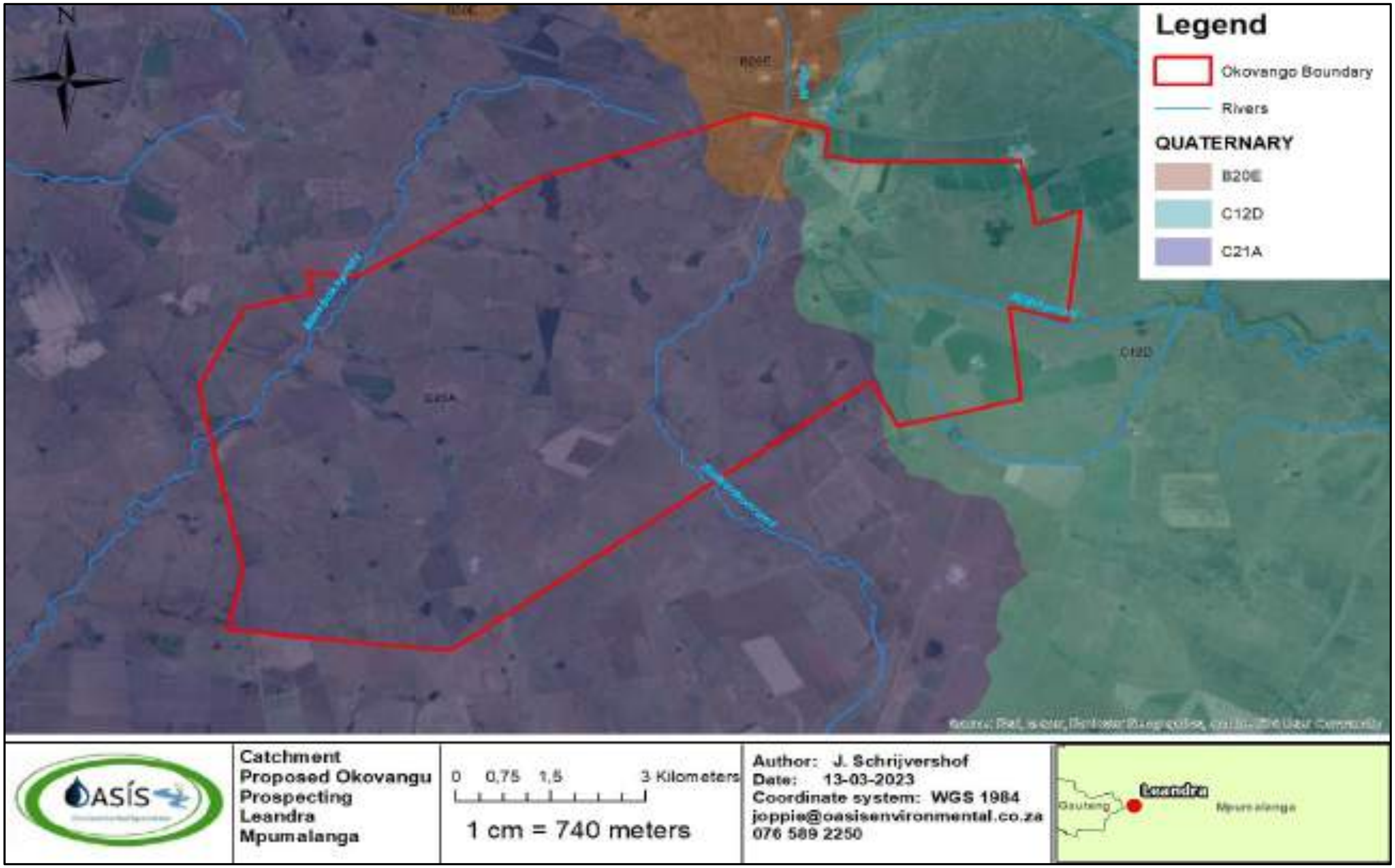

Figure 4: Quaternary Catchment map.

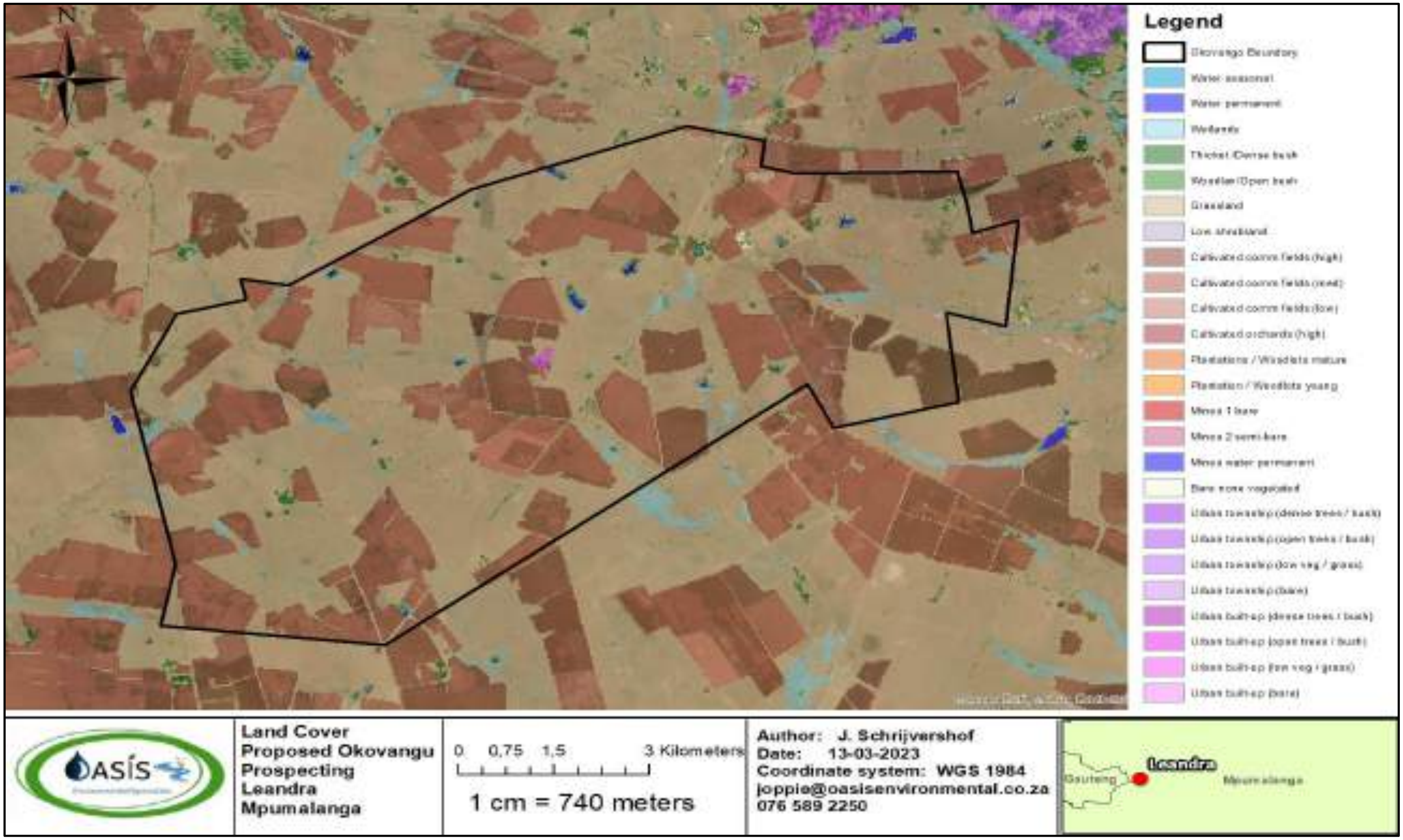

Figure 5: Land cover map.

3.1.2 NFEPA Wetlands

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA) database was undertaken for the study area. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. They are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands/pans and estuaries (MacFarlane *et al*., 2009). Identification of FEPA Wetlands is based on a combination of special features and modelled wetland conditions that include expert knowledge on features of conservation importance as well as available spatial data on the occurrence of threatened frogs and wetland-dependent birds.

Several small segments of seep and valley bottom wetlands were identified within the application area according to the NFEPA wetlands database (**Figure 6**).

Ground-truthing the existence and condition of FEPA wetlands is important to understand local conditions which have an impact on the wetland system, their functional integrity and health.

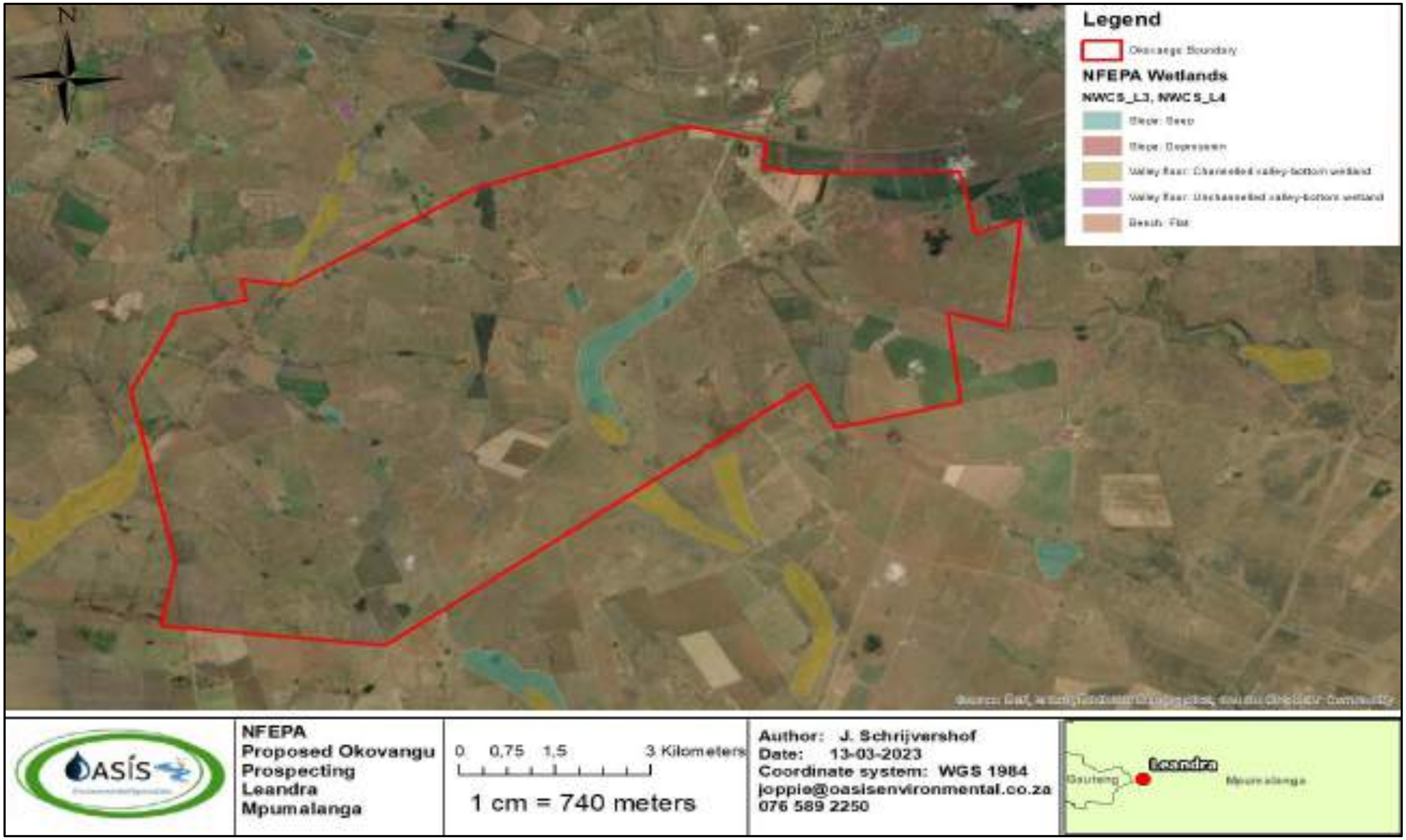

Figure 6: NFEPA Wetlands map.

3.1.3 Terrain Indicator

The topography of an area is generally a good practical indicator for identifying those parts in the landscape where wetlands and pans are likely to occur. Generally, wetlands occur as a valley bottom unit however wetlands can also occur on steep to mid slopes where groundwater discharge is taking place through seeps and where pans can collect water in a depression (DWAF, 2005). In order to classify a wetland/pan system, the localised landscape setting must be taken into consideration through ground-truthing of the study site after initial desktop investigations (Ollis *et al*., 2014).

The area ranges in altitude from 1629 m to 1705 m above sea level. A Digital Elevation Model (DEM) of the aerial photography of the site revealed that the topography of the landscape is a relatively flat with drainage line landscape. The landscape is drained towards the south-west to the Vaal catchment and north-east to the Olifants catchment (**Figure 7**).

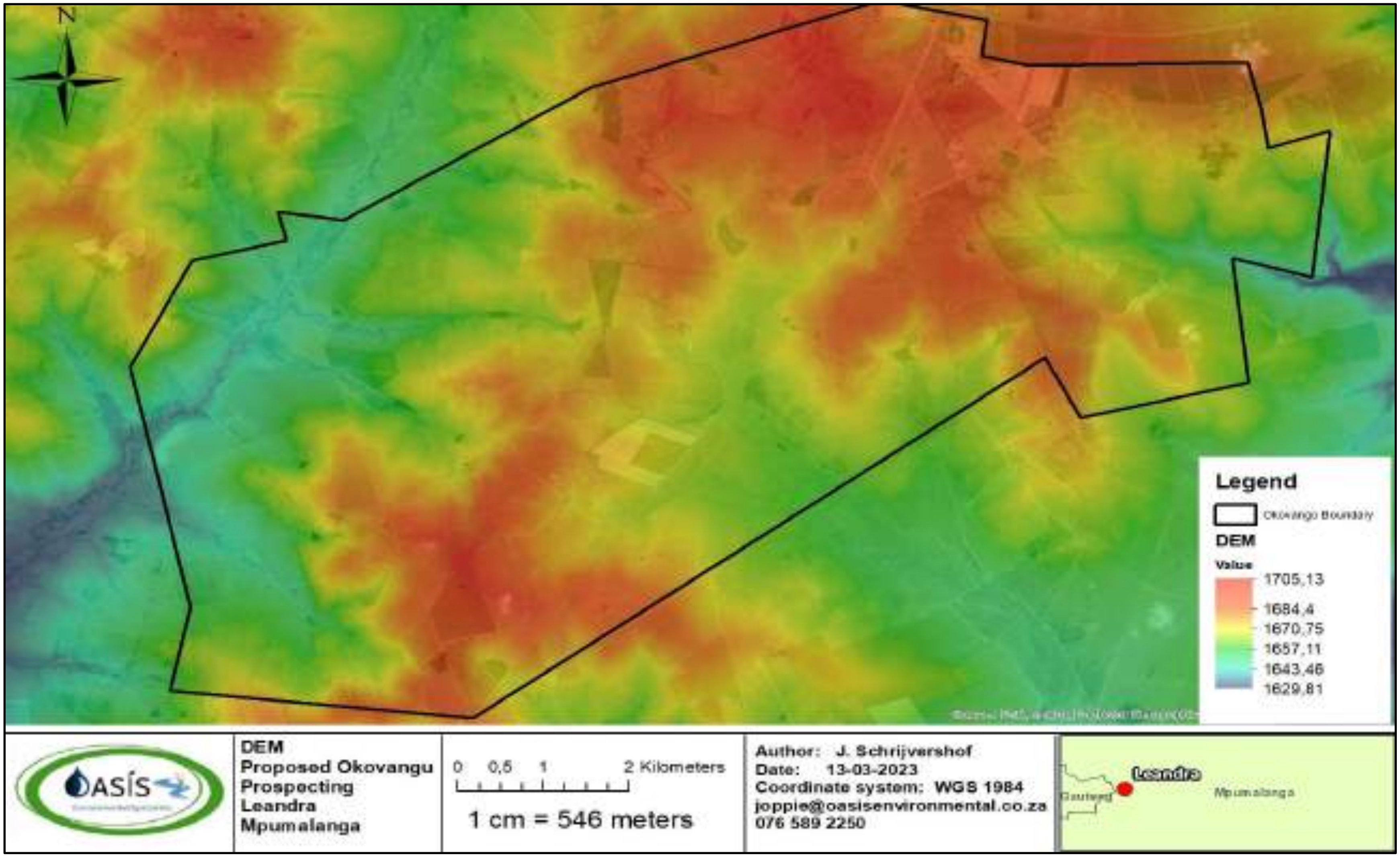

Figure 7: Digital Elevation Model map.

3.2 Ecological Desktop Assessment

3.2.1 Vegetation

The project boundary overlaps with two major vegetation units in terms of Mucina and Rutherford (2013) namely the Soweto Highveld grassland and the Eastern temperate Freshawater Wetlands as listed in **Figure 8**.

3.2.1.1 Soweto Highveld Grassland (Mucina and Rutherford, 2006)

Distribution: Stretches over the Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North-West) Provinces: In a broad band roughly delimited by the N17 road between Ermelo and Johannesburg in the north, Perdekop in the southeast and the Vaal River (border with the Free State) in the south. It extends further westwards along the southern edge of the Johannesburg Dome (including part of Soweto) as far as the vicinity of Randfontein. In southern Gauteng it includes the surrounds of Vanderbijlpark and Vereeniging as well as Sasolburg in the northern Free State. Altitude ranges between 1420 m to 1760 m.

Vegetation & Landscape Features: Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.

Geology and Soils: Shale, sandstone or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites which feature prominently in the area. In the south, the Volksrust Formation (Karoo Supergroup) is found and in the west, the rocks of the older Transvaal, Ventersdorp and Witwatersrand Supergroups are most significant. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types.

Climate: Summer-rainfall region with Mean Annual Precipitation of 662 mm. Cool-temperate climate with thermic continentality (high extremes between maximum summer and minimum winter temperatures, frequent occurrence of frost, large thermic diurnal differences, especially in autumn and spring).

Important Taxa: Graminoids: *Andropogon appendiculatus* (d), *Brachiaria serrata* (d), *Cymbopogon pospischilii* (d), *Cynodon dactylon* (d), *Elionurus muticus* (d), *Eragrostis capensis* (d), *E. chloromelas* (d), *E. curvula* (d), *E. plana* (d), *E. planiculmis* (d), *E. racemosa* (d), *Heteropogon contortus* (d), *Hyparrhenia hirta* (d), *Setaria nigrirostris* (d), *S. sphacelata* (d), *Themeda triandra* (d), *Tristachya leucothrix* (d), *Andropogon schirensis*, *Aristida adscensionis*, *A. bipartita*, *A. congesta*, *A. junciformis* subsp. *galpinii*, *Cymbopogon caesius*, *Digitaria diagonalis*, *Diheteropogon amplectens*, *Eragrostis micrantha*, *E. superba*, *Harpochloa falx*, *Microchloa caffra*, *Paspalum dilatatum*. Herbs:

Hermannia depressa (d), *Acalypha angustata*, *Berkheya setifera*, *Dicoma anomala*, *Euryops gilfillanii, Geigeria aspera* var. *aspera*, *Graderia subintegra*, *Haplocarpha scaposa*, *Helichrysum miconiifolium*, *H. nudifolium* var. *nudifolium*, *H. rugulosum*, *Hibiscus pusillus*, *Justicia anagalloides*, *Lippia scaberrima*, *Rhynchosia effusa*, *Schistostephium crataegifolium*, *Selago densiflora*, *Senecio coronatus*, *Vernonia oligocephala*, *Wahlenbergia undulata*. Geophytic Herbs: *Haemanthus humilis* subsp. *hirsutus*, *H. montanus*. Herbaceous Climber: *Rhynchosia totta*. Low Shrubs: *Anthospermum hispidulum*, *A. rigidum* subsp. *pumilum*, *Berkheya annectens*, *Felicia muricata*, *Ziziphus zeyheriana*.

Conservation: Listed as an endangered ecosyetsm. Only a handful of patches statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site). Almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have been flooded by dams (Grootdraai, Leeukuil, Trichardtsfontein, Vaal, Willem Brummer). Erosion is generally very low (93%).

3.2.1.2 Eastern Temperate Freshwater Wetlands (Mucina and Rutherford, 2006)

Distribution: Stretches over the Northern Cape, Eastern Cape, Free State, North-West, Gauteng, Mpumalanga and KwaZulu-Natal Provinces as well as in neighbouring Lesotho and Swaziland: Around water bodies with stagnant water (lakes, pans, periodically flooded vleis, edges of calmly flowing rivers) and embedded within the Grassland Biome. Altitude ranges between 750 m to 2000 m.

Vegetation & Landscape Features: Flat landscape or shallow depressions filled with (temporary) water bodies supporting zoned systems of aquatic and hygrophilous vegetation of temporarily flooded grasslands and ephemeral herblands.

Geology, Soil & Hydrology: Found on younger Pleistocene to recent sediments overlying fine-grained sedimentary rocks of the Karoo Supergroup (on sediments of both Ecca and Beaufort Groups due to the large extent of the area of occurrence) as well as of the much older dolomites of the Malmani Subgroup of the Transvaal Supergroup in the northwest. Especially the areas built by Karoo Supergroup sediments are associated with the occurrence of Jurassic Karoo dolerite dykes having a profound influence on run-off. Soils are peaty (Champagne soil form) to vertic (Rensberg soil form). The vleis form where flow of water is impeded by impermeable soils and/or by erosion resistant features, such as dolerite intrusions. Many vleis and pans of this type of freshwater wetlands are inundated and/or saturated only during the summer rainfall season, and for some months after this into the middle of the dry winter season, but they may remain saturated all year round. Surface water inundation may be present at any point while the wetland is saturated and some plant species will be present only under inundated conditions, or under permanently saturated conditions. The presence of standing water should not be taken as a sign of permanent wet conditions.

Climate: Exclusively summer-rainfall region with a Mean Annual Precipitation 421 mm - 915 mm. Cool-temperate pattern with MAT ranging between 12.6°C and 16.7°C. Due to high elevation, frost is a frequent phenomenon.

Important Taxa: Megagraminoid: *Cyperus congestus* (d). Graminoids: *Agrostis lachnantha* (d), *Carex acutiformis* (d), *Eleocharis palustris* (d), *Eragrostis plana* (d), *E. planiculmis* (d), *Fuirena pubescens* (d), *Helictotrichon turgidulum* (d), *Hemarthria altissima* (d), *Imperata cylindrica* (d), *Leersia hexandra* (d), *Paspalum dilatatum* (d), *P. urvillei* (d), *Pennisetum thunbergii* (d), *Schoenoplectus decipiens* (d), *Scleria dieterlenii* (d), *Setaria sphacelata* (d), *Andropogon appendiculatus*, *A. eucomus*, *Aristida aequiglumis*, *Ascolepis capensis, Carex austro-africana*, *C. schlechteri*, *Cyperus cyperoides*, *C. distans*, *C. longus*, *C. marginatus*, *Echinochloa holubii*, *Eragrostis micrantha*, *Ficinia acuminata*, *Fimbristylis complanata*, *F. ferruginea*, *Hyparrhenia dregeana*, *H. quarrei, Ischaemum fasciculatum*, *Kyllinga erecta*, *Panicum schinzii*, *Pennisetum sphacelatum*, *Pycreus macranthus*, *P. nitidus*, *Setaria pallide-fusca*, *Xyris gerrardii*. Herbs: *Centella asiatica* (d), *Ranunculus multifidus* (d), *Berkheya radula*, *B. speciosa*, *Berula erecta* subsp. *thunbergii*, *Centella coriacea*, *Chironia palustris*, *Equisetum ramosissimum*, *Falckia oblonga, Haplocarpha lyrata, Helichrysum difficile*, *H. dregeanum*, *H. mundtii*, *Hydrocotyle sibthorpioides, H. verticillata*, *Lindernia conferta*, *Lobelia angolensis, L. flaccida*, *Mentha aquatica*, *Monopsis decipiens*, *Pulicaria scabra*, *Pycnostachys reticulata*, *Rorippa fluviatilis* var. *fluviatilis*, *Rumex lanceolatus*, *Senecio inornatus*, *S. microglossus*, *Sium repandum*, *Thelypteris confluens*, *Wahlenbergia banksiana*. Geophytic Herbs: *Cordylogyne globosa*, *Crinum bulbispermum*, *Gladiolus papilio*, *Kniphofia ensifolia*, *K. fluviatilis*, *K. linearifolia*, *Neobolusia tysonii, Nerine gibsonii* (only in Eastern Cape), *Satyrium hallackii* subsp. *hallackii*. Megagraminoids: *Phragmites australis* (d), *Schoenoplectus corymbosus* (d), *Typha capensis* (d), *Cyperus immensus*. Graminoid: *Carex cernua*. Aquatic Herbs: *Aponogeton junceus*, *Ceratophyllum demersum*, *Lagarosiphon major*, *L. muscoides*, *Marsilea capensis*, *Myriophyllum spicatum, Nymphaea lotus*, *N. nouchali* var. *caerulea*, *Nymphoides thunbergiana*, *Potamogeton thunbergii*. Carnivorous Herb: *Utricularia inflexa*. Herb: *Marsilea farinosa* subsp. *farinosa*.

Biogeographically Important Taxon: (Highveld endemic) Herb: *Rorippa fluviatilis* var. *caledonica*.

Endemic Taxa: Geophytic Herbs: *Disa zuluensis, Kniphofia flammula* (northern KwaZulu-Natal), *Nerine platypetala*. Succulent Herb: *Crassula tuberella*.

Conservation: About 5% statutorily conserved in the Blesbokspruit (a Ramsar site), Hogsback, Marievale, Olifantsvlei, Seekoeivlei (a Ramsar site), Wakkerstroom Wetland, Umgeni Vlei, Umvoti Vlei and Pamula Park Nature Reserves. It is also protected in private nature reserves such as the Korsman Bird Sanctuary and Langfontein. Some 15% has been transformed to cultivated land, urban areas or plantations. In places intensive grazing and use of lakes and freshwater pans as drinking pools for cattle or sheep cause major damage to the wetland vegetation. The following aliens are encountered in this type of wetland: *Bidens bidentata*, *Cirsium vulgare*, *Conyza bonariensis*, *Oenothera rosea*, *Physalis viscosa*, *Plantago lanceolata*, *Rumex crispus*, *Sesbania punicea*, *Schkuhria pinnata*, *Stenotaphrum secundatum* (native on South African coast, alien on highveld), *Trifolium pratense*, *Verbena bonariensis*, *V. brasiliensis*, *Xanthium strumarium*, etc.

Remarks: Vegetation patterning in the form of concentric belts ('rings') is often found in pans. Pan size and depth may be a factor limiting vegetation, as large water bodies with shallow water may experience wave action. This limits the presence of species with floating leaves as well as some submerged and marginal macrophytes. The situation is more complex in vleis as these often have variable microtopography and soil types within a single wetland. It is possible for seasonally inundated zones to occur embedded inside the permanently inundated zone of a vlei, if this zone is present.

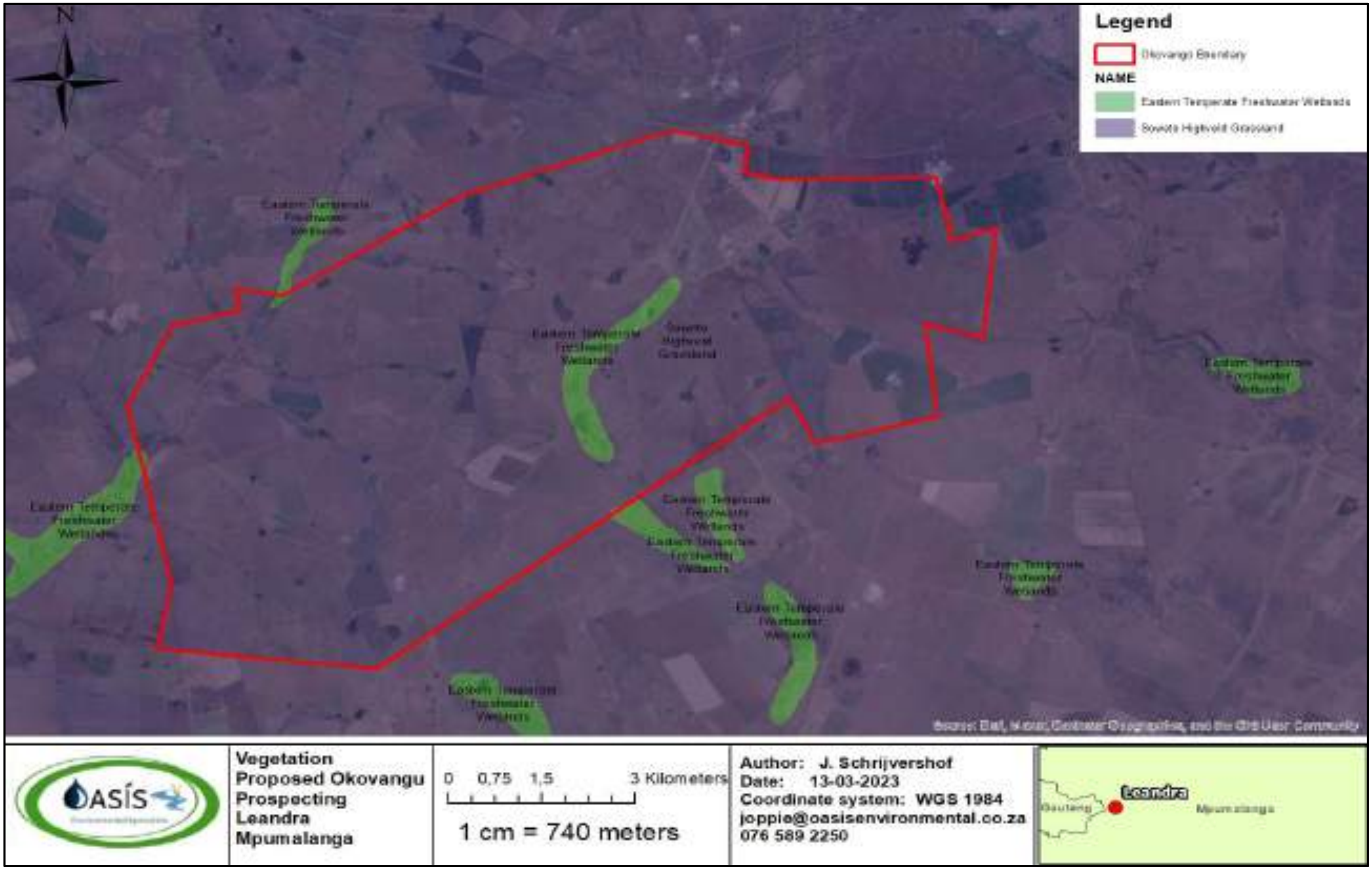

Figure 8: Vegetation map.

3.2.2 Critical Biodiversity Areas

According to the Critical Biodiversity Areas datasets provided by SANBI (2023), a very large portion of application area falls within Critical Biodiversity Areas as seen in **Figure 9**. The remainder of the application area overlaps with Ecological Support Areas. The sensitive areas seems to be associated with the wetlands and rivers within the area.

3.2.3 Threatened Ecosystems and Protected areas

The proposed prospecting project does overlap with the Soweto Highveld Grassland and is listed as an endangered ecosystem. Only a handful of patches statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site). Almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have been flooded by dams (Grootdraai, Leeukuil, Trichardtsfontein, Vaal, Willem Brummer).

3.2.4 Important Bird Areas

The proposed prospecting project not fall within/close to any Important Bird Areas.

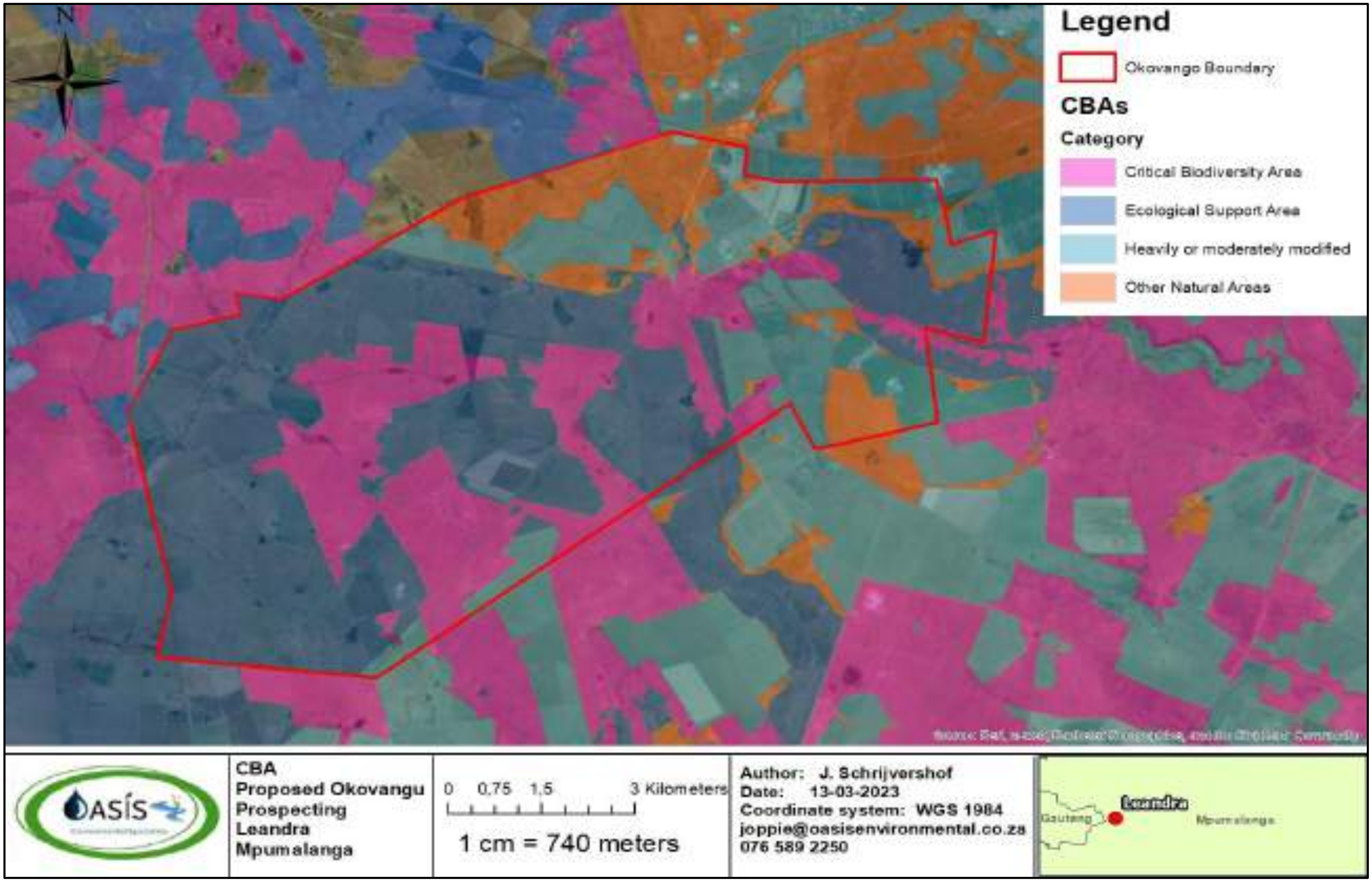

Figure 9: Critical Biodiversity Areas map.

3.3 Flora

Vegetation normally associated with that area is listed in **Appendix A** depicted from SANBI's POSA list. Information on plant species recorded in that area was extracted from the POSA list, indicate that 80 plant species have been recorded in the area queried of which 77 are endemic species are known to occur within the area queried. (**Table 3**). *Nerine gracilis* listed as Vulnerable and *Kniphofia typhoides*; *Stenostelma umbelluliferum*; *Gladiolus robertsoniae* listed as Near Threatened is thought to occur within these areas.

Table 3: Floral species summary for the area queried around the proposed areas as per SANBI (2023).

Number of Families	Number of species	Endemic species	Exotic species	IUCN Red Listed Species
28	80	77	3	4

3.4 Fauna

Disturbance factors such as anthropogenic activities result in disturbances to the naturally occurring faunal species. However faunal species normally associated with that area is listed in **Appendix B**.

3.4.1 Reptiles

No red data reptiles were identified as occurring in the quarter degree squares 2628BD.

3.4.2 Amphibians

No red data amphibians were identified as occurring in the quarter degree squares 2628BD.

3.4.3 Avifauna

All desktop findings were extracted from the ADU, SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas and from the Red Data Book of Birds (Taylor *et al.,* 2015) with the distribution being confirmed in Roberts – Birds of Southern Africa, 7th edition (Hockey *et al*., 2005) (**Appendix C**). Based on an evaluation of the pentads 2625_2845 and 2625_2850 the potential of these red listed species occurring within the area is provided in **Table 4** below.

Table 4: Red listed avifaunal species identified during the desktop study around the proposed areas.

Common Name	Scientific Name	Conservation Status
Pallid Harrier	*Circus macrourus*	Near Threatened
Black Harrier	*Circus maurus*	Vulnerable
Maccoa Duck	*Oxyura maccoa*	Near Threatened
Blue Crane	*Anthropoides paradiseus*	Vulnerable
Grey Crowned- (Crowned) Crane	*Balearica regulorum*	Endangered
Blue Korhaan	*Eupodotis caerulescens*	Near Threatened
Denham's (Stanley's) Bustard	*Neotis denhami*	Near Threatened
Secretarybird	*Sagittarius serpentarius*	Vulnerable

3.4.4 Mammals

The Highveld Golden Mole (*Amblysomus septentrionalis)* listed as Vulnerable; the Southern African Hedgehog (*Atelerix frontalis*); Southern African Vlei Rat (*Otomys auratus*); African Clawless Otter (*Aonyx capensis*); Swamp Musk Shrew (*Crocidura mariquensis*) and Serval (*Leptailurus serval*) listed as Near Threatened is thought to possibly occur within the area according to SANBI (2023).

4 CONCLUSION AND RECOMMENDATIONS

The site falls within the quaternary drainage regions B20E which is part of the Olifants Water Management Area, where the C21A and C12D catchments forms part of the Vaal Water Management Area. From a land use perspective, the water management area still remains almost totally under natural vegetation. Sheep and goat farming is practiced over most of the area. Cultivation is restricted to isolated patches where the majority consists of low shrubland.

No RAMSAR wetlands are found within the vicinity of the study site. Several small segments of seep and valley bottom wetlands were identified within the application area according to the NFEPA wetlands database. The area ranges in altitude from 1629 m to 1705 m above sea level. A Digital Elevation Model (DEM) of the aerial photography of the site revealed that the topography of the landscape is a relatively flat with drainage line landscape. The landscape is drained towards the south-west to the Vaal catchment and north-east to the Olifants catchment.

The project boundary overlaps with two major vegetation units in terms of Mucina and Rutherford (2013) namely the Soweto Highveld grassland and the Eastern temperate Freshawater Wetlands. According to the Critical Biodiversity Areas datasets provided by SANBI (2023), a very large portion of application area falls within Critical Biodiversity Areas. The remainder of the application area overlaps with Ecological Support Areas. The sensitive areas seems to be associated with the wetlands and rivers within the area. The proposed prospecting project does overlap with the Soweto Highveld Grassland and is listed as an endangered ecosystem. The proposed prospecting project not fall within/close to any Important Bird Areas.

Vegetation normally associated with that area is listed in **Appendix A** depicted from SANBI's POSA list. Information on plant species recorded in that area was extracted from the POSA list, indicate that 80 plant species have been recorded in the area queried of which 77 are endemic species are known to occur within the area queried. *Nerine gracilis* listed as Vulnerable and *Kniphofia typhoides*; *Stenostelma umbelluliferum*; *Gladiolus robertsoniae* listed as Near Threatened is thought to occur within these areas.

All faunal species thought to occur within 2628BD is listed in **Appendix B**. No red data amphibians or reptiles were identified as occurring in the quarter degree squares 2628BD.

Based on an evaluation of the pentads 2625_2845 and 2625_2850 (**Appendix C**) the potential of these red listed species occurring within the area include Pallid Harrier (*Circus macrourus*) listed as Near Threatened; Black Harrier (*Circus maurus*) listed as Vulnerable; Maccoa Duck (*Oxyura maccoa*) listed as Near Threatened; Blue Crane (*Anthropoides paradiseus*) listed as Vulnerable; Grey Crowned (Crowned) Crane (*Balearica regulorum*) listed as Endangered; Blue Korhaan (*Eupodotis caerulescens*) listed as Near Threatened; Denham's (Stanley's) Bustard (*Neotis denhami*) listed as Near Threatened and the Secretarybird (*Sagittarius serpentarius*) listed as Vulnerable.

The Highveld Golden Mole (*Amblysomus septentrionalis)* listed as Vulnerable; the Southern African Hedgehog (*Atelerix frontalis*); Southern African Vlei Rat (*Otomys auratus*); African Clawless Otter (*Aonyx capensis*); Swamp Musk Shrew (*Crocidura mariquensis*) and Serval (*Leptailurus serval*) listed as Near Threatened is thought to possibly occur within the area according to SANBI (2023).

It is recommended that the proposed prospecting sites be assessed for any wetlands by means of a field survey to ground truth the presence of the NFEPA wetlands identified in the desktop study. The riverine areas should be assessed in terms of their ecological state and the aquatic risk assessment must be implemented. The area must be surveyed to groundtruth any red listed fauna and flora species.

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APPENDIX A – FLORA SPECIES LIST FOR THE LEANDRA AREA SANBI (2023)

Family	Genus	Species	IUCN Status	Ecology
Agavaceae	*Chlorophytum*	*cooperi*	LC	Indigenous
Aizoaceae	*Chasmatophyllum*	*musculinum*	LC	Indigenous
Amaranthaceae	*Amaranthus*	*hybridus*		Not indigenous; Naturalised
Amaryllidaceae	*Crinum*	*graminicola*	LC	Indigenous
Amaryllidaceae	*Nerine*	*krigei*	LC	Indigenous; Endemic
Amaryllidaceae	*Nerine*	*gracilis*	VU	Indigenous; Endemic
Amaryllidaceae	*Crinum*	*bulbispermum*	LC	Indigenous
Anacardiaceae	*Searsia*	*discolor*	LC	Indigenous
Anacardiaceae	*Searsia*	*magalismontana*	LC	Indigenous
Apocynaceae	*Ceropegia*	*praelonga*		Indigenous
Apocynaceae	*Orbea*	*cooperi*	LC	Indigenous
Apocynaceae	*Asclepias*	*gibba*	LC	Indigenous
Apocynaceae	*Aspidoglossum*	*lamellatum*	LC	Indigenous
Apocynaceae	*Cordylogyne*	*globosa*	LC	Indigenous
Apocynaceae	*Ceropegia*	*circinata*		Indigenous
Apocynaceae	*Ceropegia*	*breviflora*		Indigenous
Apocynaceae	*Stenostelma*	*umbelluliferum*	NT	Indigenous; Endemic
Apocynaceae	*Xysmalobium*	*undulatum*	LC	Indigenous
Apocynaceae	*Asclepias*	*multicaulis*	LC	Indigenous
Asphodelaceae	*Kniphofia*	*typhoides*	NT	Indigenous; Endemic
Aspleniaceae	*Asplenium*	*adiantum-nigrum*	LC	Indigenous; Endemic
Asteraceae	*Artemisia*	*afra*	LC	Indigenous
Asteraceae	*Eriocephalus*	*karooicus*	LC	Indigenous; Endemic
Asteraceae	*Euryops*	*transvaalensis*	LC	Indigenous
Asteraceae	*Seriphium*	*plumosum*		Indigenous
Asteraceae	*Dimorphotheca*	*caulescens*	LC	Indigenous
Brassicaceae	*Lepidium*	*bonariense*		Not indigenous; Naturalised
Colchicaceae	*Colchicum*	*striatum*	LC	Indigenous
Commelinaceae	*Cyanotis*	*speciosa*	LC	Indigenous
Convolvulaceae	*Ipomoea*	*oblongata*	LC	Indigenous

Family	Genus	Species	IUCN Status	Ecology
Fabaceae	*Senna*	*occidentalis*	NE	Not indigenous; Naturalised; Invasive
Fabaceae	*Rhynchosia*	*adenodes*	LC	Indigenous
Fabaceae	*Lessertia*	*depressa*	LC	Indigenous
Fabaceae	*Dolichos*	*linearis*	LC	Indigenous
Geraniaceae	*Pelargonium*	*sidoides*	LC	Indigenous
Hyacinthaceae	*Albuca*	*sp.*		
Hyacinthaceae	*Albuca*	*virens*	LC	Indigenous
Hyacinthaceae	*Dipcadi*	*viride*	LC	Indigenous
Hyacinthaceae	*Ledebouria*	*revoluta*	LC	Indigenous
Hyacinthaceae	*Ledebouria*	*sp.*		
Hyacinthaceae	*Ledebouria*	*cooperi*	LC	Indigenous
Hyacinthaceae	*Albuca*	*setosa*	LC	Indigenous
Hyacinthaceae	*Ledebouria*	*minima*	LC	Indigenous
Hyacinthaceae	*Dipcadi*	*sp.*		
Hypoxidaceae	*Hypoxis*	*hemerocallidea*	LC	Indigenous
Hypoxidaceae	*Hypoxis*	*acuminata*	LC	Indigenous
Hypoxidaceae	*Hypoxis*	*rigidula*	LC	Indigenous
Iridaceae	*Syringodea*	*bifucata*	LC	Indigenous; Endemic
Iridaceae	*Gladiolus*	*robertsoniae*	NT	Indigenous; Endemic
Iridaceae	*Gladiolus*	*sericeovillosus*	LC	Indigenous
Iridaceae	*Gladiolus*	*crassifolius*	LC	Indigenous
Iridaceae	*Duthiastrum*	*linifolium*	LC	Indigenous; Endemic
Lamiaceae	*Syncolostemon*	*canescens*	LC	Indigenous
Malvaceae	*Hermannia*	*sp.*		
Malvaceae	*Hermannia*	*coccocarpa*	LC	Indigenous
Orchidaceae	*Orthochilus*	*welwitschii*	LC	Indigenous
Orobanchaceae	*Alectra*	*vogelii*	LC	Indigenous
Phrymaceae	*Mimulus*	*gracilis*	LC	Indigenous
Poaceae	*Panicum*	*schinzii*	LC	Indigenous
Poaceae	*Brachiaria*	*serrata*	LC	Indigenous
Poaceae	*Themeda*	*triandra*	LC	Indigenous
Poaceae	*Trisetopsis*	*imberbis*		Indigenous
Poaceae	*Digitaria*	*ternata*	LC	Indigenous
Poaceae	*Brachiaria*	*eruciformis*	LC	Indigenous
Poaceae	*Fingerhuthia*	*sesleriiformis*	LC	Indigenous
Poaceae	*Harpochloa*	*falx*	LC	Indigenous

Family	Genus	Species	IUCN Status	Ecology
Poaceae	*Brachiaria*	*advena*	NE	Not indigenous; Naturalised
Poaceae	*Eragrostis*	*curvula*	LC	Indigenous
Poaceae	*Eleusine*	*coracana*	LC	Indigenous
Poaceae	*Aristida*	*diffusa*	LC	Indigenous
Poaceae	*Setaria*	*nigrirostris*	LC	Indigenous
Poaceae	*Catalepis*	*gracilis*	LC	Indigenous
Poaceae	*Sporobolus*	*africanus*	LC	Indigenous
Poaceae	*Eleusine*	*coracana*		Indigenous
Poaceae	*Fingerhuthia*	*africana*	LC	Indigenous
Ruscaceae	*Eriospermum*	*corymbosum*	LC	Indigenous
Scrophulariaceae	*Jamesbrittenia*	*sp.*		
Scrophulariaceae	*Jamesbrittenia*	*stricta*	LC	Indigenous
Selaginellaceae	*Selaginella*	*caffrorum*	LC	Indigenous
Thymelaeaceae	*Gnidia*	*gymnostachya*	LC	Indigenous

APPENDIX B – FAUNAL SPECIES LIST FOR ALL FAUNAL SPP. OCCURING WITHIN THE 2628BD QDS.

Family	Species	Common Name	Status
Insects			
Scarabaeidae	*Coptorhina auspicata*		
Scarabaeidae	*Onthophagus binodis*		
Hesperiidae	*Metisella meninx*	Marsh sylph	Least Concern (SABCA 2013)
Hesperiidae	*Spialia asterodia*	Star sandman	Least Concern (SABCA 2013)
Hesperiidae	*Spialia mafa mafa*	Mafa sandman	Least Concern (SABCA 2013)
Lycaenidae	*Aloeides henningi*	Hillside russet	Least Concern (SABCA 2013)
Lycaenidae	*Azanus jesous*	Topaz babul blue	Least Concern (SABCA 2013)
Lycaenidae	*Lampides boeticus*	Pea blue	Least Concern (SABCA 2013)
Lycaenidae	*Lycaena clarki*	Eastern sorrel copper	Least Concern (SABCA 2013)
Lycaenidae	*Zizeeria knysna knysna*	African grass blue	Least Concern (SABCA 2013)
Lycaenidae	*Zizula hylax*	Tiny grass blue	Least Concern (SABCA 2013)
Nymphalidae	*Catacroptera cloanthe cloanthe*	Pirate	Least Concern (SABCA 2013)
Nymphalidae	*Danaus chrysippus orientis*	African plain tiger	Least Concern (SABCA 2013)
Nymphalidae	*Junonia hierta cebrene*	Yellow pansy	Least Concern (SABCA 2013)
Nymphalidae	*Junonia orithya madagascariensis*	African blue pansy	Least Concern (SABCA 2013)
Nymphalidae	*Telchinia rahira rahira*	Marsh telchinia	Least Concern (SABCA 2013)
Nymphalidae	*Vanessa cardui*	Painted lady	Least Concern (SABCA 2013)
Pieridae	*Belenois aurota*	Pioneer caper white	Least Concern (SABCA 2013)
Pieridae	*Eurema brigitta brigitta*	Broad-bordered grass yellow	Least Concern (SABCA 2013)
Pieridae	*Pontia helice helice*	Southern meadow white	Least Concern (SABCA 2013)
Aeshnidae	*Anax ephippiger*	Vagrant Emperor	LC

Family	Species	Common Name	Status
Aeshnidae	*Anax imperator*	Blue Emperor	LC
Coenagrionidae	*Africallagma sapphirinum*	Sapphire Bluet	LC
Coenagrionidae	*Ischnura senegalensis*	Tropical Bluetail	LC
Coenagrionidae	*Pseudagrion citricola*	Yellow-faced Sprite	LC
Libellulidae	*Crocothemis erythraea*	Broad Scarlet	LC
Libellulidae	*Sympetrum fonscolombii*	Red-veined Darter or Nomad	LC
Libellulidae	*Trithemis dorsalis*	Highland Dropwing	LC
Amphibians			
Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern (IUCN, 2016)
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	Least Concern
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	Least Concern (2017)
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern (2013)
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern
Reptiles			
Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	Least Concern (SARCA 2014)
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern (SARCA 2014)
Gekkonidae	*Pachydactylus capensis*	Cape Gecko	Least Concern (SARCA 2014)
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	Least Concern (SARCA 2014)
Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	Least Concern (SARCA 2014)

Family	Species	Common Name	Status
Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern (SARCA 2014)
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern (SARCA 2014)
Leptotyphlopidae	*Leptotyphlops sp.*		
Leptotyphlopidae	*Leptotyphlops scutifrons conjunctus*	Eastern Thread Snake	
Pelomedusidae	*Pelomedusa galeata*	South African Marsh Terrapin	Not evaluated
Scincidae	*Acontias gracilicauda*	Thin-tailed Legless Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern (SARCA 2014)
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern (SARCA 2014)
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern (IUCN 2022)
Avifauna			
Accipitridae	*Accipiter melanoleucus*	Black Sparrowhawk (Goshawk)	
Accipitridae	*Buteo [augur] rufofuscus*	Jackal Buzzard	
Accipitridae	*Buteo buteo*	Steppe (Common) Buzzard	
Accipitridae	*Circus macrourus*	Pallid Harrier	Global: NT; BLSA: NT
Accipitridae	*Circus maurus*	Black Harrier	Global: VU; BLSA: EN
Accipitridae	*Circus pygargus*	Montagu's Harrier	
Accipitridae	*Elanus caeruleus*	Black-shouldered (Winged) Kite	
Alaudidae	*Calandrella [brachydactyla] cinerea*	Red-capped Lark	
Alaudidae	*Spizocorys conirostris*	Pink-billed Lark	
Anatidae	*Alopochen aegyptiaca*	Egyptian Goose	Least Concern (IUCN, 2018)
Anatidae	*Anas erythrorhyncha*	Red-billed Teal (Duck)	
Anatidae	*Anas smithii*	Cape Shoveler	
Anatidae	*Anas undulata*	Yellow-billed Duck	

Family	Species	Common Name	Status
Anatidae	*Oxyura maccoa*	Maccoa Duck	Global: NT; BLSA: NT
Anatidae	*Plectropterus gambensis*	Spur-winged Goose	
Anhingidae	*Anhinga rufa*	African Darter	
Apodidae	*Apus caffer*	White-rumped Swift	
Ardeidae	*Ardea cinerea*	Grey Heron	
Ardeidae	*Ardea melanocephala*	Black-headed Heron	
Ardeidae	*Ardea purpurea*	Purple Heron	
Ardeidae	*Bubulcus ibis*	Cattle Egret	
Ardeidae	*Egretta alba*	Great Egret	
Ardeidae	*Egretta intermedia*	Yellow-billed (Intermediate) Egret	
Ardeidae	*Nycticorax nycticorax*	Black-crowned Night-Heron	
Burhinidae	*Burhinus capensis*	Spotted Thick-knee (Dikkop)	
Cerylidae	*Ceryle rudis*	Pied Kingfisher	
Charadriidae	*Charadrius tricollaris*	Three-banded Plover	
Charadriidae	*Vanellus armatus*	Blacksmith Lapwing (Plover)	
Charadriidae	*Vanellus coronatus*	Crowned Lapwing (Plover)	
Ciconiidae	*Mycteria ibis*	Yellow-billed Stork	Global: LC; BLSA: EN
Cisticolidae	*Prinia flavicans*	Black-chested Prinia	
Columbidae	*Columba guinea*	Speckled (Rock) Pigeon	
Columbidae	*Streptopelia semitorquata*	Red-eyed Dove	
Columbidae	*Streptopelia senegalensis*	Laughing (Palm) Dove	
Cuculidae	*Clamator (Oxylophus) jacobinus*	Jacobin (Pied) Cuckoo	
Estrildidae	*Amadina erythrocephala*	Red-headed Finch	
Estrildidae	*Ortygospiza atricollis*	Quailfinch	

Family	Species	Common Name	Status
Falconidae	*Falco amurensis*	Amur (Eastern Red-footed) Falcon (Kestrel)	
Falconidae	*Falco biarmicus*	Lanner Falcon	Global: LC; BLSA: VU
Falconidae	*Falco rupicoloides*	Greater Kestrel	
Fringillidae	*Serinus atrogularis*	Black-throated Canary	
Fringillidae	*Serinus flaviventris*	Yellow Canary	
Gruidae	*Anthropoides paradiseus*	Blue Crane	Global: VU; BLSA: NT
Gruidae	*Balearica regulorum*	Grey Crowned-(Crowned) Crane	Global: EN; BLSA: EN
Hirundinidae	*Hirundo albigularis*	White-throated Swallow	
Hirundinidae	*Hirundo cucullata*	Greater Striped-Swallow	
Hirundinidae	*Hirundo spilodera*	South African Cliff-Swallow	
Laridae	*Chlidonias hybridus*	Whiskered Tern	
Motacillidae	*Anthus cinnamomeus*	African (Grassveld/Grassland) Pipit	
Motacillidae	*Macronyx capensis*	Cape (Orange-throated) Longclaw	
Muscicapidae	*Myrmecocichla formicivora*	Ant-eating Chat	
Muscicapidae	*Oenanthe pileata*	Capped Wheatear	
Muscicapidae	*Saxicola torquata*	African (Common) Stonechat	
Numididae	*Numida meleagris*	Helmeted Guineafowl	
Otididae	*Eupodotis caerulescens*	Blue Korhaan	Global: NT; BLSA: LC
Otididae	*Neotis denhami*	Denham's (Stanley's) Bustard	Global: NT; BLSA: VU
Passeridae	*Passer diffusus*	Southern Greyheaded Sparrow (split)	
Passeridae	*Passer domesticus*	House Sparrow	
Passeridae	*Passer melanurus*	Cape Sparrow	
Phalacrocoracidae	*Phalacrocorax africanus*	Reed (Long-tailed) Cormorant	

Family	Species	Common Name	Status
Phasianidae	*Pternistis swainsonii*	Swainson's Spurfowl (Francolin)	
Phasianidae	*Scleroptila levaillantoides*	Orange River Francolin	
Phoenicopteridae	*Phoenicopterus roseus*	Greater Flamingo	Global: LC; BLSA: NT
Picidae	*Jynx ruficollis*	Red-throated Wryneck	
Ploceidae	*Euplectes afer*	Yellow-crowned (Golden) Bishop	
Ploceidae	*Euplectes progne*	Long-tailed Widowbird	
Ploceidae	*Plocepasser mahali*	White-browed Sparrow-Weaver	
Ploceidae	*Ploceus velatus*	Southern Masked-Weaver	
Ploceidae	*Quelea quelea*	Red-billed Quelea	
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	
Podicipedidae	*Podiceps nigricollis*	Black-necked Grebe	
Podicipedidae	*Tachybaptus ruficollis*	Little Grebe (Dabchick)	
Rallidae	*Fulica cristata*	Red-knobbed Coot	
Rallidae	*Gallinula chloropus*	Common Moorhen	
Rallidae	*Porzana pusilla*	Baillon's Crake	
Sagittariidae	*Sagittarius serpentarius*	Secretarybird	Global: VU; BLSA: VU
Scolopacidae	*Gallinago nigripennis*	African (Ethiopian) Snipe	
Scopidae	*Scopus umbretta*	Hamerkop	
Strigidae	*Asio capensis*	Marsh Owl	
Sturnidae	*Creatophora cinerea*	Wattled Starling	
Sturnidae	*Spreo bicolor*	Pied (African Pied) Starling	
Sylviidae	*Stenostira scita*	Fairy Flycatcher (Warbler)	
Threskiornithidae	*Platalea alba*	African Spoonbill	
Tytonidae	*Tyto capensis*	African Grass-Owl	Global: LC; BLSA: VU
Viduidae	*Vidua macroura*	Pin-tailed Whydah	

Family	Species	Common Name	Status
Mammals			
Bovidae	*Antidorcas marsupialis*	Springbok	Least Concern (2016)
Bovidae	*Damaliscus pygargus phillipsi*	Blesbok	Least Concern (2016)
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (2016)
Chrysochloridae	*Amblysomus septentrionalis*	Highveld Golden Mole	Near Threatened (2016)
Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	Near Threatened (2016)
Felidae	*Leptailurus serval*	Serval	Near Threatened (2016)
Felidae	*Panthera leo*	Lion	Least Concern (2016)
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern (2016)
Herpestidae	*Suricata suricatta*	Meerkat	Least Concern (2016)
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern
Molossidae	*FAMILY Molossidae*	Unidentified Molossidae	
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	Least Concern (2016)
Muridae	*Otomys auratus*	Southern African Vlei Rat (Grassland type)	Near Threatened (2016)
Muridae	*Rhabdomys pumilio*	Xeric Four-striped Grass Rat	Least Concern (2016)
Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened (2016)
Sciuridae	*Xerus inauris*	South African Ground Squirrel	Least Concern
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened (2016)
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern (2016)
Vespertilionidae	*Neoromicia capensis*	Cape Serotine	Least Concern (2016)
Viverridae	*Genetta tigrina*	Cape Genet (Cape Large-spotted Genet)	Least Concern (2016)

APPENDIX C – AVIFAUNA SPECIES LIST PENTADS 2625_2845 AND 2625_2850

Common species	Genus	Species
Pentad: 2625_2850		
Hamerkop	*Scopus*	*umbretta*
Quailfinch	*Ortygospiza*	*atricollis*
Ruff	*Calidris*	*pugnax*
Secretarybird	*Sagittarius*	*serpentarius*
Pied	*Recurvirostra*	*avosetta*
Southern Red	*Euplectes*	*orix*
Yellow-crowned	*Euplectes*	*afer*
Dark-capped	*Pycnonotus*	*tricolor*
Cinnamon-breasted	*Emberiza*	*tahapisi*
Common	*Turnix*	*sylvaticus*
Common	*Buteo*	*buteo*
Jackal	*Buteo*	*rufofuscus*
Black-throated	*Crithagra*	*atrogularis*
Yellow	*Crithagra*	*flaviventris*
Yellow-fronted	*Crithagra*	*mozambica*
Ant-eating	*Myrmecocichla*	*formicivora*
Sickle-winged	*Emarginata*	*sinuata*
Cloud	*Cisticola*	*textrix*
Desert	*Cisticola*	*aridulus*
Levaillant's	*Cisticola*	*tinniens*
Pale-crowned	*Cisticola*	*cinnamomeus*
Wing-snapping	*Cisticola*	*ayresii*
Zitting	*Cisticola*	*juncidis*
Red-knobbed	*Fulica*	*cristata*
Reed	*Microcarbo*	*africanus*
White-breasted	*Phalacrocorax*	*lucidus*
African	*Crecopsis*	*egregia*
Blue	*Grus*	*paradisea*
Wattled	*Grus*	*carunculata*
Cape	*Corvus*	*capensis*
Pied	*Corvus*	*albus*
Diederik	*Chrysococcyx*	*caprius*
African	*Anhinga*	*rufa*
Cape Turtle	*Streptopelia*	*capicola*
Laughing	*Spilopelia*	*senegalensis*
Namaqua	*Oena*	*capensis*
Red-eyed	*Streptopelia*	*semitorquata*

Common species	Genus	Species
Rock	*Columba*	*livia*
African Black	*Anas*	*sparsa*
Maccoa	*Oxyura*	*maccoa*
White-backed	*Thalassornis*	*leuconotus*
White-faced Whistling	*Dendrocygna*	*viduata*
Yellow-billed	*Anas*	*undulata*
African Fish	*Haliaeetus*	*vocifer*
Black-chested Snake	*Circaetus*	*pectoralis*
Spotted	*Bubo*	*africanus*
Great	*Ardea*	*alba*
Intermediate	*Ardea*	*intermedia*
Little	*Egretta*	*garzetta*
Western Cattle	*Bubulcus*	*ibis*
Amur	*Falco*	*amurensis*
Lanner	*Falco*	*biarmicus*
Red-headed	*Amadina*	*erythrocephala*
Southern	*Lanius*	*collaris*
Greater	*Phoenicopterus*	*roseus*
Grey-winged	*Scleroptila*	*afra*
Orange River	*Scleroptila*	*gutturalis*
Domestic	*Anser*	*anser*
Egyptian	*Alopochen*	*aegyptiaca*
Spur-winged	*Plectropterus*	*gambensis*
Black-necked	*Podiceps*	*nigricollis*
Great Crested	*Podiceps*	*cristatus*
Little	*Tachybaptus*	*ruficollis*
Helmeted	*Numida*	*meleagris*
African Marsh	*Circus*	*ranivorus*
Black	*Circus*	*maurus*
Montagu's	*Circus*	*pygargus*
Pallid	*Circus*	*macrourus*
Black	*Egretta*	*ardesiaca*
Black-headed	*Ardea*	*melanocephala*
Goliath	*Ardea*	*goliath*
Grey	*Ardea*	*cinerea*
Purple	*Ardea*	*purpurea*
Striated	*Butorides*	*striata*
African	*Upupa*	*africana*
African Sacred	*Threskiornis*	*aethiopicus*
Glossy	*Plegadis*	*falcinellus*

Common species	Genus	Species
Hadada	*Bostrychia*	*hagedash*
Greater	*Falco*	*rupicoloides*
Rock	*Falco*	*rupicolus*
Pied	*Ceryle*	*rudis*
Black-winged	*Elanus*	*caeruleus*
Blue	*Eupodotis*	*caerulescens*
Northern Black	*Afrotis*	*afraoides*
African Wattled	*Vanellus*	*senegallus*
Blacksmith	*Vanellus*	*armatus*
Crowned	*Vanellus*	*coronatus*
Pink-billed	*Spizocorys*	*conirostris*
Red-capped	*Calandrella*	*cinerea*
Rufous-naped	*Mirafra*	*africana*
Spike-heeled	*Chersomanes*	*albofasciata*
Cape	*Macronyx*	*capensis*
Banded	*Riparia*	*cincta*
Brown-throated	*Riparia*	*paludicola*
Common House	*Delichon*	*urbicum*
Common	*Gallinula*	*chloropus*
Common	*Acridotheres*	*tristis*
Common	*Struthio*	*camelus*
Marsh	*Asio*	*capensis*
Speckled	*Columba*	*guinea*
African	*Anthus*	*cinnamomeus*
Plain-backed	*Anthus*	*leucophrys*
Kittlitz's	*Charadrius*	*pecuarius*
Three-banded	*Charadrius*	*tricollaris*
Southern	*Netta*	*erythrophthalma*
Black-winged	*Glareola*	*nordmanni*
Black-chested	*Prinia*	*flavicans*
Tawny-flanked	*Prinia*	*subflava*
Common	*Coturnix*	*coturnix*
Harlequin	*Coturnix*	*delegorguei*
Red-billed	*Quelea*	*quelea*
African	*Rallus*	*caerulescens*
Marsh	*Tringa*	*stagnatilis*
Wood	*Tringa*	*glareola*
South African	*Tadorna*	*cana*
Cape	*Spatula*	*smithii*
Red-backed	*Lanius*	*collurio*

Common species	Genus	Species
African	*Gallinago*	*nigripennis*
Cape	*Passer*	*melanurus*
House	*Passer*	*domesticus*
Southern Grey-headed	*Passer*	*diffusus*
Chestnut-backed	*Eremopterix*	*leucotis*
White-browed	*Plocepasser*	*mahali*
African	*Platalea*	*alba*
Swainson's	*Pternistis*	*swainsonii*
Cape	*Lamprotornis*	*nitens*
Pied	*Lamprotornis*	*bicolor*
Wattled	*Creatophora*	*cinerea*
Black-winged	*Himantopus*	*himantopus*
Little	*Calidris*	*minuta*
African	*Saxicola*	*torquatus*
White	*Ciconia*	*ciconia*
Barn	*Hirundo*	*rustica*
Greater Striped	*Cecropis*	*cucullata*
South African Cliff	*Petrochelidon*	*spilodera*
White-throated	*Hirundo*	*albigularis*
African Palm	*Cypsiurus*	*parvus*
Little	*Apus*	*affinis*
White-rumped	*Apus*	*caffer*
Red-billed	*Anas*	*erythrorhyncha*
Whiskered	*Chlidonias*	*hybrida*
White-winged	*Chlidonias*	*leucopterus*
Spotted	*Burhinus*	*capensis*
Cape Rock	*Monticola*	*rupestris*
Sentinel Rock	*Monticola*	*explorator*
Cape	*Gyps*	*coprotheres*
Cape	*Motacilla*	*capensis*
Common	*Estrilda*	*astrild*
Orange-breasted	*Amandava*	*subflava*
Southern Masked	*Ploceus*	*velatus*
Capped	*Oenanthe*	*pileata*
Mountain	*Myrmecocichla*	*monticola*
Pin-tailed	*Vidua*	*macroura*
Fan-tailed	*Euplectes*	*axillaris*
Long-tailed	*Euplectes*	*progne*
Red-collared	*Euplectes*	*ardens*
White-winged	*Euplectes*	*albonotatus*

Common species	Genus	Species
Green	*Phoeniculus*	*purpureus*
Red-throated	*Jynx*	*ruficollis*
Pentad: 2625_2845		
Bokmakierie	*Telophorus*	*zeylonus*
Hamerkop	*Scopus*	*umbretta*
Mallard	*Anas*	*platyrhynchos*
Neddicky	*Cisticola*	*fulvicapilla*
Quailfinch	*Ortygospiza*	*atricollis*
Ruff	*Calidris*	*pugnax*
Secretarybird	*Sagittarius*	*serpentarius*
Pied	*Recurvirostra*	*avosetta*
Acacia Pied	*Tricholaema*	*leucomelas*
Black-collared	*Lybius*	*torquatus*
Crested	*Trachyphonus*	*vaillantii*
European	*Merops*	*apiaster*
Southern Red	*Euplectes*	*orix*
Yellow	*Euplectes*	*capensis*
Yellow-crowned	*Euplectes*	*afer*
Dark-capped	*Pycnonotus*	*tricolor*
Cinnamon-breasted	*Emberiza*	*tahapisi*
Denham's	*Neotis*	*denhami*
White-bellied	*Eupodotis*	*senegalensis*
Common	*Turnix*	*sylvaticus*
Common	*Buteo*	*buteo*
Jackal	*Buteo*	*rufofuscus*
Black-throated	*Crithagra*	*atrogularis*
Yellow	*Crithagra*	*flaviventris*
Yellow-fronted	*Crithagra*	*mozambica*
Ant-eating	*Myrmecocichla*	*formicivora*
Sickle-winged	*Emarginata*	*sinuata*
Cloud	*Cisticola*	*textrix*
Desert	*Cisticola*	*aridulus*
Levaillant's	*Cisticola*	*tinniens*
Pale-crowned	*Cisticola*	*cinnamomeus*
Wing-snapping	*Cisticola*	*ayresii*
Zitting	*Cisticola*	*juncidis*
Red-knobbed	*Fulica*	*cristata*
Reed	*Microcarbo*	*africanus*
White-breasted	*Phalacrocorax*	*lucidus*
Burchell's	*Centropus*	*burchellii*

Common species	Genus	Species
Temminck's	*Cursorius*	*temminckii*
Blue	*Grus*	*paradisea*
Wattled	*Grus*	*carunculata*
Cape	*Corvus*	*capensis*
Pied	*Corvus*	*albus*
Diederik	*Chrysococcyx*	*caprius*
African	*Anhinga*	*rufa*
Cape Turtle	*Streptopelia*	*capicola*
Laughing	*Spilopelia*	*senegalensis*
Namaqua	*Oena*	*capensis*
Red-eyed	*Streptopelia*	*semitorquata*
Rock	*Columba*	*livia*
Fork-tailed	*Dicrurus*	*adsimilis*
African Black	*Anas*	*sparsa*
Fulvous Whistling	*Dendrocygna*	*bicolor*
Knob-billed	*Sarkidiornis*	*melanotos*
Maccoa	*Oxyura*	*maccoa*
White-backed	*Thalassornis*	*leuconotus*
White-faced Whistling	*Dendrocygna*	*viduata*
Yellow-billed	*Anas*	*undulata*
African Fish	*Haliaeetus*	*vocifer*
Black-chested Snake	*Circaetus*	*pectoralis*
Booted	*Hieraaetus*	*pennatus*
Spotted	*Bubo*	*africanus*
Great	*Ardea*	*alba*
Intermediate	*Ardea*	*intermedia*
Little	*Egretta*	*garzetta*
Western Cattle	*Bubulcus*	*ibis*
Amur	*Falco*	*amurensis*
Lanner	*Falco*	*biarmicus*
Peregrine	*Falco*	*peregrinus*
Red-footed	*Falco*	*vespertinus*
Cuckoo	*Anomalospiza*	*imberbis*
Red-headed	*Amadina*	*erythrocephala*
Southern	*Lanius*	*collaris*
Greater	*Phoenicopterus*	*roseus*
Lesser	*Phoeniconaias*	*minor*
Fiscal	*Melaenornis*	*silens*
Grey-winged	*Scleroptila*	*afra*
Orange River	*Scleroptila*	*gutturalis*

Common species	Genus	Species
Red-winged	*Scleroptila*	*levaillantii*
Domestic	*Anser*	*anser*
Egyptian	*Alopochen*	*aegyptiaca*
Spur-winged	*Plectropterus*	*gambensis*
Black-necked	*Podiceps*	*nigricollis*
Great Crested	*Podiceps*	*cristatus*
Little	*Tachybaptus*	*ruficollis*
Common	*Tringa*	*nebularia*
Helmeted	*Numida*	*meleagris*
Grey-headed	*Chroicocephalus*	*cirrocephalus*
African Marsh	*Circus*	*ranivorus*
Black	*Circus*	*maurus*
Montagu's	*Circus*	*pygargus*
Pallid	*Circus*	*macrourus*
Black	*Egretta*	*ardesiaca*
Black-crowned Night	*Nycticorax*	*nycticorax*
Black-headed	*Ardea*	*melanocephala*
Goliath	*Ardea*	*goliath*
Grey	*Ardea*	*cinerea*
Purple	*Ardea*	*purpurea*
Squacco	*Ardeola*	*ralloides*
European	*Pernis*	*apivorus*
African Sacred	*Threskiornis*	*aethiopicus*
Glossy	*Plegadis*	*falcinellus*
Hadada	*Bostrychia*	*hagedash*
Greater	*Falco*	*rupicoloides*
Lesser	*Falco*	*naumanni*
Rock	*Falco*	*rupicolus*
Malachite	*Corythornis*	*cristatus*
Pied	*Ceryle*	*rudis*
Black-winged	*Elanus*	*caeruleus*
Yellow-billed	*Milvus*	*aegyptius*
Blue	*Eupodotis*	*caerulescens*
Northern Black	*Afrotis*	*afraoides*
African Wattled	*Vanellus*	*senegallus*
Blacksmith	*Vanellus*	*armatus*
Crowned	*Vanellus*	*coronatus*
Eastern Clapper	*Mirafra*	*fasciolata*
Melodious	*Mirafra*	*cheniana*
Pink-billed	*Spizocorys*	*conirostris*

Common species	Genus	Species
Red-capped	*Calandrella*	*cinerea*
Rufous-naped	*Mirafra*	*africana*
Spike-heeled	*Chersomanes*	*albofasciata*
Cape	*Macronyx*	*capensis*
Banded	*Riparia*	*cincta*
Brown-throated	*Riparia*	*paludicola*
Common House	*Delichon*	*urbicum*
Rock	*Ptyonoprogne*	*fuligula*
Sand	*Riparia*	*riparia*
Common	*Gallinula*	*chloropus*
Common	*Acridotheres*	*tristis*
Common	*Struthio*	*camelus*
African Grass	*Tyto*	*capensis*
Marsh	*Asio*	*capensis*
Western Barn	*Tyto*	*alba*
Greater	*Rostratula*	*benghalensis*
Speckled	*Columba*	*guinea*
African	*Anthus*	*cinnamomeus*
Buffy	*Anthus*	*vaalensis*
Nicholson's	*Anthus*	*nicholsoni*
Plain-backed	*Anthus*	*leucophrys*
Yellow-breasted	*Anthus*	*chloris*
Common Ringed	*Charadrius*	*hiaticula*
Kittlitz's	*Charadrius*	*pecuarius*
Three-banded	*Charadrius*	*tricollaris*
Southern	*Netta*	*erythrophthalma*
Black-winged	*Glareola*	*nordmanni*
Black-chested	*Prinia*	*flavicans*
Tawny-flanked	*Prinia*	*subflava*
Common	*Coturnix*	*coturnix*
Harlequin	*Coturnix*	*delegorguei*
Red-billed	*Quelea*	*quelea*
African	*Rallus*	*caerulescens*
Cape	*Cossypha*	*caffra*
Common	*Actitis*	*hypoleucos*
Curlew	*Calidris*	*ferruginea*
Marsh	*Tringa*	*stagnatilis*
Wood	*Tringa*	*glareola*
Streaky-headed	*Crithagra*	*gularis*
South African	*Tadorna*	*cana*

Common species	Genus	Species
Cape	*Spatula*	*smithii*
Lesser Grey	*Lanius*	*minor*
Red-backed	*Lanius*	*collurio*
African	*Gallinago*	*nigripennis*
Cape	*Passer*	*melanurus*
House	*Passer*	*domesticus*
Southern Grey-headed	*Passer*	*diffusus*
Chestnut-backed	*Eremopterix*	*leucotis*
White-browed	*Plocepasser*	*mahali*
Black	*Accipiter*	*melanoleucus*
African	*Platalea*	*alba*
Swainson's	*Pternistis*	*swainsonii*
Cape	*Lamprotornis*	*nitens*
Pied	*Lamprotornis*	*bicolor*
Wattled	*Creatophora*	*cinerea*
Black-winged	*Himantopus*	*himantopus*
Little	*Calidris*	*minuta*
African	*Saxicola*	*torquatus*
Abdim's	*Ciconia*	*abdimii*
Black	*Ciconia*	*nigra*
White	*Ciconia*	*ciconia*
Yellow-billed	*Mycteria*	*ibis*
Barn	*Hirundo*	*rustica*
Greater Striped	*Cecropis*	*cucullata*
Lesser Striped	*Cecropis*	*abyssinica*
South African Cliff	*Petrochelidon*	*spilodera*
White-throated	*Hirundo*	*albigularis*
African	*Porphyrio*	*madagascariensis*
African Black	*Apus*	*barbatus*
African Palm	*Cypsiurus*	*parvus*
Alpine	*Tachymarptis*	*melba*
Common	*Apus*	*apus*
Horus	*Apus*	*horus*
Little	*Apus*	*affinis*
White-rumped	*Apus*	*caffer*
Blue-billed	*Spatula*	*hottentota*
Cape	*Anas*	*capensis*
Red-billed	*Anas*	*erythrorhyncha*
Whiskered	*Chlidonias*	*hybrida*
White-winged	*Chlidonias*	*leucopterus*

Common species	Genus	Species
Spotted	*Burhinus*	*capensis*
Karoo	*Turdus*	*smithi*
Sentinel Rock	*Monticola*	*explorator*
African Pied	*Motacilla*	*aguimp*
Cape	*Motacilla*	*capensis*
Lesser Swamp	*Acrocephalus*	*gracilirostris*
Willow	*Phylloscopus*	*trochilus*
Common	*Estrilda*	*astrild*
Orange-breasted	*Amandava*	*subflava*
Cape	*Ploceus*	*capensis*
Southern Masked	*Ploceus*	*velatus*
Capped	*Oenanthe*	*pileata*
Mountain	*Myrmecocichla*	*monticola*
Cape	*Zosterops*	*virens*
Long-tailed Paradise	*Vidua*	*paradisaea*
Pin-tailed	*Vidua*	*macroura*
Fan-tailed	*Euplectes*	*axillaris*
Long-tailed	*Euplectes*	*progne*
Red-collared	*Euplectes*	*ardens*
White-winged	*Euplectes*	*albonotatus*
Green	*Phoeniculus*	*purpureus*
Red-throated	*Jynx*	*ruficollis*

Palaeontological Impact Assessment for the proposed Okavango 17449 Prospecting Right application, southwest of Leandra, Mpumalanga Province

Desktop Study (Phase 1)

For

Eco-Elementum (Pty) Ltd

04 March 2023

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Palaeobotanist
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Expertise of Specialist

The Palaeontologist Consultant: Prof Marion Bamford
Qualifications: PhD (Wits Univ, 1990); FRSSAf, mASSAf
Experience: 34 years research and lecturing in Palaeontology
26 years PIA studies and over 350 projects completed

Declaration of Independence

This report has been compiled by Professor Marion Bamford, of the University of the Witwatersrand, sub-contracted by Eco-Elementum (Pty) Ltd, Pretoria, South Africa. The views expressed in this report are entirely those of the author and no other interest was displayed during the decision making process for the Project.

Specialist: Prof Marion Bamford

Signature: 

Executive Summary

A Palaeontological Impact Assessment was requested for the prospecting right application by Okavango Holdings (Pty) Ltd for several farms southwest of Leandra, western Mpumalanga Province. The farms are Winterhoek 314, Watervalshoek 350, Kuilwater 347, Wonderfontein 342, Wonderfonein 341, Palmietfontein 316 and Gruisfontein 344. This is known as the Okavango 17449 project.

To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development.

The proposed site lies mostly on non-fossiliferous Jurassic dolerite, with small areas on the potentially very highly fossiliferous Vryheid formation that might preserve fossil plants of the *Glossopteris* flora. According to borehole data, fine-grained shales and siltstones that are ideal for preservation, are rare in this part of the Highveld Coalfield. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, environmental officer or other designated responsible person once excavations, drilling or mining activities have commenced. The impact on the palaeontological heritage would be low, so as far the palaeontology is concerned, the prospecting permit should be granted. The results of the prospecting (presence of fossils and depth at which they occur) should be used for the mining right application.

Table of Contents

1. Background

Okavango Holdings (Pty) Ltd is applying for a Prospecting Right (PRA) on various portion of six farms located southwest of the town of Leandra, western Mpumalanga Province (Figure 1). The farms are Winterhoek 314, Watervalshoek 350, Kuilwater 347, Wonderfontein 342, Wonderfonein 341, Palmietfontein 316 and Gruisfontein 344 (Figures 2-3). This is known as the Okavango 17449 PR-Okavango Holdings (Pty) Ltd-2023-01-16 08-49.

A Palaeontological Impact Assessment was requested for the Okavango 17449 PRA project. To comply with the regulations of the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) was completed for the proposed development and is reported herein.

Table 1: National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) - Requirements for Specialist Reports (Appendix 6).

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	**Relevant section in report**
ai	Details of the specialist who prepared the report,	Appendix B
aii	The expertise of that person to compile a specialist report including a curriculum vitae	Appendix B
b	A declaration that the person is independent in a form as may be specified by the competent authority	Page 1
c	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
ci	An indication of the quality and age of the base data used for the specialist report: SAHRIS palaeosensitivity map accessed – date of this report	Yes
cii	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d	The date and season of the site investigation and the relevance of the season to the outcome of the assessment	N/A
e	A description of the methodology adopted in preparing the report or carrying out the specialised process	Section 2
f	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Section 4
g	An identification of any areas to be avoided, including buffers	N/A

	A specialist report prepared in terms of the Environmental Impact Regulations of 2017 must contain:	Relevant section in report
h	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
i	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
j	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Section 4
k	Any mitigation measures for inclusion in the EMPr	Section 8, Appendix A
l	Any conditions for inclusion in the environmental authorisation	N/A
m	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 8, Appendix A
ni	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised	Section 6
nii	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Sections 6, 8
o	A description of any consultation process that was undertaken during the course of carrying out the study	N/A
p	A summary and copies of any comments that were received during any consultation process	N/A
q	Any other information requested by the competent authority.	N/A
2	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

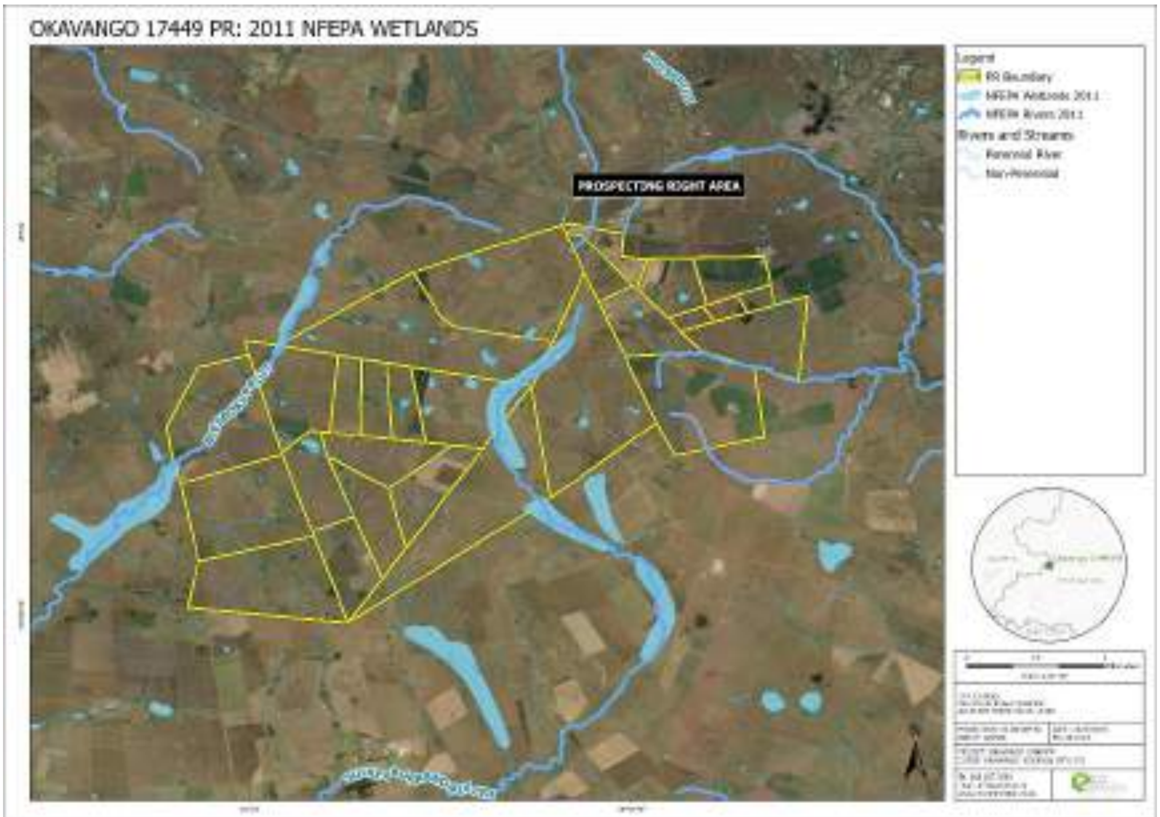


Figure 1: Annotated Google Earth map of the general area to show the relative landmarks. The Okavango 17449 prospecting area is shown by the yellow outlines.

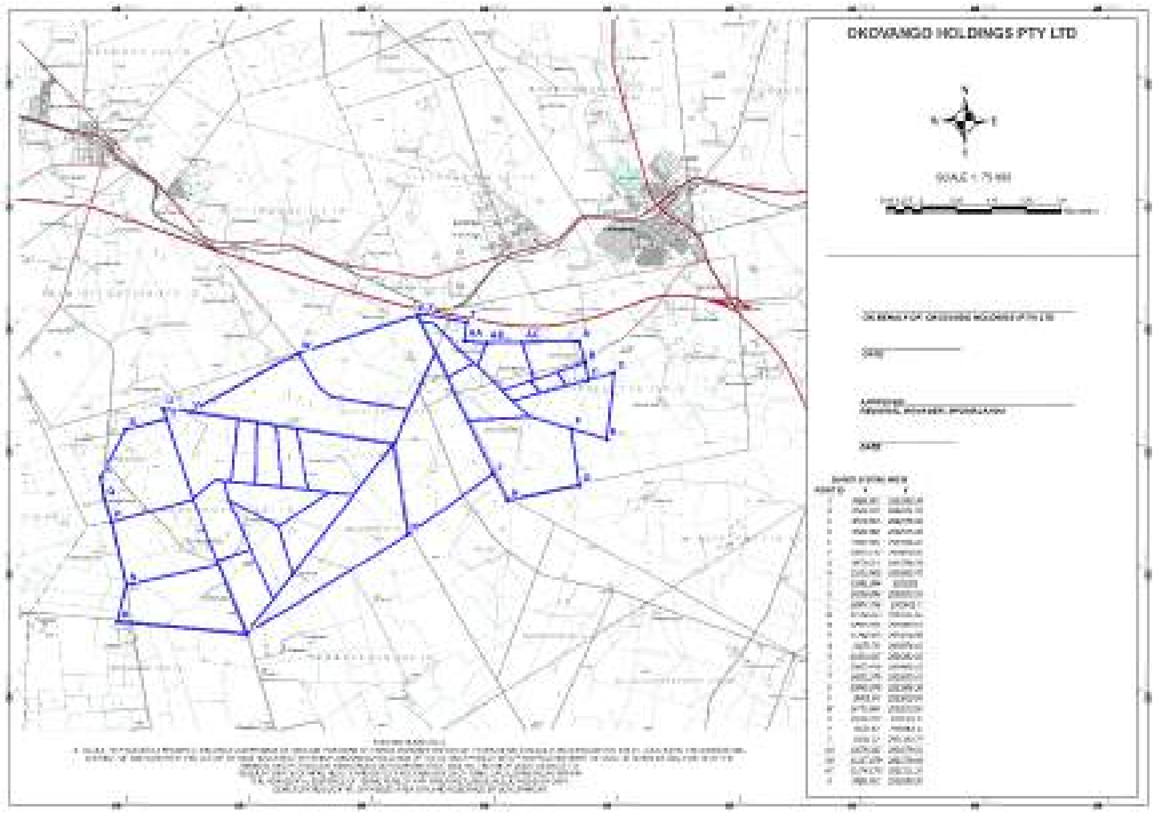


Figure 2: Topographic Map of the proposed PRA area for Okavango 17449 shown by the blue outline.

2. Methods and Terms of Reference

The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA.
The methods employed to address the ToR included:

1. Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases;
2. Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

3. Geology and Palaeontology

i. Project location and geological context

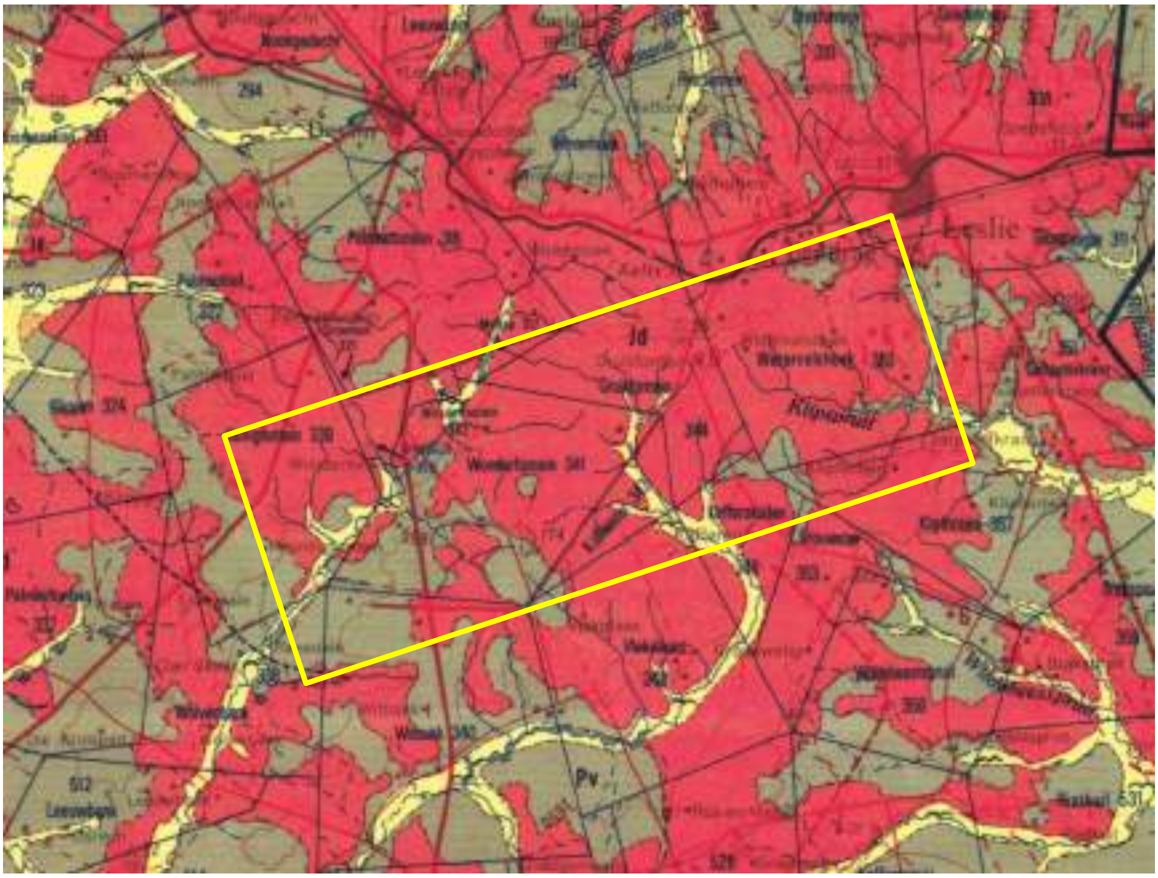


Figure 3: Geological map of the area around the proposed Okavango 17449 prospecting area with the project area indicated within the yellow rectangle. Abbreviations of the

rock types are explained in Table 2. Map enlarged from the Geological Survey 1: 250 000 map 2628 East Rand.

Table 2: Explanation of symbols for the geological map and approximate ages (Eriksson et al., 2006. Johnson et al., 2006; Partridge et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years; grey shading = formations impacted by the project.

Symbol	Group/Formation	Lithology	Approximate Age
Q	Quaternary	Alluvium, sand, calcrete	Quaternary Ca 1.0 Ma to present
Jd	Jurassic dykes	Dolerite dykes, intrusive	Jurassic, approx. 183 Ma
Pv	Vryheid Fm, Ecca Group, Karoo SG	Shale, mudstone, coal, sandstone	Middle Permian ca 266 – 260 Ma

The project lies in the central part of the main Karoo Basin where the older strata are exposed and extensive dolerite incursions are evident (Figure 3). Along the watercourses are much younger sands and alluvium.

The Karoo Supergroup rocks cover a very large proportion of South Africa and extend from the northeast (east of Pretoria) to the southwest and across to almost the KwaZulu Natal south coast. It is bounded along the southern margin by the Cape Fold Belt and along the northern margin by the much older Transvaal Supergroup rocks. Representing some 120 million years (300 – 183Ma), the Karoo Supergroup rocks have preserved a diversity of fossil plants, insects, vertebrates and invertebrates.

During the Carboniferous Period South Africa was part of the huge continental landmass known as Gondwanaland and it was positioned over the South Pole. As a result, there were several ice sheets that formed and melted, and covered most of South Africa (Visser, 1986, 1989; Isbell et al., 2012). Gradual melting of the ice as the continental mass moved northwards and the earth warmed, formed fine-grained sediments in the large inland sea. These are the oldest rocks in the system and are exposed around the outer part of the ancient Karoo Basin, and are known as the Dwyka Group. They comprise tillites, diamictites, mudstones, siltstones and sandstones that were deposited as the basin filled (Johnson et al., 2006).

Overlying the Dwyka Group rocks are rocks of the Ecca Group that are Early Permian in age. There are eleven formations recognised in this group but they do not all extend throughout the Karoo Basin. In the central and eastern part are the following formations, from base upwards: Pietermaritzburg, **Vryheid** and Volksrust Formations. All of these sediments have varying proportions of sandstones, mudstones, shales and siltstones and represent shallow to deep-water settings, deltas, rivers, streams and overbank depositional environments.

Large exposures of Jurassic dolerite dykes occur throughout the area. These intruded through the Karoo sediments around 183 million years ago at about the same time as the Drakensberg basaltic eruption.

ii. Palaeontological context

The palaeontological sensitivity of the area under consideration is presented in Figures 4-5. The site for prospecting is in the non-fossiliferous dolerite and the very highly sensitive shales of the Vryheid Formation.

The **Vryheid Formation** lies on the uneven topography of pre-Karoo or Dwyka Group rocks in the northern and northwestern margins, but lies directly on the Pietermaritzburg Formation in the central and eastern part. The lithofacies show a number of upward-coarsening cycles, some very thick, and they are essentially deltaic in origin. There are also delta-front deposits, evidence of delta switching, and fluvial deposits with associated meandering rivers, braided streams, back swamps or interfluves and abandoned channels (Cadle et al., 1993; Cairncross, 1990; 2001; Johnson et al., 2006). Coal seams originated where peat swamps developed on broad abandoned alluvial plains, and less commonly in the backswamps or interfluves. Most of the economically important coal seams occur in the fluvial successions (ibid). In the east (Mpumalanga and northern KwaZulu Natal), the Vryheid formation can be subdivided into a lower fluvial-dominated deltaic interval, a middle fluvial interval, and an upper fluvial-dominated deltaic interval again (Taverner-Smith et al., 1988). Vertebrates do not occur with the fossil plants.

Fossil plants of the *Glossopteris* flora occur in the Vryheid Formation. This flora includes *Glossopteris* leaves, seeds, fructifications, roots and wood, as well other groups such as the lycopods, sphenophytes, ferns, cordaitaleans and early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004).

Figure 4: SAHRIS palaeosensitivity map for the site for the proposed Okovango 17449 PRA shown within the yellow rectangle. Background colours indicate the following

degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

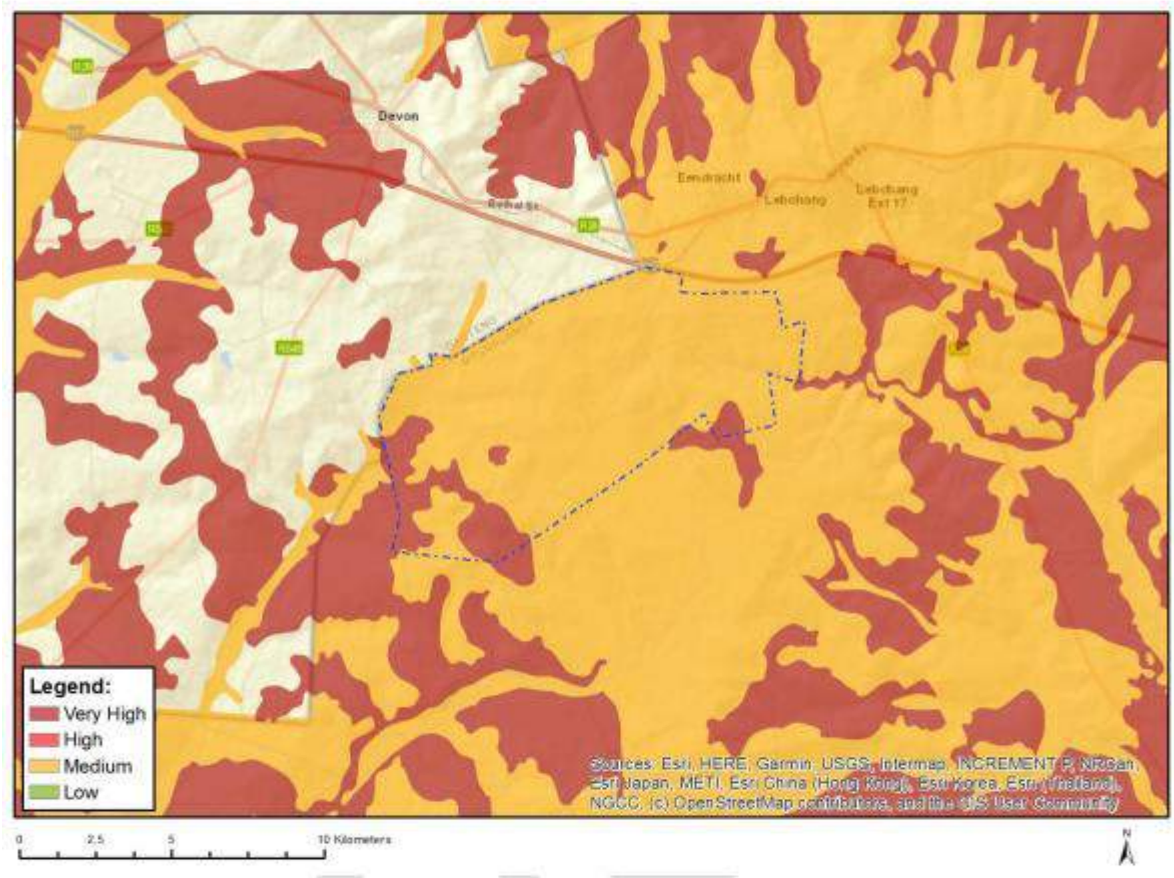


Figure 5: DFFE palaeosensitivity screening map for the Okavango 17449 PRA. Note the very high sensitivity is the same in both maps but the DFFE incorrectly shows the Jurassic dolerite as moderately sensitive (orange). Volcanic rocks do not preserve fossils so all the dolerite should be shown as grey.

Although coal is a product of intense alteration by heat and pressure on buried peats (dead plant matter), there are no visible plant structures in coal itself. Impressions and compression of the plants sometimes occur in the carbonaceous shales between coal seams. In the Leandra area the uppermost coal seam (No 5) is more than 20m below the ground surface and is covered by sandstone (based on borehole cores described by Snyman(1998), fig. 16), Furthermore, the area is sandstone-rich, with only narrow bands of shale and siltstone. Since sandstones are generally too coarse to preserve fossil leaves, shales are much better, the likelihood of fossil plants occurring in this area is low.

4. Impact assessment

An assessment of the potential impacts to possible palaeontological resources considers the criteria encapsulated in Table 3:

Table 3a: Criteria for assessing impacts

PART A: DEFINITION AND CRITERIA		
Criteria for ranking of the SEVERITY/NATURE of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national
PROBABILITY (of exposure to impacts)	**H**	Definite/ Continuous
	M	Possible/ frequent
	L	Unlikely/ seldom

Table 3b: Impact Assessment

PART B: Assessment		
SEVERITY/NATURE	**H**	-
	M	-
	L	Soils do not preserve fossils; so far there are no records from the Vryheid Fm of plant or animal fossils in this region so it is very unlikely that fossils occur on the site. The impact would be negligible
	L+	-
	M+	-
	H+	-
DURATION	**L**	-
	M	-
	H	Where manifest, the impact will be permanent.

PART B: Assessment		
SPATIAL SCALE	**L**	Since the only possible fossils within the area would be fossil plants in the shales of the Vryheid Fm, the spatial scale will be localised within the site boundary.
	M	-
	H	-
PROBABILITY	**H**	-
	M	It is extremely unlikely that any fossils would be found in the loose soils and sands that cover the area. It is possible that fossil plants of the Glossopteris flora may occur in the shales of the Vryheid Fm, therefore, a Fossil Chance Find Protocol should be added to the eventual EMPr.
	L	-

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the wrong type to contain fossils (dolerite). Since there is a small chance that fossils from the Vryheid Formation may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

5. Assumptions and uncertainties

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and some might contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils.

6. 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 and sands of the Quaternary. There is a very small chance that fossils may occur in the rare shales of the early Permian Vryheid Formation so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer or other responsible person once excavations and drilling for prospecting have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low, so as far the palaeontology is concerned, the prospecting permit should be granted. The results of the prospecting (presence of fossils and depth at which they occur) should be used for the mining right application.

7. References

Anderson, J.M., Anderson, H.M., 1985. Palaeoflora of Southern Africa: Prodromus of South African megafloras, Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam. 423 pp.

Bamford, M.K. 2004. Diversity of woody vegetation of Gondwanan southern Africa. Gondwana Research 7, 153-164.

Cadle, A.B., Cairncross, B., Christie, A.D.M., Roberts, D.L., 1993. The Karoo basin of South Africa: the type basin for the coal bearing deposits of southern Africa. International Journal of Coal Geology 23, 117-157.

Cairncross, B. 1990. Tectono-sedimentary settings and controls of the Karoo Basin Permian coals, South Africa. International Journal of Coal Geology 16, 175-178.

Cairncross, B. 2001. An overview of the Permian (Karoo) coal deposits of southern Africa. African Earth Sciences 33, 529–562.

Falcon, R.M.S. 1989. Macro- and micro-factors affecting coal-seam quality and distribution in southern Africa with particular reference to the No. 2 seam, Witbank coalfield, South Africa. International Journal of Coal Geology 12, 681-731.

Taverner-Smith, R., Mason, T.R., Christie, A.D.M., Smith, A.M., van der Spuy, M., 1988. Sedimentary models for coal formation in the Vryheid Formation, northern Natal. Bulletin of the Geological Survey of South Africa, 94. 46pp.

Johnson, M.R., van Vuuren, C.J., Visser, J.N.J., Cole, D.I., Wickens, H.deV., Christie, A.D.M., Roberts, D.L., Brandl, G., 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. and Thomas, R.J., (Eds). The Geology of South Africa. Geological Society of South Africa, Johannesburg / Council for Geoscience, Pretoria. Pp 461 – 499.

8. Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and discard must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone or coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones (for example see Figure 6). This information will be built into the EMP's training and awareness plan and procedures.

4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the contractor, developer or environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

9. Appendix A – Examples of fossils from the early Permian Vryheid Formation

Figure 6: Photographs of fossil plants from the Vryheid Formation.

10. Appendix B – Details of specialist

Curriculum vitae (short) - Marion Bamford PhD January 2023

Present employment	:	Professor; Director of the Evolutionary Studies Institute. Member Management Committee of the NRF/DSI Centre of Excellence Palaeosciences, University of the Witwatersrand, Johannesburg, South Africa
Telephone	:	+27 11 717 6690
Cell	:	082 555 6937
E-mail	:	marion.bamford@wits.ac.za ;

marionbamford12@gmail.com

ii) **Academic qualifications**
Tertiary Education: All at the University of the Witwatersrand:
1980-1982: BSc, majors in Botany and Microbiology. Graduated April 1983.
1983: BSc Honours, Botany and Palaeobotany. Graduated April 1984.
1984-1986: MSc in Palaeobotany. Graduated with Distinction, November 1986.
1986-1989: PhD in Palaeobotany. Graduated in June 1990.

iii) **Professional qualifications**
Wood Anatomy Training (overseas as nothing was available in South Africa):
1994 - Service d'Anatomie des Bois, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, by Roger Dechamps
1997 - Université Pierre et Marie Curie, Paris, France, by Dr Jean-Claude Koeniguer
1997 - Université Claude Bernard, Lyon, France by Prof Georges Barale, Dr Jean-Pierre Gros, and Dr Marc Philippe

iv) **Membership of professional bodies/associations**
Palaeontological Society of Southern Africa
Royal Society of Southern Africa - Fellow: 2006 onwards
Academy of Sciences of South Africa - Member: Oct 2014 onwards
International Association of Wood Anatomists - First enrolled: January 1991
International Organization of Palaeobotany – 1993+
Botanical Society of South Africa
South African Committee on Stratigraphy – Biostratigraphy - 1997 - 2016
SASQUA (South African Society for Quaternary Research) – 1997+
PAGES - 2008 –onwards: South African representative
ROCEEH / WAVE – 2008+
INQUA – PALCOMM – 2011+onwards

v) **Supervision of Higher Degrees**

All at Wits University

Degree	Graduated/completed	Current

Honours	13	0
Masters	13	3
PhD	13	7
Postdoctoral fellows	14	4

vi) **Undergraduate teaching**
Geology II – Palaeobotany GEOL2008 – average 65 students per year
Biology III – Palaeobotany APES3029 – average 25 students per year
Honours – Evolution of Terrestrial Ecosystems; African Plio-Pleistocene Palaeoecology; Micropalaeontology – average 12 - 20 students per year.

vii) **Editing and reviewing**
Editor: Palaeontologia africana: 2003 to 2013; 2014 – Assistant editor
Guest Editor: Quaternary International: 2005 volume
Member of Board of Review: Review of Palaeobotany and Palynology: 2010 –
Associate Editor: Cretaceous Research: 2018-2020
Associate Editor: Royal Society Open: 2021 -
Review of manuscripts for ISI-listed journals: 30 local and international journals

viii) **Palaeontological Impact Assessments**
25 years' experience in PIA site and desktop projects

- Selected from recent projects only – list not complete:
- Skeerpoort Farm Mast 2020 for HCAC
- Vulindlela Eco village 2020 for 1World
- KwaZamakhule Township 2020 for Kudzala
- Sunset Copper 2020 for Digby Wells
- McCarthy-Salene 2020 for Prescali
- VLNR Lodge 2020 for HCAC
- Madadeni mixed use 2020 for Enviropro
- Frankfort-Windfield Eskom Powerline 2020 for 1World
- Beaufort West PV Facility 2021 for ACO Associates
- Copper Sunset MR 2021 for Digby Wells
- Sannaspos PV facility 2021 for CTS Heritage
- Smithfield-Rouxville-Zastron PL 2021 for TheroServe
- Glosam Mine 2022 for AHSA
- Wolf-Skilpad-Grassridge OHPL 2022 for Zutari
- Iziduli and Msenge WEFs 2022 for CTS Heritage
- Hendrina North and South WEFs & SEFs 2022 for Cabanga
- Dealesville-Springhaas SEFs 2022 for GIBB Environmental
- Vhuvhili and Mukondelei SEFs 2022 for CSIR
- Chemwes & Stilfontein SEFs 2022 for CTS Heritage
- Equestria Exts housing 2022 for Beyond Heritage
- Zeerust Salene boreholes 2022 for Prescali
- Tsakane Sewer upgrade 2022 for Tsimba
- Transnet MPP inland and coastal 2022 for ENVASS
- Ruighoek PRA 2022 for SLR Consulting (Africa)
- Namli MRA Steinkopf 2022 for Beyond Heritage

ix) **Research Output**
Publications by M K Bamford up to January 2022 peer-reviewed journals or scholarly books: over 170 articles published; 5 submitted/in press; 14 book chapters.
Scopus h-index = 31; Google Scholar h-index = 39; -i10-index = 114 based on 6970 citations.
Conferences: numerous presentations at local and international conferences.

SCREENING REPORT FOR AN ENVIRONMENTAL AUTHORIZATION AS REQUIRED BY THE 2014 EIA REGULATIONS – PROPOSED SITE ENVIRONMENTAL SENSITIVITY

EIA Reference number: 22-2123

Project name: Okavango 17449 PR

Project title: Okavango 17449 PR Application

Date screening report generated: 16/01/2023 08:56:04

Applicant: Okavango Holdings (Pty) Ltd

Compiler: Eco Elementum (Pty) Ltd

Compiler signature:

………………………………………………………………………………………………

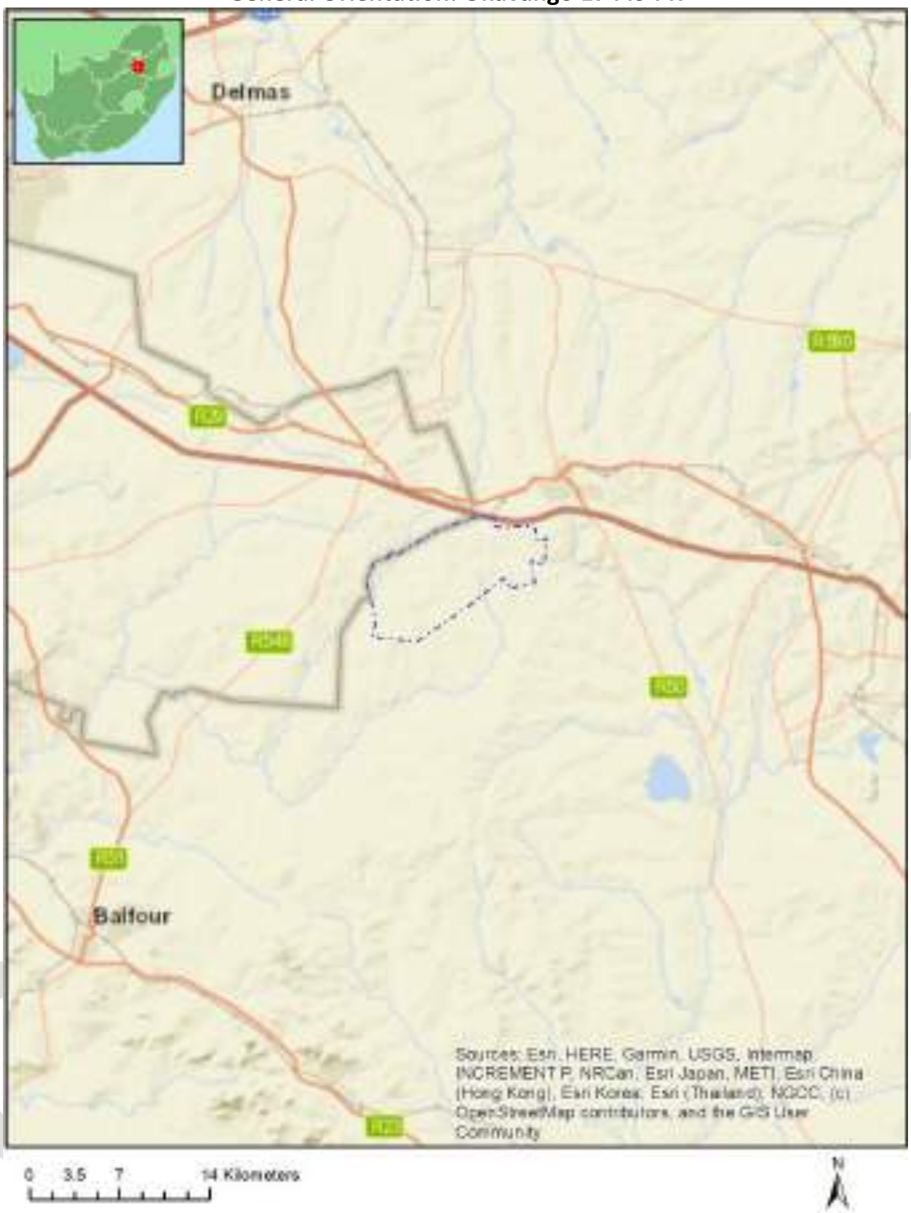
Application Category: Mining|Prospecting rights

Table of Contents

Proposed Project Location

Orientation map 1: General location

General Orientation: Okavango 17449 PR



Map of proposed site and relevant area(s)

Cadastral details of the proposed site

Property details:

No	Farm Name	Farm/ Erf No	Portion	Latitude	Longitude	Property Type
1	WINTERHOEK	314	0	26°22'28.94S	28°49'53.91E	Farm
2	WATERVALSHOEK	350	0	26°24'49.79S	28°54'20.55E	Farm
3	KUILWATER	347	0	26°27'10.34S	28°50'40.8E	Farm
4	WONDERFONTEIN	342	0	26°25'14.15S	28°48'6.47E	Farm
5	WONDERFONTEIN	341	0	26°26'56.45S	28°48'34.96E	Farm
6	PALMIETFONTEIN	316	0	26°23'48.24S	28°47'0.99E	Farm
7	GRUISFONTEIN	344	0	26°25'17.71S	28°51'2.68E	Farm
8	KUILWATER	347	0	26°27'10.34S	28°50'40.8E	Farm Portion
9	WATERVALSHOEK	350	26	26°24'37.64S	28°52'58.8E	Farm Portion
10	WONDERFONTEIN	341	14	26°26'1.55S	28°49'49.3E	Farm Portion
11	WONDERFONTEIN	342	0	26°25'14.15S	28°48'6.47E	Farm Portion
12	WATERVALSHOEK	350	1	26°25'57.83S	28°53'18.1E	Farm Portion
13	WONDERFONTEIN	341	9	26°26'13.61S	28°47'40.22E	Farm Portion
14	GRUISFONTEIN	344	2	26°24'37.98S	28°51'3.04E	Farm Portion
15	WATERVALSHOEK	350	35	26°24'7.22S	28°52'15.72E	Farm Portion
16	WONDERFONTEIN	341	15	26°25'58.97S	28°49'28.98E	Farm Portion
17	WATERVALSHOEK	350	32	26°24'25.78S	28°52'6.21E	Farm Portion
18	WATERVALSHOEK	350	4	26°24'31.06S	28°53'39.93E	Farm Portion
19	WONDERFONTEIN	341	12	26°28'7.57S	28°48'14.31E	Farm Portion
20	WONDERFONTEIN	341	3	26°26'37.59S	28°49'32.52E	Farm Portion
21	WONDERFONTEIN	341	7	26°26'2.93S	28°50'31.12E	Farm Portion
22	GRUISFONTEIN	344	1	26°25'54.29S	28°51'57.75E	Farm Portion
23	GRUISFONTEIN	344	3	26°25'14.6S	28°50'1.82E	Farm Portion
24	WATERVALSHOEK	350	19	26°25'1.23S	28°53'12.39E	Farm Portion
25	WINTERHOEK	314	3	26°24'3.63S	28°50'7.87E	Farm Portion
26	WONDERFONTEIN	341	4	26°27'0.74S	28°50'6.88E	Farm Portion
27	WONDERFONTEIN	341	8	26°25'56.22S	28°49'9.14E	Farm Portion

28	WONDERFONTEIN	341	2	26°25'50.55S	28°48'32.22E	Farm Portion
29	WATERVALSHOEK	350	17	26°25'14.38S	28°53'59.2E	Farm Portion
30	WATERVALSHOEK	350	27	26°24'53.92S	28°53'36.54E	Farm Portion
31	WATERVALSHOEK	350	3	26°25'6.2S	28°52'38.31E	Farm Portion
32	WATERVALSHOEK	350	28	26°24'46.86S	28°53'59.05E	Farm Portion
33	WINTERHOEK	314	6	26°23'57.47S	28°50'51.03E	Farm Portion
34	PALMIETFONTEIN	316	20	26°24'23.48S	28°49'29.76E	Farm Portion
35	WONDERFONTEIN	341	1	26°26'56.19S	28°48'47.33E	Farm Portion
36	WONDERFONTEIN	341	6	26°27'53.83S	28°49'9.93E	Farm Portion
37	WONDERFONTEIN	341	10	26°27'15.42S	28°47'56.82E	Farm Portion
38	WONDERFONTEIN	341	5	26°27'19.72S	28°49'27.1E	Farm Portion

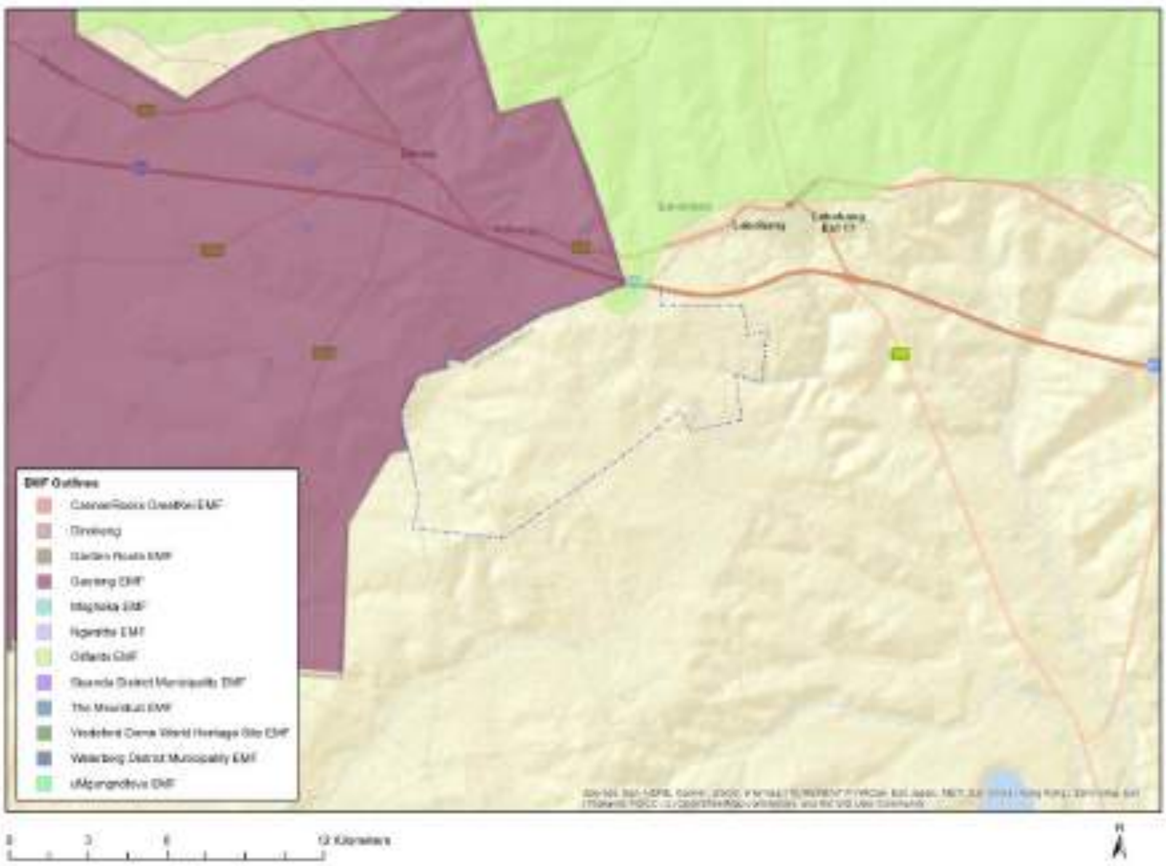
Development footprint[1] vertices:
No development footprint(s) specified.

Wind and Solar developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area

No	EIA Reference No	Classification	Status of application	Distance from proposed area (km)
1	14/12/16/3/3/2/706	Solar CSP	Approved	26.7

[1] “development footprint”, means the area within the site on which the development will take place and incudes all ancillary developments for example roads, power lines, boundary walls, paving etc. which require vegetation clearance or which will be disturbed and for which the application has been submitted.

Environmental Management Frameworks relevant to the application



Environmental Management Framework	LINK
Olifants EMF	https://screening.environment.gov.za/ScreeningDownloads/EMF/Zone_46,_67,_78,_80,_92,_103,_122,_129.pdf
Gauteng EMF	https://screening.environment.gov.za/ScreeningDownloads/EMF/GPEMF_2021_Gazette_and_summary.pdf

Environmental screening results and assessment outcomes

The following sections contain a summary of any development incentives, restrictions, exclusions or prohibitions that apply to the proposed development site as well as the most environmental sensitive features on the site based on the site sensitivity screening results for the application classification that was selected. The application classification selected for this report is:
Mining|Prospecting rights.

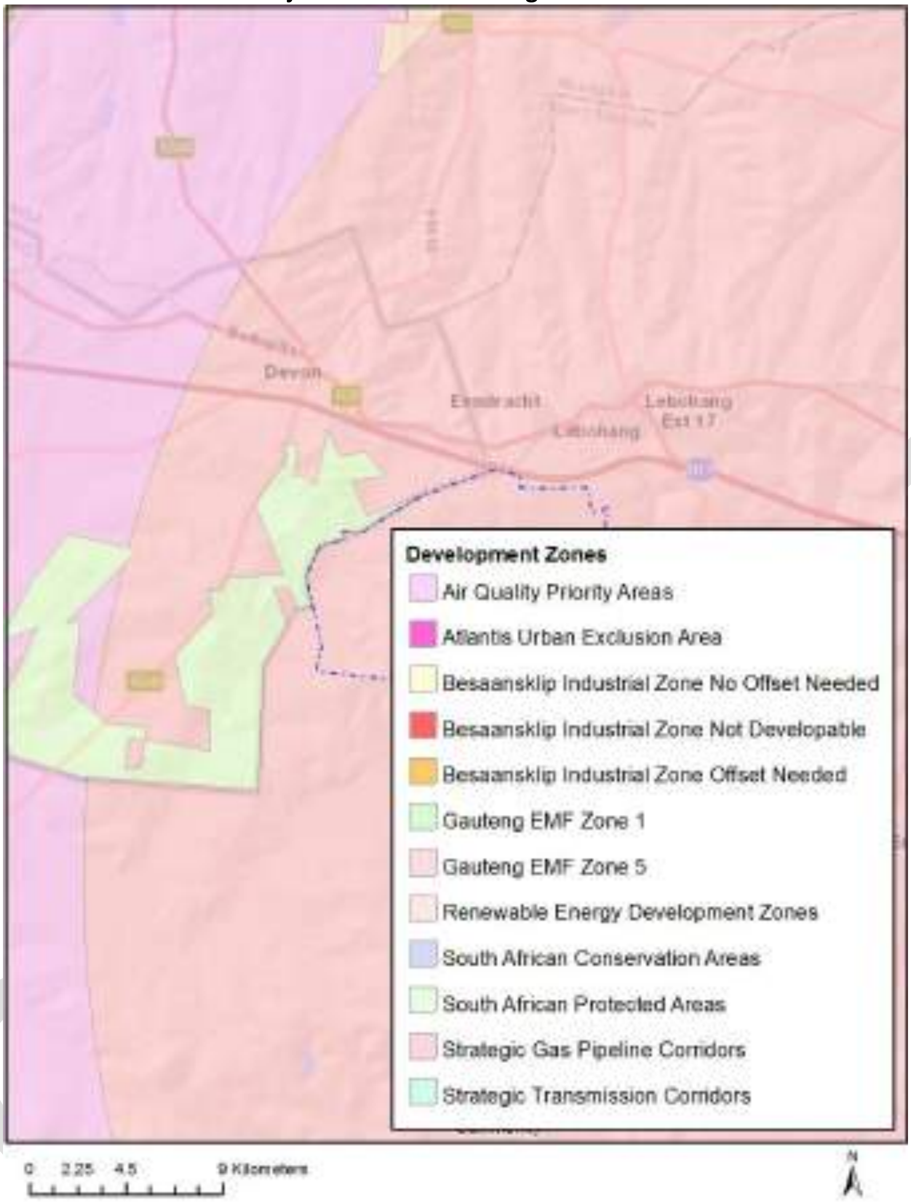
Relevant development incentives, restrictions, exclusions or prohibitions

The following development incentives, restrictions, exclusions or prohibitions and their implications that apply to this site are indicated below.

Incentive, restriction or prohibition	Implication
Air Quality-Highveld Priority Area	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/HIGHVELD_PRIORITY_AREA_AQMP.pdf
Strategic Gas Pipeline Corridors -Phase 8: Rompco Pipeline Corridor	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/Combined_GAS.pdf
South African Protected Areas	https://screening.environment.gov.za/ScreeningDownloads/DevelopmentZones/SAPAD_OR_2022_Q2_Metadata.pdf

Map indicating proposed development footprint within applicable development incentive, restriction, exclusion or prohibition zones

Project Location: Okavango 17449 PR



Proposed Development Area Environmental Sensitivity

The following summary of the development site environmental sensitivities is identified. Only the highest environmental sensitivity is indicated. The footprint environmental sensitivities for the proposed development footprint as identified, are indicative only and must be verified on site by a suitably qualified person before the specialist assessments identified below can be confirmed.

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme	X			
Animal Species Theme		X		

Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme		X		
Defence Theme				X
Paleontology Theme	X			
Plant Species Theme			X	
Terrestrial Biodiversity Theme	X			

Specialist assessments identified

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the following list of specialist assessments have been identified for inclusion in the assessment report. It is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study including the provision of photographic evidence of the site situation.

No	Specialist assessment	Assessment Protocol
1	Agricultural Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Agriculture_Assessment_Protocols.pdf
2	Archaeological and Cultural Heritage Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
3	Palaeontology Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
4	Terrestrial Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Terrestrial_Biodiversity_Assessment_Protocols.pdf
5	Aquatic Biodiversity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Aquatic_Biodiversity_Assessment_Protocols.pdf
6	Noise Impact Assess	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Noise_Impacts_Assessment_Protocol.pdf

	ment	
7	Radioactivity Impact Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_General_Requirement_Assessment_Protocols.pdf
8	Plant Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Plant_Species_Assessment_Protocols.pdf
9	Animal Species Assessment	https://screening.environment.gov.za/ScreeningDownloads/AssessmentProtocols/Gazetted_Animal_Species_Assessment_Protocols.pdf

Results of the environmental sensitivity of the proposed area.

The following section represents the results of the screening for environmental sensitivity of the proposed site for relevant environmental themes associated with the project classification. It is the duty of the EAP to ensure that the environmental themes provided by the screening tool are comprehensive and complete for the project. Refer to the disclaimer.

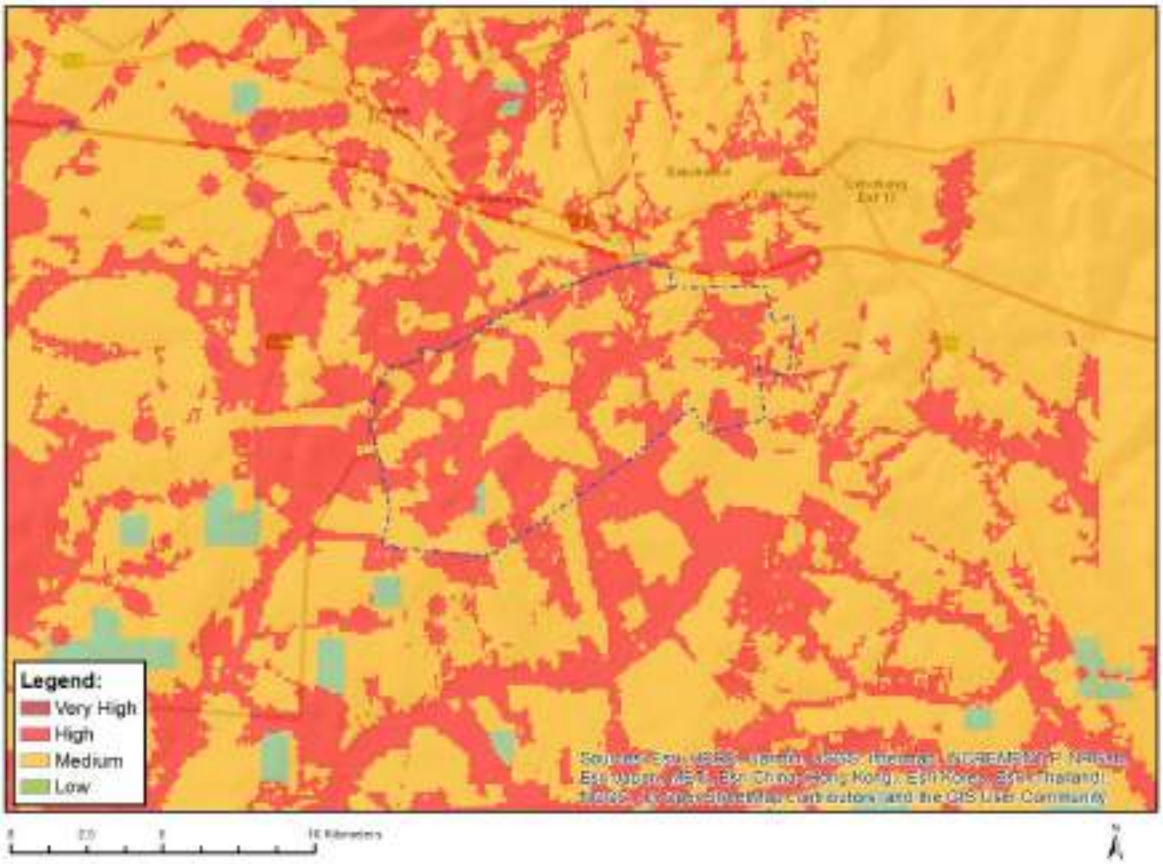
MAP OF RELATIVE AGRICULTURE THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;09. Moderate-High/10. Moderate-High
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
Very High	Horticulture / Viticulture;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

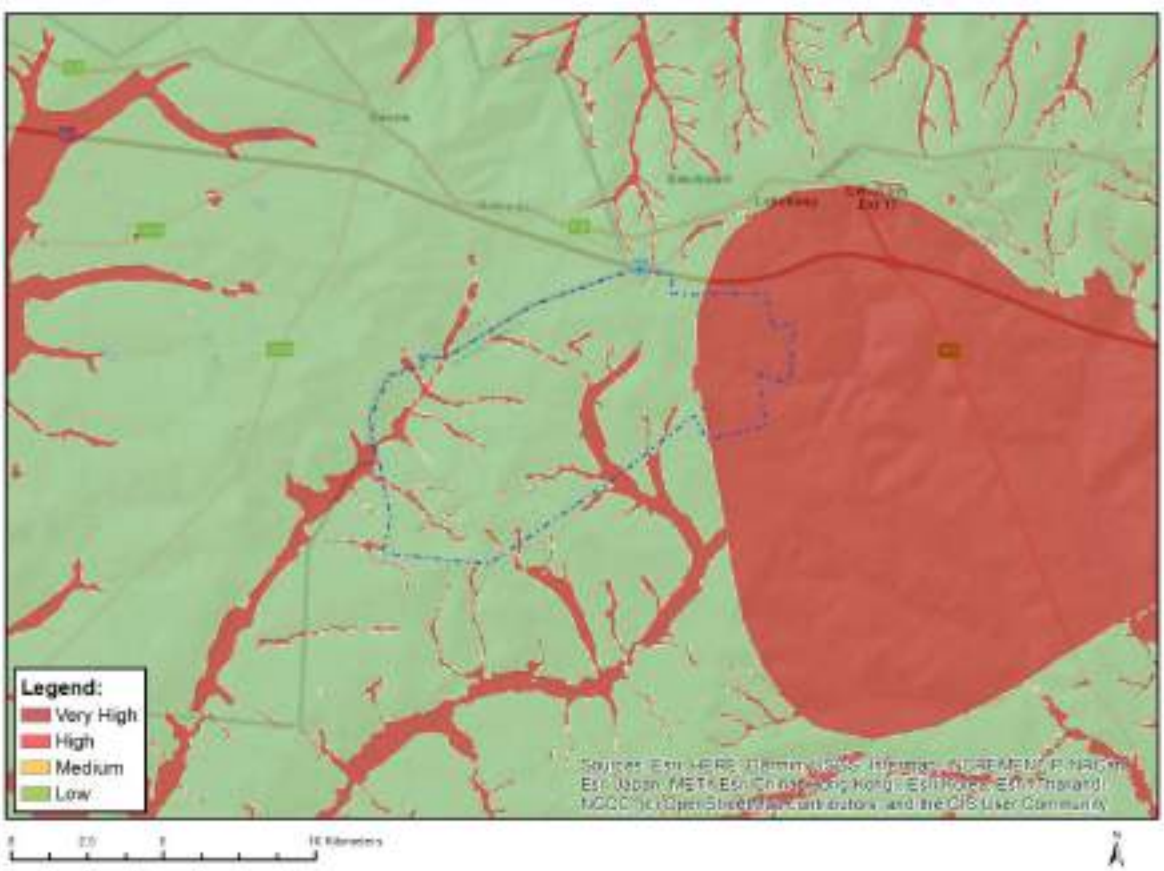
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Tyto capensis
High	Aves-Circus ranivorus
High	Aves-Neotis denhami
High	Aves-Sagittarius serpentarius
High	Aves-Eupodotis senegalensis
High	Aves-Grus carunculata
High	Aves-Mycteria ibis
Low	Subject to confirmation
Medium	Aves-Hydroprogne caspia
Medium	Aves-Neotis denhami
Medium	Aves-Balearica regulorum
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Tyto capensis

Medium	Insecta-Lepidochrysops procera
Medium	Mammalia-Chrysospalax villosus
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Dasymys robertsii
Medium	Mammalia-Hydrictis maculicollis

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

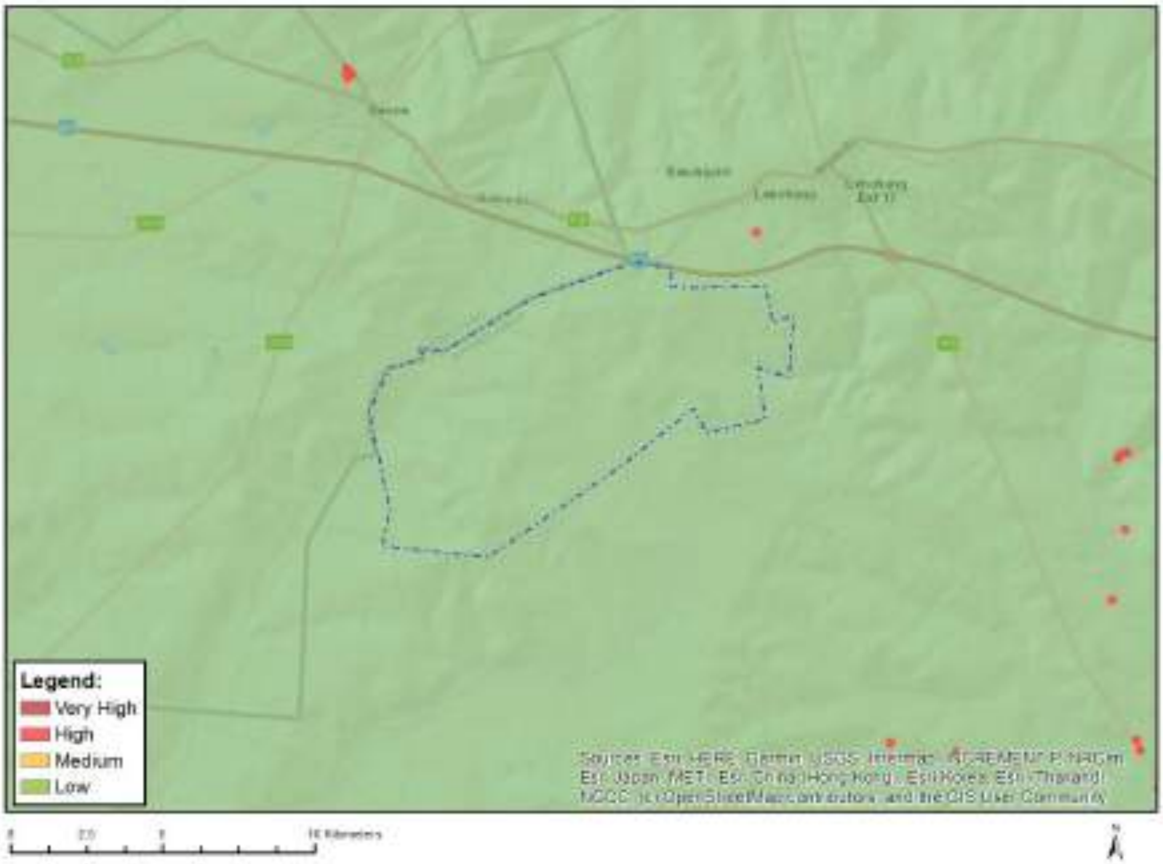


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Very High	Aquatic CBAs
Very High	Strategic water source area
Very High	Wetlands and Estuaries

MAP OF RELATIVE ARCHAEOLOGICAL AND CULTURAL HERITAGE THEME SENSITIVITY

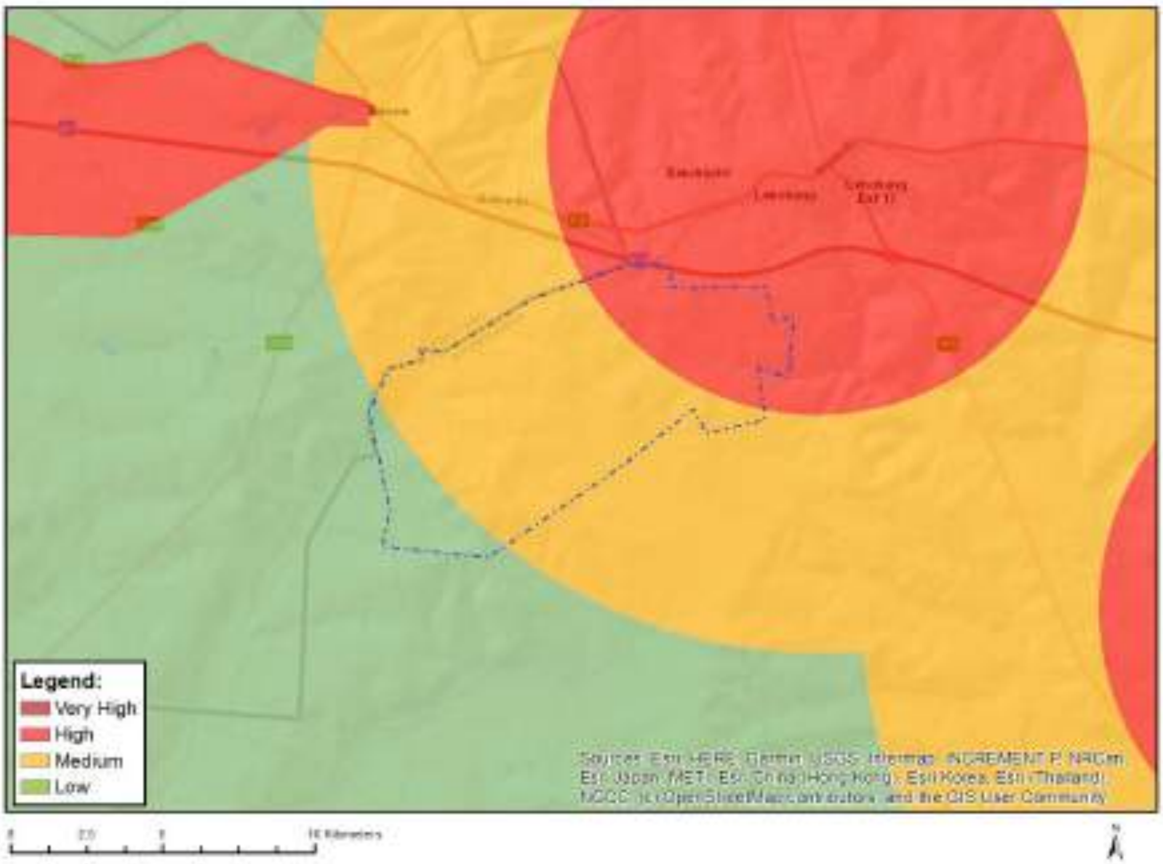


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity

MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Within 8 km of other civil aviation aerodrome
Low	Low sensitivity
Medium	Between 8 and 15 km of other civil aviation aerodrome

16/01/2023

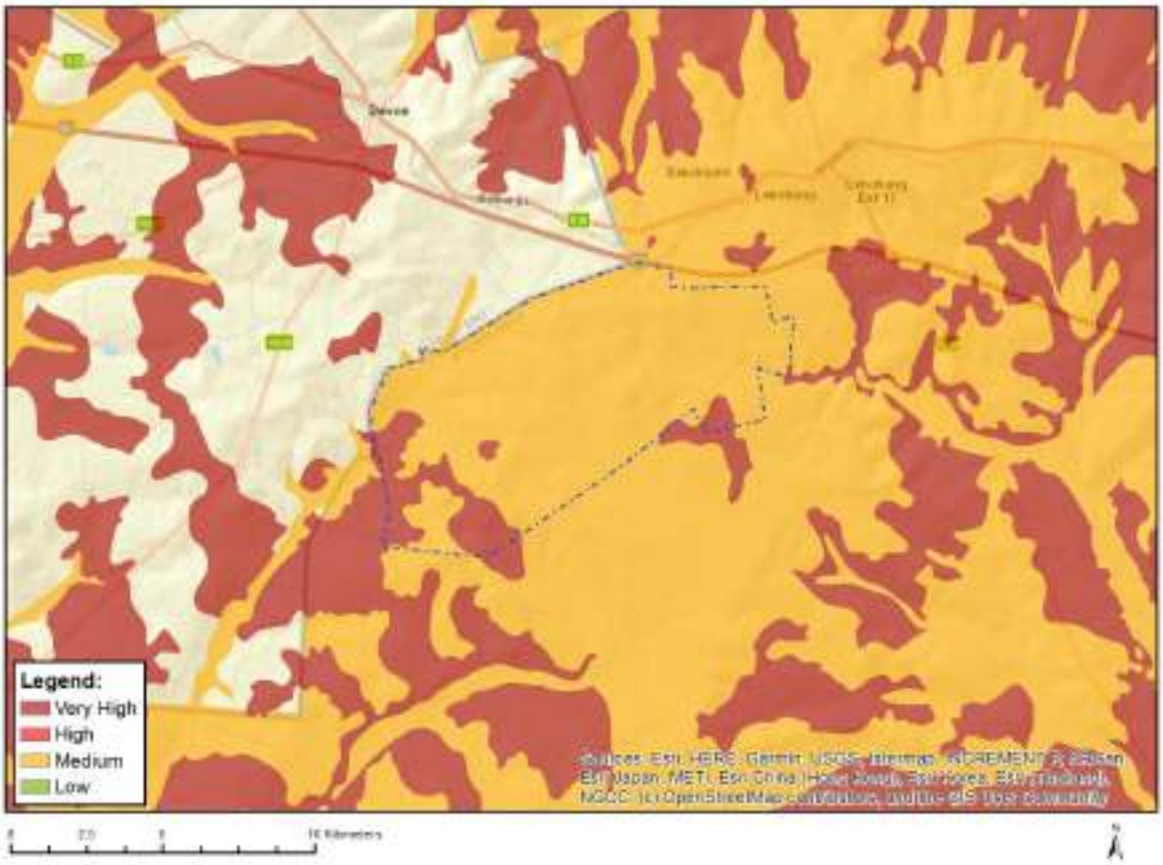
MAP OF RELATIVE DEFENCE THEME SENSITIVITY

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

MAP OF RELATIVE PALEONTOLOGY THEME SENSITIVITY

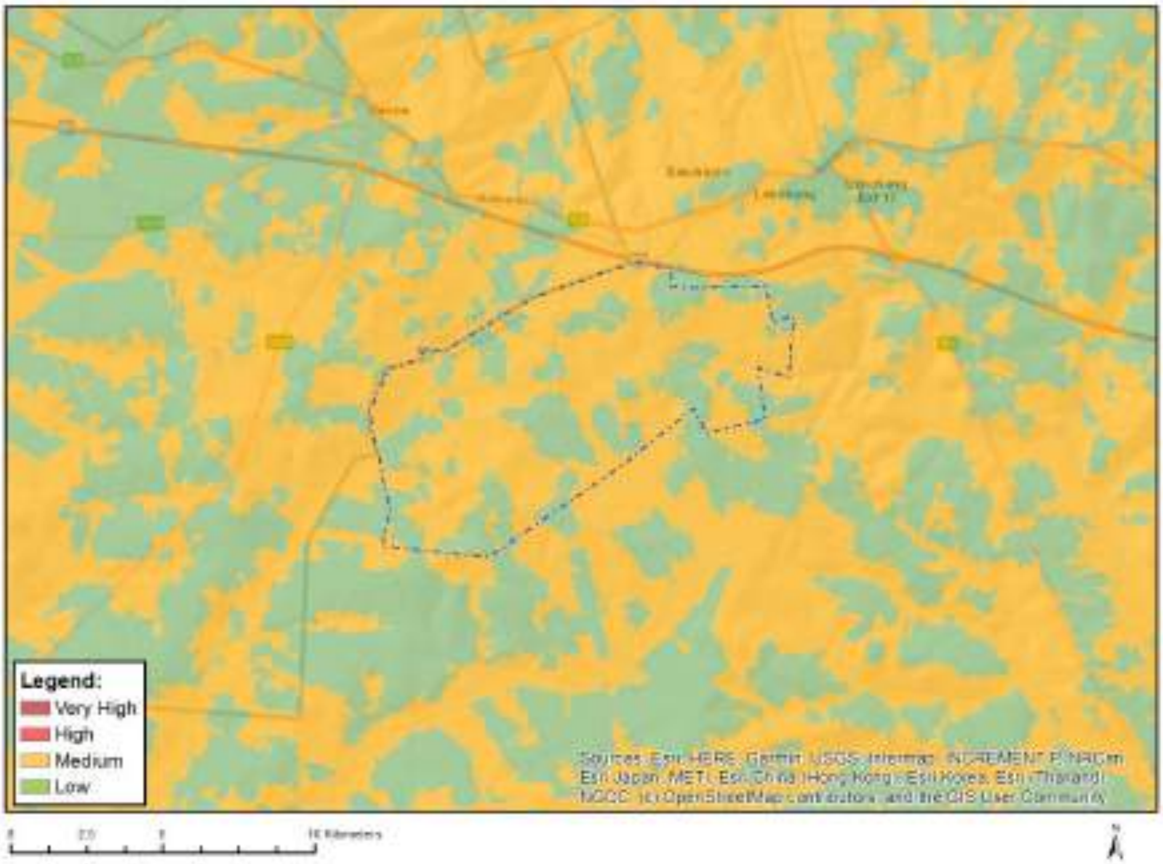


Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Features with a Medium paleontological sensitivity
Very High	Features with a Very High paleontological sensitivity

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



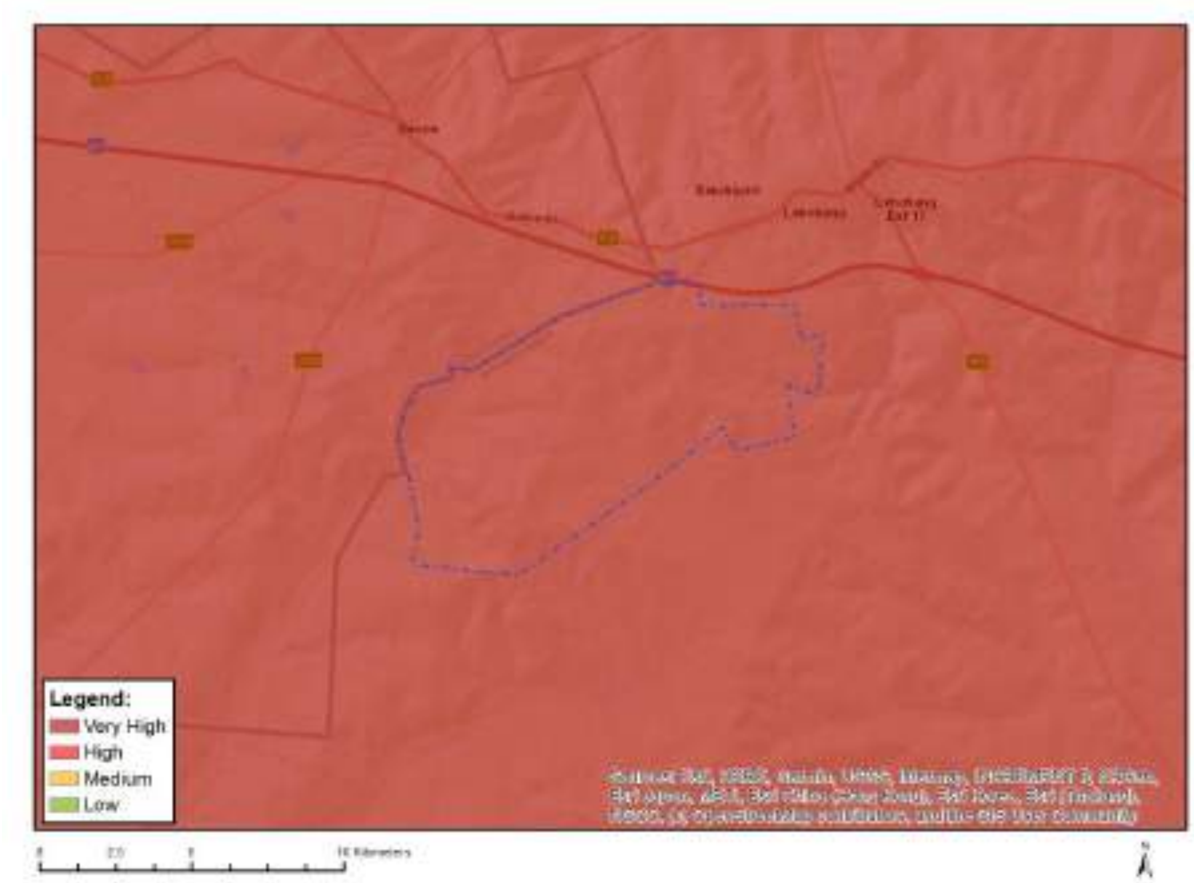
Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Medium	Sensitive species 1252
Medium	Sensitive species 691
Medium	Pachycarpus suaveolens

MAP OF RELATIVE TERRESTRIAL BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 1
Very High	Ecological support area
Very High	Critical biodiveristy area 2
Very High	Ecological support area: local corridor
Very High	Ecological support area: species
Very High	Protected Areas Expansion Strategy
Very High	Critically endangered ecosystem
Very High	Vulnerable ecosystem
Very High	Devon Protected Environment

16/01/2023